ICT Development and Innovation Policy in China

YUAN Li-ke, ZHANG Zong-yi
School of Economics & Business Administration, Chongqing University  Chongqing  400044  China

Abstract  The information and communications technology (ICT) industries’ development and the China’s trend to innovative economy are outlined. The relationship between the national innovation system and innovation policy are analyzed. Moreover, the innovation policy in China is discussed and a recommendation to the further ICT innovative policy making is made.

Key words information and communications technology (ICT); information society; innovation policy

Since 1980s, the information and communications technology (ICT) has had a rapid development, leading to different theories of information society and arguments about the emergence of a ‘new economy’.

Major changes have been caused by the ICT industries’ rapid development on the international economic arena. For example, at the end of the World War II, Britain had a comparative advantage in the computer industry, surpassed only by that of the United States. However, at the beginning of the 1990s, the last major British computer company was purchased by a Japanese company[1]. Korea, which notably started its efforts to build the computer industry only after India and Brazil, made together with other newly industrialized states its successful emergence into the group of industrialized countries.

The success of all modern developed countries lies in industrial innovation and the role of nation policies is crucial here. As reported, among others, by Dosi: “The strict relationship between economic growth and change, on the one hand, and technical progress on the other is rather evident and well recognized ‘fact’ in economic thought”[2]. ICT is one of the key technologies that are currently leading the economic paradigm that started in the beginning of the 1990s. Based on the ICT industries’ development in China, here we try to access the China’s trend to innovative economy and outline the innovation policy in China.

1 National System of Innovation and Innovation Policy

Some of the basic ideas behind the concept of national innovation system go back to Friedrich List[3]. His concept of national system of production took into account a wide set of national institutions including those engaged in education and training as well as infrastructure such as networks for transportation of people and commodities. Freeman treats national innovation system as “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies”[4]. Another classical approach is stated by Lundvall[3]. Narrow definition includes “organizations and institutions involved in searching and exploring – such as R&D departments, technological institutes and universities”, but for the current discourse the wider approach that includes ‘all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring – the production system, the marketing system and the system of finance present themselves as sub-systems in which learning takes place’ is applied.

It is essential for policy makers to understand the national innovation system since the innovation policy can be regarded as targeting different elements of the national innovation system, elements being organizations (e.g. SMEs, research institutes) and institutions (e.g. relationships between organizations, public attitude towards new technologies). Although some elements of innovation systems tend to be mostly universal between countries, the systems differ remarkably in the institutional sense. For this reason, innovation policies, targeting at strengthening the national system of innovation, are also different. This also explains why pure copying does not work.

Innovation policy, a sub-field of industrial policy, is targeting at dynamic elements. Lundvall and Borrás suggests that the innovation policy aims at elements of
science, technology and industrial policy that “explicitly aim at promoting the development, spread and efficient use of new products, services and processes in markets or inside private and public organizations”[5]. This definition for innovation policy seems to be implicitly and explicitly widely applied. By such definition innovation policy is a horizontal policy, in addition organizational, financial and commercial steps which actually, or are intended to lead to the implementation of technologically new or improved products or processes are subjects to innovation policy[6].

Although as previously argued, ICT is a technology superior to others, there is no unique set of tools or specific objectives of innovation policy. Since development levels of economic systems are different, this way of ICT-related developments should be definitely targets of innovation policy. However, policy objectives, targets, and innovation modes differ remarkably between countries and technologies.

2 China’s Trends to Information Society

Societal inclination towards a fast acquisition of modern technologies, willingness to experiment with new solutions and internationally successful promotional campaigns has introduced China on the international arena as a rapidly evolving information society. For example, the issue of technological developments and their impact on society has been analyzed by the international analytical reports and China has been improved rank rapidly. The latest (2005) Human Development Report issued by the United Nations Development Programmer (UNDP) also ranks countries next to human development index (where China holds 85th position and make a good progress with 20% comparing with the year of 1990) also according to the technology achievement index[7].

A reasonable state policy has generated rapid catching-up both in the fields of information industry and also formulated the technology standards by itself. China makes a rapid progress to open the telecommunications market for liberalization, giving a good basis for further development.

2.1 Communication Industry

Ever since 1984, the communication industry has gained fast, stable and sustained development, as shown in Tab.1. For 20 consecutive years, the growth rate is even higher than that of the national economic development, having implemented the Government’s strategy of appropriate advanced communication development on P&T.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total amount of communication service (billion RMB Yuan)</th>
<th>Growth rate compared to the previous year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>407.0</td>
<td>24.0</td>
</tr>
<tr>
<td>2002</td>
<td>554.7</td>
<td>24.7</td>
</tr>
<tr>
<td>2003</td>
<td>728.2</td>
<td>30.7</td>
</tr>
<tr>
<td>2004</td>
<td>979.1</td>
<td>34.9</td>
</tr>
<tr>
<td>2005</td>
<td>1219.9</td>
<td>24.6</td>
</tr>
</tbody>
</table>

The telecommunication infrastructure has been greatly improved. China has built up the largest fixed telephone network and the largest mobile telephone network in the world. With the long-distance backbone networks construction in several “five-year-plan” periods, “eight longitudinal and eight horizontal” fiber-optic backbone cables and “grid” national optic cable backbone networks have been built up, with the total length of optical cables over 1 million kilometers and with 0.224 million kilometers of long distance backbone optical cables out of the total. The total capacity of mobile communication exchanges has come to 98.43 million subscribers and the total capacity of data communication ports by the end of 1999 was 780 thousand. The total number of international communication service circuits has reached 36 600, connecting over 100 countries and regions. The international circuit-switching capacity has reached 90 thousand circuit-terminals. The communication network development has been accelerated in the direction towards the integration of voice, data and images etc. and broadband orientation, digitalization and personalization[8].

2.2 Electronic Information and Software Products

Three types of electronic products, the investment, consumption and component products, are developing in coordination. The main products such as mobile handsets, personal computers and integrated circuits have sustained double digit growth; while the research & development in the products of mobile communication, optical communication, medium & low rate routes, DVD and new type batteries etc. have made remarkable progress. The software industry has enjoyed a well-developed period. The technology of information processing in Chinese and 64-bit operating system etc. has made a new breakthrough. The major
sale regions for the software market are eastern region, northern region and southern region in China with market shares of 24%, 23% and 20% respectively as well as southwestern 12%, Central China 10%, Northeast 8%, and Northwest 3%.

2.3 Information Service Industry

China’s Internet subscribers have obtained geometric growth. By the end of 2005, domestic Internet has had over 290,000 Chinese websites and over 12,000 registered websites of governments at various levels. A lot of enterprises involved in information services have also been growing rapidly. At present, the on-line trade amount was 645 billion Yuan in 2005. This also enjoys great potential and sustainable growing strength.

3 Innovations and China Innovation Policy

3.1 Knowledge-based Economy

Because of the fast development of technology in the past two decades, economic development relies deeply on knowledge. China is facing difficult task of development to keep this trend. China’s entry into the WTO makes China opening up to the outside faster and fully.

ICT is one of important causing factors of knowledge-based economy. Knowledge-based economy is based on well and fast development of ICT. According to the calculations at the Organization for Economic Co-Operation and Development (OECD), the ICT market in China is growing at over 20% average annual rate. For China, each million Yuan of investment in the ICT sector will have a social return of 200,000 Yuan per year. Each million Yuan increase in demand for the products and services of ICT sectors will have an own multiplier value of about 1.7, leading to an output expansion of 1.7 million Yuan. Although the total economy-wide linkage effects will take some years to develop fully, even at the current stage the economy-wide multiplier is about 2. In other words, an expansion of demand for the ICT sectors already spills over and generates demand for other sectors as well.

3.2 Strategic of ICT

Despite of the great development, China is still a developing and semi-industrialized country. Chinese government is facing tough tasks of realizing industrialization and informatization in China. The national strategic mission is to take the great effort to push forward the national economic development and social informatization. The top leaders of China and the social mainstream are fully aware of the coming of globalization and knowledge-based economy trend and the importance of the knowledge for development issues. As a national policy and development strategy, ICT policy is the overall strategic measures for China’s modernization construction. China will take the latest development advantage of ICT to bring along the industrialization of China and remodel traditional industries in the course of promoting informatization. Meanwhile applying ICT will raise the industrialization standard in the course of completing industrialization.

The 10th “5 years plan” gave a good performance of ICT. During this period ICT played an important part in the economy development. China uses ICT or informatization as a tool to promote and bring along China’s industrialization which is one of the major measures for national economy strategic structure adjustment and restructuring. In order to realize the leaping over development of information industry, China speeds up the information industry. ICT will become the largest industry sector in China. Now the 11th “5 years plan” of the information industry has been constituted and the object is establishing a preparatory information industry technology innovation system.

Since the 10th “five years”, China takes great effort to promote and push forward informatization of China. In order promote informatization in metropolis Broadband IP MAN will be constructed by using technology of gigabit Ethernet, fast Ethernet, IP over SDH/WDM, super-high speed router. Push forward e-resident-area and e-building in metropolis. For e-resident-area realizes Gbit line to area, hundred Mbit line to building, ten Mbit to family. For e-building realizes Gbit line to building, hundred Mbit to floor, ten Mbit to desk.

With a view of providing stronger leadership to the promotion informatization of the nation, the State Informatization Leading Group (SILG) has been set up. SILG’s duty is drawing up the blueprint of national ICT. The State Council Informatization Office headed by high rank officials is in charge of the routine affairs of SILG. The Advisory Committee for State Informatization (ACSI), which includes 43 senior academicians, is set up as the consultant council of SILG.
China keeps its promise to WTO and gets ready for opening the sector to the outside. Many reform steps are made to break the monopoly of China Telecom in the market. From 1994 to 1998, Chinese government separates postal and telecom services and introduces Unicom and CNC-Netcom into the market. From 1999 to 2001, China Telecom Group is separated into 3 parts, i.e. China Telecom, China Mobile, China Satellite Com. At the same time Jitong and Railcom are permitted to enter this market. In 2002, China Telecom North, Jitong and Netcom merged into new Netcom Group. Today the players become six: China Telecom, China Netcom, China Mobile, China Unicom, China Railcom, and China Satellite com.

Government and administration organization in China issued a series of regulations on ICT development. Ministry of Information Industry (MII) of China is in charge of regulation making. The regulation and law system for ICT development and informatization is establishing (such as Telecommunications Act, Private Data Act, and Post Act etc.) and strengthening. Parts of the regulations and acts are shown in the Tab.2.

<table>
<thead>
<tr>
<th>Regulation/provision/Act</th>
<th>Entry into force</th>
</tr>
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<tbody>
<tr>
<td>The management measures for Internet information servers</td>
<td>2000/9/25</td>
</tr>
<tr>
<td>Regulations of the People’s Republic of China on Telecommunications</td>
<td>2000/9/25</td>
</tr>
<tr>
<td>Regulations for the protection of computer software</td>
<td>2001/1/1</td>
</tr>
<tr>
<td>Administrative provisions on foreign investment in telecom service industry</td>
<td>2002/1/1</td>
</tr>
<tr>
<td>Digital signature act</td>
<td>2005/4/1</td>
</tr>
</tbody>
</table>

A state-private sector partnership is developing in China through financial, infrastructural and other supporting relationships in the computer and related sectors. Both the government and the non-state actors emphasize the fundamental importance of technological learning. ICT’s development shares some same characteristics of knowledge-based economy, like updating so fast, all time learning needed. The implications of China’s joining the WTO for these sectors are significant for ICT technology acquisition, use and development. China is firmly committed to the creation of a largely self-sustaining innovation system, called positive feedback loop innovation systems.

3.3 Availability of Needed Skills and Policies Related to Training and Skill Development in the ICT Sector

The acquisition of technologies went through three periods. In first period, full use of foreign technologies and funds was made, and a batch of badly-needed and world advanced technical equipment were introduced to alleviate the strained status of communications in coastal cities and provincial capital cities as soon as possible. In the second period, advanced equipment production technologies and production lines were imported, digested and absorbed so as to transform into initiative production capability for laying the foundation for domestication of communication equipment. In the third period, while tracking and using foreign advanced technologies for reference, domestic R&D efforts were made to tackle key problems, and new communication technologies and equipment were developed. Through implementations of these three periods, the scale and capacity as well as technical level of China’s communication networks have entered the world’s advanced rank. At the same time, this has facilitated the upgrade of R&D and capabilities of domestic communications technology development and equipment production.

China introduced the first SPC switch with the capacity of 10000 lines in 1982. It was only 4 years after the introduction of first foreign GSM equipment when China developed its own GSM equipment. Based upon importing, digestion and absorption of foreign technologies, China enhanced its own R&D work and innovation, a large amount of China-made communication equipment with its own intellectual property have been applied to China communication network successively. Represented by Datang Telecom, Zhongxin and Huawei companies, Chinese national communication manufacturing industry have made a breakthrough as a group effect.

In the field of mobile communication, China has already set up the world’s largest GSM communication network. However, the mobile communication equipment-manufacturing sector has relatively lagged behind. At present, for the purpose of changing the passive situation of domestic mobile communication
industry, the major technical innovations should be carried out. China’s own standards should be established in the phase of stipulating the international standards of the third generation mobile communication equipment. The third generation mobile communications is new generation technology and system of the digital mobile communication, offering high quality voice, data and multimedia services to the society and broad mass of customers and facing with the 21st century. China-developed TD-SCDMA standard on its own initiatives was selected in 1999 as one of the standard plan of ITU third generation mobile communication. At the beginning of 1998, China began to formulate the third generation mobile communication radio transmission technology (RTT) standards. Now already as the third generation of mobile communication standard that China has put forward TD-SCDMA wireless transmission technology. TD-SCDMA has been accepted for one of the third generation of mobile communication standards by International Telecommunications Union and it will become 3 main competitors of standard with WCDMA of Europe and cdma2000 of America in future global 3G mobile communication.

4 Discussion and Conclusions

In recent years, China’s promoting and supporting technical innovation vigorously leads to rapid development of ICT industry. The entry of China into WTO has profound influence on ICT industrial enterprises, and this enables enterprises and their employees to enhance their senses of urgency, crisis and worry & care consciousness, to exert themselves to improve quality and services and competitiveness actively. This also will facilitate enterprises to introduce new technologies and management experiences from other countries and to stimulate the investment and enable ICT enterprises to absorb more funds for expenditure.

At present, China puts forward the great development strategy of “Developing the West”. The implementation of this strategy needs acceleration of telecom infrastructure, and application of information technologies for supporting and guaranteeing the strategy of “Developing the West”. And this will push the development of ICT industry in western region to a certain extent and narrow the gap between western region and eastern developed regions. But China’s policies still have somewhat contained the development of ICT industry. China has been a member of WTO and further opens its market. Nevertheless, perfect market entry system and system of laws and legal rules governing telecom and information service market has not yet been laid down. It is difficult for enterprises to operate truly in line with market mechanism, due to more regulatory control from the government. The fund-raising channel is unitary, and the market is not transparent, these factors have restricted the enterprises’ development.

The government should set up a series of policies to improve the innovative capacity for the ICT industry, and then come into being a healthy and sustainable development for National Innovation System in China. The “Telecom Act”, “Internet Operational Act” and relevant legal rules & regulations must be formulated as soon as possible to ensure the competition proceeding in line with laws, rules and regulations in good order with China’s entry into WTO. It is also necessary to enhance the administration of ICT industry and establish a fair, efficient and orderly market competition pattern. The stipulation of universal service fund (USF) system should be proposed, to this end the telecom operators should pay USF fee in certain proportion to guarantee universal service construction funds. While creating market competition pattern in policies, efforts also should be made to encourage and promote cooperation between sectors in ICT to jointly explore both international markets and domestic market.

References


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