



Telecoms Infotech Forum

Briefing paper

Singapore's Broadband Future: the iN2015 Initiative

June 2007, Singapore

www.trp.hku.hk/tif

Telecoms InfoTechnology Forum

TIF is an industrial and policy forum run by the Telecommunications Research Project *Corporate* (TRPC) directors Dr. Peter Lovelock and Dr John Ure. The TRPC is the executive training and corporate consulting arm of the Telecommunications Research Project (TRP). TRP provides background briefing papers for each TIF and posts these, together with presentations and proceedings papers, on the website www.trp.hku.hk/tif.

The output of the TRP is public domain research into economic, policy and regulatory aspects of telecommunications and related sectors such as IT, new media, Internet and e-commerce.

The objective of TIF is to stimulate informed interest in the policy and regulatory aspects of information and communications technologies (ICTs), to foster greater transparency and a better understanding of the economic and technological dynamics of the sector, its impact on social welfare and its policy implications.

For further details of TIF, please contact:

Jenny Wan at the *Telecommunications Research Project*:

tel: +852 2859-1919;

fax: +852 2857-9434 or

email: trproj@hkucc.hku.hk

iN2015: Singapore's Broadband Future

Five years down the road, we hope to see every business and home having broadband at hundreds of megabits, even a gigabit and beyond. Which means that you have the possibility of carrying not just the usual telecom service but, more importantly, services like HDTV (high-definition TV), IPTV (Internet Protocol TV), all provided via this big network... My point is, the availability of bandwidth always leads to new things happening... That's why this infrastructure development is important. You have to invest ahead - because, by the time we can see clearly, it will be too late.

– Leong Keng Thai, deputy CEO iDA.¹

Singapore needs to attract individuals with bright ideas who can develop the next YouTube or the next Skype... The key thing is that the biggies are all coming from small groups of individuals with a bright idea. For us to get our share, we need to be able to attract some people with ideas and give them a launch pad to develop these ideas and plug them into a global market.

– Dr. Vivian Balakrishnan, Second Minister for MICA.²

The Future: A Work in Progress

The launching of Singapore ONE (One Network for Everyone) in 1999 as part of the IT2000 Masterplan was the government's first major national initiative to promote mainstream broadband adoption in Singapore. (The IT2000 Masterplan, launched in 1992, was however the government's *third* strategic plan for transforming Singapore into an 'intelligent island' through the application of IT. It was preceded by the National Computerisation Plan in 1980-1 and the National Information Technology Plan in 1986 – see Table 1 below.) The project, to diffuse broadband Internet access was spearheaded by a number of government organizations including the then-existing Telecommunication Authority of Singapore (TAS), the National Computer Board (NCB), the National Science and Technology Board (NSTB), the Singapore Broadcasting Authority (SBA) and the Economic Development Board (EDB). It was also a collaborative effort between government and industry, with 1-NET – a consortium of the three major ISPs, Singapore CableVision and TAS – responsible for building and operating the core ATM backbone.³

Singapore ONE was to cover the island entirely with broadband services and to reach 900,000 households or obtain 400,000 subscribers by 2001. However, by January 2001, the number of broadband subscribers was only 85,000 despite the original target of physical coverage more or less having been met. The low penetration rate was attributed to high costs and a lack of services, which in turn was attributed to a lack of competition

¹ *Business Times Singapore*, 17 April, 2006.

² Speaking after a speech at the World Economic Forum, February 2007, see *Straits Times*, 7 February, 2007.

³ TAS, which initially owned 40 per cent of 1-NET, divested its equity to Pacific Internet and Cyberway. SCV and Singapore Telecom, which owns ISP SingNet, held 30 per cent each. 1-Net was acquired by MediaCorp in October 2000 and became its wholly-owned subsidiary.

and the high costs of using an ATM backbone rather than Internet protocol to provide broadband access.

Broadband adoption rose dramatically after 2001 when the number of broadband access providers increased to six; ADSL prices dropped 40 per cent in a year. An Open Access Policy was introduced in 2002, allowing ISPs to use SingTel's and SCV's networks. Broadband subscribers grew from 85,000 in 2001 to 300,000 in mid-2003 and 780,000 by April 2007.

In 2000, Singapore launched its fourth strategic plan for the sector, the Information and Communications Technology for the 21st Century Plan (Infocomm 21 or ICT21). The objective was to develop Singapore into an Infocomm Hub through the development of an interactive broadband multimedia (IBBMM) industry. A number of specific initiatives were adopted including the licensing of fixed wireless broadband services, establishing a Content Hosting Scheme for content providers to host their content in Singapore, moving up to 90 per cent of Government services online, and encouraging hotels to offer broadband services through the Hotel Refurbishment Scheme.

Plan No.5 – the Connected Singapore Masterplan – was developed and launched in March 2003. One key aspect this time was to *extend broadband access through wireless* with an integrated network of wireless LAN, broadband Internet and mobile telephony.

In 2005, the Intelligent Nation 2015 Masterplan (iN2015) was put forward as the next major, holistic step forward in the city state's IT infrastructural development. The programme was launched at Communicasia 2006 by Minister Lee Boon Yang. The key driver for the new Plan was a recognition – or fear – that despite a series of past integrated IT initiatives, Singapore had in fact fallen behind other regional cities both in its infrastructure deployment and in network usage. As a result of a series of regional benchmarking studies, the key feature of the new Plan is a Next-Generation National Broadband Network (Next-Gen NBN),⁴ capable of delivering 1 Gbps downstream access and 500Mbps upstream access to every home office and school by 2012-2015. In what are still largely undefined terms, the plan envisions the creation of an independent operating company (OpCo) that will provide pervasive bandwidth connectivity services on a wholesale basis to retail service providers who compete in providing services to end users. In this way, also, the existing 'last mile' duopoly will finally be curtailed.⁵

⁴ The Next-Gen NBN is a part of the Next-Generation National Infocomm Infrastructure (NGNII) initiative.

⁵ Where applicable, OpCo bidders for the project are likely to leverage on existing infrastructure assets [to some extent owned by SingTel, StarHub and SMRT] to lower the cost of rolling out. This will work itself out into a lease versus build decision point for the bidders and translate into how much government support is sought.

Table 1: Singapore's National IT Plans

Year	Plan	Objectives
1981-1985	National Computerisation Plan	Embark on a strategy to computerise the major functions in every government ministry. Facilitate the development and growth of the local IT industry, and develop a pool of manpower.
1986-1991	National IT Plan	Extended the computerisation programme to the private sector. In particular, the use of IT in automating and integrating traditional manual processes in applications such as School Links, Integrated Land Use System (ILUS), One Stop Change of Address Reporting Services and networks such as Tradenet, LawNet and MediNet.
1992-1999	IT2000	To transform Singapore into an 'Intelligent Island' and a global IT hub. Emphasis placed on the integration of computing resources through consolidation of computing facilities in a data centre and through a civil service-wide network. The Internet was the new delivery channel.
2000-2003	Infocomm21 (and e-Government Action Plan I)	Developing the e-economy and e-society while establishing Singapore as a global infocomm capital.
2003-2005	Connected Singapore (and e-Government Action Plan II)	Infocomm as a key enabler, to create new ideas that enrich lives, bringing together the power of computing, communications and content, to create new business opportunities, consumer values and cultural experiences.
2006-2015	Intelligent Nation 2015 (iN2015)	To spearhead the transformation of key economic sectors, government and society through the more sophisticated and innovative use of infocomm. This will be achieved by establishing an ultra-high speed, pervasive, intelligent and trusted infocomm infrastructure

Applications, Services, and Network Beneficiaries

A further integral part of Next-Gen NII is the creation of a wireless Internet access network 'to turn Singapore into one big hotspot'. As part of this, the Singapore e-Government Leadership Center was established in 2006 to deliver training programmes covering public policy, infocomm technology (ICT) policy and management, as well as case studies in innovative e-government, for industry and government personnel. As with previous masterplans, there is an important job creation component, as Singapore adjusts to the relocation of semiconductor and electronics plants to low-cost centres like Malaysia and China by seeking to diversify its economic base into, among other industrial sectors, digital media, biotechnology and nanotechnology.⁶

A Digital Media hub?

⁶ The move to China by hard disk maker Maxtor in 2005 cost Singapore 5,500 jobs. iN2015 targets include 80,000 new jobs, 90 per cent homes using broadband, 100 per cent computer ownership for all homes with school-going children, a two-fold increase in value-added of the infocomm industry to S\$26 billion and a three-fold increase in infocomm export revenue to S\$60 billion.

Singapore's Media Development Authority (MDA) was established on 1 January, 2003. A central objective for the MDA is to transform Singapore into a global digital media hub and, establish the city state as Asia's management, processing and distribution node for digital content.⁷ In a parallel development to the iDA's drive, the MDA's Media 21 blueprint outlines strategies that aim to increase the contribution of the media industry from 1.6 per cent to 3 per cent of GDP within ten years (2005-2015) and create over 10,000 new jobs. The government's projected spending for the sector over this period is US\$614 million.

A number of specific initiatives have been launched. The MDA is collaborating with the Jurong Town Corporation and Economic Development Board to establish a Fusionpolis within the Central Xchange of One-North which intends to attract a community of researchers, content creators, ICT and media related industry players and financiers. The Central Xchange will occupy 10.9 hectares and consist of commercial units, research institutes, business facilities and residential units. The Singapore Games Bazaar, a partnership between SingTel EXPAN and Hewlett Packard (HP) Singapore, was established to provide developers and distributors of digital games a hosting platform to test their products. The IDA also signed a Memorandum of Intent (MOI) with the Korean IT Industry Promotion Agency (KIPA) to cooperate in the promotion of the games industry.⁸ The Games Exchange Alliance (GXA), a twelve-member business alliance, was formed to provide their expertise in games distribution, hosting, localisation and marketing to help companies commercialise their games in Asia.

On the TV content side, an interactive TV Content Creation Centre was created by Zentek Technology for interactive TV application developers to test their applications in a controlled environment, ensuring compliance with the Multimedia Home Platform standard. And in mid-2006 Singapore became the first country in south-east Asia to launch high-definition TV (HDTV) trials on terrestrial and cable platforms to test the local market.⁹ The iN2015 includes the setting up of a global Digital Assets Marketplace (DAM), a one-stop, always on destination for digital media companies to store, buy and sell content from anywhere in the world.

The Digital Cinema initiative, which involves the replacement of the physical distribution of celluloid film prints with electronic delivery, is part of Singapore's Digital Exchange (DX) program, meant to increase the value of digital transactions through Singapore from S\$150 million to S\$500 million by 2006. The first cross-border distribution of a digital movie took place through SingTel's ATM network from Hong Kong to digital theaters in Singapore in December 2003. There are a total of 21 digital cinema screens in Singapore,

⁷ Digital media encompasses areas such as games development, animation, film-making, special effects, intellectual property rights management, licensing and merchandising.

⁸ The Korean Broadcasting Commission (KBC) signed a memorandum of understanding in January 2005 with the MDA to co-operate in the field of broadcasting.

⁹ In 2005, local production house Mega Media was awarded a contract to produce US\$20 million worth of HD programmes for New York-based Rainbow HD Holdings. Chipmaker STMicroelectronics has invested S\$40 million to set up its biggest HDTV product development centre in Singapore. Foreign production companies Pilot Film & TV Productions (UK), MidiTech and UTV (both India) and Bang Productions have established bases in Singapore.

the fourth highest number after the US, China and Japan, and each is equipped with digital equipment, fibre and satellite connectivity. A Digital Broadcast Transmission Centre was also established to train and upgrade existing manpower capabilities in digital broadcasting to fulfill the growing demand for talents as a result of the development in the content industry.

Benchmarking the Region: How Does Singapore Compare?

Japan and Korea

In many ways it makes sense to compare the approaches and experience of Japan and Korea because these two economies, comparable in many ways and yet very different, benchmark each other in the same way Hong Kong and Singapore do. Like Hong Kong and Singapore, government policy sees the chances of promoting new industries – or the transformation of older industries – as greatly enhanced by ubiquitous access to ‘next generation’ broadband (that is, of speeds between 10 – 100 Mbps). In the case of Hong Kong and Singapore the emphasis is upon creative new media where the scarce resource is creative talent, whereas in Japan and Korea there is a much wider aim of re-generating the entire industrial economy, including their major manufacturing sectors using digital technologies to achieve process as well as product innovation.

Japan

The telecom network investment part of total capital expenditure on broadband in Japan is projected to reach US\$400billion by 2010, roughly four times that of Korea – and an indicator of the difference in scale of the two economies. By this time ‘u-Japan’ (ubiquitous broadband) should be achieved and Japan re-established itself ahead of its benchmark countries, the USA and Korea. This programme came about because of Korea’s remarkable rise up the broadband table in the early 2000s to become the world’s Number One in percentage of broadband connections.

Driving Japan’s broadband initiatives is an interesting mix of public policy and intensive private competition. Public policy has been primarily concerned with keeping Japan as a world leader, with the MPHPT (also known as the Ministry of Home Affairs and Communications) emphasizing an infrastructure that will facilitate, and by implication promote, convergent services and applications, but with the Ministry of Economy, Trade & Industry (METI) looking for more tangible and targeted industry benefits.

The promotion of broadband access has been facilitated by a ministerial policy of helping new entrants by means of unbundling the local loop of NTT at very low cost. At cabinet level, a policy of providing financial incentives has been pursued. The MPHPT has provided direct subsidies for rural and local government network development; the DJB (Development Bank of Japan) has provided interest-free loans to public bodies and along with the TAO (Telecommunications Advancement Organization) provides low interest loans to private enterprise. In addition a range of special tax rates are available for investment in broadband networks.

Korea

The relationship between the ‘chaebol’ conglomerates and government in Korea has always been a mixed one. On the one hand, chaebols have sought to keep government out of their affairs. On the other hand the two sides have needed each other, the government for support for its industrial policy objectives to match the competitive power of Japan, the chaebols for political endorsement of their closely-knit conglomerate cross-holdings and for policy support for their investments in new technologies, such as CDMA 2G

mobile networks and equipment and handset manufacturing. An added factor is the national security situation, compelling government to plan in a very strategic manner. For example, in Seoul all the government offices are located close to the metro lines, and the City Government has used this location advantage to link by fibre all its municipal buildings.

The government has developed ambitious plans to make broadband usage as well as access ubiquitous, and this is perhaps the most interesting aspect of NGB in Korea. It involves extensive social programmes to bring the Internet to all segments of society, including the elderly, the handicapped and even the imprisoned. The funding of Korea's NGB is a mix of private sector investment facilitated by the close knit conglomerates who dominate the industry, government tax incentives and central and local government funding.

Conclusion on Japan and Korea

Both economies display a powerful mix of public-private collaboration which is historically rooted in their industrial cultures. In the case of Japan, market scale has allowed government to open the market to competition in a very liberal way, but the economies of scale and scope dictate that only the large players can survive without regulatory intervention, for example unbundled local loops. In Korea, as in Japan, consumer culture has spread usage rapidly, although in Japan next generation of mobile communications (3G and beyond) is growing more rapidly. Many Japanese homes do not have a PC, and Japanese business culture has also been slow to adapt to the PC. But digital TV and other entertainment over xDSL, cable and FTTH is growing fast. In Korea, home usage seems more widespread, especially e-commerce and buying stocks online as well as game playing.

China

The rapid growth of cities in Eastern China over the past twenty years in terms of economy and population (migration) has encouraged municipal governments to compete with each other for both domestic and foreign investment. Telecommunications and now NGB have been a major element in this. In some cities, like Shanghai and Hangzhou, strong new media sectors have sprung up such as the Shanghai Media Group that alone is licenced by SAFT (State Administration for Film and TV) to offer IPTV in China, and in Hangzhou, Alibaba, China's largest online auction site. Beijing's specific competitive advantage, besides being the all-important seat of Central Government, is the 2008 Olympic Games. Embracing all these city-level initiatives are the Digital City strategies and the 11th 5-Year Plan which is interesting not just for its commitment to NGB and to China developing its own equipment standards and IP in a range of consumer electronic projects, but also for its emphasis upon the need for enterprises to *use* the new technologies productively to foster innovation. In the Plan the focus is less on the technology *per se* (unlike previous Plans) or on the role of the State, and more on *enterprise-level initiatives*.

At city levels for the larger municipalities expenditures by the state on NGB are running at between US\$500 million and US\$2 billion. Apart from these projects, the incumbent

telecom operators are putting in broadband connections as a matter of course into new office and residential complexes.

Conclusion on China

In effect, the identification of NGB by countries such as Japan and Korea are being replicated within China at municipal levels. This threatens, temporarily at least, to widen the digital divide within China, but reinforces China's ever growing ties to the global economy.

Taiwan, Hong Kong and Singapore

Three island economies, three different trajectories. In Taiwan, the principal involvement by government has been to promote wireless broadband, WiFi and WiMax, largely in response to investment commitments by Intel. This is seen as strengthening the future of Taiwan semi-conductor and computer fabrication plants (i.e., positive economic returns are expected). WiFi is being rolled out across Taipei, although the business case (i.e., the financial returns) is as yet unclear. The incumbent fixed line operator, Chunghwa Telecom, has committed to a substantial NGB rollout, but nothing approaching ubiquity. In this sense, Taiwan is undergoing something close to a broadband 'trial' rather than committing to an island-wide network development.

Hong Kong's traditional approach has been government 'hands-off' except for initiatives under the Digital 21 programme, but these relate not to network development but to support for content and applications development, such as funding a Wireless Development Centre (HKWDC), a Film Development Unit and a Multimedia Development Centre at the unsuccessful Cyberport IT development – an initiative undertaken before the collapse of the first dot.com boom. Network development has been fostered through a very successful and liberal licensing policy resulting in competition driving investment. However, 2007 has seen a very slight shift towards a more pro-active interventionist approach. One example is the decision by the policy bureau, CITB, to reserve spectrum for China's TD-SCDMA 3G mobile technology, a policy that abandons the 'technology neutral approach' of the regulator, OFTA. Another example is the decision by the CITB to partially fund a territory-wide WiFi network in public places. The reaction from private sector operators has been almost universal concern that public money will be used to offer services in competition with their own, an echo of the debates in the USA where city governments have come under fire for similar reasons. But it is far too early to conclude that Hong Kong has changed course. The explanation may lie rather in an underlying fear that Hong Kong will lose its competitive and distinctive edge to other cities in China.

In contrast to Hong Kong which has benefited since China's Open Door policy of 1978, Singapore has never enjoyed the advantages of becoming China's gateway to the world economy. Singapore has had few choices other than to 'go it alone' to a large degree, resulting in a more pro-active and interventionist state. The economic results have been remarkably successful, and iN2015 is a logical extension of that policy into an era of NGB. But in contrast to Hong Kong, where market-led development has gone hand-in-

hand with relatively high rates of usage and a rapid, but nevertheless an incremental and commercially very successful broadband rollout, in Singapore it would seem that, despite every effort to encourage broadband diffusion, actual usage remains subdued or below expectations.

Conclusion on Taiwan, Hong Kong and Singapore

The economies of density are not dramatically different between Taipei, Hong Kong and Singapore, although they are probably not so strong in Singapore given the spread of population. In Taiwan broadband penetration rates are lower and the current emphasis is more upon wireless NGB given the strategic importance of the PC industry to Taiwan. Hong Kong enjoys the strongest economies of density, highly competitive low prices and a vibrant entrepôt trade with China that ratchets up communications usage of all kinds.

Overall Conclusion

NGB is a common global theme, and basically the same set of arguments are used, or assumed to hold good, for (a) achieving or maintaining a city as a communications hub, (b) stimulating closely associated industries, whether they be manufacturing network equipment or access devices, or providing services, content and applications, and (c) closing the digital divide and working towards a ubiquitous digital society. The estimated or 'forecast' financial returns (i.e., direct returns to the investor) on investment tend to be low, the contribution to GDP usually ranges from 2-5 per cent, and the economic returns (i.e., social costs and benefits, e.g. e-health, e-education, e-government, etc) are arguably higher. The question is then how to close the gap between financial and economic returns? One way is a set of measures to reduce the cost of private investment, such as facilitating network construction in various ways, and the other way is to boost demand and usage through a series of public-private initiatives.

A Final Comment:

In other words, how far is public policy a leap of faith and how far can it be founded upon a sound business plan with defined deliverables? The latter is the *sine qua non* of the private sector, but this does not mean that realistically defined deliverables place all such initiatives exclusively within the private domain. This is a crucial point. To achieve results there often needs to be other parallel and complementary developments. In the private sector this is often referred to as an 'ecosystem', implying that one company alone cannot guarantee that all the pre-requisites for success exist. Often times new products fail the first time around because complementary markets do not yet exist. In networked industries, for example, this often involves compatible standards and interoperability of technologies. GSM was a good early example of this in the area of mobile networks and access devices. In the case of major public initiatives the same is true, but with a crucial difference. The state is in a far more advantageous position to ensure that complementary policies and public investments take place that can ever be achieved by the private sector.

In the case of a broadband network, among the many important complementary conditions that need to hold good are investments in infrastructure and accessibility,

investments in human resources, in IT skills and user know-how, and investments in usage to achieve critical mass. Investment in infrastructure includes facilitating, through investor-friendly regulations, private investments; for example, making it easy to gain access to ducts and conduits and towers for cable construction, and providing access to incentive financing. Investment in HR and usage skills includes a concerted effort to introduce ICTs into schools and colleges and institutions of adult education, community centres and youth clubs, and in a whole range of public-sector institutions, such as hospitals, libraries, etc. Easily said, but how effectively is it done? To achieve results, governments around the world are appointing Government CIOs or tasking bodies (such as the iDA) with these projects, but that alone is just the first step. These tasks need to be treated as 'project management' tasks, not an easy accomplishment in a cross-agency environment. Yet without that commitment to creating a critical mass of users, the deliverables will be hard to achieve and the private sector reluctant to commit.

Questions to Consider

1. What is the role of government?
 - a. Funding? 'Guiding'? Coordinating? Participating?
 - b. From the purposes of NBN build-out, *who* exactly is 'government'?
 - c. How are government agencies coordinated?
 - d. How is success measured?

2. How important is it to get the mesh of technologies in the Network correct?
 - a. How do you 'future-proof' the network?
 - b. How important is it to adopt an Open Access architecture over an integrated, proprietary, 'kit'?
 - c. How broad a technology mix should be encompassed?

3. Focusing on delivery?
 - a. How important is it to enable 1Gbps downstream delivery?
 - b. In a peer-to-peer and rich media world, what level of upstream delivery is required?
 - c. How important a consideration is *equal* access?
 - d. How realistic an aim is *ubiquitous* access?

4. How best to enable services and economic benefit?
 - a. What has worked elsewhere? (And what hasn't?)
 - b. Who will make use of high bandwidth delivery initially?
(Big business? Gamers? Couch potatoes? Film-makers? The Health system? The logistics industry?)
 - c. What ancillary work should be considered if usage is the objective?
 - d. How does Singapore benefit economically?

5. Who is the audience?
 - a. Are current telecom econometric modeling practices applicable?
(Is the modeling itself 'future proof'?)



TIF Background Briefings and **Summary Papers** can be downloaded at <http://www.trp.hku.hk/tif/papers.php>

TRP Papers and **Publications** can be downloaded at http://www.trp.hku.hk/trp_papers.php and <http://www.trp.hku.hk/publications.php>

For information on **TRP Corporate (TRPC)**, the training and services arm of the TRP, please visit <http://www.trpc.com.hk/>