

# ICT Initiatives in China

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## ABSTRACT

This paper presents the ICT initiatives in five aspects. First, it makes a brief review of the development history of the information and communications technology. Second, it explains why the concept of ICT initiatives was put forward and what its meaning is. Third, it puts forward what considerations should be taken or what relationships should be dealt with appropriately in China's drive of promoting ICT deployment. Fourth, it describes the status quo of China's ICT-readiness. Fifth, it outlines the ICT applications. Sixth, it identifies reasons for development and existing problems. Finally, it envisages the prospect of the ICT initiatives.

## INTRODUCTION

After 20 years' ICT initiative, great achievements

have been made in China and at the same time, there is still a long way to go. How have we managed to get to the point we are now at? What development has been made? What experiences have we obtained? What lessons have we learned? And where is the way in the future? I would like to share my views with you on these issues based on my personal experiences in participating in the national initiatives of promoting ICT diffusion in China.

## COURSE OF ICT DEVELOPMENT

The development of the modern information and communications technology began in the West in the 19<sup>th</sup> century, and its history is just 100 years or so. As far as communications technologies are concerned, telegram was invented in the first half of the 19<sup>th</sup> century, and telephone came into being in the second half of the 19<sup>th</sup> century, ushering in the development of the modern communication technologies. By the end of the 19<sup>th</sup> century and at the beginning of the 20<sup>th</sup> century, radio technology was born. Telephone became a household technology in the developed countries in the first half of the 20<sup>th</sup> century. In the second half of the century, technologies such as stored program controlled telephone switching systems, optical fiber communications, and satellite communications were invented one after another. Communication technology is among the earliest developed information and communications technologies, and by now it has already a history of about 160 to 170 years. There was radio broadcasting technology after radio technology was invented. In the first half of the 20<sup>th</sup> century, TV was invented with color TV following it, and in the second half of the century,

cable TV was born. The development of both broadcast and TV technologies enabled the full development of both the audio and video technologies. Today, we can't live without radio or TV. The computer technology was invented relatively late, and the first digital electronic computer appeared in 1946. The first computers used vacuum tubes, which were replaced by transistors shortly, and the latter again was replaced by IC technology. Computer has entered the 4.5<sup>th</sup> generation. Now high performance computers built with large scale IC boards can perform tens of thousands of billion times of calculations per second. After the invention of computers, the production of corresponding software gradually became an industry. In addition, with the advent of database systems, we had a way to store data information.

There are two other new and most influential technologies. One is the cellular mobile communications, and the other is the Internet.

The principle of the cellular mobile communications was from the Bell Lab around 30 years ago. In the 1980s some countries built a few cellular systems, but there were only a few people using mobile phone in the west countries back in 1985. The first use of mobile phone in China was in late 1980s, and the first cell phone was introduced in China's Guangdong province. The large scale application of the cellular mobile communications began in the 1990s. Now the total number of cell phone subscribers worldwide has begun to surpass that of fixed phone subscribers. There are about 1 billion fixed phone subscribers now after about 100 years of development, whereas the number of cell phone has already reached 1 billion after only 10 years of development. The number of cell phone subscribers has already exceeded that of fixed phone subscribers in quite a few countries.

The principle of the Internet also has a history of nearly 30 years. It began with two nets in the U.S. One was the net for science and education, and the other was the net for defense. Later, due to the end of the Cold War, the U.S. was also transforming some military technologies into civilian

ones. So this technology was used for civilian purposes, and hence the Internet was created as a result. The Internet technology itself also has decades of history. But the large scale use of the Internet was later than cellular mobile communications, and it has a history of only less than ten years. In 1994, the first world conference on telecom development was held in Argentina, and ITU invited Vice President of the United States Al Gore to deliver a keynote speech. Gore said that the U.S. put forward the NII (National Information Infrastructure) concept in 1993. We now say GII, that is, Global Information Infrastructure. Back then, what Gore said was the Internet. And it was the first time the American recommended the Internet to the world as the Global Information Infrastructure, which commonly known as the Information Highway. Internet is still growing very fast today, although it has a history of only a few years. At the beginning, seventy to eighty percent of those who were using the Internet were Americans, and now other countries also see the rapid development of this technology, with Americans accounting for approximately one third of the total web surfers. Apart from these, other technologies such as radar, navigating, positioning, and various sensors are also growing fast.

## THE COCEPT OF ICT INITIATIVES

There are two backgrounds for the birth of the concept of ICT initiatives. One is that western countries had basically realized industrialization in the first half of the 20<sup>th</sup> century, and the economic development entered a new stage. The other is the development of ICTs as well as its high permeability.

There are two levels of meaning for the concept of ICT initiatives: one is the development of the information and communications industry.

### 1. Development of the ICT Industry

The development of ICT has formed an ICT indus-

try of considerable size, which will take a very important position in the national economy. The ICT industry has two aspects: One is the manufacturing industry and the other is the service industry. The manufacturing industry includes the manufacturing of communication and broadcasting equipment, computers and related equipment, consumer products, and components and production equipment. The service industry includes communications industry, networking industry, broadcast and TV industry, as well as consulting integration industry. Today's information industry has some new dimensions and new divisions.

One is the software sector. Software originally belonged to computer manufacturing. But because software is very important, it becomes an independent industry. According to the Moore's Law, the cost of hardware is declining continuously. But software does not follow the law, and a software program needs people to write it sentence by sentence. When the cost of hardware is declining, software is becoming increasingly complicated, and its share in the whole computer system is becoming bigger and bigger. Therefore it was taken out to become an independent industry. Consulting integration was added to become a software industry in a broad sense.

The other aspect is the changes in the service industry. In the past, communication industry was just about transportation, and it had nothing to do with content. But with the advent of the Internet, things have changed. People are getting online to obtain content, and the network itself provides contents. So transportation and contents are combined together this way. The industry becomes very complicated too. The traditional communication industry can't provide content. So the industrial chain has to be re-divided into the transportation provider, the content provider, and the access provider. This division of industrial chain is different from the division of traditional industrial chain in the past, and the new division is far from completed and is still in the process of evolution.

## 2. Information Permeation

### **Above all, information can permeate into politics.**

It is all aware that the fundamental issue of politics is democratization. The permeation of information into politics means that it should help improve democratization. The right to know is often talked about and the development of ICT is to serve the purpose of making the general public be aware what's going on. When information and communications technology was not available in the past, it's hard to achieve the right to participate, or the right to say. Now with a single push of the voting button, this problem is solved. Other means, such as mass media, including web media (or the fourth media) has greatly improved the democratic level.

**Secondly, information can permeate into economics.** Information technologies including CAD, CAM and other CAXs have been widely used in the R&D and the manufacturing process. Take the design of aircraft at Boeing for example. If using drawing papers, the weight of all the drawing papers used will exceed that of a whole aircraft. Also, the design of a Boeing aircraft is going on at many different places in the world at the same time, and if there is no information and communications technology, this will not be possible. With the advent of the Internet, the company can mobilize designers from different places to design an aircraft, and the whole process almost does not use paper at all.

In terms of production and business activities, information technologies such as ERP, SCM and CRM are also widely used. Modern logistics is one that involves not only materials but also information systems. Using information systems to guide material flow constitutes modern logistics.

It holds true for financial sector too. Modern financing is finance in terms of business operation and is an information process in terms of physical process. The modern financial system is essentially an information system from the perspective of physical concept.

In the management aspect, lots of management

tasks including the management of people, the management of materials, and the management of money require modern information technologies.

**Thirdly, information can permeate into the culture.** In this regard, in addition to the movie and TV culture, there is also the online culture, which has many new laws that we still haven't understood and are still under study. For example, we send and receive lots of email and short messages each day. In addition, recreation is also a very important aspect when talking about the permeation of information and communications technology. The main content of i-mode is recreation, involving cultural traditions. Web-enabled recreation hasn't taken foot in western countries, but it has in eastern countries, like Japan and Korea, which all have successful examples. This phenomenon really deserves our study.

## RELATIONSHIPS IN PROMOTING ICT INITIATIVES

### 1. Relationship of Infrastructure, Information Source and Information Applications

Building a large information system needs information sources most importantly, then needs information infrastructure, and finally needs applications. The relationship between them should be properly dealt with. A common problem now is that attention is being paid to the middle, that is information infrastructure, and the two ends are overlooked. This problem is seen not only in developing countries, but also in developed countries, with the former more severe. That's because information resource in developing countries is especially scarce. Take statistics data for example. Many statistics data we see now should come with a question mark. Let me give you a simple example. The GDP growth rate of all of 31 provinces, municipalities and autonomous regions in China is higher than the national GDP growth rate, and this is the case each and every year. This can hardly be understood. In addition, the customs and the foreign trade ministry give different

import/export figures each year, and the State Council has decided to use the figures from the customs, but hasn't asked the two to have consistent figures. That's why figures from the two government agencies are still not the same. Also, the public security authority and the civil affairs authority have different population figures. I have been advocating that when building any system, attention must be paid to the two ends, that is, attention must be paid to information sources and information applications. Just building the hardware system is relatively easy, and you can do it if you have money. If the two ends can not be given enough attention, they will become very serious problems for developing countries.

### 2. Relationship between the Service Sector (Information Infrastructure) and the Information Equipment Manufacturing Sector

The relationship between the service sector (information infrastructure) and the information equipment manufacturing sector in the information industry is particularly important to a big country like China. In other words, modernization can't be bought, neither can ICT readiness. Buying everything from abroad might be doable at the initial stage. But for a country like China, if you want to have a complete coverage, you can't buy everything from abroad, and you must have your own information manufacturing industry as a support.

### 3. Relationship between ICT and Modernization.

ICT is the means, not the goal. Our goal is to realize modernization. For now, we can't go ahead with modernization without promoting ICT deployment. This must be made clear.

### 4. Relationship between ICT and Industrialization

The two are interacting with each other. There are several aspects to this relationship. One is that the improvement and reform of traditional industries needs the use of ICTs. The so-called advanced

manufacturing is in general the combination of the improvement of traditional technologies themselves and ICTs. The other is that due to the catalyzing role of ICTs, many new industries have come into being. For example, bio-informatics is included in biotechnology. The application of ICTs in the medical field results in a very big industry, and now the new medical equipments are taking wide use of ICTs. Both CT and MRI are based on ICTs.

Among the trends in the development of manufacturing are automation, integration, virtualization, green production and globalization. There is a big issue in the modern industry, that is, the integration of mechanical and electrical parts into one body. So far the controlling parts of the digitally controlled machine tools in China are mostly imported. These parts are very simple in the eyes of those in the ICT field. But without the cooperation of the mechanics sector and the electronics sector, integration is hard. You may know that the third-phase furnaces of the Baosteel were all built by itself, but the automation parts of the furnaces were imported. Furnaces can be built, but not the controlling parts, which need to be imported. Therefore integration is a big issue. Virtualization is to create virtual companies through the networks. Green production means without producing waste. Globalization can't be realized without the deployment of ICTs. All these can't do without the permeation and applications of ICTs.

### **5. Digital Divide**

The so-called Digital Divide refers to the gap between different people in their retaining of information. There are two aspects for Digital Divides: One is between different countries, such as that between developed countries and developing countries, and the other is between the poor and the rich within a country. Ordinarily, the depth or difference of Digital Divide is bigger than that of Economic Divide. For example, the U.S. has a lot of homeless people, and the U.S. government can provide financial help for them, but it can do

nothing about the Digital Divide. The same is true for the Digital Divide between countries. The difference between phone penetration rates in the most developed countries and the least developed countries is bigger than their economic gap. The problem of Digital Divide within a developing country is even worse than that within a developed country, because apart from economic difference, there are also differences in culture and education. One must be adequately educated to use the Internet. Therefore attention should be paid to the Digital Divide in developing countries. The Digital Divide can't be eliminated. The point is how to narrow it. Currently, the phone penetration rate in China's urban areas is 3 times that in its rural areas, and it's not easy to eliminate this gap.

## **STATUS QUO OF ICT-READINESS IN CHINA**

The ICT development environment can be summarized in the following aspects: The first aspect is that the development level of China's economy is still low, and the per capita GDP is only about \$1,000, although the country has enjoyed 20 years of continuous and high speed development. The second aspect is that China is in the process of economic transformation, and the framework for market economy has been established essentially, although there is still a long way to go to build a full market economy. The third aspect is that China has already participated in the process of economic globalization after joining the WTO. The fourth aspect is that ICTs are developing rapidly in China. These are the major aspects of the environment or background for China's ICT deployment initiatives.

The first driving force of ICT initiatives is the push of the government. The ICT construction in the U.S. can't be what it is today without the push of the Clinton and Gore administrations, and the worldwide campaigns can't be what they are today either. In China, the push force of the government is even bigger. The second driving force

is the pull of the market. In a planned economic system, there is no big use for information. But a market-oriented economy needs information. The third driving force is the catalyzing effect of the international environment. The development of ICTs, especially the automatic phone system, began in the special economic zones in the coastal areas, because foreign businessmen needed to make phone calls when they came to China. Hence, the ICT initiative was made possible by the push of the government, the pull of the market, and the catalyzing effect of the international environment.

Furthermore, achievements in different stages of the ICT deployment should be made clear of. To put it simply, in the information service sector, China is already the world's number one in terms of the number of fixed phone subscribers, the number of mobile phone subscribers, and the number of TV sets currently in use, and ranks second in the world in terms of the number of web users. The development of the information manufacturing sector is also very fast, with both the production of telephone switching systems and the production of TV sets being at the first place in the world. However there is still a big gap between China and the developed countries in the IC sector.

There exist some problems in the whole manufacturing sector in China. The total industrial output value for electronic information products published in 2001 was RMB 1,300 billion yuan. Some people argued that the total GDP of China was only RMB 820 billion yuan, whereas electronic information products accounted for 1/9 or even 1/8, and this was misleading. The RMB 1,300 billion yuan figure was obtained based on the fixed unit price in 1990. But the prices of electronic products have been lowering. Therefore, the sales income should have been about RMB 820 billion yuan, among which RMB 170 billion yuan was the industrial added value. The industrial added value was included in GDP, accounting for 1.85% of GDP. Plus the added value in the service sector, the total proportion of the information industry in China's GDP

was 4.2%. The figure for the U.S. was 8.4%, which is 2 times the figure for China.

The ICTs can be applied in many fields. One is the sectional application, including a couple of the so-called "Golden Projects", such as the Golden Tax Project, the Golden Customs Project, and so on. The other is the regional application, including the Yangtze Delta and the Pearl River Delta. Now the central government asks all regions to initiate the ICT application campaign. The third is the application in enterprises. Some enterprises are serious about this, and others are promoting ICT applications just for the sake of the campaign itself. In addition, ICT deployment in communities has just started, only a few regions are doing this, and it's not been widely adopted nationwide.

## ICT APPLICATIONS

**Specifically, ICTs are used in the following areas:**

### 1. E-government

The State Informatization Office will take e-government as the most important area for ICT deployment. But to what degree the deployment should be is a subject worth of study. E-government is a very important issue, but will encounter resistance. It will surely be objected, and right now the resistance is seriously underestimated. E-government will make government affairs transparent, and both the government and its officials should give up some of their powers and interests. This must be made clear, or e-government can't be a success. The style of government management relies to a large degree on the asymmetry of information. If this asymmetry is eliminated or reduced, the management style must be changed entirely. Therefore the resistance to e-government initiatives must not be underestimated.

### 2. E-commerce

Books are non-differential commodities, and are the easiest to sell online. But many other commodities

are not like books. They are differential, and people need to compare when purchasing. There are some people, especially women, who argue against e-commerce. They think shopping is a pleasure, and e-business deprives this pleasure of people. Therefore e-commerce, especially B to C, will not grow fast in China. There are of course successful examples, such as EDI, which is good due to the needs of international trade and the catalyzing of international environment. But generally speaking, there is still a long way to go to see the booming of e-commerce.

### **3. Long Distance Learning**

It was fairly good in China at the very beginning, such as the TV Universities. But long distance education can't replace face-to-face education fundamentally. We once went to the U.S. to take a look at the American online universities. They didn't build anything physically, but just utilized public networks. However they provided a lot of services. The student classes of online universities were even smaller than those of face-to-face schools, and usually had 10 students in a class. Students could ask for help from their teachers online, and they could get their answers any time of a day. In China we would first build networks when starting long distance education, and lots of money would be used in building networks instead of in applications.

### **4. Entertainment and Query**

On-line entertainment and search services have made substantial progress in China.

## **REASONS FOR DEVELOPMENT AND EXISTING PROBLEMS**

### **1. Reasons for Development**

Why have we been able to get these achievements at this stage? The reasons can be traced in the fol-

lowing aspects: The first aspect is that there is the demand, which includes three parts: one is the demand arising from the reform and opening up, or internationalization; the other is the demand arising from the market-oriented system reform; and the third is the demand arising from the improvement of people's living standards thanks to the implementation of the reform and opening up policy. The second is the policy aspect. The government introduced preferential policies in taxation and financing. For example, the former posts and telecommunications authorities charged customers for installing telephone lines. In addition, there are also preferential policies in using foreign exchange and in importing equipment. The third is the system aspect. One reason is that the service sector is in a monopoly position. Today, with the development of technology and the expansion of scale, there is a need to break the monopoly, and there is no doubt that competition is necessary. But until now, no single country in the world has completely opened up. Oligarchic competition or oligarchic monopoly is still common. Until now telecommunications sector in China is still in an oligarchic competition situation, and the broadcasting and TV sector is still under monopoly, and will not open up in a short time. Of course it's open to competition in the manufacturing sector. We can say that the manufacturing of telecommunications equipment is the most opened up one in all the sectors in China. Compared with the auto industry, telecommunications equipment manufacturing has achieved a lot relatively, irrespective of the shortcomings.

### **2. Existing Problems**

Many problems exist in China's ICT field. One is the lack of contents, and this is a common problem worldwide, but more severe in China. The second is the lack of a law framework. Until now there is not a single law dedicated to this area, let alone a law governing the Internet; what we have are only some administrative measures. So regulation is an issue of big concern. The third is the gap between

urban and rural areas. The fourth is the waste of investment. The problems Americans are facing today have a lot to do with over-investment, I am afraid. Some argue that the utilization rate of the backbone optical fiber lines is only 1%, and I estimate the rate is about 10% in China. Some of the wastes of investment in computers are caused by the upgrading trick of both Intel and Microsoft, and others are caused by ourselves. Such wastes are different from those in industry, and are often overlooked. So the problem of ICT investment waste is very serious. The fifth is no unified standard in e-government, and different agencies and regions are doing it on their own. If the standards are unified one day, they will have to get rid of their respective standards and start from the scratch again, and this is absolutely a waste. The sixth is that China lacks products with its own IPRs, although the manufacturing industry is considerably developed. Another problem is security.

## THE FUTURE THAT HOLDS FOR US

**First, ICT deployment in China will be developing at a relatively fast speed, and as a whole will be ahead of social and economic development, but it will not be too much ahead.** The current level of e-readiness in China is far higher than that in countries at the same economic development level with China or developed countries when they were at the same level with China economically. ITU has a curve for phone penetration rate. According to the curve, the phone penetration rate is closely correlated with per capita GDP, and China is above the curve. There are many different reasons for this, and low service charge is an important one. Our ARPU is very low, only about one fourth to one eighth of the west countries. This situation will continue, and it's not likely for us to get detached completely from economy. Now many people say that our phone penetration rate is 30% and the rate in other countries is over 100% (all refer to the sum of fixed and mobile phones), meaning that we still have a

big room for growth. To say this is irresponsible. Such people don't see that our per capita GDP is only about one thousand US dollars and their per capita GDP is over 20 or even 30 thousand US dollars. Economic level determines development level. Development can be ahead of economy, but can't be too much ahead. Some cities claim that their output of information industry will account for 50% of their total GDP. This is against common laws in economics, no single sector can account for 50% of GDP, and the contribution of the whole second industry to GDP is only 50%. The growth rate of fixed line business is already lower than that of the national economy, and this is very natural. Another example is the railway sector, which has been slower than the whole economy in growth for many years. It's a steadily growing sector. Our higher than normal growth in previous years has something to do with the historical stage of that period, and now it seems that stage has passed.

**Secondly, urban-rural gap and Digital Divide will be eliminated gradually with the development of urbanization.** There was an idea in the past that we should build the countryside to be as good as cities, and now it seems that this is a dead end. Now it's clear that we should urbanize the countryside. There are two different views about urbanization: one is to develop small towns, and the other is to develop cities. In the final analysis, it is inclined to population concentration due to the concern of scales of economy. done if the population is small, such as road building and water treatment. So we should move more people into cities and reduce rural population. This way many things (such as roads, sewage treatment, posts and telecommunications, etc.) can be easily solved, the level of ICT will also be improved. But this will be a very long process.

**Thirdly, it is necessary to gradually expand the areas for ICT applications, and make efforts to explore areas where ICT applications can result in benefits.** Two points should be mentioned here: one is that the progress of the e-government initia-

tive should be in coordination with the process of government restructuring and functional change. E-government can't be a success without this process. The second point is that the progress of the e-commerce initiative should be in coordination with the process of building a market-oriented economic system. E-commerce can't be a success without a market-oriented economy.

**Fourthly, the ICT deployment should be in coordination with the improvement of the income level, especially the improvement of the cultural and educational level.** Now universities don't have problems in providing computers, and middle schools and primary schools don't have problems in offering computer classes. But it may not be practical to buy a computer for each student in high schools and primary schools for them to practice on. The exam-based educational system in China can't be changed in a short time. Many people argue that we should adopt heuristic and discuss-focused teaching in our primary schools, as is the case in the U.S. This is not possible at a large scale in China. If parents have bought computers for their kids, but the kids are using the computers to play online games all day long, will the parents still agree to do it? Therefore, the level of ICT-readiness in the whole society should be compatible with the level of people's living standards, the level of culture and education, and the level of economic development.

Fifthly, comprehensive integration and industrial chain reorganization should be strengthened in the

service sector. The key is that the government should put into place practical and effective laws and regulations, and we are still very weak in this aspect. In the manufacturing sector, it is necessary to gradually increase the proportion of products with our own IPR. Now the scale of the manufacturing sector in China seems very big, but in the RMB 800 billion yuan sales volume, industrial added value is only RMB 170 billion yuan, just over 21%. At the beginning of reform and opening up, the proportion of industrial added value in China's total industrial output was a little bit over 30%, and now this figure is continuously lowering at about 26% at present. That is to say that our many technologies are imported from abroad, and the added values are not ours. The ratio of industrial added value is close to 50% in developed countries, and we are about half of it. Electronic industry should belong to the hi-tech category, and the ratio of industrial added value should be higher than average. But the ratio in China is lower than average, just over 21%. Therefore our hi-tech industry shouldn't be counted as hi-tech industry in a strict sense. Our R&D input is very low, far less than 10% of the sales volume. That's why I said that we should increase products with our own IPRs.

**Last point: we should be clear-headed in looking to the fast global changes, seek efficiency in rapid development, and let the market play a more active role under the guidance of the government.**