

Research on the reform of the replacement localization talent training model in the service manufacturing industry in higher vocational colleges

Hanyu Wan ^a, Hongsheng Lu

¹Wuhan Polytechnic, Wuhan, China

Abstract. As the lifeline of national economy, the manufacturing industry is an important cornerstone to support the country's comprehensive national strength. In order to achieve the strategic goal of "from large to strong" in China's manufacturing industry, the substitution of localization technology is the only way as well as the development trend of various manufacturing enterprises. Moreover, many major breakthroughs have been made in the substitution of localization technology in many fields. Due to the historical reasons, personnel training in the past mainly centered on foreign technologies. As domestic technologies gradually become the mainstream of the development of the manufacturing industry in China, the supply of talents should also keep pace with it. Therefore, it is urgent for higher vocational colleges to reform the talent training mode in the aspect of replacing the localization of service manufacturing industry. It is necessary to comprehensively update the talent training mode from the aspects of curriculum reform, teacher promotion, integration of industry and education, and actively promote the localization of technology supply enterprises to play a leading role.

1 Introduction

Localization substitution refers to the process of realizing independent, controllable and alternative application of core technology by means of independent innovation. The promotion of domestic substitution does not mean the pursuit of the "China-to-the-world" type of isolation, but an economic security measure to avoid the stranglehold problems, so as to form a new development pattern of domestic and international economic circulation.

As a major manufacturing country, the manufacturing industry in China is the lifeline of the national economy and the important cornerstone to support the comprehensive national strength. Due to the lack of core and key commonness technologies, the manufacturing industry has become the worst-hit area that has been jammed^[5]. A large number of core technologies are in the hands of others. Once security problems occur, huge losses will be caused to the national economy and people's livelihood.

Localization of core technology is the key to transforming into a manufacturing powerhouse. In the industrial chain of localization technology development, application and service, any link must be promoted by professional talents. Therefore, the localization of substitution can not only be the responsibility of the localization of technology suppliers, higher vocational colleges should take the lead in training technical talents.

^a Corresponding author: 52815166@qq.com

In post practice, localization of technical personnel can also guide employees to change their attitude and cognitive inertia towards domestic technology, provide timely application feedback for domestic technology, help research and development units to continuously improve their technical performance, and accelerate the process of domestic replacement.

At present, the research and practice of higher vocational colleges serving the reform and innovation of manufacturing industry are obviously insufficient. Through "localization + talent cultivation", we searched on CNKI and Wanfang database respectively, and got 3 literatures. Engineers Zhang Hongwei and Jiao Lihong mainly discussed the reform path of talent training in IT infrastructure localization^[3]; Teachers Su Shuguang and Shen Gang mainly discussed the training path of innovative talents in the localization of operating systems^[4]; Nie Jing and Liu Tingting discussed the curriculum construction plan of domestic PLC technology^[2]. How to train technical and skilled personnel to meet the need of localization replacement of manufacturing industry has not been reported.

2 Background of localization replacement

2.1 The substitution trend of localization

To promote domestic substitution of core technologies is

a strategic measure to cope with external environment changes and internal development needs, as well as a dynamic process of industrial structure upgrading and gradual development.

2.1.1 Technological development

At the beginning of reform and opening up, the development of China's manufacturing industry started from a low point, with large capital requirements and high technical base requirements for scientific and technological development. Import rather than independent development was then a more reasonable strategic choice for China's manufacturing industry.

Forty years later, China has become a veritable "factory of the world", whose overall scientific and technological strength has undergone earth-shaking changes. In order to overcome the difficulties such as high price of imported technology, long delivery time and untimely service, and improve the added value of the industry, many domestic manufacturing enterprises have transformed and upgraded from simple processing of incoming materials to high-end manufacturing. This is accomplished on the basis of rapid acquisition, assimilation and absorption of domestic technology in the early stage, thus leading to the path of domestic substitution. In addition, in the process of domestic substitution, a cost-effective advantage over foreign products has been formed.

2.1.2 Get out of the jam

The transformation and upgrading of Chinese manufacturing to high-end manufacturing will inevitably affect the profit margins of developed countries. Therefore, these countries began to safeguard their national interests and international status by means of export control and technological blockade. As a result, the development of some core technologies in our country faces difficulties, and the security of the industrial chain and supply chain is impacted. Under the background of economic anti-globalization, complex game between major powers and technological decoupling, the hot war of trade war and cold war of science and technology are becoming increasingly fierce, the crisis of global supply chain disruption and the risk of technological decoupling are becoming increasingly obvious, and the process of replacing key core technologies and supply chain localization in various countries is accelerating. For example, the EU took the lead in adopting the alternative strategy of independent research and development of key core technologies, taking localization and supply chain security as an important part of policy adjustment, and especially proposed that critical external dependence on chips should be reduced.

The ZTE and Huawei incidents in 2018 and the "Matlab Ban" incidents in 2020 have aroused the concern of the whole manufacturing industry in China about the "bottleneck" of core technologies. The blockade and sanction of China's science and technology by developed

countries have stimulated China to accelerate its substitution of domestic production. The development of domestic equipment in industrial machine tools, aerospace, new materials and other fields has obviously been accelerated.

In the Outline of the 14th Five-Year Plan, China points out that it will "adhere to the principle of autonomy, control, safety and efficiency", and promote the modernization of the industrial chain and supply chain by replacing key core technologies with domestic products and facilitating local support. In recent years, in the process of localization of core technologies, the government, capital, industry and companies have all been mobilized to carry out commercialization of independent innovative technologies and localization of external innovative technologies by combining local institutional and market advantages. More and more capital began to enter the domestic core technology field, even becoming an investment climax.

There are high technical thresholds and barriers in core technologies that play leading and supporting role for the development of the industry, resulting in difficulties in copying and imitating these technologies. Localization substitution is a trend that is destined to logically good, but it is only the difference between strength and speed. Some fields have shown a trend of substitution acceleration at present.

2.2 The development status of localization alternative

The strong underlying motivation of the Chinese nation, unique Chinese advantages coupled with the continuous accumulation of research and development environment and strength have gradually broken the foreign monopoly of core technologies, and many technical barriers have been constantly overcome.

China's high-speed railway has established a domestic replacement system for core technologies and realized the localization of the whole industrial chain. China now ranks first in the world in photovoltaic and wind power. In the field of new energy vehicles, BYD has accumulated a lot of technical knowledge and ability in the process of battery OEM, and realized the leapfrog development of its own brand. Geely Auto has made up for its shortcomings in transmission technology, broken the monopoly of foreign enterprises on core transmission technology, and realized the autonomous controllable and domestic substitution of the technology. In mobile phones, Huawei, Xiaomi, VIVO and other domestic brands have occupied half of the market. In the high-end shaver market, the long-term monopoly of foreign brands has been broken, and domestic brands are occupying more than 60 percent^[5].

It is certain that China's manufacturing industry still lags far behind the world level in many core technological areas. Almost 100% of the operating systems in domestic mobile phones are Apple's iOS and Google's Android, and the core of mobile phones - chips, are almost all imported. In the field of equipment manufacturing, high-end CNC machine tools, industrial

design software and basic equipment rely heavily on imports, and even milk cartons are mostly European brands.

China will be boomed to walk a difficult and long path from focusing on "manufacturing" to "research and development design", to getting out of the predicament of low-end lock and imitation, then to achieving the localization of core technology.

3 Current situation of localization skill talent training

The sustainable development of the substitution of domesticated technology requires human resources to produce domesticated technology equipment and apply domesticated technology. Graduates of higher vocational colleges work in the front line of production, who become the direct users of hardware and software technology. Compared with the supply of indigenization technology, our country has not established effective training system of indigenization technical skill personnel, thus hindering the whole indigenization development.

3.1 The awareness of "localization" of talent training is not strong

Over the years, manufacturing enterprises have introduced a large number of foreign technologies in the process of technological upgrading, including various industrial hardware and software or systems. As a result, technological dependence has gradually been formed. Accordingly, the training of technical talents is basically centered on foreign technology, which has formed a thinking inertia. The awareness of localization is generally weak. Due to the short development time of the substitution of localization technology, the limited application of industrialization, and the lack of effective policy guidance, the awareness of "localization" of talent training is generally weak, and the teaching research and preparation of "localization" of talent training are insufficient.

3.2 Specialization curriculum system foreignization

Due to historical reasons, in the process of transformation and upgrading of China's manufacturing industry, foreign technology, technical equipment and industrial software have been dominating for a long time, forming strong customer stickiness. In the docking of posts and courses in higher vocational colleges, professional courses are limited in some foreign technical frameworks, and the teaching is generally carried out around a few foreign brands, which severely limits the domestic substitution.

For example, the PLC (Programmable Logic Controller) course of equipment manufacturing mainly focuses on a few foreign brands such as Mitsubishi, Siemens and Schneider. Students generally know little

about domestic PLC, which further represses the development and progress of local brands.

In terms of mechanical engineering software, students in higher vocational colleges mostly take American AutoCAD, UG, Pro/E, Mastercam and other software as learning objects. Domestic software such as Zhongwang CAD, Haochen CAD, CAXA and Kaimo-DFM are not popular among users due to their low marketization rate, insufficient industrial accumulation and precipitation, and the habit of engineers to use foreign products. It is difficult to change, poor living environment in the enterprise, As a result, the domestic software is difficult to enter the curriculum system of higher vocational colleges.

Domestic technology is separated from classroom teaching, thus foreignizing the talents, technical cognition, habits, skills and abilities provided by domestic technology and becoming the users and brand communicators of foreign technology. Enterprises applying domestic technology are faced with the dilemma of being unable to recruit employees. The supply of technical talents is mainly completed through "internal training", which consumes a lot of resources.

In recent years, the Ministry of Education has promoted the integration of domesticated technology into the training system of skill competition by means of "promoting construction by competition" and "promoting reform by competition", but the curriculum is lack of universality.

3.3 There is a serious shortage of teaching resources for localization technology

3.3.1 The shortage of teachers trained by domestic talents

In the period when old teachers are updating their technical knowledge and young teachers are accumulating their technical knowledge, they basically learn foreign technical tools, which leads to the weakness of the teachers in domesticated technology.

3.3.2 Scarce teaching resources

Due to the late start of localization technology, small number of users, lack of basic accumulation and other reasons, the development cost of relevant textbooks is high. Teachers' enthusiasm to write and publish domestic technical textbooks is not high, leading to the scarcity of relevant textbooks.

To further expand the user base and "occupy" the ecology, foreign technology companies lower the learning threshold of learners through free simulation teaching software and online tutorials. In contrast, course resources based on domestic technology are even more scarce.

Because of the "foreignization" of the curriculum, the practical teaching conditions in higher vocational colleges are mainly serving foreign brands and domestic products based on foreign technology, while the

domestic technology resources are marginalized. Due to the small number of users, off-campus practice conditions are insufficient.

4 INNOVATION IN PERSONNEL TRAINING MODE

4.1 Curriculum system reform

4.1.1 Curriculum architecture

Basic sharing. The scientific principle and even the underlying technology of domestic and foreign technologies are basically the same. They are different implementation schemes of the same principle. Engineering software, for example, is based on computer graphics as the basic theory, the differences are modelling principles, functional advantages and user experience. Numerical control machining technology at home and abroad is the use of digital program to control the mechanical movement and machining process, the machining system of which is composed of control system, servo system and position measurement system. PLC products at home and abroad use exactly the same ladder diagram, STL and other programming languages. In addition to the technical basis, the global manufacturing industry has also formulated a lot of international standards, such as PLC international electrical standards IEC, CNC machine tool inspection international standard ISO, etc., becoming the common basis for countries to formulate technical regulations and standards. Therefore, in the curriculum system of manufacturing technical talent training, the specialized basic courses of Chinese and foreign technology are shared.

Combination of "Chinese and foreign brands". Nowadays, in the hardware technology equipment and operating system used in manufacturing industry, foreign technology has a dominant position and domestic technology has not been used in industrialization. No matter from the technical level, replacement cost, or user habits, it is not possible to realize the localization of foreign technology replacement in a short time. Under the trend of economic globalization, this kind of substitution is not worth pursuing. The future picture should be the coexistence of domestic and foreign technologies. Accordingly, the reform of higher vocational curriculum system for the replacement of domestic technology does not aim to replace foreign technical courses with domestic technical courses, but to realize the coexistence of domestic and foreign technical courses. In this way, the contradiction between the supply of technology and the supply of technical skills will be eliminated.

4.1.2 Development of localization technology courses

Choose the technology brand. At present, similar domestic technology products in the market are in a state

of competitive development, mainstream and stable core brands have not yet emerged. Which brand of technology "curricular" (the choice of technology category) will become the primary issue in the development of domestic technology curriculum that needs to be fully investigated and demonstrated. The research is mainly carried out through industry visits, analysis on authoritative statistical data, expert interviews and other approaches, depending on the market share of relevant domestic technology in the technology application market or the development status of market share of products based on domestic technology, core technology advantages with independent intellectual property rights in domestic and foreign counterparts, and the scale of technology supply enterprises. The larger the enterprise with independent core technology is, the stronger its sustainable research and development ability is, and the larger the curriculum value of its core technology will be.

Design and develop courses. After determining the curricular technology brand, through investigation and analysis of the domestic technology supply enterprises, domestic technology application enterprises production, and service front-line job needs, and by following the general principles and methods of vocational education curriculum development, the course objectives will be determined, the course contents will be organized, the course model will be designed, the curriculum standards will be formulated and even revision of professional standards will be conducted. With the accelerated replacement of localization technology, higher vocational colleges should dynamically adjust the course setting of localization technology according to the changes of related industry demands.

4.1.3 Build curriculum resources

While promoting technology, domestic enterprises supplying technologies should simultaneously organize and fund corresponding simulation software and practical training software development to improve learning effectiveness; It is necessary to provide technical support for the development of teaching materials, courseware production and the construction of online courses, and high-quality resource sharing courses in the colleges; It is necessary to organize various online and offline activities, such as online lectures, video conferences, special lectures, etc., to make up for the current shortage of teaching resources.

Higher vocational colleges should strengthen the foundation accumulation of teaching resources oriented by domestic technology, actively plan the resource construction projects, rely on the internal training resources of enterprises, and organize resources to build teaching resources.

Education-related departments should guide colleges to actively develop resources oriented by domestic technology, give appropriate priority to relevant projects, and encourage course resource management enterprises to provide green channels for the distribution of relevant publications and the Internet access of resources.

4.2 Deepening cooperation between industry and education

Localization technology is currently in an upward development stage, and there is a strong demand for technical skills. In terms of joint construction of training bases, order-based training, and teacher team construction, all-round and three-dimensional cooperation between colleges and enterprises is indispensable.

4.2.1 Jointly build training bases

Based on the insufficient market-oriented supply of practice teaching resources for localized technology, it is necessary for localized technology supply units and colleges to jointly develop localized technology training projects and practical training teaching equipment. During the implementation of the project, the colleges and the enterprises should jointly raise funds and plan and build practical teaching conditions.

In order to solve the problem of lack of practical positions in enterprises, domestic technology suppliers need to build a public platform specially for students' practical training. At the same time, colleges and enterprises should jointly establish a mechanism to transfer students' practical training classes from inside colleges to enterprises.

4.2.2 Order training cooperation

In some fields, Chinese manufacturing has realized the localization of the whole process from production to technical equipment, production organization and management. At present, the demand for technical skills of relevant enterprises is characterized by non-adaptability and small scale. For example, the operation and maintenance personnel of the domestic chip production line are the process technology of "electromechanical + domestic chip", which is a domestic and cross-professional compound demand, and there is almost no market-oriented talent supply channel. To meet this demand, college-enterprise order-based talent training cooperation has become the major solution.

Due to the non-universality of order-based talent training programs based on domestic technology, colleges and enterprises are required to jointly develop teaching resources and implement the teaching plans. When jointly formulating talent training plans, in order to ensure the employment of students, the training plans should not only meet the needs of order-based training, but also take into account the needs of the general job market.

4.2.3 Build a team of teachers

In order to make up for the current shortage of domestic technical teachers, colleges should include the training of domestic technology as a topic in the training plan, and cooperate with the supplier of domestic technology,

jointly organize and undertake the training activities of domestic technology.

As there has been few domestic technology application enterprises and their own technical strength is limited, domestic technology supply units should cooperate with technology research and development institutions and select technical personnel as part-time teachers in colleges. Colleges and enterprises should work closely together to improve the employment mechanism for part-time teachers in enterprises.

4.2.4 Establish a skill competition mechanism

Skill competition has a great guiding and stimulating effect on curriculum reform based on domestic technology, which will arouse students' learning enthusiasm. Colleges and enterprises can jointly develop competition projects on domestic technical skills, design technical documents and regulations for the competitions, and jointly organize such competitions. On the basis of accumulating technical experience, the social influence of the competition will gradually be expanded, so that the skills competition activities will become an important starting point to promote the cultivation of domestic technical skills talents.

5 Conclusion

Crossing the river by touching someone else's stone is not a long-term solution. The localization of core technologies cannot be realized only by the supply of domestic technologies to enterprises. It needs the coordination of government policies and social talent supply to form an ecological environment. Higher vocational colleges should lay out in advance according to the general trend of the development of localization technology replacement, and speed up the training of technical skills to serve the localization of core technology replacement.

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References

1. Wang Chang, He Qi, Geng Hongjun et al. (2022) Logic, driving factors and implementation path of domestic substitution of key core technologies. *The Economist*, 2022, (03): 99-108
2. Nie Jing, Liu Tingting. (2022) Exploration and Research of school-enterprise interactive PLC course teaching under the trend of domestic substitution. *Automotive Education*, 2022, (6): 54-56
3. Zhang Hongwei, Jiao Lihong. (2021) Research on Innovation of talent training system based on

- localization environment. *Science and Information Technology*, 2021, (3) : 191-192
4. Su Shuguang, Shen Gang, Zou Deqing. (2022) Thinking and practice on the cultivation of operating system innovative talents under the background of localization. *Higher Engineering Education Research*, 2022, (2):52-57
 5. Wu Boyong. (2020) The underlying logic of domestic alternative trend.
<https://xueqiu.com/3146547267/161991730>
 6. Zhu Junlong. (2020) Current Situation and Future Development of Mechatronics Localization. *Modern Industrial Economy and Informationization*, 2020, (7): 20-21
 7. Li Xin, Liu Wei, Huang Juqin, Chen Jiuguo, Tang Juan. (2022) Build a scientific and technological innovation system to accelerate the research on the localization path of chips. *Technology and Industry Across the Straits*, 2022,35(04):5-7
 8. Zhao Jungui.(2021) The localization of major technical equipment is related to national security. *China Petrochemical Industry Observe*, 2021, (05):32
 9. Yang Chunzhi. (2021) Discussion on Substitution of Equipment Electronic Components in China. *Modern Industrial Economy and Informationization*, 2021,11(01):123-124
 10. Zhang Zhen. (2021) Implement localized replacement projects to create a high-end industrial chain of CNC machine tools. *Wisdom China*, 2021,(04):16-18