

# **Research on the Design of the Intelligent Management Platform for the Integration of Production and Education in Higher Vocational Colleges from the Perspective of "Internet +"**

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**Abstract:** Deepening integration of production and education is a strategic measure for the country to promote the development of education. The "National Pilot Implementation Plan for integration of production and education" proposes to explore the construction of a regional information service platform for integration of production and education in order to reduce the costs of institutional transaction in cooperation between colleges and enterprises. Focus on solving outstanding problems involves in Information asymmetry and unsmooth docking in college-enterprise cooperation. Based on the analysis of the background of the construction of the intelligent management platform for integration of production and education, this article proposes the feasibility of building an information service platform for the integration of production and education from the perspective of "Internet +". Then clarify the design body of the intelligent management platform for integration of production and education, determine the design principles and main content of intelligent management platform for integration of production and education, and relevant suggestions and strategies are put forward for the operating mechanism of intelligent management platform for integration of production and education in higher vocational colleges.

## **1. Introduction**

Deepening integration of production and education is a national strategic measure to promote the development in education priority, talent leadership, industrial innovation and high-quality economy <sup>[1]</sup>. An effective docking communication platform is the key to achieving integration of production and education. In 2019, the National Development and Reform Commission issued the "National Pilot Implementation Plan for integration of production and education" (hereinafter referred to as the "Plan"). The "Plan", which clearly pointed out the need to reduce the institutional transaction costs of college-enterprise cooperation, focus on solving outstanding problems such as the asymmetry of college-enterprise cooperation information and unsmooth docking and cooperation. It explores the construction of a regional information service platform for integration of production and education.

It can be seen that in the information age where technologies such as the Internet of Things, artificial intelligence, 5G, cloud computing and big data are rapidly developing, an intelligent management platform for the integration of production and education based on the "Internet +" perspective is to be created.

For the realization of the precise connection of various needs of colleges and enterprises, the promotion of industry-leading enterprises in conjunction with vocational colleges and colleges and universities to form a substantive operation of industry-education integration groups (alliances), and build industry scientific research innovation, achievement transformation, information docking, education service platforms, and promoting the connotative development of higher vocational colleges has important practical significance.

## **2. The background and feasibility analysis of the construction of intelligent management**

## **platform for the integration of production and education**

The intelligent management platform for integration of production and education is based on the Internet as well as integration of production and education is based on the social foundation. Building an industry-oriented high-quality professional development model carrier through resource construction, talent training, innovation and entrepreneurship, and improvement and breakthroughs in regional economic service capabilities.

Building an intelligent management platform for integration of production and education based on the "Internet +" perspective is not only the result of the development of the Internet era, but also the result of the continuous and in-depth advancement of integration of production and education.

### **2.1. Rapidly developing in information technology supports for platform building**

"Internet+" is the most important feature in the information age. On September 29, 2020, the China Internet Network Information Center (CNNIC) released the 46th "Statistical Report on China's Internet Development Status" (hereinafter referred to as the "Report"). The annual "Report" is a multi-angle and all-round data display of my country's Internet infrastructure, the size and structure of Internet users, the development of Internet applications, the development of Internet government affairs, and Internet security.

The "Report" pointed out that China's five-tier online service system has taken shape. The system covers urban and rural areas, interlocks up and down, and has clear levels", "cross-to-side and vertical-to-bottom".

The network infrastructure has been continuously improved, and the F, I, L, J, and K root mirror servers have been introduced successively to promote more complete network infrastructure security protection, the development of the network security industry has entered the "fast lane". Nowadays, network security products and services have gone from the basic the field of network security extends to cloud services, big data, Internet of Things, industrial control, 5G and other different application scenarios, achieving comprehensive coverage of multiple dimensions such as basic equipment, basic technologies, security systems, and security services <sup>[2]</sup>.

Nowadays, "Internet+" is an important part of daily life around production, working, and learning. In the meanwhile, rapidly developing information technologies such as the Internet of Things, artificial intelligence, 5G, cloud computing, and big data are gradually entering the daily management of government, enterprises, colleges and other departments.

It also supports for the technologies in the intelligent management platform of integration of production and education.

### **2.2. Transformation and development of economic society supports for the platform building**

China is currently in a critical period of transformation and development. Deepening integration of production and education and promoting college-enterprise cooperation are major measures taken by China to promote the development of industrial innovation and economic transformation.

In January 2019, the State Council promulgated the "National Vocational Education Reform Implementation Plan"(hereinafter referred to as the "Plan"), which mentions the term "integration of production and education" is up to ten times. The Plan proposes to build tens of thousands of integrated enterprises of production and education, build high-level professional training bases for integration of production and education, establish production-education-integrated certification systems and organize the implementation of modern vocational education related to integration of production and education, etc. These measures fully reflect the state's emphasis on integration of production and education between enterprises and colleges in the development of vocational education.

In October 2019, the State Council issued the "National Pilot Implementation Plan for the Integration of Production and Education". Followed by Guizhou Province, Guangdong Province, Shanghai and other pilot projects to build the first batch of national integrated cities of production and education successively released relevant implementation plans.

Take Shanghai as an example. In August 2020, Shanghai released the "Shanghai Pilot Program for Building an Integrated City of Production and Education", which puts forward the development ideas of deepening the reform of vocational education and higher education based on the establishment of an information exchange platform, explores the establishment of an information service platform for the integration of production and education, encourages companies to participate in operations, provides information services such as industry news release, talent demand and forecast, college resources, etc., and promotes the precise connection of supply and demand between colleges and industry organizations, enterprises, and industrial parks.

It can be seen that in the period of economic and social transformation and development, the creation of an intelligent management platform for the integration of production and education in higher vocational colleges has become the meaning of promoting the integration of production and education.

### **2.3. The connotative development of higher vocational colleges provides internal motivation for platform building**

In 2019, in order to implement the spiritual instructions of the National Education Conference and the "National Vocational Education Reform Implementation Plan", we will concentrate our efforts on building vocational schools and professional groups with Chinese characteristics and world standards, and drive the continuous deepening of vocational education reforms, strengthen connotation construction, and achieve For high-quality development, the Ministry of Education decided to implement a high-level vocational school and professional construction plan with Chinese characteristics, also known as the "Double High Plan".

The "Double High Plan" is undoubtedly another "heart-strengthening shot" injected into the development of higher vocational education after the implementation of the national backbone demonstration higher vocational college construction plan. The integration of production and education is exactly the important principles of the "Double-High Plan".

Adhere to integration of production and education, college-enterprise cooperation is an innovative operating model for the development of higher vocational education and industry integration, which helps to accurately meet the needs of regional talents, enhance the ability of higher vocational schools to service industry transformation and upgrading, and promote the formation of destiny for higher vocational colleges and enterprises community is an important support and foothold for accelerating the construction of a modern vocational education system.

In 2020, the Ministry of Education issued the "Vocational College Digital Campus Specification" to replace the "Vocational College Digital Campus Construction Specification" promulgated in 2015, clearly proposing that the management service information system should realize data integration, intercommunication and sharing, and build an integrated information service platform. Achieve the goal of "letting information run more and teachers and students running less errands".

It can be seen that, as one of the important layouts for realizing integration of production and education, the establishment of an information interaction platform between enterprises and vocational colleges has become an important symbol of the level of connotation development of vocational colleges. The connotative development of vocational colleges provides internal driving force for the creation of an intelligent management platform for integration of production and education in vocational colleges.

## **3. The design body and design principles of intelligent management platform for integration of production and education**

### **3.1. Government, industry organization, Enterprise, College: The main body of intelligent management platform for integration of production and education**

The design of intelligent management platform for integration of production and education and education is closely related to the fields involved in the integration of production and education.

Under the background that multi-party collaborative education has become a consensus, this

research believes that the current integration of production and education includes at least four main bodies, such as "government, industry organization, enterprise and college".

Main body 1: Government. As a whole, coordinate the development pattern of integration of production and education, systematically plan the implementation plan, and undertake the functions of overall planning, resource allocation, and macro-control<sup>[3]</sup>.

Main body 2: Industry Organization. Perform functions such as formulating industry technical specifications, talent demand forecasting, college-enterprise cooperation, education and teaching guidance, and vocational skills appraisal in the process of integration of production and education.

Main body 3: Enterprise. The main body of the achievement conversion in the process of integration of production and education is mainly technological innovation, knowledge innovation, technology transfer and knowledge application<sup>[4]</sup>, and at the same time, knowledge inheritance and dissemination through production practice training.

Main body 4: College. The subject of "education" in the process of integration of production and education is mainly responsible for the training of high-skilled talents and the innovation and research and development of key production technologies of the company

These four main bodies make the intelligent management platform for integration of production and education become a comprehensive information carrier that is coordinated and guided by the government for the training of technical skills and meets the needs of the enterprise industry, which can not only serve professional construction but also effectively serve industry enterprises<sup>[5]</sup>

Meanwhile, the new era background also gives the four main bodies of intelligent management platform for integration of production and education to rely on each other and promote the development of each other.

The government as the "coordinator" is based on the overall design of the effective integration of the social industrial system and the vocational education system based on social development, the government and industry associations constitute the external environment for IPE between enterprises and colleges, enterprises and colleges are the most direct participants in the process of integration of production and education, and are the key to the success of integration of production and education. The success of integration of production and education provides intellectual and human support for the development of the regional economy and industry.

### **3.2. Design principles of intelligent management platform for the integration of production and education**

The purpose of the construction of intelligent management platform for integration of production and education is to reduce the institutional transaction costs of college-enterprise cooperation, realize the accurate docking of college-enterprise cooperation information, and integrate all kinds of industry-education activities, technical courses and training teaching, and industry-education integration. Training bases, production-education integration technology parks, crowd-creation spaces, and industrial colleges are organized to form a standard open IMP based on the Internet platform.

Since this platform is an intelligent platform that integrates production-education-integrated cities, industry-education-integrated industries, industry-education-integrated enterprises, and industry-education-integrated colleges, it covers "Internet + government affairs" and "Internet + production". "Information systems such as "Internet + commerce" and "Internet + teaching management", in order for this platform to better exert its potential value in information sharing, resource coordination, and decision-making support. Therefore, the following design principles should be followed when building the platform.

#### **3.2.1. Demand analysis, unified standards**

The main purpose of building an intelligent management platform for integration of production and education is to realize the information interconnection of the government, enterprises, industries, and colleges in the field of integration of production and education. However, in a specific aspect, its needs may be different due to their different interest needs or social responsibilities.

The government may expect that intelligent management platform for integration of production

and education can promote the continuous economic and social development of the region, and it also needs to play a certain regulatory role. Enterprises hope to provide enterprises with qualified talents through the platform on the one hand, with the help of the colleges' technical guidance to solve the technical problems for enterprises.

The industry hopes to gather industry resources through this platform, improve the industry chain, formulate industry standards, and enhance the industry's social reputation. Building an intelligent management platform for integration of production and education is useful not only for students to meet the practical training needs, but also for teachers to participate in the timely getting the latest information of the industry.

Therefore, in addition to fully analyzing the needs of all parties, uniformity of platform design standards is also necessary. The intelligent management platform for integration of production and education which involves the four main bodies of "government, industry organization, enterprise and college" has covered countless companies and industry colleges. Therefore, it is difficult to design separately. The platform must be unified first. When formulating the platform, it is a must to unify the data indicators of the colleges and the enterprises and determine the business norms. To ensure that more units participate in the operation of the platform through open interfaces in the future, and then develop a personalized service system is developed separately according to the unique needs of each subject

### **3.2.2. Hierarchical advancement, comprehensive coverage**

As a system integration, the intelligent management platform for integration of production and education which involves "government, industry organization, enterprise and college" is destined to adopt the "one platform involved multiple systems" design model. "One platform" refers to the intelligent management platform for integration of production and education, and "multi-system" refers to the subsystems of the four main bodies according to their own needs. Due to the particularity of this design pattern, the platform needs to adopt hierarchical advancement and comprehensive coverage design principles in the process.

Hierarchical advancement means that the multiple subsystems under the intelligent management platform for integration of production and education are not developed simultaneously. Instead, the internal systems of the colleges and the enterprises are developed first, and then the connection the college- enterprise subsystem is realized. Subsequently the subsystems of industry organization and government management departments, and then realize the integration of multiple sub-systems to become an intelligent comprehensive management platform.

Compared with the previous social management service platforms, most of the top-level design which adopted the top-down design and development plan is led by government. This bottom-up hierarchical design plan is based on the two main bodies of integration of production and education, take enterprises and colleges as a starting point, giving priority to designing two basic subsystems according to the actual conditions of colleges and enterprises, and then designing government and industry subsystems on this basis, which can overcome the information asymmetry caused by top-down design losses can also give play to the overall planning function of the government and industry organizations.

Comprehensive coverage is carried out on the basis of hierarchical advancement. After the design requirements of the two basic systems are met, the design and development are carried out in accordance with the needs of the government and the industry.

On this basis, the platform design also needs to reserve some modules and interfaces to ensure the subsequent access of other subsystems and the function expansion of other systems.

## **4. The content and operating mechanism of the intelligent management platform for integration of production and education in higher vocational colleges**

Higher vocational colleges are an important participant in intelligent management platform. The improvement of talent quality requires higher vocational colleges to change the single knowledge education model. It has become an inevitable trend for enterprises and colleges to use their respective

advantages to participate in talent training together. At the same time, the transformation of knowledge production mode requires the deep integration of scientific research results of higher vocational colleges and enterprise scientific and technological innovation results <sup>[6]</sup>.

After analyzing the overall design of the intelligent management platform for integration of production and education, this article studies the content and operating mechanism of the industry-education intelligent management platform from the standpoint of higher vocational colleges.

#### **4.1. The content of the intelligent management platform for integration of production and education in higher vocational colleges**

As a subsystem of the general platform, the intelligent management platform for integration of production and education in higher vocational colleges, according to the development concept of integration of production and education and collaborative education. Relying on Internet of Things, cloud computing, virtual reality and other Internet technologies, the platform can be designed into 4 sub-platforms. The four sub-platforms are teaching resource platform, smart learning platform, industry-university-research platform, and public service platform.

The teaching resource platform is the infrastructure and resource environment guarantee for the in-depth implementation of integration of production and education. The resource quality of the existing digital teaching websites is not high. Most of them are simple listing of course content, not strong interaction, emphasis on quantity, and light on quality <sup>[7]</sup>, the teaching resource platform of the intelligent management platform for integration of production and education in higher vocational colleges mainly covers the curriculum resource center, case resource center, professional group resource center, dual-professional teacher team management center, shared base information center, etc.

The teaching resource platform in the "Internet +" era will no longer be a simple digital collection of teaching resources, but will reflect the characteristics of intelligence. The collection, push, and presentation of teaching resources need to be individualized.

The smart learning platform is based on emerging technologies such as artificial intelligence, big data, and the Internet of Things. It relies on various smart devices and networks to create a smart learning support environment for learners.

The "Educational Information 2.0 Action Plan" pointed out that it is necessary to vigorously promote intelligent education, develop a learner-centered intelligent teaching support environment, promote the full-process application of artificial intelligence in teaching and management, and use intelligent technology to accelerate talent training Reform of models and teaching methods, exploring the construction and application of a new environment for ubiquitous, flexible and intelligent education and teaching.

<sup>[8]</sup> The training of talents in higher vocational colleges is extremely dependent on the actual production environment, with particular emphasis on personal experience. The training of talents lacking practical training in production is tantamount to "talking on paper". The rise of information technologies such as virtual reality and artificial intelligence will undoubtedly provide more favorable conditions for integration of production and education. Therefore, the smart learning platform for integration of production and education in higher vocational colleges will be supported by 5 experience centers, which are teaching big data center, innovation and entrepreneurship center, joint teaching and research center, professional operation center, and virtual studio center.

The industry-university-research platform is an important aspect of resource sharing in the process of college-enterprise cooperation and IPE. If it is said that the teaching resource platform and the smart learning platform are mainly to deepen the connotation of integration of production and education from the perspective of co-education of talents, then the industry-university-research platform emphasizes the "feedback" of the college to the development of the enterprise from the perspective of technology sharing.

The platform mainly covers Open Laboratory Information Center, Engineering Technology Information Center, Industry College Information Center, Science Park Management Center, etc.

The public service platform is an important auxiliary subsystem of the intelligent management

platform for integration of production and education, which is used to assist the training of talents and technology research and development in the process of integration of production and education among colleges, governments, industries, and enterprises, mainly includes the Intellectual Property Transaction Information Center, the Talent Demand Information Center, the Vocational Skills Appraisal Center, the University Student Innovation and Entrepreneurship Information Center, and so on.

The above four platforms cover the four major areas of teaching, learning, research, and social services involved in the process of vocational colleges participating in integration of production and education.

Through the platform to carry out the construction of curriculum resources, smart learning practices, critical technical challenges, "two teachers in one lesson" embedded integration innovation, Internet + innovation colleges, Internet + industry development research and other connotative constructions, vocational colleges will further promote integration of production and education. It is not only clear in form, but also solid in content.

## **4.2. Operation mechanism of the intelligent management platform for integration of production and education in higher vocational colleges**

### **4.2.1. Top-level planning, overall management**

The intelligent management platform for integration of production and education in higher vocational colleges, as an important part of the entire intelligent management platform for integration of production and education, is no longer a simple information display and query website in the Internet era, but is based on big data and cloud computing centers. Architecture, an information system with massive data and powerful functions. It is necessary to do a top-level planning before operation to achieve overall management.

In particular, the following three tasks need to be done:

Firstly, to clarify the development concept. As mentioned above, the intelligent management platform for integration of production and education in higher vocational colleges covers at least four platforms: teaching resources, smart learning, industry-university-research integration, and public services. Each platform contains multiple small modules. The effective operation of the intelligent management platform for integration of production and education is inseparable from the coordinated operation of various small modules. Therefore, it is necessary to unify the development concept before the platform runs. The in-depth promotion of integration of production and education as a responsibility recognized by all departments is one of the development goals of each department.

Secondly, to determine the organization. Integration of production and education is a collaborative innovation education activity that all departments of the college need to participate in. It is necessary to break through the absolute boundary barriers and constraints inside and outside the various institutions, and promote the optimal allocation and reasonable flow of education resources in accordance with the education rules<sup>[9]</sup>. The organizational structure must be determined to build whether the organizational department of the entity or a management committee based on working relationships. It will play a coordinating and leading role in integration of production and education throughout the colleges.

Thirdly, to improve system construction. Through system construction, the rights and interests that all departments in the college should enjoy when participating in integration of production and education are guaranteed.

At the same time, their respective responsibilities can be clarified through a sound system, so that the operation of the intelligent management platform for the integration of production and education in higher vocational colleges can be regulated.

### **4.2.2. Demand motivation, clear rights and responsibilities**

The construction of an intelligent management platform for integration of production and education in higher vocational colleges is not only the embodiment of the realization of "Internet + government" in the implementation of the concept of integration of production and education in



higher vocational colleges in the information age, but also the adaptation of the university's talent training model and social service model to the adjustment of economic industrial structure. The initiative is an exploration and practice of the reform of the talent training model for colleges and universities forced by economic transformation and upgrading.

The development of the platform has not only the internal demand motivation of higher vocational colleges, but also the demand motivation outside the colleges. The internal demand motivation of higher vocational colleges is mainly reflected in two aspects of talent training and scientific and technological services. The driving force of demand outside the college is mainly driven by policy, social psychology, and market demand. How to transform external demand power into internal demand power will be the direction that the platform needs to work hard on during its operation.

First of all, actively strive for resource allocation. In the context of supply-side structural reforms, in addition to obtaining funds and policies from the government, colleges also need to use their own advantages in disciplines, talents, and scientific and technological resources to obtain the resources in experimental training, research and development, etc. from industry organizations and enterprises.

Second, respect the interests of various external entities, unify them with college development, achieve mutual benefit and win-win results, and share the results of integration of production and education.

Finally, clarify the rights and responsibilities of all parties.

In order to coordinate the distribution of rights and responsibilities between various departments, the rights and responsibilities of each platform and sub-module can be clarified through various rules and regulations internally. Externally, it can be determined by integration of production and education agreement.

#### **4.2.3. Dynamic adjustment, coordinated linkage**

The dynamic coordination mechanism is to coordinate the various relationships between the system and the external environment, as well as between the vertical and horizontal directions within the system. It is a behavioral mechanism that makes the division of labor and cooperation, clear powers and responsibilities, cooperates with each other, and effectively achieves goals and improves overall efficiency.

On the one hand, the intelligent management platform for integration of production and education in higher vocational colleges is a general platform, established by the various departments of the college, based on the goal of integration of production and education. It is also a section of the large platform for integration of production and education. The coordination of powers and financial powers, personnel powers and decision-making powers among the modules requires the establishment of a dynamic adjustment mechanism for external parties to deal with the division of labor and cooperation between the government, industry organizations and enterprises.

The intelligent management platform for integration of production and education in higher vocational colleges based on "Internet +" provides good technical conditions for the operation of the dynamic adjustment mechanism. Monitoring the needs of the status, includes professional integration of production and education, job capabilities and technical breakthroughs, etc. through big data analysis, which promotes the upgrading of the teaching resource library for integration of production and education, improves the intelligent learning support platform, enhances the industry-education-research skills, improves the service quality of the public service platform, and promotes the high-quality development of integration of production and education.

#### **4.2.4. Performance evaluation, improve efficiency**

Performance evaluation is the evaluation of the completion of the main indicators of the platform operation, and plays a guiding, diagnosing and stimulating role for the various modules of the platform in personnel training, scientific and technological services, platform construction, etc., and helps to improve the overall benefits of integration of production and education in higher vocational colleges.

The following four steps need to be taken in the intelligent management platform for integration of production and education in vocational colleges:



Firstly, determine the main body of evaluation. Generally speaking, the daily evaluation is mainly led by the government or higher-level management departments. However, with the increasing emphasis on user experience today, the performance evaluation of the platform can not only stop at the top-down evaluation, but also requires the participation of teachers, students and enterprises to participate in the evaluation process.

Secondly, develop evaluation criteria. The formulation of standards can be carried out using classification and stratification methods. For example, the intelligent management platform for integration of production and education in higher vocational colleges is composed of four sub-platforms. Each sub-platform has different functions and goals so that the evaluation standards for whether to complete the performance goals are also different. Therefore it needs to be adapted to local conditions and classified evaluation. The hierarchical evaluation criteria can set different levels of evaluation goals according to the goals of each sub-module at each stage.

Thirdly, determine the evaluation method. The determination of the evaluation method is mainly to assign scores to each evaluation standard and determine the weight of each module. It is also necessary to determine the evaluation period, and make good use of process evaluation and summative evaluation as needed.

Finally, pay attention to the application of evaluation results. The ultimate purpose of the evaluation is reflected in the application of evaluation results. Due to the application of information technology such as big data and cloud computing, data analysis of professional construction, operation, online learning, employment, etc. can achieve data-based platform operation functions Diagnosis and quality improvement.

## 5. Conclusion

The integration of production and education, and college-enterprise cooperation, as the key way to talent training, have become important promoters of promoting the high-quality development of vocational education. The advent of the Internet + era puts forward higher requirements for college-enterprise cooperation, and also provides feasible solutions for college-government-business-enterprise (colleges, governments, industries, and enterprises) to solve problems such as information asymmetry and unsmooth docking and cooperation. On this basis, intelligent management platform for the integration between production and education designed according to the principle of "demand analysis, unified standards, hierarchical advancement, and comprehensive coverage" will play a role in overall management, clarification of rights and responsibilities, dynamic adjustment, and performance evaluation for the integration of production and education in higher vocational colleges. It plays a major role in promoting the quality and efficiency of higher vocational education.

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