Information Technology Development in China and Related Human Resource Policy

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1. National IT Policy/Plan
1.1 Fundamental Policy
Statement of principles, Long-range plan
The general principles of the IT development in China are “Planning as a whole, sharing the resources, leading by the application requirements, oriented by the market, being secure and dependable, and achieving substantial effects”
Long-range plan not available.
IT related fundamental law and regulation
Regarding the IT development, the legislation process in China needs to be accelerated. Much emphasis should be put on the law making on the telecom, broadcast and TV, Internet, software, information security, on the improving of laws and regulations on E-commerce secure transactions, intellectual property protection, public information resource management, network management, digital signature, and data protection. Modifications should be made on some regulations and procedure laws, to prevent and punish crimes on the computer and network. China will also actively participate in the international information organizations, taking part in the negotiations and development of international treaties on the information technology.
The important IT related fundamental laws and regulations includes:
The post law of People’s Republic of China
The telecom regulation of People’s Republic of China
The MII public notification of Internet domain name system of China
The Internet information service administration
The temporary regulation of the Internet culture administration
The provision of reporting of significant telecom accident
Other laws and regulations can be achieved from: http://www.mii.gov.cn/mii/zcfg.html and http://www.law-bridge.net/sec.asp?o=1067
The organization in charge of IT Policy/Plan
The Informatization Agency of the State Council is in charge of the nationwide information technology application and the legislation issues of IT development in China. There is a division in charge of the information technology application in each ministry or state department, and in each provincial or municipal administration. All these IT divisions will act according to the policies of the Informatization Agency of the State Council.
The Ministry of Information Industry is in charge of the strategy, policy, and planning of information infrastructure construction, electronics product manufacture, and information resource development.
The Standard Administration of China is in Charge of the development and administration of Information Technology and IT application standards.
The very specific dividing of responsibilities among these players is not available.
1.2 IT related Policy
1.2.1 Governmental IT promotion plan
1.2.1.1 Regulations
Regarding the IT development, the legislation process needs to be accelerated. Much emphasis should be put on the law making on the telecom, broadcast and TV, Internet, software, information security, on the improving of laws and regulations on E-commerce secure transactions, intellectual property protection, public information resource management, network management, digital signature, and data protection. Modifications
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the computer and network. China will also actively participate in the international information
organizations, taking part in the negotiations and development of international treaties on the
information technology.
1.2.1.2 System reform
Regarding the technology advancement and market requirements, China will continue to
deepen the reform of the telecom and broadcasting and TV system, to open the market,
break the monopoly, to form an orderly and efficient competitive market structure. China will
also deepen the reform in the Information technology financing. The China government will
also change its role, to strengthen the supervision, and to enhance the forming of a
self-disciplined mechanism of the IT industry. The construction of information technology
infrastructure in western areas of China will be strengthened. China will gradually form a new
price supervision and management system.
1.2.1.3 International cooperation
In order to improve its international competitiveness, China will enlarge its international
cooperation. According to the strategy of “Going out”, the enterprises will be encouraged to
establish plants in foreign countries, and will be encouraged to enter the international
telecom service market. The strategic cooperation with famous international IT corporations
will be strengthened, to make a deeper understanding of the key technologies and advanced
management experiences. Since China became a member of WTO, the trade policies will be
adjusted, and the management of importing and exporting will be improved.
1.2.1.4 human resource development
To better develop the information technology, popularized education and training is
necessary. Therefore, education of computer and network will be carried out in different
levels of schools and universities, and training of IT knowledge and skills will be widely
adopted in the whole society. Unified computer and network courses will be set in the primary
and high school curriculum. New departments about IT will be added to the universities and
the curriculum will be adjusted. Teachers, public servants and people in other government
positions will be given substantial IT training.
In order to satisfy the need for high level IT and management persons, China welcomes
persons studying abroad to return. The rewarding conditions in technology, management,
intellectual property, and share holding will be improved.
1.2.1.5 standard development
Standard plays a very important role in the information technology development. To
achieve a sustainable development, China will develop the indicator system, specifications
and standards for the national IT development, improve the technology system of telecom,
broadcasting and TV, reinforce the efforts in the barcode, organization coding, and other
basic information standards. Cooperation of standard will be improved between the telecom,
broadcasting and TV, system integration and electronics products manufacture corporations.
Domestic intellectual property standards and systems will also be encouraged.
1.2.2 The favorable treatment for enterprises which introduce IT
Not available.
1.2.3 Other measures for promoting IT socially
1.2.3.1 Extending the use of information technology applications and improving the IT
application level
Fully utilizing the information network infrastructure, China will promote the information
resource development and sharability, and extend the use of IT application in the different
areas of the nation’s economy, to drive the nation’s development as a whole and to
strengthen the comprehensive national power, including the following aspects:
(1) Transforming and upgrading the traditional industries.
In this field China will drive the industrialization by the IT development and put much
emphasis on the utilization of information technology to promote the industrialization level.
During the IT development, the IT technology implementation to transform and to improve the
traditional industries will be enhanced, and the IT development in the areas of agriculture, energy, transportation, construction and manufacture will be facilitated.

(2) Promoting the E-government

E-government is an important area of the national IT development. Therefore, great efforts should be made to promote E-government applications. To change the role of the government, promote the government information resource development and sharing, strengthen the government supervision and improve policy making and administration efficiency will be considered in the next few years, to provide a wide range of service and advance the national economy and social IT development.

(3) Actively developing e-Commerce

Regarding the e-Commerce, China will strengthen the macro planning, guiding and market supervision and encourage the enterprise initiatives. Regulations and standards about e-Commerce will be developed and completed to make perfect the e-Commerce application supporting system and to create an environment good for the development of e-Commerce.

(4) Promoting the social affairs information technology implementation

This is to make use of the information technology to improve people's life and social advancement, including science and education, health and medication, broadcast and television, and social security and public affairs.

(5) Accelerating the development of information service industry

The information consultation service market in China needs to be greatly improved. China will make great efforts to develop the information consultation service in fields of network information, information content providing. Innovations in other areas of information service will also be encouraged.

1.2.3.2 Enhancing the construction of modern information infrastructure

In the coming years, China will establish the enterprise credit information database that covers the large and medium sized enterprises, and improve the consuming credit database, which covers the city consumers, and related service system. Information technology will be widely used in the modern payment, logistics, customer service system and the credit system development.

Fully utilizing the existing network resource and funds, to establish a well structured, high speed, and future oriented national information network. Great efforts will be made to develop high-speed information network, focusing on:

- The basic transmission net
  Facilitating the inter/intra-province fiber optics network construction and upgrading, and putting emphasis on the development of access network.
- The service network
  This includes the mobile telecom network, multimedia network based on the IP technology. Great efforts should also be made to develop the next generation high-speed and wide-band information network.

1.2.4 Hardware and software industry promotion plan

The IT development in China also requires to develop, improve and carry out the industry policy, make good combinations of resources like funds, technology, human resource and market, in order to promote the development of electronics and information product manufacture.

- Integrate circuit
  To establish the integrate circuit industry system, achieve a development that catches up to the advanced technology generation in nowadays, and shorten the distance between China and the more advanced countries on this aspect.
- New types of electronic component
  China will support the development and production of new types of electronic component and enlarge the production scale, in order to improve the product technology and quality, and increase the added value and exporting.
- Telecom product
  Strengthening the third generation mobile telecom research and development, and
enhancing the third generation telecom system industrialization.

- **Computer and network product**
  Great efforts will be made to develop high performance computer and network product. Research and production will be strengthened in information security, network control, next generation network equipment and computer central processing unit.

- **Digital video and audio product**
  High definition digital TV standards need to be developed in China. Also, great advancements need to be made in the technologies like digital video compressing encoding and decoding, high density CD, data broadcasting, and the production of digital TV, video signal recording equipment and high quality digital audio product will be encouraged.

- **Software**
  The development in software has four aspects:
  1. To establish a new software financing system, make efforts to develop different types of human resources, and to create an environment suit for the software industry development;
  2. To enhance the software development and innovations and master core software technologies;
  3. Supporting large native software corporations and enlarge the market size;
  4. Encouraging independent software R&D of native corporations, and software exporting.

1.3 Human Resource Development Plan
In the information technology application in other industries and in most of the governmental branches, 2 problems are most outstanding:
  1. Many employees don’t have enough training of IT knowledge and skill.
  2. There is a lack of high level IT experts that are both capable of IT knowledge and the industry knowledge, and a lack of persons not only mastering IT knowledge but also being excellent in management.

To solve these problems, most of the government branches and large state owned enterprises have the following plan:
  1. Providing necessary trainings for the employees and arrange IT tests in the qualification system.
  2. Providing good conditions to introduce qualified persons from the HR market.
  3. Strengthening the international cooperation and encouraging the high level persons working or studying abroad to come back to China.

Regarding the electronics and information manufacture Industry, manpower in 2002 increased 7.3% from 3,260,000 to 3,400,000. What kind of and how much needed is not available except in the software industry:

While the structure of IT HR resources should be of a shape of “pyramid”, the structure in China is of a “olive”. There are the following problems regarding the IT industry human resource in China:
  1. High level system analyzers, project management persons that have strong industry background and software operators are greatly needed.
  2. A lot of the university graduates have to do the simple programming and coding work, and the HR expenses of software is very high. This creates a waste of HR resource.
  3. Low price human resource is lacking to do the simple programming and coding work.

In 2002, the manpower in the software industry doubled to 590,000.
The concrete plan to solve the HR problem in the electronics and information industry is not available.

2 The trend of IT in your country
2.1 The general situation
   Social system (e-government, e-commerce, e-learning)
   1. e-commerce
      The major players of e-commerce researching and strategy include China International
Both e-Commerce and e-Government in China first began from the establishment of the National Public Telecom Network, and the establishment of “Gold Bridge”, “Gold Card”, “Gold Custom”, etc. (As in the e-Government paragraph).

Security corporations, financial organizations, air ticket booking center, and credit card issuing banks are the first to introduce e-Commerce.

In 2000, B2C transactions reached 400,000,000 RMB, B2B transaction is more than 70,000,000,000 RMB.

The latest data is not available.

(2) e-government

The e-government construction will be focused on “One site, two webs, four databases, and 12 Golds”:

“One site” refers to the major government web site.
“Two webs” refer to the administration inner web and the outer web.
“Four databases” refer to the basic databases of population, organizations, geography and nature resources, macro economy.
“12 Golds” projects refer to 12 projects that all have a name beginning as “Gold”:

The first level is the projects of office business resource system and the macro economic management system to enhance government monitoring, to improve the government efficiency, and to facilitate public service.

The second level is the projects to increase the government input, including “Gold tax”, “Gold Custom”, “Gold Finance”, “Gold Card”, and “Gold Auditing”.

The third level is the projects to ensure the public security and to provide a good social environment, including: “Gold Shield” (refers to public security), “Gold social welfare”, “Gold Water” (water conservancy), “Gold Agriculture”, and “Gold Quality”.

(3) e-learning

Now, China has 67 universities are allowed to implement distant education. Before 2005 all universities in China will establish campus network, the registered e-learning students will reach 5,000,000; 90% primary and high school student will have access to Internet in 5-10 years. According to Zdnet, in 2002 the investment in e-learning is 3,820,000,000 RMB.

The diffusion of PC (unit : set)

In 2001, PC diffusion in China is about 3 per 100 people overall. The penetration rate varies across the country, with wealthier urban areas like Beijing and Shanghai being much higher. However, China’s PC market continues to grow around 35% per year, and low-cost PCs bring more consumers into the market.

Information and Communication Industry

Considering the Information Industry, the whole industry achieved a production of 1,780,000,000,000 RMB in 2002, increasing 20.9% than 2001. In 2002 the whole industry employed 3,260,000 manpower with a increase of 7.3%. The rate of the technology engineers is 18%.

In 2002, the communication industry completed a business volume with a value of 554,700,000,000 RMB.

Trend of Internet

Internet in China has the following trends:

(1) The purpose of the Internet users changed from just enjoyment to working and learning. The Internet user is increasing rapidly. According to statistics of CNNIC in 2002, there are 33,700,000 Internet users in China, while Nielsen NetRatings has a statistics of 56,600,000 in May in the same year.

(2) The major internet service providers begin to gain profit. In 2001, the Internet advertisement turnover doubled to 600,000,000. For example, www.sohu.com has an advertisement profit of 5,800,000 RMB in 2000, and 9,200,000 in 2001.

(3) The websites of different industries developed rapidly. For example, the education web sites and construction materials websites. (See the development of e-learning above.) Zhaoshang Bank’s personal internet service makes it have 2,000,000 personal users and
95% e-commerce website use its payment system.
(4) Wide-band channel is developing very fast. China’s access to the foreign countries increased from 2799M in Jan, 2001 to 7597.5M in Jan, 2002.
(5) Information resources increased rapidly. “Digital Library” was listed in the 863 projects and will be finished in 2005. Information in Chinese also boosted to 159,000,000 web pages in April, 2001, according to CNNIC.
(6) Internet service changed from free to charge. Several major websites established charged channels to provide high quality service, like sina and 263.
(7) The government investment in the IT infrastructure made the Internet a new growing point in the national economy.

Trend of language Information Processing (character code sets, font and key board )
The Chinese character input method has a development less rapid than the Chinese character identifying and the Chinese voice identifying. This is my estimation, especially that the voice identifying technology developed very fast, for example its use in mobile phone.

Standardization
Most of the basic network and telecom standard are international ISO/IEC standard and RFC specifications. China’s Datang Telecom Corporation developed a CDMA standard that became an international standard. Now China allows three CDMA standards.
With regard to the e-commerce and e-government, CNIS plays an important role. China has adopted ISO 9735 as the China’s EDI GB standards. Now CNIS is focusing on the research of ebXML and e-commerce organizations such as Rossettanet. The information classifying and coding is also an important area in CNIS research of IT standardization.

2.2 The scale of the IT industry
2.2.1 The scale of the hardware industry
In 2002, the information hardware output of China is $35,225,000,000 ranking second in the world.
The number of employees and the future view are not available.

2.2.2 The scale of the software industry
In 2002, the number of software enterprises with a scale are 4700, with employee of 590,000. The whole industry achieved an income of 110,000,000,000 RMB from software and system integration.
According to the government planning, in 2005, the sale of software industry of China will reach 250,000,000,000 RMB, with a exporting of $5,000,000,000 and software manpower of 8,000,000,000 At that time China will have 3% share of international software market.

2.3 The situation of foreign firms
The information industry in China can be divided to telecom and electronics and information manufacture.
In the telecom field, the foreign investment is not allowed until China entered the WTO. Now the foreign investment begin to enter China’s telecom market and some joint initiatives between China telecom companies and foreign companies has begun.
The electronics and information manufacture is one of the earliest industries that introduce foreign investment. According to official statistics, the total investment is $70,000,000,000 and the number of foreign companies is 10000 by the end of 2001, from 61 foreign nations and regions.

2.4 Law and regulation related to piracy and the restriction on communication
The law and regulation related to piracy includes:
- Software product administration method.
- The notice of software copyright administration
The laws and regulations related to restrictions on communication contains a large amount of state administrative orders, notices and other forms of official documents in the link I gave on 1.1.

2.5 Human Resource Development
2.5.1 Information technology education
(1) Listing Information technology as a mandatory course in the primary and high school curriculum.
   - By the end of 2001, senior middle schools in the whole country and the junior middle schools in the middle-sized and large cities should all have the mandatory information technology course; by the end of 2003, junior middle school in developed regions should all have the mandatory information technology course; by 2005, all junior middle schools and primary schools in developed regions should have mandatory information technology course.
   - At the same time, schools are encouraged to adopt information technology in other courses.
   - During the primary school or junior middle school, students should have at least 68 credit hours of information technology course; during senior high school, students should have 70-140 credit hours of information technology courses.

(2) Construction of school to school network
   - In 5-10 years, about 90% primary and high schools have access to Internet;
   - All schools should make efforts to develop IT education resources, especially multimedia materials and distant education courses.
   - All schools should construct information education equipments and campus network according to the local conditions. Inter-connection between schools will be greatly encouraged.

(3) IT training of primary and high school teachers
   - Normal universities should have IT courses, and set up the majors of IT teaching.
   - Make efforts to train the teachers, who are currently at their positions, the information technology courses.

(4) College level IT education (This part is from my personal knowledge, but highly reliable)
   After entering the college, students will continue to receive IT education, students in most of other majors will also have more than one computer courses, depending the curriculum planning of the school.

   In the computer departments, students will have courses like programming language(C and C++ is most widely adopted), data structure, micro computer theory, data circuit, network, database, multimedia, etc. Most computer department have laboratories that will do R&D projects invested by the different level administrations and some corporations. Graduate student and outstanding undergraduate students will take part in these projects, as an experience enabling them more qualified for the future IT job.

   On the college level, schools have a more free planning of their education plan of IT, according to the market needs. As far as the policy concerned, the establishment of software institutions in many universities is the most influential measure at current. (2.5.3)

2.5.2 IT trainings in different professions

   Most departments of the central government of China and many state owned enterprises lack information technology manpower, especially persons with both the knowledge of their own profession and information technology, and persons being capable of both management and information technology. Many persons in position don’t have enough training in information technology. Therefore, many departments and enterprises will take the following measures:
   - To strengthen the training of current employees, including using the distance education.
   - To enhance the international cooperation and communication, and provide favorable conditions for the students and workers living abroad.
   - To add Information technology examinations to the public servant qualification criteria.

2.5.3 Cooperation of universities and IT enterprises

   Cooperation in education between large international software corporations, major domestic software corporations and science and research institutions is encouraged to train high level software system analysis, designing and management persons. China has
established software institutions in 35 universities like Tsinghua University and Peking University. In the funding of these institutions, investment from companies are allowed to enable the cooperation between the software corporations and universities. The government has no specific stipulations on the number of students, form of tests and courses, textbooks or the background of investing parties. Besides, other forms of high level Information technology training are encouraged, such as the private educational institutions and cooperation with foreign universities.

2.5.4 statistical data

(1) The training facilities for IT Manpower

Not available.

(2) A typical computer department and the number of graduates

We will take Chongqing University as an typical, which is a multiversity and ranked 60 in netbig's 2002 university rankings.

The Computer science school of Chongqing University has two PH.D programs and three MS programs. It has four PH.D program advisors, 10 professors and 42 assistant professors. It has RS/6000 and AS/400 SUN E450 work station 6 IBM X-Station graphic work stations more than 500 PC are better than PII. All these computers are connected into a LAN, with access to Internet.

In the Chongqing University computer science will have about 100 new graduate students and will have about 150 new undergraduate students.

(3) The number of computer sets

In China different regions have different number of computer sets for students. The following is my estimates:

- elementary schools and junior high schools
  In advanced regions and large cities most elementary have a computer classroom contain about 30-50 computer set. In undeveloped areas only few elementary schools have a computer classroom. In the very poor areas of China elementary schools have no computer.
- high schools
  In advanced regions and large cities most high school have computer classroom contain about 50-100 computer sets, and most of them have access to internet. In less developed areas, a few high schools have a computer classroom of 30-50 set. In the very poor areas, only the center high school can have a small computer classroom.
- colleges and universities
  Still take the Chongqing University as an example, the whole university has more than 5000 computer sets. (The estimation from all departments, the accurate number is not clear.)

(4) The Plan to build or equip training facilities for IT Manpower

Not available.

(5) IT Engineer Qualification Systems

Now there are a list of the IT qualification certifications in China.

- The National Computer Level Testing.
  This test is sponsored by the Testing Center of Education Ministry, and already became an important criteria adopted by many organizations in promotion and profession qualification judgement. It has four levels:
  - The first level aims at the basic knowledge of computer and the primary skills of using a computer.
  - The second level aims at the basic knowledge about the softwares and hardwares of a computer and the examinees should have the ability to use a programming language like QBASIC,FORTAN,C or FOXBASE.
  - The third level includes the testing basic knowledge of computer application and some ability of the hardware or software development.
  - The fourth level tests the analysis ability of the computer application project or application systems.
The Software Profession Qualification and Software Level Testing
This testing is sponsored by the Ministry of Personnel and the Ministry of Information Industry and the testing is admitted by Japan. The software qualification testing has three levels includes: junior programmer, programmer and senior programmer. The software level testing has 4 levels of junior programmer, programmer, senior programmer and system analyzer and 2 levels of network programmer and network designer.

The National Information Technology Testing (NIT)
This test is sponsored by the testing center of the National Education Committee and cooperated with CIT (Cambridge Information Technology Testing), aiming at 8 areas: computer basics, English characters processing, electronic forms, database, programming, desktop publishing Chinese characters processing and computerized accountant.

Other IT certificates
Other certificates include the regional tests and the certifications of large IT corporations like Microsoft, cisco, IBM, Linux, Sun, and Oracle.