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SCIENTIFIC AND TECHNOLOGICAL CULTURE: THE CASE STUDY FROM CHINA

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I. General Understanding to Scientific and Technological Culture

Since the midle of the twentieth century, the new development in natural science has more and more influence on economy and social life, and makes people pay much attention to science and technology (S&T) activities. When people talk about science and technology, a series of pictures appear in their mind: nuclear technology, advanced jets, super computers, satellites, manned spacecraft, space shuttles, automobile popularity, convenient forms of space movement for human beings, TV and broadcasting technology, mobile telecommunications making people broaden their horizons and speed up information exchange, biotechnology bringing about breakthoughs in agriculture and medicine… As scientific philosophers said, the expansion of science and technology widens the function of human organs and body. But on the other hand, people also experience some negative impacts of science and technology, although indirect, such as large scale destructive weapons, air pollution, industrial waste water, sharp reduction of marine resources, soil desertification, and hardpan arable land… It makes people often experience primitive human's feeling: keep warm by fire and aware of being scalded by it.

The impact of science and technology to economic and social development makes people shift their focus on S&T itself. The concept of scientific & technological culture (STC) allows us to comprehend science and technology from a social cultural viewpoint.

Scientific and technological culture is an interesting concept. Firstly, it seems to be regarded as a kind of spiritual life of human beings. Scientific and technological culture, like traditional social culture, not only becomes a component of human life, but also creates human life itself. Secondly, Scientific and Technological culture seems to be a part of a general social culture (here we simplify it as big culture). It has its own features and borders, different from and going with big culture. During the last 50 years of the twentieth century, people might have felt the impact of S&T culture on their social life, and this experience is different among the different regions and countries.

We could comprehend and construct a concept of scientific and technological culture, based on our understanding of social culture.

When we observe general social culture, we always notice some typical events of human activities, such as marriage, funerals, beliefs, work, holidays, ceremonies, eating and drinking, personal adornment, singing, dancing, arts, language and writing, etc. As a result, we could say that culture expresses the state of human life on the one hand, and presents the intrinsic inclination of human behaviors on the other hand. When thinking about scientific and technological culture, we might also find a series of typical events, such as a famous person in science history, inventors, science theory, science courses, seminars and discussions, labs and experimental equipments etc.

Now we explain our ideas in following imaginary example. Assume there are two regions, A and B, let E_i (i=1,2,.....n) and STE_i (i=1,2,.....m) denote social culture events and scientific and technological culture events respectively. The detailed chart is presented in Figure 1.

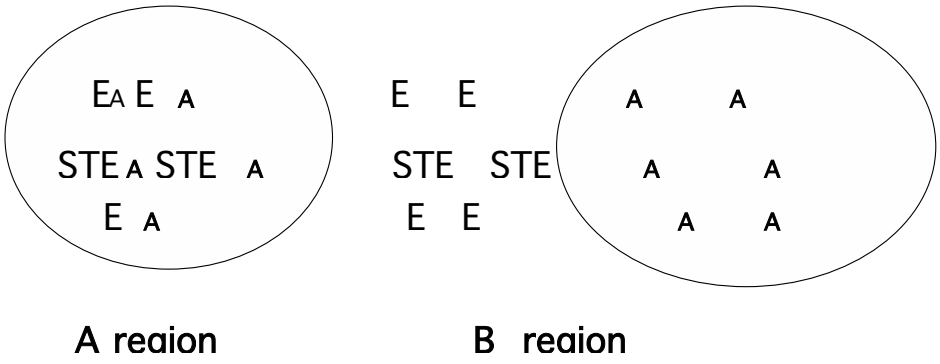

Figure 1

This example implies that we could comprehend culture in A region (A(E_1, E_2, E_3)) based on B region's culture (B(E_1, E_2, E_3, E_4)). The culture difference in two regions only results from different states of E_i, and scientific and technological culture events(STE) are of almost the same state in A and B regions. So scientific and technological culture is a kind of common culture wherever people are in A or B region. This is a difference between scientific and technological culture and general social culture.

In terms of human culture concept viewpoints, we have noticed that people are under influence of both "big culture"(social culture) and scientific and technological culture. Namely, people are involved in both E_i events and STE_i events. If they engage in scientific and technological work, They will have more behavior inclination for disseminating science and technology than others. So what does it imply. Let us look at Figure 2.

We assume that people are involved in an event (E_i) in a region. No matter what event, it has to bear with two extended directions. One is that people always give it an interpretation, making it within a knowledge system. That is a direction of science in general sense. Another is that people will "do" the event according to the given procedures and methods. Their behavior inclination is to make the event done well. That is a direction of technology in a general sense. Based on this

explanation, scientific and technological culture shapes human behaviors, making people have extended inclination along with the S and T axis (Figure 2).

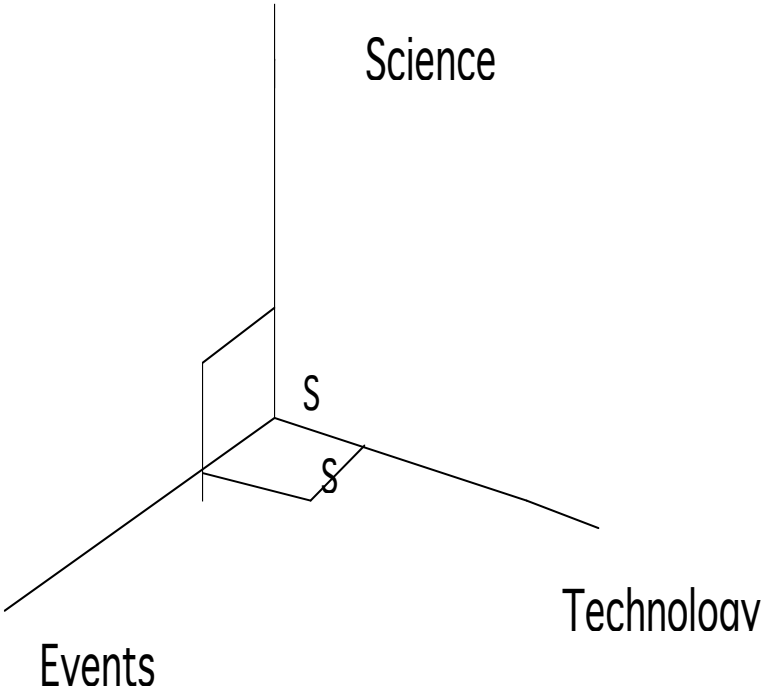

Figure 2

On the contrary, people with a weak science consciousness pay no attention to the implication of their participating in culture events and events' operating procedures, methods and manner.

Now we reach the following conclusions:

1. STC is represented by some events, which have historical continuity.

2. STC is a human behavior inclination, which always go towards the direction of expanding the space of human's knowledge and ability.

3. General social events contain elements of STC, it means these events shall shape themselves with science and technology in the future.

4. The spreading of STC mainly depends on the intellectual group and is associated with civilization of society.

Based on this understanding, we give several cases, trying to show the background for spreading of scientific and technological culture in China. As we have known, there was a golden time of flourishing science and technology in ancient China. But for a long period of time in its history, China's science and technology had little development. Today's China, as a developing country, has fully realized that modern science and technology play a very important role in its economic development. The cases we provided are to illustrate and analyze the impacts of science and technology on China's conventional customs and social life from different aspects.

II. Cases studies

Case one: The initial phase of China's using foreign technology

In the first ten years of the establishment of the People's Republic of China, China made use of foreign technology as an important means to restore and develop the national economy. According to relevant statistics, China signed 450 contracts of sets of equipment, assembly lines and individual items with foreign counterparts from 1950 to 1959. Of them, 215 contracts were from the former Soviet Union, 108 contacts were signed with eastern European countries and only three items were from western countries. This batch of contracts was worth 2.7 billion US dollars. These contracts were a top priority of China's key projects at that time.

At present, people in Chinese industrial, scientific research circles have still remembered 156 key projects brought about by those contracts from the former Soviet Union. These projects included big iron and steel factory, heavy chemical base construction, heavy industrial machinery, agriculture machinery, power generation equipment, heavy-duty lorry, instrument and meter plant etc. The imported technology included following activities:

1. imported sets of equipment of large production enterprises aiming at taking shape scale operation capacity.

2. expert panel from the former Soviet Union participated in and guided project implementation.

3. sending selected Chinese young technicians to universities and corporations for technical training in the former Soviet Union

The implementation of the 156 above-mentioned projects has been taken as an initial symbol of China's using foreign technology and it laid the initial foundation for China's industry.

Comments:

This case shows that China's absorbing the large scale foreign technology also brought about the impact of exotic culture. Chinese workers and management personnel had opportunities to exchange ideas with former Soviet Union's experts face to face, to find out how foreign experts deal with and illustrate problems, to learn how they live. We have noticed that technology diffusion is often carried with local culture. Besides, new machinery, new operation organizations are set up and with their created large scale production capacity, could become a kind of impact factor, from which Chinese workers learn what they can do and how to do, aided by this newly imported technology,

Case 2: China's S&T Long-term Planning

After the founding of new China, four long term development programs for science and technology were drawn up respectively in 1956, 1963, 1978 and 1983. To some extent, they played a part in directing and boosting the development of scientific and technological undertakings and contributed to economic growth, defense building and social progress in China. Here we take one of the programs, the 12-year-program, as an example, and inspect its function of spreading out science and technology in China.

In October 1955, the Working Group for Scientific Research and Planning under the State Council proposed a report on the preparation of the Twelve-year S&T Program. Upon approval of the report by the State Council, the Working Group started organizing manpower in January 1956 to draft the outline of the program. There were 757 scientists and senior engineers taking part in drafting the outline of the program. By August 1956, they had finished such documents as "An Outline for the Long Term Development of Science and Technology for 1956-1967 (draft)";

"57 Major Tasks in Science and Technology"; and "Some Comments on the Twelve Year Development Programs". In October of the same year, the program was approved by Chinese Party Central Committee and the State Council. Most important of all were the four urgent measures that were taken to concentrate efforts on the development of electronics, automation, semiconductors, jet and nuclear technology. From then on, a number of new emerging technologies were gradually established from scratch in China.

The first program was well implemented. By 1962, after seven years of strenuous efforts, the objectives set forth therein were accomplished in the main.

This program has achieved the following results:

1. Setting up a national management system of science and technology. National S&T undertaking was located in the following five parts: The Chinese Academy of Sciences, Colleges and Universities, R&D Institutions under central and local governmental departments, and Defense.

2. Building up a group of 68,000 scientists and technicians who created an atmosphere of receiving, assimilating and spreading advanced science and technology.

3. Completed batch of R&D projects in agriculture, industry, medicine and health, and emerging technology, which will meet the needs of national economic and social development.

4. Let the public widely know the significance of science and technology to economic and social development, and learn the framework of the government's science and technology policies.

Comments:

The formulation and implementation of this twelve-year S&T program was an important part of the Chinese government's S&T policies. In terms of implementing results, this plan was one of the most successful in all the various in S&T programs. It was also a good evidence of government directly intervening S&T activities and expanding its social impacts. It let people think that the impact

of S&T to economic and social system seems to be widened by government administrative means.

Case 3: The Spark Program

Since 1978, the Chinese Government's policies for rural economic development have produced a nationwide impact. Guided by such policies, rural restructuring is bringing about encouraging results and constitutes a major step in the overall rural economic reform. However, the final success of this historical undertaking will depend on science and technology and accelerated development of rural and township enterprises. To invigorate village and township enterprises and rural economic development throughout the application of science and technology, therefore, poses an arduous yet important task before the Chinese government. Based on the above consideration, the State Science and Technology Commission initiated the Spark Program in 1985.

The background:

The advent of the Spark Program is by no means an accident. It is a consideration prompted by the urgent need for rural economic development and based on full social studies and in-depth analysis.

Village and township enterprises have boomed during the first five years of the 1980s in the vast rural areas in China and become an important part of its national economy. For local economic development, they play an even greater role. Statistics indicate that the output value by village and township enterprises in 1984 reached 170 billion yuan, which accounts for more than 17 percent of the national industrial and agricultural output, with 18.74 billion yuan of net profit and 9.06 billion yuan handed to the Government as tax and profit returns. In certain provinces such as Jiangsu and Zhejiang, which are developing at a faster rate than average, village and township enterprises produce more than 50 to 70 percent of the local industrial and agricultural output. 1985 witnessed an even faster nationwide growth of village and township enterprises, with production over 230 billion yuan, nearly 20 percent of the total industrial and agricultural output and 30 percent of the total industrial output. With an annual incremental growth of 10 percent, their production may reach 1,000 billion yuan by 2,000 and constitute

more than one third of the national industrial and agricultural output. It is clear that the enterprises have become an important pillar in the national economy and will play a vital role in quadrupling China's industrial and agricultural output to 2800 billion yuan by the end of this century. The village and township enterprises are of a far-reaching strategic significance.

While village and township enterprises suffer from relatively backward management, there are also special advantages. Most of them came into being and grew through market economic competition. They must secure raw material and energy supply on their own, have less management personnel with lower administrative cost, coordinate production with supply and sale. And for these reasons, they are highly adaptive to the changing environment.

With their many advantages, village and township enterprises have taken root in the vast rural areas in China and are growing ever strong. Today, there is a worldwide trend of developing large numbers of small but specialized modern plants. This is true in the United States, Japan, The Federal Republic of Germany, the United Kingdom, Italy, France and as well as some developing countries. The boom of village and township enterprises in China is very much in line with this trend.

China has 800 million farmers. There can be no economic modernization, nor national revitalization without a significant progress in their ways of life and production. Lack of knowledge, want of science and technology "and low labor productivity" constitute the very source of poverty that still exists in China's vast rural areas today. It is only under the correct policy guidelines of the government and with the help of science and technology, that China's farmers will be able to embark on a path to wealth.

Initiation of the Spark Program

The "Spark Program", as a path breaker in invigorating local economy, has the important mission of disseminating advanced appropriate technologies to village and township enterprises and rural areas. Since its initiation, the Spark Program has been attached great importance by the State Council. The former Premier Zhao Ziyang remarked "this is a realist undertaking that has far-reaching significance.

Agriculture restructuring must depend on the development of village and township enterprises whose future lies in science and technology. The combined endeavors may result in a new strategy that fits China's specific environment. We will see unexpected good result, if it is taken persistently as a long term fundamental policy".

The Spark Program has been well received across the country and well responded to by scientists and technicians. It has increased their enthusiasm for local economic development and gives support to their longing to serve village and township enterprises. It offers a promising prospect for their wisdom and initiatives to be fully brought into play. With the approval from the State Council, the State Science and Technology Commission is organizing and coordinating the implementation of the Program in May, 1985. It is taken as an important component of the national science and technology development program as well as national economic development program. Science and technology must serve local economic development, while local economic prosperity depends on science and technology. This is the only course to invigorate local economy.

Comments:

This case implied that 1) diffusion of technology followed economic development. Generally speaking, the more local economy develops, the more S&T is needed and is paid attention. 2) For a developing country, the regional development program carried out under government guideline and coordination seems to be effective and successful. China's situation has shown that the change of the agriculture production system resulted in diffusion of appropriate technology in rural areas. It was the diffusion that brought about factors of scientific and technological culture in China's rural land.

CASE 4: Different ideas on house moving

Liu Jun, a common citizen of Beijing, had mixed emotions about moving out of his old house in the city. He regarded it as a blessing to move into a more spacious high-rise flat for he had no privacy in the courtyard in DFJ Hutong (lane) in the East-city District, where the family lived with 10 others in the same yard. "You couldn't keep many secrets in our narrow and crowded courtyard," said the 39-

year-old official from the Ministry of the Foreign Trade and Economic Co-operation. Moreover, the walled courtyard was noisy and dirty. And when he was allocated the new flat Liu found life improved hugely: "I could then listen to my favorite music and chat with my friends as long as I like," he said. "I could talk about private matters with my wife without worrying if the walls had ears. Above all, I didn't need to line up at the toilet early in the morning any longer."

But he was left feeling sad because the thought of moving was less than thrilling to one member of his family. His 70-year-old mother refused to go. She called the flat "a cement cage" and said families living in high-rises keep their doors shut "for fear of letting anyone know about their world, even the color of their carpet." A simple "Hello" in the narrow corridor, she said, was all there was to neighborly relations. The change was too much for the old woman, so she stayed behind in the courtyard. "There I could chat with my neighbors, watch TV and have meals with them," she said. "It's better than the dull life in the high-rise, where I didn't even know anyone except my son, my daughter-in-law and my grand-daughter – the three 'intellectuals' of our family," she said. She visits Liu and his family only on the weekend.

Liu's mother is lucky to have the option of living in a high-rise or a courtyard. Many people her age have no choice.

Comments:

This case lets us see the conflict of two different ideas in life-style during economic development. The young generation has a different attitude to their surroundings than older generation. They more easily fit in with emerging things and new concepts. In this sense, young people are closer to scientific and technological culture.

Case five: Foreign Cartoons Occupied China's Market

While Chinese movie stars are walking into the world spotlight, the country's animated cartoon world is occupied by foreign images: Micky Mouse, Donald Duck, Robot and Sacred Fighter. And Chinese children are infatuated with them.

With a population of 370 million children and teenagers, there is a lust for entertainment in China. And with an established background in animated movies – Chinese in their 20s and 30s cannot possibly forget about favorite "Monkey King" and "Fishing Boy" – the country is home to popular and quality cartoons, right? Wrong!

In recent years, homemade cartoons have gradually lost their attraction as well as their producers. In a recent survey of 1,000 children, the most popular idols are two boy heroes in a Japanese television cartoon series, says Guanming Daily.

Since 1985 more than 30 foreign cartoon companies have swept into the country to set up joint ventures. Many local experienced cartoonists and artists, lured by attractive salaries, are drawn away from their former state studios. In the Shanghai Cartoon Film Studio, the country's leading producer of animated movies, more than 40 chief drawers have taken their brushes and their talents to foreign companies, according to Guangming Daily.

Gone is the heyday of Chinese cartoons when many domestic animated movies received international acclaim for interesting plots and unique artwork. During the last few years, however, made-in-China TV cartoons, together with domestic toys and children's books seem to have lost their appeal. This is largely due to outdated techniques, shoddy management, the loss of talented cartoonists and, as a result, the lack of new eye-catching designs.

It was then that Chinese children were treated to high-quality imported cartoon series.

Guangming Daily said that many native cartoonists are still obsessed with the conventional concept that the art of cartoons is a teaching form rather than entertainment.

Comments:

Cartoons are what we call "a typical culture events". Recently, Chinese children prefer foreign cartoons. The reasons are not only brain drain, lack of funding, like case mentioned, but also 1) exotic culture brought by the story in foreign cartoons is attractive for children 2) the subject in cartoons carried new developments in

modern science and technology, such as robots and spacecraft, etc. 3) advanced producing techniques, screen, pictures, colors, sounds make children have a sense they never experienced before.

The case gives us an impression that there exists technological advantages in foreign cartoons, which, we suppose, is an element of scientific and technological culture.

These cases imply that:

1. As a developing country, China has been developing its science and technology activities increasingly, and its scale has been expanded gradually. In this process, foreign technologies have played an important role. These foreign technologies came from the former Soviet Union and eastern European countries in the 1950s and 1960s while coming from the US, Japan and European countries in the 1980s and 1990s.

2. China focused its science and technology policies on spreading S&T to rural areas and regions in the 1980s, which achieved the remarkable result in promoting scientific and technological culture build-up and expanding its impact.

3. Since implementing the open door policy in the 1980s, China's economy has entered a sustainable development phase. During this period, with the development of city construction and increases of culture & arts exchanges, it has greatly influenced people's traditional concepts and life style. While expanding enterprise production capacity, it also results in some negative impacts – air pollution, toxic disposal etc. Technologies in this stage have become a spreading media of foreign culture.

4. China has taken shape of its own S&T professional group following over 40 years of its founding. This group has become a basic source of China's scientific and technological culture. Compared with China's huge population, S&T professional group (about one million) only accounts for one thousandth of its population. Some surveys have also shown that scientific and

technological culture is only a very small part of China's conventional social culture, and its impact to economic and social development is very limited.