
CHAPTER 4

UP-DATE: PEOPLE'S REPUBLIC OF CHINA

Executive Summary

The number of Internet users in the People's Republic of China (PRC) doubled in nine months, from 620,000 in October of 1997 to 1.2 million in July of 1998.²²⁸ The Chinese leadership has allowed the Internet to grow this rapidly because the Internet is seen as an essential tool for economic prosperity, the harbinger of a "knowledge economy," where information flows replace industrial processes as the basis for the economy. Chinese society has been struggling with how to facilitate, manage, and control such a major transformation and groups are vying over who will be the winners and losers in the process.

As part of this process, the National People's Congress (NPC) in March of 1998 made a decision to merge the Ministry of Electronic Industries (MEI) and the Ministry of Post and Telecommunications (MPT) with the telecommunications parts of the Ministry of Radio, Film, and Television (MRFT), and the Aerospace Industry Corporation (satellite communications) to create a new Ministry of Information Industries (MII).

The MEI had been competing with the MPT for control of Internet policy and the two ministries were operating rival Internet backbone services. Because no one ministry had control over the Internet, decisions about Internet policy were coordinated by a Steering Committee on National Information Infrastructure that was made up of stakeholder ministries. Now, with the establishment of MII, the Steering Committee has been abolished and its responsibilities transferred to the new ministry. It is apparent that the MPT faction is now in control of the MII.

Although the telecommunications operator, China Telecom, has been separated from the Ministry, some observers believe that China Telecom is well positioned to be the dominant provider of Internet backbone services. Other observers point out that China Telecom is being rapidly decentralized with local authorities playing a greater role in building out network infrastructure. One fairly advanced (but not yet approved) plan is to create a company separate from China Telecom that runs the national trunk. The question remains as to whether the provincial China Telecoms and their political backers will be able to work together to maintain their dominant position.

China Telecom believes that the government can afford to invest in only one high-speed national backbone. The Ministry of Education and the Chinese Academy of Services (CAS) can offer their organizations global Internet connectivity, but they must generally use China Telecom's Digital Data Network (DDN) and Frame Relay services infrastructure. ChinaGBN, which has been relying on VSAT service, has been told that it must begin to utilize China Telecom's data transport services, too.

Probably the greatest challenge to China Telecom comes from the cable (CATV) networks. These systems are being upgraded in some places with ATM switches and fiber. Huge regional CATV systems with fiber and HFC are already in place in Shanghai, Beijing, and Guangzhou/ Shenzhen.

²²⁸ This is a follow-on study. For the results of the original study see Goodman, *et al.*, "People's Republic of China," *The Global Diffusion of the Internet Project: An Initial Inductive Study*, *op. cit.*, pp. 109-145.

In fact fiber from the Bureau of Radio, Film, Television (BRFT) is being used in the new Beijing Internet exchange. There are plans for building a national fiber backbone to interconnect the local CATV systems.

Unicom's hopes for being able to provide a national data service were placed into question when MII's challenged the mechanisms and contracts used for funneling foreign funds into Unicom's telecommunications ventures.

Table 38 and Figure 9 provide the current dimensions of the Internet in the People's Republic. There has not been any change in the determinates that were documented in the previous study.²²⁹

Dimension	Level	Explanation
Pervasiveness	(2) <i>Established</i>	Having reached one user per thousand inhabitants, the user community has expanded from networking technicians to students, government (including the military), large business, and the broader public.
Geographic Dispersion	(3) <i>Highly Dispersed</i>	This dimension has not changed from March 1998. Internet access is available in all first-tier administrative sub-divisions.
Sectoral Absorption	(2) <i>Moderate</i>	This dimension has not changed. The Internet is in moderate use in the academic sector and is rare in the other sectors.
Connectivity Infrastructure	(2)	This dimension has not changed. China, by increasing ChinaNET's backbone capacity and international link is still approaching Level 3. There are limits on the availability of service greater than E-1.
Organizational Infrastructure	(2) <i>Controlled</i>	This dimension has not changed. There is healthy competition among ISPs in major cities, but only four networks can interconnect with the Internet and only through an MPT gateway. Now both commercial IP backbones are under one Ministry.
Sophistication of Use	(2) <i>Conventional</i>	This dimension has not changed. The Internet is used to enhance current processes, such as messaging, without fundamentally changing those processes.

Table 38. Internet Dimensions for China

The Internet is not just about enabling individuals, but has a collectivist component. It is worth exploring how the Internet in China resonates with the collectivist spirit of China. The Internet, rather than undermining society, is strengthening the relationships that are the very basis and underpinning of Chinese society. People and businesses are investing in Internet accounts, to stay connected. The Chinese government controls the Internet primarily through self-discipline. The

²²⁹ *ibid.*, p. 123.

government relies on the fact that users are strongly conditioned not to do anything that would harm the web of relationships in which they participate.

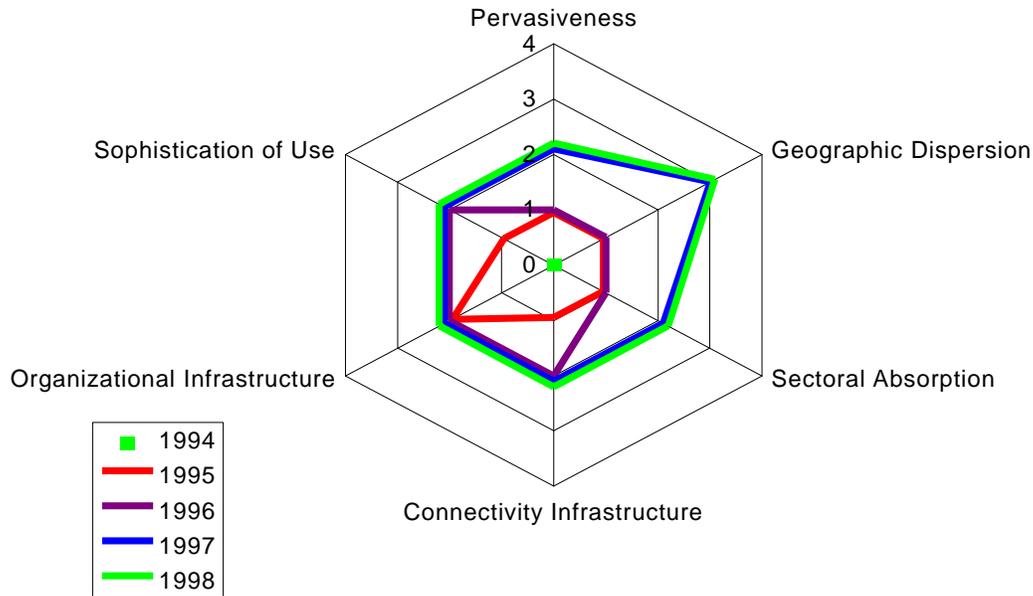


Figure 9. Internet Dimensions for China

The government does not hesitate; however, to make an example of those who are using the Internet to organize opposition to the State. During the summer of 1998, the government arrested Lin Hai for providing 30,000 Chinese e-mail addresses to a US-based Internet democracy magazine.²³⁰ They have also arrested the publishers of *Tunnel*, a weekly on-line magazine written in China that featured dissident writings. The publishers had unsuccessfully disguised themselves by sending the newsletter to a server in California where it was electronically distributed back into China.

The Ministry of Public Security's December 1997 Internet regulations do not mention encryption, but new provisional regulations have been prepared and are kept secret. Officials have been reluctant to ban encryption, because it is seen as a necessary requirement for electronic commerce. At the same time, the government believes it has the power to make senders and receivers provide copies of keys or unencrypted copies of messages.

PRC leaders are venturing that the Internet will be a force for social cohesion and economic growth and will not destabilize the country. They are still grappling with models of how to informatize the country. They are looking to the United States for assistance, while being aware that the Internet in China has profoundly Chinese characteristics. The Internet will have an impact on Sino-US discussions about China's entry into the WTO, infrastructure protection, crime, and human rights.

²³⁰ "China To Try Computer Engineer," *AP Online* (29 July 1998).

Introduction

This is an update to the initial assessment of the Internet in the People's Republic of China (PRC) provided in Chapter 6 of *The Global Diffusion of the Internet Project: An Initial Inductive Study*.²³¹ The initial study examined the dimensions and determinants of Internet diffusion in the PRC with a particular focus on the interplay between the State ministries over control of the Internet. Since the study was released, the two major competing ministries were merged into the new Ministry of Information Industries (MII). This up-date examines the impact of this new Ministry on the scope and character of the Internet. It also explores the use of the Internet by provincial governments and for electronic commerce. Finally, the up-date examines China's reluctance to allow foreigners to operate telecommunications facilities in the context of its national security concerns. Table 39 provides summary statistics on the PRC for background information.²³²

Metric	Value	Remarks
Population	1,232.08	millions, 1996
Population density	128	per km ² , 1996
GDP	697.6	US\$billions, 1995
GDP per capita	575	US\$, 1995
Telephones	54,947	thousands, 1996
Teledensity	4.46	per 100 inhabitants, 1996
Teledensity in largest city	18.97	per 100 inhabitants, 1996
Cellular subscribers	6,850.0	thousands, 1996
Cellular density	0.56	per 100 inhabitants, 1996
PCs	3,700	thousands, 1996
PC density	0.3	per 100 inhabitants, 1996
Television sets (receivers)	310,000	thousands, 1996
Television density	25.2	per 100 inhabitants, 1996
Literacy rate	81.5	per 100 inhabitants older than 15 years, 1997
Infant mortality	37.9	per 1,000 live births, 1997 estimate

Networks in China

Up to this point, only four organizations have been authorized to run Interconnecting Networks (IN) that link to the global Internet (Table 40). These four networks provide Internet connectivity to other networks, known as Access Networks (AN). Many of ANs are in fact Internet Service Providers (ISP), of which there are over 200 in the country.

Organization	Network
China Telecom	ChinaNET
Jitong	ChinaGBN
State Education Commission (SEC)	CERNET
Chinese Academy of Science (CAS)	CSTNet

ChinaTelecom was part of the former Ministry of Post and Telecommunications (MPT) and Jitong was associated with the former Ministry of Electronic Industries (MEI). In March of 1998, the MPT and the MEI were merged, but the decision thus far is to maintain ChinaGBN and ChinaNET as two separate commercial networks.

²³¹ Goodman, *et al.*, *The Global Diffusion...*, *op. cit.*

²³² Sources: *World Telecommunication Development Report*, *op. cit.*; Literacy rate, Infant mortality: U.S. Central Intelligence Agency, "China," *The World Factbook 1997*, <<http://www.odci.gov/cia/publications/factbook/ch.html>> (25 August 1998).

Internet Dimensions

Pervasiveness By July 1998, there were 82,000 Internet hosts under the .cn national top-level domain (TLD) according to China's domain name registrar, China Internet Network Information Center (CNNIC) (Table 41).²³³ The number of hosts has grown by 56 percent from the 50,000 registered in December 1997. However, the ratio of hosts to population remains low at 65 hosts per million people.

Table 41. Internet Hosts in China ²³⁴			
Date	12/97	2/98	6/98
Number of hosts	50,000	60,000	82,000

CNNIC estimates that there were 1.17 million Internet users in China at the end of July 1998.²³⁵ (Table 42). The ratio for users per capita continues to be low, although there has been exponential growth in recent years.

Table 42. Internet Subscribers in China ²³⁶			
Date	12/97	2/98	6/98
Subscribers	670,000	820,000	1,170,000

Geographic Dispersion Table 43 summarizes the characteristics of the INs. By early 1996, ChinaNET has established access nodes in all of the provincial capitals. During 1997 and 1998, the provincial Posts and Telecommunication Administrations (PTA) extended the Internet to other cities in the provinces. More than 200 cities have access to ChinaNET.

Table 43. Interconnecting Networks			
IN	Routers	Networks/Cities Supported	Backbones
ChinaNET	Cisco	200 Cities	E-1 DDN, Frame Relay, higher speed circuits between network operation centers
ChinaGBN	Cisco	100 Networks	E-1 VSAT from PanAmSat
CERNET	Cisco	300 Universities	E-1 DDN, Frame Relay
CSTNet	Cisco	200 Research Networks	E-1 DDN, Frame Relay, VSAT from Asia II

²³³ CNNIC, *Chinese Internet Developmental Condition Report* (Chinese), 11 August 1998, <<http://www.cnnic.net.cn/jb/cnnic-65.html>> (30 August 1998).

²³⁴ *ibid.*

²³⁵ *ibid.*

²³⁶ *ibid.*

The Golden Bridge Network (ChinaGBN), which relies on the JiTong's national very small aperture terminal (VSAT) satellite communications backbone, provides Internet access in 24 cities at rates between 64 Kbps and E-1 (2.048 Mbps) using a PanAmSat space segment. It is currently supporting 100 customers through VSAT stations. ChinaGBN is based on Cisco 7507 routers and currently has two international links (E-1 and 256 Kbps) from Beijing and one (E-1) from Shanghai. MII has informed ChinaGBN that they should begin to use China Telecom's Frame Relay service for some of its backbone requirements.

The Ministry of Education's academic network, CERNET, is currently providing access to about 300 universities around the country. Based primarily on Cisco technology, CERNET is upgrading its Cisco equipment in the fall of 1998 to support Layer 3 switching and Voice over IP.²³⁷

CAS's CSTNet has also interconnected several hundred research institutes distributed around China using 10 VSAT connections to the Asia II satellite as well as leased lines from China Telecom. CSTNet also uses Cisco routers.

Sectoral Absorption As seen in Figure 10, the majority of registrations are under the .com.cn domain that is set aside for businesses.

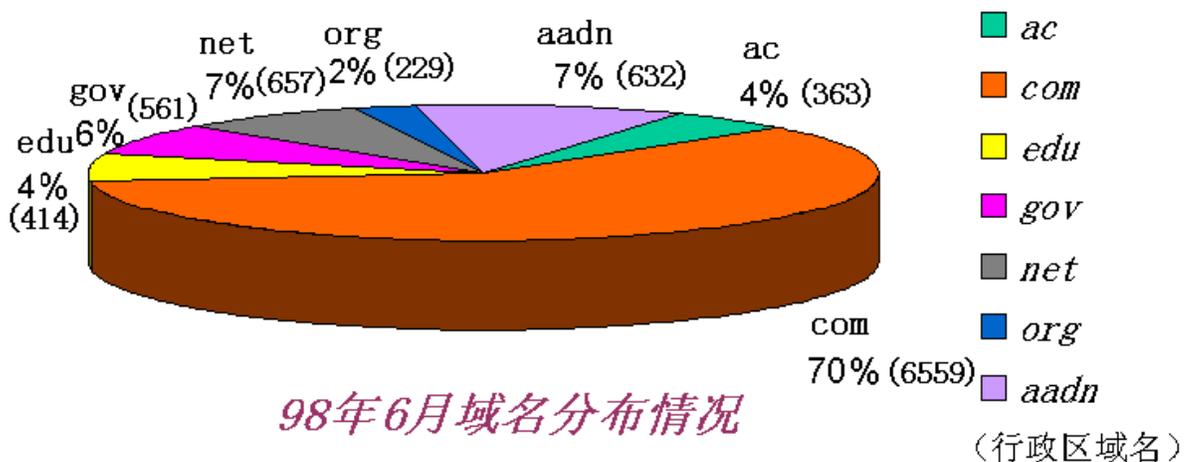


Figure 10. Distribution of Second-level Domains Under the .cn TLD, 6/98²³⁸

Although the majority of registered domains are in the .com sector, it is not true yet that the majority of businesses in China have domain names. The State Economic and Trade Commission estimates that half of China's 1500 medium to large state owned businesses are utilizing the Internet for business. The percentage of smaller firms who are doing so is somewhat less.²³⁹

The academic sector, where 300 of a total of 1000 universities have leased line connectivity, has the highest penetration of all of China's sectors.

²³⁷ "China's CERNET Upgrades National Backbone," *Newsbytes*, (3 September 1998)

²³⁸ CNNIC, *Chinese Internet...*, *op. cit.*

²³⁹ "Chinese Firms Conduct Business via Internet," *Xinhua English Newswire* (14 August 1998).

Government agencies have been very slow to develop a Web presence. MII now has a Web site that explains the restructuring and CNNIC has an informative Web site. In addition, various government ministries and a few provincial and local governments have been involved in the development of sites oriented towards tourism and economic development.

Connectivity Infrastructure By June of 1997, the four Interconnecting Networks in China had interconnected using bilateral peering (Figure 11) and upgraded their interconnections to E-1 speeds.

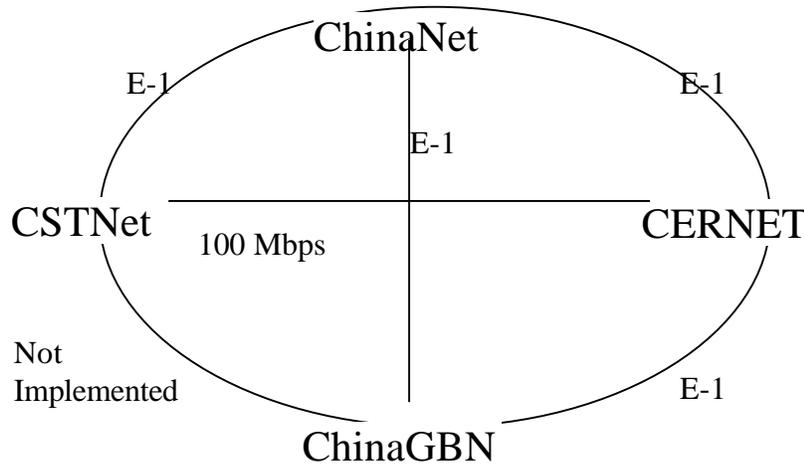


Figure 11. Interconnection of Backbones, June 1998

Exchanges

In 1997, the Steering Committee announced its plan to set up three Internet exchanges in Beijing, Shanghai, and Guangzhou to facilitate interconnection between the four national interconnecting networks: ChinaNET, ChinaGBN, CERNET, and CSTNet. The plan stalled due to technical, financial, and coordination difficulties and by the restructuring of MII.

On 22 October 1998, the Beijing City Information Office and the China Information Highway Corporation signed a joint venture agreement with Cisco Systems to construct the Capital Public Information Platform (CPIP), China's first Internet exchange. The exchange point will connect ChinaNET, ChinaGBN, CERNET, CSTNet, and the China Financial Network.²⁴⁰

CPIP will run over fiber optic cabling owned by the Bureau of Radio, Film, and Television (BRFT) and will also connect to BRFT's planned ATM backbone network. The core of CPIP will comprise two Cisco BPX ATM switching systems linked by fiber optic cables. This backbone infrastructure will deliver quality of service (QoS) management across the network and enable bandwidth to be scaled up beyond the initial 155 megabit per second (Mbps) throughput.

Cable Modems

China has an extensive cable network (CATV) that could potentially provide high-speed access to millions of families and businesses throughout China. The cable network is owned and operated by the former Ministry of Radio, Film and Television (MRFT) and its provincial and city branches.

²⁴⁰ "Cisco JV To Build China's First Internet Exchange," *Newsbytes* (22 October 1998).

There are 70 million cable TV subscribers, of which 20 million are commercial users. The cable network is growing at a rate of 10 million subscribers per year and has penetrated 17 percent of all houses. In contrast, the rate for phone penetration of households is 9 percent and PC penetration is 1-2 percent.²⁴¹ The system is decentralized and primarily offers local coverage. Presently most systems are unidirectional. There are a number of pilot projects for Internet access over cable modems, but these efforts are still in the early stages and have yet to solve the complex management issues associated with widespread bi-directional deployment.

Some of the cable systems have been upgraded with fiber, including HFC, in such places as Shanghai, Beijing, and Guangzhou/Shenzhen. State Council Directive No. 33 temporarily has limited the use of CATV for voice and data but this regulation is already breaking down.

Presently, there is a low-capacity national backbone. However, there are plans to expand this to a fiber-based national high-capacity backbone in the next two-to-three years. It is expected that this backbone will be able to carry IP traffic. Many anticipate that the cable operator will become the fifth IN. Another scenario in circulation involves the merging of China Telecom and the cable operator.²⁴²

International Circuits

Only the four authorized INs can presently connect to the global Internet and then only through China Telecom's gateways (Figure 12). In 1997, the Chinese prices for the higher end international half-circuits were more than double the cost of the United States-to-China half-circuit (see Table 44). China Telecom's expensive rates for international half-circuits discourage competitors such as ChinaGBN and slow Internet expansion.

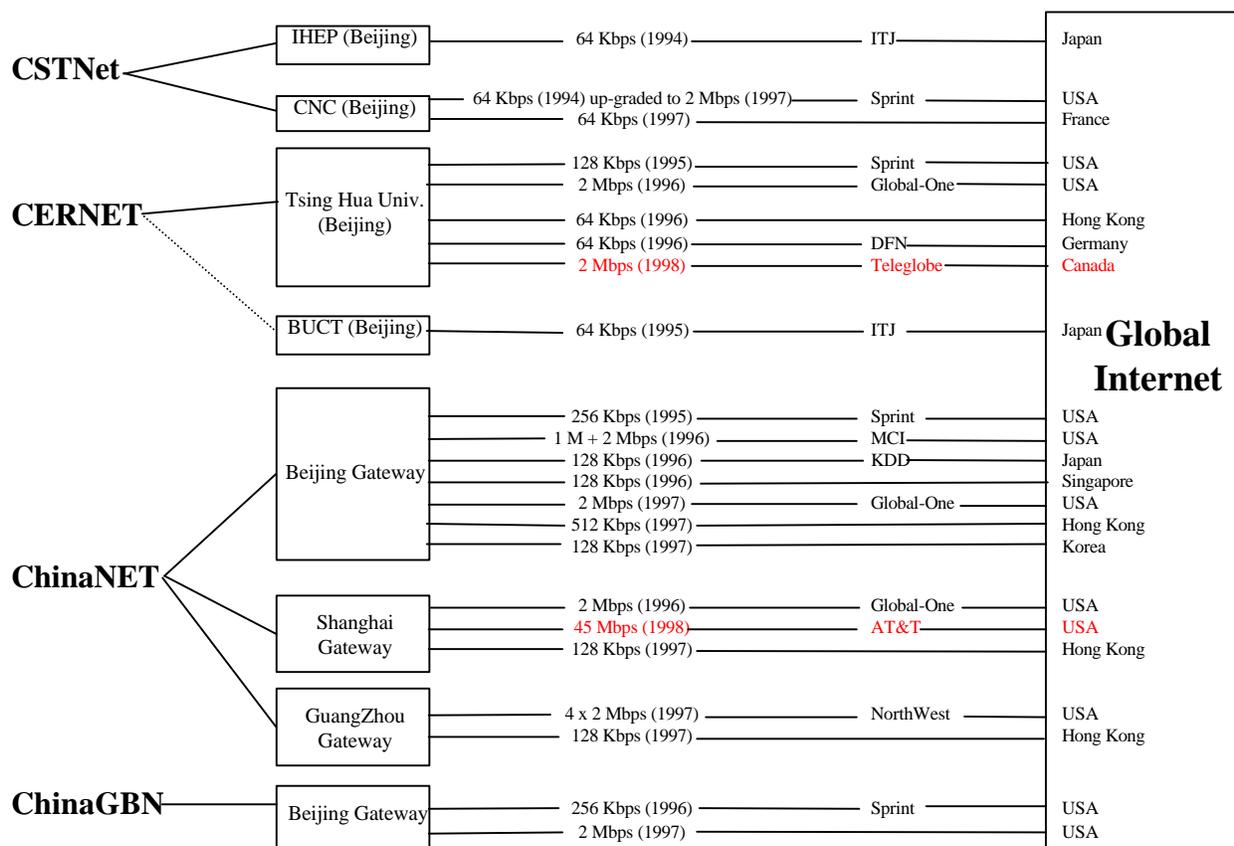
Bandwidth	64 Kbps	128 Kbps	256 Kbps	1 Mbps	2 Mbps
China half-circuit	\$6,585	\$10,600	\$18,000	\$49,000	\$73,000
Foreign half-circuit	\$6,585	\$8,300	\$9,900	\$18,000	\$22,000

Western observers often note how slow the Chinese Internet is. The Internet is fine for sending e-mail using the SMTP protocol, but there are often delays of up to three minutes associated with downloading Web pages. These delays make it painful to visit sites with multiple links or to engage in Web surfing. Although some networks such as Sparkice have reasonably good response times, many networks, including many in governmental agencies, are so slow as to make it very frustrating to utilize the Web unless you have one particular URL to find. Additionally, most Chinese pay for Internet service on a per-hour basis plus local phone charges. This makes them reluctant to use the Web even though they will send and receive e-mail every day. The issues of speed and pricing create real barriers to the use of the web.

²⁴¹ Jingling Chen, "Broadcasting and Cable TV Networks: The Potential for Telecom Services," *Telecomworld* (May 1998), pp. 25-27.

²⁴² The Cable Operator has been spun off from the Ministry of Broadcast, Movies, and Television.

²⁴³ Internet Forum at <<http://sunsite.net.edu.cn/IFM/97/5/lnw.htm>> (March 1997).



Total International bandwidth (as of 9/98) = 70 Mbps. 1998 circuits in red

Figure 12. China's International Links, 1994-1998²⁴⁴

Organizational Infrastructure There were more than 200 ISPs in China in the middle of 1998. Approximately 100 of the ISPs, including the Beijing Telecommunications Administration, are part of China Telecom. Many of these ISPs have already invested millions of dollars in their networks. However, ChinaNET has had to struggle because of the high priority that China Telecom gives to telephony and the fact that the local ISPs are losing money during this start up period. ChinaNET managers are running their operations with Internet savvy, gained from hours of Web surfing, combined with their training and experience in the telephone business.

In addition, there are over 100 ISPs who are independent from China Telecom. Though they differ widely in their financial, technical and management strengths, there are some that represent a credible challenge to ChinaNET. Many of them, like ISPs elsewhere, are diversifying into developing and hosting content as well as providing system integration services. These ISPs are playing a major role in connecting individuals and businesses in China with the Internet. They are making investments in infrastructure, technology, and marketing to broaden the appeal of the Internet. However, the non-China Telecom ISPs do not currently have formal representation before MII.

²⁴⁴ Sources: ChinaNET, ChinaGBN, CSTNet, and CERNET.

As a remedy, it has been proposed that a China Internet Society be formed as a channel for ISPs to participate in the decision-making process regarding the national information infrastructure.

Sophistication of Use Applications such as e-mail and Web access are being utilized to substitute for telephone calls and mail. There is not a lot of evidence that the Chinese are developing and implementing Internet technology in new and innovative ways. They are behind many countries in terms of implementing electronic commerce.

There has been much public discussion about the merits of transforming China into a knowledge-based economy. The government has embarked on a number of “Golden” projects aimed at transforming parts of the economy. The Golden Card project, for example, involves the deployment of smart cards for electronic currency. At the same time, a few China Telecom-affiliated ISPs are starting pilots providing stock market purchasing, electronic banking, and other services over the Web. It is unclear how and whether the “Golden” projects and the innovations associated with the Internet are going to come together. There is no indication that the government has developed an intellectual framework for achieving a knowledge-based economy nor has it established indicators to evaluate progress.

Summary The six dimension ratings for China have not changed since March 1998 and are not expected to change significantly in 1999. These ratings are depicted in Figure 13 and summarized in Table 45.

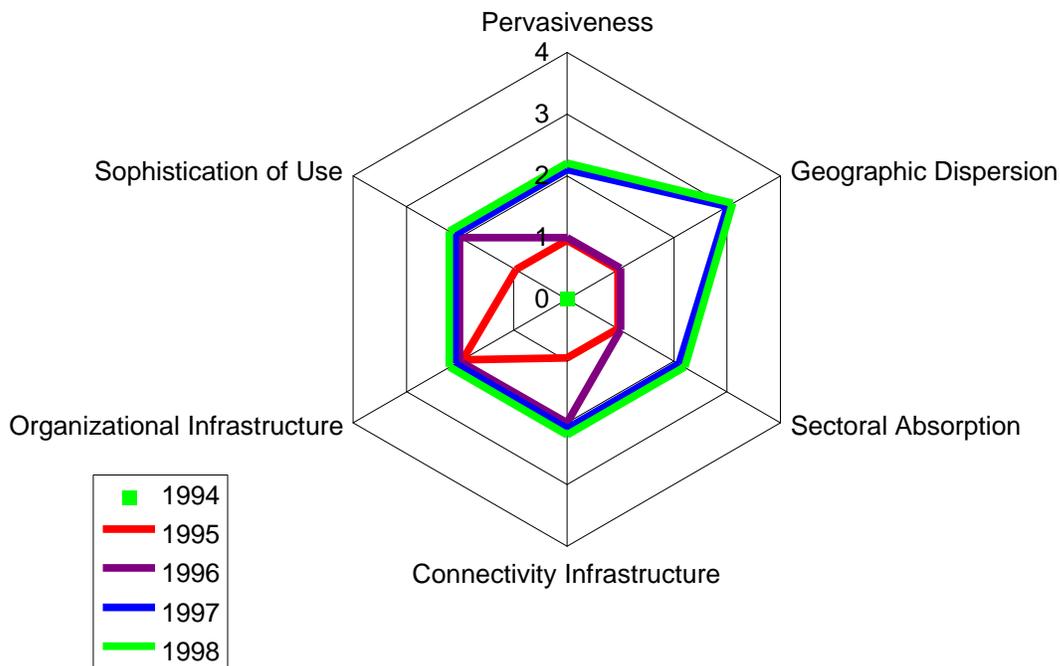


Figure 13. Internet Dimensions for China

Dimension	Level	Explanation
Pervasiveness	(2) <i>Established</i>	Having reached one user per thousand inhabitants, the user community has expanded from networking technicians to students, government (including the military), large business, and the broader public.
Geographic Dispersion	(3) <i>Highly Dispersed</i>	This dimension has not changed from March 1998. Internet access is available in all first-tier administrative sub-divisions.
Sectoral Absorption	(2) <i>Moderate</i>	This dimension has not changed from March 1998. The Internet is in moderate use in the academic sector and is rare in the other sectors.
Connectivity Infrastructure	(2)	This dimension has not changed from March 1998. China, by increasing ChinaNET's backbone capacity and international links, is still approaching Level 3. There are limits on availability of service greater than E-1.
Organizational Infrastructure	(2) <i>Controlled</i>	This dimension has not changed from March 1998. There is healthy competition among ISPs in major cities, but only four networks can interconnect with the Internet and only through an MPT gateway. Now both commercial IP backbones are under one Ministry.
Sophistication of Use	(2) <i>Conventional</i>	This dimension has not changed. The Internet is used to enhance current processes, such as messaging, without fundamentally changing those processes.

Table 45. Internet Dimensions for China

Electronic Commerce

Electronic Commerce is moving relatively slowly when compared to the rate of Internet diffusion. There are Chinese currently purchasing products internationally over the Web. MasterCard estimates that there are 10,000 people in China with international credit cards.²⁴⁵ Assuming that only a small fraction of these cardholders use the Internet for purchases, one can deduce that the amount of electronic purchases must be rather low. China also has credit cards that are not convertible to US dollars. There have been a few pilot programs where these credit cards have been accepted for web transactions but to date the number of these pilots has been limited.

One of the first successful pilots has involved the online trading of stocks. There is hope that this application will blossom into a wide range of e-commerce services. There is a great deal of interest in electronic commerce, especially centered around Shanghai. During the spring of 1998 there was a major conference the potential of electronic commerce in China.

²⁴⁵ Mastercard's Beijing Office, personal communication (7 July 1998).

Another form of electronic commerce is electronic document interchange (EDI). This form of business computer to business computer transaction has not been popular thus far. Estimates are that only 100 Chinese organizations use EDI and only a portion of those are using it on a daily basis. It can be assumed that EDI is also being used more extensively in joint ventures and in multinational communities. One of the major barriers to further EDI deployment is the fact that many Chinese businesses are not fully automated. In particular, the order entry/inventory systems of most Chinese businesses are not fully computerized and still involve manual interventions. Although EDI has been very successful in Taiwan and Hong Kong, businesses there have not forced their mainland China suppliers, so far, into EDI relationships.

There are legal as well as cultural obstacles to electronic commerce. China has yet to develop legal/cultural standards for digital signatures nor has it developed a legal code for electronic transactions. More importantly, many Chinese express a reluctance to engage in electronic contracts and prefer to meet “face to face” with someone before they do a “deal.” There is fear that agreements entered into electronically cannot be relied upon. There are a number of solutions being explored to address some of these concerns, including the use of human representatives who can answer questions over the telephone before a contract is entered into.

The Internet is being used as a way of finding matches between buyers and sellers. One of the most important Web sites is the China Economic Information Network, which currently lists over 100,000 products.²⁴⁶ Buyers and sellers are listed, but transactions have to be negotiated and completed off-line.

China must take great strides before electronic transactions become commonplace. The biggest barrier is China’s desire to control its currency, particularly across international boundaries. It is questionable whether China can build a domestic electronic marketplace while excluding its citizens from participating in the global marketplace on the Web. Although some people would argue that an inability to participate in the global marketplace will encourage the Chinese to purchase products and services within their own country, it has yet to be seen how long it will take the domestic electronic marketplace to develop enough momentum by itself, existing barriers.

Provincial Government Web Sites

As the Chinese government decentralizes, individual provinces can be expected to try and carve out their own identity in the global marketplace. The Internet is a tool for doing this. There are currently three general categories of provincial Web sites:²⁴⁷

Web sites with ties to provincial and city arms of China Telecom. This group which makes up the bulk of provincial government web pages can be classified further into two groups: (1) sites provided in conjunction with China Economic Information Network (CEINet),²⁴⁸ and (2) those made

²⁴⁶ State Information Center, “CEI Serving You,” *China Economic Information Network* (Chinese), 27 August 1998, <<http://serve.cei.gov.cn>> (17 August 1998).

²⁴⁷ This section of the report is based on a study conducted by the MOSAIC Group in partnership with CyPRG. Under this study we evaluated all provincial government Web sites and rated them for transparency and interactivity. The CyPRG methodology can be accessed at CyPRG Coding Criteria, <<http://w3.arizona.edu/~cyprg/Coding.htm>> (14 July 1998).

²⁴⁸ State Information Center, “CEInet Country Sites,” *Central Economic Information Network* (Chinese), 28 August 1998, <<http://www.cei.gov.cn/col/ceinod.htm>> (30 August 1998).

available through ChinaInfo. CEINet is an effort of the State Information Center, which is part of the State Planning Commission. ChinaInfo is run by China Telecom. Both are part of a State Council-backed effort to create a state-interconnected network with a Chinese-language environment.²⁴⁹ Many of the ChinaInfo sites also double as headquarters for the city arms of China Telecom, and thus combine the roles of ISP and provincial information site. Chinainfo sites are developed by the city ISPs, but include provincial information. The CEI pages are the only pages devoted to the provinces. Most of both the CEINet and ChinaInfo pages are in Chinese only, although a few have both English and Chinese options. Chinese pages are always given precedence, i.e., the homepage is in Chinese, but an English option, usually not as comprehensive, is available.

Web pages hosted by the provincial government themselves. These pages are extremely rare. Of all sites, only the Sichuan and Guangdong provincial People's governments have sites using a .gov domain name.²⁵⁰ Sichuan, in fact, has two. The Guangdong sites contained only links to other major Guangdong sites. Of the municipalities, Tianjin has one (www.tianjin.gov.cn), whereas Shanghai and Beijing have no sites hosted under their domain names. In contrast, many provincial cities do in fact host their own Web servers.

Web pages written by other companies to promote the provinces. China-Window²⁵¹ and China-Pages²⁵² are two examples. China-Window is a cooperation between China-Window Inc. and GlobalNet Inc. It also has a relationship with the State Information Center. Hosted in both China and the United States, China-Window is designed to bypass the trans-Pacific bandwidth problem. ChinaPages is a "commercial undertaking of Hope Information Service Co. Ltd."²⁵³ These are companies set up to promote provincial and city economies on the Web.

Difference between the provinces

Regardless of the economic and technological condition of the province, all provinces have a page provided to them by CEI; some provinces also have pages by Chinainfo. Therefore, no province is left without Internet presence. There is one exception, however, and it is Tibet, which has neither a CEI nor a Chinainfo site. Tibet is represented on the China-Window Web site.

The number of provincial pages does differ between provinces (Table 46). These differences are somewhat divided along wealth and technology lines. The richer, more technologically-oriented provinces and municipalities of Guangdong, Fujian, Beijing, and Shanghai have the highest number

²⁴⁹ China Telecom, *China Information Network* (Chinese), 29 August 1998, <<http://www.cninfo.net>> (30 August 1998).

²⁵⁰ *Sichuan Province International Cooperation Net* (Chinese), 7 August 1998, <<http://www.sichuan-china.gov.cn>> (30 August 1998); China Sichuan Province Automatization Office, *Sichuan Government Net* (Chinese), 13 May 1998, <<http://www.sichuan.gov.cn>> (30 August 1998); Guangdong Government, *Guangdong Information Internet Exchange Net* (Chinese), 29 June 1998, <<http://www.gd.gov.cn>> (30 August 1998).

²⁵¹ China-Window Inc. and GlobalNet, *China-Window*, 4 August 1998, <<http://www.china-window.com>> (30 August 1998).

²⁵² Hope Information Services, "China Business Information Resources," *China Pages*, 6 August 1998, <<http://www.chinapages.com/travel.html>> (30 August 1998).

²⁵³ Hope Information Services, "About ChinaPages," *China Pages*, 26 June 1998, <<http://www.chinapages.com/about.html>> (30 August 1998).

of pages. The number of their pages, and scores for transparency and interactivity, are in general higher than the other provinces. Sichuan and Jiangsu, also relatively wealthy, have a high number of pages that scored well. The self-regulating zones of China, with the exception of the mineral-rich Xinjiang, fared poorly. Gansu, Inner Mongolia, Guizhou, Yunnan, and Guangxi had scores well below the other provinces. Low scores, however, were not limited to these special zones and high scores were not limited to wealthy provinces. Jiangxi, Anhui, and Shanxi have low scores, whereas Liaoning, Hebei, and Hainan have relatively high scores.

Province ²⁵⁴	# Sites	Transparency Points	Interactivity Points
Beijing	88	382.5	85.2
Shanghai	62	400.4	116.5
Fujian	52	352	99.8
Sichuan	47	243.5	57.6
Guangdong	41	302.7	77.3
Hebei	37	205.5	49.3
Jiangsu	37	269.9	86.3
Liaoning	34	235.5	70.2
Hunan	33	141	46.1
Hainan	24	156.5	40.3
Henan	23	114	23.1
Xinjiang	23	141.5	43
Shaanxi	18	108	23
Shandong	16	90	24
Hubei	15	136	29.9
Guizhou	14	43	34
Shanxi	14	64	13
Jilin	13	88	23.1
Zhejiang	13	60	22
Guangxi	11	90	23.1
Jiangxi	10	57	15.8
Yunnan	10	44.5	11
Anhui	9	62.5	23
Gansu	6	48.5	15.1
Inner Mongolia	6	26	4
Ningxia	5	23	10
Tibet	5	17	1

Although most sites do not provide insights into the government itself, the Sichuan Web site does provide the mission statement for the province.

Provincial Agencies on the Web

The Chinese provincial government sites are rarely divided along ministry/agency lines. Only Beijing, Sichuan, and Guangdong have a significant number of pages devoted to ministries or agen-

²⁵⁴ The Heilongjiang Province was not coded because of an excessive number of down sites.

cies. Of the three, the Sichuan and Beijing agencies provide no individual agency e-mail addresses, but do provide the mailing addresses. The Guangdong agencies are the best developed: each agency has an e-mail address and they are all listed. Figure 14 provides a breakdown of the types of information displayed on provincial Web pages.

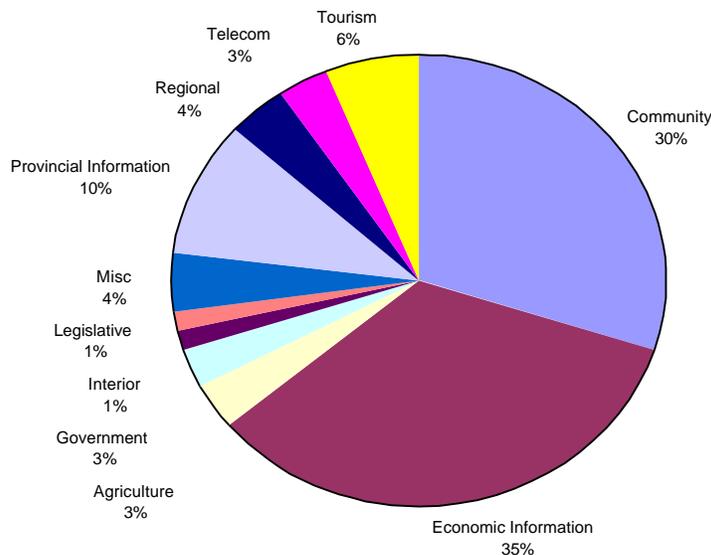


Figure 14. Chinese Provincial Pages by Category

Transparency and Interactivity of Pages

Table 47 provides a breakdown of the percentages of provincial pages that have some features associated with transparency and interactivity. It is important to note how few Web sites provide e-mail addresses for anyone other than the Webmaster. Links are fairly common and many of the pages provide information on government reports and laws.

Economic Information Pages

Regardless whether it is a CEI, Chinainfo, or China-Window site, all provincial sites contain a page related to economic information. Within this category are investment, trade, industry, finance, and, of course, general economic information pages. Of the economic information pages, 91 percent contained reports, research, laws, or regulations in easily readable formats.

What these percentages do not convey, however, is the presentation of the pages. Some of these pages contain screen after screen of rules and regulations. Incentives and tips for businesses to investment in the province are given, but none give more than the Webmaster's e-mail address or the mailing addresses for the contact personnel and provincial businesses. Many of their issue-related links to non-governmental pages were to businesses hosted on the same server, which contained no more than the addresses, descriptions, and goals of the companies.

As was mentioned, the numerous links given from the economic information pages are mostly within the site itself, so that the Fujian Commerce and Trade page will have links to numerous businesses, but the pages at the end of the links tell the investor little about company opera-

tions.²⁵⁵ Links to the few well-developed provincial company Web sites, usually with their own domain names, are often displayed prominently on the front page of the provincial site.

Table 47. Transparency and Interactivity of Chinese Provincial Pages

Criteria: [T]ransparency, [I]nteractivity ²⁵⁶	All Pages	Homepage (Frontpage)	Community Pages	Economic Information Pages
Contacts				
T2a (non-email address)	36%	54%	39%	39%
T2c (email of one other than webmaster)	6.3	15	9.3	7.2
I1b (official email address)	1.3	4.3	2.0	1.4
I2b (email to employees)	0	0	0	0
T2d (phonebook with address)	2.4	3.6	2.4	2.3
I2c (chatroom/listserve)	8.2	26	15	4
Issues/Organizational Information				
T3a (about/by/for head official)	15	16	14	16
T3f (organizational chart)	4.8	1.6	6.8	2.3
I3b (issue-related government links)	26	65	28	28
I3c (other government links)	9.8	41	17	6.3
I3d (issue-related non-govt. links)	30	75	33	32
T3g (reports, laws in easily readable format)	90	97	92	91
T4a (text of report, laws.)	44	58	45	58
I4c (downloadable text of report, laws)	3.4	6.5	7.8	2.7
I4e (online form submission)	5.1	7.2	7.8	5.0
Citizen Consequences/Responses				
T4b (consequences of laws/reports)	18	21	24	23
T4d (appeal process for decisions)	0.5	1.4	1.5	0

Exceptions

Pages concerning the stock market, e.g., Hubei's Stocks and Bonds page,²⁵⁷ stand out from the economic information pages. Aside from educational pages providing lessons and exercises for download, these finance pages are among the only pages with downloadable texts and regulations. A user can download an executable file and use it to track the stock market and specific stocks. There is also advice from specialists and "chat" rooms for investors.

Community Pages and BBS

The Chinainfo sites and some others provide information to the community. Many of these pages are highly decorated. Banners lie in every possible position and direction and there are multiple Java applets to load. Part of the community pages are Bulletin Board Systems (BBS). For example, in the Hainan Province Melon and Vegetable Information Net is a Melon and Vegetable Talk

²⁵⁵ China-Window, *Fujian Commerce and Trade*, 14 August 1998, <http://www.china-window.com/Fujian_w/trade.html> (30 August 1998).

²⁵⁶ CyPRG Coding Criteria, <<http://w3.arizona.edu/~cyprg/Coding.htm>> (14 July 1998). Included at Tab F.

²⁵⁷ Hubei Telecom Office, *Hubei Stocks and Bonds* (Chinese), 15 April 1998, <<http://www.ht.cninfo.net/zqjy/default.htm>> (30 August 1998).

BBS. Although the rules require all comments to be confined to agriculture, its consists of 30 messages, some serious and some ridiculous. Some were apparently from farmers asking for advice on crops. One allegedly from “Zhu Rongji” stated, “Thank you for the hard work comrades.” BBS and “chat” rooms in other provincial pages contain similar material and nothing that could be deemed even remotely threatening to the government.

The BBSs do seem to tolerate messages about the use of pirated software. Out of some 20 BBSs in one ChianInfo site, one was blatantly named “Hacker,” and another “Software.”²⁵⁸ Both contained messages full of registration numbers for software, including Dr. Solomon’s Antivirus Toolkit and Freehand 7.0. Messages were blatantly asking for registration numbers for NetTerm and other software.

Links with the West

The exchange of promotion and services with Western pages were nearly nil, with one known exception being the Tucows station from Shanghai Online.²⁵⁹ Links to Yahoo! or Infoseek by the CEI pages were abundant, as were links to foreign universities from the education pages and foreign businesses links from the investment or trade pages. Most links to Western pages were made without fanfare or promotion and apparently for the convenience of the users only.

In conclusion, there is no one Chinese province that stands out in its ability to make use of the Web to build relationships. The provincial organizations are not very transparent, nor are decision-makers available electronically. On the other hand, almost all of the provinces are using the Web to some extent to attract investors and to provide information on laws and regulations.

Government Decision-Making

The Ministry of Information Industries

In March 1998, the National People’s Congress (NPC) made a decision to create a new Ministry of Information Industries (MII) by merging the MPT, MEI, and parts of MBMT, China Aerospace Industry Corporation (satellite communications), and China Aviation Industry Corporation (air traffic control system).

Wu Jichuan, former Minister of MPT, was appointed as head of the new Ministry and five vice-Ministers were chosen from MPT (2) and MEI (3) (Table 48).

However, when one of the new vice-Ministers, former MEI’s Liu Jianfeng left MII. Many observers believe this indicates that the former MPT faction has gained the upper hand. This view is reinforced by the fact that MII includes roughly 230 staff from MPT and only 80 officials from MEI.²⁶⁰

According to its July 1998 mission statement, the State Council has given MII broad responsibility for planning and overseeing the development of China’s electronics, telecommunications, and electronic information industries (Table 49). It is responsible for setting up laws and regulations for each sector and for coordinating the informatization of the country. With respect to the Inter-

²⁵⁸ Hebei Telecom Office, “Welcome to WHOLBBS,” *Chinainfo* (Chinese and English), 29 August 1998, <<http://bbs.hb.cninfo.net/cgi-bin/bbsall?>> (30 August 1998).

²⁵⁹ Shanghai Online, *Shanghai-Online*, 25 July 1998, <<http://www.infoworld.sh.cn>> (25 July 1998).

²⁶⁰ “PRC Government Restructuring Continues,” *China Business Review* (1 September 1998).

net, MII is given specific control over domain names and IP addresses. More importantly, MII is specifically given responsibility for planning construction and administration of private networks for the Communist party and other government ministries. According to the State Council, the National Bureau of Post Services is under the auspices of the MII. It is also in charge of the over-all planning of private networks.

Minister Wu Jichuan	Former MPT Minister
Vice Minister Liu Jianfeng	Former MEI Vice-Minister
Vice Minister Yang Xianzhu	Former MPT Vice-Minister
Vice Minister Lu Xinkui	Former MEI Vice-Minister
Vice-Minister Qu WeiZi	Former MEI Vice-Minister
Vice-Minister Zhou Deqiang	Former MPT Vice-Minister
Director of Post Bureau Yang Xianzhu	Former MPT Vice-Minister

Prior to the formation of MII, the MPT and MEI competed for control of the Internet. Because no single ministry could claim the Internet as its own, a Steering Committee on National Information Infrastructure was created to coordinate decision-making regarding the Internet. The Steering Committee has since been abolished and its functions absorbed by MII. The MII will have to consult with other stakeholders, but the situation is very different than in 1997, when there was no one decision-making ministry (Figure 15).

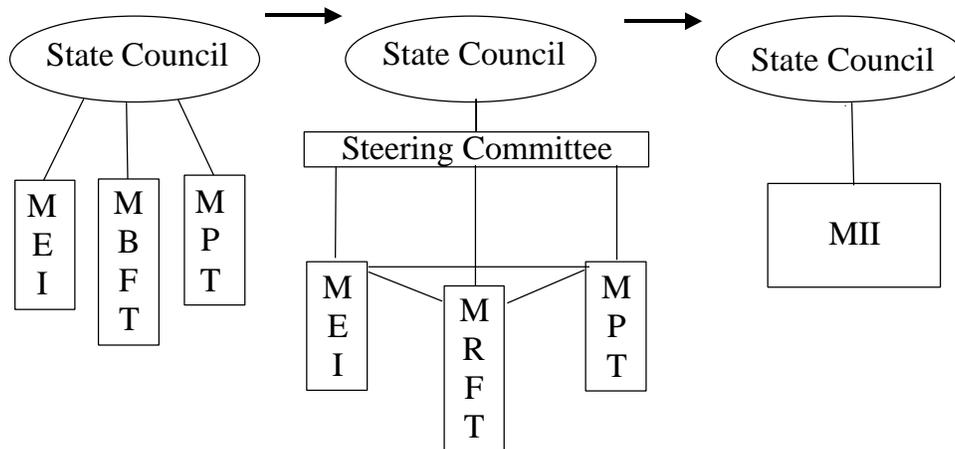


Figure 15. Evolution of Internet-Related Decision-Making

Many government bodies will still have a role in the decision making process (Table 50). The Science and Technology Commission, which has responsibility for research and development, was elevated to ministerial rank. In the telecommunication sector, the new Ministry of Science and Technology (MST) will have some responsibilities that overlap with MII, especially when it comes to promoting informatization.

Table 49. The MII's Mission²⁶¹

1. Research and formulate the development strategy, policy, and overall planning of China's Information industry; revitalize the manufacturing industry of electronic information products, the telecommunications industry, and the software industry; promote the informatization and China's economy and social services.
2. Formulate laws, regulations, and directives regarding the manufacturing industry of electronic information products, the telecommunications industry, and the software industry; responsible for the administrative implementation and monitoring of those laws, regulations, and directives.
3. In charge of the overall planning of all networks including China's public telecommunications networks (local and long-distance networks), radio and TV broadcasting networks (cable and wireless), military networks, and all private networks owned by others; responsible for overall sector administration.
4. Coordinate and publish technology policies, technology architectures, and technology standards for the electronic information products industry, the telecommunications industry, and the software industry; publish technology architectures and standards for the radio and TV transmission networks; responsible for the approval of telecommunications networking equipment and terminals; provide guidance on quality monitoring and administration for electronic information products.
5. Responsible for the allocation and administration of China's public telecommunications resources, including frequency spectrum, satellite slots, network IDs, domain names, and IP addresses; in charge of the construction approval, tracking, and monitoring of all the radio stations, including coordinating radio administration, signal interference, and signal control.
6. Monitor and administrate, based on laws, the telecommunications and information service market; implement the necessary operation licensing system; monitor service quality; insure open competition and universal services; safeguard national interests and consumer interests; formulate the interconnection rules and settlement methods among various networks and monitor the implementation.
7. Formulate policies on rates of telecommunications and information services; determine pricing standards on basic posts and telecommunications services; monitor the implementation.
8. Responsible for the planning, construction, and administration of private networks for Communist Party and governments; manage and administrate national telecom network monitoring and controlling center and international gateways; coordinate the operation of special telecom services for Communist Party and governments, disaster emergency telecommunications services and other important telecommunications services; protect the national telecommunications security and information safety.
9. According to the industry policy and technology development policy, guide and nurture the development of information industry; guide the adjustment of the structure of industry, products, and corporations; guide the re-organization of state-owned enterprises and the formulation of holding groups; reasonably allocate resources and prevent duplication of projects.
10. Advance the R&D of the manufacturing industry of electronic information products, the telecommunications industry, and the software industry; coordinate and implement the major R&D projects and the digestion, absorption, and improvement of imported technologies; promote the commercialization of R&D outcomes; nurture and promote indigenous industry.
11. In charge of the military electronic industry; formulate development strategy, policy, and planning for the military electronic industry; cooperate in planning with the military and the Commission for Defense Science, Technology and Industry; implement the plan.
12. Formulate development planning for the informatization and national economy; promote China's key informatization projects; guide, coordinate, and organize the development and applications of information resources; guide the broad adoption of electronic information technology and promote the education of informatization.
13. Organize and guide the financial submission, internal redistribution, and settlement of major post and telecommunications enterprises; coordinate the operation between post and telecommunications services; implement the subsidization of universal services on post and telecommunications sectors; implement the human resource authority on its staff in MII and top managers in affiliated organizations.
14. Represent China in international organizations and sign bilateral agreements; coordinate economic and technical cooperation and exchanges with foreign countries; handle all the relevant foreign affairs.
15. Study telecommunications and information policies regarding the Special Administrative Region of Hong Kong, and Macao, and Taiwan; handle relevant issues.
16. Publish the statistics and other information regarding information industry.

²⁶¹ MII, *MI Mission* (Chinese), August 1998, <<http://www.mii.gov.cn>> (22 October 1998).

17. Responsible for other authorities assigned by the State Council.

Table 50. Key Policy Bodies (changes since March 1998 are in red)

Name	Historical Mission	Interest in Internet
Ministry of Information Industries	(New ministry)	Information Technology Decision-Maker and Regulator
Ministry of Public Security (MPS)	Police of Chinese society	Ensure Internet is not used to leak state secrets, conduct political subversion, or spread pornography or violence
Ministry of Education	Policy-maker and administrator for China's education system	Internet support for university and secondary education
The Chinese Academy of Sciences (CAS)	Scientific research policy-maker and host of hundreds of research institutes	Technology transfer; Internet-oriented research and development
Chinese Academy of Social Sciences (CASS)	Provide government decision makers with information and analysis.	Research regarding social impact of Internet; Electronic Commerce
Xinhua News Agency	Monopoly news producer	Leverage and protect monopoly on news
Propaganda Department Of Communist Party	Makes sure that mass media is under the guidance of the Party	Especially concerned with the influence of Western information
State Planning Commission (SPC)	Controls China's economic resources	Funds for infrastructure; pricing of Internet services. Some of this responsibility is being shifted to MII.
State Council	Highest organ of State executive and administrative power	Ensure that Internet and the Ministries that are involved with it are serving the interest of the State.
State Economic and Trade Commission (SETC)	Policy decisions regarding infrastructure and relationships with foreign firms	Foreign investment in China's Internet Infrastructure
Ministry of Science and Technology (MST)	Policy-making and financing of China's research and development	R&D for Internet
People's Bank of China	Loans to Chinese firms	Control of electronic currency and certificate authority
People's Liberation Army	State Security; also has ties to many manufacturing interests	Security issues; expanding into Internet?
Provincial and Municipal Bodies	Moving away from Central government in pursuit of their own economic development	Develop Internet infrastructure. Attract investment through Internet

The MII is partially bound to the decisions of the Steering Committee as to which Ministries should run the limited number of INs. The Ministry of Education and CAS will continue to operate their INs because educational and research networks are both a national priority and can be

separated from the commercial marketplace. At least for the time being, MII will allow both ChinaGBN and ChinaNET to continue operating as the sole commercial INs.

CNNIC

Control of the .cn Top-Level Domain has been an issue since 1995. The MPT, MEI, and CAS all stated they had a claim to the .cn domain name, although the CAS's China Network Information Center (CNNIC) actually held authority from the Internet Assigned Number Authority. The Steering Committee took control of the issue and created a special Working Committee for the CNNIC. CNNIC is housed at CAS and, in addition to its domain name responsibilities, also offers IP number allocation. However, it is not the only source for IP numbers as ISPs can get their IP addresses from ChinaNET or directly from APNIC itself, as is the case with CERNET. CNNIC also gathers the best statistics on the Internet in China and provides network security services to other organizations. The relationship between CNNIC and MII is still in the process of being worked out, though MII according to its mission statement has the authority to set policy directions for CNNIC.

China Telecom and the question of the National Backbone?

There is a great deal of discussion within China over whether multiple government organizations should be allowed to invest in building national physical layer data backbones to compete with China Telecom. Many believe that the government can not afford to invest in redundant architecture on a national scale. Competition should be encouraged at the periphery of the network, but long distance data traffic should utilize China Telecom's network such as its new Frame Relay service.

Supporters of competition point to the example of ChinaGBN, which was affiliated with the old MEI. ChinaGBN uses VSAT for its national backbone but was still required to buy its international circuits through China Telecom. ChinaGBN has carved out a niche serving government companies, but also is an option for Internet Service Providers. Although it is difficult to assess the impact of ChinaGBN on China Telecom's ChinaNET service, most observers believe that competition and the threat of it has had its impact on China Telecom's investment, deployment, and service decisions. China Telecom might not have rolled out service as quickly and effectively if there was not the threat that ChinaGBN would lock in new customers.

As things presently stand, ChinaGBN will continue to operate its national network. However, because both ChinaGBN and China Telecom are now under the same ministry, MII has decided that ChinaGBN will have to start purchasing some backbone connectivity from China Telecom. Needless to say, the engineers at ChinaGBN are uncomfortable with China Telecom's role as both a competitor and a supplier and are distrustful of becoming more dependent on China Telecom.

Although there is some discussion as to whether ChinaGBN and ChinaNET should ultimately be merged, it is clear that they will not be merged into MII. ChinaGBN is already an independent corporation under the old MEI and even China Telecom is being separated from MII. Some decision-makers in China believe that the introduction of competition and the break-up of the MPT monopoly are among the major achievements of the past few years.

Others argue that the government can not afford to waste resources on multiple national backbones. What is likely is that ChinaGBN will be left as a separate corporate entity, while buying

more and more of its high bandwidth capacity from China Telecom. ChinaGBN currently is limited to E-1 capacity on its VSAT circuits. As it moves to provide higher bandwidth services and China Telecom upgrades its network, ChinaGBN will buy more of its high-bandwidth capacity from China Telecom. It is less likely that ChinaGBN will be able to operate its own fiber network or to purchase dark fiber from China Telecom in order to build its own high-bandwidth service. The education network, CERNET, and the research network, CSTNet, will also probably remain dependent on China Telecom for data services, although each is operating a national IP backbone.

Another threat to China Telecom's monopoly of high bandwidth data services is from Unicom, the corporation sponsored by the former MEI, that has been competing against China Telecom in the provision of cellular service and just recently in the provision of wireline services. Unicom has the potential for building a national backbone network, but it is questionable whether it has the funding and the political clout. With the absorption of MEI into MII, Unicom is losing its advocate. Some argue that the MII policy of "separating enterprises from government administrations" will put Unicom on equal footing with MPT. "China Telecom and China Unicom, the two telecom enterprises, will compete with each other according to new market regulations and rules of the game."²⁶²

Unicom has received a total of US\$1.5 billion in funding from international sources through the "Chinese-Chinese-Foreign" (CCF) mechanism where a foreign company invests in a joint venture with a Chinese company and then the joint venture invests in Unicom. MII raised questions about whether these arrangements violated the prohibitions on foreign ownership and operation of telecommunication facilities. The State Council is considering the matter and new terms for CCF have been proposed. These terms include a grandfather clause for existing operations, a ban on additional CCF after 2000, and a requirement that joint venture partners may be required to dilute the foreign equity position to 25 percent. With the cutoff of its foreign capital supply, China Unicom will be hard pressed to find the financing necessary to build its own high speed national backbone. It is possible that elements of the PRC government would choose to invest in a Unicom backbone, but many argue that the government can only afford to invest in one national backbone and that Unicom should remain confined to competing on the periphery of the network.

The bureau responsible for cable (CATV) networks also has the potential to build a national backbone connecting potentially all cable subscribers to the Internet. Current plans call for constructing a national fiber-optic backbone. Although this backbone with the right engineering could rival China Telecom's, there is also the potential, however, that the cable operator in each city will be merged with the local China Telecom.

An even bigger uncertainty is the existence and expansion of private networks that individual ministries are building to support their data communication needs. Most of these networks are utilizing China Telecom's Frame Relay or DDN services. However, the possibility exists that a ministry with its own fiber might choose to build its own backbone data service. It is open to question as to whether this ministry would be allowed to offer services to other organizations. The PLA has often been cited as an organization with the potential and the desire to attempt to build a national network. The recent decision to have the PLA divest its commercial holdings will most likely put a brake on its networking ambitions.

²⁶² "Minister Wu Jichuan's New Initiative...", *Telecom World* (May 1998), p. 4.

China Telecom is an amalgam of organizations. In addition to the central government component there is a provincial government component, the Posts and Telecommunications Administrations (PTA). There is also a city government component, the Posts and Telecommunications Bureaus (PTB). The leaders in MII make it clear that restructuring or divestiture of China Telecom is a high priority. There is strong speculation that China Telecom, which is already rapidly decentralizing, may be divided into its provincial components with a separate “shell” company running the national trunk.

Even if the provincial administrations and municipal bureaus do become more autonomous, it is questionable that they would sell excess capacity such as “dark fiber” if it would potentially undermine China Telecom’s service. Each provincial China Telecom will have a stake in maintaining the national backbone. The national backbone should be seen as a cooperative enterprise involving central, provincial, and city telecommunications components. By making it difficult for other organizations to get “dark fiber” and run their own national backbones, the new decentralized China Telecom maintains its position. More importantly, because MII regulates the ability of organizations to offer a national backbone, China Telecom, no matter how it is structured, can be expected to be in a dominant position for the foreseeable future.

China Telecom has invested heavily at both the provincial and national levels in a Frame Relay technology which has a limit of 2 Mbs. The organizational structure that operates China’s Internet will in part determine the evolution of China’s high-bandwidth service. The choice of protocols is tricky. In the United States, various competitors are investing in a wide variety of solutions, including Asynchronous Transfer Mode (ATM), Synchronous Digital Hierarchy (SDH), and Wave Division Multiplexing (WDM). One of the real questions is whether to build an ultra high performance IP network that it is hoped will evolve to support Quality of Service (QoS) and Multimedia or to put in an ATM network that can deliver on QoS and services such as video conferencing today. Given the fact that IP traffic makes up over 70 percent of all data traffic in China, some question whether it is appropriate to add the additional overhead and costs associated with architectures such as ATM instead of just running IP over SDH. There were in fact two seminars in the spring of 1998 in China on the alternative of running IP over SDH. However, there are doubts whether an IP over either SDH or WDM strategy meets China’s needs for reliability and configurability. China has in fact developed its own technology for IP over fiber and is attempting to make this technology an International Telecommunications Union standard.²⁶³

China Telecom has announced that plans to build a national multimedia backbone based on ATM and to continue to offer its ChinaNET IP service. It is assumed, but hasn’t been confirmed, that the IP service will utilize the same ATM switched fabric as the multimedia backbone. Individual provinces are also investing in WDM and Dense WDM (DWDM) fiber optic equipment along with ATM switches. Fujian province, for example, has signed a contract with Lucent Technologies for Lucent Wave Star optical communication network which will utilize DWDM to support Internet, video conferencing, and telephone service.²⁶⁴

Internet Management Policies

²⁶³ Xinhua News Agency, “China boosts role as “standard setter” in Telecom,” *BBC Asia Pacific Economic* (14 September 1998).

²⁶⁴ “Lucent to Supply Fujian with Wave Star,” *AsiaInfo* (16 October 1998).

Content Control Policy The Chinese government has begun to enforce its December 1997 regulations that forbid the use of the Internet to “harm national security, disclose state secrets, harm the interests of the State, of society or of a group, the legal rights of citizens, or to take part in criminal activities.”²⁶⁵ During the Summer of 1998, the MPS arrested Lin Hai for providing 30,000 Chinese e-mail addresses to *Dacankao*, an U.S.-based Internet democracy magazine.²⁶⁶ Supposedly the e-mail addresses were collected for advertising purposes, but were passed on to the magazine when they did not generate as much interest as expected. Though the prosecutor has rejected the case for lack of evidence the MPS has continued to hold Lin Hai.²⁶⁷

The MPS also arrested the publishers of *Tunnel*, a weekly on-line magazine written in China that featured dissident writings.²⁶⁸ The publishers, based in Jiangxi province, had attempted to hide their tracks by sending the newsletter to a server in California where it was electronically distributed back into China. They had electronically published more than 20 editions of the magazine before they were caught.²⁶⁹

In May 1998, four Taiwanese businessmen were arrested for spying. The PRC said they had collected intelligence on the mainland via the Internet and other channels.²⁷⁰

A special computer bureau of the MPS has been set up to enforce the regulations, and 150 computer engineers were hired in Shanghai alone. Ultimately a situation has been set up where the interconnecting networks authorize and have responsibility for the networks and businesses that connect to them. Webmasters are required to get permission before they offer a new service or business on the Internet. In addition, Internet service providers are responsible for their customers and are required to make back-up tapes of all SMTP (e-mail) traffic that passes through their network. The ISP is required by the regulation to act as an agent of the MPS and must provide the MPS with any information that the MPS requests including the back-up tapes. Needless to say, these back-up tapes can become a management headache in their own right and some ISPs are known not to be maintaining them.

It is rumored that the MPS has made arrests only rarely because of information found through monitoring e-mail. Rather, the MPS has often discovered illegal activities through other sources, and made public claims that they located the guilty party through e-mail. It is also important to note that people who choose to use Web-based mail services hosted outside of China, such as Hotmail and Yahoo, circumvent the SMTP mail capture procedures and make it difficult for the MPS to access to their e-mail accounts. So far, there have been no regulations against the use of Hotmail or Yahoo and many, particularly students, are using these services.

²⁶⁵ U.S. Embassy, Beijing, “New Regulations Codify PRC Internet Practice,” 6 February 1998 <<http://www.redfish.com/USEmbassy-China/sandt/netreg.htm>>. The Chinese full text is available at <<http://www.edu.cn/law/glb.html>>.

²⁶⁶ “China To Try Computer Engineer,” *AP Online* (29 July 1998).

²⁶⁷ “China prosecutor rejects e-mail subversion case,” *Reuters* (2 September 1998).

²⁶⁸ According to U.S. based Chinese Democratic Party as quoted by Chan Yee Hon, “Subversion charge laid over e-mail address,” *South China Morning Post* (30 July 1998).

²⁶⁹ According to *U.S. News and World Report*, the authors of *Tunnel* have been in hiding since June. “Chinese ‘hacktivists’ spin a Web of trouble,” *U.S. News and World Report* (28 September 1998). *Tunnel* continued to be published through September 1998.

²⁷⁰ Daniel Kwan, “Journalist traced to jail, say activists,” *South China Morning Post* (9 June 1998).

China continues to block certain foreign Web sites, including those belonging to the *Washington Post* and *The New York Times*. The sites that are blocked do change over time and there are no explicit regulations on what sites should or should not be blocked. The decision to block is a collective decision of the MPS, MII, and the Propaganda Department. Since the blocking takes place on the router of the IN, reports that different networks are blocking different sites are plausible. There are some unconfirmed reports that the networks are also filtering for key words.²⁷¹ Since neither ChinaNET nor ChinaGBN is currently using proxy servers, such reports should be questioned.²⁷²

Dissidents in China and the Internet It has been reported that Ren Wanding, a Beijing dissident, uses the Internet to keep track of news both within and outside of China.²⁷³ Ren Wanding can supposedly use the Internet even though there is usually a police guard outside his front door and he is prevented from receiving guests. One of his sources is the underground publication *Xiaocankao*—meaning “mini-reference”—which runs excerpts of news stories from the Hong Kong and Taiwan press.

On the other hand, there have been reports of the MPS harassing dissidents who utilize the Internet.²⁷⁴

Encryption Policy The 30 December 1997 MPS regulations do not mention the use of encryption over the Internet, but there are rumors that such regulations are now under consideration. The Chinese community has up to this point operated in a gray area with regard to encryption. Encryption is being used for implementations of EDI and some individuals are using PGP (Pretty Good Privacy) software.

There are confidential regulations that the government be given the design documents for all encryption technologies that are to be imported into China. Because China has committed to making its import laws as transparent as possible, some observers believe that these classified regulations will become public.

Internet Telephony Policy There has been no official regulation of Internet telephony yet. MII, as the telecommunications regulator, would be expected to be the key decision-maker. However, no regulation is expected before MII's internal structure is finalized and staff are assigned. In practice, the MII treats Internet telephony as an illegal service. However, the difficulty of differentiating types of IP traffic makes it almost impossible for MII to control the situation. Sparkice, an affiliate of Unicom, was offering international Internet telephony in its Internet cafés using the argument that its parent company has been authorized to offer basic telecommunication services. Under official pressure, Sparkice has since discontinued this service.

Universal Service Policy It was the responsibility of China Telecom to provide Internet access to the provincial capitals. It is now the responsibility of the PTAs and PTBs to roll service out through the provinces. Generally, service is first going to second-tier cities and then to third-tier

²⁷¹ Carol Giacomo, “China, U.S. open cyberspace channel for doctors” *Reuters* (26 June 1998). The authors could find no evidence of filtering when they used a PC at the Sparkice Café, which is connected to ChinaGBN, retrieving documents with the words “dissident,” “Tibet,” and “Taiwan” with no problems.

²⁷² The network at the Chinese Academy of Social Sciences does use a proxy server.

²⁷³ “Internet connections away from prying eyes of police” *South China Morning Post* (4 June 1998)

²⁷⁴ “Subversion charge laid...,” *op. cit.*

cities, and is following the telephone system deployment model. There is some revenue sharing between the provinces that helps drive network expansion in some of the poorer provinces.

There does not seem to be a national commitment to putting an Internet node in every village, although there is talk of putting a phone in every village. The Internet is seen as a tool by which the educated elite can pull along the rest of the country, but not something of much use to peasants.

Knowledge Economy and Sustainable Development

There is a growing awareness in different sectors of the government of the connections between sustainable development and a knowledge economy. China's decentralizing of decision making is resulting in enormous growth, but such rapid growth has its costs. To be sustainable, decision making needs better information and needs to take into account market externalities.

The knowledge economy is envisioned as a way to create value with minimal environmental cost. At the same time it can provide the information needed for sound decision making on the part of government officials, producers, and consumers.

There is not unanimous agreement on the role that government workers should play in a future knowledge economy or what a knowledge economy with a socialist face looks like. So far, it seems the Chinese have not developed a consensus framework for establishing a knowledge economy. It is possible that they may now do so in the context of MII. It is also possible that because of the struggles over the formation of MII, that no vision will be hammered out.

Determinants of Internet Capabilities

Role of Foreign Companies

China has a long-standing prohibition against foreign ownership and operation of telecommunication services. This ban was primarily driven by the former MPT in its attempt to protect its own operations from foreign competition. But there are also a range of broader concerns that have prevented the opening up of the telecommunications market even in the face of widespread pressure under the negotiations regarding entry of China into the World Trade Organization. The fear of foreign ownership can be traced back to the legacy of the opium wars and the efforts of Western powers to economically dominate and control China. Although China has been willing to allow foreign corporations into many sectors of the society, it has drawn a strong line against the operations of telecommunications services by foreigners.

This concern about foreigners also has national security dimensions. The Chinese government is concerned that its control over the nation's communications infrastructure could be weakened if it was owned and operated, even in part, by foreign companies. This policy that was developed for the telecommunication field has not changed in recent years. While excluding foreign companies from telecommunication services, it opens the entire manufacturing sector to foreigners irrespective of the corporate form—joint venture or wholly-owned. However, foreigners are encouraged to engage in the high technology side of manufacturing and are discouraged or even restricted from entering manufacturing operations that the Chinese have already established. The rationale is that the Chinese want to encourage investment in complex technologies while discouraging competition in technologies that they have already mastered.

Although the service side of telecommunications is officially closed to foreigners, there are several back doors available to them. The most common of these is the CCF (Zhong-Wai) model which involves a foreign corporation teaming with a Chinese partner to form a joint venture. The joint venture then signs a contract with a Chinese service provider. As noted earlier most of the Chinese Unicom projects are financed and implemented through this model. Now that this method is no longer authorized, it will be much more difficult for foreign corporations to invest in Chinese telecommunications.

China is under immense pressure, both from other nations and from unmet consumer demands, to open its services sector. There have been a number of vague statements by government agencies that China intends to open its value-added services operations to foreigners in the near future. However, no policy has been published yet. Nor has China clarified the complex question as to whether the Internet qualifies as a value-added service or as a basic telecommunication service. This question has bedeviled regulators in the United States and will most certainly surface if foreigners are allowed to provide value-added services. It can be assumed that foreigners will neither be allowed to run the physical Internet backbone nor will they be able to run INs.

Even today, there are a number of foreigners who are offering Web services in China. Certain organizations, such as the American-owned Red Fish Group, are actually hosting their Web services in Florida. *Shanghai-Ed* is a Web-based magazine that is developed in Shanghai and published on a Web server in New Jersey. *Shanghai-Ed* is operated by a partnership between its English editor and a Chinese colleague. To date this magazine has operated in a gray area regarding regulations and does not have an official license. Many of the owners of these Web businesses enjoy operating in the gray zone that characterizes business in China.

Madeforchina.com is a new Internet magazine targeting the global marketing community that is interested in selling in China. It is run by an expatriate, but is owned by his Chinese mother-in-law. *Madeforchina.com* operates a Web site in China. It clears new services with China Telecom before introducing them to the public. In fact, it has been told that, for the present time, it cannot expand into the dating or bulletin board services. This is despite the fact that China Telecom is offering pilots of such services in other parts of the country.

One of the most innovative ISPs in Beijing is Unicom Sparkice, founded by 35 year old Edward Q. Zeng, a Canadian-educated Chinese. Zeng has extensive connections in the Chinese government and has affiliated his company, Unicom Sparkice, with the alternate government telecommunications services provider, Unicom. Unicom Sparkice has merged with another ISP to form USI which is the largest ISP after ChinaNET. Observers note that Zeng has successfully capitalized on his Canadian and Chinese connections.

The United States's IBM corporation has worked extensively to build relationships with the Chinese government. Charles Wu, the general manager of IBM in Shanghai, has a very clear understanding of the Chinese situation. IBM has been able to receive a license to provide IP connectivity to foreign corporations and joint ventures. Although this license states that IBM cannot offer Internet service, it can be assumed that companies can utilize this service to access Internet gateways in their own companies. Mr. Wu believes that IBM received such a license only because it has a history of being a respectful partner with the government. IBM had excellent ties with the former MEI and is building new ones with MII. He takes great pride in the fact that IBM also has been active in introducing Internet technologies for reinventing government. They have a special

center in Shanghai where government officials can see how the Internet can be used to improve productivity.

The most important foreign corporation responsible for the design and implementation of ChinaNET is a US firm founded by Chinese-born Edward Tian, PhD. He originally came to the United States to pursue a PhD in agriculture. In the process, he developed a computer referral business, AsiaInfo, linking Chinese and American businesses. He later subcontracted with Sprint to facilitate much of the early implementation of ChinaNET. AsiaInfo now employs over 400 Chinese in Beijing and is heavily involved in system integration and is developing, among other things, applications for ISPs. Foreign investors have invested over \$18 Million in AsiaInfo and see it as a wise example of how to participate in the informatization of China.

Dr. Tian believes very strongly that the Internet is a crucial tool for moving China to a knowledge-based economy. He has a deep concern for the quality of the environment and the potentially disastrous changes driven by the effect of technology. As an author, he has written a number of articles on the importance of bringing China into the information age. He is highly respected and one of the younger leaders who have risen to positions of leadership in China's Internet.

Cisco and the PRC

Though the four INs and many of the intranets within China have been using Cisco equipment, this year the Cisco-PRC relationship has moved to a new level. CERNET has made a commitment to utilize Cisco equipment for its next generation architecture. Cisco has in turn committed to building a router manufacturing plant in China and investing \$100 million in the plant and other activities in the PRC. In addition, Cisco won a US\$11 million contract to supply countrywide backbones for ChinaNET and the China Multimedia Service Network. Under the deal, Cisco will supply equipment for the backbone, including six Cisco 12000 series Gigabit Switch Routers and nearly 100 Cisco 75000 series routers.²⁷⁵ As noted earlier, Cisco has also signed an agreement to develop the new Beijing Internet Exchange.

Now that the PRC is one of Cisco's largest customers, the two are negotiating over how and whether Cisco should modify its equipment to meet China's data monitoring and control requirements.

National Commitment to Education and Research

Despite the fact that students played a critical role in the 1986 demonstrations, the government has decided to give today's students access to this powerful communication medium. The government has made a significant investment in providing its universities and research institutions with access to the Internet. This has been done because Internet access is critical for the academic and research communities to keep up with their colleagues around the world. Students have been quick to grasp the possibilities of the Internet and use has skyrocketed. Although CERNET provides connectivity to the universities, many students have their own private accounts with ISPs. The Internet has spread from students to their friends and families.

²⁷⁵ "Cisco Wins Two Chinese IP Backbone Contracts," *Newsbytes* (14 October 1998).

CERNET has developed and implemented a system that bills students on the basis of the amount of international traffic they generate. It is important to note that such a system can also be utilized to monitor what students are doing with the Internet.

National Security

There are a number of areas where the Chinese government may be concerned about threats to national security from the Internet. National infrastructure could be placed at risk by hackers or even hostile governments. Another vulnerability is that the Internet could serve as an incubator for dissent and could result in political forces that might topple the government or splinter the country. The third is the possibility that applications could be developed on the Internet that weaken the PRC's control of its currency.

It is important to note that encryption has an impact on all three vulnerabilities. Robust encryption is a requirement for protecting national infrastructure, but it can be used to protect those who want to avoid government scrutiny. Finally, encryption is an essential component of any digital currency and can potentially be utilized to circumvent Chinese currency controls. The encryption policy that is currently under development will signal what national security concerns most trouble the PRC government and how they will choose between options, when it is released.

There are also national security implications in the choices that the PRC makes with regard to the national backbone. Some might see a national security risk in using foreign satellites to provide backbone capability, as is the case with ChinaGBN's use of PanAmSat. Fiber optic lines are inherently less susceptible to monitoring and disruption by foreign countries. It is unclear why ChinaGBN chose PanAmSat over domestic satellite service, although the reasons have most likely to do with quality of service and economics. It is also unknown whether national security concerns are partially behind MII's decision that ChinaGBN should begin to use China Telecom's terrestrial data services.

National security concerns are also involved in discussions over whether China Telecom should operate one physical national backbone or whether there should be competitive service providers. Although the rationale most often given for a single backbone is that the government cannot afford to invest in multiple backbones, there are also issues of control. One avenue of PRC control of the Internet is through access to the backbone by organizations and individuals. China Telecom, by being the one gatekeeper, provides both accesses for customers and protection for the government. The PRC is distrustful of having its core telecommunications controlled by foreigners, because it is not clear that they will play a similar role. By keeping China Telecom in a dominant position, the State is assured that it can control and monitor access.

There is a lot of discussion within China about the potential vulnerabilities of using foreign equipment in their telecommunication infrastructure. So far there has been only talk and no explicit policy or regulation has been released. There is concern that there may be back doors into equipment that foreign governments, particularly the American government, know about and could potentially exploit to monitor and even disable China's telecommunication infrastructure. The story is often told in China of certain foreign computer equipment stopping in Iraq at the time of the initial bombings. Despite these national security concerns, China's network operators prefer the reliability and flexibility of Cisco equipment to any homegrown alternative.

There is no public equivalent of the American government's Presidential Commission on Critical Infrastructure Protection. CNNIC has been authorized to provide security services to other organizations, but the scope of its mandate is focused on technical concerns. There are some in the MST who believe such a commission is one of the most important tasks for the government. Others believe that if such a commission exists, it is secret.

One respected observer notes that there is greater concern about viruses and who controls the money spigot than about national security. "National security" is mostly an argument made by the people with power in MII and China Telecom in order to scare their somewhat unsophisticated bosses into issuing tough edicts. According to this line of reasoning few of them give a damn about national security, assuming that its either a red herring or someone else's problem.

It is difficult to say whether the closing of the CCF loophole for foreign funding was due to national security concerns or part of an effort by China Telecom to protect its monopoly. The answer is of course that both are true.

Fear of Cultural Imperialism

One of the investigative goals of the Chinese Academy of Science is to gather information on how China can protect its culture in the face of the Internet. They are concerned given the fact that American culture will gradually overwhelm Chinese culture. The Academy is looking to France and Canada to show the way to potential solutions to this threat. They are afraid that because many Chinese use English and are attracted to Western culture, Chinese culture will become less valued and important to them. There is also a fear that the US is so far ahead of the rest of the world in developing a knowledge society, that there is no way that China can catch up.

A large problem is the relative attractiveness of Western Web sites as compared to Chinese sites. The Chinese government wants to encourage the development of Chinese content, but is still struggling with how to safely unleash the creative and market forces needed to develop compelling content.

To help the government work through these issues, the Academy believes that it is important to develop policies on information flows and is investigating the policies of 18 other countries, including India.

Protecting the Chinese language is a major concern. Though most Chinese Web sites are in Chinese, many Chinese still use English for e-mail. The fact that many of the dominant e-mail programs store data in 7 bits has ruled out the use of 8-bit schemes for encoding Chinese characters. There are now applications that work around the problem, and e-mail in Chinese is becoming common.

In a June 1998 spot survey sponsored by CNNIC and Computer World, 45.5 percent of the respondents said they were dissatisfied by the insufficiency of Chinese-language information on the Internet.²⁷⁶ The same survey reported that the most-wanted (67.2 percent) information on the Internet is on science and technology; 66.3 percent of all people surveyed enjoyed sports; 45.1

²⁷⁶ Edward Zeng, "The Presence of Internet in China," *China Telecom 2000 Proceedings*, Information Gatekeepers Conference "China Telecom 2000, New York City, 29-30 September 1998

percent of all people surveyed reported that they wanted political and financial news; 26.1 percent wanted business information, and 15.2 percent desired advertisements.

In June 1998 there were 3,700 web sites in the PRC.²⁷⁷ What is really lacking is compelling content in Chinese. As mentioned earlier, the ChinaNET ISPs are developing pseudo “portal sites” in conjunction with ChinaInfo and commercial ISPs are following suit. These sites provide up to date sports information and news. What these sites can’t provide is the incredible wealth of technical and product information available from the West.

Hong Kong

A year after the transition of control of Hong Kong to the PRC, there has been no evidence that the PRC government has sought to contain or control the Internet in Hong Kong. There are currently over 850,000 households with access to the Internet in Hong Kong through more than 80 Internet service providers.²⁷⁸

The ISP industry, however, has not been free of controversy. Several of Hong Kong’s largest ISPs blocked traffic to a controversial new company that is affiliated with the Chinese University of Hong Kong. The new company, called IXTech, is offering corporate customers access to the Hong Kong Internet Exchange (HKIX) for only the cost of a leased line.²⁷⁹

The Chinese University of Hong Kong argued that it is trying to increase the use of inter-company, intra-Hong Kong broadband services. Other ISPs were concerned that the government-financed activities of the Chinese University were being used to support IXTech’s 100 Mbps link to HKIX and gave IXTech an unfair advantage. The fact that IXTech’s new business was intertwined with the Chinese University’s research into advanced broadband networks only complicated things. This struggle was over how to separate low-cost, high-bandwidth domestic connectivity from high-cost international connectivity so as to encourage the growth of the former. The Chinese University, and the Hong Kong government that funds it, attempted to solve the problem without enrolling the major stakeholders—the ISPs. The fact that the ISPs have been able to organize and challenge the initiative is a sign of the freedom that businesses still have in Hong Kong. The ISP Association leading the blockade has announced plans to end it.²⁸⁰

Problems and Prospects

The Chinese Internet impacts a number of national security concerns of US policymakers (Table 51). The PRC is making a major stretch in integrating the Internet into its society. In doing so, the PRC opens itself up to potential vulnerabilities that may lead to conflict with the United States. The PRC’s perceived need to control its political discourse, currency, and telecommunications infrastructure are in tension with American values and policies. America and China now share a new border that neither fully understands. Boundaries in cyberspace are more difficult to control

²⁷⁷ *ibid.*

²⁷⁸ Headcount.com, “Hong Kong,” *Who’s Online by Country*, undated, <<http://www.headcount.com/searchresult.cfm?choiceb=COUNTRY&choice=country&choicev=Hong+Kong&search=Country>> (15 August 1998).

²⁷⁹ Neil Taylor, *Newsbytes* (20 July 1998).

²⁸⁰ “Group to recommend members lift blockade of firm’s Net traffic,” *South China Morning Post* (15 September 1998).

than physical borders. Attempts by the PRC to both maintain control and rapidly transform may result in unpredictable conflicts.²⁸¹

Table 51. US National Security Concerns About the Internet in the PRC	
National Security Concern	Impact of Internet
Conflict over boundaries	The United States and China now share a highly ambiguous border in cyberspace.
China destabilizes and fragments	Internet could be a force for destabilization, yet it is also a force for stabilization by promoting economic growth.
Chinese offensive Information Warfare	Internet facilitates expertise development
Conflict with neighbors	Internet could exacerbate tensions
Proliferation of weapons and technology to rogue states	Internet can facilitate trade and flows of information
PLA involvement in business and corruption	PLA's control or lack of control over commercial Internet service
China's contributions to global warming	Internet is tool to enable Chinese sustainable development

As the Chinese build a more complex network, their networking skills and capacities are growing. In particular, the MPS is beginning to develop sophisticated skills to track the use of the networks. How readily these skills can be applied to international intelligence gathering and information warfare is open to question. The Internet has the possibility of drawing the PRC into conflict with its neighbors,²⁸² although the PRC would not be expected to aggressively use the Internet for propaganda purposes. One of the greatest American national security concerns is the proliferation of weapons and technologies from China to rogue states. Although the Chinese could use the Internet to market weapons technologies; there is no evidence that they are using the Internet for such purposes.

The Chinese government is investing significant resources in its national networks. If China's leadership is unable to deliver economic benefits; it may face major political opposition and instability. The Internet has the potential to deliver economic benefits, but it is not clear that the Chinese government has a roadmap for how to realize these benefits. This is not to imply that the American government does. But in the United States, the Internet since the early 1990s has been market-driven. In China, the Internet and particularly the physical backbones that support it are still very much in the hands of China Telecom. As a government-operated provider, China Tele-

²⁸¹ A recent South China Morning Post article states "The US-based Chinese Democratic Party's Web site and other pro-democracy online publications were recently wiped out by police computer programs..." Chan Yee Hon, "Subversion charge laid over e-mail addresses," *South China Morning Post* (30 July 1998). Although we have not been able to validate this claim, it does point to potential areas of conflict with the United States if the PRC reaches too far into cyberspace to silence its critics.

²⁸² The Internet has helped mobilize concern in the Chinese community over the systematic rapes of ethnic Chinese during the riots in Indonesia. It is too early to tell how much of an impact this issue will have on PRC - Indonesian relations.

com's decisions about technology, service, and capacity are made partially by the market and partially under other decision-making criteria. China Telecom is rapidly decentralizing as provinces and cities are building out their own networks. In addition, there are a wide range of other organizations that are investing in the Internet and who China Telecom depends on to provide access, content, and services. The Internet in China is being run on a decentralized socialist basis. How effective this form of technical and business decision making will be for China's development will have to be seen.

Not all development is necessarily good. It is possible that in the struggle to advance, China, the world's largest consumer of coal, could end up causing major environmental damage and potentially negative impact climate change. China's leaders recognize the danger and yet they are between a rock and a hard place, as their legitimacy depends on economic growth. A few of them, including Dr. Tian of Asia-Info, believe that sustainable development depends on the development of a knowledge economy built upon the Internet.

Whether China has a realistic chance of migrating to a knowledge economy is open for discussion. Although China's intellectuals are still struggling to develop a theoretical framework for getting there and despite the major political risks associated with the Internet, China's leaders are moving forward. Substantial investments are being made at the national, provincial, and city level. Even more important businesses and individuals are investing in PCs and Internet accounts. They are investing in this technology because they grasp the power of networking. Networking is not an alien concept. The Internet serves to reinforce the family, cultural, business networks that are such a part of Chinese life. Because these other networks can use the Internet, it will continue to rapidly expand and develop.

Tab E **China Glossary**

AN	Access Network—A network that provides access to the Interconnecting Networks; generally an ISP
APNIC	Asia-Pacific Network Information Center—Allocates IP numbers in Asia
CAnet	China Academic Network—An early (1987) Chinese academic network
CAS	Chinese Academy of Sciences—China's foremost research organization
CCCCP	Central Committee of the Chinese Communist Party (CCCCP)—The ruling political organization in China and provides the supreme political, ideological, and organizational leadership for the nation.
CERNET	China Education and Research Network—A national educational network that is operated by the Ministry of Education, formerly the State Education Commission.
ChinaGBN	China Golden Bridge Net—A network operated by JiTong which is aligned with the former MEI. Now under MII.
ChinaNET	The former MPT's Internet network—The national interconnecting IP network run by China Telecom.
CNNIC	China Internet Network Information Center—Allocates domain names and keeps network statistics for China.
CPIP	Capital Public Information Platform (CPIP). First Internet Exchange in China.
CRnet	China Research Network—An early (1990) network that used X.25 link to exchange information with Internet
CSTNet	China Science and Technology Net—A national interconnecting network run by the CAS that connects research organizations
CWW	China Wide Web—An Internet based-information service partially owned by Xinhua News Agency
GRCITP	General Research Center for IT Projects—A research center formerly operated by MEI in conjunction with IBM; focuses on Internet infrastructure research.
HKISPA	Hong Kong Internet Service Provider Association—Association of Hong Kong ISPs that has developed self-regulatory policies on content control
IHEP	Institute for High-Energy Physics—The first organization to have a TCP/IP connection to the Internet.
IN	Interconnecting Network—IP-based networks that connect to the global Internet.
ISTIC	Institute of Scientific and Technical Information of China—Collects data on scientific research in China and makes the databases available through ChinaInfo.

MEI	Former Ministry of Electronics Industries—Used to control significant part of electronics industry in China and was very politically powerful.
MII	Ministry of Information Industries—Formed by the merger of MEI and MPT and parts of other ministries. Responsible for setting policies and regulations regarding telecommunications, infomatics, and the Internet.
MOFET	Ministry of Foreign Trade—Involved in all international trade agreements and joint ventures.
MPS	Ministry of Public Security—Has the responsibility, <i>inter alia</i> , for ensuring that the Internet is not used against the interests of the State.
MPT	Former Ministry of Posts and Telecommunications—Operated the dominant telecommunications provider, China Telecom.
MRFT	Former Ministry of Radio, Film and Television—Now the Bureau of Radio, Film and Television. with some functions transferred to MII.
MST	Ministry of Science and Technology—Responsible for R&D. Formerly, was the Science and Technology Commission.
NPC	National People’s Congress—The organizational form of national power in China, representative of China’s sociopolitical life as a whole. Operates under the authority of the CCCCPC.
PLA	People’s Liberation Army—The military service, comprising ground, naval, and air units; has unsuccessfully tried to get permission from the State Council to run an IN.
PRC	People’s Republic of China
PTA	Posts and Telecommunications Administration—The provincial arm of the former MPT. Responsible for the deployment of the provincial ChinaNET.
PTB	Posts and Telecommunications Bureau—The city arm of the former MPT. PTB’s run many of the ISPs in China.
SCPB	Standing Committee of the Politburo—Made up of the top five to seven leaders of the Communist Party; sets major policy direction for country.
SEC	State Educational Commission—Runs one of the four INs, CERNET. Now the Ministry of Education.
SETC	State Economic and Trade Commission—The trade commission; the State Council has granted it authority over Jitong and Unicom.
SPC	State Planning Commission—Responsible for formulating strategic and long term goals for national development, goals unveiled in China’s ten-year, five-year, and one-year development plans.

Tab F CyPRG Criteria

The following criteria were used by CyPRG for evaluating provincial web sites:

T1a: Agency involvement with the site (average of Webmaster within the agency and tailoring, both 0 or 1)

This tests to see if the agency helped in the making of the Web site and how different it is from the Web sites of other agencies in the same government. Marked by the average of the Webmaster within the agency's involvement and agency-specific tailoring, both of which are a 0 or 1.

T1b: Provides different Webmaster within the agency from main government page

This tests to see if the agency, or subagency, has some measure of control or direct contact in regard to their Web site. Marked by a 0 or 1.

T1c: Provides obvious tailoring indicating the agency itself has ownership of the site content

This tests to see how much the agency is involved with the content of its Web site. Marked by a 0 or 1.

T2a: Provides central agency non-e-mail addresses

This tests to see if the agency can be contacted by regular, non-electronic mail. Marked by a 0 or 1.

T2b: Provides e-mail address to Webmaster within the agency

This tests to see whether the agency has a Webmaster within the agency or not. Marked by a 0 or 1.

T2c: Provides e-mail address to someone inside the agency in addition to Webmaster within the agency

This tests to see if the agency lists the e-mail addresses of employees and/or managers within the agency. Marked by a 0 or 1.

T2d: Provides some kind of addresses for employees within the agency beyond the top guys (e.g., shows a phonebook with position)

This tests to see if the agency provides phone numbers and/or addresses for the employees within the agency, excluding their managers and or any other top level officials. Marked by a 0 or 1.

T2e: Provides addresses for subelements within the agency (can you write them a letter at this address?)

This tests to see if the agency provides a non-electronic address for subelements (such as smaller divisions) within the agency. Marked by 0 or 1.

-
-
- T2f: Provides e-mail address to someone responsible for both content of the site and technical support for the site?
Marked by a 0 or 1
- T2g: Provides e-mail address only to someone responsible for technical support for the site?
Marked by a 0 or 1
- T2h: Provides e-mail address only to someone responsible for content of the site?
Marked by a 0 or 1
- T2i: Does the person responsible for technical support for the site appear to be a commercial firm?
Marked by a 0 or 1
- T3a: Provides details on senior official's experiences or vision of the future for the organization
This tests to see if the agency provides any information about/by/for the head official of the agency. Marked by 0 or 1.
- T3b: Provides mission statement and various activities of agency
This tests to see if the agency provides any data as to what function it serves, what its goals and values are, and how it accomplishes these goals. Marked by a 0 or 1.
- T3c: Provides other issue-related government addresses
This tests to see if the agency provides the addresses (URL or regular mail addresses) of any other government agencies (or within the agency itself) whose function is related to this agency. Marked by a 0 or 1.
- T3d: Provides non-issue-related other agency addresses
This tests to see if the agency provides the addresses (URL or regular mail addresses) of any other government agencies (or within the agency itself) that are not related to the agency at all. Marked by a 0 or 1.
- T3e: Provides issue-related other non-governmental information sources
This tests for the same as T10, but the address must be for a non-government source. Marked by a 0 or 1.
- T3f: Provides organizational structure in graphic form (add 0.1 for every level above or below shown in graphic)
This tests to see if the agency provides an organizational graphic (such as a flow chart): Marked by a 0.1 for each element and shown in the graphic.
- T3g: Provides reports, research, laws, and regulations in easily readable format on the screen.
This tests to see if the agency has taken the time to provides an easily readable, organized format for reports, research, laws, and regulations. Marked by a 0 or 1.

-
-
- T4a: Provides text of regulations/laws/agency research or in-depth explanations of requirements imposed on citizens resulting from agency activities
Tests to see if the agency provides any data on regulations, laws, or research that the agency carries out or is related to the agency. Marked by a 0 or 1.
- T4b: Provides instructions on how to complete these actions
An extension of the previous attribute, this tests to see if the agency provides citizens with instructions, help, tips on how meet the requirements/regulations/laws imposed by the agency (such as the providing instructions on how to file a tax form): Marked by a 0 or 1.
- T4c: Provides form in graphics for screen capture or copy
This tests to see if the agency provides any necessary forms in graphic form so that citizens may copy them to fill them out. Marked by a 0 or 1.
- T4d: Provides appeal process for decisions or address of an ombudsman
This tests to see if the agency provides—on-line—instructions and/or a way for citizens to appeal agency decisions. Marked by a 0 or 1.
- T5a: Notes the latest published “last updated” date (yyyymmdd) on the main page or, if none, a key subordinate page, or 0 if no date listed on any of these pages.
- T5b: Notes the latest last updated date of the page for noted in T20by going into View Doc Info and noting the last update date (yyyymmdd): If no published date, uses the latest from the either the main page or a key subordinate page.
- I1a: Presents clickable e-mail link to Webmaster within the agency
This tests to see if the e-mail link to the Webmaster within the agency is clickable (a mailto link). Marked by a 0 or 1.
- I1b: Presents clickable e-mail link to senior agency official
This tests to see if the e-mail link to any senior officials is clickable. Marked by a 0 or 1.
- I2a: Presents clickable e-mail link to someone inside the agency in addition to Webmaster within the agency
This tests to see if any other e-mail addresses provided by the agency are clickable (mailto) links. Marked by a 0 or 1.
- I2b: Presents clickable e-mail link to a number of agency employees
This tests to see if the agency provides clickable e-mail links to a large portion of its employees. Marked by a 0 or 1.
- I2c: Provides an on-line issue-related forum for outsider participation such as chat lines and list servers.
This tests to see if the agency provides a chat line or list server for citizens, agency employees, and other interested individuals to discuss topics related to the agency. Marked by a 0 or 1.

-
-
- I3a: Presents clickable easy down-load of mission statement and various activities of agency
This tests to see if the user is able to easily down-load a list of the goals/functions of the agency. Marked by a 0 or 1.
- I3b: Presents clickable hot link to other issue-related government addresses
This test to see if the addresses provided are clickable. Marked by a 0 or 1.
- I3c: Presents clickable hot link to non-issue-related other agency addresses
This tests to see if the addresses provided are clickable. Marked by a 0 or 1.
- I3d: Presents clickable hot link to issue-related other non-governmental information sources
This tests to see if the addresses provided are clickable. Marked by a 0 or 1.
- I3e: Provides an agency newsletter which you can get automatically on-line via a subscription (more than a pamphlet offering a list of reports—this has content itself).
This tests to see if the agency has a newsletter, either hard copy or e-mail, that the user can subscribe to which provides up to date information about the agency and its activities. If the agency does not have this but has a service offering to notify the user when the Web site is up-dated or changed, give a .5. Marked by a 0 or 1.
- I3f: Provides a searchable index for archived newsletters, laws, regulations, and requirements.
This tests to see if the agency allows the user to search to site for old newsletter, laws, regulations, or anything relating to the content the agency provides on-line. Marked by a 0 or 1.
- I4a: Presents clickable hot link to listed subelements within the agency (add 0.1 for every subelement hot-linked)
This tests to see if subdivisions within the agency have a clickable link made to them from the main page. Marked by adding 0.1 for each link provided.
- I4b: Presents clickable hot link to sublevels noted in the agency's organizational structure graphic (add 0.1 for every level above or below hot-linked)
This tests to see if the elements within the agency's organizational graphic (such as the area for president, vice president, etc.) are clickable. Marked by a 0.1 for each element available to be clicked.
- I4c: Presents clickable hot link to down-load text of regulations/laws/agency research or in-depth explanations of requirements imposed on citizens resulting from agency activities
This tests to see if the user can easily click and down-load the regulations/laws/research of the agency. Marked by a 0 or 1.
- I4d: Presents any required submission forms on-screen for clickable down-load (add 0.1 for every form accessible for down-load)
This tests to see if the user can easily down-load any forms needed/required by the agency for compliance with certain laws/regulations. Marked by adding 0.1 for each form available for down-load.

-
-
- I4e: Presents on-line form completion and submission (add 0.1 for every form accessible for on-line completion and submission). This includes ordering publications on-line.
This tests if the user can complete and submit a form on-line to the agency. Marked by adding 0.1 for every form available for on-line completion and submission.
- I4f: Presents an automatic response limit for response to on-line submissions
This attribute notes if the agency tells the user how long it will take until he/she receives a response from the agency. Marked by a 0 or 1.
- I4g: Presents clickable link to appeal process for decisions and/or an ombudsman
This tests to see if the appeals process provided is clickable and easy to use. Marked by a 0 or 1.
- I4h: Provides other language access to site for visitors unable to speak or read the language of the host country.
Marked by a 0 or 1
- I4i: Provides iconographic access to site for visitors unable to speak or read the language of the host country.
Marked by a 0 or 1
- I4j: Provides audio access to site for visitors unable to see the site.
Marked by a 0 or 1