



Barriers of IT Diffusion in China

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1. INTRODUCTION

Major restructuring of all Information Technology and Telecommunications businesses in China grows rapidly over the past 10 years. China government realizes the important role of Information Technology in the national economy and makes lots of effort and investment in the IT industry. However, the current situation and results show the fact that there are still many big barriers in this field. These barriers are not only involved with the national policy, but also with the social and physical infrastructure of IT. The paper is designed to find all these barriers we could find currently in China that prevent healthy and quick diffusion of information technology. Firstly, the paper is trying to give an analysis of barriers of IT diffusion in the policy issue, especially the monopoly of China telecom in the IT industry. Secondly, the paper is taking two perspective views towards the IT barriers, according to Kling's terminology, physical infrastructure and social infrastructure. In the case of physical infrastructure, the paper mainly discussed issues of outdated mainframes, the fallibility of circuitry and system, current Internet Service and the import of information products. In the case of social infrastructure, the paper searches the barriers in intellectual property, immature of the market, education level, insufficient investment on the development of IT, and imbalance of the development between urban and rural Areas. Finally, the paper makes some specific recommendations relevant to the barriers discussed in the first two parts.

2. THE BARRIERS IN THE POLICIES OF IT IN CHINA

Over the past decade, information technology and services have become increasingly important to global trade and economic growth. As one of the world's largest and fastest growing economies, the evolution of IT in China has significant effects to the market and the lives of common citizens (Sheehan, 1999). Moreover, IT has been a major element of the development roadmap for China. However, there are some barriers in diffusion of IT in the country where both tradition and innovation are existing synchronously. Obviously, these obstacles include the public policies between development and self-protection. In the barriers, more importantly, as the orientation of the development and diffusion of IT the public policies has become more remarkable and critical. Through researching, the analysis in-depth to the barriers of IT diffusion in China are attempted to be given.

Economic pressures towards openness compete with political pressures towards regulation of information flows into China (Street, 1998). The solution of this paradox can be defined the future of the Internet in China. China's government concerned with how to deal with the problem of undesirable information flows into China. To do so, Chinese government established an Intranet, access to the Internet is partly limited those with a specific need such as scholars and university students.

Another fact is that the government still wants some control over the dissemination of information, and telecommunications is effectively one of the biggest state-owned enterprises. This monopolized policy has caused much negative effects in society. Competition advantages of IT industry is difficult to be facilitated and developed. Chinese government sensitivities about control of information coming into China are reflected in the strict controls it maintains over

publishing, broadcasting, and electronic communications, including the Internet (Ure, 1999). Hence, communications networks in China are state-controlled and monopoly-controlled. This apparent centralization of power disguises a reality in which control is dispersed. The policy has become an obstinate obstacle and it is difficult to be eliminated in a shot time.

3. IN-DEPTH ANALYSIS OF BARRIERS

According to Kling's terminology, we analyze the barriers of IT diffusion in China in two perspectives: physical and social infrastructure.

3.1 Physical Infrastructure Analysis

Nowadays, physical infrastructure has always played an important role in information communication technology. Social infrastructure is the body of research that examines the design, uses and consequences of information and communication technology in ways that take into account their interaction with institutional and culture context (Rob Kling, 2000). "In information technology and on the Internet, physical infrastructure is the physical hardware used to interconnect computers and users. It includes the transmission media, including telephone lines, cable television lines, and satellites and antennas, and also the routers, aggregators, repeaters, and other devices that control transmission paths. Infrastructure also includes the software used to send, receive, and manage the signals that are transmitted". (SearchEbusiness.com, July, 2001). Physical infrastructure is the foundation of information communication technology. But without investments and efforts in the social infrastructure such as skills and training, physical infrastructure cannot be applied adequately. Therefore, physical infrastructure and social infrastructure have complicated relation and affect each other. In the process of developing information communication technology, there will appear some barriers in China, which make physical infrastructure expand hardly and slowly.

3.1.1 Outdated Mainframes

Outdated mainframes are still widely used in information development, which turn out to be one of the main barriers of IT diffusion. In today's world, the number of mainframes a country or an enterprise possesses is often seen as an indication of its level of scientific and technological development. The significance of the research on computer architecture and parallel computation environments to the computer industry of a nation is analogous to the role of the infrastructure in the overall development of a nation's economy. But a close look at China's mainframe technology shows that the key facilities are extremely limited in number, which cannot set up the large-scale computer architecture or make important research and development of sophisticated computer environments. At its present technological level, China can neither manufacture nor perform high-level technical support like those world "giants" (Microsoft, or IBM), so the limited investment on computer facilities cause the effects of laggard systems for many IT industries.

The technological limitations in computer science in China make it develop IT slowly. In the rapidly developing computer world, the

The Increase of the International Bandwidth in China (Table1)

Date	Bandwidth£ M£ ©
1997.10	25.408
1998.7	84.64
1999.1	143.25
1999.7	241
2000.1	351
2000.7	1234
2001.1	2799
2001.7	3257
2002.1	7597.5

existing computer infrastructure would be rendered obsolete if one refuses to keep oneself abreast with the latest developments in the area. Consequently, updating the current facilities and adopting new IT software and hardware are the key success to the diffusion of IT.

3.1.2 The Fallibility of Circuitry and System

The fallibility of the foundation facilities also makes a bad effect on the information technology. The number of Internet customers increases rapidly now, which make bandwidth crowd and speed descent. There is a joke that the WWW has become the "World Wide Wait". Although more advanced network technique are being researched or carried out, for instance, kilomega network and ATM is an ideal technique, the price is expensive and update is not on time. Since, in China, some circuitry and system are too old. It may also be a barrier of information technology. From China Internet Network Information Center survey, we found that the total bandwidth of leased international connections for now is only 7597.5M.

As a result, not especially China, any country if it wants to develop itself information technology, the government should put much more investments to improve the foundation facilities, which can ensure that information technology develop well.

3.1.3 Internet Service

The Internet service should be thought as other barriers, for example ISPs, the Internet speed and so on. There is a table from the semiannual survey report on the Development of China's Internet (CNNIC.com, January, 2002).

According to Table 2, the present Internet of China is just on a normal level.

The speed and service quality of ISPs are both evaluated to be three stars, which show that most customers are not satisfied with the current

Users' Views toward the Present Internet (Table2)

Satisfaction Stars	● ● ● ● ●	● ● ● ●	● ● ●	● ●	●
Speed	2.9%	22.1%	36.6%	23.3%	15.1%
Cost	5.1%	21.3%	33.6%	23.1%	16.9%
Abundance of Chinese Information	4.7%	38.0%	42.2%	12.3%	2.8%
Facticity of Contents	2.1%	20.1%	52.1%	20.6%	5.1%
Privacy Protection	3.5%	18.7%	45.0%	24.2%	8.6%
Conveniency of Usage	8.1%	39.4%	39.8%	10.4%	2.3%
Service Quality of ISPs	3.8%	27.3%	51.0%	12.7%	5.2%

Internet. There are lots of phenomenons which indicate the poor service of ISPs. For example, in busy time, it is difficult to get on the Internet, but ISPs still collect the Internet fee. As we know that it is an info-society that it develops fast. Time is very important for some business operation. A case in point is banking; Traditional banking businesses carry out each operation in several minutes or seconds. On the contrary, the service of most Internet banks for arriving cannot be so quick. Likewise, the bargain of customer can not make sure, and it only has to pass the bank account to confirm. In other words, the service just bring to bank the convenience, however, it lets the customer cost excessive bargain time. These will affect the diffusion of information technology, if governments solve these barriers, it must be beneficial to enable IT to be higher level of development.

3.2 Social Infrastructure

Social infrastructure could be another aspect of barriers that facilitate and prevent the effective use of IT to enable higher levels of development. The reason for that is obvious that people interact with each other in the society and the development of IT also rely on the social infrastructure issues. The case country we investigate is China for the reason that IT in China has got fast development in recent years and China is a big country with big population that makes a big market.

3.2.1 Intellectual Property

The first social infrastructure that affects the effective use of IT to enable higher levels of development is intellectual property. Intellectual property (IP) represents the product of your mind or intellect. It can be an invention, trademark, original design or the practical application of a good idea. For a company, it is very important and it means a key component of success in business today. In the case of China, it was found that IP perform an important role in facilitating and preventing the effective use of IT. IP has both positive and negative effects on the development of IT. It is obvious that out of control of IP will lead to many problems in the use of IT and will prevent the effective use of IT.

IP makes profit for the companies and then the companies, especially the IT companies, will have sufficient money to put forward the effective use of IT. In China, also the government has done a lot of things to protect IP; there are still many problems to solve. In 1998, the Guangdong Police Department closed more than 200 pirated software factories and destroyed nearly 300 production lines.

However, huge profit margins (500%-600%) encourage pirates and re-sellers to take risks. There are still many people sell products that have no trademark or just fake. Copyright was not well protected. For instance, there are many small software companies in China but they can hardly make profit because after their software was produced and put into market, the software was cracked soon and be copied by many people.

Beginning in late 1999, several leading Chinese software companies lowered the price of their software by 80%, mainly in the auto-translation and the anti-virus sectors. In October 1999, for example, Kingsoft Software declared in Beijing that it had launched an "Authentic Software Storm". During this campaign, it cut the price of its leading product, Kingsoft 2000, bilingual and voice-enhanced translation-aid software, from RMB 168 (USD 20) to RMB 28 (USD 3.33).

Finally many small software companies came to naught for this reason. Without the effort of the companies working on the diffusion of IT and the development of IT, the speed of the development of IT will be obviously slow down.

On the other hand, losing control of the protection of IP will also provide certain people the chance to get idea from others or make use of an invention easily. For example, people use the cracked software and learn about the software, which some time will make their work efficient. In addition, people can also get some good idea, which is protected, and make full use of the idea. All these things in the It area will also help the efficient use of IT to enable higher levels of development.

It could be said the IP is a double-edged sword. But balance the benefit and the risk; losing control of the protection of IP will be a barrier of the development of IT and sometimes will make big problems.

3.2.2 Immature of the Market

Immature of the market is another social infrastructure issues that have negative effect on the development of IT. In the case we studied, the immature of the market focused on the illegitimate competition such like unfair price competition.

One of the negative effects of unfair competition is that it cuts the profit of IT companies. For example, if an IT company sold its products cheaper than others, it is clear that this company will get more profit and win in the competition. However, in the long term, this kind of competition will do harm on the whole market and all the companies will find that the profit is too little to bear. In the case we studied, the unfair competition was found in selling software. Some company in order to sell their product; they sell their software only about AU\$5 to 6.

Another negative effects of unfair competition are that it makes profit centralize in some certain companies that will prevent the efficient use of IT. Competition is important in the development of IT. Competition can improve technology and reduce price. But unfair competition will always lead to the profit centralize in some certain companies and even monopoly.

It is said by some people that people will benefit from unfair price competition. But it is not actually. From a short-term view, this kind of competition makes low-price products in the market. However, from a long-term view, we can see that for the reason of profit cut companies will pay less attention to the invention of new technology and the diffusion. Therefore, the immature market relating to unfair competition presents a big barrier to the IT diffusion and development of China.

3.2.3 Education Level

Education level of people will have direct effect on the development of IT. In China it is also a barrier of that prevents the efficient use of IT. The education level of two groups of people will be discussed. One group is the people who work on the development IT. The other group is the customers who use IT.

The education level of people who work on IT is one barrier. Technology is an important issue in the development of IT. Furthermore, people especially professional people are the inventor of new technology and play a very important role in the development of IT. In China, the number of professional people in the IT area is insufficient. Also there are many people working on the development of IT, only some of them are professional. There are also problems of education system that prevent students from contributing more of their time in the research of IT. Moreover, only few of the Chinese university have the major of IT, which makes it hard from some student to gain help from their teacher or others.

The education level of general people is the other barrier of the development of IT. People who have different education level will usually have different views on certain things. When deciding whether or not uses certain IT technology, they will have different opinion. 80% of the Chinese population is peasant and their education level is low. The case we found is a small village in north China with a population about 3000. Only small number of them (12%) knows PC and few of them (2%) access Internet. For most of the peasants (97%) whose education level is only junior school IT is very strange and has no meaning. That is a big barrier of the development of IT in China. On the other hand, even in the urban area, many people including managers of companies ignore the efficient use of IT. The reason for this is probably the low education level of the managers. It seems very strange that managers have a low education level but it really exist in many companies.

4. SPECIFIC RECOMMENDATIONS

Through our research analysis, we gave the following recommendations relevant to all these barriers we found in IT diffusion of China.

- **Outdated Mainframes**
For this barrier, a sufficient and effective of government investment would be greatly helpful. Sound basic infrastructure can help the country to improve the development of information technology at a large scale.

- **The Fallibility of Circuitry and System**
Improvement of bandwidth can expedite Information flow and development in China. For better usage of Internet and other IT facilities, China need find a solution to solve the bandwidth problem. Satellite can cover most of the areas, but it is extremely expensive. DSL or cable also can be an alternative. Considering the situation of the country, China should consider satellite in a long run, and encourage DSL, cables or other high connection methods for the current situation.
- **Current Internet Service**
Competition can urge manufacturers or companies to provide quality service. Therefore, China must allow some competitive market exist in the Internet service industry.
- **Intellectual Property**
IP problems involves not only with the usage of foreign IT import and usage, but also with the development of domestic IT industry. For foreign IT products, China's strict policy is extremely important. Governmental anti-piracy campaigns should continue so that IT providers can be optimistic about their IT investment in China.
- **Immature of the Market**
To avoid the unfair competition in the immature IT markets, China must establish strict rules and regulations to lead a mature and healthy market.
- **Education Level**
For students in school or colleges, computer knowledge should be provided as early as possible so that they can easily master the innovative technology of information technology once they enter the society for work. For general people who are currently not pursuing higher learning, especial training programs can be conducted in the neighborhood communities or inside the company. People can start to learn whenever they want, as knowledge is a cumulative process. Therefore, Chinese people should learn about new knowledge or technology from now, and professionals should accumulate technical experience from work and spare-time training.

In short, recommendations are all related to government policy and support. If the country really wants to improve IT development and conquer these barriers, it must take many aspects in consideration besides the above few solutions.

5. CONCLUSION

In summary, we studied many barriers of IT diffusion in China: one is from the perspective of policy issues, the other is from the perspective of physical and social infrastructure.

Firstly, we found that the government control on the dissemination of information and telecommunications affects the quick development of a competitive IT market in China. Secondly, we found that IT industry of China cannot boost as we expected because many barriers in the social and physical infrastructures still exist currently. To solve these problems, the China government has to make a great effort in the investment and policy-making. They should take more practical and quick action instead of making an announcement of what they are going to do in future.

Lastly, we tried to give some specific recommendations which can be used to solve the problems we found in the first parts of the paper. All the suggestions are some or less related to the government policies, as better diffusion of IT in a country cannot exist without the government's full support.

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