Mobile Communication &
Mobile Internet in China

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SUMMARY

China became the number one country in the world in terms of mobile subscriber base as at July 2001 when its user size increased to 120.6 million. It is very impressive to see that mobile telephony grows so quickly in China on the one hand and WAP fails to pave its way in the market on the other. However, there have been some important changes taking place in the Chinese mobile Internet field. Based on the background of China's telecommunications take-off in the last decade, this paper discusses issues in the mobile sector, with a special focus on progress to date. This paper is a part result of my academic visit to Sweden from August to October 2001.

PREFACE AND ACKNOWLEDGEMENTS

This paper 'Mobile Communication and Mobile Internet in China' was written during my academic visit to Sweden from August to October 2001.

Sweden is one of the most advanced countries in the world in terms of mobile communication and China has now become the largest country in mobile user size. I began to pay attention to the mobile Internet or m-Internet early in 2000 when the leading companies in the sector, including Ericsson, were promoting the Wireless Application Protocol (WAP) technologies in China. Eighteen months have passed since then. It is very impressive to see that mobile telephony grows so quickly in China on the one hand and WAP fails to pave its way in the market on the other hand. This paper discusses issues of mobile communication and m-Internet based on the background of China's telecom take-off in last decade, and especially focuses on the progress of the mobile sector up to the present time.

I am very glad to have had this opportunity to do research as a Guest Professor in Sweden. Professor Jon Sigurdson, my host from the Stockholm School of Economics (SSE), suggested that I should introduce my research on China's mobile sector to Swedish friends when we met up last June in Beijing. This is the original of the paper. Both the European Institute of Japanese Studies (EIJS) in SSE and the Department of Computer & System Science (DSV) in Stockholm University (SU) provided me with good research facilities for my visit. Mr. David Almstrong vice president of Ericsson (China) introduced many people for me to interview and Dr. Erik Bohlin invited me to visit Chalmers University of Technology. I would like to thank all the friends here who helped me during my visit. Besides Jon Sigurdson, David Almstrong and Erik Bohlin, I would like especially to acknowledge Professor Magnus Blomström, the President of EIJS; Ms Birgitta Schuberth, Administrative Manager of EIJS; Professor Carl Gustaf Jansson, my host in DSV of SU; Mr. Tom Morell, International Relations Manager of SU; and Ms Gloria Dixon-Svärd, the Administrative Manager of K2lab in DSV.

MOBILE COMMUNICATION & MOBILE INTERNET IN CHINA

BACKGROUND

Two Fundamental Points

In discussing China's economic issues, two fundamental points or facts which affect all Chinese economic issues in general, including the mobile communication sector, should not be forgotten:

1. *China is the largest developing country in the world.* China has the biggest population (1.26 billion in 2000) and about 65% live in less-developed rural areas. Since the 1980s China's national economy has grown very fast. Its annual growth rate of GDP reached approximately 9% in the last two decades. China's GDP had increased to RMB 8940 billion yuan (a little over US$1000 billion) in the year 2000 and it became the seventh biggest economy in terms of GDP after the US, Japan, Germany, France, UK and Italy. But its GNP per capita is still quite low; only about US$800. China is among low-middle income countries.

2. *China is still in the process of economic reforms and opening to the outside world.* China began its economic reforms and opening policies in 1979 and these reforms aim to transfer China from a central planning economy into a market-oriented economy and from self-closed into an active part of the current highly globalised economy. After two decades of reforms, the non-state-owned economy in China accounts for about 70% of industrial production and nearly 50% of investment (see Tables 1 and 2). China's international trade and foreign direct investment (FDI) grew quickly to US$474 billion and US$289.8 billion respectively. Comparatively, China's FDI in the last few years (1995-1999) was in third position in the world, behind the US and UK according to an official Swedish source (see Figure 1)[1]. More important is the fact that China has made a great effort to join the WTO and has made changes to meet the WTO's requirements[2].

Table 1: Industrial Production

Year	Industrial production (billion yuan)				
	Industrial Production	State-owned and Controlled	Percentage	Non-state-owned (Percentage)
1993	4,840	2,273	47	53
1994	7,018	2,620	37	63
1995	9,189	3,122	34	66

[1] See the Invest in Sweden Agency, http://www.isa.se.
[2] It is reported that the WTO successfully concluded negotiations on China's entry on September 17 2001, see http://www.wto.int.

1996	9,960	3,617	36	64
1997	11,373	3,597	32	68
1998	11,905	3,362	28	72
1999	12,611	3,557	28	72

Source: China's Statistics Yearbook, 2000

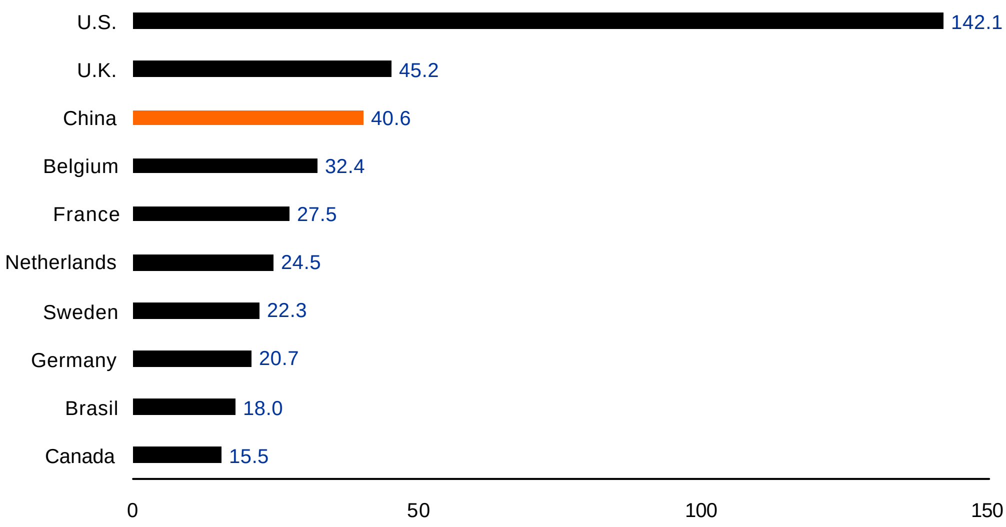
Table 2: Fixed Assets Investment

Fixed assets investment (billion yuan)

Year	Total	State Economy	%	Collective Economy	%	Private Economy	%	Others	%	Total Non-state Economy %
1993	1,307	793	61	232	18	148	11	135	10	39
1994	1,704	962	56	276	16	197	12	270	16	44
1995	2,002	1,090	54	329	16	256	13	327	16	46
1996	2,291	1,201	52	365	16	321	14	404	18	48
1997	2,494	1,309	52	385	15	343	14	457	18	48
1998	2,841	1,537	54	419	15	374	13	510	18	46
1999	2,985	1,595	53	434	15	420	14	537	18	47

Source: China's Statistics Yearbook, 2000

Figure 1: 10 largest recipients of FDI, 1995-99 (US$ billion, average per year)



(Source: Invest in Sweden Agency, 2001)

Telecommunication Development in China

China's telecom sector achieved dramatic growth in the 1990s, which could be described as a period of 'telecom take off'[3]. Historically, China's telecom provision was

[3] Xiangdong Wang: 'China's Telecommunication Take Off and its Policies', in the Survey on International

a bottleneck in the national economy in the 1960s and 1970s when the annual growth rate was 5%-6% and telecom availability was very poor. In the 1980s, among other industrial adjustments, China changed its telecom policies to speed up telecom development. Since strong telecom demand was there, a focused effort was made by the telecom sector to mobilize more and varied resources to invest in telecommunications.

To achieve this goal, in the 1980s the Chinese government began to:

- allow the domestic non-state economy to make investments;

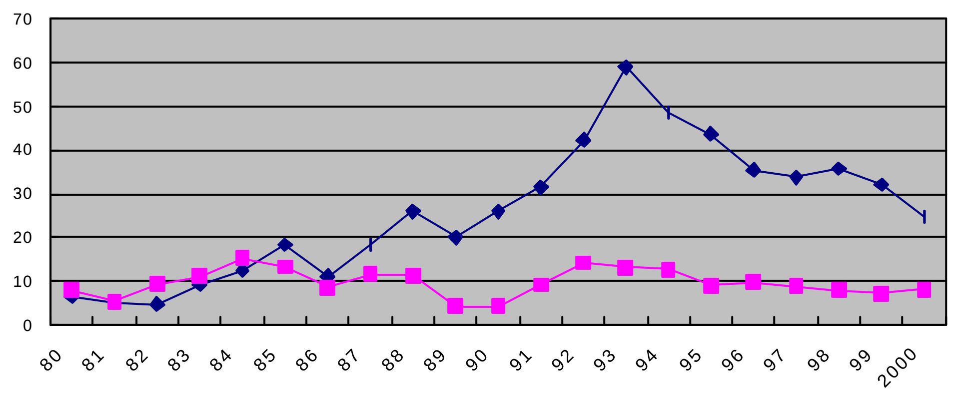
- introduce foreign loans in the sector (although with a ban on foreign ownership and operation of domestic telecom networks)[4];

- allow the former China Telecom (CT, the sole monopoly operator before 1994) to keep more revenues for its network capacity enlargement, and

- gave approval for CT to charge a high special fee of RMB 3000-5000 yuan, for example for installation, to new telephone subscribers.

These policies ensured heavy investment input into the sector and saw a speed-up in value of the growth rate of telecom traffic from the early 1980s to the mid-1990s, with the highest year, 1994, about five times higher than GDP. In recent years, the growth rate has slowed down while the telecom tariff has gone down meanwhile (see Figure 2). However, there has been a very steep and steady rise in the number of telephone subscriber (see Figure 3 and Column 1).

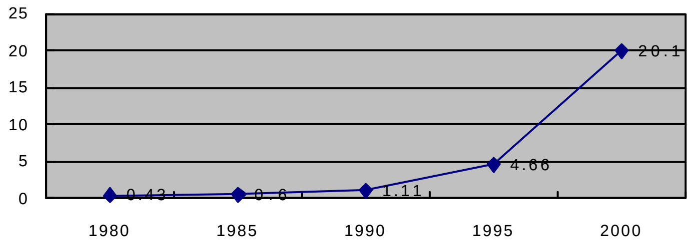
Figure 2: Growth Rate - Telecom vs. GDP (1980-2000, %)



Source: Chinese telecom regulator, the MII and formal MPT

Informatization and Its Policies, Japanese International University, March 1998.
[4] Up to 1998, foreign loans in China's telecom sector had reached about US$7 billion.

Figure 3: Telephone Penetration Rate (fixed-line and mobile phones/100 people)



Source: The MII and formal MPT

Column 1: Milestones for Tele-subscribers in China

➢ 1979	2 million
➢ 1992	10 million
➢ 1998	100 million
➢ 2000	200 million
➢ 2001	300 million

Source: The MII

Telecommunications Restructuring

Real restructuring in China's telecommunications service sector began in the 1990s although the government opened the Chinese market in the telecom equipment and construction sector earlier. Some of the major steps in China's telecom restructuring in the 1990s included:

- Separating regulation from operation by transforming China Telecom, the sole monopoly operator at that time, into a company and establishing a telecom administrative department in the former MPT in the early 1990s on the basis of decentralisation with empowerment to provincial PTAs;

- Splitting telecom operations from postal operations, although the telecom sector still subsidises the postal sector according to government policy;

- Breaking the telecom monopoly by opening 9 categories of non-basic telecom services for domestic operators to competition in 1993, including ISP, paging, VSAT and value-added voice services, and also introducing new telecom competitors nationwide with the setting up of China Unicom and Jitong Communications in 1994;

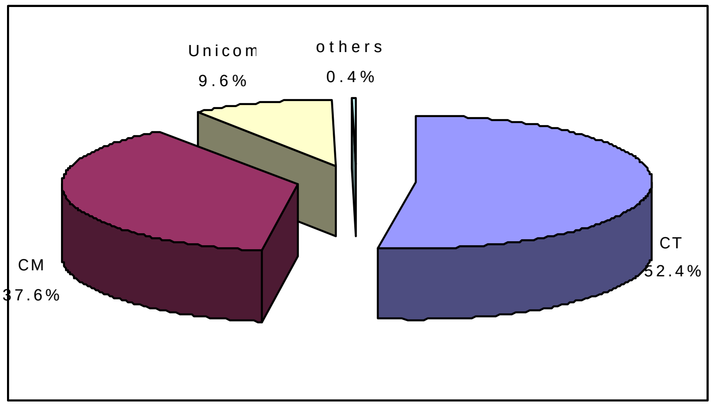
- Telecom market reshaping in 1999 by splitting the former China Telecom into four parts. The new China Telecom focuses on fixed-line services, China Mobile on mobile communication, China Satellite on Satellite network and services, and China Paging soon merged into Unicom;

- Opening the telecom market to foreign investors but controlled by the government. The former MPT and its successor, the MII, fought determinedly against Unicom's model of introducing foreign investment, called 'Zhong-Zhong-Wai' ('China-China-Foreign'), to bypass the ban on foreign investors. Meanwhile the MII supported China Telecom (later taken over by China Mobile) and China Unicom which listed and set up a new joint venture in Shanghai with AT&T.

After two new operators, China Netcom and China Railcom entered the market in 2000 there are now 7 national telecom operators in the ring: namely, China Telecom; China Unicom; China Mobile; China Satellite; Jitong Communications; China Netcom; and China Railcom. In addition to these, there are 2,000-3,000 local operators and ISPs in the market.

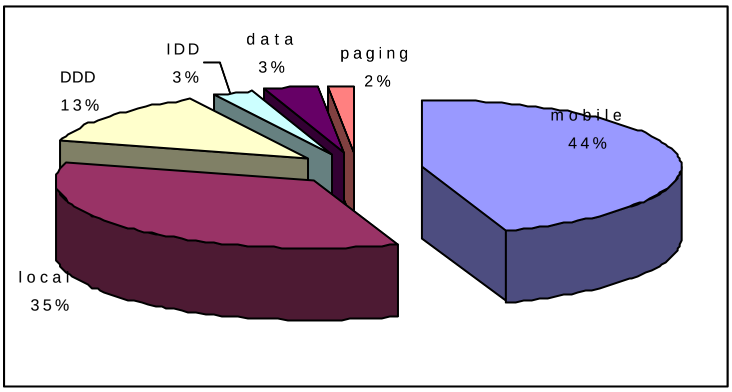
Figures 4 and 5 show the market shares in the first half of 2001. From them, it can be seen that effective competition has still to be achieved. It is partly because the new entrants are still very weak on the one hand and partly because there is no real competition in some sub-markets, especially in the local fixed-line field, on the other.

Figure 4: Market Share by Companies



Source: The MII

Figure 5: Market Share by Services



Source: The MII

MOBILE COMMUNICATION IN CHINA

The Largest Mobile User Size in the World

The first commercial call from a mobile phone in China was made in 1987. Thanks to quick growth from then on, China has become the largest country in terms of mobile subscriber size. According to China's authority, the MII, the number of mobile subscribers in China was 120.6 million in July 2001, a little more than the 120.1 million mobile subscribers in the US at that time[5].

[5] See the MII official website of http://www.mii.gov.cn.

Column 2 shows mobile communication milestones in China. It is significant to note that China Unicom's competition with China Telecom before 1999 and with China Mobile since its setting up has acted as a very important driving force to speed up mobile communication development in China. This competition has not only been

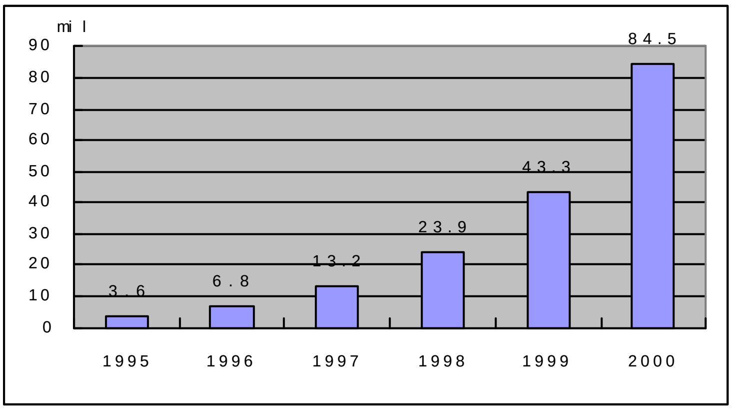
Column 2: Milestones of Mobile Communication in China

- 1987: Analogue cellular mobile phones introduced into China
- 1993: China's subscribers number 1.6 million
- 1994: China Unicom chooses to construct a GSM network; as does China Telecom
- 1995: CDMA trial by Great Wall Telecom begins in 4 Chinese cities
- 1997: China's mobile subscribers reach 10 million; the number of GSM users exceed analogue phone users
- 1999-2000: China Telecom split into 4; China Mobile is set up; Unicom wins CDMA licence
- 2000: WAP introduced into China; China Mobile and Unicom undertake GPRS trials; China Mobile launches the Monternet (see detail in Part 4)
- 2001: mobile subscribers reach 100 million; mobile services become the first revenue resource; GPRS services launched

technological, i.e. China Unicom opted for digital GSM instead of analogue cellular mobile phones before China Telecom, but also economic, meaning lower prices, more choices for customers and promised better service.

Figure 6 shows mobile subscriber growth from 1995 to 2000 and the annual average growth rate was around 80% during this period. During the first 7 months of 2001, 36.1 million new subscribers were added, a rate of more than 5 million per month. The penetration rate of mobile subscribers for the entire country has increased to about 9%.

Figure 6: Mobile Communication Subscribers (millions)



Source: The MII

Market Structure in China's Mobile Sector

Up until now, there have been two licensed operators providing mobile communication services in China's domestic market. China Mobile is the incumbent operator and has about 75% share of total customers. However, China Unicom has had a faster growth rate comparative to China Mobile in gaining new subscribers, especially since 1998 when the MII replaced the former MPT.

China Unicom currently enjoys more support from the government than in the past. The State Council appointed Mr. Yang Xianzhu, the former Vice Minister of the MPT, as the Chairman of China Unicom after the MII was established. Along with Mr. Yang, other key people from the regulatory body and the former China Telecom also became high level managers in the company. For instance, Mr. Wang Jianzhou, the General Manager of China Unicom, used to be the director of the Planning Department in the MII and Mr. Liu Yunjie, the General Engineer of China Unicom, was the director of the Data Communication Bureau of China Telecom. After the former China Telecom split up, China Unicom successfully merged with China Paging. China Unicom is also more successful in interconnection than its competitors with support from the government after the company experienced difficulties with interconnection issues for some time.

Now, China Unicom is the sole full service provider in China's telecom market. It has licences to provide all telecom services from fixed-line to mobile, from leased line to Internet and other value-added telecom services. After the company took over the CDMA networks from the former Changcheng (or the Great Wall) Communication, which was a joint venture of the old China Telecom and the Army, China Unicom had both GSM and CDMA mobile networks and is now the only operator of CDMA services in China. Its competitor, China Mobile, focuses on GSM. China Unicom is deploying and enlarging its CDMA networks; its designed capacity is about 15 million and is scheduled for completion by the end of 2001. But currently CDMA user size is very small and most mobile services are based on GSM networks. Analogue cellular services are being replaced by more advanced digital services in China.

Since the regulations allow new competitors such as China Unicom to charge 10% less for services than the incumbent operators like China Mobile in the mobile market and China Telecom in the fixed-line sector, this has enabled China Unicom to win more new customers, especially in recent years. Table 3 shows the difference in tariffs between China Mobile and China Unicom. At the end of June 2001, China Unicom's market share by subscriber number was up to 26.3% from 18.8% in June 2000 and 22.7% at the end of 2000[6].

Table 3: Mobile Tariffs in China (RMB yuan, 2001/1h)

	China Unicom	China Mobile
Monthly rental	45	50
Communication	0.36/minute	0.40/minute

Source: China's domestic market, June 2001

In comparison to China Mobile's shrinking market share, China Telecom has had to meet a bigger challenge since its split in 1999. For instance, in the first half of 2001, its revenue only grew 5.8% comparative to the whole sector's 14.7% and was also lower than the 7.9% GDP growth rate. Meanwhile China Mobile and China Unicom grew 20% and 58% respectively. The main reason for China Telecom's revenue shrinkage is that it no longer has a mobile licence and the average revenue per user (ARPU) of fixed-line service is much lower than that of mobile service, based on the current tariff and traffic structure in China. According to a report, China Telecom's monthly ARPU is RMB 73.3 yuan, much lower than China Mobile's RMB 134.7 yuan and the Unicom's RMB 104.7 yuan[7]. To improve its financial situation, China Telecom is trying its best to apply for the third mobile licence and meanwhile, in more than 100 Chinese cities in about 20 provinces, its local wireless service based on PHS has won more than 3 million subscribers[8].

Strong Growth but Still Lower than Expected: A Case Study of China Mobile (Hong Kong)

China Mobile (HK) is a public listed company on the Hong Kong stock market. Before the old China Telecom was split, the government approved the company's listing plan that brought three provincial mobile networks and services together (Guangdong,

6 Data come from the series reports by the MII.
7 See details in the analyses on the site of http://tech.sina.com.cn/it/t/2001-08-22/81484.shtml.
8 Besides China Telecom, other operators applying for mobile licences are Netcom, Jitong and China Satellite. The latest data about the PHS local wireless service provided by China Telecom was from the report on the site of http://tech.sina.com.cn/it/t/2001-09-29/86516.shtml.

Jiangsu and Zhejiang, the most developed provinces in mobile communications) to set up a new company, which was then listed in Hong Kong. Now, China Mobile has taken over China Telecom's share and China Mobile (HK) has enlarged itself from 3 provincial networks to 13.

China Mobile (HK) saw quite strong growth in the first half of 2001. According to its most recent semi-annual report, the company had 58.9 million subscribers at the end of June 2001 (or 31% growth), a figure which accounted for more than half of all China's mobile subscribers at that time and almost 70% of all China Mobile Group's clients. Its financial results were even better; operational revenue increased to RMB 48.9 billion (growth of 69%) while net profits and EBITDA increased to RMB 13.8 billion (58%) and RMB 29.2 billion (73%) respectively. China Mobile (HK)'s ARPU was RMB 158 yuan, higher than the RMB 134.7 yuan of the Group as a whole which is a very high revenue level by Chinese standards[9].

However, after the semi-annual report of China Mobile (HK) was issued its stock value went down by 9.77%. The main reason for the downturn was that China Mobile (HK)'s operational results were lower than expected by its shareholders who had anticipated, for example, that the company's ARPU would remain at the same level as the previous year, that is around RMB 221 yuan (compared to the actual ARPU of RMB 158 yuan)[10].

Some analysts believed that competition with China Unicom was the key factor in driving China Mobile's ARPU lower. However, I would argue that the competition between the two mobile operators is helpful in attracting more new users but the way in which China Mobile (HK) lowered the tariff was not helpful. Now, in China the regulator decides mobile communication tariffs, although the operators did sometimes compete unofficially on prices in local markets. Since the ARPU of an operator depends on usage by its subscribers at a certain tariff level, the increase in new users paying lower tariffs is the key reason for China Mobile (HK)'s lower ARPU. Another reason is the readjustment of the mobile tariff earlier in 2001 in which the government cancelled a connection fee of RMB 100 yuan per new subscriber which had to be paid before they could connect into an operator's network. In addition, there is some evidence showing a trend to more new users paying lower tariffs joining the market in China as coverage of the two operators' networks is extended from urban areas to rural areas with fewer subscribers from higher income brackets and more from lower income brackets.

THE INTERNET IN CHINA

[9] See the report by China Mobile (HK), first half of 2001.
[10] Ditto.

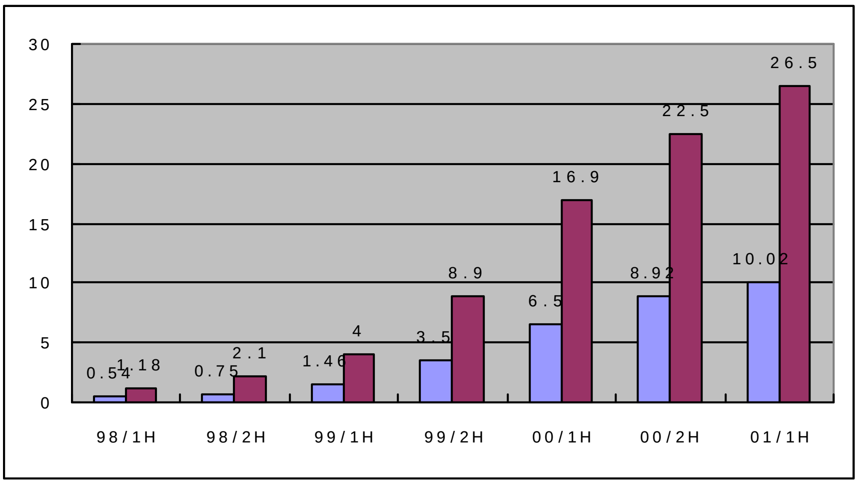
Internet Development in China

Commercial Internet services began to be introduced into China in 1995, although there had been non-commercial Internet usage, mainly academic, since the first e-mail sent from China to Germany in 1987. In recent years the Internet in China has developed quite fast, especially in user size, see Column 3 and Figure 7.

Column 3: Milestones of Internet Development in China

- 1987: first e-mail from China to German
- 1990: a Chinese scholar registered China's TLD of 'cn'
- 1993: first 64k circuit interconnected with Stanford University (for e-mail only) with hundreds of scientists as users
- 1994: US agrees to open other Internet services to China; first domestic Web server and Chinese Website in place
- 1995: '.com' and commercial Internet subs in place
- 1996: domestic Internet backbone established; the government issues the first regulation on Internet in China
- 1997 CNNIC established and issues first report (hosts 0.299m, users 0.62m); 4 main ISPs interconnected
- 1998: China's ICPs developed fast
- 1999: e-commerce Websites in practice
- 2000: first set of Chinese .coms listed in NASDAQ and suffered there

Figure 7: Internet Development in China (millions)



Source: The CNNIC

The Chinese Internet Network Information Center (CNNIC) was established in 1997 and was authorised by the government to be a domain name management entity. CNNIC has issued semi-annual reports on China's Internet development based on its surveys since 1997. According to CNNIC's definition, Internet users mean those who go online for at least for one hour a week. Under this definition, China's Internet user size nearly doubled every six months from June 1998 to June 2000 but has slowed down since then[11].

The latest report issued by CNNIC showed that by the end of June 2001 there were 26.5 million Internet users in China with access through 10.02 million Internet hosts. The Second-Level Domain Name (SLD) under '.cn', China's Top-Level Domain Name (TLD), reached more than 128,000, of which '.com.cn' accounted for 78%. Local Chinese Websites increased to about 243,000, of which 79% were owned by '.com.cn'.

Internet infrastructure in China has developed very fast too. International bandwidth in June 2001, for example, increased to 3,257 mbps in total, from 1,234 mbps a year before (see Table 4). The domestic Internet backbone and the interconnection bandwidth between the ISPs have also been improved.

Table 4: The 8 National ISPs and Their International Bandwidth (mbps)

Network	International bandwidth (June 2001/ June 2000)	Note
Chinanet	2387 / 711	Commercial / China Telecom
ChinaGBN	151 / 69	Commercial / Jitong Communication
Uninet	100 / 55	Commercial / China Unicom
CNCnet	355 / 377	Commercial / China Netcom
Cmnet	90	Commercial / China Mobile
CSTnet	55 / 10	Non-commercial / China Academy of Sciences
CERnet	117 / 12	Non-commercial / Ministry of Education
CIETnet	2	Non-commercial / Ministry of Foreign Trade and Economic Cooperation

Source: CNNIC semi-annual reports, July 2001 and July 2000

China's Internet Users

The main group of Internet users in China is similar to other countries; they are mostly male, young, unmarried, with some college education but less income. Another similar trend is that other groups of users are growing faster and have made the user structure more balanced than before. Column 4 indicates China's Internet users in June 2001.

Column 4: Some Basic Indicators of China's Internet Users

- Gender: male - 61.3%; female - 38.7%
- Age: 30 years old or younger - 68%

[11] See the series 'Semiannual survey reports' by the CNNIC.

➢ Marriage:	unmarried - 58.5%
➢ Education:	some college education - 60.03%
➢ Income:	RMB 2,000 yuan/month or less - 70.8%

Source: CNNIC, July 2001

According to CNNIC's survey, the characteristics of China's Internet users are as follow:

- approximately 60% of all respondents access the Internet at home, 45% at their workplace, with some accessing the Internet both at home and at their workplace;

- most users (70%) pay for Internet usage themselves, while for 13% it is paid for by their employers and for the remainder (17%) it is paid partly by themselves and partly by their employers;

- nearly 70% of all respondents pay less than RMB 100 yuan per month (of whom 36% pay RMB 50 yuan or less, while 32% pay RMB 50-100 yuan) and 24% pay between RMB 100-200 yuan per month;

- the average online time of users is 8.7 hours per week.

The survey discloses some other interesting facts. For instance, each Internet user has 2.6 e-mail accounts on average, of which 2.3 are free accounts. The most popular uses in China are e-mail, search engines, downloads, WWW, chat and ICQ.

E-commerce in China

E-commerce is in its infancy in China. Compared to Western countries, China's market systems are much less developed. For instance, credit standing and trust are big problems and distribution and delivery systems are inadequate[12]. According to IDC, e-commerce sales, including B2B and B2C, in China in 2000 was about US$2.2 billion or 0.2 % of GDP. Another higher figure was RMB 77 billion yuan, of which B2B accounted for 95%[13]. A survey from one Chinese authority said that there were about 1,100 e-commerce Websites in China in 2000, including more than 600 online retailers, more than 100 auction sites and 180 tele-education sites[14]. However, e-commerce in China has a bright future and it is forecast by IDC that sales will increase to US$152.7 billion in 2005, of which B2B will account for USD$133 billion[15].

CNNIC's survey supported the view that China's e-commerce will grow and it showed

[12] Zhong Fengliang, Chen Shijun: 'On the Development Policies of China's E-commerce', 2000, see it on the website of http://www.Chinatelecom.com.cn.
[13] CCID, July 2001.
[14] See the report, http://www.chinabbc.com.cn/qyxxh/jjfa/chinabbc_jjfa42.htm.
[15] See http://www.enews.com.cn/article/200107/20010710040155_1.xml.

that more and more users are getting involved in e-commerce transactions with 32% of Internet users having bought goods or services online within the last 12 months[16]. The principal goods and services bought online were books, PCs and components, education services, audio/video products, telecom products, gifts, everyday goods and ticket booking.

The government called on domestic enterprises to get online and move their business on to the Internet. The Leading Group for Enterprise Informatization was established in 2000 and several key departments, including such as the State Economic and Trade Commission (SETC), the Ministry of Science and Technology (MST) and the Ministry of Information Industries (MII), have been involved. One of its main tasks is to move forward the growth of e-commerce China.

MOBILE INTERNET IN CHINA

Wireless Data Services and WAP Introduced into China

Before WAP services were introduced into China in March 2000, China's operators had launched commercial wireless data services on their networks. Besides SMS and wireless fax/data, some users could access their e-mails with pagers. In 1999, when the former China Telecom connected its mobile networks and paging networks with Chinanet, the largest commercial Internet infrastructure in China, sales of wireless data services as a whole were limited and unbalanced in different regions.

[16] See CNNIC report, July 2001.

However, a successful case of wireless data application in China is GWCom, see detail in Column 5.

Column 5: GWcom Inc. - A Pioneer in the M-Internet Market

GWcom was founded by Mainland Chinese in the US in 1994. Its headquarters are in Silicon Valley and it has operations in Hong Kong and the 20 largest cities in China. The company's business consists of marketing wireless data networks and providing M-Internet content and applications.

In 1998, GWcom launched both commercial wireless information services and the world's first mobile wireless stock trading with palmtop devices. In early 1999, GWcom expanded its information services to cover 20 major categories, with 200 sub-headings and over 2,000 items updated daily.

Its network product PLANET is a cellular packet data network for serving wireless palm computers and PDAs to constantly receive information such as stock quotes with low or no cost. It is the only wireless data network that has won the Chinese government's approval to operate commercially in China. It has been offering services such as wireless e-mail and stock trading in the largest cities in China.

byair.com is GWcom's subsidiary and China's largest mobile ISP. It has been a partner of China Mobile in supplying WAP and SMS content and applications to users. Its content products include news, weather forecasts, stock information, ring tone/picture downloads, horoscopes, jokes, etc. byair.com not only offered the world the first wireless stock trading but also is the leader in offering location-based mobile information and commerce.

GWcom's major strategic partners include Ericsson, Siemens, Intel, Inktomi, Bestbuy, over 30 major ICPs and e-commerce portals and more than 20 major securities trading firms in China.

With the background of the rapid growth of the Internet and mobile telephony in China, it was through promotions of WAP that more and more users became accustomed to the concept of the mobile Internet or m-Internet as a means to get online with handsets.

Both operators and equipment providers such as Ericsson, Nokia and Motorola strived to promote WAP in China from the Spring of 2000 and WAP became a hotspot very soon after the two mobile operators, China Mobile and China Unicom launched trial WAP services. In March 2000, China Mobile began to test its WAP services in six major Chinese cities (Beijing, Shanghai, Tianjin, Guangzhou, Hangzhou and Shenzhen), while China Unicom did so in Guangdong province and Shanghai. On Telecom Day, May 17th, 2000, both operators reported on the progress of their operations. China Unicom had expanded its coverage of WAP services to more than 20 cities and constructed local gateways for its operation there. China Mobile's WAP services covered even larger regions.

At first in China, users saw WAP-compatible handsets made by the famous technology giants such as Ericsson's R320, Nokia's 7110/9110, Motorola's L2000I and so on. But months later, some domestic manufacturers like Xiahua, TCL, Kejian and Bird began to sell their WAP-compatible handsets. The prices of WAP handsets ranged from about RMB 2 thousand yuan to nearly RMB 10 thousand yuan. It was reported that the number of WAP-compatible handsets sold in the second half of 2000 amounted to 15% of all mobile subscribers in China.

WAP portals in China mainly come from telecom operators and the traditional portals such as sina.com and sohu.com. For example, sina.com launched a WAP search engine service in June 2000. Using WAP handsets, users can access nine kinds of WAP sites (including news, life, finance, entertainment, commerce, sports and so on), from the search engine of sina.com.

WAP: Unsuccessful Trial in China

There are no authoritative statistics to show how large the WAP market is in China. However, by comparing data from different sources, a figure of about 100,000 WAP users in China at the end of 2000 is probably a realistic estimate[17]. Only a small proportion of users applied for WAP services and some of these dropped out later, although WAP-compatible handsets accounted for as much as 15% of total sales. Moreover, no meaningful revenue was being earned from WAP services at this time.

The financially unsuccessful situation was a direct result of China Mobile's free-of-charge policy for WAP services in the trial operation period. At first, the company planned to begin charging WAP users from June 1st, 2000, but actually delayed initially until September 20th and then to December 1st, 2000 because of too few WAP subscribers[18]. As the incumbent operator in the Chinese mobile market, China Mobile did not make money, let alone the other operators.

[17] For example, Mybuy.com's figure was 50,000 WAP users at the end of 2000 and GWCom's 100,000.
[18] http://tech.163.com/tm/000920/000920_8421.html.

This raises an important question as to why so many users failed to accept WAP services, especially among those who had bought WAP-compatible handsets. Some of the main factors which limited the growth of WAP services in China include the following:

1. Slow speed: WAP services are based on GSM and the transmission speed is 9.6 kbps. These services are not delivered by way of packet data exchange and are not always online. In this case, users need to dial a specific number on their handsets when they want to get online. This usually takes several minutes or, even worse, they cannot access a WAP site at all when the network is congested with traffic in peak hours.

2. Pricing method: The way WAP service providers charged users was based on usage time. It meant that the slower the speed, the longer subscribers used the services and the more they paid. China Mobile's postponement of charging users was not helpful in enlarging the subscriber base because all users knew that they would still have to pay for the services later rather than sooner.

3. Limited content and applications: There was a long-running argument in China during the trial operation period of WAP services about the operators' role and relationships between the operators and content/application providers. Most content/application providers opposed China Mobile's original plan to be both network platform provider and content/application provider as well as they felt that other content/application providers would not have sufficient room for development. In the event, many potential content/application providers did not enter the market because competition with their network provider would be very hard for them to win. This was the reason why content and applications were so limited during the trial operation period.

Users in China waited for more advanced networks, better and cheaper services, and more attractive content and applications, while potential service providers wanted a better market environment before entry. Some first-movers did provide services in the trial period, but the quantity and quality of the services were not satisfactory. Table 5 shows the accessibility of various WAP-sites in November 2000. Most of the WAP-format contents they provided were transferred and translated from fixed-line Websites.

Table 5: Results of Accessibility Test for WAP-sites (November 2000)

Access test	WAP-site	Sites	Accessible	(%)
General	Netease,China,sina,yahoo.cn	40	32	80
Travel	Travelsky,byecity,linktrip	6	4	75
Operator	CM(HQ & CQ),Unicom(SH & GZ)	20	16	80
Leisure	At86,gznet,popu,elong,dllwap	7	6	85.7
ICQ	5390,WAPICQ	2	1	50
Search engine	WAP86,cst,Unicom Yellowpage	4	4	100
Services	Wap172,askuchina,desktime	10	8	80
B2C	China Motion, aladeng	7	4	57
Auction	Each, yesbid	3	2	66.7
Financial	Yestock,gtja,indollar	13	11	85
Market place	China Market, Alibaba	7	5	71

Source: WAP86.com, November 2000

New Progress in the M-Internet Sector in China

There have been three developments in the progress of the m-Internet sector in China since the end of 2000. They have had, and will continue to have, an important effect on the sector.

1. Short Message Service(SMS) becomes the mainstream of m-Internet services

Commercial SMS in the Chinese market began in May 1999. Up to the end of 2000 China Mobile had deployed about 90 SMS centres on its GSM networks, while China Unicom had about 30[19]. There is no official data showing how much SMS traffic is via the Internet and how much in a point-to-point way through the mobile telecom network in China. But it is true that more than 100 ICPs and Internet application providers have launched SMS for users in partnership with the mobile operators. A growing number of commercial Websites regard SMS as a new revenue resource and are preparing to provide services to users. Moreover, some are reported to have received revenue from the services, though no exact figures are available.

Column 6 is an example of how successful one Internet application provider has been in China's SMS market.

On the other hand, SMS as a whole has grown very quickly since the last quarter of 2000 in China. Take China Mobile's SMS as an example. According to Mr. Lu Xiangdong[20], Vice General Manager of China Mobile, its monthly SMS traffic grew from 80 million in October 2000 to 547 million in May 2001. Every month there has been an additional 40 million SMS sent. The quarterly growth rate was more than 75%

[19] Tao Hong, Unlimited Commercial Opportunities in SMS, 2001.
[20] http://www.peopledaily.com.cn/GB/it/49/150/20010521/470068.html.

from the last quarter of 2000 to the middle of 2001 and there were about 1.3 billion SMS sent in the first half of 2001 in total. The company has got more than 12 million SMS users currently. According to China Mobile's operation plan, its SMS traffic will reach 10 billion in the year 2001.

Column 6: Mobile QQ - A Successful Case of SMS application in China

Tencent Technology Limited (www.tencent.com) was established in October 1998 in Shenzhen, China. Its main product is 'QQ', an Internet-based instant messaging service, like ICQ. Both consumer and corporate customers can select a number of different ways to communicate, build relationships and browse the Internet.

Tencent launched its mobile instant messaging service, called 'Mobile QQ', in May 2000 with China Unicom by connecting its instant messaging system with the operator's GSM SMS and WAP systems and 3 months later went into partnership with China Mobile too.

Mobile QQ has the following abilities: 1. To send instant messages between cell phones and PCs seamlessly; 2. To receive messages sent to PC-based QQ clients remotely on their cell phone; 3. To check the present status of other QQ online contacts to verify if they are online and available for instant communication; and 4. To get profile information on other QQ subscribers and potential contacts delivered to a cell phone.

Currently, Mobile QQ covers both operators' networks in most provinces across China and has extended into Hong Kong and Macao. Up to August 31, 2001, 'QQ' had increased to more than 87 million subscribers, the peak online users reached 1.8 million and there were about 10 million users of its services. In the middle of 2001, Mobile QQ traffic was about 3 million SMS sent every day, according to Tencent.

The other operator, China Unicom, has tried its best to promote its SMS too. The company has launched a different tariff policy for its SMS. The company charges users RMB 0.1 yuan for each SMS sent in a point-to-point way and RMB 0.05 yuan for each SMS sent and received with a handset to the Web or, alternatively, its users can choose a flat price of RMB 30 yuan per month. Meanwhile, China Mobile's tariff policy is simply RMB 0.1 yuan for each SMS sent and no charge for SMS received without differentiating between point-to-point and handset with PC.

This difference in pricing has partly become an excuse for China Mobile to postpone interconnecting its SMS system with China Unicom's SMS system. It is a disadvantage for China Unicom which has a smaller part of the market share and, more importantly, it is inconvenient for both companies' users to have to communicate between the two SMS systems[21].

[21] http://cww.net.cn/xw0117.htm.

2. General Packet Radio Service (GPRS) is in operation

The operators knew from the start that WAP was just a kind of 'DOS' in the wireless world and would be replaced by a 'Windows' when they launched WAP services in China. Users want 'always online' technologies and GPRS is suitable since it is easier to update on the base of GSM networks. As early as June 2000, China Mobile began to deploy its GPRS networks in the seven biggest cities across China. China Unicom began its GPRS commercial trial in Shenzhen, Guangdong province two months later.

The unsuccessful trial of WAP commercial operations in China forced the two operators to make new choices. China Mobile decided to speed up deployment of its GPRS network since the company accounts for a big share of China's mobile market based on GSM networks. In December 2000, China Mobile launched the first stage of construction of its GPRS network which was planned to cover 25 cities in 16 provinces, with the user capacity of core equipment up to more than 1 million in the first quarter of 2001[22]. Ericsson has won a big share; nine of the 25 cities. Finally in July 2001, China Mobile announced the start of GPRS services in these cities and thousands of users became its first group of GPRS subscribers. The company is just beginning promote the service but users seem to be more cautious than last year when WAP was introduced. However, it is too early to draw any clear conclusions on its market results in this phase.

On the other hand, China Unicom chose a different way. The company focused on CDMA development rather than expanding its GPRS coverage since it is the sole licensed operator to provide a CDMA service in China. According to its business plan, China Unicom will deploy its CDMA network in more than 200 Chinese cities with network capacity of up to about 15 million users within one year and meanwhile it will update its IS-95 CDMA to CDMA2001x. It is reported that China Unicom will launch its CDMA2001x services in October 2001.

Motorola was the first manufacturer to sell its GPRS A6288 handsets in China and Ericsson, Siemens and others have brought nearly 10 brands of GPRS handsets into China's market since August 2001. On the CDMA side, Motorola and some Japanese, Korean and Chinese domestic manufacturers became CDMA handset providers in China.

3. *China Mobile launched the 'Monternet'*

The 'Monternet' is an abbreviation for mobile Internet. It is not only the uniform brand name of China Mobile's m-Internet services but also are a kind of game rules that China Mobile made for China's m-Internet market, especially for its content/application provider partners which in the Monternet are called Service Providers (SPs) by China Mobile. The last aspect is more important for China's m-Internet sector.

[22] See China Mobile's website, http://www.chinamobile.com/readnews/readNewsc.asp?id=2747.

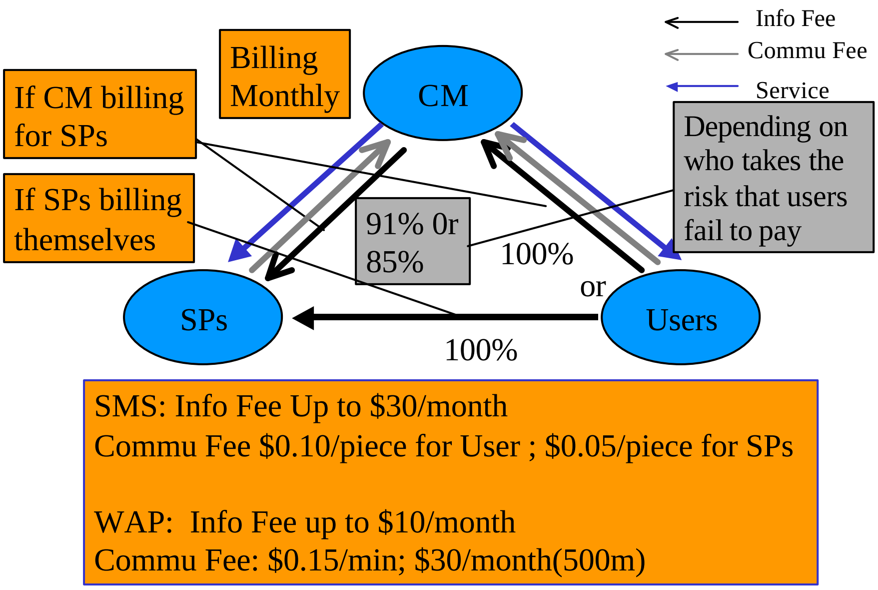
Monternet began on December 1st, 2000. As a billing standard for end customers and revenue-sharing standard for the SP partners if they use China Mobile's billing systems to charge fees to their users, Monternet is a symbol of the end of the m-Internet commercial trial period and the beginning of a new push of m-Internet in China.

Before discussion of Monternet in more detail, the following comments on the three areas of progress above may be helpful. The rise of SMS provides the operators and their partners with the kind of encouragement to make real money from the m-Internet or wireless data services, especially after the unsuccessful trial of WAP for the operators and the financially difficult 'winter' for many dotcoms. GPRS, based on data packet transmission technology, should overcome the limitations in access and transmission speed and change time-based pricing into data-traffic-based pricing. And finally, the Monternet has built up a transparent mechanism for co-operation and revenue-sharing between the operator and most SP partners, although many of them still complain that China Mobile keeps too large a share.

The Monternet

How the Monternet works and how the payment and information fee is shared between China Mobile and its SP partners are shown in Figure 8.

Figure 8. The Monternet: Payment and info Fee share



In general, end users pay two sorts of fees for their m-Internet usage. One is a communication fee that is determined by the regulator and collected by the operators who provide mobile communication services. For the Monternet, China Mobile charges an end user RMB 0.1 yuan per piece SMS send and RMB 0.05 yuan from its SP. For the WAP service, the communication fee is RMB 0.15 yuan per minute or RMB 30 yuan per month (or 500 minutes). The other fee is called an Information Fee in the Monternet and is paid for the specific content or application services provided by a SP via China Mobile's network. The Information Fee is paid to and determined by a SP itself but China Mobile suggests the upper limits to its SPs for their SMS (RMB 30 yuan per month) and WAP (RMB 10 yuan per month) services, respectively.

The Information Fee is shared if a SP needs to use China Mobile's billing systems to charge the Fee due from its users. On the other hand, if a SP can do it itself, it does not need to share the Fee with China Mobile. But, in practice, most SPs do not have their own billing systems and it is more convenient for them to use the operator's billing system. In this case, the Monternet gives every SP two options before signing a business contract. One is that if a SP chooses to take the risk that users fail to pay, China Mobile will share 9% of the Information Fee and then transfer 91% of it to the SP. A SP may choose to let China Mobile take the risk. If so, China Mobile will share 15% of the Information Fee.

Obviously, there is something in common between the Monternet and the game rules of NTT DoCoMo, which shares the service fees charged to i-mode users in Japan with its content/application partners. In fact, before China Mobile decided to open access to its billing system and network platforms to the SPs, the company did learn something from the successful experience in Japan, in which the establishment of a win-win relationship between the operator and its content/application partners is a very important part. China Mobile also takes the same percentage, 9% of the Information Fee, as NTT DoCoMo does, but makes some additions or changes in the Monternet too.

China Mobile's SP partners have grown greatly in number since the Monternet began. For example, its SP partners who provide WAP content and applications increased to more than 400 in the middle of 2001 from about 100 end of 2000[23]. Some WAP applications in the Chinese market are shown in Column 7.

Column 7: Some WAP Applications

For individuals:

- News
- M-email/M-ICQ (i.e. M-QQ)
- Daily life (i.e. weather)
- Finance (i.e. M-banking)
- Entertainment and leisure
- Personal services (i.e. download)
- M-commerce (i.e. M-booking)
- Education and employment
- Travelling

[23] The speech by Mr. Lu Xiangdong, Vice General Manager of China Mobile, on Telecom Day, May 17th, 2001.

For businesses:

- M-intranet (i.e. internal database)
- Communication
- Promotion
- M-office

The other operator made a similar effort, too. On August 1st, 2001, China Unicom launched its uniform brand of mobile Internet services called 'Uni-Info', which are mainly based on SMS. Its tariff charging from end users is somewhat different from the Monternet but it remains unclear whether China Unicom has set up a revenue-sharing standard of its own or not, especially compared to the Monternet set up by its competitor, China Mobile.

CONCLUSION

In the last decade China has seen the very rapid growth of its mobile subscriber base. It became the largest country in the world in terms of the number of mobile subscribers in July 2001 when the figure reached 12.06 million, but mobile Internet and its applications are still in their infancy in China.

The commercial trial of WAP services in 2000 revealed some major obstacles to mobile Internet development. Of these, the most fundamental were, technologically, the lack of workable network and, economically, reasonable game rules with the aim of cheaper tariffs. It is for these reasons that the advent of both GPRS and the Monternet should help.

After the failure of WAP, m-Internet shows hopeful growth in SMS-based services in China. There is no evidence to show that China Mobile's Monternet and GPRS services launch have had any negative effects on the SMS market up to now; on the contrary, the growth of SMS-based services encourages the operators to continue with the development of m-Internet.

Although the mobile telecom operators are more powerful financially, mobile content/ application providers or SPs, will play a key role in China's m-Internet market in the near future. In other words, the success or otherwise of China's m-Internet will depend on whether an effective supply of mobile content and applications can pay their way in the marketplace and, moreover, whether the SPs can survive and develop in a sustainable way, especially in the financial 'winter' of the Internet sector.

It is too early to make any final judgement on the likely outcome. That is partly because the mobile content/application services sub-sector is, as yet, too young and vulnerable in most countries across the world, and also because of the lack of homemade key technology provisions in China, especially in comparison to the potential number of its end users. In the area of mobile content/application services, there has not been a clear and mature supply train in place and the growth of a relative bio-system in the sector is just in its bud period.

The killer applications of m-Internet, for instance mobile commerce or m-commerce, still seem far away for most mobile telecom users nowadays. We are not sure how many kinds of m-Internet applications there will be, nor of the willingness of consumers to pay. Clearly, though, this is critical importance for all application developers and providers.

Besides these factors, some other questions can be posed including:

a) When will 3G be put into commercial use in China?

b) How will China Unicom and other potential competitors join the m-Internet market and will they accept or challenge the emerging m-Internet game rules shaped by the Monternet?

(a) What changes will take place in China after it becomes a member of the WTO in the near future?

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