China:
IP Telephony and the Internet

This case has been prepared by Dr. Peter Lovelock <peter@madeforchina.com>. *China: IP Telephony and the Internet* is part of a series of Telecommunication Case Studies produced under the New Intiatives program of the Office of the Secretary General (OSG). The case studies program is under the direction of Dr. Ben Petrazzini, <Ben.Petrazzini@itu.int> Policy Advisor, Strategies and Policy Unit (SPU). Other cases, including IP Telephony cases in Colombia, Peru and Thailand can be found at <http://www.itu.int/iptel>. The opinions expressed in this paper are those of the author and do not necessarily reflect the views of the ITU or its membership.

Contents

Figures

Tables

1 Introduction

In the latter part of the 1990s, many small computer and ISP outlets across China used the country's network backbone to provide domestic long distance and international calls to the public, and in some cases at less than half the rate charged by the incumbent, China Telecom. Yet, despite an abundance of network infrastructure, the Ministry of Information Industry (MII), via its leading telecom enterprise, China Telecom, had until 1998, steadfastly resisted the proliferation of IP telephony services – *implying* that such services were not legal and then clamping down on anyone who tried to provide them.[1]

When, however, the prosecution failed and they realised that their position was untenable, China Telecom rapidly embarked upon a dramatic turnaround. Government officials at the MII created a new licensing framework for Internet telephony operators, limited in the first instance to the government-affiliated telecom bodies – China Telecom, China Unicom and Jitong. They also focused the newly licensed carrier, China Netcom, on IP services and they galvanized China Telecom to undertake the largest roll-out of an IP telephony platform in the world.

Almost overnight the government had swung around from blocking IP telephony (in much the same way that they had banned callback operators) to driving it out as a central plank of their emerging telephony, data and Internet agendas.

China's IP telephony market formally opened on April 28, 1999, with the MII issuing licenses to China Telecom, China Unicom, and Jitong to begin six-month periods of operation in a total of 26 cities. This was later extended into the new year. In so doing, the legalization of IP telephony ended what was still effectively a *de facto* long distance and legal international monopoly held by China Telecom.

China Telecom was the first of the three carriers to launch services in an initial roll-out comprising 25 cities. The network was rated as one of the fastest IP telephony roll-outs to date, taking just two months. To build a circuit-switched network of comparable size and capacity would have taken 1.5 years and cost three times the amount. Unicom launched its IP telephony trial in 12 test cities, acquiring nearly 700,000 customers between June and November 1999. The company plans to have IP telephony gateways in 250 of China's biggest cities by the end of 2000. Unicom's 12-city trial network reached full capacity in only 80 days instead of the predicted six months.

During the trial, the three companies issued IP telephony 'phone cards. The cards contained a unique account number for use from any phone from within the service areas of the respective companies. At Jitong's sales offices in Shanghai more than 2,000 people lined up—some of them from as early as 2 a.m.—to buy the IP telephony cards when they went on sale on 19 May 1999. From June to August 1999, the total revenue from sales of IP phone cards was estimated at US$35 million, with an annual potential of US$150-200 million. China Telecom instead set up only one sales counter at the Beijing Long distance Telephone Exchange Bureau, and issued only a very limited number of IP cards. Even with their limited attention to the market, the Beijing Telecom office had over 500 people per day sign up for telephone service during the first two days following the announcement. Previously the office had handled about 20 telephone subscriptions per day.

Since the trial the IP telephony market in China has been expanding at a rapid. The MII has predicted that the market size of China's IP network will reach US$12 billion by the end of 2000.[2] Ironically, by the start of 2000, with the government ready to open the market to new competing licensees, many inside of the three existing competitors—Unicom, Jitong and Netcom—already questioned the basic business proposition for IP telephony in the country. A recent China Telecom's price revisions meant that all three were looking for replacement revenue streams with long-term growth potential. Nobody doubted the importance of IP services, nor that voice traffic in China would increasingly be IP traffic. However, IP telephony as a stand alone business proposition has rapidly become questionable.

[1] In late-1998 the proprietors of a small computer shop in the southern Chinese province of Fujian were arrested and hustled off to jail for selling Internet Protocol (IP) telephony services to the public. The prosecution failed, for more information see Section 5.1.

[2] *Communications World*, 18th edition, March 2000.

2 The Internet in China

The first Chinese Internet connection was established by the Chinese Academy of Science (CAS) in 1988, which registered the '.CN' domain name with the Internet Society in 1990.[3] As was the case elsewhere in the world, while the academic community was the first to begin to develop Internet usage in China, it has been the commercial world that has spurred the government to act, and in China, commercialization of the Internet occurred in June 1995. However, commercialization of the Internet in China also represented a means for the Ministry of Posts and Telecommunications (MPT) to regain control of a telecommunication service with regard to which it had "missed the boat", regaining the initiative from CAS and attempting to block rival government agencies from exerting control. The MPT, the Ministry of Electronics Industry (MEI), the State Commission of Education (CES), and CAS had, by this time, been struggling to gain control of the registration function for the .cn domain as China's Internet began to significantly expand.

An associated reason for commercializing Internet service was that, after establishment in May 1994, the CAS network was often overloaded. A new system, charging for access at market rates, was seen as a way of relieving congestion on the single existing connection and funding further build-out of the network.[4] Commercialization of Internet services and the introduction of the World Wide Web into China combined to fuel the growth in user numbers (see Figure 1 below). As was the case elsewhere, China's administration of the Internet was thus forced to evolve rapidly.

The Leading Group on Informatization (LGI), a cross-ministerial coordination group reporting directly to the State Council (see Appendix) was responsible for the first attempt to establish regulatory guidelines for Internet development in China: the Interim Regulations [on International Interconnection of Computer Networks], issued in January 1996.[5] The Regulations stated that the LGI was in charge of overseeing the Internet in China; and separated networks into Interconnecting Networks (IN)—which connect into the global Internet—and Access Networks (AN)—providing local access to the Internet. The order further specified that four organizations would operate INs:

- the Ministry of Posts & Telecommunications (MPT): ChinaNET,
- the State Education Commission (SEC): CERNET,
- the Ministry of Electronics Industry (MEI): ChinaGBNet, and
- the Chinese Academy of Science (CAS): CSTNet.

Each of the three bodies *other* than the MPT chosen to administer INs had to connect to the MPT international gateway if they wished to access international circuits. The MPT therefore, in the interests of national security and orderly administration, was able to maintain its 'gateway' position, managing both availability and price of international bandwidth. Subsequently, the Ministry of Public Security (MPS) issued regulations requiring Internet users to register with public security authorities.[6] Users were forbidden to employ the Internet to transmit or receive information that challenged laws or administrative regulations of the state, or endangered national unity.[7] In addition, INs and ANs were required to work with the MPS to prevent and deal with illicit conduct. Given that the MPS had neither the resources nor personnel to effectively track Internet use, it was dependent on the INs and ANs to serve as its agents, and to instil a high level of self-censorship.

---

[3] Tan Zixiang 1995. 'China's Information Superhighway: What is it and who controls it,' *Telecommunications Policy*, 19(8): 721-31.

[4] Triolo, Paul and Peter Lovelock. 1996. 'Up, Up, and Away—With Strings Attached: Internet in China,' *China Business Review*, 23(6): 18-29; Foster, Will. 1998. *The Global Diffusion of the Internet*. [mimeo, provided February.]

[5] PRC State Council, 'Interim Regulation on International Interconnection of Computer Networks in PRC,' Order No. 195 (1 February 1996), as modified by PRC State Council's Order No. 218, 1997 (20 May 1997).

[6] Under regulations promulgated on December 30, 1997, the MPS was charged with ensuring that the Internet was not used to harm the interests of the State. See 'Regulations on the Security and Management of Computer Information Networks and the Internet' (US Embassy, Beijing, 'New Regulations Codify PRC Internet Practice,' <http://www.redfish.com/USEmbassy-China/sandt/netreg.htm>. The Chinese full text is available at <http://www.edu.cn/law/glbf.html>.). The new regulations were a codification of existing practices and built on 'The Regulations of Safety Protection for Computer Information Systems' and 'Notice on Strengthening the Management of Computer Information Network and Internet Registration Information', both of February 1996, and the 'Temporary Regulations on Electronic Publishing' of March 1996. (Order No. 147 requires users to register with the MPS.)

[7] There were also clauses against making falsehoods or destroying the order of society as well as promoting feudal superstitions, sexually suggestive material, gambling, violence, and murder.

The MPS' gain in responsibility came at the loss of the Ministry of Radio, Film and Television (MRFT), which had traditionally controlled mass media in China, but had not yet moved effectively to extend its domain to cover interactive services such as the Web. This jockeying for administrative responsibility grew through the 1990s (Table 1).

Many expected that the Chinese government's regulatory restrictions on the Internet were related to a desire to keep the number of Internet users in China to a linear growth path. After all, it was widely accepted that the Chinese government was not keen to promote widespread access to information.[8] However, constrained Internet development was quite obviously *not* the case – as the roll-out of the network, the Government Online program (see below), and the extraordinary growth in subscription levels began to demonstrate. In China, growth, rather than simply control, was the government's primary objective (as had been demonstrated through the early 1990s in basic telecommunications).

Clear evidence of this is, for example, the fact that in 1999 to expand access to the Internet, Chinese authorities twice cut the fees that ISPs pay to access telecommunications lines. By late-October, the fees for a 2-megabyte domestic connection to an international digital line had been reduced to 220,000 yuan (US$26,579) per month. (Prior to the cut in October the fee was 320,000 renminbi.) The monthly rental fee for the use of switching stations was 280 yuan per month (down from 600 yuan) and the charges for domestic long distance digital lines had fallen to 80,000 yuan (down from 431,000 yuan) per month. (Digital data line fees were also reduced by 45 per cent in October 1999.) With this and a number of other promotional measures the stage has been set for an explosion in Internet subscription and usage.

Box 1: China's Education & Research Network (CERNET)

The first IP network connecting China with the outside world was established in 1988 via a gateway at Karlsruhe University, Germany. Through the first few years of the 1990s a number of universities and research institutes established email access through a variety of Internet links. For example, in 1990, the State Planning Commission and the World Bank started a project called the National Computing Facilities of China (NCFC). This project included a supercomputer center and three campus networks: China Academy of Sciences Network (CASnet), Tsinghua University Network (TUNet) and Peking University Network (PUnet). The construction of these three individual campus network was completed in 1992. In 1994, a 64Kbps satellite link was established and full Internet access became available to the users of CASnet, TUnet and PUnet. However, there was no nationwide education and research Internet backbone, such that each entity had to arrange its own connection.

Thus, in December 1993, the China Education and Research Network (CERNET) project was started. The CERNET project (<www.cdnet.edu.cn/>), funded with Chinese government seed money of Rmb80 million (US$10 million), was the first major Internet development project across China and was placed under the direct management of the Chinese State Education Commission (SEC). Also known as "The Golden Intelligence Project" — one of the manifold government 'Golden' networking projects — CERNET has been built to connect regional computer networks with university campuses.

The main objectives upon establishment were to: (a) develop a nationwide IP backbone interconnecting eight regional networks (Table 1) and connect them to the global Internet; (b) set up a national network centre; (c) set up ten regional network nodes; (d) adopt TCP/IP as the network protocol and establish network management systems; (e) provide Internet applications and develop China's information resources and applications. Ultimately, all campus networks across China are to be interconnected, with each other and then with the Internet. The CERNET centre is in Beijing's Qinghua University. Given China's enormous population, officials expect that CERNET will become the world's largest national education and research network. By 1997, mainland China had 1,075 universities, with more than 390,000 university staff, 94,200 graduate students and 2,184,000 undergraduate students.

Following the roll-out to universities and leading institutes, more than 39,412 middle schools with 55,120,000 students and 160,000 primary schools with 122,000,000 pupils will be connected into CERNET.

Source: <www.edu.cn/cernet/intro/index>

[8] This is not to say that the issue of content control is trivial in China – it is in fact very important – but controlling it is does not have the priority among government agencies that many [outside or Western] observers stress.

Table 1: Internet-interested actors in China, 1997

Agency	Traditional role	Internet role
Ministry of Posts and Telecommunications (MPT)	Regulator and operator of telephony and data networks	Protect its position as dominant provider of telecommunications
Ministry of Electronics Industry (MEI)	Manufactured information-technology products	Leverage its decaying manufacturing base and political power to pursue lucrative service industry
Ministry of Radio, Film & Television (MRFT)	Regulator, producer, and operator of mass media	Protect ministry's power and influence as interactive technologies challenge traditional broadcast technologies
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
State Education Commission (SEC)	Policy-maker and administrator for China's education system	Internet support for university and secondary education
Chinese Academy of Sciences (CAS)	Scientific research policy-maker and host of hundreds of research institutes	Technology transfer; Internet-oriented research and development
Xinhua News Agency	Monopoly news producer	Leverage and protect monopoly on news
Propaganda Department	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	Pricing of Internet and telecommunications services; funds for infrastructure
State Economic and Trade Commission (SETC)	Policy decisions regarding infrastructure and relationships with foreign firms	Foreign investment in China's Internet infrastructure
State Science and Technology Commission (SSTC)	Policy-making and financing of China's research and development	Internet is a "major focus"
People's Bank of China	Loans to Chinese firms	Loans to Internet firms
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

Source: Adapted from Foster (1998).

3 Internet market profile

By July 1997, there were some 25,594 Internet hosts using the .CN national top-level-domain (TLD), according to China's domain name registrar, China National Network Information Center (CNNIC).[9] By December 1999, this had grown to 3.5 million (Figure 1, left hand side). The number of Internet subscribers was growing even more dramatically. From about 80,000 subscribers in 1996, the market had grown to 2.1 million by the end of 1998 and 8.9 million by the end of 1999 (Figure 1, right hand side). The government predicted that there would be at least 20 million Chinese on the Internet in China by the end of 2000 and

[9] CNNIC Newsletter, No.1, November 1997. See <www.cnnic.net.cn>

more than 80 million by 2003. There is good reason to think, however, that these numbers – impressive as they are – are still conservative. Many observers would agree that the real number of Internet *users* in China is significantly higher than the official figures.[10]

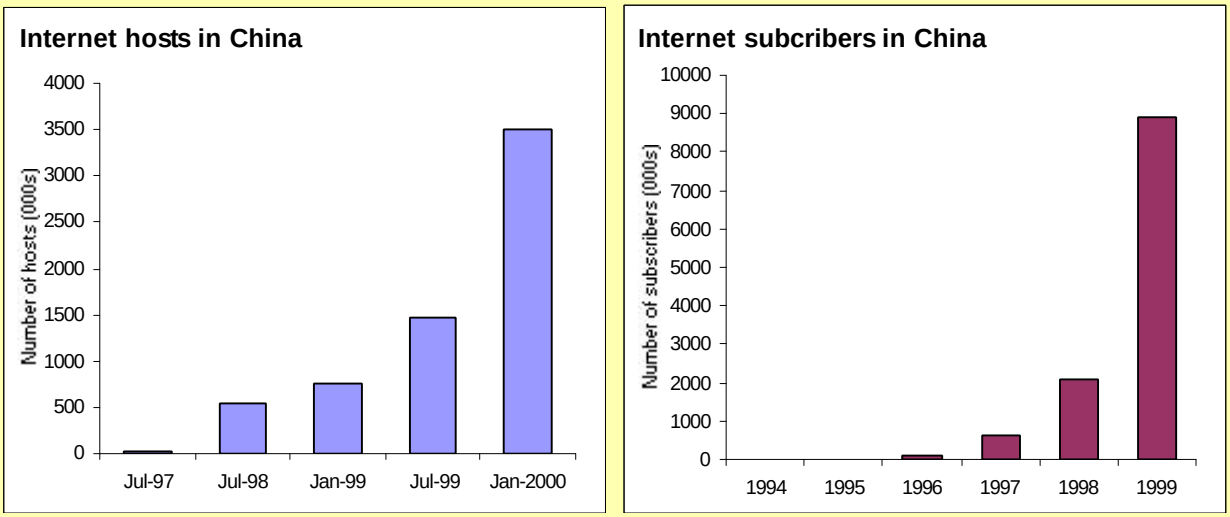
While *controlled* growth was the ideal of the telecommunications authorities, the high Internet subscription rates can most effectively be explained by the competition between the various administrative bodies – initially the MPT and the MEI; later the MII and MOFTEC, the SARFT, and the Propaganda Bureau. The MPT/MII was forced to add bandwidth, lower prices and disperse geographically far faster than it would have been likely to if it were the only agency intent on developing the sector (and hence the only provider).[11]

4 Internet gatekeepers

The main providers of Internet access to the public are:

- China Public Computer Network (ChinaNet). ChinaNet, run by the operator of China's national public telephone network (China Telecom), is the dominant Internet access provider. Often referred to as the 163 network after the number users dial to gain access to it (see "Going on-line in Beijing"), ChinaNet is also the effective international gatekeeper by virtue of the fact that all networks must go 'through' China Telecom's international telecommunications access.
- China Public Multimedia Network (169 Network). The Multimedia Network, more often known by its dial-up access number, 169, is an attempt by the government to build a China-specific content platform for domestic users. Effectively, an America Online style platform, it does not provide direct access to the Internet, but rather creates a Chinese intranet, allowing the government to provide cheaper access and Chinese-language content.
- Golden Bridge Network (GBNet). GBNet provides the commercial alternative to ChinaNet. Run by Jitong, a state-owned company formerly linked with the now abolished Ministry of Electronics Industry, GBNet has focused primarily on the corporate market.

Figure 1: Internet growth in China



Source: China National Network Information Centre

[10] This is because there are usually more than one individual to each official account in China, i.e., multiple users. CNNIC realizes this and assigns multipliers to different categories – 1.85 users per dial-up account, 3.96 users per leased line. But the government agency goes no further than this; making no distinction between the different kinds of users – whether they are in business, government or education. Surveys of different work places, however, have consistently found more people logging on from each account, especially for dial-up and leased lines in businesses and for leased lines used in government offices.

[11] By contrast, the Persian Gulf governments only allowed the monopoly PTT to offer Internet service, in the interests of maintaining control. This kept prices high, slowed growth and put a damper on sales and innovation.

- China's Education and Research Network (CERNET). CERNET is the principal academic network. It is centred upon Beijing's prestigious Qinghua University and links together the universities, schools and education and research institutes. It is still technically distinct from the main public network such that Web sites which are blocked by the government on ChinaNet (see below) will often be accessible from CERNET.
- China Science and Technology Network (CSTNet). CSTNet is similar to CERNET, but significantly smaller in scale: it connects subsidiaries of the Chinese Academy of Sciences (CAS).

ChinaNet is by far the most important of the four Interconnecting Networks; it is by far the dominant provider and, through China Telecom (and thence the MII) is the only point of public international interconnection. This means it can – ostensibly – control who can set up web sites and which web sites can be blocked. Although technical means do and will always exist for users with the know-how to find their way to blocked sites, formally this means that China Telecom remains in charge overall of who accesses what on the Internet via the public telephone system.

Of the four Interconnecting Networks (INs), only ChinaNet and GBNet can sell Internet access [on commercial terms] to other Internet service providers (ISPs). (CERNET and CSTNet are limited to only providing access to educational and research institutions. Because China Telecom owns the vast majority of telecommunications infrastructure in China, this in effect means it is the monopoly supplier. All 150 or so of China's ISPs are small and local, and China Telecom has shown no compunction to date in squeezing as much money from these businesses as possible, with the result that whereas in the Unites States, line rental accounts for only about five per cent of an ISP's costs, in China the average is nearly 80 per cent.

Even more restrictive is a China Telecom practice of linking line rental to the amount of revenue per line. Consequently, instead of rental declining with volume, it rises, making an ISP less profitable the more it increases its user base or usage. Given a playing field tilted so steeply against them, most independent ISPs have found it impossible to stay in business without receiving some degree of assistance or lenience from China Telecom. As a result, although China saw a small blossoming of ISPs in 1997 and 1998 (many being small bulletin board service operations which decided to go commercial), many of the companies granted ISP licenses have subsequently stopped offering ISP services, or have been incorporated into the ChinaNet framework.

As a consequence, the majority of subscribers, whether companies, organizations or individuals, are connected with ChinaNet, either directly or indirectly. Educational users will, of course, access the Internet via CERNET, and those in the Chinese Academy of Sciences via CSTNet. GBNet, while initially offering Internet access to individuals only, is now being developed principally to service corporate customers.

One recent alternative to ChinaNet's 163 network has been China Telecom's 169 network – again named after its dial-up access number. The 169 network, also known as the China Public Multimedia Network, is an attempt to build a China-only internet. Started in 1998, it is run by China Telecom's Data Communications Bureau. Despite its title, it uses the same telecom backbone as 163, the public network. Its main distinguishing feature to date is that all its content is in Chinese.

Table 2: Bandwidth: Limited but growing

Total bandwidth, million bits per second

	Jan. 1999	July 1999	Jan. 2000
ChinaNet	123	195	291
GBNet	8.256	18	22
CERNET	8	8	8
CSTNET	4	8	10
UNINET[12]	--	12	20
TOTAL	143.256	241	351

Source: CNNIC

[12] Uninet is a commercial IN under the Shanghai municipal government. Information can be found at: <www.uninet.com.cn>.

Box 2: Going on-line in Beijing: two easy options

As an example of how easy it has become to go online in China, we can look to the residents of the capital, Beijing. Here the easiest way of getting onto the Internet is through Beijing Online, operated by Beijing Telecom (which is, of course, a subsidiary of China Telecom, ChinaNet's parent company). By 1999, all one had to do to set up an Internet account was to install Beijing Online's dial-up software, dial 2631, and enter user name 263 and password 263.[13]

By contrast, to get onto the GBNet network requires buying a pre-paid card priced from Rmb55 (US$6.6) for five hours access, to Rmb6,000 (US$723) for 1,000 hours, then going through a procedure similar to that for getting on-line via 2631.

GBNet has certain advantages in that it provides a free email address, usable in most large cities across China, and is often significantly less congested than the ChinaNet network. Of course, GBNet also has its drawbacks. One has to find an outlet that sells the cards, and pay in advance. If you run out of credit in the middle of the night, there's little you can do about it.

Source: Peter Lovelock 1999[14]

It is also difficult to access the network from outside, making it far more secure than the Internet proper, while at the same time allowing users controlled access to the "real" Internet. The network is being pushed by the telecommunications authorities as the best home for the country's On-line Government project, a scheme aimed at getting ministries and other state organizations to have an on-line presence. This project has gained widespread acceptance amongst the senior Chinese leadership and government departments which are not yet connected to the 163 network are being encouraged by the State Council to go on-line via the 169 network.

Through the 163 network, a subscriber can access global Internet resources and can also be accessed by worldwide Internet subscribers. According to the authorities, "considering the shortage of IP addresses, the threat of information security, the large amount of sexual and reactionary information, vulnerability to the attacks of hackers, and the language barrier (most of the Internet content is in English), the Ministry of Information Industry has constructed a nationwide huge Intranet – called the '169 network'." Compared with the 163 network, the 169 network provides features as follows:

1. Restricted to internal IP addresses only, thus alleviating the shortage of IP addresses.
2. The 169 network can access the *domestic* part of the 163 network through IP address mapping, thus "screening all sexual and reactionary information [from] overseas".
3. The 169 network "cannot be accessed easily from networks outside 169 network, ensuring information security".
4. All content on the 169 network is in Chinese.
5. Subscribers to the 163 network can access sites within 169 network through static IP address mapping.

The future of the 169 network is by no means assured. It is the latest in a series of ventures aimed at developing Chinese-only versions of the Internet walled off from the rest of the world. Among other similar schemes have been China Internet Corporation (CIC)[15] and Yinhaiwei.[16]

[13] This method is particularly useful for users who have an Internet account elsewhere and want to access their email. Because usage shows up on a phone bill, however, it may not always be appropriate or, in the case of hotels which block such lines, possible to use this means.

[14] Peter Lovelock 1999 "E-China: Why the Internet is Unstoppable" China Economic Quarterly, Vol.3, Iss.1.

[15] China Internet Corporation (CIC), is a Hong Kong-based company, created in 1996, linked with Xinhua news agency—that has subsequently turned into chinadotcom. CIC first suggested it would control all international Internet gateways, and then that it would build a "China Wide Web", which would offer the Internet in China serving only palatable material, initially Chinese-language Reuters and Bloomberg wires, minus any politically sensitive stories. In July 1999, China.com raised US$84 million with its listing on the Nasdaq stock exchange – the first China Internet company to do so. The company then raised US$395.25 million in a second stock offering in January 2000. In November the company changed it's name from China.com to chinadotcom.

[16] This network, established by a Chinese businessman, was based on domestic information sources – travel, book reviews and so on – and chat groups. Modelled on CompuServe and America Online, it was made available via proprietary software. It attracted a

Making the 169's future more promising than its predecessors is Beijing's commitment to the On-line Government project. The project is currently envisaged as a three-stage process. Stage one is to connect around 800-1,000 government offices and agencies to the network. Stage two involves getting the offices and agencies to move their information systems into sharable electronic form. Stage three, which is not foreseen as happening until well into the next decade, calls for all offices and agencies to become paperless. As with the 'Golden Projects', the purpose is to create a centrally accessible and controllable system, which collects and transports data to and from users (which are planned to include the public as well as government departments).

To support these kinds of initiatives, China rapidly expanded its broadband communications network in the late 1990s. The government had, since the advent of the 'Golden Projects' initiative in the early-1990s, recognized the importance of data transmission. As a result, the government's goal of installing fiber optic telecommunications lines to major buildings in urban areas and to large villages in rural areas by the end of 2000 meant significant near-term investments. MII authorities expected China to invest US$2.5 billion to develop its broadband infrastructure in 2000 alone, with investment expected to reach US$24 billion by 2005, of which transmission systems would account for US$15 billion, access networks US$6 billion, and data communications hardware US$3 billion.

What this meant for China was that, by the end of the 1990s, the PRC had invested heavily in China Telecom's ATM network to deliver both voice and data over a national – centralized – communications platform. The MII (and China Telecom) had effectively centralized Internet policy-making and network control under ChinaNet, limited the three other national ISPs (or Interconnecting Networks) to discrete user domains, and funnelled all international access through a few control points. Given this intense streamlining, it had been posited that China Telecom's national ATM network would – given time – duly deliver good Internet service to China's users. Unfortunately for China Telecom, the introduction of the new IP technology had eliminated the luxury of time.[17]

5 IP Telephony: The government initiative

China's IP telephony market formally opened on April 28, 1999, with the MII issuing licenses to China Telecom, China Unicom, and Jitong to begin six-month periods of operation in a total of 26 cities (Table 3). This was later extended into the new year.[18] In so doing, the legalization of IP telephony ended what was still effectively a de facto long distance and legal international monopoly held by China Telecom. The opening of the IP telephony market had been preceded by a substantial amount of 'grey market' activity by ISPs, computer shops, and local CATV networks. What galvanized the market was a lawsuit brought against the MII by two brothers in the southern Chinese province of Fujian.

5.1 The brothers Chen

In 1998, the Chen brothers had begun offering IP phone service through their computer store in Fuzhou city. China Telecom insisted that the brothers had broken the law, and filed a judicial demand to get them

certain amount of attention, and succeeded in selling the Ministry of Posts and Telecommunications and the Ministry of Foreign Trade and Economic Cooperation a one-third ownership stake. Users, however, never rose beyond a few thousand, and the business disappeared

[17] IP telephony operators in China, and most of the equipment manufacturers selling to those operators, initially favoured the more mature technology of ATM (asynchronous transfer mode) over IP, which sacrificed some bandwidth but guaranteed quality of service. (However, almost all were in agreement that the future of IP telephony would be based on more advanced optical networking technology, most likely IP over DWDM (dense wavelength division multiplex).) This was primarily a result of the extensive deployment of ATM that had already occurred in China's rush to build out its PSTN and DDN networks. ATM technology was designed in the 1980s to optimize voice transmission in a regulated environment, and China had been a large adopter of the technology.

[18] At the end of 1999, the MII announced that, with new Internet regulations in the process of being drafted and placed before the State Council, the existing IP telephony licenses would be extended. Once the new Internet regulations were published, the existing licenses were expected to be extended and new licenses awarded.

arrested. After the police detained the brothers and seize their equipment, the Chens filed suit against China Telecom for the illegal capture of their computer equipment.

The Internet phone service offered by the Chens from their store allowed customers to make international calls at half the rate charged by China Telecom. The brothers pointed out that the only *telecommunication* regulations which appeared to directly relate to their service were the 1993 "Provisional Arrangement for the Approval and Regulation of Decentralized Telecommunications Services" which had listed the services considered to be telecommunications value-added services, for which a license was required. Computer services, they reasoned, having not been listed, could not therefore be considered a telecommunication service, and as such fell outside the authority of the MII. While the Chens lost their original hearing at the court of first instance, the Mawei District People's Court, they won on appeal at the Fuzhou Intermediate People's Court. The judge accepted their argument that the activity was not covered by criminal law, and was at most an administrative matter. Local court officials then agreed with the brothers that offering IP telephony service was not explicitly prohibited under existing administrative rules and regulations.

Reports from the case in the Chinese media said that the appellate court had consulted with Internet 'experts' and made its decision on the basis that Internet telephony is technologically different from conventional telephony. While the judge's position was said to be sympathetic because he himself was a *wangchong* (an Internet worm), it is widely accepted that senior government officials in Beijing countered any overt pressure from the MII and made the court aware of the administrative battle surrounding the Internet. Premier Zhu Rongji's widely-known antipathy for the MII's market dominance had dovetailed with the government's administrative restructuring program and the leadership's desire to promote economic growth and market competition.

The MII's response was two-fold. First it issued a notice of its intent to clarify any regulatory ambiguity regarding IP telephony (while simultaneously stating that the ministry still had responsibility for all matters to do with telecommunications in China and that IP telephony was a telecom activity – in short, an assertion that the Fuzhou court was wrong). However, with the gate now opened there was widespread recognition, even within the ministry, that a ban on IP telephony would be a difficult position to maintain.

Chinese newspaper editorials began to point out that overseas users would be able to adopt Internet phone technology to make calls *to* China, while organizations such as foreign companies in China would be able to use Internet telephony over their networks for outbound calls, using private lines leased from China Telecom. Policing of such set-ups would be virtually impossible. As had been the case prior to the 1993 bout of regulatory liberalization and the eventual introduction of (limited) domestic competition, arguments in favor of cheaper costs and alternative operators for Internet access began to emerge from major users. Organizations such as the Ministry of Foreign Trade and Economic Cooperation (Moftec), began to argue that unless the MII allowed Chinese companies to make international calls at the cheapest rate, then domestic companies would be at a competitive disadvantage. Minister Wu Jichuan and his colleagues found themselves under siege. It began to look as though the gray market activity was to be legitimized and that the IP telephony market would rapidly become competitive, just as, for example, the paging sector had experienced in the mid-1990s.

The MII's second response therefore turned out to be perfectly in character. In April 1999, they licensed three carriers – all now under the umbrella administrative control of the MII – to conduct a six-month trial of IP telephony services. They also announced that China Telecom would begin one of the world's fastest large-scale IP telephony roll-out programs.

5.2 The IP phone trial

Using VocalTec equipment (both hardware and software), China Telecom was the first of the three carriers to launch services on April 28, 1999 in an initial roll-out comprising 25 cities (Table 3). The roll-out was fairly small in financial terms, with the US$2million project utilizing 100 E1 connections.[19] However, the network was rated as one of the fastest IP telephony roll-outs to date, taking just two months. To build a

[19] E1 refers to European (digital signal level) 1 and has a capacity of 2.048 Mbps; while a T1 carries 1.544 Mbps

circuit-switched network of comparable size and capacity would have taken 1.5 years and cost three times the amount.[20]

Yang Xianzu, China Unicom's Chairman and President (until early-1999 Yang an MII Vice Minister) stated that, in 1999, Unicom would, by contrast, invest Rmb2 billion (US$241 million) to complete its IP telephony trial in 12 test cities and build up a data and computer network covering as many as 90 additional cities. Unicom's 12-city trial network reached full capacity in only 80 days instead of the predicted six months.

During the trial, the three companies issued IP telephony 'phone cards with face values of Rmb50, Rmb100, Rmb200, Rmb300, and Rmb500. The cards contained a unique account number for use from any phone from within the service areas of the respective companies (see Table 4). (The cards were not interchangeable.) To access the service, a user entered the local access number (a POP) of the vendor, account number, area code, and phone number. The phone charges were then deducted from the account.

The MII's initial pricing structure for the trial showed the potential consumer appeal of IP telephony (see Table 4).[21] During the initial trial stage, domestic long distance charges were levied at Rmb0.30 (US$0.04) per minute, while international long distance calls were charged at Rmb4.8 (US$0.58) per minute. Long distance calls to Hong Kong, Macau and Taiwan were charged in two ways. When calling from mainland China (except Shenzhen) to Hong Kong, from mainland China (except Zhongshan and Zhuhai) to Macau, or from mainland China to Taiwan, the charge was Rmb2.5 (US$0.30) per minute. When calling from Shenzhen to Hong Kong, or from Zhongshan or Zhuhai to Macau, the charges were Rmb1.5 (US$0.18) per minute. In November 1999, China Telecom expanded the number of countries to which its IP telephone cards provide service from 16 to 50.[22]

Several technical issues appeared early in the trial, but were effectively solved. First, there was limited access capability (in cities where the service was available), so that certain customers had to dial local long distance for access, thereby incurring higher charges. This problem was dealt with by the provision of national access numbers. Second, all three networks experienced serious traffic congestion and dropped calls as they failed to cope with the levels of traffic – particularly during peak periods. As a result of the traffic load and slow response time, a high per centage of calls were not picked up on the first attempt. The gateway

Table 3: Testing IP

Cities selected for IP telephony trial, primary equipment suppliers, and local access number, 1999.

Company	*Primary equipment supplier*[23]	*Local access number*	*Trial cities*
China Telecom	VocalTec	17900	Beijing; Changchun; Changsha; Chengdu; Chongqing; Dalian; Dongguan; Fuzhou; Guangzhou; Hangzhou; Harbin; Jinan; Kunming; Nanjing; Qingdao; Shanghai; Shenyang; Shenzhen; Suzhou; Tianjin; Wuhan; Xiamen; Xian; Zhengzhou; Zhuhai
Unicom	Cisco	17910	Beijing ; Chengdu; Chongqing; Dalian; Fuzhou; Guangzhou; Hangzhou; Nanjing; Shanghai; Shenzhen; Tianjin; Xiamen
Ji Tong	Clarent	17920	Beijing; Dalian; Dongguan; Guangzhou; Hangzhou; Ningbo; Qingdao; Shanghai; Shenzhen; Tianjin; Wuhan; Xiamen

Source: Ministry of Information Industry, China

[20] See the Yankee Group report: "Internet Telephony in the Asia-Pacific Region," *Asia-Pacific Communications,* Vol.7, No.12, August 1999.

[21] The price pressure from IP telephony on traditional phone services had already been made clear when, on February 28 the MII announced major price reductions in existing phone service and installation fees.

[22] See *Tongxin Chanye Bao* (Communications Weekly), November 17. The 34 added countries were: Albania, Algeria, Argentina, Australia, Austria, Belgium, Brazil, Colombia, Denmark, Egypt, Finland, Greece, Hungary, Iceland, India, Indonesia, Korea, Malaysia, Mexico, New Zealand, Norway, the Philippines, Poland, Portugal, Romania, Singapore, Slovakia, Sweden, South Africa, Spain, Thailand, Turkey, the Ukraine and the United Kingdom.

[23] In October 1999, China Telecom announced a deal with Clarent for a new dedicated IP-based "Economy International Direct Dial (IDD)" phone service. The prepaid calling card is called *YiTong* in Chinese, which means "will provide even more prosperous communication over time."

Table 4: Falling prices

MII's IP telephony prices compared vs. non-IP prices.

Services	*Telephony (non-IP) tariffs*	*IP telephony tariffs*
Domestic long distance	0.9-1.1 Rmb/min	0.3 Rmb/min (US$.04)
Hong Kong, Macau & Taiwan[24]	5 Rmb/min	2.55 Rmb/min
International	12-15 Rmb/min	4.8 Rmb/min (US$.58)

Source: Ministry of Information Industry, China

for Beijing Telecom, for example, had to go through a capacity upgrade only weeks after the service was introduced. Finally, voice quality was poor because of deep compression, traffic load, and possibly lost packets. These problems were alleviated after network expansion and new management tools were implemented by all three service providers. Assessing trial results The MII announced at the outset of the trial that how and who they would subsequently license to provide IP telephony services would depend on the results of the trial. The results of the trial, however, seemed to depend on who was asked.

5.3 Assessing Trial results

China Telecom went out of its way to play down both the impact of the trial upon the market and the demand for such services. Two months into the trial, company spokesmen announced that Internet Protocol telephony services had been a disappointment in China: "Long distance and international IP phone trials have failed to attract the anticipated response on the local market."[25] According to a report from the Beijing Telecom Administration, the total business volume of international phone services had decreased 5.67 per cent in the first half of the year, while the total business volume of domestic long distance calls had increased "only" 25.6 per cent. The report showed that customers preferred to use IP phone cards for domestic long distance calls, with the number of domestic long distance calls made via the Internet 3.17 times greater than that of international calls. The "unsuccessful trial" was attributed to limited market demand for international phone calls and the relatively small area where the trial was held.

However, this data was contradicted by both the evidence and the tone from the other IP telephony operators. While international calls accounted for less than 50 per cent of Unicom's IP business, by November 1999 the carrier – which had not previously been licensed to carry international voice traffic – was already generating "several million minutes" in monthly traffic between China and the US. Between June and November, Unicom had acquired nearly 700,000 customers through its 12-city trial. Another important outcome of the trial is that Unicom's 12-city trial network reached full capacity in only 80 days instead of the 180 days predicted at the start of the operations. Company representatives interviewed were predicting that 10 per cent of international phone calls from China would be carried over the Internet by 2000 and 35 per cent by 2003.[26]

Indeed, using IP telephony as a lever to liberalize the international services market in China has prompted aggressive roll-out plans. Unicom, for example, planned to have IP telephony gateways in 250 of China's biggest cities by the end of 2000.[27] It publicly aspires to a 50 per cent share of China's IDD traffic by 2003. In the past, Unicom has more often than not failed to achieve its own ambitious sales targets. With a customer base in excess of two million cellular phone subscribers, Unicom did, however, stand to benefit enormously given that it had previously collected no revenue for outgoing international calls. Initially though, Unicom was required to carry IP telephony traffic over China Telecom's digital data network until

[24] Except HK-Shenzhen & Macau-Zhuhai, Macau-Zhongshan (see text).

[25] Quoted in ChinaByte (www.chinabyte.com), August 11.

[26] The Yankee Group has predicted that upwards of one-third of all China's international traffic minutes could be carried over IP telephony services by 2002. See the Yankee Group report: "Internet Telephony in the Asia-Pacific Region," *Asia-Pacific Communications*, Vol.7, No.12, August 1999.

[27] In late-1998, China gave state-owned Unicom, its second-largest telecommunications carrier, permission to become the country's fifth Internet service provider.

its own US$200 million IP backbone (built in association with strategic supplier Cisco) was completed. While Unicom had the additional option of using the MoR's fiber backbone, this had proved a contentious issue over the previous five years, due to disputes over revenue-sharing arrangements and control of the network.

Similarly, Jitong portrayed the trial as an unmitigated success. At Jitong's sales offices in Shanghai more than 2,000 people lined up to buy the IP telephony cards when they went on sale on May 19 – some of them having lined up at 2:00 a.m. Jitong employed a small army of people through 15 sales agencies to push their cards and in their first month of service was able to sell some 50,000 in just five cities. From June to August, 1999, the total revenue from sales of IP phone cards was estimated at US$35 million, with an annual potential of US$150-200 million (assuming the service is expanded). And yet, compared with Jitong's strong IP sales force, China Telecom's IP cards sales were like "the shy blossom of roses," according to one newspaper editorial. China Telecom set up only one sales counter at the Beijing Long distance Telephone Exchange Bureau, and issued only a very limited number of IP cards. While the cards sold out quickly, the difference in emphasis and effect was telling.[28]

5.4 China Netcom

The fourth carrier to be licensed by the government to trial IP telephony services was a new [state] company, China International Network Telecommunications Co. Ltd. (China Netcom). Netcom, in and of itself, provides an interesting study of where the IP telephony market may be headed in China and what the government's designs may be.

In 1998, a number of Chinese economists in the State Development & Planning Commission (SDPC) began calling for the establishment of a new telecommunication firm incorporating the existing network and equipment of the railway industry. Plans for the MoR's network had been considered by both senior Chinese leaders and the leaders of the ministry for several years (see "Future Transportation"). With some 35,000 kilometers of fibre already laid, the MoR had the largest high-speed network outside of the MII.[29] (It was the MoR's spare network capacity which was the initial *conceptual* basis for domestic competitor Unicom back in 1993. However, the MPT managed to thwart Unicom's fixed-line ambitions and Unicom became effectively a 'cellco'.)

One part of the motivation for the plan for Netcom was to foster competition in the domestic telecommunications market, as earlier reforms and the existing structure had not created an "effective competition mechanism". Another part was the emergence of the Internet and the market for broadband communications.

As a result, a high-speed Internet project, known formally as the Broadband Internet Protocol Network Model Project, was ratified by the SDPC under the State Council. This was to be a broadband, high-speed network designed and built for Internet Protocol (IP) services. In the first instance, the project involved the Chinese Academy of Sciences (CAS), the Ministry of Railways (MoR), the State Administration of Radio, Film, and Television (SARFT) and the Shanghai Municipal People's Government.[30] Each of the four participants had an equal stake in the company, capitalized at US$50 million.[31] The initial plan was to build a backbone network linking 15 major cities on the eastern seaboard of China, including Beijing, Shanghai, and Guangzhou.[32] The company designated to run the project was Netcom.

28 Even with limited attention to the market, the Beijing Telecom office had over 500 people a day sign up for telephone service during the first two days following the announcement. Previously, the office handled about 20 telephone subscriptions a day.

29 China Telecom's fiber optic network runs to approximately 200,000km.

30 As one commentator put it, "CAS provides the 'brains', MoR the trunk lines, SARFT the access lines, and the Shanghai city government its internet gateway called Shanghai Infoport."

31 In addition to the original investment, the Ministry of Finance issued Rmb200 million in 10-year bonds on behalf of the company.

32 The eldest son of Chinese President, Jiang Zemin, is linked to the project unofficially through his role as IT supervisor to the Shanghai city's government. China Netcom's CEO is Edward Tian, a 37 year old national who was educated in the US at Texas Tech University.

Box 3: Future Transportation with the Ministry of Railways

The Ministry of Railways' (MoR) telecommunications network, by far the largest and most advanced of the 'private' telecom systems in China, is formidable. This is because the MoR has long occupied a central strategic position in the nation's infrastructure development plan. In 1985, the MOR received the first of a series of World Bank loans dedicated to building a reliable internal ('private') communications network. (This was a US$259 million loan for route electrification along the Chongqing-Guiyang line.) By 1986, the system accounted for 5-12 per cent of the total estimated active local circuits installed in China, with 250,000 line subscribers nationwide. By the end of 1993, the MoR was estimated to be in control of some 80,000 exchange lines and 500,000 mainlines.

By 1998, the Ministry was actively exploring the creation of multi-lateral Internet peering sites in China to improve network efficiency and the co-location of Web servers, and the building of an international exchange so as to enable pan-Asian traffic exchange and reduce dependence on costly international connectivity. As it did so, the MoR (in a bid to supplement its revenues by moving into the lucrative telecommunications sector) was eyeing the growing enterprise market – estimated to encompass 5-10 per cent of China's population. Highlighting the less-than-comprehensive reach of China's telecommunications administration, the MoR had also begun talking with several of the more geographically remote and economically disadvantaged PTAs to build independent IP networks and e-commerce services.

In addition then to the resources that it had provided separately to Netcom and Unicom, the MoR also commissioned Hong Kong systems integrator Computer and Technologies Holdings to build a US$3 million voice over IP network for the ministry itself. According to the company, the MoR plans to offer the service to 36 cities throughout China once it is licensed. The internal VoIP network will provide dial-up links between phones, faxes and PCs. The network's E1 network backbone will span 29 nodes with Cisco 7500 routers installed at the ministry's support center in Beijing, as well as in Shanghai, Guangzhou, Lanzhou, Chengdu, Zhengzhou, and Shenyang. The network will be capable of supporting up to one million customers initially.

Source: Computer & Technologies Holdings

Netcom's 20Gbps IP/DWDM (dense wavelength division multiplexing) fiber-optic network backbone will cover 6,000 miles and 15 Chinese cities and be ready for operation by late-2000. With one of the highest-speed backbones in the world, Netcom aims to link corporate and government buildings in major cities directly to the IP backbone, providing 2-10 Mbps to the desktop – enough to download video in real time. In addition to focusing on the corporate market, Netcom is pursuing the opportunity to create a niche as a wholesaler of broadband network capacity. Netcom began trials of IP telephony services across its 15 cities in October 1999.[33]

On 30 March 2000, China's Ministry of Information Industry (MII) granted licenses to China Telecom, China Unicom, Jitong Communications and China Netcom to perform commercial operations of IP telephony services. Officials from the Telecommunications Administration Bureau of MII informed that another license is reserved for China Mobile, which will provide IP phone service by using the wireless application protocol (WAP). China Mobile will obtain its operating license once it completes the application process, which may take another month.

6 Going forward: The growth of the China IP market

The MII is expected to extend IP phone services across the country and to grant licenses to a number of other groups such as the Ministry of Railways, Shenzhen China Motion Company, a number of the PTAs (either under their own domains or, more likely, under a sub-domain of China Telecom) and perhaps the State Administration of Radio Film and TV. Government estimates already suggest that the IP telephony market will amount to some Rmb100 billion (US$12.2 billion) by the year 2002.

With the national teledensity still only 11.2 per cent (as of March 1999) and more than 50 per cent of villages still without basic communications access, one suggestion for the government's rather dramatic push is that IP telephony may be the low-cost solution to vastly increasing universal access. Another suggestion is

[33] One of the first commercial offerings from Netcom, in late-1999, was pre-paid VoIP telephony services to the Chinese *ex-pat* community, estimated at some 50 million people, in the US and Japan. The service is to be made available via local resellers. On-demand content services will also be offered.

that, as part of its 'buy local' push, the government believes that it cannot afford to fall behind in the adoption of new technologies.

Indeed, there is a general consensus in the Chinese telecommunications administration that IP telephony based on packet-switching technology will eventually replace the traditional telephone technology. To this end, the government has established an IP telephony standards group, consisting of 27 domestic telecommunications research institutes and equipment manufacturers to:

- Establish a set of technology standards for IP telephony in China;
- Support and facilitate interconnection among Chinese IP gateways;
- Evaluate the four existing test networks (China Telecom, China Unicom, Jitong and Netcom);
- Support deployment of domestic IP products; and
- Work on laws and regulations relating to IP telephony.

Localization has already become an issue in China's IP telephony program, following complaints from vendors that they have been shut out from the market during the trial period. Following patterns established with a previous generation of basic telecom equipment such as switches, the Chinese are now being offered discounts of up to 60 per cent by foreign vendors, keen to get in at the ground level of what is obviously going to be an extensive roll-out. VocalTec, for example, offered a basic platform (not including billing) covering about 20 million subscribers to China Mobile (the newly separated arm of China Telecom) for US$500,000. CMC responded that this was "too expensive"!

Unicom and Jitong have both planned to roll out post-trial networks of some 300 E1 lines. China Telecom, on the other hand, is looking to build a network in the next phase which encompasses 1000 E1 lines – perhaps the largest roll-out in the world. And yet, as of Friday December 17, 1999, the Ministry of Information Industry had once again mandated lower international call tariffs: dropping the per minute price for calls on its 16 major routes to Rmb 4.8/minute – or the same price as IP phone tariffs; and for off-peak times, tariffs were dropped to Rmb 2.9/minute – 40 per cent cheaper than comparable IP calls. Clearly, China Telecom is not yet ready to promote IP telephony, but nor is it ready to give away the market, by ignoring it.

Box 4: Equipment production and national champions

If Chinese telecommunications equipment vendors (such as Huawei and Zhongxing) were to develop the necessary production lines to become national champions, let alone world class vendors, then China Telecom could not simply shut down the market. However, nor could China's protected telecommunications services and Internet market simply be opened to international competition – particularly if the domestic vendors were to be given the chance to catch the leading foreign equipment manufacturers in R&D. Thus, the government offered a limited number of licenses to leading domestic telecoms concerns, and at the same time, encouraged China Telecom to undertake a dramatic build-out program, so as to maintain its dominant position.

From the viewpoint of the state in China, the challenge continued to be to steer regulatory reforms in the direction of industrial and technological modernization without weakening China's bargaining position with the world's leading multinational IT companies. At root, that bargaining position is to demand a commitment to technology transfer into China. The multinationals will be hoping for a growing convergence of interests between themselves and Chinese enterprise partners, especially where research and development, intellectual property rights, licensing and franchising issues are involved. Nevertheless, IP telephony has offered a valuable window of opportunity in China's lucrative toll services market.

7 Conclusion

China's official licensing and commencement of IP telephony was expected to begin sometime early in 2000. However, for all intents and purposes, the IP telephony business had already been launched quite successfully in China by the end of 1999, with the four trial licensees having committed resources, developed networks, and begun to market their services – with varying degrees of aggressiveness.

In quite a dramatic reversal of attitude, the government had gone from trying to marginalize IP services and alternative network solutions, to actively licensing and promoting such options, and then to sponsoring the incumbent telecom operator, China Telecom, to build the largest such network in the world. In the space of less than a year, IP telephony had moved from *de facto* illegal status in China, to being at the center of telecommunications development, and prospectively one of the world's largest markets.

The government's turnaround has not, however, simply reflected a wholehearted intent to respond to and drive nascent market demand. Rather, it can be seen, on the one hand, to reflect the MII's concern over lost revenues and China Telecom's desire to dominate all major telecommunication sectors, and on the other, to reflect the government's desire to promote sustained economic development and technological growth. Through focusing on the emergence of this new market sector, China Telecom has also begun to refocus the roll-out of its networks on an advanced 'next-generation' data communications platform.

To comprehend the government's push for an IP telephony network alternative the various contending forces of Internet development in China need to be put into context. By 1995, China already had an Internet 'grey market'. The imminent arrival of commercial Internet access, its convergence with existing data traffic, its perceived importance to sustained economic development, along with the types of content that were being transmitted, motivated the government to commercialize access to the Internet. It also motivated the Ministry of Posts and Telecommunications to refocus its attention on the Internet, having underestimated its early significance. Within two years the MPT had very successfully achieved its goal of market dominance. But its implementation of a centralized network administration meant that by 1998 there was once again a 'grey market' in the provision of various Net-based services – certain networks were successfully bypassing China Telecom's ATM network – and if left unanswered, these services would eventually challenge China Telecom's dominant market position.

Perhaps not surprisingly then, the outside observer can perceive several contending objectives within the government's IP telephony initiative. The first is the contradiction between the MII's concerns over lost revenues and China Telecom's ambition to dominate the market. To grab market share with a new service offering in a competitive field, China Telecom has had to price and market its service competitively, hence prices have been driven down – at precisely the time the government is looking for the necessary investment to roll out a new infrastructure platform. Given that telecommunications in China was, by 1999, the second largest contributor to state coffers (after the tobacco industry), many in the government were loathe to cannibalize this revenue stream, by opening to the doors to such competitive offerings as IP telephony.

The second, and related, challenge was the trade-off between control and market growth. Uptake of the new IP telephony service required a wide roll-out and convenient access. But, following on the heels of concerns related to the Internet and to information access, there were again voices in the government arguing for a slower, more orderly development of the market, rather than a chaotic, market-driven approach. Equally, however, with a teledensity of only 11.2 per cent, IP telephony was seen by certain sections within the government as a possible low-price means to rapidly increase China's universal access to basic communications.

Third, China's highly centralized ATM network infrastructure was already stressed, and it was increasingly recognized that the squeeze on cheap access and high-speed connectivity would result in China being poorly positioned to participate in international e-commerce. China's single network structure limited availability and escalated the prices for bandwidth – marketed both as leased data circuits to ISPs and as plain old telephone service to enterprises and consumers – as well as for Internet access.

Finally, there was the issue of domestic market development in the face of increased international competition. Government estimates in mid-1999 suggested that the IP telephony market could amount to Rmb100 billion (US$12.5 billion) by the year 2002 – for both equipment and services. But while China was

producing much of its own basic telecommunications equipment by 1999, the equipment required for broadband and IP-based infrastructure was new and comprised leading edge technology. Telecommunication officials in China were therefore quite concerned that they would once again be forced to rely on foreign vendors. Therefore, in a bid to drive down the prices charged by foreign vendors and to stimulate domestic production, the government's strategy was to initiate *and* centralize domestic demand. This coordinated approach suggested countering China Telecom's built-in dominance of the market by opening it to some degree of "controlled" competition. The government's solution was to mimic its earlier success in market 'liberalization' by introducing a limited competitor as a pace-setting 'hare' for China Telecom to chase – the aim being to promote domestic development while simultaneously maintaining overall market control.

Ironically, by the start of 2000, with the government ready to open the market to new licensees, many inside of the three existing competitors – Unicom, Jitong and Netcom – already suspected that the basic business proposition for IP telephony was finished. China Telecom's price revisions meant that all three were looking for replacement revenue streams with long-term growth potential. Nobody doubted the importance of IP services, nor that voice traffic in China would increasingly be IP traffic. However, IP telephony as a stand-alone business proposition had rapidly become questionable.

APPENDIX 1:
Telecommunications in China

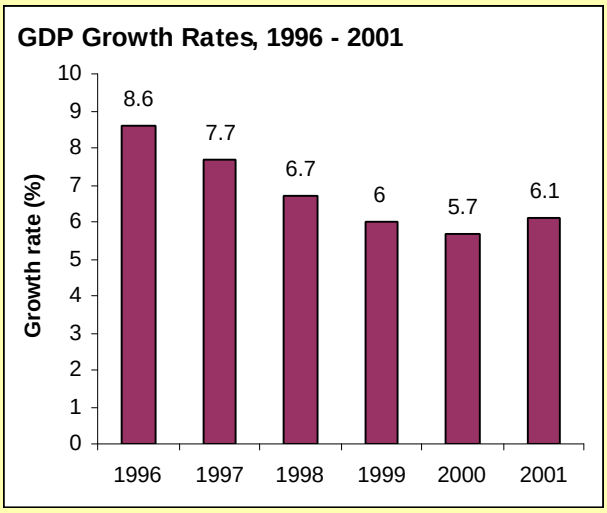
China's socioeconomic profile

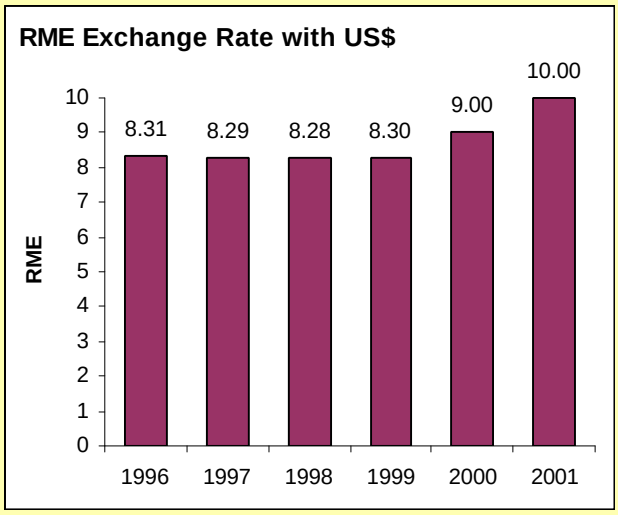
Having grown extraordinarily rapidly through the late 1980s and early 1990s (see Box 5 "China's Economic Reforms"), China's economy has been slowly stalling for the last several years. Official GDP figures are still strongly positive, but they are slowing (Figure 2, left side), and the high growth figures mask the growth of the overall society. Chinese Vice Premier (and 'economic czar'), Zhu Rongji, has consistently said that the government needs to maintain GDP growth in excess of six per cent per annum if the country is to enjoy real growth.

The main focus for re-igniting GDP growth has been to try and boost domestic consumption. The government has slashed interest rates and promised civil servants big wage increases. The central bank has increased loans for consumers to buy homes, cars and appliances, and has made attempts to inflate the stock market. The government is also considering a 20 per cent tax on savings in a bid to spur spending. If none of this works it is widely expected that China will devalue its currency (Figure 2, right side).

At the industrial level, the State Development and Planning Commission (SDPC) has been pushing for the government to open up "non-essential industry sectors" to foreign investment. In the first instance, this initiative has followed on from calls for a debt-for-equity swap, allowing foreign investors to purchase the equity of state enterprises. (A related idea being considered is to transform state corporations into shareholding companies. This is a route actively being pursued in the telecoms and high technology sectors.) These developments have gained considerable momentum from the November 1999 deal struck between China and the US over China's pending WTO accession. Accession to the WTO is expected to bring a wave of new foreign investment into the country, lifting spending and promoting development. It will, however, also expose domestic industry to much greater competition than has previously been the case.

Figure 2: China's Economic Indicators





Source: Pyramid Research

Box 5: China's Economic Reforms

China Opens the Door to economic development and information technology

Before economic reform began in 1978, China pursued a policy of self-reliance. Its economy was one of the world's most isolated, and represented a tiny share of world trade. Domestic industry was protected from foreign competition by direct controls on imports and investment. Foreign trade and currency exchange were under the monopolistic control of a central government ministry, which used an overvalued currency to support the import-substitution policies of the central plan. Only the central foreign trade ministry and its twelve trade corporations were permitted to engage in international trading activities.

In December 1978, the Central Committee of the Chinese Communist Party (CCP) accepted Deng Xiaoping's proposals for reforming China's economic structure. The objectives of the reform were to improve economic performance and raise the living standards of the people. Among Deng's policies, were included two key reforms. One freed farmers from the constraints of the commune system by allowing peasants to farm on a family basis. The other was the initiation of the "Open-Door Policy", which aimed to attract foreign investment and trade, and to begin to modernize China's economic industrial structure through the import of Western science and technology.

In March 1998, the Ninth National People's Congress (NPC) ratified the most wide-ranging restructuring of China's state bureaucracy since the end of the Cultural Revolution. The total number of ministry-level bodies was cut from 40 to 29, and their total staff numbers slashed by 50 per cent to just over 20,000. This was meant to be just the beginning, with the eventual goal being to reduce the total number of civil servants employed across the country by 50 per cent, which would mean shedding some four million workers. The goal of restructuring was two-fold. First, the central government needed to cut costs: the total state budget for administrative expenditure had grown from around five per cent of all government expenditure in 1978 to about 15 per cent by 1998. Second, and far more important, the restructuring was aimed at changing the function of government, bringing to an end its involvement in enterprise management.

Nearly all of the ministries which were disbanded in the restructuring were industrial ministries, folded into either the State Economic and Trade Commission or the newly created Ministry of Information Industry (MII). This administrative and ministerial disbanding reflected the overall goal of producing a government focused on the *macro*-economic environment and on setting policy. To do so, ministries had to free themselves of vested interests, especially enterprises which they had felt obliged to protect and nurture. Hence the abolition of the majority of industrial ministries and the order given to the MII to separate itself from its highly successful corporate entity, China Telecom.

Telecommunications reform and restructuring

As part of the government's restructuring efforts, the Ministry of Information Industry (MII) was created in March 1998, absorbing the Ministry of Posts & Telecommunications (MPT), the Ministry of Electronics Industry (MEI) and the Ministry of Radio, Film and Television (MRFT) together with others: on the policy side the State Radio Regulation Commission (SRRC) was absorbed; on the industry side, the satellite administrations of the China National Aerospace Industry Corporation and Aviation Industries of China were included. The new 'super ministry' was created as part of Premier Zhu Rongji's efforts to streamline and modernise the Chinese bureaucracy through the closure, consolidation and merger of various ministries. At the core of the new ministry was the old MPT which had exercised overall responsibility for policy, planning and development of the national public switched telecommunications network. The MPT had also built, managed and operated domestic long distance and international services through the Directorate-General of Telecommunications (DGT) until the DGT was officially spun-off as an independent body in 1994 and incorporated as China Telecom in 1995.

Within the new ministry structure, former MPT officials claimed eight of the 13 directorates. These included leadership of the most politically sensitive areas of the MII's activities: policy, planning, regulation, economics, wireless administration, personnel, and foreign affairs. Furthermore, the governmental functions of regulating program content and network development, previously controlled by the former MRFT, the Aerospace Industry Corporation and the Aviation Industry Corporation, were all transferred to the MII. The MII also took control of the newly established State Postal Bureau. The State Council Steering Committee of National Information Infrastructure, a non-standing governmental body, was dissolved and incorporated into the MII, as was the State Radio Regulatory Commission.

Box 6: Ministry of Information Industry (MII)

The MII has 13 functional departments and 320 staff, including one minister, four vice-ministers and forty-five directors. The 13 functional departments are:

- *General Office*: Daily operation of the Ministry office; public relations, finance and management of State assets.
- *Department of Policy and Law*: Research and formulation of general policies and major plans for reform; laws, administrative regulations and enforcement; research on policies regarding Hong Kong SAR, Macau & Taiwan.
- *Department of Planning*: Research and formulation of development strategy as well as medium and long-term plans for the development of electronics, telecoms, and software industries.
- *Department of Science and Technology*: Monitoring trends in international information technology; standards setting for telecoms and radio/TV network transmission; numbering; co-ordinating research and development; electronics quality control.
- *Department of Economic Reform and Operations*: Operations research and planning enterprise restructuring, including the formation of large groups; statistics, forecasting and market analysis; macroeconomic management of electronic information products and technology imports.
- *Telecommunications Administration Bureau*: Planning telecoms development and 'fair competition'; licensing; service quality and pricing; interconnection, inter-operability and account settlements between networks; numbering plan; domain name services; co-ordination of private telecom networks of government departments; international gateway management; security issues.
- *Department of Economic Regulation and Telecommunication Settlement*: Adjustment and account settlement implementing policies and laws on the management of state-owned assets and the accounting system; tariffs, billing and subsidies to service and postal sectors.
- *Department of Electronic Information Products Management*: Research and formulation of medium and long-term development plans, policies and measures for electronic industry and software industry; co-ordinating development of basic equipment and microelectronics products.
- *Bureau of Military Electronics Industry*: Management of military electronic industry
- *Department of Information Promotion (State Information Office)*: Research and formulation of plans for the promotion of an information-based national economy; providing assistance to major informatization projects; organising, co-ordinating and promoting the development of the software industry; policy and research for the development and co-ordinated utilisation of information resources; information systems security; public education on information development.
- *Radio Regulation Bureau (State Radio Office)*: Spectrum planning, control of interference, management of radio stations.
- *Department of Foreign Affairs*: Organising participation in international organisations and events.
- *Personnel Department*: Human resources management, training, and wage setting.

Functions shed: (a) postal services taken over by the State Postal Services Bureau; (b) telecommunications trunklines and local networks devolved to operators; (c) management of industrial and materials enterprises and buildings.

Functions acquired: The administrative functions of (a) the former State Radio Administrative Commission and its General Office; (b) the former State Leading Group of Information Industry and its General Office; (d) the former Ministry of Radio, Film and Television in the overall planning of radio and television transmission network (including cable TV network), industrial management, and organisation and formulation of technological system and standards of radio and television transmission network; (e) the former Space Industry Corporation in drawing up development plans and technological standards for telecommunication and broadcasting satellite networks. It also acquired the functions of: (a) the former Commission of Science, Technology, and Industry for National Defence in co-ordinating the satellite orbit position domestically; (b) the former State Planning Commission in the management of public telecommunication service charge and formulation of basic telecommunication service charged standard

Source: MII

As a result, the MII drafted the plan, policy and regulation for the entire information industrial sector, thus encompassing: the policy power previously possessed by the MPT and the MEI; the network regulatory power over program content, broadcasting networks and private satellite networks; the overall planning of all types of public and private communications networks; the reasonable allocation of communications resources (including frequency allocation and land rights); and the guarantee of information security. A statement from the government identified the major responsibilities of the MII as:

- Revitalizing the electronic and information technology manufacturing sector, the telecommunications sector and the software sector;
- Promoting the informatisation of the national economy and social services;
- Making plans, policies and regulations for the information industry;
- Conducting overall planning and regulation for the national backbone communications networks (including both local and long distance telecommunications networks), the radio and television broadcasting networks (including both cable and non-cable TV networks) as well as the private networks of the military and other sectors;
- Reasonably allocating resources to avoid duplicative construction and safeguarding information security.

Liberalization of basic services

However, even under a more market-oriented administration words in China still often take on a meaning rather different from that which they are given elsewhere. Within the Chinese telecommunications structure, the word *liberalization* continues to mean something quite different from that which it implies in the West: the throwing open of the sector to free competition between private players. Change therefore needs to be put in the context of the Chinese socialist state, which still regards direct running of the economy as one of its primary goals, looking to maximize economic returns for the country as a whole, rather than for one particular sector. With telecoms having performed outstandingly through the 1990s, any initiatives undertaken still need to be understood within a framework of ensuring that the benefits of success would be passed on to other parts of the economy.

Local Services

The MII and China Telecom guard the basic services market so jealously that the domestic competitor, China Unicom, has faced significant difficulty in breaking into the basic services market, despite its state-sanctioned license. In December 1993, the State Council authorized the introduction of competition by approving the establishment of Unicom – a circuitous route to liberalization which left the new carrier with the right to exist, but with no regulatory framework to protect or defend it. In May 1997, the State Council gave approval to Unicom to operate fixed telephone networks in the cities of Tianjin, Chongqing and throughout Sichuan province. These locations represented the first planned roll-out of fixed network service by Unicom, which planned to deploy wireless local loop for local connection and offer long distance services.[34]

But without an impartial regulatory authority, Unicom was stranded – its first fixed line network was opened in Tianjin in July 1997 to much fanfare but did not go into commercial operation due to interconnection problems until 1999. With the MII and its local bureaus, the PTAs, controlling access to the PSTN, Unicom also had its entry into the cellular market impeded. Without fast cellular cash, this further stalled its bid to develop fixed networks.

Although China Telecom and China Unicom were technically the only licensed providers of local telecom services, a number of large state-owned companies were essentially subcontracted by local PTBs to provide telecom services to their employees. These large *danwei*, or work units, were able to run large-scale private networks as part of the public network. The local PTB awarded 'branch' status to the *danwei*, which then took on responsibility for installation of access networks and telephones, provision of local service, revenue collection, and other local service-related activities.

Long Distance Services

In the long distance market China Telecom remained the sole provider, as the only other authorized operator, Unicom, continued to struggle in its roll-out of local fixed line networks. Unicom had hoped to use its fixed line telephone services as a platform to break into the more profitable long distance telephone services. With the regulations regarding the leasing of domestic circuits to third parties being vague and administered by the MII (and its PTAs) – this remained another anti-competitive hurdle for the new entrant. Thus, prior to the IP

[34] China Unicom planned to roll-out fixed line networks in 18 cities – chief among them Beijing, Guangzhou and Shijiazhuang.

telephony opportunity, building its own facilities was the only way that Unicom believed that it could mount an attack on the long distance market.[35]

International Services

By 1999, China Telecom was still the sole licensed provider of international services in China. Again, prior to the IP telephony opportunity, regulation had effectively walled China Telecom off from foreign threats to its international services market, and no domestic operator had the technical, financial or political capability to stage an entry bid. Unicom was not licensed to operate international services, and with its focus on building out its cellular networks and its struggles to roll out fixed line services, it was increasingly seen as being spread too thin to foray into the international services market as well.

Like operators around the world, China Telecom was not immune from increased competition from international call-back service providers whose arbitrage activities served to decrease international call service revenues. In response to the threat, the MPT had issued a blanket prohibition against such services in July 1995. DTA Document No. 12 [1995] specifically banned all resale of international telecommunication services and the use of call-back services. The prohibition was based on the long-standing policy of not allowing foreign operation of telecom services in China. Document No. 12 stated that international telecommunication services could only be centrally operated by China's posts and telecommunications departments, and that all other organizations and individuals were prohibited from the sale or re-sale of international telecommunication services. Thus, foreign companies advertising 'call-back' services or anyone using 'call-back' services were deemed to be in violation of the MPT's government-sanctioned regulations.

Liberalization of non-basic services

In August 1993, under growing pressure to both open the telecommunications market to competition and to develop the overall market more rapidly, the MPT decided to allow domestic non-MPT institutions to operate in nine "non-basic" or "value-added" telecom service sectors.[36] These liberalized business areas grew tremendously through the mid-1990s, driven by swelling demand and entrepreneurialism. The best example was paging services, which, by 1998, had over 3,000 non-MII service providers collectively commanding about 33 per cent of China's paging market. In reality, the market-opening directive merely formalized what had already been taking place in China's 'grey' market: hundreds of non-MII paging operators selling pagers to the public through back channels. The emergence of the Internet was expected to similarly open possibilities for players other than China Telecom and Unicom to enter the market.

Market development

By the end of 2000 China's public telecommunications switching capacity will have exceeded an astonishing 180 million circuits, making it the world's largest network. As Figure 3 shows, the growth rate of the PSTN remained in double-digits through the 1990s, with over 18,000 circuits installed during 1997 and another 22,000 in 1998.

By mid-1999, China had a subscriber base in excess of 100 million for fixed wireline and 38 million for cellular wireless, with an average teledensity of 30 for urban areas. In cities such as Beijing, Guangzhou and Shanghai teledensities around 40 or more could be expected. Nationwide teledensity was estimated to be approximately 11. This highlighted the MII's commitment to tackle the uneven pace of development between rural and urban areas, between the eastern and coastal regions (where most of the industrial and

[35] In September 1997, Unicom announced the formal establishment of its long distance company, Unicom Long Distance Telecommunications Corporation. The company, based in Beijing, is a joint venture company between China United Communication Company and Unicom Import and Export Liability. Unicom holds a 95 per cent share in the US$3.6 million venture, while Unicom Import and Export Liability takes up the remaining 5 per cent. Unicom Long Distance Telecommunications Corporation will construct a long distance communication network and undertake the development and transfer of communication network products. The company's activities will also include designing communication engineering, sales of electronic communication equipment, and technical training.

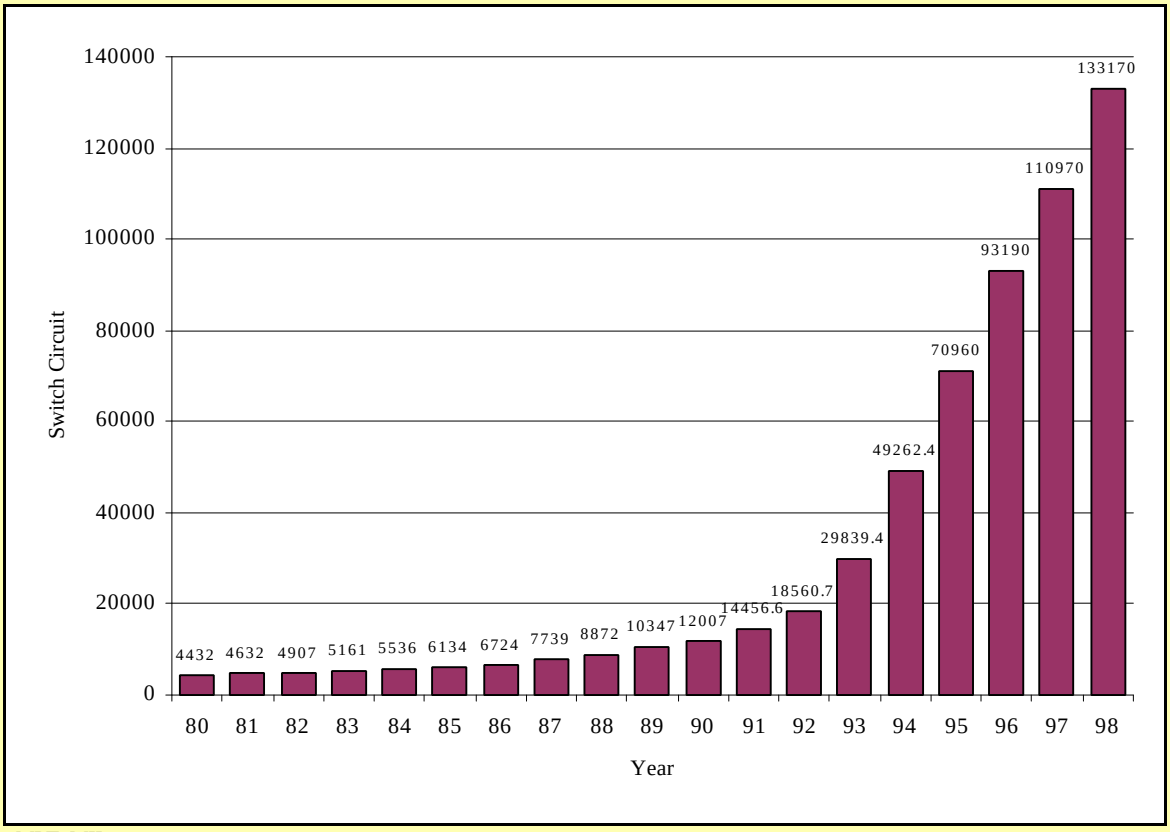
[36] The Provisional Arrangement for the Approval and Regulation of Decentralized Telecommunications Services.

urban centres are to be found), and between the landlocked central and western regions. Figure 4 shows the gradually narrowing gap in the shares of national telecommunication revenues coming from the three regions with the share of the Eastern region falling from 74 per cent to 66 per cent, the Middle region rising from 17 per cent to 23 per cent and the Western regional rising from eight per cent to 11 per cent.

By the late-1990s, digital switching in the local loop had become standard for all new installations for cities above the county level and "in almost all the urban and rural areas of China".[37] But even more significant was that more than 80 per cent of *all* subscribers were residential (in 1990 this figure was less than 30 per cent), and nine out of ten *new* subscribers were residential. Household penetration of telephone lines will have important consequences for the growth of the Internet and future interactive services to the home.

On the long distance and international side, the network was already almost 100 per cent digital in both switching and transmission. A large scale optical fibre cable trunk network with eight longitudinal and eight latitudinal lines crossing China was to be completed by 2000. Combined with satellite and digital microwave, this would treble the 1997 long distance capacity.[38] Forty-two per cent of telecom revenues accounted for by China Telecom, the PTAs and rural operators came from domestic long distance (31 per cent) and international traffic (11 per cent) and around 24 per cent from local traffic, with 27 per cent from cellular services (Figure 5). Data communications and paging services contributed around nearly two per cent and five per cent respectively.

Figure 3: Capacity of Office Exchanges in China, 1980-1998

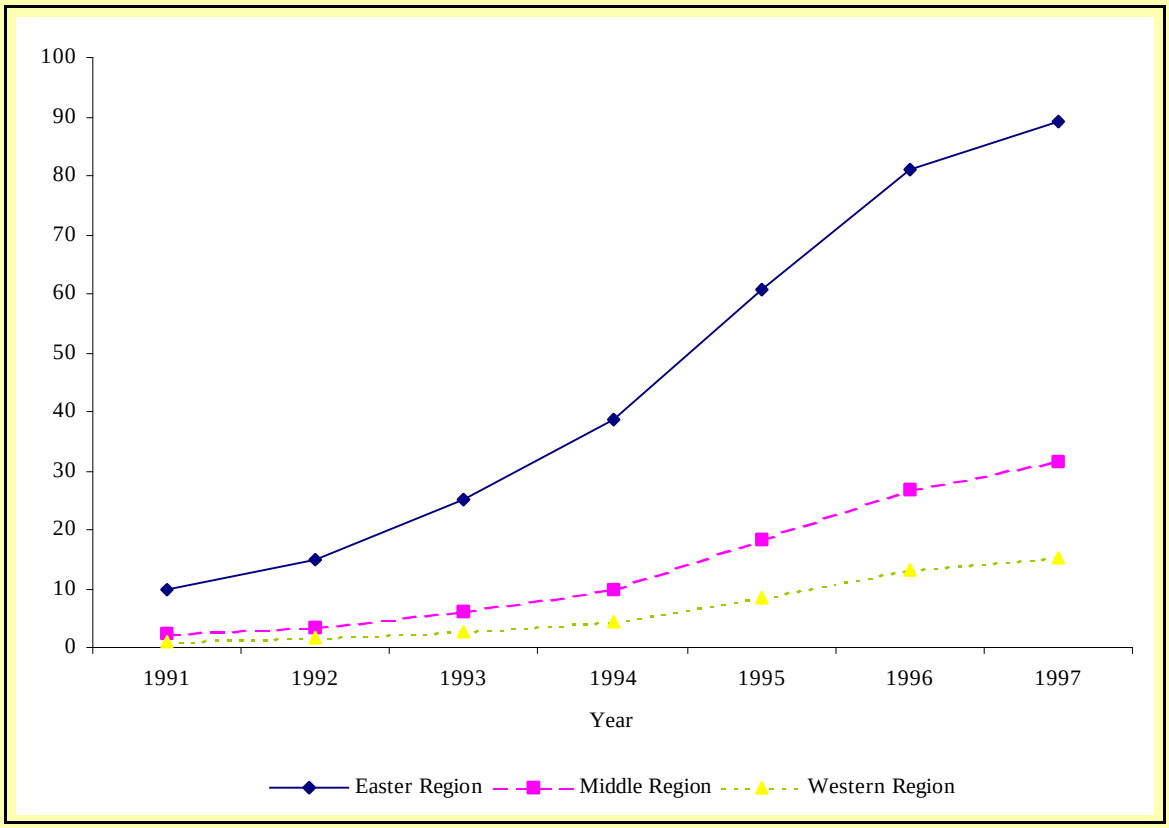


Source: MPT, MII

[37] MPT 1997 Annual Report, p.35

[38] 200,000 kilometers of optical cable will be supplemented with 140,000 kilometers of digital microwave and 40 large satellite earth stations.

Figure 4: Total Turnover of Telecommunication Services (Yuan Billion)



Source: MPT, MII

Investment

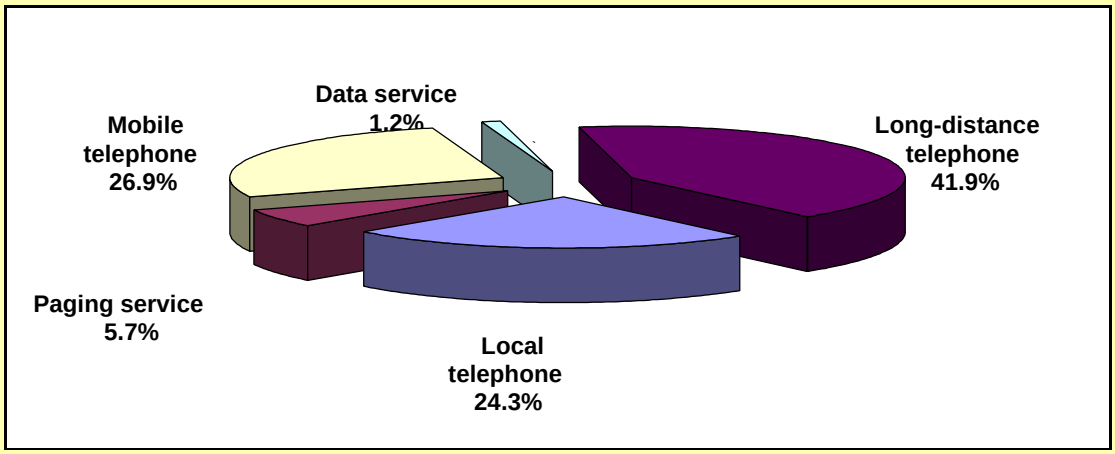
An important feature of China's build-out of its information infrastructure was the degree to which it had avoided dependency upon foreign direct investment. For example, around 80 per cent of investment in the telecommunications infrastructure came directly from revenue sources, of which 35 per cent came from installation or connection charges and 40 per cent from usage charges. Soft loans from multilateral agencies, foreign governments and international companies, and leaseback arrangements involving Chinese state enterprises also contributed. Overall, foreign investment has accounted for no more than 15 per cent of capital expenditure. The revenue growth of the MPT/MII during the 1990s illustrates the case (Table 5).

Table 5: MPT/MII Revenues

Year	Telecom Turnover (US$)
1992	$2.6 billion
1993	$4.3 billion
1994	$7 billion
1995	$11 billion
1996	$15 billion
1997	$19 billion
1998	$24 billion
2000	$34 billion (est)

Source: MPT Annual Reports

Figure 5: Revenue Shares in the Telecommunication Services Market, 1998



Source: Ministry of Information Industry

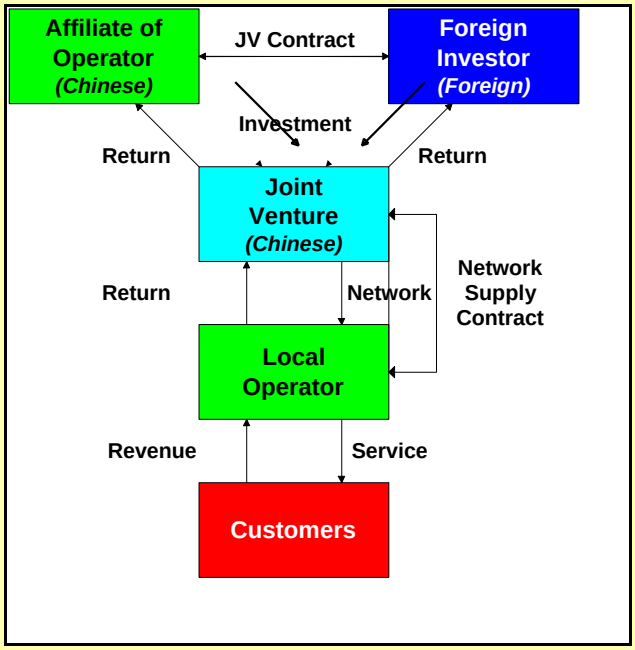
Access to finance is crucial for new entrants into China's information services markets. Unicom, for example, pioneered what was known as the China-China-Foreign (CCF) finance model whereby a foreign company partnered with a China company, usually in a joint venture which, in return for investment, equipment and telecoms management expertise received a revenue share from the network's operations which were run entirely by Unicom. This somewhat convoluted arrangement was designed to circumvent China's strict ban on foreign companies having any equity ownership or operational control over networks and network services (Figure 6).

The arrangement came under fire from the MII shortly after a report from the State Planning & Development Commission, the State Economic & Trade Commission and the Ministry of Finance (Document 405) raised concerns that foreign companies were getting too close to network operations through this back door method. It reaffirmed that foreign investors should not be allowed "to participate in the design, construction, operation and management of telecommunications networks."[39] State Council Document 98 was subsequently issued, with instructions to the MII to investigate existing Unicom contracts.[40]

[39] Ji Jiao Neng (18 March, 1998) No.405 General Office of the State Planning Commission, Beijing.

[40] *Asia-Pacific Telecoms Analyst*, 14 September 1998 (Financial Times Media & Telecoms) p.1. According to the *Financial Times* (30 October 1998), Minister Wu "said the main violation was that foreign partners have often derived revenue from installation fees. Such fees should be used to pay for infrastructure construction, especially in the more marginal areas of China." The issue of document 405 raised questions as to the prospects for foreign investment opportunities in China's burgeoning information infrastructure and services sectors, and serious doubts as to whether experiments with schemes for turning non-equity funding into equity-funding would be allowed. Restrictions on foreign entry into the film and television industry have been even more severe as these media are considered especially sensitive areas. Some foreign broadcasts, for example CNN, are permitted through satellite downlinking, mostly to hotels and large business establishments, while selective foreign TV programming and films are shown over China's free-to-air and cable networks and cinemas. In China's computer electronics industry entry through foreign joint ventures is more acceptable because it brings a certain level of technology transfer with it, but participation in China's online information services sector is basically governed by the same restrictions imposed upon telecommunications. The convergence of these sectors under the control of the MPT-dominated MII at first sight seems to consolidate these restrictive policies.

Figure 6: Typical 'CCF' Revenue Structure



Source: Ken Zita, "Will China Embrace Competition? Foreign Equity in Telecoms Hangs in the Balance." Proceedings of the Pacific Telecommunications Council, 1999.