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Internet in China: A Study of Internet Diffusion and Use

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Abstract

Internet evolution has skyrocketed in recent years. The China Internet Network Information Center (CNNI) reported there were 26,500,000 people online in China by the end of June 2001. Like many developing countries, China has considered the Internet a powerful tool for national development economically and socially. As Internet growth becomes more and more significant, it becomes important to outline the present status of Internet development and usage in China and identify the major barriers to Internet adoption. This paper analyses and assesses the current state of Internet expansion and Internet use in China and compares two different diffusion models. It focuses on the factors that led to current conditions and which will likely influence future development.

Keywords

Internet, Diffusion, China

INTRODUCTION

Internet evolution in China started with the creation of a research and academic network. In 1989, the government initiated NCFC net that connected CASnet (Chinese Academy of Sciences), Tunet (Tsinghua University) and Punet (Peking University). NCFC net was completed in 1993 and linked to Internet through Sprint at 64kbps in 1994, which marked the beginning of the Internet in China. Since then, Internet diffusion in China has been very rapid and extensive. There were 26,500,000 people online in China by the end of June 2001. Like many developing countries, China has considered the Internet a powerful tool for national development economically and socially. As Internet growth becomes more and more significant, it becomes important to outline the present status of Internet development and usage in China, identify the major barriers to Internet adoption, and review the model of diffusion in China. The findings of this study may help to better understand Internet expansion in China. China also needs to prepare itself to survive in the e-world and realize the potential of the Internet growth for national development in the future.

OVERVIEW OF INTERNET IN CHINA

Telecommunications Infrastructure

China has built up a telecommunications networks centered around 22 optical cable lines and accompanied by multiple means of communications networks such as microwave, satellite, telephone, mobile phone, digital communications, and multi-media communications (Horvath 1999). The optical cable trunk line including eight horizontal and eight vertical trunk lines totals 1.25 million kilometers and reaches all provincial capitals and 70% of China's big cities. The digital data communications network reaches 90 percent of the cities and counties throughout the country, and the public computer network covers 239 cities. Approximately 13 percent of households throughout China have telephone access, with urban penetration running at over 40% (Horvath 1999). The teledensity (the number of telephone lines per hundred people) and Cellular penetration had reached 17.8% nationwide and 6.7% of the population respectively by the end of 2000.

Access to Internet

China first linked up to the Internet in 1994 and since then it has developed rapidly. From 1997 to 2001, Computer hosts, Internet users, domain names registered in the top level domain .cn, web sites and total bandwidth capacity of leased international connections respectively increased by over one thousand percent. (See figure 1).

	Computer Hosts	Internet Users	Domain Names(.cn)	Web Sites	International Bandwidth
Nov 97	299,000	620,000	4,066	1,500	18.64Mbps
July 98	542,000	11,750,000	9,415	3,700	84.64Mbps
Jan 99	747,000	2,100,000	18,396	5,300	143Mbps
July 99	1,460,000	4,000,000	29,045	9,906	241Mbps
Jan 2000	3,500,000	8,900,000	48,695	15,153	351Mbps
July 2000	6,500,000	16,900,000	99,734	27,289	1234Mbps
Jan 2001	8,920,000	22,500,000	189,617	265,405	2799Mbps

Figure 1: Internet growth in China (Source: CNNIC, 1997-2001)

Eight large networks provide global Internet connectivity to other networks or Internet Service providers (ISP), of which there are over 500 in the country. The total capacity of international Bandwidth is 2799M. (See figure 2). Each of these large networks has a specific function and service. CERnet (China Education and Research), funded by government, was built up in 1995 to connect all universities, high schools and primary schools, and other educational institutes. CSTnet (China Science and Technology), funded by government, was established to link all scientific and technological research and academic institutes. CHINAGBNnet, national public economic information communication network, aims to connect ministries and State Owned Enterprises. CHINAnet, run by China Telecom and UNInet, operated by Unicom are commercial networks providing national data service and Internet service. The China International Electronic Transaction Network (CIETNET) affiliated with Ministry of Foreign Trad and Economic Cooperation (MOFTEC). In 1999 China Netcom started to build CNCnet that links 15 cities on the east coast. CMnet is a mobile telecommunication backbone network linking Beijing, Shanghai, Guangzhou, Tianjin, Nanjing and Hangzhou. It has 377 Mbps of international bandwidth to support IP telephone and Internet Service.

	CHINANET	CHINAGBN	CSTNET	CERNET	UNINET	CNCNET	CIETNET	CMNET
Bandwidth	1953M	148M	55M	117M	55M	377M	4M	90M
% of total	70%	5%	2%	4%	2%	13%	0.1%	3%

Figure 2: The total capacity of bandwidth of national backbones (Source: CNNIC, as of Jan 2001)

Internet Use

User Demographics

The number of Internet users has experienced exponential growth in recent years. Based on the five surveys by CNNIC, Chinese Internet users are characterised by the following:

- 70% are male.
- 65% are single.
- 70% are under 35.
- 75% have a tertiary education.
- 70% have a monthly income less than US\$250.
- 60% access the Internet from home.
- 50% spend about 15 hours/week online.

Most Chinese Internet users live in 5 highly developed big cities or provinces. Beijing, Guangdong and Shanghai have led the country in numbers of Internet users since 1997 as shown by figure 3.

The top three occupations which use the Internet are Students, IT professionals and Staff working in foreign or joint venture companies. (See Figure 4)

Nov 97	Beijing (36%)	Guangdong (8.3%)	Shanghai(8 %)	Jiangsu (5.9%)	Shandong (4%)	Other (37.8%)
July 98	Beijing (25.3%)	Guangdong (11.5%)	Shanghai (7.8%)	Jiangsu (6.9)	Shandong (4%)	Other (44.5%)
Jan 99	Beijing (23.93%)	Guangdong (20.93%)	Jiangsu (5.31)	Zhejiang (4.63)	Shanghai (4.34)	Other (40.86%)
July 99	Beijing (21.02%)	Guangdong (11.77%)	Shanghai (8.71)	Jiangsu (6.76)	Zhejiang (5.97)	Other (45.77%)
Jan 2000	Beijing (21.24%)	Guangdong (12.94%)	Shanghai (11.21%)	Jiangsu (5.91%)	Shandong (5.19%)	Other (43.51%)
July 2000	Beijing (18.72%)	Guangdong (12.82%)	Shanghai (10.97%)	Shandong (8.53%)	Jiangsu (6.76%)	Other (42.2%)
Jan 2001	Beijing (12.39%)	Guangdong (9.69%)	Shanghai (8.97%)	Zhejiang (6.62%)	Jiangsu (5.43%)	Other (56.9%)

Figure 3: Top 5 of a total 31 cities or provinces) in percentage of the number of Internet users (Source: CNNIC, 1997-2001)

<p>Student 21%</p> <p>Computer Industry 12.9%</p> <p>Foreign and Joint venture Company 8.7%</p> <p>Other Professionals 8.6%</p> <p>General Commerce 7.4%</p> <p>Finance 6.2%</p> <p>Staff in Government Agencies 6.2%</p> <p>Telecom Industry 5%</p> <p>Senior Managers in Government and industry 3%</p> <p>Agriculture 3%</p> <p>Service Industry 2.6%</p> <p>Small Business 2.5%</p> <p>Medicine 2%</p> <p>Others 1.9%</p> <p>Media 1.8%</p> <p>Entertainment and sports 1.8%</p> <p>Manufacturing or mining 1.8%</p> <p>Military and law enforcement 1.5%</p>

Figure 4: Net users by Occupation (Source: CNNIC as of Jan 2000)

Usage Patterns

The Internet is mainly used for e-mail and web browsing. China now has 65.5 million e-mail accounts. (CNNIC, 2000). On average, Internet users receive 20 e-mails per week and send 10 e-mails per week. The major reasons for going online are to seek information and learn computer science and other new technologies. (See Figure 5.)

<p>Looking up information: 95%</p> <p>Using E-mail: 94%</p> <p>Download software: 77%</p> <p>Chat with others on Internet: 42%</p> <p>Entertainment & Games: 35%</p> <p>Using some new technique such as IP Phone and Internet Pagers 19%</p> <p>E-business/ Internet Shopping:15%</p>
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Figure 5: Reasons for using Internet in China (Source CNNIC, as of Jan 1999)

Sectoral Adoption

The number of domain names has grown from 4066 in 1997 to 122,099 in 2001. This means the Internet is being increasingly adopted in all China's sector. The top three sectors are COM, NET and GOV sectors. (See figure. 6)

	AC	COM	EDU	GOV	NET	ORG	ADDN
Nov 97	259	2131	325	323	370	99	559
July 98	363	6559	414	561	657	229	632
Jan 99	432	13913	531	982	1223	409	906
July 99	502	22220	615	1663	2221	649	1175
Jan 2000	500	38776	731	2479	3753	940	1516
July 2000	624	78878	812	3665	10719	1912	3124
Jan 2001	682	96221	1127	4615	13291	2596	3567

Figure. 6: Distribution of Second-level Domains Under the .cn TLD (Source CNNIC, 1997-2001)

MEASURING THE CHINESE INTERNET

A Framework for Analysis

The MOSAIC Group (1998) has developed a framework in their global diffusion project that characterises the state of the Internet along six dimensions.

- *Pervasiveness* is a function principally of the number of users per capita, but also reflects the degree to which non-technicians are using the Internet.
- *Geographic dispersion* describes the physical dispersion of the Internet within a nation and the extent to which public access is available.
- *Sectoral absorption* measures the degree of Internet use in the academic, commercial, health and public sectors.
- *Connectivity infrastructure* assesses the bandwidth of the national backbone, the bandwidth of the International IP links, the number and type of exchange points and a variety of access methods in use.
- *Organizational infrastructure* represents the state of ISP industry and market competition environment.
- *Sophistication of use* indicates how the Internet is utilised from conventional way to innovative way.

Analysis and Preliminary Findings

This section applies the MOSAIC Group framework to assess the recent data about Internet development in China. The number of Internet users has grown exponentially but the ratio of users to population is still at a low level at less than 4 users per hundred people, compared to 50% adult online in Australia. Although Internet users are highly dispersed throughout the county, a closer look at table 3 reveals that geographic dispersion is quite uneven. There are more users in 5 high-income cities or provinces than all the other 26 regions. In the dimension of sectoral acceptance, although the majority of registered domains are in the .com sector, this does not mean that the majority of business in China are putting business on the Internet. 90% business web sites have no “transactive content” except for the photos of General manager and products. According to one estimate by the State Economic and Trade Commission, only half of China’s 1500 medium to large state owned businesses are utilising the Internet for business. The percentage of smaller firms who are doing so is somewhat less (Xinhua English Newswire (14 August)) cited in Mosaic Group (1998). The academic sector and the IT industry have played a key role in Internet diffusion in China. In particular, about 700 of a total of 1090 universities and 200 research institutes have leased-line Internet connectivity. The .gov sector experienced rapid development in 1999, benefiting from the Government Online Project. More than 60% of ministries have web sites. But this does not imply that they offer services electronically. Most web pages simply provide some information on the introduction and function of the department. As for connective infrastructure and organizational infrastructure, the bandwidth of International IP links still needs to increase. China has established a competitive environment for Internet service operation. Entrance barriers are low. In the dimension of sophisticated use, few are engaged in sophisticated use such as e-commerce, online education and online medicine.

MAJOR BARRIERS TO INTERNET ADOPTION IN CHINA

Poor Speed and Expensive Access to Information Infrastructure and Services

Internet users have listed “Speed is too low” and “Price is too high” as the top two most disappointing aspects of the Internet since CNNI released statistical reports of the development of Chinese Internet in November 1997. (See figure 7)

	Nov 1997	July 1998	Jan 1999	July 1999	Jan 2000	July 2000	Jan 2001
Speed is too low	49.1%	88.9%	92%	49.3%	52.98%	48.54%	46.41%
Price is too high	32.6%	61.2%	74%	36.8%	34.28%	35.67%	20.83%
Information in Chinese on Web is too little	7.3%	45.5%	49%	9.1%	7.35%	6.11%	6.41%

Figure. 7: Top three disappointing points of Internet (Source: CNNIC, 1997-2001)

Currently, 50% of Internet Users have dial up access to the Internet with 33.6k modems. Therefore, transmission speed is slow. As for costs, the majority of Internet users in China are those who have US\$100-US\$300 monthly income and spend over 10-15 hours on the net each week. The average costs for full international access option users are about US\$25 for 50 hours from CHINANet at 56kbps link, compared to the costs of US\$24.95 for a US user for 150 hours from UUnet at the same speed connection (UUNET 2001). In Australia, Internet users spend approximately 1~2 percent of their monthly incomes for unlimited access to the Internet while Chinese users have to spend 10~20 percent of monthly income to get online for about two hours a day. Apparently, the costs are too high as a percentage of income. As a result, lower speed and higher costs are most cited as barriers to Internet use.

Local Content and Information in Chinese

Information exchange and dissemination is a very important factor in the process of the Internet diffusion. A newly published survey by Greater China Portal Alliance (GCPA) confirmed that an increasing number of users demand for Chinese content. About 95% of respondents said that they would like more local Chinese content and regional information and community services (itdaily December 21,1999). As shown by figure 7, Net surfers are disappointed by too little information available in Chinese. According to research by the Internet Society, more than 80 per cent of Web pages are in English. If users can not find content in Chinese, and they understand little English, how can they use the Internet? Availability of content in Chinese and the development of Chinese-based uniform resource locators (URLs) will surely affect the course of Internet diffusion (ITU 1999).

Problems of Poverty

To get connected, end-users need an Internet-ready PC at least which costs about US\$1000 in China at the time of this study. However, GDP per capita was US\$680 in China in 1999.

70% of the population live in the countryside where Internet service does not reach. Their incomes are even lower than US\$680. Purchasing a computer is beyond the capability of most of them. If the majority of people with low income can not afford a PC, how can they access the Internet? If they remain offline, it is impossible for China to achieve a pervasive level of Internet diffusion. Therefore, large-scale poverty is a major obstacle to the spread of the Internet in China.

Human Resources Factors

It is widely recognised that the development of human resources is a major factor effecting Internet diffusion. This is particularly the case with the Internet, as its successful use requires new skills for digital literacy. As Press (1996) points out, this is the toughest nut to crack. The solid base for these skills should be laid in primary and high school education. Currently very few primary schools and high schools in China have access to the Internet. At the early stage, it may not appear to have constrained Internet diffusion in developing nations but it is of increasing importance. (Press 1998). With the improvement of infrastructure and the reduction of PC and access cost, the biggest obstacle to Internet diffusion in China will soon change from have-nots to know-nots.

INTERNET DIFFIUSION MODELS

U.S. Model

The process of Internet diffusion in America indicates that government started the ball rolling, and rapid capitalization and growth followed in the private sector (Press 1997). But government is not only the major player in the adoption of the Internet. In the early 1980s the commercial sector became interested in Internet technology and Internet service. The Internet has been market-driven since the early 1990s. As a result, the penetration of the Internet is pervasive. The six Internet dimension ratings of the MOSAIC Group model are all at the highest level. This model reflects the dominance of US industry in many areas of the information economy. The Internet is largely seen as a commercial technology, which the privates sector controls (DFAT

1999). The U.S government adopted a “hand-off” Internet policy that allows Internet to develop free from the burdens of traditional regulatory mechanisms and ensures Internet universal access. (Kennard 1999) The major principals to encourage Internet growth include (Kennard 1999):

- *The private sector should lead. To attract private sector investment, policymaker must remove barriers and establish favourable investment incentive.*
- *Government should follow a decentralised technology-neutral approach to policy.*
- *Internet development should be driven by market forces, not regulatory actions.*
- *Open and vigorous competition is a principal driver for establishing Internet infrastructure and fostering Internet services.*

Top-down Government Model

As most analysts point out, the development of the Internet and e-commerce in China is primarily a top-down effort on the part of the Chinese Government. The government played a crucial role in building a national information infrastructure and developing an information economy. All of the telecommunication infrastructure in China would have been impossible without government support. The government initiates improvements in China’s Internet including substantial upgrades to the national backbone capacity of international bandwidth from 18.64Mbps in 1997 to 2799Mbps in 2000, and funding and support for academic and research networks such as CSTnet and CERnet. In the past decade, China has taken a series of actions to improve access to information infrastructure and to promote the use of Internet, including:

Golden Projects:

- Golden Bridge-- National public economic information communication network aims to connect ministries and State Owned Enterprises and to build the infrastructure backbone over which other information services will run.
- Golden Card---electronic money project which aims at setting up a credit card verification scheme and an interbank, inter-region clearing system.
- Golden Customs---National foreign economic trade information network project.
- Golden Macro --- National economic macro policy technology system
- Golden Tax--- computerized Tax Return and Invoice System Project
- Golden Gate ---a foreign trade information network aimed at improving export-import trade management.
- Golden Enterprise ---Industrial production and information distribution system
- Golden Intelligence--- China education and research Network (CERnet)

Government Online Project

Government use can play a crucial catalytic role in promoting Internet diffusion in China. The Ministry of Information Industry and China Telecom jointly launched the Government Online Project in 1999. This project aims to put government information online, increase transparency of government work, reduce office costs and encourage vendors to do business with the government electronically. Currently, 4615 domain names are on .gov.cn sectors.

The Chinese government is supportive of Internet development while struggling to control every aspect of China’s Internet. China’s Internet sector is specifically governed by two regulations: *Interim Regulations on International Interconnection of Computer Networks in PRC* and *Measures for the administration of Internet information services*. The Interim Regulations specified that all ISPs provide access to the Internet through Interconnecting Networks and Interconnecting Networks connect into global Internet via the gateway administered by China Telcom, which was until 1998 part of former Ministry of Post and Telecommunications. Currently Ministry of Information Industry, which is in charge of Chian’s telecommunication sector and its Internet sector, licensed eight Interconnecting networks providers. (See figure 2) The Measures require Internet information providers to obtain approval from the Ministry of Information Industry before establishing a joint venture with a foreign company. Also, Internet access providers are required to keep the records of the log-on time of users, user’s account as well as telephone number from which users dial in for 60 days and provide to State authorities on demand. The measures stipulate that the Internet content provider must record the content and URLs provided on their web sites as well as the time of release that information. Apparently these regulations are a reflection of Chinese government’ desire to keep its hands on the reins through central planning of national backbone networks, careful structuring of the Internet in China and control over Internet content. (Torrens 2000)

Discussion

It goes without saying that governments play a key role in both models of Internet diffusion. The difference is that the government is the only enabler of Internet diffusion in China. This is not the same as in the USA where bottom-up business is another driving force of the diffusion. Government involvement is definitely needed in China but Internet expansion must be driven primarily by the market itself and business broader participation, which is required by the Internet's decentralised nature and its tradition of bottom-up governance (OECD 1998). Time is a very important factor in the diffusion of innovation. From the successful U.S. story, the Chinese government should be aware that the role of government can change over time from a major player to a minor one.

CONCLUSION

Internet diffusion in China has been very rapid since it was linked to the Internet. But on a national scale, the level of the diffusion in many areas remains low. Internet use is concentrated in large cities. Government plays a central role in Internet diffusion but pervasive penetration of the Internet can not be based on top-down regulation. A further challenge facing China is to remove the barriers and to build up a more favourable environment for Internet development, such as promoting the growth of the basic telecommunications market and Internet access market, and expanding access to infrastructure and service. Government has an important role to play by promoting production of local content and ensuring reasonably priced access for schools, universities, libraries and other public service institutions (ITU 1999). In a nutshell, the benefits of the Internet should be as widely distributed as possible within China.

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