

# Research on Adaption Strategy of Higher Vocational Colleges Based on Industry 4.0

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**Abstract:** The new revolution of science and technology impacts and overturns the original human production and lifestyle widely and profoundly with the Industry 4.0 as the engine, so that the social production and the people's lifestyle, behavioral habit and thinking mode can be changed and remodeled revolution. In the national educational system, the higher vocational colleges are firstly impacted by the Industry 4.0 most widely and profoundly, and this is due to the basic function and mission of the higher vocational education in China. Under the new situation, the higher vocational colleges in China should undertake the important responsibility to build, develop and cultivate professional qualified inter-disciplinary talents, change the original ideas, integrate the Industry 4.0 technology basic ideas, adapt to the new ecological, dock with the artificial intelligence and incubate new achievement, expand new routes in order to promote the healthy development of own adaptability.

**Keywords:** Industry 4.0; Higher vocational education; Educational ecology; Talents training mode; School-Enterprise fusion

## 1. Introduction

At present, the Industry 4.0 mode is carried out comprehensively, and the incubated new technological achievement goes deep into social production and life. Technological achievements of the fourth industrial revolution that takes the informatization and automation technology as the main means and marks are widely applied and impact and overturn the people's production and life with unprecedented strength. The industry transboundary, industry fusion, idea overturn, mode change, thinking and management mode are fermented and reconstructed deeply and permanently. The influence, innovation, creativity and fusion will change the ecological environment of all industries, create and build new existence mode and thought and thoroughly change the whole world.<sup>[1]</sup>

The issuing of 13<sup>th</sup> Five Year Plan of National Educational Business<sup>[2]</sup> clearly promotes the educational reform to provide talent support for the nation building. The Outline points out higher vocational colleges are the major component of national education system, and it should closely follow the national economic development strategy and cultivate high-skilled and professional inter-disciplinary talents as well as the "modern craftsmen" that adapt to the social development and construction. Therefore, the flourished higher vocational education in China should clear up the tide impact of the fourth industrial revolution, utilize the advantages, define the reform goal, renovate the talents' training mode, adapt to the fusion and integration of new technology quickly, build the new development route of higher vocational education and create the new advantage of personalized competition and cooper-

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ation to enhance the core competitiveness of vocational education and expand the new vision of vocation education.<sup>[3]</sup>

## 2. Influence of the Fourth Industrial Revolution (with the Industry 4.0 As the Engine) on the Higher Vocational Education in China

### 2.1 Connotation of the Fourth Industrial Revolution

The first three industrial revolutions of human social change, that is, the "Age of Steam", the "Age of Electricity" and the "Age of Information", integrate the resource of human social development with the counterattack and build a common fusion ecosphere.

The formal concept of the fourth industrial revolution that takes the "Internet +" as the main characteristic and the carrier was put forward on the Germany Hanover Industrial Fair in April of 2011, that is, the "Industry 4.0". Main characteristics: the information technology acts on the whole field of social production and life; the industrial automation technology realizes stronger transboundary fusion of all industries. Big data, cloud computing and Internet of Things realize the integration, fusion and sharing of the information technology and achievements, greatly reducing the direct intervention in human power on production and life and accelerating the participation of automation robot in production and life. The influence and overturn of the industrial revolution (with the Industry 4.0 as the engine) on the productivity liberation, social production and social life are unprecedented. Humankind has stepped into the gate of industrial automation technology.

At present, the world is just in the front end or starting period of the fourth industrial revolution, and the speed, breadth, depth and system change exceed those of all previous industrial revolutions. In general, the characteristic of industrial revolution is: all industrial revolutions took

place when the social productivity developed to a certain stage and the production relationship and productivity had many contingencies; all industrial revolutions had linear influence and promotion of the temporal social production, social life and social civilization; the influence of each revolution was deeper and deeper.

### 2.2 Influence of the Fourth Industrial Revolution in the Vocational Education in China

At present, the quantity of China vocational education is about 1,300 schools, which accounts for about 35 million of the general college student enrollments (71 million). Among them, the quantity of higher vocational education students is about 20 million.

The higher vocational education in China enters the competition winning stage from the scale expansion stage, and some areas enter the advanced stage of personalized competition and cooperation in advance. Currently, there are about 100 higher vocational demonstration and backbone colleges in China. The strategy "high-quality college" is implemented quickly to promote the personalized competition and cooperation construction, create the core competitiveness, adapt to the requirement of Industry 4.0, improve the talent cultivation quality, promote the industry-university-research incubation technical capacity, press ahead the technical application and integration and give impetus to the Chinese economic and social development.

It turns out that vocational education is the engine of social and economic development, industry expansion and enterprise growth, and its development guides the talent demand of social and economic development to some extent. "Made in China" is impossible without the talent active power of vocational education. The strategy planning Made in China 2025 aims to transform and upgrade the

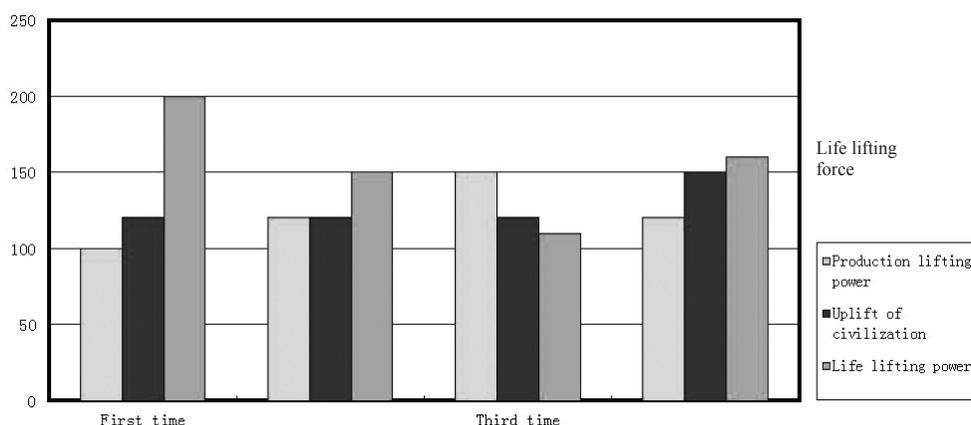


Figure 1. Influence of the fourth industrial revolution in the social and life development

manufacturing industry through the fusion of informatization and industrialization and the "Internet +" technology to realize the crossing from "Made in China" to "Created in China". Therefore, the strategic conception Made in China 2025 is basically consistent with the purpose of the fourth industrial revolution. "The Chinese high-speed railway technology becomes the world standard" is just a good example. At present, the strategy Made in China 2025 and the fourth industrial revolution promotion basically depend on and promote the revolution of Chinese vocational education. Meanwhile, the fourth industrial revolution and the changes of economy, production and public governance will definitely influence the Chinese vocational education.<sup>[4]</sup>

### 2.2.1 Changes in Human Resource Structure and Talent Standard Appeal

The emerging of automation technology revolution is to liberate the direct intervention of human power on production and life, and the liberation of manpower is the important factor in the productivity. The most distinctive characteristics of the Industry 4.0 technology and Made in China 2025 planning are informatization and intelligence, and the industry development highly depends on the integration and innovation of knowledge and the high skilled talents. Transboundary, reconfigurable production and innovative management mode can be realized through big data, cloud computing and the fusion correlation industries on the Internet of Things. Therefore, the human resources in China are lack of structure, which is mainly represented as the quantity and quality shortage of high-skilled talents.

Related studies show that the quality and time limit of the vocational education high skilled talent cultivation fall behind the industrial transformation, which results in that the enterprises and other social employing institutions have difficulties in employing the "well-liked" and "proficient" employees. According to the analysis and prediction of the Mckinley Global Institute, the global enterprises will be confronted with 40 million technical talent gap by 2020; by 2020, the high-tech enterprises in China will need about 140 million high skilled talents and 22 million technical talents.

The changes of production, economic life and government governance brought by the fourth industrial revolution cause the change of talent requirement standard. Artificial intelligence becomes the orientation and the trend. For the employees in the first line of production, construction, service and management and the main tendency of talent standard are: (1) The knowledge reserve

and structure should be adjusted accordingly. (2) The requirement layout of vocational skills will go through a process of sublation and adjustment. That is, the process that the traditional skills adapting to the traditional industrial upgrading and transformation are reserved, innovated and integrated, and the process that the skills related to the emerging industries are embedded into the vocational skill system framework. (3) The attitude composition and orientation of employees tend to the cooperation, efficiency feeling and innovation spirit exploration. (4) The thought and wisdom of employees require multidimensional and diversified inclusiveness. (5) The employees tend to be the inter-disciplinary talent with high technical skills and comprehensive quality.<sup>[5]</sup>

### 2.2.2 Future Changes of Higher Vocational Education Mode and Management Process

The higher vocational education should not only cultivate many practical, high-skilled and professional inter-disciplinary talents, that is, "modern craftsmen", but also undertake the school-enterprise fusion technical integration and innovation research. Obviously, the "double shoulder task" of higher vocational education is not only different from the medium vocational education (focus on the operation ability), but also different from the education above the undergraduate (focus on management and research). The practice proves that the higher vocational education and vocational education play an irreplaceable role in talent cultivation and integration innovation. In the national economic construction and social life, the higher vocational education is the easiest to make achievements. Among the model workers and the innovation, patent, invention and tools reformation that commended by the country each year, most models have good higher vocational education background. In the future, under the promotion of the Industry 4.0 automation technology revolution, the higher vocational education will make rich achievements in "dream lighted by science and technology" of school-enterprise deep fusion and the talent cultivation quality accelerated by modern craftsmen. The specific influences are as follows:

The first influence is that the educational technique and mode of vocational education are faced with the infiltration of new technology. The educational technology, education communication means, instructional design and teaching mode in the vocational education field will be changed definitely. The classroom teaching method change of teachers is the integration organization planner of information resource rather than the leader of classroom teaching. We should concentrate on the comprehensive use technology of information resources, internet

technological means and multimedia.<sup>[6]</sup>

The second influence is that the management style of vocational education is faced with transformation. (1) The new technology will further penetrate the whole process of vocational education management, and this situation, including the management process of informatization, automation, intelligence and mobile internet, digital identity and Internet of Things is melted into the education decision, management process and quality/efficiency evaluation. (2) The scientific management develops further. It not only represents as the wide application of modern management theory, but also represents as the strong intervention of other relevant science. (3) The behavioral process and management process of higher vocational education are faced with replacement and transformation.

The third influence is that higher requirement is put forward for the social functions of vocational education. (1) As the main supplier of social human resource, vocational education plays a key role in leading the economic change of the fourth industrial revolution. (2) Vocational education, especially the higher vocational education, is not only the education institution of science and technology, but also has the functions of social communication, production and science and technology service of new science and technology knowledge, and the effect of the latter is unusual for the fourth industrial revolution. (3) The political function of vocational education should be further strengthened and followed appropriately. (4) The deep promotion of the fourth industrial revolution requires that the vocational education further plays the cultural function, so that culture atmosphere can be built for the employees and society.

The fourth influence is that the new requirement is put forward for the teaching staff construction of higher vocational education. (1) For the emerging technology of the fourth industrial revolution, the teaching staff professional composition or a knowledge reserve of vocational education is obviously insufficient. (2) The new requirement is put forward for the teaching staff of higher vocational education on thought quality, behavioral mode and value. (3) The new requirement is put forward in the education teaching ability of vocational education teaching staff.

The influence of the fourth industrial revolution tide on the vocational education and the solution to vocational education will be carried out quickly. The emergency plan should be prepared for the starting period of the fourth industrial revolution; various national development strategy superposition advantages of vocational education shall be

utilized; the strategic policy of the fourth industrial revolution is embedded in the overall development planning and "action system" of vocational education; play the "active molding function" of education, influence the fourth in the fourth industrial revolution in the subjective form of talent cultivation; all the above is the task that vocational education, especially the higher vocational education should be confronted with and actively explored and solved.

### **3. Strategy for Higher Vocational Colleges Coping with the Influence of Industry 4.0**

#### **3.1 Based on Top-Level Design**

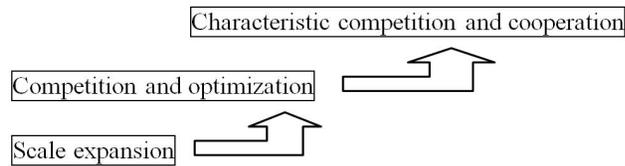
The country has made new deployment and positioning for the higher vocational education. By 2020, a modern vocational education system with reasonable structure and complete functions will be basically established basically. Stress on the features, optimize the structure, improve the quality, enhance the vitality, focus on cultivating high-quality workers and skilled talents and gradually build the modern vocational education system that the vocational education and social training are developed simultaneously, labor employment and economic adapts to the social development, various education and vocational education are mutually connected, general and vocational education are accommodated, and further studies and employment are equal important. Clear higher vocational college development route diagram is built based on the labor force talent market matched with the national human resource and social development.

The effect of implementing the "higher vocational demonstration project" and "higher vocational backbone project" is good. The 2015-2018 Development Planning Outline for Higher Vocational Colleges is the so called "higher vocational high-quality Elite School Project". Accelerate the characteristic competition and cooperation, and explore the road adapting to the social development self-growth.

Local education groups focus on promoting the fusion and development of "teaching, scientific research, training, development, production and information service" to realize the large scale, grouping and chain of teaching, scientific research and service.

Elimination and integration of vocational education and professional qualification certificate system. The country divides the emerging occupation. At present, there are about 1,300 vocational colleges in China, wherein 700 higher vocational colleges participate in the national strategy, plan the path and explore the development law of

higher education.



**Figure 2.** Three development stages of higher vocational education in China

### 3.2 Create New Type Teachers

The main body of the school is teachers and students. The main responsibility for cultivating "modern craftsmen" is high quality teachers. In terms of the characteristics of the current higher vocational colleges in a stage that competition wins, the status quo of teachers cannot match. It mainly manifests in: the professional competence and level of the team of teachers need to be improved. Their career and vision is not wide enough, and they are at disadvantage in the level of knowledge, design level of teaching, scientific research transformation capacity and other aspects.

The task and mission of talent training in higher vocational colleges determine the basic requirements of "three kinds of teachers". Teachers shall be equipped with a very deep level of professional knowledge, and at the same time, they shall have the experience and ability in the associated profession as well as skills in the integration of the incubation of industry-university-research-teaching. In general, teachers in higher vocational colleges shall teach a lesson, do experiments (practical training) and establish enterprises, that is, "professional teachers, masters of craftsmen and professional managers", as well as "capable people" who are able to coordinate the integration of industry-university-research-teaching in the aspect of professional knowledge, production practice and management operation.<sup>[7]</sup>

Higher vocational colleges shall strengthen the construction of team of teachers. They shall furnish teaching reference, full-time and part-time teachers reasonably. They shall recruit good teachers, cultivate double-position teachers, manage and take advantage of good teachers. Higher vocational colleges shall pay attention to the optimization in knowledge updating and structure of knowledge skills of teachers. Connect Industry 4.0 and the concept of the results of new technologies and automation technology, and build consciously adaptable "mental structure" and "value system". Team of teachers shall have the world vision, establish international stan-

dards, strengthen local characteristics, and consciously use new technologies, new means and new ideas, improve and enhance the ability and level of educational research business and cultivate high-quality "modern craftsmen".

### 3.3 Professional Transformation and Upgrading

As higher vocational colleges exposed to the revolutionary tide of Industry 4.0, transformation and upgrading of traditional profession has become a key link.

A batch of new professions comes into being. Higher vocational colleges shall speed up the transformation of profession settings and traditional professions, and shall optimize the layout of profession settings and structure of professions. For example, a higher vocational college characterized by shipping actively connects the construction and operation of automated terminals, develops clusters of the profession of container transport, clusters of port equipment and electrical profession and other popular professions, strengthens cooperation with the corresponding domestic enterprises with automated container terminals, upgrades and transforms traditional professions, promotes the construction of key professions in provinces and cities, and actively develops and constructs new courses. Actively broaden the internationalization path of talent cultivation combined with the ocean economy and the "Belt and Road Initiative". Make important progress in the order class, minority language class, school-enterprise cooperation class, 3+2 class from secondary to higher vocational schools, 3+2 cooperation undergraduate class and other aspects, which has achieved good results and shown gratifying changes in the stage of constructing national backbone higher vocational colleges and integration of characteristics.

Higher vocational colleges shall consciously adapt to the national strategy, follow the pace of the industrial revolution, get rid of the dependence on traditional professions, take the pulse of new requirements proposed by scientific and technological revolution on the talent cultivation and profession settings, actively explore and accelerate the upgrading and transformation of traditional professions, and establish the correct positioning in the new round of development.

### 3.4 Characteristic Course System

One of the important goals of the development of higher vocational colleges is to develop and construct the course system that keeps up with the times. If there is no precise profession settings, unique course system, it is difficult to achieve the transformation and innovation of teaching contents and construction and reorganization of the course system, and it is also difficult to establish advantages in

the new round of development and competition of higher vocational colleges, and it's more tough to adapt to Industry 4.0 and Made in China 2025.

The characteristic course system of higher vocational colleges shall focus on: serving the local economy, taking the pulse of intelligent industry, inheriting and developing the original courses, professional background of teachers and scientific research ability; setting up a good platform for teachers to develop new and characteristic courses. Higher vocational colleges actively build a platform to give teachers with scientific research ability the corresponding care in time, treatment, foreign training and other aspects to solve the worries behind. Build the good "mental model" and "value recognition", so that the majority of teachers are willing to develop and happy to develop with accurate development.

### 3.5 Teaching Operation System

In view of the impact of the industrial revolution, higher vocational colleges shall actively develop and construct in the aspects of informatization, cloud computing and big data in order to build a new high quality and efficient teaching and management system of higher vocational colleges.

Strive to re-create the original teaching operation and management process, speed up the integration, analysis and application of teaching information under the background of digitalization, informatization and intelligentization, upgrade teaching services, and develop and apply the teaching mode and technology based on the modern teaching theory and learning theory.

Highlight the construction of the associated project of the operation and management of intelligent teaching.

### 3.6 Integrate the Quality School Spirit

In the current and future period of time, the way for higher vocational students to be enrolled by filling out the college application through the national entrance examination still will not change. After students passing the national entrance examination are selected and admitted to higher vocational colleges, there is a certain gap between knowledge base and learning habits of them and undergraduates. At the same time, society does not highly recognize the value of higher vocational students. The survey discovers: how to improve the effect of classroom teaching of students in higher vocational colleges is a problem that troubles the majority of teachers. In the future, teachers shall make great efforts in the interesting and substantive teaching.

Excellent school spirit requires the long-term and un-

remitting persistence and efforts of several generations of people. In the future, China may consider enrolling and filling out the college application in the enrollment of higher vocational colleges and colleges according to different scores. As society carries forward "the spirit of modern craftsmen", recognition of the value of students and teachers in higher vocational colleges shall be deepened. A batch of application-oriented higher vocational colleges appears.

Higher vocational colleges shall focus on the living and learning habits of students in the aspects of teaching management, student management, and daily life of students and exploration of promotion of fine traditions, centralized strict control and different individual treatment are necessary. In addition to cultivating "modern craftsmen", it is more important for higher vocational colleges to form the concepts and habits of the school so that students can inherit and pass on, and students who have graduated can grow up and make a difference in the growth of and changes in society and enterprises. This is the so-called school spirit and style of study.

### 3.7 New School-Enterprise Integration

Led by local governments with independent higher vocational colleges, promote the deep integration system of "zero distance docking" between vocational colleges and affiliated enterprises in the profession settings, talent cultivation, application of new technologies, tackling key problems in applicable projects and other aspects, so that benign interaction between colleges and enterprises can be realized, benign interaction between higher vocational colleges and affiliated enterprises can be achieved, higher vocational education and market demands are closely linked, and goals of win-win for schools and enterprises common progress and development will be realized.

Higher vocational colleges strive to build the platform for cooperation and application of new achievements and technologies in the enterprises, set up the project tackling team to customize "diagnosis" for the development of enterprises with continuous follow-up and promotion and form long-term cooperation mechanism. In the stage that characteristic professions win, higher vocational colleges shall create conditions to facilitate the echelon of "double-position and triple-position teachers" to implement the deep school-enterprise integration. Explore models of "studying while working", "work-integrated learning" and "flexible length of schooling"; professional backbone teachers implement directed training of the "naming class"; build and create the famous brand of the "project of training employees in enterprises" in the industry; cre-

ate the "brand of internship for students"; further open and enrich the "alumni directory of intelligent campus", track the quality for market to use talents, highlight the positive energy through the romantic alumni of "modern craftsmen" in the era, and ultimately form the comprehensive effect of a good talent market, so that the talent market and enterprises can inspect the achievements of running higher vocational colleges.

#### 4. Conclusion

The social changes in the higher vocational education caused by the plans of Industry 4.0 and Made in China 2025 will be the first to produce profound changes. To handle new techniques and technologies, big data, cloud computing and Internet of things, high vocational education 4.0 will also be ready to come out.

The adaptation strategy for higher vocational colleges to face the fourth scientific and technological revolution has experienced the accumulation in the stage of scale expansion, and it will go through the tough stage of competitive optimization to accumulate energy. Through characteristic competition and cooperation, this comprehensive and three-dimensional project will enter the right track of adaptable development, which is the only road with difficulties and exploration.

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