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return of the tigers:

asian-pacific innovation in mobile communications

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The recession of the late 1990s has not derailed the growth of mobile communications in the Asia-Pacific region. Thanks to i-mode, mobile internet access is well established in Japan, paving the way for 3G and giving a fillip to the content industry. Hardware manufacturers are also tooling up for 3G, while developing countries in the region are saving billions by leap-frogging fixed lines for mobiles. For next-generation mobile technologies, will the sun rise in the east?

The economic recession that hit many Asia-Pacific economies between 1997 and 1999 left the mobile telecommunications sector remarkably unscathed. The rise in cellular subscribers continued unchecked, from 33.2 million in 1996 to 234.6 million in 2000 (see Figure 1). Indeed, several giant mobile operators emerged from the region during this period, including the world's top three cellular operators by subscription (see Figure 1). This paper aims to provide a comprehensive review of the impressive development of mobile communications in the Asia-Pacific region, and identify the key factors behind their fast growth.

Figure 1: Mobile cellular subscribers in Asia Pacific and the top eight mobile operators in the world.

Liberalization: a powerful driver of growth

Perhaps the most powerful driving force behind the development of mobile communications in Asia-Pacific has been the pro-competitive policy stance of most governments in the region. Economic recession has not dimmed their enthusiasm for liberalizing telecommunications – on the contrary, it has accelerated it.

For example, both Taiwan and Korea have further liberalized their mobile markets, which has had a significant impact on growth. With five new operators starting operation at the end of 1997, Taiwan went from a monopoly to one of the most competitive mobile markets in Asia. The impact has been incredibly powerful, with mobile teledensity rising from seven at the end of 1997 to over 70 by the end of 2000. Korea further opened its mobile market in 1997, going from a duopoly to a five-operator market. Korea and Taiwan have joined Hong Kong, long the competitive market leader, in having more mobile than fixed telephone subscribers. Singapore also entered this league in July 2000, after a third mobile operator launched in April of that year.¹

Figure 2 shows the number of economies allowing cellular competition and the total number of operators providing cellular mobile services in the Asia-Pacific region. Where liberalization has not occurred, in most cases it has been because of limited market potential: 18 of the 23 economies where mobile communications are still under monopoly operation have populations of less than one million.

As well as opening the market, regulators in the region have implemented several strategies of their own to enhance market competition. For example, Singapore was the first economy, and Hong Kong the third economy in the world, to enforce number portability for mobile communications.² This has given subscribers the freedom to change operator (choosing between low tariffs and high quality, for example), while at the same time retaining their numbers. By the end of March 2001, 2 632 048 numbers had been successfully ported since mobile number portability was introduced in Hong Kong. The increased subscriber churn has imposed high pressure on operators, while the intensified competition has led to dramatic reductions in tariffs. In the two months after number portability was introduced, 440 000 new customers subscribed to cellular services in Hong Kong.³

1. T. Kelly, M. Minges and B. Petrazinni, 'From Handyphone to i-mode: Asia Pacific mobile markets', *ITU News*, December 2000.

2. Singapore introduced a system based on call forwarding in April 1997, and Hong Kong a database-based system in March 1999.

3. Office of the Telecommunications Authority (OFTA), <http://www.ofta.gov.hk>

Figure 2: Market freedom.

Number of economies allowing mobile cellular competition and number of cellular operators, Asia Pacific

Number of economies allowing cellular competition, Asia Pacific

Number of mobile operators, Asia Pacific

Note: Figures are based on 44 economies. Figure in the top chart is based on actual rather than legal status of competition.
Source: International Telecommunication Union Indicators Database.

Foreign investment in the mobile market

The rapid expansion of the mobile cellular market in the Asia-Pacific region has significantly raised the demand for direct foreign investment. By the end of 2000, of the 39 economies where mobile cellular services were available, 28 had opened their markets to foreign direct investment, and 86 of their 122 operators were wholly or partly owned by foreign investors.

In addition to the financial demand generated by the rapid development of the mobile market, intervention from international organizations such as the International Monetary Fund (IMF), and pressure from foreign governments, have played important roles. In Korea, for example, under conditions attached to IMF aid during the financial crisis, the government amended telecom business law and raised the limitation on foreign direct investment from 33% in 1998 to 49% in July 1999, two years ahead of the government's commitment to the WTO. Since 1999, Korea has allowed the largest shareholders in telecoms companies to be foreign.⁴

During its negotiations to join the WTO, the Chinese government has also come under intense pressure from other member countries. Under the terms of a deal struck with the USA and the EC in early 2000, China agreed that should it accede to the WTO, it will open its mobile communications markets to direct foreign investment.⁵ So far, China has been cautious about this, preferring to set up a branch company in Hong Kong to attract the capital needed to support the development of mobile systems. The state holds majority shares of this branch (around 75%) and the rest (around 25%) is listed on the stock markets of Hong Kong, New York and Europe. This branch then re-invests or takes over mobile networks in China, leaving the operation in the hands of local Chinese operators.

So far, both China Mobile and China Unicom have set up branches in Hong Kong. In its initial public offering in June 2000, China Unicom raised about \$5.65 billion. As a measure to prepare the post-WTO competition, both China Mobile and China Unicom's branch companies in Hong Kong have set up strategic relationships with overseas operators. In 2000, China Mobile (HK) sold 2% of its shares to Vodafone, while China Unicom (HK) sold 2% of its shares to Hutchison.

Mobile communications and socio-economic development

By July 2000, six economies in the Asia-Pacific region had higher mobile than fixed penetration rates.

4. Y.W. Shim, 'The economic crisis and its impact on Korea's telecommunications policy', presentation at the 13th Biennial Conference of the International Telecommunications Society, Argentina, 1-4 July 2000.

5. With an initial ownership limitation of 25%, to be raised to 49% three years later.

6. Kelly *et al*, *op cit*, Ref 1.

These were: Cambodia (1993), Korea (Aug 99), Hong Kong (Nov 99), Taiwan (Feb 00), Japan (Mar 00) and Singapore (Jul 00).⁶ At the beginning of the fiscal year 2000, for the Asian-Pacific region as a whole, the number of mobile users (as a percentage of total telephone subscribers) was 36.2%, a close second to Europe (see Figure 3).

Figure 3: Cellular mobile subscribers as a percentage of total telephone subscribers (early 2000).

Source: International Telecommunication Union Indicators Database.

Compared with Europe and the Americas, most economies in Asia-Pacific have a less developed infrastructure for fixed network communications. However, the digital cellular mobile system has provided these economies with a fast and relatively cost-effective way to meet the growing demand for communications. Most new entrants use mobile communications as their first service to penetrate the market. Cambodia, for example, was the first country in the world with more mobile than fixed users, surpassing 31 other countries in overall telephone penetration during the period 1993 to 1999.⁷

Mobile cellular technology has also facilitated governments' ambitions of achieving universal service or universal access. In Bangladesh, Grameen Telecom, a company which is dedicated to extending the benefits of the information revolution amongst rural people, has initiated a so-called 'Village Phone Program' to provide mobile cellular services to 100 million rural inhabitants in the country's 68 000 villages. Grameen is a Bengali word meaning 'rural', and the Program is funded by the Grameen Bank, established by Professor Muhammad Yunus 20 years ago to provide much-needed credit for his country's villagers. The bank has focused on making loans as small as \$30 for seed money to start micro businesses. Borrowers are required to organize into small groups and guarantee one another's loans. Over the past two decades, the bank has covered almost every corner of Bangladesh with nearly 1100 branches. Specifically, women account for 94% of the bank's customers.

In 1996, Grameen Telecom was formally established. This company is entrusted with the responsibility of providing telecommunication services in rural areas of Bangladesh, and also acts as a sales agent for mobile phones for individual urban subscribers. Grameen Telecom buys airtime in bulk from GrameenPhone for rural operations.

(GrameenPhone is a company that was awarded a nationwide licence for the GSM 900 cellular mobile phone service, and in which Grameen Telecom holds a 35% stake.)

7. *World Telecommunication Development Report*, ITU, 1999.

The Grameen Bank helps Grameen Telecom in collecting bills and selecting village operators from amongst its members according to their credit record. Additionally, the Bank acts as the first point of contact for the resolution of problems related to the Village Phone Program.

Under the terms of the programme, operators can obtain a loan of 15 000 taka (\$300) to buy a Grameen handset and re-sell call time to other villagers. Over three years, Grameen Telecom has extended this innovative scheme to more than 700 rural women.⁸ Compared with the approach in some other countries, where a fixed-line payphone is installed in the centre of a village, the advantage of the Village Phone Program is that villagers can both originate and receive calls.

Because only 50% of villagers own any land, labour mobility and agricultural product marketing have increased dramatically in recent years, and communications between villages and the outside world are in great demand. Statistics shows that 42% of calls are for discussions on remittances from abroad, while 44% are social calls to family and friends.⁹ The village phone has also strengthened the base of democracy in Bangladesh. Many operators keep the phone number of local Members of Parliament, and even that of the Prime Minister.

The Program has effectively improved the income of the village phone operators. On average, the net income of the operator is \$5.71 per week. More than 30% of operators use their extra income for the education of their children, which is critical for future sustainable development in Bangladesh.¹⁰

Mobile-fixed network interconnection

However, intensified competition in the mobile communications market is not enough: there remains the issue of interconnection between mobile and fixed networks, particularly where competition over fixed networks is still weak. New users tend to subscribe to networks that can provide effective connections to as many other users as possible (so-called 'network externality'). The result, in a segmented telecommunications market without cross-network interconnection, is that while some networks become steadily larger, others disappear.¹¹

A newly licensed but improperly connected network is effectively an isolated network. In this sense, a new entrant is easily vulnerable to an ineffective interconnection arrangement, especially when there is vertical integration, with the incumbent owning both fixed and mobile networks. To facilitate mobile/fixed network interconnection, an appropriate regulatory framework is very important. In China, for example, the new entrant, China Unicom, had an extremely hard time before the establishment of the independent regulator – the Ministry of Information Industry – in 1998. This was because the incumbent operator had been closely affiliated with the former regulator, the Ministry of Posts and Telecommunications.

In 1998, the Chinese regulatory framework was restructured to encourage competition in the industry. The environment for interconnection was greatly changed with

8. R. Zaman, 'The "mobilization" of Bangladesh – the introduction of cellular phones has dramatically changed the lives of businesses and individuals', *Herald Tribune*, 13 October 1999.

9. *Grameen Telecom's Village Phone Program in Rural Bangladesh: a Multi-media Study*, TeleCommons Development Group (TDG), Canada, March 2000.

10. M. Isa, 'Connecting people – sharing knowledge', presentation at the International Policy Dialogue of the World Bank, Hanover, Germany, September 2000.

11. C. Shapiro and H.R. Varian, *Information Rules – A Strategic Guide to the Network Economy*, Harvard Business School Press, Boston, MA, 1999.

the arrival of the independent regulator, the Ministry of Information Industry (MII), which has already taken several major steps. The most recent regulatory move has obliged the incumbent operator (China Mobile) to provide a roaming service to China Unicom's subscribers in areas that have not yet been covered by the new entrant's mobile network. Thus, China Unicom's subscribers can benefit from nationwide roaming services, just like China Mobile's subscribers.¹² It is as a result of such regulatory change that China Unicom has achieved rapid network expansion in 1999 and 2000: its market share jumped from less than 6% in 1998 to more than 22% in 2000 (see Figure 4).

Figure 4: Growth of China Unicom's market share ('000s).

Another controversial issue regarding mobile/fixed network interconnection relates to who should pay for each individual call, the calling party or the receiving party. In Australia, Korea, Malaysia and the Philippines, the Calling Party Pay (CPP) scheme was introduced when the mobile cellular service was launched, while Cambodia and Mongolia switched to CPP in 1997 and 1996 respectively. In many other economies, such as China, Hong Kong, India, Singapore and Sri Lanka, the most commonly used scheme is Mobile Party Pay (MPP).¹³ That is, cellular subscribers pay for both originating and receiving calls.

This has not been a concern for developed economies such as Hong Kong or Singapore, because they have a higher income *per capita*, but it has been a problem for other economies. In China, for example, carrying both a mobile phone handset and a radio pager is a common phenomenon. The mobile phone is mainly used to originate calls, while

information on the pager is used to help subscribers decide whether or not a prompt reply is needed. The mobile phone remains switched off most of the time. Subscribers may save money by avoiding receiving or paying for unimportant calls, but they are also inconvenienced. As a result, there has been a powerful lobby for the introduction of a CPP regime in China and other Asian-Pacific economies.

12. Y. Xu, *Fixed-Mobile Interconnection: The Case of China and Hong Kong SAR*, a study for the International Telecommunication Union, 2000, <http://www.itu.int/interconnect>

13. BDT Telecommunication Regulatory Database, International Telecommunication Union.

However, there are many factors to consider when migrating from MPP to CPP. In India, for example, when the regulator proposed to adopt a CPP regime, Telecom Watchdog, a consumer organization, took action through the courts. It argued that the implementation of CPP was against the public interest, as it would increase tariffs for fixed line calls by 100–200%. This would be contrary to the principle of universal service, for most fixed service users are not in the category of high income. In China, the government also worried that the introduction of CPP would increase the overheads of its departments, and the state-owned enterprises that still dominate the economy.¹⁴

Even in economies that have adopted the CPP regime, other problems have arisen. In particular there is a case for specific regulatory schemes to increase the transparency of mobile call charges. Because different mobile operators levy different termination charges, it can be difficult for callers from fixed lines to know how much they will be charged for a call.

WAP vs i-mode: a tale of two technologies

The hottest issue in the mobile communications industry in the Asia-Pacific region during the past two years has undoubtedly been WAP and i-mode. WAP has been available in many economies, while i-mode has been exclusively provided by NTTDoCoMo within Japan. The technology may be similar (so-called '2.5G', straddling second- and third-generation mobile), but the market reaction could not have been more different.

Although the Wireless Application Protocol (or WAP) was extensively trailed by the industry before the first handsets became available in late 1999, the rate of take-up has been disappointing. For example, Smartone, one of the first WAP service providers in Hong Kong, had managed to sign up only 20 000 WAP users by August 2000.¹⁵ In Beijing, China Mobile only managed to sign up 8000 WAP users in the five months after the service was launched on 28 March 2000.¹⁶ i-mode, meanwhile, has built its user base at an average rate of around 668 700 per month since the service was launched on 22 February 1999. In May 2000, NTTDoCoMo had to temporarily suspend new subscriptions, having reached system capacity. By the end of April 2001, the total number of i-mode subscribers had reached 22 990 000.¹⁷

There are a number of reasons why the market has reacted so differently to the two systems. First, WAP uses Wireless Mark-up Language (WML) for content programming. The need for content providers to learn this language (or have material translated) has implications in terms of the quality and availability of content. For i-mode, the compact HTML (CHTML) programming language, which is a subset of HTML 3.0 for internet content, means there is no switching cost for internet content providers.

Second, WAP is still based on a circuit-switching system. Not only does this have a slow transmission speed, but users are charged according to the length of time for which they occupy the circuit. For i-mode, the packet-switching system PDC-P is used, which means faster transmission and

14. Xu, *op cit*, Ref 12.

15. 'SmarTone claims 20 000 WAP users', <http://www.telecomasia.net>

16. 'WAP users surpass 8000 in Beijing', *China Infonews*, <http://www.cci.cn.net>

17. <http://www.nttdocomo.com>

payment per packet of data, rather than time online. Currently, one packet of 128 bytes of data is charged at a rate of 0.3 Yen, or approximately 0.25 US cents.

Third, for information access via WAP, users must dial in with user name, password and several numbers. For i-mode, packet switching means the handset is 'always on', with users able to receive data without paying for the time of connection.

In addition to these technical strengths, NTTDoCoMo has also created a successful business model. It provides a platform upon which content providers provide the content, either for free or for a small premium fee, set at a maximum of 300 Yen per month. NTTDoCoMo then shares revenues with content providers, normally keeping about 9% of revenue from traffic for downloading the content. This has provided a strong incentive for content providers.

As a result, a tremendous range of content is available. In April 2000, for example, there were 448 application alliance partner companies and 8023 voluntary i-mode internet websites, including 20 search engines. The availability of a wide range of content has attracted more and more subscribers, who in turn attract more content providers. A positive feedback loop is established.

Thanks to these technical and business strengths, i-mode has achieved impressive success, strongly raising its operator's ambitions to export the platform overseas. Since 2000, NTTDoCoMo has set up strategic partnerships with Hutchison Whampoa of Hong Kong (19% stake), KPN Mobile of the Netherlands (20% stake) and AT&T Wireless (16% stake).¹⁸ However, i-mode may experience some technical obstacles to achieving its international ambitions.

First, while i-mode is based on the PDC-P standard of Japan, it is the General Packet Radio Service (GPRS) network that is being rolled out internationally and that will act as the carrier for WAP. Operators might simply borrow the business model of i-mode without installing a PDC-P network. That is, they can provide an i-mode-like service on the GPRS network without setting up a strategic partnership with NTTDoCoMo. For example, China Mobile launched a so-called 'Monternet' program in early 2001. This uses a similar revenue-sharing model to i-mode, but does not copy NTTDoCoMo technology.¹⁹

Another consideration is that all programming languages are moving towards XML (eXtensible Mark-up Language), so the advantage of CHTML over WML might soon disappear. Additionally, as 3G licences have been issued in many countries (in many cases representing massive investments for their holders), operators and regulators alike may balk at another intermediate technology between WAP and 3G. All this suggests that the cheap and cheerful i-mode may not prove as exportable as first thought.

18. <http://www.telecomasia.net>

19. <http://www.totaltele.com>

The implications of 3G for Asia-Pacific

Many European countries have already conducted lucrative spectrum auctions and are planning to launch 3G networks in 2002. Compared with European countries, the pace of issuing 3G licences seems slower in Asia-Pacific. However, there are a number of reasons to believe that Asia-Pacific will be an active player in the emerging age of 3G:

- The success of i-mode shows that an appropriate technical approach and an astute business model can still capture the emerging mobile internet market. Due to similarities of culture, there is reason to believe that similar success can be repeated in other Asia-Pacific economies.
- The relatively lower internet penetration rate in Asia-Pacific could make 3G attractive to mobile users for internet access. In developing countries in particular, 3G internet could even overtake computer-based access, just as mobile phones are overtaking fixed telephone lines. For example, in China at the end of 2000, there were 85.2 million mobile users, but only 16 million internet users. As a result, there are more people using the short message service on mobile phones for information delivery than using the internet for email. (The total number of short messages sent by subscribers of China Mobile jumped from 56.7 million in the first quarter of 2000 to 191.5 million in the last quarter of 2000.)²⁰
- 3G could reshape the market for equipment and handset manufacturing, and challenge the dominance of European vendors in the GSM market. By 2000, Samsung of Korea was the world's fourth-largest supplier of handsets. This might be due to the Korean government's policy of obliging operators to subsidise Korean handsets (not lifted until June 2000) as much as Samsung's exclusive technology. Similar policy approaches could be adopted by China, as its TD-SCDMA has been accepted as one of the 3G standards by the International Telecommunication Union. If Chinese operators decide to adopt TD-SCDMA as their own standard, the huge subscriber base in China could diffuse TD-SCDMA to neighbouring countries as well. While this will undoubtedly be a threat to some foreign vendors, it will be an opportunity for others. Siemens of Germany, for example, is currently cooperating closely with China in developing TD-SCDMA technologies.²¹
- The existence of three 3G standards might be causing controversy in some regions, but experience in Asia-Pacific with 2G services shows that multiple mobile systems can co-exist effectively. Currently in the Asia-Pacific region, there are over half a dozen mobile technologies in operation, more than any other region.²² One of the reasons for this is population density, allowing economies of scale at regional or even local level.
- Lessons from 3G licensing in Europe have taught governments and regulators in the Asia-Pacific region that a balance has to be struck between effective spectrum management and swift network roll-out. In Japan, operators obtained their licences for free, while in Singapore, operators paid the government in a fixed price. Hong Kong took a different approach by auctioning the royalty of revenues, instead of a pre-paid lump sum.²³ These schemes could help encourage market entry by reducing the start-up cost of 3G networks.

20. *China Mobile Annual Report 2000–2001*

21. H. Zhu, 'The impact of the industrialization policy on telecommunications, the deregulation process and foreign financing: China's case', *Communications and Strategies*, No 41, 2001, pp 37–62.

22. Kelly *et al*, *op cit*, Ref 1.

23. <http://www.ofta.gov.hk>

On 1 October 2000, SK Telecom of Korea launched the world's first commercial service based on a CDMA2000 system. Although this system was deployed on SKT's existing spectrum band rather than 3G frequencies, and its speed is 144 kbps instead of the 384 kbps of WCDMA, it was nevertheless an important benchmark for Asia-Pacific in the 3G age.²⁴ Appropriately enough, it is NTTDoCoMo who will launch the world's first 3G service (scheduled for 30 May 2001), under the brand name of FOMA (Freedom of Mobile multimedia Access). The initial product will be an 'introductory' service rather than a full commercial one, which will only arrive in October. That hasn't stopped it becoming the focus of interest for a telecommunications industry beset by pessimism and uncertainty. Both within Asia-Pacific and beyond, there are many who are counting on DoCoMo's Midas touch for 3G.

Conclusions

This paper has provided a general review of the rapid development of mobile communications in Asia-Pacific – a revolutionary growth that has brought significant socio-economic benefits to both developing and developed economies in this region. The study clearly indicates that a pro-competitive policy stance is probably one of the most powerful drivers for telecommunications development. Equally importantly, foreign investment has been a profound resource to finance the rapid expansion of cellular networks.

There remain some problems over such regulatory issues as mobile/fixed network interconnection. However, there seems to be no best solution to settle all disputes and please all parties. The best approach is probably to set up an appropriate regulatory framework so as to deal with those regulatory issues in a fair and transparent approach.

Similar to other regions in the world, Asia-Pacific is currently in the process of upgrading its mobile systems. The success of i-mode in Japan and the efforts of China with TD-SCDMA indicate that Asia-Pacific could become an active player, both in operating 3G mobile networks and manufacturing hardware for them.

24. 'SK Telecom kicks off 2.5-3G service', <http://www.telecomasia.net>, 4 October 2000.