Internet Diffusion and Usage in China[1]

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ABSTRACT *This article examines China's fast-growing Internet market from the perspective of its users in terms of adoption dynamics and usage patterns, using first-hand survey data and extensive background information on China's Internet. Present users are an elite group whose profile is presented in the article. Barriers to Internet diffusion include mainly resources, speed, and a limitation of online applications. These factors also impact on usage characteristics. Several policy recommendations and emerging trends, such as e-commerce and Internet telephony, are also discussed.*

Keywords: China Internet, diffusion of innovations, Internet cafe, e-commerce, China telecommunications.

Introduction

Over the past few years, Internet development in China has been phenomenal. The growth rate during the period 1996–1998 averaged 300%, three times more than the rest of the world. China had registered 2.1 million Internet surfers by 31 December 1998, showing an increase of 1.43 million or 213% over 1997.[2] It is predicted that China will have 6–7 million Internet users by the year 2000.[3] This would make China the biggest Internet market in Asia–Pacific outside Japan. At this stage of Internet diffusion, one essential concern is how the diffusion rate can be predicted and expedited. To address this issue, it is imperative that we identify and understand the present adopters as well as what factors may have led to the rapid diffusion of the Internet.

Although Internet development in China has attracted interest and attention from the industry, academia, and policy makers, few studies have directly addressed the issues from the perspective of Internet users. Using recent survey data of Internet users in China, this study examines the Internet adoption dynamics by utilising theories of innovation, but it also expands the theoretical framework to incorporate other disciplinary variables such as Internet market liberalisation and Internet service pricing. As the Internet is becoming a powerful communications technology in China, the larger issue concerning Internet diffusion in China is economic and political as well as cultural. Will China's Internet develop and evolve in the same way that it has in the United States and other countries? What implications will the Internet have on China's economic and social life when the Internet becomes a major source of information? A description of China's Internet is presented for general interest. Theoretical framework and empirical results are analysed concerning Internet diffusion and present Internet users in China. Finally, implications and policy recommendations for China's Internet development are discussed.

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Background: Internet in China

China's recent remarkable economic growth has created demands for and fuelled its telecommunications development. Since 1989, telecommunications in China have been expanding at an annual rate of 30–50%. Each year, about 10 million phone lines are added to the nation's public network. In early 1997, China had a fully digital network of almost 55 million main lines—providing a teledensity of 4.5%; by the end of 1998, teledensity nationwide reached 10.64% (in cities, 27.7%).[4] The substantial investment in telecommunications infrastructure expansion and network digitisation has paved the way for the fast takeoff of China's Internet. To further develop and adopt cutting edge information technology, China has launched its own National Information Infrastructure projects, generically known as the 'Golden Projects'. At the forefront of China's NII initiatives is its desire to build up its own ubiquitous Internet.

Brief History and Network Structure of China Internet

As in many other countries, China's early computer networking efforts centred on research and education activities in the field of computer science. CANet (China Academic Network), established in 1987, is generally cited as the first computer network in China. In 1990, CANet registered the top domain 'cn' in InterNic. Two other early, independent sources of Internet development were the China Research Network (CRNet) and the Institute of High Energy Physics (IHEP).[5] Also of importance to China's early computer networking was a project called National Computing Facilities of China (NCFC), which was established in 1989 by the China State Planning Commission and the World Bank. This project included a supercomputer centre and three campus networks.

In 1994, China's CSTNet (China Science and Technology Net), a network for scientists and researchers, was first linked to the Internet via a Sprint 64kbps line. China became the 71st nation to log onto the Internet. In May of the same year, the primary server for 'cn' domain was settled in China. China's commercial Internet service did not begin until the construction of the Ministry of Posts & Telecommunications (MPT)'s ChinaNET backbone in 1994. In January 1995, the MPT's operating arm, China Telecom, connected to the Internet via Sprint two 64K lines in Beijing and Shanghai, and began to offer Internet Access services through the public telephone network, dedicated lines and X.25 network. By January 1996, ChinaNET nationwide backbone network was completed, and began service operations on a national scale.

China's Internet is now made up of four largely separate national networks: the MPT (now Ministry of Information Industry or 'MII')'s ChinaNET; the Ministry of Electronics Industry (MEI)'s China Golden Bridge Net (ChinaGBN or GBNet); the State Education Commission (SEC)'s China Education and Research Network (CERNet); and the Chinese Academy of Sciences (CAS)'s China Science and Technology Net (CSTNet). CERNet and CSTNet are academic networks, and ChinaNET and ChinaGBN are commercial networks. ChinaNET is China's primary commercial network now connecting virtually every major city. Plans are to link all government offices, over 360,000 state enterprises in more than 600 cities, and over 8 million other industrial and commercial enterprises throughout China by late 1999. Until March of 1997, these four networks had virtually no interconnectivity—all inter-network traffic had to be routed via the United States. Today, there is limited connectivity via low bandwidth (128k) leased line connections between the four networks, though these connections are completely saturated. By December 1998, the four networks' international bandwidth reached 143M

256Kbps, connecting countries or regions such as the US, Canada, UK, Germany, France, Japan and Hong Kong. The total bandwidth is divided as such: ChinaNET, 123M; ChinaGBN, 8M256K; CSTNet, 4M; CERNet, 8M.[6] The bandwidth has increased tremendously compared to when the four networks first started, but as the number of Internet users increases rapidly, the limited bandwidth is becoming a bottleneck.

A fifth network, ATM-based China Multimedia Services Network, is currently under development and is already available in a number of cities. The network, also referred to as the 169 network (what users dial to log on), currently offers limited access to the global Internet.

Internet Regulation and Policy

In February 1996, the State Council issued Order No. 195, 'Provisional Regulations of the PRC on the Administration of International Interconnection of Computer Information Networks'. This was the first piece of Internet regulation in China. Order No. 195 divides China's Internet networks into two categories: Interconnected Networks (INs) and Access Networks (ANs). INs refers to those computer networks directly linked to the Internet through international leased circuits; ANs refers to computer networks that are connected by INs. With respect to INs, the State implements the principle of overall planning, standard setting, distributed administration and promotion development. The State Council's Leading Group on Informatization is responsible for co-ordinating and solving major issues in international networking. The Order requires that all INs be controlled and administered by one of the four organisations: the MPT, SEC, MEI, and CAS. ANs must carry out international networking through INs. All outgoing and incoming international traffic must go through the MPT.

In 1997, new regulations were imposed requiring all units doing business related to the global computer network to apply for licenses. In addition, the Ministry of Public Security (MPS) requires all Internet users to register with the MPS bureau in their locality. The State Council also promulgated the 'Computer Information Networks International Interconnection Security Protection Practice' further authorising the licensing, registration, and content control of the use of the Internet.

The Chinese central government has expressed concern over the potentially subversive content on the Internet and has exerted control over it as much as they can. The first person convicted in China's effort to crush dissent in cyberspace, even as it harnesses the Internet for economic and educational use, was Lin Hai. The Chinese software entrepreneur, accused of subversion for providing a list of 30,000 Chinese e-mail addresses to a US-based pro-democracy online publication called Big Reference, was sentenced in December 1998 by Shanghai's court to 2 years imprisonment. Lin Hai's case reflects China's determination to curb the free flow of ideas over cyberspace. However, because of the decentralising structure of the Internet, it is defiant to any centralised control. Ironically, in Asia, where governments have been most active in regulating it, the Internet has experienced one of the highest annual growth rates in the world—an average of 136.5% per year between 1993 and 1996.[7] China experienced even higher growth rates.

On the other hand, the Chinese government sees the Internet as a powerful communications technology and takes a proactive role in promoting the development of it, primarily for reasons of economic and administrative control of information. Take the 'Government Online' project for example. Initiated by 48 Chinese Ministries, Commissions and Bureaus and managed by China Telecom and the Economic Information

Center of the State Economic & Trade Commission, the 'Government Online Project' has been inaugurated recently (http://www.gov.cn). The Project will put public information from the various government departments on the Internet. The objective is to put 60% of government departments on the Internet this year and 80% by the end of 2000.

Internet Service Market

China's Internet regulation recognises diversity and competition. The four INs are potentially competitive and new INs will be permitted. There are several hundred ISPs in China, up from just six of them 3 years ago.[8] Even though the Internet access market is meant to be competitive, high leased line prices charged by incumbent telephone operators have discouraged Internet development. In China, 80% of the operating costs of ISPs are from leasing telecom lines from the monopoly telecom operator, compared with 5.6% for American ISPs, leaving little for profit margin.[9] The high charges have been blamed as one of the factors that hinder the development of the information industry, and many Internet service providers feel that it is difficult to make a profit from a small market. Moreover, private ISPs are at a great disadvantage when competing with China Telecom, the monopoly telecom operator, who also provides Internet services.

Many of the countries that have a high level of Internet penetration also have low access charges for using the service. End-user access charges are of even greater significance in developing countries since incomes are considerably lower. Internet charges in China are comprised of two elements: usage charge of the telephone network and the ISP's access charge. In China, local calls are charged by the minute. Even with a relatively low Internet access charge, the combined cost of Internet access is huge. The high cost of using the information superhighway has become the biggest headache for most Chinese. The people of Beijing on average spend 34.8% of their monthly salaries just to get onto the Internet, a sharp comparison to the 1% in the United States.[10] This has discouraged significantly residential uses of the Internet. Most ISPs in China have differentiated pricing for local, domestic, and 'global' Internet use, thereby further discouraging uses of the 'global' Internet.

Statistics

By the end of 1994, a conservative estimation of total Internet users in China was 1600. In 1995 there were 6400. By early 1997 MPT's ChinaNET had about 200 access networks and 41,000 users; ChinaGBN had about 40 access networks and 2000 users; CERNet had about 200 campus networks and 24,000 users; while CSTNet had about 100 campus networks and 12,000 users.[11] Over the past few years, the Internet has experienced remarkable growth in China.

In November 1997, the China Network Information Center (CNNIC) issued the first *Statistical Report of the Development of China Internet*, which found that there were 299,000 computers connected to the Internet by November 1997, and 620,000 Internet users. The second report, issued in July 1998, found that 542,000 computers were connected to the Internet and the number of Internet users had grown to 1,175,000. In January 1999, CNNIC issued its third report. According to the report, by the end of 1998, China had 747,000 computers connected to the Internet, 2.1 million Internet users, 18,396 registered domain names under the 'cn' top-level domain, and 5300 WWW sites. Among the 2.1 million Internet users, 400,000 were direct line users, 1,490,000 were dial-up users and 210,000 users were using both.[12]In addition, Internet cafes have become

popular across China's prosperous eastern cities and so the Internet is accessed by many more users. Most of these cafes are linked to proxy servers to give users access to forbidden websites.

Theoretical Assumptions and Research Objectives

Past research on China's Internet has focused on infrastructure development, policy issues, political control and the democratic nature of the Internet. It is generally agreed that China's Internet has come a long way in a short time. The promising signs are its economic boom, construction of the national information infrastructure, and sharply escalating PC sales; while the problems facing China's Internet include high entry costs, low teledensity and PC penetration, slow speed and congested networks, high illiteracy rate, inadequate funding, and administrative inefficiency.[13] The Internet has often been heralded as posing threats to nondemocratic rule, therefore how the Internet and nondemocratic rule coexist in the case of China is an issue of interest.[14] China's embrace and attempted control of the Internet illustrates a dilemma faced by China's leadership: economic informatisation and information control.[15]

Although the Internet phenomenon in China has attracted much research interest, little is known about what users actually do on the Internet, their usage patterns, or any interaction between Internet policy, services, demographics and behaviours. If we consider Internet service as an 'innovation', diffusion of innovations theory may offer insights on who is likely to adopt it relatively early. The diffusion of innovations theory presents a comprehensive model for explaining and predicting the adoption of an innovation, such as a new idea, technology, product or process. It has been widely applied to the study of new media technologies, including PCs and the Internet in recent years.

The Diffusion of Innovation Perspective on Internet Studies

Broadly speaking, diffusion research addresses the characteristics of innovations and those who adopt them. Rogers defined innovativenss as 'the degree to which an individual is relatively earlier in adopting an innovation than other members of his social system'.[16] He classified adopters in five categories: innovators, early adopters, early majority, late majority and laggards, on a time dimension. In respect to the characteristics of innovations, Rogers further distinguished between continuous innovations (those representing a variation of existing channels) and discontinuous ones (those more difficult to adopt, e.g. involving the purchase of a separate piece of hardware). These have laid some of the foundations for exploration of micro-level concepts encompassing personal attributes and other specific adoption-related behavioural patterns.

The actual adoption is a result of a combination of one's need for innovativeness and other circumstantial factors that are considered barriers to adoption. According to Rogers, there are five attributes of an innovation that may help determine the rate of adoption: (1) relative advantage; (2) compatibility; (3) complexity; (4) trialability; and (5) observability. In the context of computer adoption, some of the dimensions such as trialability and observability may not directly apply, as argued by C. A. Lin.[17] Lin suggested that 'complexity' and 'relative advantage' are two components most worthy of consideration in PC adoption, and added another dimension called 'resources', which refers to the evaluation of financial resources available for purchase. According to S. Rafaeli, 'interactivity' is one of the defining qualities of communication on the Internet.[18] The attribute of 'interactivity' has recently been incorporated in the diffusion of Internet studies.[19]

Past studies indicate that demographics are associated with new media adoption.[20] Adopters tend to be upscale, better educated, and younger than nonadopters. This has been found to be true of computer adopters as well.[21] Other market profiles noted the existence of a gender gap in the use of online services, as two-thirds of users in a survey were men.[22] As Rogers' typology predicts, demographic differences between adopters and nonadopters have been levelling for more 'mature' media, including cable, VCR, and other technologies. Perhaps because the Internet is still relatively in its early stage of diffusion, past studies point to an upscale adopter profile. Studies of computer adoption also suggest that computers are perhaps the most discontinuous of media technologies, given the relatively high financial and skill barriers associated with adoption.[23] The existence of the 'computerphobia' literature attests to the perceived high complexity associated with such information technologies as the Internet.[24]

Although some early studies suggest that computer technology adopters tend to be of a higher socio-economic status than the rest of the population,[25] it has been found that income and education bear only a weak inverse relationship with interest in adopting specific Internet utilities. Some applications, e.g. sending or receiving messages, ordering goods, may be less expensive substitutes for functions performed by traditional media, such as the telephone.[26] Moreover, Lin's computer service adoption study discovered a 'likely adopter' profile involving young, computer-literate innovators who, despite deferred adoption due to financial limitations, will likely become adopters when earnings increase.[27] Other work suggests that audience needs or media use patterns are much more powerful than demographics in explaining cable, videotext, audiotext, computers and the Internet.[28] The Internet represents a broad range of opportunities for communications. Different user needs or usage patterns are likely to lead to adoption of the Internet for different purposes.

Research also indicates that adoption of new technologies is related to other innovations, for example, the experience with technology encourages the adoption of cable, audiotext and computers.[29] Reagan *et al.* expanded that notion to include adoption of functionally similar technology repertories.[30] Such a collection might be stimulated by the acquisition of a trigger innovation, such as a computer, which encourages adoption of related technologies.

Based on our knowledge of Internet development in China, the present users of the Internet, who constitute only an insignificant percentage of the overall population, are classified as innovators or early adopters. They are assumed to be of a higher socio-economic level than the rest of the population. Further, they are generally cosmopolite, as the Internet is now considered as an urban phenomena, partly because of the concentration of PCs and telecom access in major cities: 11.89% of urban families own PCs, in Beijing 22.39%; 20.42% families with PCs have Internet connection, in Beijing 26.7%. Overall, 1.7% of residents in big cities use the Internet, Beijing and Guangzhou has the highest percentage of 8.7 and 4.6%, respectively.[31]

Aside from an individual's innovativeness, circumstantial factors influencing Internet adoption in China are expected to be found along four dimensions: (1) complexity; (2) resources; (3) interactiveness; and (4) relative advantage. Complexity refers to the skills and knowledge required to operate the computer and use the Internet, which can be technical, cognitive, and language. Resources refer to the how people are willing to pay for the costs of PC and Internet connection. Interactiveness relates to speed, as higher speed leads to greater ease of use. Relative advantage has been operationalised by other researchers as essentially the usefulness and enjoyment of use. How these factors are addressed will have an impact on the large-scale adoption of the Internet.

Internet Usage

When the focus is on telecommunications access, people often neglect the usage patterns. The experience of telephony in China has suggested that while there was a 'rush' towards installation of telephones, people have not used them as much as outsiders would have expected. This phenomenon was referred to as 'hot' installation and 'cold' usage. Residential users were cautious about how many calls they made, even local calls, and the duration of them. Some residential phones served as primarily receiving ends, very few outgoing calls were made from them. The same may hold true for China's Internet. Are they using the Internet extensively? What applications do they run most, and why? Are China's Internet users following the same trend as set by the advanced countries, e.g. e-commerce? In addition to understanding who uses the Internet, we need to know how they are using it and what factors influence their usage patterns. It is assumed that with high telecommunications and Internet access fees, most Chinese users can not afford to spend a great amount of time online.

The usage of the Internet has important implications, both economically and politically. The Internet is an emerging source of information in China. Twenty years ago, Chinese people used mainly the radio, newspapers or magazines, and TV to get information. Now, TV has become the primary source of information. Pager has risen greatest, now 10.52% as an information source. Car radio and the Internet have increased from representing zero share of information to 1.31 and 1.69%, respectively.[32]

Research Objectives

The purpose of this study is to make an exploratory assessment of Internet development in China from an essential aspect of it—its users. It is expected that how the present adopters use and perceive the Internet is likely to have an impact on the future development of China's Internet. The study will explore these topics of interest:

1. the profile of Internet users in China, and how demographics and other factors influence Internet adoption; and
2. Internet usage patterns among Chinese users and what factors affect their usage patterns.

Based on the findings and background information of China's Internet, this study will make policy recommendations to expedite the diffusion of Internet in China, and suggest some emerging trends.

Method and Findings

Surveys were conducted between February and March of 1999 in Nanjing, a major eastern city in China. The survey questionnaire was designed for different user groups based on their methods of Internet access. There are generally three methods of access: at home, at work, and at Internet cafes. Because China still has a low telephone penetration (national level 10–11%, urban 20–30%) and an even lower percentage of computer and Internet users, it would be unrealistic to use some of the common survey techniques from the US, such as random digit dialing. It would also be unrealistic to include a large sample of which only a tiny percentage is Internet users. Therefore we only surveyed Internet users, and used the administered survey method.

In Nanjing, 150 copies were distributed for Internet cafe users, 100 copies for workplace users and 100 copies for home users. For the first type of users, we distributed

questionnaires in Jinling Online's Net Friend Club, which is the biggest Internet cafe in Nanjing established by the Telecommunications Bureau. For workplace users, survey questionnaires were distributed to a computer company, a bank and a university that have the right conditions for their computers to be connected to the Internet. As for the home users, survey questionnaires were collected from friends and colleagues who have the opportunity to use the Internet at home. By late March 1999, 176 usable survey questionnaires had been collected, of which 74 were mainly Internet café users, 62 were home users and 40 were workplace users. Between a quarter and a third of the total respondents had multiple methods of Internet access. It was realised that such a survey method had certain limitations (e.g. not a random sample). To make up for such limitations, relevant national data are used as benchmarks to provide the reader with a comprehensive picture.

Compared with a national online survey (22,000 respondents) conducted by CNNIC in December 1998, the Nanjing survey shows similar demographic composition. One major difference is that the Nanjing survey has a larger representation of Internet café users, which include a large percentage of college students, therefore, a larger representation of the age group of 20–24, with lower income and higher education. Table 1 lists some of the demographic composition of our survey and the CNNIC survey.

'Early Adopters' Profile

As can be seen from Table 1, Internet users in China are predominantly young (around 70% are between 20 and 29), male (well over 80%), well educated (well over 70% have a college education), and single (well over 60%). They also have higher incomes. This is consistent with the 'early adopters' profile suggested by studies on new media adoption in the US, which found that adopters tended to be upscale, better educated, and younger than nonadopters. The existence of a gender gap in computer and online service uses is also found among Chinese Internet users.

The CNNIC statistical report also reveals that geographically, eastern, central and coastal areas are more advanced in Internet development than the west and inner areas. This is consistent with the economic situation in China. In terms of occupational field, the CNNIC report found that Internet users in China are scattered across almost all walks of life, and no particular occupation boasts a dominant number of Internet users. However, computer professionals (17.4% among the total sampled) and college students (17.4%) seem to have a relatively larger Internet population.

College students who do not have their own computers and Internet services are likely adopters of them. College students are young and computer- and English-literate, their deferred adoption is largely due to financial limitations. In the Nanjing survey, college students made up 29% of the sample, and 50% of the Internet cafe portion.

Another significant group of Internet users in the Nanjing survey was employees of joint ventures or foreign companies in China. Their work background, which involves some foreign experience, is a likely influence on their adoption of the Internet. They are also fluent in English and have the financial resources to adopt new technologies. People who work in the higher research and education field also make up a significant percentage of online users. In addition, computer and telecommunications professionals were among the first to use the Internet.

The growth of the Internet has occurred in a way that favoured the use of English, due to the origination of it in the US. For this reason, information technology (IT) or computer literacy is related to some extent to English literacy. Language undoubtedly plays an important role but is not prevalent. The present users of the Internet in China

Table 1. Nanjing survey and the national picture

	Age			Source of payment			Gender	
	< 20	20–29	30–39	Office	Personal	Both	Male	Female
CNNIC[a]	10.1%	68.4%	16.2%	26%	45%	29%	86%	14%
NANJING	5.8%	77.9%	16.3%	14.7%	64.2%	21.1%	88%	12%

	Educational level			Monthly income (yuan)				Marital status	
	SS or TS[b]	College	Grad.	400 or below	400–1000	1000–2000	2000 or more	Single	Married
CNNIC	11%	77%	12%	5%	37%	33%	25%	64%	36%
				500 or below	500–1000	1000–3000	3000 or more		
NANJING	7.8%	79.4%	12.7%	18%	35%	29%	17%	75%	25%

Note: [a] CNNIC survey data here were adapted from *Statistical Report of the Development of China Internet*, CNNIC, January 1999.
[b] Secondary School or Technical School.

have generally a good command of English and are computer literate. Forty-nine percent of the Nanjing survey considered themselves to have an intermediate level of computer skills and 11.5% thought that their computer literacy level was expert. Only 13.5% rated their English as 'not good', while 42.3% rate their English as 'fair', 36.5% as 'good' and 7.7% as 'very good'.

Personal Computer (PC) penetration undoubtedly plays an important role in Internet development. China's PC market is an emerging world market, expanding rapidly with approximately a 30% annual growth rate over the last several years, despite a recession in many regions of the world.[33] Moreover, the home PC sector is blooming; its share of the overall PC market is expanding every year, and is expected to top 30% by the year's end. Official statistics show that the sales volume of PCs reached 3.5 million in China in 1997, worth 41.5 billion yuan (US$5 billion) and will increase to 50 billion yuan ($6 billion) in 1999, the Ministry of Information Industry claims.[34] Overall, household PC penetration in China is still very low (2.45%),[35] but urban penetration is much higher (11.89%). In the Nanjing survey, PC ownership among individual Internet users is as high as 69.7%. This implies that PC ownership is likely to 'trigger' the adoption of Internet service because of their close affinity.

Internet users also tend to be adopters of a variety of other media technologies or appliances. The ownership of other information and entertainment technologies among the Nanjing survey respondents is as follows: cable television, 83.5%; VCR, 48.6%; VCD, 63.3%; home theatre, 33.0%; pager, 65.1%; cell phone, 35.8%; fixed line phone, 86.2%. In any measure, this kind of ownership of media technologies is much higher than the national average. This confirms the notion of technology clusters, as the adoption of an innovation is powerfully related to other functionally similar technologies.

Factors Influencing Adoption of the Internet

Respondents were asked to rank their agreement on a Likert-type 5-point scale with a series of 16 statements related to the adoption of the Internet. As Table 2 shows, it is a strong consensus that, at present, the Internet in China is expensive to use and the connection speed is slow. Chinese content on the Internet has been developed to such a level that people are satisfied with the quantity and availability of it. Another encouraging sign is that although English is still needed to use the Internet, the technical aspect of Internet skills is not daunting. People who have experience with using the Internet agree it is not complicated. The advantages that the Internet brings are various, such as enhancing education, increasing work opportunities, staying abreast with the 'information society', and enjoyment in life.

Factor analysis of these statements using principal component analysis yielded six factors—resources and speed (statistically one but conceptually two factors), advantage, Internet service quality, complexity, innovativeness, and Internet content (see Table 3)—basically consistent with expectations derived from the theoretical assumptions discussed above. Two new attributes were discovered, which are ISP service quality and Internet content.

Internet Usage: Online Time, Activities and Orientation

According to the Nanjing survey, about one-third of Internet users are new to the technology, with less than 6 months experience. About 25% have used the Internet for between 6 months and 1 year. Close to one-third of them have used the Internet for between 1 and 2 years, and 11% have used it for over 2 years.

Table 2. On a Likert scale of 1–5 (from 'strongly disagree' to 'strongly agree')

Statement	Mean	Standard deviation
It is expensive to use the Internet	4.39	1.02
Personal computers are costly	4.18	0.73
The access speed is too slow	4.21	1.00
It takes a long time to download things from the Internet	4.42	0.66
There are too few sites to visit	2.99	1.25
There is not enough Chinese content on the Internet	2.58	1.30
The ISP service quality good	2.52	1.03
The Internet connection I get from the ISP is reliable	2.82	0.88
It requires complicated skills to use the Internet	2.82	1.31
One needs to have good English command to use the Internet	3.60	1.24
Knowing how to use the Internet can increase one's work opportunity	3.54	1.20
The Internet is helpful to education	3.98	1.04
It is fun to use the Internet	4.23	0.89
The Internet is a sign of information society	4.30	0.92
I am willing to accept new ideas	4.35	0.88
I follow closely new technologies	4.29	0.94

As to the time spent online, among home users, 14.9% spent less than 1 h per week, 34% spent between 1 and 5 h per week, 31.9% spent between 5 and 10 h per week, and 19% stayed for over 10 h per week online. In fact, there is a wide variation in the amount of time spent online among these users. They pay a range from 15 to over 1000 yuan (US$1 equals approximately 8.3 yuan) for monthly Internet access fees depending on the time online, and the commensurate telephone charges (1 min of local calls is 0.10 yuan

Table 3. Factor analysis of adoption of Internet variables

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Resources						
Internet usage expense	**0.65**	−0.42	0.32	−0.01	−0.01	0.11
PC cost	**0.60**	−0.41	0.30	−0.005	−0.18	0.01
Interactivity						
Speed slow	**0.67**	−0.49	0.29	−0.12	0.16	−0.22
Wait time long	**0.63**	−0.49	0.31	−0.01	0.18	−0.18
Content						
Few sites	0.24	−0.38	−0.1	−0.01	0.20	**0.51**
Not enough Chinese content	−0.19	0.19	0.39	−0.01	0.003	**0.65**
Service						
Service quality	−0.24	0.47	**0.69**	0.17	0.31	−0.005
Reliability of connection	−0.27	0.45	**0.75**	0.005	0.18	−0.11
Complexity						
Skills required to use Internet	−0.01	−0.18	−0.13	**0.75**	0.34	−0.01
English needed to use Internet	0.21	−0.18	−0.23	**0.69**	0.30	0.19
Advantage						
Help education	0.56	**0.47**	−0.003	0.21	−0.16	0.28
Fun	0.66	**0.49**	−0.004	0.01	−0.20	0.003
Sign of information society	0.59	**0.49**	−0.18	0.21	−0.14	0.11
Innovativeness						
Willing to accept new ideas	0.60	0.55	−0.25	−0.20	**0.31**	−0.01
Follow closely new technology	0.59	0.50	−0.23	0.29	**0.38**	−0.11
% Variance explained	23.6	17.3	11.5	9.5	6.5	6.3
Eigenvalue	3.77	2.77	1.83	1.52	1.03	1.00

in China). There are, however, roughly four levels among such a great variation where users tend to cluster: 20, 50, 100, and 200 yuan for Internet access. On the whole, 75.5% of home users pay less than 100 yuan monthly for Internet access, and 72.5% pay less than 100 yuan for phone charges for Internet use. Compared with the typical $19.95 per month unlimited toll free commercial Internet service in the US, most Chinese Internet users are spending a greater amount (even in absolute value) and getting much less online time. Cheap and easy access to the Internet may be taken for granted in the US, but it is still a dream for the Chinese.

Internet cafe users are likely to spend more time online than home users. Around 50% of cafe users come to the cafe on a daily basis and 42.9% spend over 4 h each time. This is probably due to the different pricing structures. The Internet cafe rate is usually by the hour, but it is a bundled rate. These rates range from 6 to 12 yuan per hour. Many Internet cafes also have promotional 'monthly cards' allowing unlimited access in 1 month. Home users are more sensitive to their time spent online because the 'meter' keeps running once you log on, and every minute online costs about 0.20 yuan. A majority of home users rely on such methods as offline e-mail composing and offline reading to save minutes online.

For Chinese Internet users, E-mail (78.0%) and browsing (54.1%) are the most common activities. Other dominant Internet uses for them are study/research (49.5%) and online chat (37.6%). The association of the Internet with study and research indicates that the Internet is considered a high-end technology. The ease with which Chinese users accept online chat indicates the Internet as an effective interpersonal communications tool. Meanwhile, the issue of privacy, which often accompanies online chat in the US and other western countries, is not prevalent in China, presumably because of the political and cultural backgrounds that discourage claims of privacy. Other common activities include downloading (31.2%) and entertainment (e.g. gaming) (27.5%). Internet telephony (4.6%) is a more common activity than online shopping (1.8%) for the Chinese. China's economic condition is not well suited for online shopping yet, which explains the low usage. The telecommunications service in China is still largely under state monopoly, and this has driven the relatively fast adoption of Internet telephony so that sophisticated users can take advantage of the new technology for their private benefit.

Chinese Internet users are rather sophisticated in using the technology, which is consistent with their claims of high IT literacy. The following lists various Internet applications and the percentage of the respondents who have had experience using them: E-mail (93.6%), WWW browsing (88.1%), online chat (72.5%), BBS (49.5%), FTP (44.0%), online games (42.2%), streaming audio/video (39.4%), Telnet (32.1%), Newsgroup (30.3%), instant messaging (22.9%) and Internet telephony (14.7%).

The Internet is becoming a major source of information for Chinese Internet users. The dominant sources of information for them are print media (newspaper and magazine), television, World Wide Web, and radio in that order. The Internet has surpassed the importance of radio for Chinese Internet users when they seek information.

Although over half of the survey respondents said that they visit about equally Chinese-based sites and English-based sites, the most frequently visited websites named by them include over 90% of Chinese websites. The number of Chinese sites has increased dramatically over the past few years. Besides the local ISP's site (www.jlonline.com), the top three sites identified by the Nanjing survey are: www.yahoo.com/gbchinese.yahoo.com (or www.sohu.com), and www.nease.net (or www.netease.com). Similar results were found in the CNNIC survey, in which some other popular sites are: www.163.net, www.263.net, www.sina.com.cn,

Table 4. Factors influencing time online

Expense	75.2%
Speed	60.6%
Free time	55.0%
Things to do online	24.8%
Useful information online	22.9%
Personal skills	15.6%

www.online.sh.cn, www.yeah.net. Most of these sites are known as 'Web portals' providing a comprehensive collection of news and interests.

Factors Influencing Usage of the Internet

Respondents were also asked to rate some of the main factors influencing their time spent online. As a result, Internet expense and connection speed were again found to be the chief reasons why they are not spending much time online (see Table 4). As the Internet is considered to be a form of leisure activity, how much free time one has is an important factor. Online content and applications also determine how much time one stays online. As for previous results for Internet adoption, personal skills for using the Internet do not play a primary role in influencing the amount of time spent using the Internet.

Implications, Limitations and Future Directions of China's Internet

The huge potential of China's Internet market is rarely disputed. However, even as the number of Internet users is expected to reach 6 million by the year 2000, it will still be a meager 0.5% of the overall population. This number will not make the Internet a mass communications medium in China, but it is high enough to make the Internet an important part of the personal, social and professional life of many urban Chinese. This study has applied the diffusion of innovation perspective to China's Internet development in order to understand present user profiles, and assess various factors that influence the adoption of the Internet.

Present Internet users in China reveal an upscale profile, confirming expectations from diffusion of innovation studies. In addition to the demographics that put them into an elite group, their ownership rates of media technologies including cable television, telephone, pager, VCR, and PCs are remarkably high. They also have good IT and English skills. However, these present users do not consider English or PC skills to be severe barriers to the adoption of the Internet, which indicates that large-scale use of the Internet is possible in the future. Chinese-based contents are increasingly accessed and viewed by these users. These are encouraging signs for China's Internet to be adopted on a larger scale.

On the other hand, huge expenses and slow speed are found to be the biggest barriers to widespread adoption and usage of the Internet in China. Internet usage in China is characterised by limited online time because of high expenses, slow speed, and a limitation of online applications. China's Internet development strategy should target these barriers. The following are some suggestions.

1. Increase competition in the telecommunications market to enhance consumer welfare. China's telecommunications market is still under the virtual monopoly of China

Telecom despite the entry of a second operator China Unicom. Telecommunications monopoly has maintained high leased line charges and end user fees, two significant barriers to the further development of China's Internet. To promote competitiveness in China's telecommunications, the MII has decided to restructure China Telecom by splitting it off into four operating companies responsible for fixed line, mobile, paging and satellite services. Perhaps the biggest challenge facing China's telecommunications is that it lacks an effective regulatory framework to ensure competition. China also needs to encourage the entry of nontraditional telecommunications service providers, e.g. cable companies, based on technological convergence.

2. Attract foreign and private investment in Internet services and content provision. To date, investment in Chinese Internet companies has been relatively small, with approximately US$40 million invested in Internet content providers such as Sohu, Netease, Chinabyte and Sina, and return on investment has been problematic for some of them.[36] As the number of Internet users expands, investment interest in China's Internet from institutional investors, capital firms and Internet related companies would grow. Private investment is likely to increase the efficiency, Internet content and service quality, which in turn will attract more Internet users.
3. Design effective Internet pricing schemes. Where telecom facilities permit it, make the distinction between 'data calls' and 'voice calls' and price 'data calls' lower. Allow flat rate pricing at certain hours (e.g. late evenings, weekends and holidays).
4. Make available alternative and innovative ways of using the Internet. Since the existing private and organisation ownership of PCs and telephone networks are limited in China, many alternatives to PCs and telephone lines can be made available. These alternatives include cable Internet service, Web TV, and Internet-enabled handheld devices. Microsoft's Venus project in China and a domestically produced project called 'Nuwa' are currently tapping into this emerging market.[37] Public or pay-per-use Internet access can be provided to individuals who do not have the hardware themselves. Internet cafes have had some success in major Chinese cities, but they need improvements in costs, location, speed and other appeals.
5. Combine online content and Internet access development. The experience of the online industry in the US and other countries suggests that the commercial potential of information content and provision will be significantly greater than the cost of underlying transport. Unlike the telephone service, the Internet is content oriented, and more profit can be made from content than simply access. Internet content and application can be developed together with Internet access, with the sponsorship of businesses that thrive on providing content. The model of 'free ISP'—free Internet service supported by advertising—may be feasible in China.

China's Internet at present is both a research and study tool and a leisure time activity. It is yet to be integrated into economic and political life. Some emerging trends are online commercial applications and Internet telephony. The world trade volume via the Internet surpassed US$8 billion in 1997, but current e-commerce volume in China is negligible. China's Ministry of Information Industry is stepping up co-operation with other departments to 'draft strict standards and create necessary conditions to ensure the orderly and sound growth of e-commerce'.[38] Business-to-business transactions will be the immediate projects for e-commerce in China as retail e-businesses are hampered by a lack of secure and convenient payment methods (e.g. credit card), slow Internet access and high telecommunications and online fees. Currently only 10% of China's large and medium-sized state-owned enterprises have computer networks that have been used to do business electronically. Given the late start for the country's e-commerce industry, Shi

Guangsheng, Minister of Moftec (Ministry of Foreign Trade and Economic Co-operation) said at a recent national conference in Beijing that China should take effective measures to follow global trends to consolidate its economic status in the coming millennium. In fact, Moftec is already engaging in China's first large-scale e-commerce project running the China market on a website (http://www.chinamarket.com.cn). The site was intended for overseas business people who are interested in China, or Chinese business people interested in the global market. The impact of IP (Internet Protocol) telephony on traditional telephony is being felt in China as well. It was ruled in a court that IP services were outside the telecom monopoly. Three telecom operators, China Telecom, China Unicom and China Jitong Corp., will officially conduct trial Internet phone services in a number of cities. The trial prices for domestic and international long distance calls via the Internet are much lower than fixed line calls, at 0.3 (US$0.036) and 4.8 yuan (US$0.58) respectively.[39] The Internet phone service is expected to be popular in China in the near future.

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