What drives broadband take-up?

The definitive version of this paper has been published in
Media International Australia, No. 127, May 2008
http://www.emsah.uq.edu.au/mia/policy.html

Abstract
This paper examines what factors drive broadband take-up. Most are beyond the reach of government regulation and policy. The focus of industry and government is now shifting to the introduction of fibre into the local loop to increase broadband speeds. So we also consider what governments are doing to support the establishment of high speed broadband networks.

Most of the factors that drive broadband take up are beyond the reach of government regulation and policy. This article examines those factors and the measures governments are taking to support the establishment of high-speed broadband networks at a time when the focus of industry and government is shifting to the introduction of fibre into the local loop to increase broadband speeds.

The concept of broadband is shifting upwards as a result of technology and users' expectations. Statistical agencies in Australia and overseas generally count fixed lines as broadband services if they deliver downstream speed of 256kbps, sometimes less. Mobile services are currently ignored. Some ISPs in Australia provide broadband services up to 24Mbps using ADSL2+ over unbundled copper loops, nearly a hundred times faster than the official definition; but only if the customer is close enough to the telephone exchange with the required equipment.

In July 2006 the Internet Industry Association (IIA) proposed a national target to get 10Mbps to 80 percent of the Australian population by 2010. The Labor policy for a National Broadband Network set in March 2007 is to provide at least 12Mbps to 98 percent of Australians. Telstra's proposed (metro only) Fibre to the Node (FTTN) network promised a minimum of 25Mbps (using VDSL2 technology). Ultimately, fibre-all-the-way (FTTH) will deliver speeds in excess of 100Mbps.

Governments believe that broadband is a "general purpose technology" like electricity that will transform economic relations, enhance productivity and create new services. It is very difficult to measure these impacts [see ITU, 2006]. But, like climate change, it is accepted as an article of faith by governments who want to facilitate broadband.

For teleworking, at least 12Mbps is desirable. For music and film downloads, compression techniques are improving and constrain the need for speed. But, for real time applications like IPtv service, higher speeds are necessary. Higher speeds also improve the quality of cheap, non-switched voice telephony (VoIP), making it more attractive.

In June 2007, Australia was ranked 12th out of 30 OECD countries for broadband take-up. This ranking is better than its 17th place at December 2005. But, can we do better?

The first two columns in Table 1 below show country rankings on broadband take-up at June 2007 and December 2005. The top ten places in both years are taken by the same ten countries. We have a pretty good idea why they are consistently good performers.

Table 1 – OECD Broadband Statistics

Penetration Rank (1)		Country	Speed (2)	Fibre (3)	Price (4)
June 2007	Dec 2005		Average Advertised Mbps	% of B'band Connections	$US Mthly Per Mbps
		Top Ten:			
1	4	Denmark	6.0	9	17.70
2	3	Netherlands	5.3	1	15.26
3	5	Switzerland	5.5	0	8.17
4	2	Korea	43.3	31	5.96
5	7	Norway	11.8	6	9.81
6	1	Iceland	4.9	1	22.22
7	6	Finland	13.0	0	13.45
8	9	Sweden	21.4	16	18.40
9	8	Canada	8.0	0	28.14
10	10	Belgium	6.3	0	18.55
		Other:			
11	13	UK	10.6	0	5.29
12	17	Australia	12.1	0	21.34
13	14	France	44.2	0	3.70
15	12	USA	8.9	2	12.60
16	11	Japan	93.7	36	3.09
17	18	Germany	9.2	0	8.44
20	22	NZ	13.6	0	16.75

Source: OECD Broadband Portal at www.oecd.org/sti/ict/broadband

(1) Ranked according to number of broadband subscribers per 100 inhabitants
(2) Average advertised download speed of broadband plans included in the survey [October 2007]
(3) Share of fibre connections in total broadband connections [June 2007]
(4) Monthly price per advertised Mbps in $US at purchasing power parity [October 2007]

An econometric study for the OECD (de Ridder, 2007) found several key factors explaining the level of broadband take-up in different countries. On the demand side they are price, income, education, weather and the size of the addressable market. On the supply side they are urbanisation, unbundling of the local loop and competition.

- *Price*: Low broadband prices are generally associated with high take-up, but not always. Japan has the lowest broadband prices in the OECD but its penetration ranking is outside the Top Ten and falling. The last column in Table 1 shows three of the Top Ten have prices under $10/Mbps and the mean price of the other seven at $19 is close to the Australian price of $21.

- *Income*: The positive relationship between income and broadband take-up is clearer across customers within a country than at the national level across countries. Governments pursue general economic policies that increase national income and the demand for broadband. And, they hope that causality will go both ways - that broadband will increase productivity and national income.

- *Education*: Tertiary education shows up as a significant factor driving higher penetration both within and across countries. This is something governments can act upon. But it has not been a reason for Australia's relatively poorer performance in broadband take-up.

- *Weather*: Poor climate seems to be part of the explanation for Iceland's strong performance in broadband rankings. The hypothesis is that fewer hours of sunshine or more days of rain keep people indoors and close to their PCs. But weather may better explain how much time customers spend on-line rather than the type of connection they choose.

- *Addressable market*: The main addressable market for broadband is dial-up customers. At December 2005, Denmark, New Zealand and Germany were among the seven countries with the greatest potential for broadband growth because dial-up customers still exceeded broadband customers. In New Zealand's case, free local calls appear to account for the slow take-up of broadband because there is less incentive to migrate to broadband [Howell, 2008].

- *Urbanisation*: It is cheaper to connect customers in densely populated areas than in country areas. A city like Paris with over 20,000 inhabitants per square kilometre is likely to have more broadband than cities like Sydney and Melbourne with less than 500 people per square kilometre.

- *Unbundling*: Intuition suggests that unbundling the local loop should lead to greater broadband take-up, because it makes it easier for operators other than the incumbent to offer services. Attempts to prove this using cross-country data, however, have generated mixed results [Table 1, de Ridder, 2007]. Korea did not require local loop unbundling until 2002, when it was already the world's leader in broadband penetration. The *lack* of forced local loop unbundling may have spurred investment in competing broadband infrastructure. Thrunet was the first to offer broadband and it did this over its own cable.

- *Competition*: The main form of cross-platform competition for broadband has been between cable and ADSL. Wireless also looks like it could become

significant. The USA is the only country where there were more cable than ADSL customers at December 2005, but it is not in the Top Ten for broadband penetration. In fact, the USA is a mystery because on five of the eight key factors it is more than one standard deviation from the OECD mean in a direction that should lead to higher broadband penetration than it has.

Full speed ahead

The current telephony network (public switched telephone network or PSTN) was designed for voice. Technology and falling costs of equipment have enabled broadband speeds that meet current demand, but user expectations are changing and other countries have shown more urgency in preparing for this To get higher speeds, the copper loops to customers from the local telephone exchange have to be shortened with FTTN or, better still, eliminated with FTTH.

The middle columns of Table 1 above show that the highest advertised speeds are in countries with fibre in the customer access network especially Japan, South Korea and Sweden, which have fibre-all-the-way (FTTH) networks. Note that speed is not advertised in New Zealand (ie the OECD estimated it for NZ) and in Australia it has to be advertised conservatively to satisfy the ACCC. The French result may be a result of advertising the three new competing fibre networks. Broadband there is usually provided over copper which does not support the high average advertised speed.

Table 2 indicates the scale and scope of investments by incumbents in fibre access networks. Sweden is not shown because the FTTH investments are not done by the incumbent. Note that some FTTN deployment will also include FTTH in new estate or "green field" developments. It is at least three times more expensive to deploy FTTH in existing premises or "brown field" situations – compare Verizon and AT&T below.

Table 2 – Fibre Deployments

	Cost $A	Homes m	Coverage %	Complete Year	Comments
FTTH:					
NTT Japan	$55bn	47	95	2010	Open access not used
KT Korea	n.a.	12	92	2010	Government subsidy
Verizon (USA)	$24bn	18	50	2010	Regulatory forbearance
France Telecom	$0.4	1	4	2009	Regulatory forbearance
FTTN:					
AT&T (USA)	$7bn	18	50	2008	Regulatory forbearance
DT (Germany)	$5bn	8	21	2008	Regulatory forbearance
KPN (Netherlands)	$1.5bn	8	100	2009	Open access
TDC (Denmark)	n.a.	2	90	2010	

Sources: Figure 2, Ofcom, 2007 and the author

Putting fibre into the customer access network is expensive. Incumbents are reluctant to make such investments if they have to share them at regulated access prices as they are currently determined. As noted in Table 2, regulatory forbearance is one solution:

- In the USA, the FCC decided in 2003 that it would not regulate access to fibre networks built by phone companies because cable companies were not regulated and provided inter-platform competition.

- In France, access to fibre access networks is currently unregulated. ARCEP, the French regulator, has discounted sub-loop unbundling as a potential remedy on the basis that France Telecom's network topology is not suitable for a FTTN with VDSL deployment [Annex 6.4, Ofcom, 2007]. It is concentrating on options to facilitate end-to-end competition in access networks by seeking to 'mutualise' next generation access investment [i.e. sharing common costs and bottleneck assets, typically ducting and in-building wiring]. There has been a burst of investments by France Telecom, Free, and Neuf Cegetel. Free has indicated that its network will be open access.

- In Germany, the Government does not require Deutsche Telekom (DT) to provide bitstream access to competitors over its FTTN network. This defies EU regulation requiring incumbent operators that choose to provide bitstream DSL for their own services or to subsidiaries or third parties also to provide these forms of access to others under transparent and non-discriminatory terms. In January 2008, the German regulator told Deutsche Telecom to grant access to its ducts and – in cases where duct capacities are not available – also to its 'dark fibre' (fibre laid but not yet used). In addition, the order made clear that DT must also offer its competitors access to the local loop in street cabinets.

Telstra unsuccessfully sought regulatory forbearance when it approached the government with a national broadband plan in August 2005. It was from this plan that the Labor Government plucked the $4.7bn cost estimate for its own National Broadband Plan. Forbearance is one of the options being considered by the UK regulator, Ofcom. There are other solutions for access regulation [see de Ridder, 2008].

In Japan, providers are required to give competitors access to their fibre but nearly all fibre connections are provided by facilities-based carriers using their own lines. And in Korea the government subsidised the construction of the country's Internet backbone and provided subsidised loans to broadband providers.

Most of the key drivers to broadband take-up are beyond the reach of government regulation and policy. Regulation and policy to promote broadband in Australia have centred on unbundling [ie unbundled local loop and line sharing] and subsidies in regional areas. However, they now face their biggest challenge with how to facilitate the National Broadband Network. If they succeed, Australia will be able to catch-up with its peers in using broadband.

References:

De Ridder (2007) *Catching-up in Broadband – What will it take?* Working Party on Communication Infrastructures and Services Policy paper DSTI/ICCP/CISP(2007)8/FINAL, OECD, Paris. Available on http://www.oecd.org

De Ridder (2008) *Goldilocks pricing for broadband*, Telecommunications Journal of Australia, Vol. 58, No. 1, May 2008

Howell, Bronwyn (2008) *Regulated retail tariff structures, dial-up substitution and broadband diffusion,* Paper for EARIE Conference in France in September 2008.

ITU (2006) *World Telecommunications/ICT Development Report – Measuring ICT for Social and Economic Development*

John de Ridder *is an independent telecommunications consultant advising government agencies and corporations on telecoms regulation, pricing and competition.*