Suggestions on Promoting Innovation and Development of Tianjin Advanced Manufacturing

Hongyin Liu[1], Xin Li[1]
[1]College of Humanities, Tianjin Agricultural University, NO.22, Jinjing Road, Tianjin, P.R.China

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Abstract: Cultivating and strengthening high-tech industry is an urgent requirement for improving quality benefits and transforming kinetic energy. However, there are some problems in Tianjin advanced manufacturing. They are slow upgrading of advanced manufacturing industry, lacking cultivation of technological innovation, lagging transformation of manufacturing service, insufficient combination of technology and finance, and deficient introduction and cultivation of technology and skilled talents. There problems lead to poor ability of transformation, R&D, and slow development of production service. This paper proposes that industrial core-technologies and common technologies should be tackled and the intelligent development of advanced manufacturing should be promoted. At the same time, advanced manufacturing innovation micro-center and regional cooperation and promotion center should be set up. Scientific and technological innovation alliance and technological innovation network should be established. Intellectual property pledge financing of advanced manufacturing enterprises and the service system of new third board transaction market should be promoted. Talent market intermediary service institutions should be encouraged and developed. Business environment should be optimized and private technology enterprises are expanded.

1 INTRODUCTION

With the advent of the fourth technological revolution, developed countries have implemented development plans of advanced manufacturing, such as the German industrial 4.0 plan and the American "advanced manufacturing strategy" plan[1]. In April 2015, the Beijing-Tianjin-Hebei Collaborative Development Plan set Tianjin as the national advanced manufacturing R&D base. In May, advanced manufacturing was listed in the "made in China 2025" plan. Tianjin has industrial base, economic conditions and policy advantages. By 2020, the proportion of Tianjin advanced manufacturing industry will be raised to more than 70%.

2 THE CONSTRAINTS ON INNOVATION AND DEVELOPMENT OF TIANJIN ADVANCED MANUFACTURING

There is a certain gap between the development target of advanced manufacturing and innovation ability, industry level, supporting service and so on.

2.1 The Upgrade and Transformation of Traditional Manufacturing is Slow and the Industrial Level is not High

First, traditional manufacturing, like petrochemical with low-added value, metallurgy and textile, accounts for more than 50% of industry in the city. The expansion of industry is not enough. Many manufacturing enterprises focus on the low-end industrial chain, while fewer enterprises gather at the high-end industrial chain, such as design, testing, marketing, service and so on.

Second, modern manufacturing has not formed a dominant position. The proportion of strategic industries, like intelligent manufacturing, new-generation information technology, accounts for less than 20% of the industry. The supporting industries are not driven strongly by high-end industries like aerospace. The degree of industrial clustering is not high enough.

Third, leading enterprises and major projects are in short. There are more than 500 famous industrial products, which only take up half of Shanghai.

2.2 The Cultivation of Scientific and Technological Innovation is Insufficient, and the Ability of R&D and Transformation of Enterprises is not Strong

First, less than 40% of the enterprises carry out innovative activities in Tianjin. The number of high-tech enterprises occupies only 1/7 of Beijing, 1/4 of Shanghai, and 1/2 of Shenzhen. The innovation and creation of private enterprises are active. The number of private enterprises in Tianjin is large, but their scale is small. In 2014, the total industrial output value in Tianjin was more than 3 trillion yuan, of which private industrial output occupied only 1 trillion yuan.

Second, the investment of R & D is insufficient. In 2014, the investment in R & D was 3%, taking up only 1/3 of Beijing and 1/2 of Shanghai. Among them, the investment of enterprises which are above the scale of the whole city, accounted for a low proportion of the main business income.

Third, the scale of Tianjin technology trading market is small. The ability to undertake, incubate and transform technology is low. The capacity of absorbing technology outside the city, especially Beijing, is weak. In 2014, the number of technical contracts that flowed from Beijing to other provinces reached 37212, among which the number to Tianjin and Hebei was 3475, accounting for only 9.3% of the output technology contracts[2].

2.3 The Transformation of Manufacturing Service is Lagging Behind, and the Development of the Productive Service is Inadequate

First, the added-value of productive service occupies only 50% of Beijing and Shanghai. The ratio of industrial added-value to productive service added-value is only 1: 0.74, while the ratio in Beijing and Shanghai are respectively 1: 3.06 and 1: 1.38.

Second, transformation of enterprises from production to service is lagging behind. The industry chain and value chain of manufacturing is not extended enough to R & D and marketing services . The service transformation has not been realized in manufacturing industry.

2.4 The Combination Between Finance and Science and Technology is Insufficient. The Financial Support for Scientific and Technological Innovation is not Enough. Indirect Financing and Direct Financing are Both Low

First, the proportion of indirect financing is low. In the period of “11th Five-Year” and “12th Five-Year”, the loans from financial institutions takes up less than 10% of the total funds of scientific and technological activities, with limited rising space. The proportion of loans for scientific and technological activities has always been around 0.3% of total financial institutions funds.

Second, there is very few direct financing. The number of listed companies in Tianjin takes up only 16% of Beijing, 18% of Shanghai and 20% of Shenzhen[3]. The number of enterprises “going out” and utilizing overseas innovation resources is even less.

2.5 There is Deficient Introduction and Cultivation of Scientific and Technical Talents. R & D Talents and Transformation Talents are in Short

First, a barrier-free mobility mechanism of Beijing-Tianjin-Hebei talents has not been formed. The siphon effect of Beijing talents has not been reversed. Tianjin gets little benefit from the spillover of Beijing talents.

Second, the supporting policies are not in designed position. There are difficulties in the introduction of high-end talents outside the city and abroad. Third, the agglomeration effect of industrial population in Binhai New Area has not been released. The training of high-skilled talents is insufficient. The R & D talents and transformation talents of advanced manufacturing are in short[4].

3 SUGGESTIONS ON DEVELOPMENT AND INNOVATION OF TIANJIN ADVANCED MANUFACTURING

3.1 Infrastructure of Advanced Manufacturing R & D Should Be Strengthened, and the Development of Intelligent Manufacturing Should be Enhanced

First, with the great demand of economic and social development, the major technical bottleneck which restrict the development of advanced manufacturing should be solved. A large number of major projects, such as intelligent manufacturing, big data and information security, new drug discovery, high-end medical equipment and key materials are implemented. These projects will enhance related technical fields.

Second, some key enterprises are selected to carry out intelligent production demonstration projects. They can enhance the function, performance and degree of automation of production system. The enterprises can develop into flexible manufacturing system, intelligent workshop, intelligent plant and intelligent manufacturing system. At the same time, collaborative planning and decision optimization management are achieved in all the links of product life cycle.

Third, the construction of physical system can be sped up through organic integration and deep collaboration of computation, communications, network and control technology. Real-time interconnection, accurate perception, effective interaction and intelligent control of production system can be achieved.

3.2 Advanced Manufacturing Innovation Micro-center and Regional Cooperation and Promotion Center Should be Established. Technology Innovation Alliance of Industry-University-research and Science and Technology Innovation Network Should Be Built

First, relying on large enterprises or industrial parks, advanced manufacturing innovation micro-centers should be established, in key areas of the new generation of information technology, high-end equipment manufacturing, new energy, new materials and biomedicine. The micro-centers can explore a new trinity innovation mode of "technological innovation + enterprise incubation + industrialization".

Second, an innovation and development platform should be established, from the constructive experience of advanced manufacturing in Binhai New Area Central Industrial Park and the experiences of R & D manufacturing links and supporting industries of Beijing high-tech industry. The platform includes high-end equipment manufacturing, new generation of information technology and biological medicine. Regional cooperation promotion center should also be built up.

Third, the postgraduate training in colleges can be combined with achievements transformation of advanced manufacturing. They can build key laboratories, engineering laboratories, enterprise technology centers and Engineering (Technology) research centers with famous universities and R & D institutions at home and abroad. The industry associations should integrate innovation resources of Beijing-Tianjin-Hebei to establish industrial innovation alliance. Research institutes, R & D centers, Industrial Innovation Alliances and technology service institutions should be integrated to form Beijing-Tianjin-Hebei manufacturing technology innovation network.

Fourth, standardized promotion plan should be implemented to construct standard system. The system follows international standard in aspects of quality, safety, health, environmental protection and energy saving. Enterprises are encouraged to adopt international standards of production. Leading enterprises are supported to participate in the revising of international standards, national standards and industry standard.

3.3 The Transformation of Manufacturing Service Should Be Accelerated. The Level of the Advanced Manufacturing Service Can Be Improved

First, manufacturing services demonstration projects can be carried out in bidding, third party logistics, optimization of supply chain management and solutions in engineering. Large enterprises and equipment manufacturing are leaded to transform from production-oriented manufacturing to service-

oriented manufacturing and from production-center to customer-center.

Second, the development of the production and service industry can be sped up. Productive services in modern logistics, e-commerce, technology services, information services, quality certification, product identification and inspection are vigorously developed. The capacity of production service for R & D, production, business operation and management of advanced manufacturing industry is improved.

Third, the development of science and technology service industry should be sped up. Specialized technology service enterprises should be cultivated in R & D, design, technology transfer and business incubation. The scale of science and technology service enterprises is expanded. A scientific and technological service system which covers the whole technological innovation process is built.

3.4 The Utilization of Foreign Capital and International Cooperation Level of Manufacturing Industry Should be Improved. Intellectual Property Pledge Financing of Advanced Manufacturing Enterprises and the Service System of New Third Board Transaction Market Should be Promoted

First, the advantages in free-trade pilot area system should be fully utilized. For example, the key areas of manufacturing are increased; the foreign capital is guided to high-end manufacturing fields, like new generation of information technology, high-end equipment, new materials and bio-medicine.

Second, it is suggested to establish Tianjin science and technology Guarantee corporation. The loans on intellectual property rights will be guaranteed to protect patents and trademarks. The government can incorporate commercial banks, which engage in the pledge loan business, and Technology Guarantee Corporation into the patent pledge compensation funds. According to the risks of guarantee and realization of the patent right, the government can determine risk level so as to give corresponding risk compensation.

Third, specialized intermediary service organizations and professional associations of new third boards are established. A competitive and orderly socialized OTC market service system is formed, which is composed of joint organizations, intermediary organizations, self-discipline organizations and service centers.

Fourth, the policy of reducing the burden on the advanced manufacturing R & D enterprises is carried out. Private scientific and technological enterprises become bigger and stronger. The tax burden and non-tax burden of the advanced manufacturing industry are reduced. The halving of income-tax preference is expanded to advanced manufacturing R&D enterprises. The R&D expenditure deduction years of the advanced manufacturing R&D enterprises is extended. The proportion of deduction in R&D expenditure is increased to 75%.

3.5 The Marketization of Talent Intermediary Service Institutions Should Be Encouraged. It is Suggested to Adopt the Complex Method of "Team + Project" to Attract Talents With Achievements and Cultural Characteristics

First, there should be policies to encourage and develop market-oriented talent intermediary service organizations. The monopoly of government talent service institutions should be broken. Medium and high-end talent intermediary service agencies should be cultivated to absorb all kinds of talents and provide professional services in Tianjin.

Second, with the help of Zhongguancun resources, Tianjin can set up a talent incubator and purchase professional R & D institutions in Zhongguancun. That will be beneficial to oriental training of senior technical talents and management talents for Tianjin advanced manufacturing industry.

Third. necessary conditions should be provided for the introduction of talents in Tianjin Development Zone, High-tech Zone and Binhai New Area. The development of key technology and the transformation of scientific and technological achievements should be promoted. A cultural environment of tolerating talents, respecting talents and preferentially treating talents should be built. Talents should be retained by achievements and characteristic culture.

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