

The Sustainable Development of ICT in China: The Rise and Future Development of the Internet

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Since the 1980s, information and communication technologies (ICT) has become a vibrantly developing field. Notably, the emergence and rise of the Internet has enabled a massive amount of information to be aggregated and has substantially transformed the way the public can obtain and disseminate information, as well as increased the digitalization of our society. However, ICT has always been controversial, especially when it comes to its future development. This can be a problem particularly with the Internet, where the extensibility, safety, and quality of service have been subject to constant debate. Many different nations are exploring ways to develop the ICT industry in a sustainable manner as a means of advancing human progress.

China is no exception. Like all the other nations, it has its own experiences and knowledge to share as far as the development of the ICT industry is concerned. Based on the history of ICT development in China, this chapter will discuss ICT's contribution to the country's economy and society, analyze the problems and challenges facing the sustainable development of ICT and make recommendations for pursuing this goal.

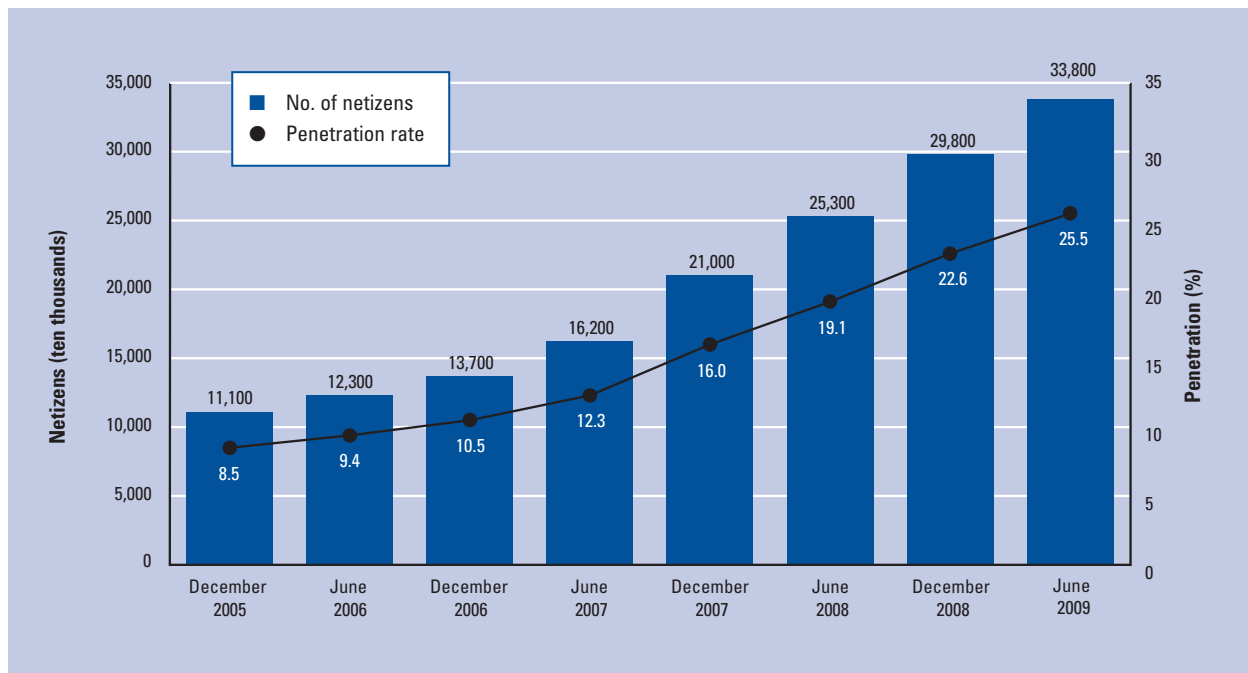
The rise of ICT in China

The ICT industry in China includes such sectors as telecommunications, the Internet, the electronic and information technology industry, and broadcasting. Of these elements, the Internet has especially seen considerable growth in recent years.

The history of the Internet in China

Concomitantly with China's economic boom and the development, by leaps and bounds, of its telecommunications industry, the Internet in the country started from scratch to reach today's impressive coverage, with the highest number of users in the world. This achievement would be unfathomable without taking into account the combined efforts of the government, the private enterprises, and the public at large. Under the planned economy, the Chinese government has implemented decisive strategies to encourage further technological development. This development laid a solid foundation for the spread of the Internet. This in turn, when nourished by a friendly market economy, has greatly spurred the development of the Internet under the favorable conditions of China's national characteristics and strong social demands.

In 1994, the Department of Post and Telecommunications established the State Administration on Data and Telecom (SADT), which was intended to run the planning, design, construction, operation, and management of data telecommunication networks in China. The SADT started constructing the Chinese Internet, referred to as CHINANET, which was launched in 1995—one of the earliest efforts in this area internationally.

Figure 1: Number of netizens and penetrations rate in China, 2005–09

Source: CNNIC, 2009.

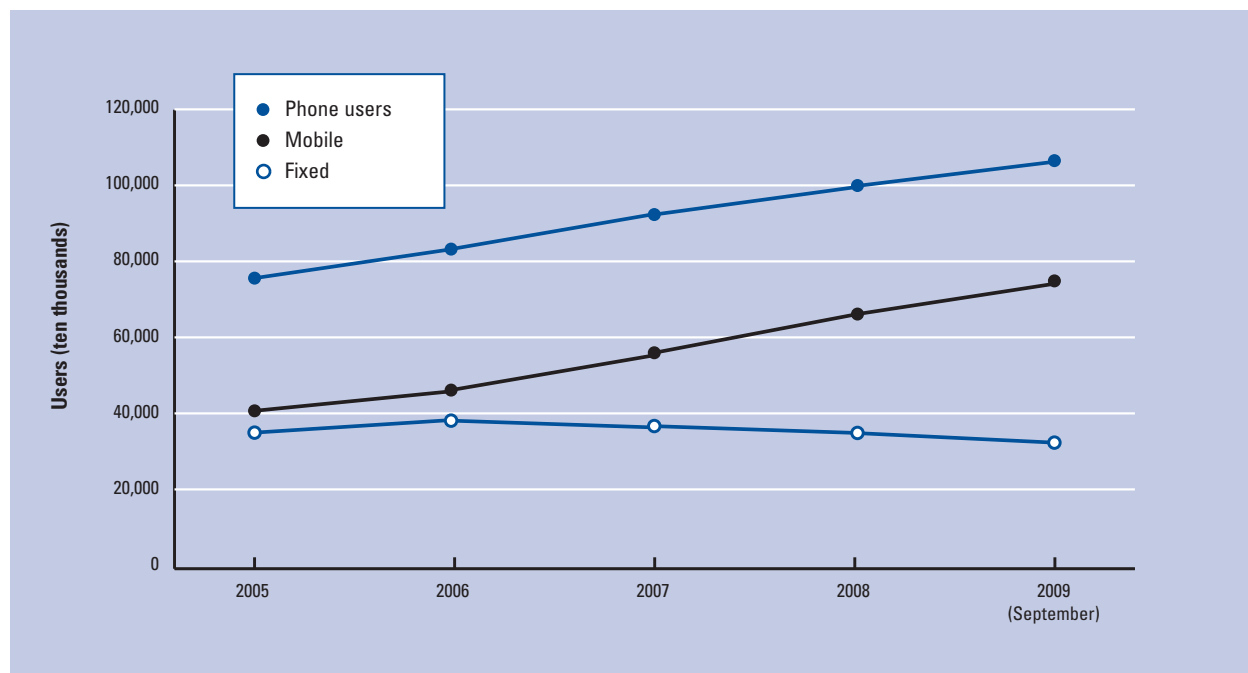
The earliest users of the Internet in China were universities and research institutes that mainly targeted international digital archives of scholarly content. At this stage, the pace of development was rather slow. In 1995, at the INET'95 International Conference held in Hawaii, the Chinese experts' request to connect the national Internet with its counterpart in the United States was flatly refused by the American experts. The reason given was the insufficient number of users and content on the part of China's Internet. The Internet in China was not at parity with that in the United States, thereby rendering an interconnection both unnecessary and undesirable. This nonetheless provided a strong incentive for the Chinese experts to develop content, as well as to tailor Internet services to the general public in the country. The synergies among the government, telecommunication enterprises, research institutes, Internet service providers, and numerous users has been indispensable to the mushrooming of the Internet in the country.

By June 2009, the number of netizens in China reached 338 million (see Figure 1).¹ The country was ranked number 1 in the whole world in this area, with a penetration rate higher than the global average of 25.5 percent. The number of broadband users reached 93.48 million, also the largest worldwide. The world's largest Internet infrastructure covered all the counties, cities, and towns in China, providing Internet access to 90.9 percent of the administrative villages. Broadband was also made available to 95.6 percent of all towns in

China. The scale of basic resources for the Internet has also expanded enormously. By June 2009, the number of Internet Protocol version 4 (IPv4) addresses reached 210 million, putting the country at 2nd place worldwide. By way of comparison, the number of domain names reached 16.26 million, of which 12.96 were .CN ones—the most widely used worldwide among all the country-designated domain names.² Moreover, this favorable environment not only catalyzed the first generation of such well-known enterprises as Sina, Sohu, and Netease, but it also contributed to the emergence of a new wave of enterprises (e.g., Tencent, Baidu, and Alibaba) at the end of the Internet bubble in 2000.

The development of ICT

As early as 1882, China had its first telephone. During the three decades from 1978 to 2008, the telecommunications industry in China built the world's biggest communications network, and also nurtured the biggest group of telecommunications users globally. Three Chinese telecommunications enterprises entered the list of Fortune 500. By September 2009, the number of telephone users in China reached 1.04 billion, of which 320 million were fixed lines users and 720 million were mobile subscribers—the biggest number worldwide. There was a substantial improvement in the country's network capacity, technology, and service quality. Furthermore, up to September 2009, the capacity of fixed-line office telephone exchanges reached 495 million, exceeding that of households and business users. Meanwhile, the

Figure 2: Telephone users in China, 2005–09

Source: MIIT, 2009 (see <http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/index.html>).

capacity of mobile telephone exchanges reached 1.305 billion.³ The fact that this number approximates the total Chinese population makes it possible to satisfy its wide variety of social and economic demands. This is even more evident when we consider the extensive coverage of telecommunication networks over almost all the populated areas and villages in China (Figure 2).

Over the last two decades, a fairly developed personal computer (PC) industry has resulted in China becoming the biggest producer of PCs worldwide. A robust local market provided a fertile environment for this burgeoning industry, where companies such as Lenovo and Founder could be created.⁴

In 1974, the first cable television (TV) station in China was launched. Three decades later, the optical-fiber telecommunication network for cable TV reached 40,000 kilometers nationally, with over 300,000 kilometers at the provincial level. Of these, the allocation access network reached 3 million kilometers; the total number of users is now as large as 164 million. From 2003 onward, China established a digital cable TV network by selecting a few cities as pilot sites. There are now many cities that have already built the technology platforms for digital cable TV. Over 100 cities, such as Qingdao, Hangzhou, and Shenzhen, have completed the overall digitalization of TV, and the number of digital cable TV users in China has reached 60 million so far.

Economic and social contributions of ICT

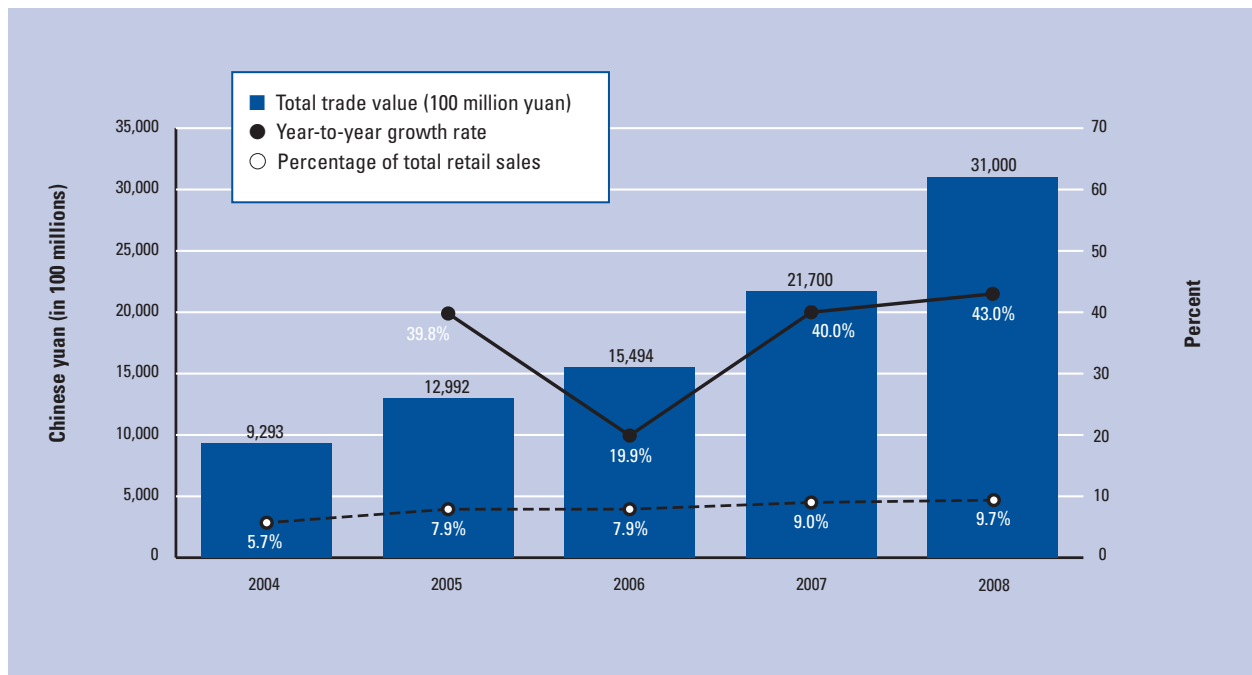
The impacts of ICT, especially the rise of the Internet, on societies and economies are palpable worldwide as well as in China. In the past three decades, ICT has played an indispensable role in facilitating China's increasing integration into the global economy and international community. Moreover, ICT has made positive contributions to such societal progress as the establishment of a civil society and an increasing democratization of the country.

The Internet and China's economic growth

The Internet industry is becoming more and more significant in China. It grows so quickly that it has become one of the factors driving the country's economic development and operational efficiency. At the same time, industries that rely on the Internet are emerging, thus creating a large number of jobs.

The rise of the Internet industry and its implications

In 2008, the Internet service market in China—including Internet access and Internet information services—generated 150 billion yuan (roughly €15 billion). Of this, Internet access provided 72.5 billion yuan in revenues and 5.6 billion yuan came from the Information Data Center, 49.2 billion yuan from fixed Internet information services, and 18.1 billion yuan from wireless application protocol (WAP) services. In the Internet information services market, the main sources of revenues came from such services as Web portals and search engine

Figure 3: Total e-commerce transactions, 2004–08

Source: National Bureau of Statistics (<http://www.stats.gov.cn/english/>); Economic Information & Agency, 2009.

advertisements, Internet games, WAP, instant messaging applications, and e-business.⁵

On a related note, a group of Chinese Internet companies rapidly grew into top global companies. Measured by their market value in March 2009, Tencent and Baidu both had joined the top 10 global Internet companies, at 8th and 9th place, respectively, while Alibaba and Netease entered the top 15, at 12th and 14th place. The average annual revenues in 2008 for the top enterprises (e.g., Tencent, Baidu, Alibaba, SDO, Netease, Sohu, Sina, and TOM) exceeded 2 billion yuan, while that of Tencent reached a record 7.15 billion yuan.⁶

The application of new technology and services to the Internet in China keeps pace with international standards. Recent Internet applications such as blogs, podcasts, wikis, socializing network services, and online videos have all experienced extremely fast growth and had considerable impact. By June 2009, the number of Chinese bloggers had reached 180 million; users of online videos numbered 220 million. The mobile Internet has been the focal point and latest trend in the development of the Internet. By June 2009, the number of mobile netizens in China reached 155 million, an increase of 38 million over the previous six months.⁷

The Internet economy and China's productivity

The Internet has significantly reduced transaction costs and raised productivity. In 2008, the total revenues of e-business transactions in China reached 3.1 trillion

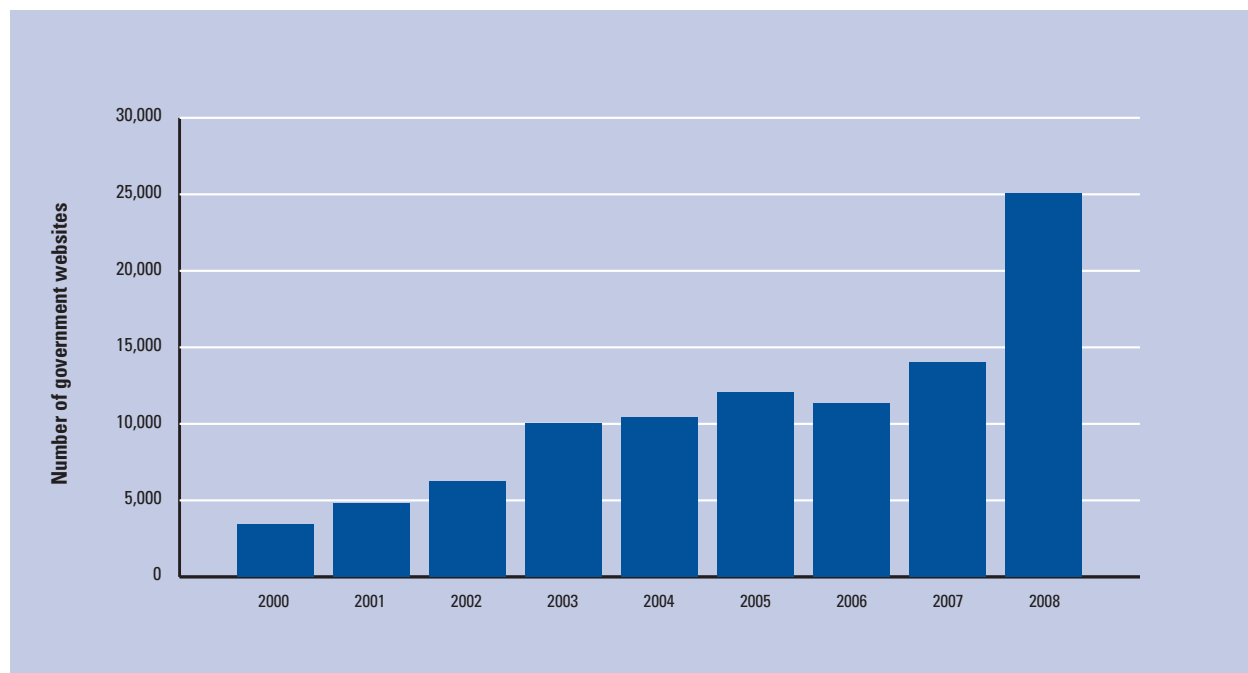
yuan—9.7 percent of the total volume of retail sales (Figure 3). The business-to-consumer online shopping market reached over 100 billion yuan. There were 7.9 million registered users for the international trading market and 30 million for the Chinese domestic market at the e-commerce platform provided by Alibaba, the third-party e-commerce service provider.⁸

Alongside reducing transaction costs, the Internet has increased payment and settlement efficiency, accelerated capital turnover rate, and fostered the economy's vitality. In 2008, the number of online payments in China reached 2.6 billion, with a total value of 263.6 trillion yuan—this is eight times China's GDP and 23.3 percent of total non-cash transactions.⁹

The Internet and emerging industries

The Internet has become the operation platform for software and service outsourcing industries. From January to June 2009, software outsourcing services experienced rapid growth, with their revenues accounting for 12.27 billion yuan at a year-to-year growth rate of 87.7 percent.¹⁰ Such unprecedented growth is fairly exceptional against the background of the current global economic crisis.

The marriage between the Internet and traditional information content and culture has greatly advanced the development of digital content and entertainment industries. In 2008, the output value for the digital content industry in China reached 210 billion yuan, with an annual growth rate of 45 percent.¹¹ It has thus

Figure 4: Number of government websites in China, 2000–08

Source: CNNIC, 2009.

Note: Government websites are those with the ending gov.cn.

become one of the new areas of economic growth, in which the revenues generated by online games, for instance, have far exceeded that of traditional entertainment industries such as film and audio-visual manufacturing. The daily download of “You and Me,” the theme song for the Beijing Olympics, reached 5.73 million at its peak, creating an overwhelming record for the music industry in China.¹²

The Internet and job opportunities

The rapid expansion of the Internet economy has created a large number of knowledge-based job opportunities, which, in turn, has compensated for the job loss resulting from adjustments in the country’s economic structure. In addition, the Internet economy has greatly helped to optimize the employment structure. In 2008, there were 557,000 direct employees in the value-added telecommunication services industry, creating even more indirect job opportunities. In 2008, the business-to-business platform of Alibaba alone involved over 10 million e-commerce employees working in small- and medium-sized enterprises. Also 570,000 individuals opened their own stores on <http://www.taobao.com>. Sixty percent of these were people between 22 and 30 years old—most of them recent university graduates or early career professionals.¹³

An Internet society, public services, and cultural development

In the first half of 2009, over 230 million Chinese used search engines for information related to work, study, and daily activities. Over 260 million used the Internet to browse the news, and 100 million used a wide variety of forums and bulletin board systems for sharing and distributing information. And 180 million Chinese disseminated information and personal opinions through blogs, while 290 million visited different websites to listen to music and 88 million shopped online.¹⁴

The Internet has also become an important part of the infrastructure for governance and the provision of public services in China (Figure 4). By 2008, 100 percent of central government agencies, 98.5 percent of municipality-level governments and 95 percent of county-level governments had established their own portal sites. Many public services—including industrial and commercial registrations, filing for taxation, and social security—had successfully gone online. Campus networks have been widely established around the country, covering over 90 percent of universities, 35 percent of technical and professional colleges, and 38,000 primary and secondary schools. Telemedicine has played an important part in medical routines and the monitoring of major epidemics.

ICT and innovation

The tremendous growth of the Internet in China can be seen from the fact that, by 2008, the country had the

Table 1: Output value of electronic and information technology products: World and China, 2007–08

| Value (US\$ trillions) | 2007 | 2008 | Year-to-year growth rate (%) |
|------------------------|-------|-------|------------------------------|
| World's output value | 1.61 | 1.66 | 3.1% |
| China's output value | 0.36 | 0.41 | 14.7% |
| China's percentage | 22.4% | 24.9% | 11.3% |

Source: MIIT, 2009; CIID analysis.

world's greatest number of netizens. A close examination reveals that the *raison d'être* for this development lies in the ICT demand prompted by the transformations brought about by institutional reforms in the telecommunications industry.

Prior to 1994, China's telecommunications industry was a national monopoly. This came to an end with the appearance of China Unicom Co. Ltd., which indicated the beginning of telecommunications competition in the country. This competition caused the whole industry to develop very quickly and fostered progress in network technologies and innovation. At the time of the global Internet boom in 1999, China Unicom grasped the opportunity to restructure its networks and propose such improvements as adding traffic engineering to IP networks, operation administration and management, and bi-directional failure detection to solve problems of the uncontrollability and unmanageability of IP networks and the lack of quality of service (QoS) guarantee. China Unicom also sought to harmonize additional functions for improving network performance with such equipment manufacturers as Cisco, Lucent, Juniper, and Huawei.

In 2000, China Unicom pioneered the use of improved IP network technologies to build the China Uninet—the world's first multiservice unified network platform with quality assurance. This network was the first of its kind to provide a single multiservice physical network that can handle voice, circuit fax, video conference, the Internet, and the CDMAIX mobile data. This network covered 337 cities in China and handled a monthly load of 1 billion minutes of Voice over Internet Protocol (VoIP) services and 3,500 concurrent video conferences at a transmission bandwidth of 384 kilobytes per second (KB/s) per conference. At that time, China Uninet was an IP network with the world's highest business volume that included high-quality assurance. This project explored effective solutions for network integration and evolution, which inspired many other international telecommunications enterprises.

Tencent is another example. When the Internet bubble burst in 2001, the company was on the verge of bankruptcy. Thanks to the instant messaging service QQ, which was highly popular among Chinese netizens, Tencent was able to rebound and has now joined the group of companies with a market value exceeding 100

billion yuan. In spite of the overwhelming global presence of Google, the Chinese search engine Baidu grew rapidly into a global company with technological innovations in searching Chinese characters. Uninterrupted technological innovation was also responsible for the growth of such companies as the telecommunication solutions provider Huawei and the telecommunication equipment and network solutions provider ZTE into leading global players.

Telecommunications, electronic and information technology, and China's economic growth

The telecommunications and electronic and information technology industries have played an increasingly important role in China's economy (see Table 1). In 2008, the combined value of the two industries took up 7.9 percent of China's total GDP, becoming the largest industry in the national economy. Of these, the output value for the manufacturing industry of electronic and information technology equipment reached 25.5 percent of the total output value of global electronic products.¹⁵

Problems and challenges facing the sustainable development of ICT

With its pervasive application, the Internet has permeated every aspect of our daily life and work. This constant use has brought to light certain latent problems that could jeopardize the Internet's robust development. We will analyze these issues in the following sections.

The scalability of IP networks

The omnipresence and explosive growth of the Internet have brought huge challenges to network capacities. For instance, even if Internet capacity in China doubles every year, it may still be unable to meet the growing users' demands. This is also the case with IP networks owned by other global operators. According to statistics by APNIC, the regional Internet registry that allocates IP and AS numbers in the Asia Pacific region, the average update rate for border gateway protocol reached 6 times per second and over 500,000 times per day. In November 2006, at the Internet Architecture Board Conference held in Amsterdam, it was pointed out that the growth rate of network routing had exceeded that of hardware performance.¹⁶ Moreover, because of the enormous growth in energy consumption by network devices, the Internet has accounted for 5.4 percent of global power consumption; this is growing at an annual rate of 8–10 percent. What is more worrisome, the IPv4 addresses will be exhausted by 2012, which may be exacerbated by the deployment of IPv6.

IP networks: Safety, controllability, manageability, and QoS guarantee

Initially, the design and application of IP networks were restricted to certain communities based on acquaintance and mutual trust; hence there was insufficient consideration of the complexity of applications that would appear in its future development. This situation has resulted in the increasingly important problem of safety for IP networks. According to statistics from the China Internet Network Information Center (CNNIC), in 2008, security incidents involving China's Internet were double that of the previous year. Current security measures of adding firewalls and closing loopholes for IP networks are far from being the systematic solutions needed for the whole network frame. Far from realizing its original purpose of serving mankind, the IP network's weaknesses have become weapons for attacking each other, which unquestionably is a great irony.

That the Internet can provide no more than a "best effort" service is mainly caused by the core network's lack of intelligence, which renders it unable to sense, detect, and control effectively. Moreover, it lacks the QoS guarantee, which is why it is often referred to as a "moron network, intelligent terminal."

The Internet and the new mobile, ubiquitous demands

In the Internet, *ubiquitous demand* refers to a comprehensive service for network users that operates regardless of time, location, and content. There are two main reasons for which the Internet needs to increase capacity to deal with this growing demand. First, because it targets fixed-location hosts and singular data services, the traditional Internet cannot provide the best solutions for mobile services, let alone the dynamic binding of hosts and IP addresses. Second, the majority of contemporary Internet services are concentrated on the client-server model, which is far from being capable of providing comprehensive and ubiquitous services. A top-down approach to examine the structure of future networks should fully take into account mobility and ubiquity, so as to support mobile and ubiquitous demands.

The widening digital divide

Internet development has also been inhibited by the economic, educational, and cultural divide in the country. The digital literacy of the poor and the disadvantaged depends on the improvement of their economic and social well-being. For instance, in China, 15 million people still live on a daily income of less than US\$0.31.¹⁷ The number of people belonging to the disadvantaged group is even higher if we use the World Bank standard of US\$1.25 per day. These people will find the Internet inaccessible because it is unaffordable to them. The sustainable development of the Internet, therefore, will be inevitably bound up with anti-poverty endeavors. In light of this perspective, the challenges posed by the

digital divide can equally present numerous opportunities for China to improve the status quo.

Different initiatives have been implemented to develop ICT, notably the Internet, in the poor regions of the country. For instance, the Sichuan Branch of China Unicom established a Tianfu Agriculture Information Network, which—through subsidies from government and enterprises—has created an all-inclusive information communication network with mobile text messages as its priority, and launched such multiple telecommunication platforms as mobile phones, fixed phones, pagers, the Internet, and call centers. A website bearing the same name has also been created. Information work stations established in over 1,000 towns and villages throughout the province have mainly been responsible for disseminating to over 500,000 local officials, agricultural enterprises, professional associations, and the rural population information about politics, agro-technology, commerce, weather, and agriculture. The Tianfu Agriculture Information Network is a comprehensive platform that can effectively communicate information to the rural areas. By promoting the division of labor, setting up markets, and improving the quality of public services, this platform is capable of substantially raising rural income. This project won the World Summit on the Information Society Prize at Tunis in 2005.

Internet trends: China's strategies for sustainable ICT development

There is a general consensus that ICT can effectively promote the goal of sustainable development, thanks to its role as an unceasing driver of economic and social progress. To achieve sustainable development of ICT, thus contributing to sustainable economic and social development, China has implemented many measures, including ICT research and development (R&D) and the application of ICT in traditional industries, with the aim of fostering the industry's growth.

Internet development trends

Faced with serious challenges of energy and environmental protection, sustainability has become an issue that concerns every walk of society. As far as network technology is concerned, a new trend that demands our attention is appearing. Networks are inevitably moving toward convergence. According to past experience, converged networks will save space, power, and network administration costs over separate networks. Cloud computing has received so much attention because of its highly efficient utilization of servers. Compared with the current low utilization of computer servers (less than 10 percent of their capacity), cloud computing may increase the servers' utilization efficiency, thus making it an inevitable choice for sustainable development. The technology of sensor networks can greatly improve humankind's ability to comprehend the world and to

explore nature by integrating its sensitivity to the physical world with network technology, computing, and control technology. For this very reason, sensor networks are regarded as one of the most promising areas for the future development of network applications.

Existing networks also have problems in areas such as scalability, security, quality of service, mobility, robustness, and energy conservation. Finding solutions for these problems will be the greatest challenge going into the future.

It is held by the international academic community that the current method of “patching up” the current network by improving it without replacing it with a new one is no longer viable for satisfying the needs of future networks. Instead, a “clean slate” strategy of constructing a new network to replace the current one should be adopted. This means the current IP network framework should be discarded and a new network framework should be constructed from scratch. As a matter of course, the advantages of traditional networks should be kept—especially existing network and user resources, which can be easily transferred to the future network.

China's strategies for the sustainable development of ICT

The Chinese government has attached great importance to the sustainable development of ICT, adopting a series of effective measures toward that end. China has extended this approach to technology innovation and industrial training. An integration of ICT with other industrial sectors is actively sought.

Key projects in ICT

In the National Mid- and Long-Term Programme for the Development of Science and Technology, the Chinese government set up 16 main projects, hoping to achieve breakthroughs in certain key areas and to enable a substantial development of overall productivity through the dynamics of the sectoral leap forward in science and technology. Of these, ICT has been highly prioritized, with three special key areas:

1. core electronics, high-end universal chips, and basic software;
2. manufacturing technology and complete processing of Great Large Scale Integration; and
3. the next-generation broadband wireless mobile communication network.¹⁸

Enterprises will carry out these projects, so as to promote a synergy between manufacturing and research through market mechanisms. In this process, the government will provide necessary support in terms of legislation and governance.

Support for ICT as an emerging strategic industry

The recent global economic crisis has probably been the worst since the Great Depression. History demonstrates that new discoveries in science and technology are frequently conceived in times of financial crises, and the past decade has witnessed the leading role played by ICT in global economic growth. The recovery and future economic growth across the world will depend largely on further developments in the ICT industry and on new technologies. In November 2009, Premier Wen Jiabao delivered a speech to the scientific research community in Beijing entitled “Enabling Science and Technology to Lead the Sustainable Development of China,” in which he pointed out that building an innovation-oriented country should be the strategic goal in fostering the sustainable development of the national economy in the long term. To achieve this, the emerging strategic industries will play a leading role. As he emphasized, “specific efforts should be directed to exploring core technologies on sensor networks and the Internet of Things, as well as to deploy R&D on post-IP technologies. The information network industry should be made the ‘engine’ in industrial upgrading and our move towards an information society.”¹⁹ The Chinese government is now exploring concrete strategies to achieve this goal.

Integration within the ICT industry and with other industries

China is actively promoting an integrated development of telecommunication networks, broadcasting networks, and the Internet, in the hope of achieving interconnection and sharing optical fiber and access pipelines among these three networks. On January 13, 2010, at the Executive Meeting of the State Council, it was explicitly suggested that from 2010 to 2012 the pilot bi-directional access be carried out between broadcasting and telecommunication services, and from 2013 to 2015, a convergence of the triple networks should be implemented.²⁰

By converging industrialization and digitalization, China wishes to carve out a path of industrialization that entails low consumption and low pollution through the application of ICT. This aim also points to the direction of future ICT development in the country, creating an enormous space for its integration with industrialization and an organic combination of the sustainable development of ICT and that of the economy. Last year, after careful examination, the MIIT organized and promoted the pilot sites of an industrialization-digitalization convergence at the three levels of enterprise, industry, and region. Enterprises were encouraged to apply ICT for raising productivity through a technological upgrade. The issuance of the Directive on Advancing the Industrialization-Digitalization Convergence for the Consumer Goods Industry was an attempt to test this convergence on specific industries.²¹ In addition,

pilot zones were set up in eight cities—including Shanghai, Chongqing, and Guangzhou—to explore different paths of convergence across regions. The positive effect of these measures is gradually manifesting itself in various aspects of the development of industrialization and digitalization.

Conclusions

One of the main lessons to be learned from the development of the ICT industry in China has to do with the joint efforts of the government, the business sector, and research institutions in such a process. The government, in particular, played a leading role, by regulating the development of ICT through market mechanisms whenever possible as well as by encouraging enterprises and research institutions to strengthen their cooperation on innovation and emphasizing the integration of ICT development and social needs.

Going forward, China's ICT industry faces some difficulties and challenges that may affect its sustainable development. Among these are the threats to networks' security and stability; information security issues such as privacy violations and youth protection; and, last but not least, the digital divide in the country. These challenges highlight the need to continuously strengthen technological innovation in order to promote the industry's development as well as to increasingly take into account the needs and participation of the whole society. This chapter has described China's strategy of cultivating a strategic emerging industry, and—through promoting the integration of information technology and industrialization—gradually encouraging an increased use of ICT in simplifying processes, improving efficiency, conserving energy, and reducing carbon emissions.

Notes

- 1 A *netizen* is a citizen who uses the Internet as a way of participating in political society (for example, by exchanging views and providing information).
- 2 CNNIC 2009.
- 3 See the Ministry of Industry and Information Technology (MIIT) at <http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/12985083.html> and <http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/12964759.html> (in Chinese).
- 4 See the State Administration of Radio Film and Television, available at <http://www.sarft.gov.cn>.
- 5 This was compiled and calculated from the data available at MIIT, annual reviews, and annual reports of listed Internet companies.
- 6 See the quarterly reports of these enterprises.
- 7 See the State Administration of Radio Film and Television, available at <http://www.sarft.gov.cn>.
- 8 See the quarterly reports of these enterprises.
- 9 Bank of China 2009.
- 10 Data from China Electronics News. See http://www.cena.com.cn/Article/yaowen/zonghexinwen/2009-07-29/20090729105329_20851.shtml (in Chinese).

- 11 These figures are from the internal journals of the Ministry of Culture.
- 12 These figures are from the MIIT, 2008. See <http://ccnews.people.com.cn/GB/87326/7646129.html> (in Chinese).
- 13 See <http://www.alibaba.com/>.
- 14 CNNIC 2009.
- 15 Figures are from the National Statistics Bureau. See Economic Information & Agency 2009.
- 16 See <http://bgpupdates.potaroo.net>. This report was generated on February 2, 2010.
- 17 See the State Council Office of Poverty Alleviation and Development, available at http://www.cpad.gov.cn/data/2009/0320/article_340063.htm (in Chinese).
- 18 See http://www.gov.cn/jrzq/2006-02/09/content_183787.htm (in Chinese).
- 19 See http://www.gov.cn/ldhd/2009-11/23/content_1471208.htm (in Chinese).
- 20 See http://www.gov.cn/ldhd/2010-01/13/content_1509622.htm (in Chinese).
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