

The Way to Develop the Skilled Personnel in the Advanced Manufacturing Industry in China Under the Global People's Circulation

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ABSTRACT

With the wide globalization in economy, technology and trade, etc., it is inevitable for the skilled personnel to circulate internationally. In a general consensus, whoever holds the skilled personnel wins the competitive advantage. Currently, the war to contend for the skilled personnel becomes more and more sharpened in the world. In China, how the advanced manufacturing industry can be effectively pushed mostly depends on whether the development of the skilled personnel succeeds or not. So, the paper analyzes the actual state of the people's development in China in the context of the global circulation of the skilled personnel, then expounds its influence on the advanced manufacturing industry, finally puts forward some tactics to develop the people to meet with the requirement of the advanced manufacturing industry.

Keywords: *tactics, global circulation, skilled personnel, advanced manufacturing industry*

I. INTRODUCTION

The advanced manufacturing industry means the industrial state that has integrated the hi-tech outcomes in the aspects of information, network, big data, artificial intelligence, new energy, new materials, etc. and applied them in the R&D, design, processing, testing and management and so on. It can realize more and better targets of economic and social benefits by improved output quality, high efficiency, low consumption, environmental protection and flexible production than the traditional manufacturing industry. It can't be separated from the traditional one, but is much more consummate. The skilled personnel are the carrier of the science, technology and knowledge. The realization of the advanced manufacturing industry depends on the construction of the skilled personnel team. The stock level and development of the skilled personnel determine the synthetic strength and sustainable competency of a nation or region or industry. Globally, the competition in the skilled personnel is now becoming more and more fierce with the fast alternate of the science and technology. The global flow of the skilled personnel directly affects

whether the advanced manufacturing industry can be implemented or not.

II. ACTUAL SITUATION OF THE GLOBAL FLOW OF THE SKILLED PERSONNEL

With the economic globalization, the global flow of the skilled personnel mainly lies in the these aspects: study or training abroad, research and academic exchange such as international students, visiting scholars and people who are engaged in the research overseas; work in the foreign country for the business either in the international direct investment or in other commercial activities. Nowadays, the global flow of the skilled personnel is shown in the form of the following:

A. *The skilled personnel flow out from the developing country*

Mostly, the skilled personnel in the developing country migrate to the more developing nation or region or to the developed country. Owing to the fast development of the hi-tech in these countries or regions, they have an immense demand to the skilled personnel. Therefore, the authorities of these places have issued many policies aiming at attracting and retaining the outstanding skilled personnel besides their strong economic strength and abundant resources in science & technology. According to the statistic from the World Bank, from 1969 to 1979, 375 thousand of

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500 thousand professional people received by the U.S.A came from the developing country or region, of which 50% was from Asia [1].

B. The flow of the skilled personnel among the developed nations or regions

According to the concerned statistic, from 1997 to 2006, over 112 thousand professional people in Australia flew out to Canada, Japan or the United Kingdom. In 2003, more than 400 thousand excellent skilled personnel from the European Union worked in the U.S.A, of which 75% was willing to continue to stay there. On the whole, due to the development difference of various developed nations in economy, science and technology, the U.S.A has attracted and kept most excellent people with its advanced research conditions. In light of the related statistic, 1.6 million people immigrate into the U.S.A per year. The technological immigrants are gradually rising, of which 40% immigrates into the U.S.A [2].

C. Bi-directional flow of the skilled personnel

In recent years, with the encouraging measures issued like well-paid employment, increase of the scientific research funds, etc. in some countries such as German, Japan, the United Kingdom, etc., the flow of the skilled personnel in the developed nations has the tendency of bi-directions. Also, owing to the improvement of the conditions in economy, scientific research and social life and so forth in such emerging nations as China, the skilled personnel flow back from the overseas in a quick rising trend ("Fig. 1").

In "Fig. 1", we can see that since 2008, the people who study abroad have been increasing quickly. By 2018, the number had got to 662 thousand persons with a proportion of 1% of the age of 18 to 22 years old in China (occupying 8% of the university graduation in that year). Contrary to those studying abroad, students returning home after achieving the study is rising year by year, too. In 2018, the people who returned home were 519 thousand with a ratio of nearly 80%.

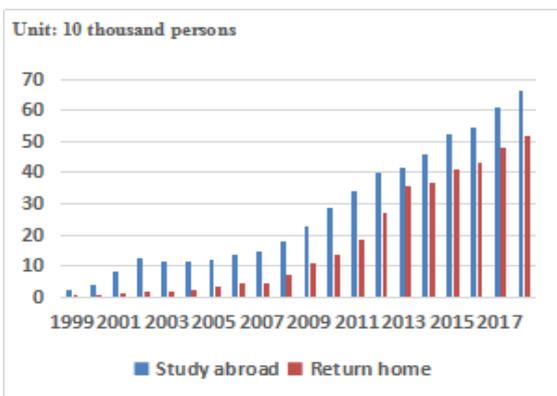


Fig. 1. Comparison of the skilled personnel between study overseas and return home [3].

III. STATE OF THE SKILLED PERSONNEL DEVELOPMENT IN CHINA

The flow of the skilled personnel is affected by multiple elements in social environment like human culture, education, social security, income and career development, etc.; economic conditions such as scale, growth, structure, and open policy, etc.; scientific & technological levels in R&D, finance and application, etc.; policy of the skilled personnel in introduction, use and appraisal, etc. [4] In order to attract the skilled personnel, some nations or regions have issued various policies of the benefits. Take it for example, China, the European Union, South Korea, etc. In 2007, the European Union made a plan of Blue Card. Its holder can enjoy the same national treatment as that of the European Union people in social security, employment and payment, etc. The government of South Korea directly makes recruitment overseas by way of mass media. As a return, over 60% of the students abroad now come back to South Korea. With the quick development in economy, science and technology and attractive policy formulated in China, the flow inward is remarkable, too. From 2013 to 2016, the average yearly increase rate of the returner specialized in artificial intelligence was about 14%. By the end of December, 2016, only the 1,000 man program had attracted more than 6 thousand high-level skilled personnel abroad. According to the Report named Trend of the Global Talent Mobility and Wealth Management in 2018 from Forbes China, the China attractive force is changing the flow pattern of the international skilled personnel from uni-polarization to multiple polarization [5].

IV. INFLUENCE OF THE GLOBAL SKILLED PERSONNEL FLOW ON THE ADVANCED MANUFACTURING INDUSTRY IN CHINA

A. Demand of the skilled personnel by the advanced manufacturing industry

Based on the China Manufacturing 2025, Guide to the Planning of Developing the Skilled Personnel in the Manufacturing Industry issued by the Educational Department, Human Resources & Social Security Department, Industry & Information Department points out the demand forecast [6] of the skilled personnel in the ten fields of the manufacturing industry (see "Table I").

TABLE I. DEMAND FORECAST OF THE SKILLED PERSONNEL IN THE TEN FIELDS OF THE MANUFACTURING INDUSTRY (TEN THOUSANDS PERSONNEL)

Ref.	Sectors	2015			2020		2025	
		Total	Total	Shortage	Total	Shortage	Total	Shortage
1	New generation information technology	1050	1800	750	2000	950		
2	Hi-level digital control machinery & robots	450	750	300	900	450		
3	Aerospace equipment	49.1	68.9	19.8	96.6	47.5		
4	Oceanic engineering equipment & hi-tech ships	102.2	118.6	16.4	128.8	26.6		
5	Advanced equipment for the rail transit	32.4	38.4	6	43	10.6		
6	Energy saving & new energy automobile	17	85	68	120	103		
7	Electric equipment	822	1233	411	1731	909		
8	Agricultural machinery equipment	28.3	45.2	16.9	72.3	44		
9	New materials	600	900	300	1000	400		
10	Biological medicine & hi-performance medical equipment	55	80	25	100	45		

B. Influence of the global skilled personnel flow on the advanced manufacturing industry

From the above table, we can see that the demand of the skilled personnel in the advanced manufacturing industry mostly refers to those people specialized in the hi-tech field. With the emerging quickly of the globalization in the capital circulation, industrial division of labor, migration of the international industry and trans-national companies, etc., the skilled personnel in science and technology flow and are shared globally [7]. It is an inevitable trend only to seek for use and not for owning in managing the skilled personnel.

The global flow of the skilled personnel can leave the effect both positive and negative. On the one hand, it can shorten the educational period of the people needed by the industry. During the global flow, the people accept the training, master the knowledge in technology, international management and marketing information, etc. This does benefits to raising the productivity by hiring them. Also, their experience can be learned and make the human capital increased in value at home. Take it for instance, the software industry in India lies in the front line in the world. This is due to the people returned who once studied in the U.S.A. They keep the connection and cooperation with the software industry in the U.S.A even after they have come back to India. At the same time, the manufacturing industry can select the people that it needs in the international market of the skilled personnel. This kind of employment may lessen the predicament in the shortage of the persons as soon as possible.

On the other hand, the global inflow of the people may cause some shocks to the pay level of the manufacturing industry. The rise of the pay will make the cost go up. Besides, the experienced people may outflow and this may bring a loss to the industry. However, only if the positive effect is larger than the negative one, it is worthwhile for the manufacturing

industry to seek for the suitable people in the international people's market.

V. TACTICS TO MEET WITH THE DEMAND OF THE SKILLED PERSONNEL BY THE ADVANCED MANUFACTURING INDUSTRY IN CHINA IN THE CONTEXT OF THE GLOBAL FLOW

Facing the large demand of the advanced manufacturing industry in China, we may reform our education and training in the arrangement of specialties, teaching content and model, etc. around the industrial demand [8]. But due to the fast alteration of science and technology and the hysteresis of the education, hiring the people needed urgently in the global market is a feasible path for the industry. The concrete tactics are presented as follows:

First, further perfect the skilled personnel market based on the industrial chain so as to raise the orientation, reduce the relative cost [9] and strengthen its attractiveness. As the transformation and upgrade of the industry is deployed deeply, the platform on which the people in science and technology can fully use their intelligence is being bettered. The relative organization should set up the employment station between the industry at home and the skilled personnel overseas so that the people having finished the study abroad could get the employment information that they wanted in time.

Next, formulate the development policy of the skilled personnel correspondent to the industrial evolution. Currently, the competition of the skilled personnel is fierce internationally. Governments at all levels should pay sufficient attention and consolidate the policy in migrant, visa, work environment and treatment, etc. for the purpose of introducing and retaining the people needed by the industry [10].

Then, intensify the construction of the skilled personnel team. Today, it is an inevitable trend for the productive element to circulate globally. To reduce the

loss effectively of the people's flow, different classes of the skilled personnel group ought to be built up. By training the green hands and compiling the documents in science, technology and process, etc., the invisible intelligence can be transferred to the visible knowledge. In this way, the risk may be cut down as much as possible.

VI. CONCLUSION

The evolution of the advanced manufacturing industry can't be separated from the innovation of hi-tech. The skilled personnel are the carriers of the innovative science & technology. Globalization in economy and technology leads to the transnational flow of the people and to a fierce rival of the skilled personnel. Therefore, the advanced manufacturing industry can attain its goal only before winning this people's contending war by a series of feasible countermeasures.

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