

The Socio-Economic Value of Emerging Engineering Education

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ABSTRACT

In order to understand the social and economic value of the construction of Emerging Engineering Education, the article adopts the literature analysis method. Through the analysis of the background and connotation of the Emerging Engineering Education, the socioeconomic value of the Emerging Engineering Education is obtained direct and indirect socioeconomic value. The direct socioeconomic value of Emerging Engineering Education includes servicing production and consumption expenditure, and directly promotes the economy growth; New high-tech enterprises derived from the Emerging Engineering Education Construction ;providing talents, technology, and cultural support for urban construction. The indirect socioeconomic value of Emerging Engineering Education includes the contribution of top innovative talents, contributions from scientific research and innovation, and spatial spillover effects of Emerging Engineering Education.

Keywords: *Emerging Engineering Education construction, socio-economic value, the connotation of Emerging Engineering Education*

1. INTRODUCTION

In the context of the new economy, in order to meet the needs of national strategies and the development of emerging industries, and to meet the country's needs for compound talents with a global vision, innovative spirit and practical ability, build a new type of engineering technology discipline characterized by multi-disciplinary cross integration Particularly important. Therefore, the Ministry of Education proposed the construction of Emerging Engineering Education subjects. The construction of the Emerging Engineering Education course was proposed in 2016, and has undergone the discussion and development of the "Fudan Consensus", "TianDa Action" and "Beijing Guidelines" trilogy. It has now been launched in many universities, and major universities have actively responded to the call of the Ministry of Education, to carry out the construction of Emerging Engineering Education. This article analyzes the background, connotation and socio-economic value of the construction of the Emerging Engineering Education department, hoping to contribute to the construction of the Emerging Engineering Education department.

2. BACKGROUND OF EMERGING ENGINEERING EDUCATION CONSTRUCTION

2.1. The New Round of Technological Revolution and Industrial Transformation Calls for Emerging Engineering Education

From the steam age of the 17th and 18th centuries; the electrical age of the 19th and early 20th centuries; the information age of the 20th century and the current 21st century. The 21st century is an intelligent era marked by big data, cloud computing, intelligent robots and 3D printing. This means that our society will enter the fourth industrial revolution which is different from the previous three industrial revolutions. In this era, the world is entering In the new active period of scientific and technological innovation, the competition of science and technology in various countries will become more intense, and the integration of the Internet, intelligence and social economic activities will accelerate. This will subvert human life, production, economic and social forms, and scientific revolutions, technological updates, and industrial revolutions will no longer The cascade development as before, but a new trend of integrated development. Engineering education originated from the needs of national defense construction and industrial development, and has now become an important source of national and regional competitiveness. In the face of a new round of technological revolution and industrial transformation,

engineering education needs to be reformed, which requires the construction of Emerging Engineering Education disciplines.

2.2. The Construction of Modern Economic System Calls for Emerging Engineering Education

On October 18, 2017, General Secretary Xi Jinping pointed out in the report of the 19th National Congress that my country's economy has shifted from a stage of rapid growth to a stage of high-quality development, and is in a critical period of transforming development mode, optimizing economic structure, and transforming growth momentum. A modernized economic system is an urgent requirement for crossing the border and a strategic goal for my country's development. A series of major strategies such as innovation-driven development, "Belt and Road" and "Made in China 2025" are being implemented in depth. The new economy characterized by new technologies, new industries, new formats, and new models is booming, which has implications for traditional engineering education. In order to cope with the new economy, we need to build emerging engineering majors, engineering technicians with higher innovation and entrepreneurial capabilities and cross-industry integration capabilities, and a more diversified and personalized engineering education training model.

2.3. Actively Respond to Future Strategic Competition and Call for Emerging Engineering Education

The times are constantly advancing, and the common problems facing mankind are also becoming prominent. Resource shortage, energy shortage, population aging, economic crisis, environmental pollution, climate change, poverty, etc. are common problems faced by mankind. These problems must be taken seriously and resolved. Only when we can achieve sustainable economic development can we realize the Chinese dream of the great rejuvenation of the Chinese nation. To solve these problems, we need to use new technologies, accelerate the construction of a manufacturing power, accelerate the development of advanced manufacturing, promote the deep integration of the Internet, big data, artificial intelligence and the real economy, and promote high-end consumption, innovation leadership, green and low-carbon, and sharing economy, modern supply chain, human capital services and other fields to cultivate new growth points and form new momentum. In order to proactively respond to future strategic competition, in order to solve the common problems faced by mankind, and to explore courageously in the "no man's land", we must adhere to the path of innovation and accelerate the construction of "Emerging Engineering Education".

2.4. Our Country's Higher Education Reform and Innovation Calls for Emerging Engineering Education

Since the founding of the People's Republic of our country, the scale of higher education in China has been continuously expanding. In 1949, the scale of higher education was 117,000, in 1978 it reached 867,000, and in 2016 it reached 41.815 million, 357 times that of the founding of the country. The scale of higher education has expanded, and it will not work if the quality cannot keep up. Improving quality is the lifeline of higher education. To improve the quality of higher education, it is necessary to reform higher education. As an important source of national and regional competitiveness, engineering education determines the overall quality of my country's higher education to a large extent. At present and for a period of time in the future, we must focus on improving the quality of talent training, build an interdisciplinary combination of emerging engineering and traditional engineering, explore and implement a new model of process education talent training, and create a new quality of engineering education with international competitiveness. Establish and improve a new system of engineering education with Chinese characteristics, and accelerate my country's transformation from a big country in engineering education to a powerful country in engineering education.

3. THE CONNOTATION OF EMERGING ENGINEERING EDUCATION

As a new concept, there are different understandings on Emerging Engineering Education. Shantou University Executive President Gu Peihua [1] believes that "Emergent Engineering" can be understood as representing the innovation and progress of modern science, applied science, engineering, and industrial practice, as well as the intersecting and merging of different discipline. Zhong Denghua, president of Tianjin University and academician of the Chinese Academy of Engineering [2] believes that the Emerging Engineering Education discipline is guided by Lide and fostering people, with the construction concept of responding to changes and shaping the future, with inheritance and innovation, intersection and integration, coordination and sharing as the main ways to cultivate the future Diversified and innovative outstanding engineering talents. Wu Aihua, director of the Science and Engineering Education Division of the Higher Education Department of the Ministry of Education [3] and others believe that the Emerging Engineering Education is relative to the traditional engineering, and it is a dynamic concept based on the background of new economy and new industries. The construction of Emerging Engineering Education disciplines, on the one hand, must establish and develop a batch of emerging engineering disciplines, and strengthen construction and improve quality; on the other hand, it must promote the reform and innovation of

existing engineering disciplines and explore new training models that conform to the laws of engineering education and the characteristics of the times. This coincides with the view of Wu Yan, Director of the Department of Higher Education of the Ministry of Education. Emerging Engineering Education is a Emerging Engineering Education specialty and new requirements for engineering. Therefore, combining the viewpoints of many scholars, this article believes that "Emerging Engineering Education" is a new form of engineering, which is future-oriented, and is adapted to the development of the new economy. It is transformed and upgraded on the basis of engineering and interdisciplinary, and a new paradigm for cultivating compound engineering talents formed by integration.

4. THE SOCIO-ECONOMIC VALUE OF EMERGING ENGINEERING EDUCATION

The socio-economic value of education, that is, the economic value in the social value of education, refers to education that improves labor productivity by improving the quality of workers, and contributes to economic growth through the development of science and technology. Educational labor can create social and economic value, mainly refers to the results of educational labor, that is, the cultivation of intellectual labor, skilled labor, and reproduction science, combined with material production materials, to create material wealth. Some people divide it into direct socio-economic value and indirect socio-economic value, which also shows that educational labor does not directly create social material wealth. It must be realized by training labor and reproducing science [4]. The development of the Emerging Engineering Education discipline conforms to the development of social economy. As an important link of higher education reform, it has epoch-making social and economic value, and its value can be explained from two aspects, direct and indirect.

4.1. Direct Socioeconomic Value

4.1.1. Emerging Engineering Education service production and consumption expenditures directly drive regional economic growth

Emerging Engineering Education disciplines can directly drive regional economic growth and can be analyzed from the dialectical relationship between production and consumption. Production determines consumption, and consumption has a counterproductive effect on production. From the perspective of production, as the construction of Emerging Engineering Education subjects continues to deepen, a large amount of funds will be invested in the construction of Emerging Engineering Education subjects, and a large amount of high-quality labor will also be invested. Especially in the short term, the construction of

Emerging Engineering Education subjects requires Government and corporate investment, even household investment, no matter what kind of investment it is, it promotes production and consumption, and it also promotes economic growth. In May of this year, the Higher Education Department of the Ministry of Education announced the application guidelines for the first batch of industry-university cooperative education projects in 2018. 346 companies released 14,576 projects, providing funding and hardware and software support of approximately 3.515 billion yuan, stimulating the growth of total social demand. The government and enterprises have provided funding and hardware and software support. The school must build Emerging Engineering Education courses in accordance with the needs of the country and the characteristics of the school. For example, Tianjin University and NXP Semiconductors Co., Ltd., a global semiconductor leader, set up the Tianjin University Emerging Engineering Education Experimental Class NXP Class, to cultivate high-quality talents with both ability and political integrity, integration of general and professional skills, global vision, innovative spirit, and practical ability. The establishment of this experimental class will attract many students who want to apply for Tianjin University, which will promote consumption in Tianjin and directly stimulate regional economic growth.

4.1.2. New high-tech enterprises derived from the Emerging Engineering Education Construction Association

Emerging Engineering Education is a product of higher education reform and a product of adapting to the development of the new economy. New technologies will give birth to new industries. New technologies represented by new energy, new materials, and biological sciences are continuously upgraded. These new technologies require industry and education Cooperation can truly apply to society and promote economic growth. The Emerging Engineering Education Department encourages all relevant units to actively apply for the "Industry-University Cooperation and Collaborative Education Project" to win support from the society and support the establishment of Emerging Engineering Education-industry-university cooperation alliances in different fields. A number of high-tech enterprises will be derived from the Engineering Construction Association. For example, under the initiative and guidance of the Ministry of Industry and Information Technology and the Ministry of Education, under the leadership of the Putian Municipal Government, and under the unified planning and coordination of the Information Technology Emerging Engineering Education Industry-University-Research Alliance, on April 11, 2018, the country's first "Emerging Engineering Education Industry College" Officially settled in Putian, ChinaSoft International, Huawei, and Tencent jointly participated in the construction of the Industrial Academy [6]. By establishing industrial colleges with universities, these

companies will enhance their corporate brand image, increase their market value and capital value, promote the technological transformation of enterprises, and transform scientific and technological achievements into capabilities, thereby enabling them to become more and more advanced in the path of high-tech enterprises.

4.1.3. Emerging Engineering Education construction provides talent, technology, and cultural support for urban construction

Educational reform and development have a promoting effect on social economy, politics and culture. As an Emerging Engineering Education discipline of higher education reform, for society, it can provide high-quality talents, new scientific and technological achievements and cultural value brought by Emerging Engineering Education for urban construction. Human resources are the ultimate foundation of national wealth and the active force to promote economic development. The construction of Emerging Engineering Education disciplines trains Emerging Engineering Education talents with global vision, innovation and creativity, and engineering expertise through cross-border integration. They have higher quality and stronger learning ability can invent and learn new technologies faster, thereby directly driving economic growth; Emerging Engineering Education construction promotes the development of knowledge economy by promoting scientific and technological progress, and promotes production changes through technological innovation, thereby promoting economic development; new the talents trained in engineering are all highly qualified talents. They not only have excellent professional knowledge, but also have excellent cultural and political qualities. Such talents will gather the strength of the masses and form a good team, whether in the enterprise or in scientific research. Cultural atmosphere, promote economic development through good cultural construction. As a product of higher education reform, the Emerging Engineering Education discipline, as a product of the Emerging Engineering Education discipline, can directly promote economic development, whether it is talents, technology or culture.

4.2. Indirect Socioeconomic Value

4.2.1. The contribution of top innovative talents

The most important economic value of education is reflected in human capital. The theory and practice have proved that long-term economic growth mainly depends on human capital investment and technological progress. In the context of the new economy, the Emerging Engineering Education Science will cultivate a group of high-quality, comprehensive top-notch innovative talents who are suitable for economic development to promote

economic growth. For example, Huawei Technologies Co., Ltd. established the Huawei ICT Academy through a school-enterprise cooperation project to cultivate and transport a large number of outstanding talents for the ICT industry chain. In order to promote the research and practice of "Emerging Engineering Education" and enrich the connotation of Huawei ICT Academy cooperation, Huawei participated in the second batch of industry-university cooperation collaborative education projects in 2017[7], by providing software development cloud platforms and supporting cloud infrastructure resources, Used in colleges and universities to carry out the teaching reform of software engineering, cloud computing, big data and other related majors, and cultivate a large number of diversified and innovative engineering and scientific talents for the society. The top-notch innovative talents trained through the Emerging Engineering Education disciplines can apply the knowledge they have learned to practice, solve the common problems faced by mankind, and thus promote economic growth and realize their social and economic values.

4.2.2. Contribution of scientific research and innovation

The goal of Emerging Engineering Education construction is to cultivate diversified and innovative outstanding engineering talents, and provide intellectual and talent support for the future. The achievements of scientific research and innovation rely on schools and outstanding talents. With reform, there will be innovation. The characteristic of the Emerging Engineering Education department is novelty, which represents new technological development and is closely related to the fast-developing industry, industry and the new economy. During the construction of the Emerging Engineering Education department, many scientific research and innovation achievements will appear. These innovation achievements It can also promote economic development. For example, the industrial design professional teacher of the School of Innovation and Design Industry of Foshan University of Science and Technology has instructed students to complete the design of innovative products for Foshan Biliou Lighting Co., Ltd., combining the actual and market needs of the company, and obtaining results in the development of intelligent sleep aid products With very good results, the small Apple LED light designed and developed has been adopted by enterprises, which proves that scientific research innovation can transform scientific research results and bring social and economic value.

4.2.3. *Spatial spillover effects of Emerging Engineering Education*

Lucas is the first person to propose the concept of spatial spillover effect. He believes that spatial spillover effect refers to the situation in which the spillover party flows capital, goods, and personnel with the recipient, so that advanced knowledge or technology and productivity are spilled locally. It is a manifestation of economic externalities, mainly relying on the diffusion of knowledge or technology to promote the development of the local economy [8]. The new industrial revolution and the frontiers of various science and technology industries need new talents. The new talents to be trained by the Emerging Engineering Education department are innovative and entrepreneurial leaders with broad vision, a sense of responsibility and mission, and technical, design, and business capabilities. Talents need to develop cross-disciplines, from simple discipline construction to discipline group construction, expand the distribution of disciplines, and establish cross-discipline centers. Teachers from multiple schools need to cooperate in research and teach together. Because of the characteristics of the Emerging Engineering Education discipline, it is determined that the Emerging Engineering Education discipline has a spatial spillover effect, which not only promotes the economic development of the region, but also spills knowledge and technology to other regions and promotes the overall social and economic development.

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