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The Local Broadband Imperative

Appropriate high-speed Internet access for Australia

Professor Joshua Gans

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About this paper

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About CEDA

CEDA (the Committee for Economic Development of Australia) connects leaders of Australian organisations to promote Australia's economic development.

CEDA's activities: CEDA holds more than 300 events, seminars and chief executive roundtables each year, and publishes a range of research papers.

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Foreword

CEDA has examined the economic effects of technology on many occasions, stretching back to the 1960s. The topic of this latest paper – broadband Internet provision – could not be more timely or central to the national economic debate. The sale of the Australian government's sale of its majority stake in Telstra, the proliferation of new broadband technology and the continuing rise of richer Internet-connected applications all underscore the urgency of resolving the broadband issue.

CEDA research projects come to us from many sources: our trustees and board, individual researchers wanting to explore issues of public importance, businesses wanting to know more about an area. A speaker at a CEDA event may point to an unexplored issue and a potential solution. Our Research Committee and our management team monitor the policy landscape looking for fresh ideas and opportunities.

All of these stakeholders have raised the broadband issue with us. We knew a fresh approach to the issue would find an attentive audience. And we knew we would make a valuable contribution when we were able to commission an examination of the issue from Professor Joshua Gans, a world-class expert on the economics and regulation of infrastructure.

Professor Gans' paper is an important contribution because it points a way past the policy impasse of recent years. For several years now Australia has been debating whether government can dictate the building of a faster national broadband network. Professor Gans points out that this is almost certainly the wrong question. Instead, government needs to enable better investment at the local level, by not one but many connectivity providers. Out of this framework, he argues, appropriate solutions will emerge.

Those who helped guide CEDA's thinking on broadband over the past few months have included the ANU's Dr Andrew Leigh, Dr Terry Cutler of Cutler & Company, and Lateral Economics' Dr Nicholas Gruen. The chairman of CEDA's Research Committee, Phil Ruthven, has constantly encouraged our interest. We are indebted to them all. Most of all, we are indebted to Professor Gans. He has attacked this issue with the energy and imagination it demands.

Greg Meek
Chief Executive (Acting)
CEDA

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Summary

Broadband needs many local solutions, not a single national solution.

This report documents how the technologies, the user requirements and the broad investment costs of providing broadband vary considerably across localities. In contrast, current proposed solutions call for national strategies far removed from local circumstance.

This analysis leads to several conclusions. First, calls for universal service obligations to be imposed on national companies are false and likely to be costly in terms of reduced competition. Instead, local service obligations need to be established and the responsibility vested with local bodies to adopt solutions for improved broadband.

"Broadband needs many local solutions, not a single national solution."

Second, calls for protection of investors from competition are also false and likely to lead to higher user costs. Local groups such as councils could use the power of competitive tender to drive those costs down or to encourage multiple local providers. In areas with sufficient demand, that competition could be sustained.

Finally, where there are areas of Australia not receiving minimally acceptable Internet access, the Federal government could continue or expand the use of targeted subsidies.

The goal here is not to compel local councils or other organisations to make broadband investments, but to give them the ability to decide whether those investments should be made. We need mechanisms to ensure that the efficient path for investment is followed, whether it be a path involving a 'big bang' catch up with other advanced economies, or a gradual roll out of broadband across Australia trading off local need and local conditions. Because no such mechanism currently exists, this should be the immediate priority for broadband policy.

1 Background

This year has seen a serious debate emerge in Australia about broadband provision – in particular, about investing in infrastructure to dramatically improve the quality of broadband Internet access. The debate is significant because it is clear that Australian broadband infrastructure lags well behind other countries, even though Australians are enthusiastic users of Internet services where they are available.

The move from dial-up to basic broadband has brought with it lifestyle changes. First, the 'always on' feature of broadband has allowed the Internet to be a regular companion at home: weather forecasts are easily accessible, traffic can be monitored before leaving for work, and delays in airline arrivals are easy to identify. Second, the greater transfer speeds have allowed more Australians to conduct work from home. This may have not yet changed real commuting patterns, but it has enabled connectivity to continue and offered more flexibility in managing home–work issues. Finally, there are moves towards the use of the Internet as a true alternative media outlet to traditional services including radio, television and newspapers. These applications and more have all been made possible by the move to broadband.

We do not know what applications a move from basic broadband to higher-speed connections might bring. This report speculates that like other changes in the technology of communication, the most significant applications are likely to be of a social nature, allowing interactivity and collaboration with others. In this respect, investments in broadband are akin to investments in social capital rather than in knowledge or informational capital. The report also argues that the investments needed and the technologies offered are likely to differ between locations, meaning that decisions regarding broadband investment need to be geographically decentralised.

This stands in stark contrast to the current mechanisms for determining broadband investment. The main decision rights in terms of generating broadband infrastructure investment currently lie with telecommunications carriers, Telstra in particular. The federal government has played some role in providing subsidies to regional providers but this is of a limited scale at present and directed at a minimum level of Internet access per se rather than at catching up to levels of investment seen elsewhere in the world.

Overseas, the strongest investors have been governments. Active government involvement has given Korea, Japan and Singapore leading technology broadband networks. In the US, the benefits have come from competition, most notably, between telecommunications and pay television companies. However, these cases are distinguished, first, by the greater

degree of competition amongst broadband infrastructure providers, and second, by the fact that these governments are embarking on strategies based on broadband leadership rather than on catch up.

1.1 Australia is a laggard

Broadband infrastructure and its improvement is a matter of timing. There is little doubt that, decades from now, high speed broadband access will be provided throughout Australia. The question is whether we need that investment to take place sooner rather than later.

"Australia has chosen to be a laggard in this regard and hence, we have given up any advantages from being a first-mover ..."

One thing is certain: Australia has *chosen* to be a laggard in this regard and hence, we have given up any advantages from being a first-mover (for instance, by allowing local development of applications with global impact). Being a laggard, however, is not without its advantages. First, we can take advantage of falling costs. Fibre and equipment prices are dropping and the longer we wait, the lower will be those costs. Second, investment raises issues associated with knowing the extent and nature of demand. Being a laggard allows us to observe that experience elsewhere and to make our decisions based on superior information.

What we lose from this is not known. Business and educational opportunities could go by and we might never know it. But more critically, the use of these services will be delayed. If the rate at which costs are falling and new information is being received drops, then the case for waiting to receive the benefits of broadband investment. The question is whether the factors driving a 'wait and see' attitude are still relevant today.

But pointing to countries that have made the decision to be leaders, as a way of justifying our own investment today, is of no value. Australia is a laggard and so those benefits are no longer available. Thus, to justify investment, we need to look elsewhere.

1.2 The false premises of the national debate

The broadband debate in Australia has proceeded on a set of premises that point to a national solution. This has led to calls for universal service obligations to be placed on companies such as Telstra, as well as to calls by Telstra (and others) for protection from competitive forces to justify the investments required. This report argues that those premises are false and that the issues are fundamentally local, requiring local solutions. Calls for universal service obligations or competitive protection are, therefore, fundamentally misplaced. Instead, *moves should be made towards encouraging competitive alternatives at the local level*.

On every dimension, broadband in Australia is lagging behind services available in similar economies. Australia's comparative broadband deficits include investment in high-speed capabilities, the distribution of bandwidth, and the adoption of broadband. The issues are most significant outside central business districts and in regional Australia, where even basic broadband remains an issue.

For regional Australia, the federal government has adopted a series of targeted subsidies aimed at connecting disaffected households and establishments. For the rest of the country, plans to improve broadband lie solely with telecommunications carriers. Telstra's upgrade plans were shelved when it was unable to secure national protection from competition. An alternative proposal by a group of other telecommunication carriers rests on their ability to invest as a joint venture, another protection from competition. In each case, the carriers' plans are seen as the only way national broadband investment will take place.

These national plans rely on two premises. First, that the investments required are national in scope. Second, that the services which broadband will deliver will rely on national content sources, and that a lack of access by some part of the population will create a national 'information divide'. If these premises are true, investment and services would appear to require a national firm to have responsibility for the required decision making.

"… the economies of scale involved in justifying investments are also local …"

However, this report shows that each of these premises is false. The key technical bottlenecks are local, not national. For the bulk of the population, upgrades to the backbone infrastructure mean that improved services will only come about if there is investment from local exchanges to the home. However, the best means by which this connectivity is achieved is likely to differ from location. Moreover, the economies of scale involved in justifying investments are also local. This means that there is scope for local competition to provide the necessary improved services.

The consumer value from improved broadband will not likely come from new content applications such as IP (Internet Protocol) television. These services are either available (with delay) or have good substitutes such as broadcast television. Instead, like improvements to Internet access in the past, the new applications are likely to involve interactivity, where quality data transfer is required in a timely manner. Because these applications invariably have a social element, broadband improvements should be a seen as an investment in social capital. They are not going to materially close an informational divide (at least for Australians not in outlying areas).

1.3 Outline

The ultimate goal of this report is to stimulate debate. It begins with the usual survey of the current state of play (section 2) before moving on to new issues. After offering provocative thoughts about what constitutes broadband (section 3), it turns to consider the premises upon which the national call for broadband is based, and dismisses each of them (section 4). The report then outlines a way forward (section 5). This is not a plan but a way of putting in place institutions and responsibilities so that broadband infrastructure decisions are made sensibly with outcomes that are likely to be efficient over the long term. In particular, the report suggests marrying the unbundling of regulation with local competition and local government authority to provide local solutions to broadband issues. This, alongside, a future program of targeted subsidies, may alleviate the gap in broadband investment between Australia and other nations, while keeping costs at a reasonable level.

2 The current state of play

This section reviews the current situation with respect to broadband and its use in Australia. The basic story is as follows:

- Australia has a lower maximum bandwidth than most other advanced economies and also a poorer distribution of bandwidth for the services offered.
- There is an issue of geographic reach, not only for regional areas but also for households further from local exchanges.
- Australia has a low rate of broadband adoption compared with other countries, but its recent growth rate is faster.[1]

2.1 Available technologies

The technical constraints on broadband in Australia are a combination of the limits of available technology and the current investment in those technologies. This report reviews the range of technologies before looking at the current deployment, and at what the next round of investment might achieve.

2.1.1 Broadband technology

The technologies for delivering broadband access to consumers continue to evolve. The main area of distinction is between wired and wireless technologies although, in many respects, Internet provision can be a mixture of these. Satellite provision, for example, is a purely wireless solution that can offer high speeds and bandwidth, but to limited volumes of customers. On the other end of the spectrum, an optic fibre backbone to telephone exchanges can be supplemented through copper or cable access to homes. Alternatively, access to homes may come through the mobile network (3G or CDMA) or through WiMax solutions. Where copper is used, it can be used all the way from the exchange to the home, or with optic fibre running to the node (FTTN), which services between 200 and 1000 copper lines. Indeed, copper lines can be replaced entirely by optic fibre to the home (FTTH), a technology already in place in central business districts. Finally, within homes, various technologies can be found, including WiFi and Ethernet. Thus, an individual home may access the Internet through an array of wired and wireless solutions.

Perhaps the main focus of discussion on broadband technology is with regard to the 'last mile' of access to homes. The dominant technologies

1 All reports on broadband have a 'Section 2' on the current state of play. This one is no different and, indeed, can be easily skipped if you have seen it all before.

used in Australia for such access are cable and ADSL (Asymmetrical Digital Subscriber Line). Each involves trade-offs. For cable, overall use in the street and the allocation of the cable for pay television services are issues. For ADSL, use in the street is not an issue, but distance from the exchange is, as speeds decline exponentially with distance. FTTN is designed to alleviate this constraint although wireless solutions are also possible here. For both ADSL and FTTN, however, the distance factor may create congestion factors. In all cases, increased use of broadband within the home creates congestion factors. Thus, absent price considerations, the optimal form of broadband access to the home is highly specific to the home itself.

All this suggests that the technology is not as important as the solution and that mandated technological routes are hard to implement and to tailor to local conditions. These considerations become even more salient in regional areas where backbone issues are important. In such areas, fibre is not an option and wireless modes such as microwave or satellite become critical. Thus, any consideration of policy towards the provision of broadband will likely have to respect 'technology neutrality' and to target characteristics (most notably, average speed) rather than specific infrastructure.

2.1.2 Broadband investment

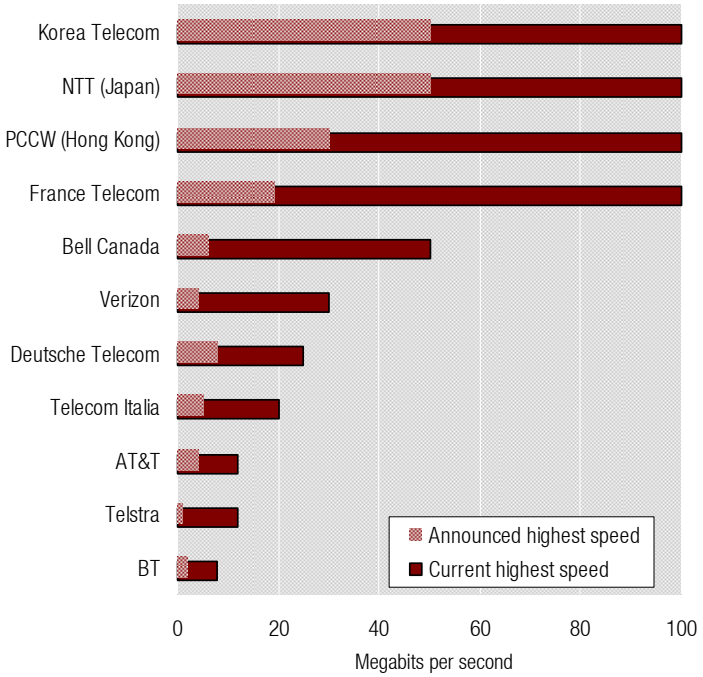
"… around 90 per cent of households in Australia have access to broadband at speeds above 256 kbps …"

Precise statistics on the extent of broadband investment in Australia are not readily available. According to a KPMG report (KPMG 2005), around 90 per cent of households in Australia have access to broadband at speeds above 256 kbps, while 40 per cent have access at speeds above 2 Mbps. The Australian Competition and Consumer Commission has stated (ACCC 2006) that as of March 2006, cable access was available in all state and territory metropolitan areas (except in the Northern Territory) and in many regional areas (except in Tasmania and in the Northern Territory); satellite was available Australia-wide; ADSL was available in all state and territory central business districts and metropolitan areas and the majority of state and territory regional centres; and some form of DSL (Digital Subscriber Line) service was available in all state and territory central business districts and metropolitan areas (except for South Australia, Tasmania and the Northern Territory). The Telstra cable network passes by 2.8 million households while the Optus HFC network passes by 2.2 million households. There is considerable overlap between these two cable networks.

2.1.3 Overseas comparison

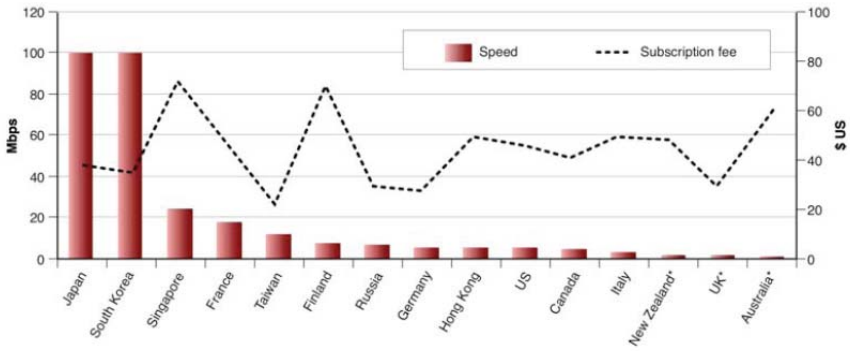
At this point, it is useful to compare Australia's current deployment with what is available elsewhere. Figures 1A and 1B represent typical analyses.

FIGURE 1A: HIGHEST AVAILABLE CONSUMER BANDWIDTH, BY COUNTRY



Source: Telstra

FIGURE 1B: TOP ACCESS SPEED AND MONTHLY SUBSCRIPTION FEE FOR INCUMBENT CARRIER'S RESIDENTIAL BROADBAND SERVICE



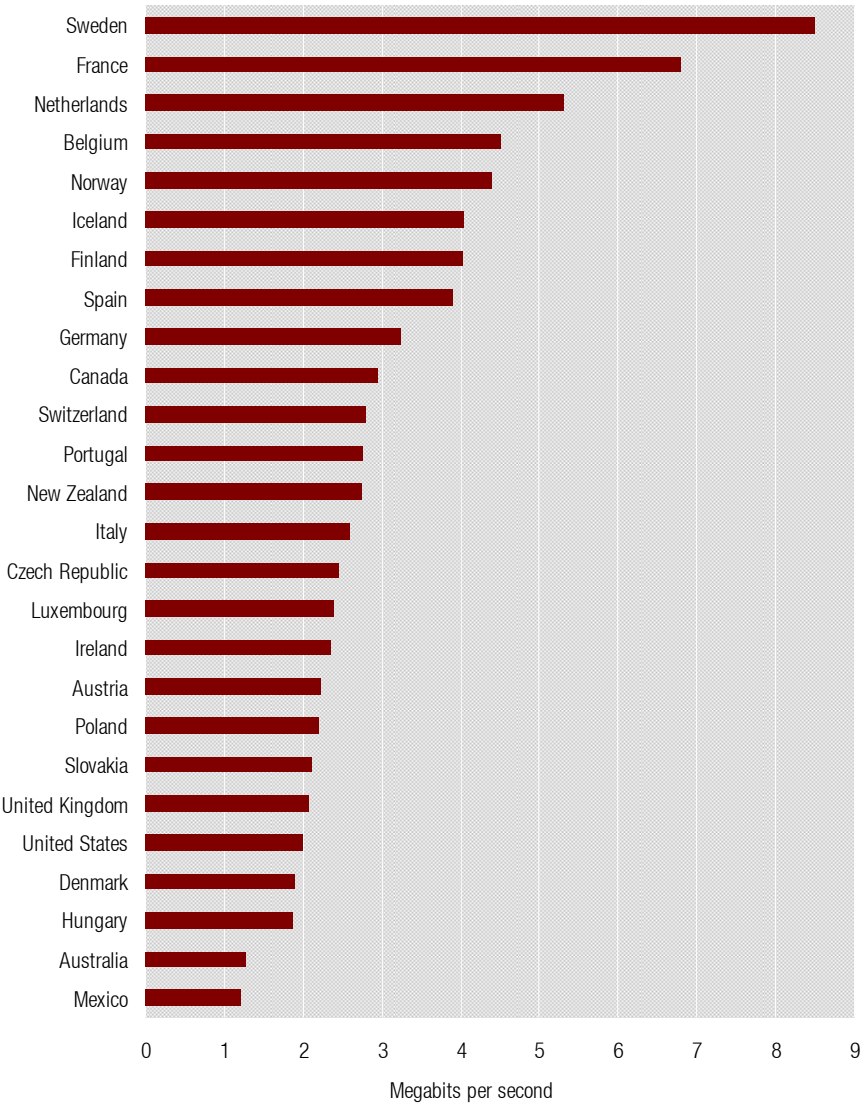
Note: (1) data only for DSL and FTTH service plans (2) Data for Canada, Japan as of Dec 05 (3) Data for Finland as of Sep 05 (4) Data for Spain as of Nov 05 (5) Data for France, Germany, Singapore, Taiwan, US as of Jan 06 (6) Data for Australia, HK, Italy, South Korea, Taiwan, as of Feb 06 (06) Data for New Zealand, UK as of March 06 (7)* indicates capped plans

Source: Spectrum Strategy Consultants, available in Allen Consulting Group et al 2006

Figures 1A and 1B reveal that in Japan and South Korea (and soon in Singapore), speeds of 100 Mbps are possible with FTTH, whereas Australia lags with a fraction of that potential. The second group of countries have FTTN technologies but also rely to a greater degree on cable rather than on ADSL.

Of course, these represent maximum speeds rather than actual averages. However, on that score, Australia lags at the bottom of the OECD (figure 2). There is little doubt that Australian investment is on the low end of broadband performance among OECD countries.

FIGURE 2: AVERAGE DOWNLOAD SPEEDS FOR DSL BROADBAND, BY COUNTRY



Source: Wairua Consulting 2006

2.1.4 Improving broadband

In Australia, improving broadband means investing in new technologies for the 'last mile'. While wired technologies have been the focus of the most recent discussion, wireless technology could potentially provide this solution. Because less is known about the capabilities of wireless solutions, however, this report focuses on the wired products.

The most advanced international providers of broadband are offering fibre to the home (FTTH). This replaces the copper network with optic fibre. Australia has this capability within its central business districts and in some other major business areas, but such capability does not exist for homes or even apartment buildings. Apart from the expense of laying new lines, there is also a question as to whether existing conduits could support the thicker fibre in many locations. This would mean making trade-offs on

aesthetics or engaging in costly conduit expansion. As power lines are moved underground, however, the incremental cost of laying fibre may be low. Again, this suggests highly location-specific costs.

There is currently no general discussion in Australia about FTTH even though it is at the forefront of efforts elsewhere. Instead, the discussion is about FTTN and/or about improving ADSL technologies to the so-called ADSL2+. It should be noted, however, that cable can already provide speeds of 17 Mbps and that this capability is being deployed – but only to one-third of Australian households and with no further deployment occurring. Excessive cable take-up is also limited by congestion issues in the street and by the bandwidth used for pay television services.

A FTTN proposal whereby the copper network is replaced between the exchange and the node (or curb) would bring ADSL speeds up to 12 Mbps. It would also resolve, to some degree, distance issues that plague ADSL for some households. Telstra initially proposed a roll out to four million premises in the five major capital cities, but has abandoned those plans. Of course, as copper lines need to be replaced between the exchange and the node, high prices for copper potentially make a fibre replacement the natural choice. It is unclear, therefore, whether a FTTN option is not being invested in anyway. It is also unclear to what extent 'unlit' fibre has already been laid that just needs to be lit. Other telecommunications carriers (the so-called G9) have proposed an alternative means of making these investments. However, at this stage, there is considerable uncertainty as to whether FTTN will become a reality in the near future.

"There is currently no general discussion in Australia about FTTH even though it is at the forefront of efforts elsewhere ..."

In the absence of FTTN, Telstra has backed upgrading its systems for ADSL2+, which theoretically could provide maximum speeds of 24 Mbps. According to a Citigroup report, however, this is likely to translate into speeds of less than 3 Mbps for average households due to the thinness of Australian copper wires (2 Mbps), distance (7 Mbps), IP overhead (3 Mbps), cross talk (3 Mbps),[2] home set-up (4 Mbps,[3] TCP (1 Mbps),[4] and sub-sea backhaul (1 Mbps).

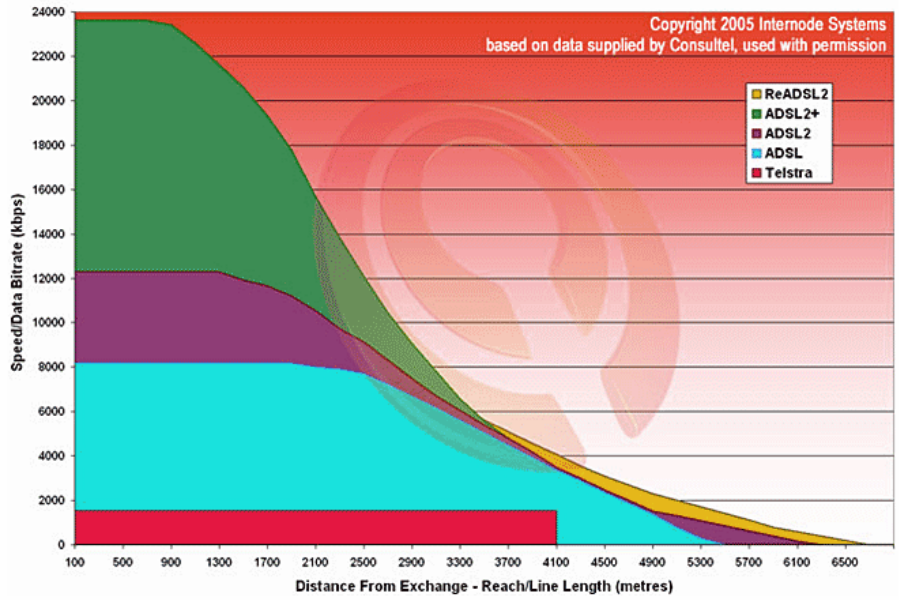
The impact of distance remains a large factor here. Figure 3 shows this impact. Note that Telstra currently manages this by reducing maximum speeds and by not selling ADSL beyond a certain distance. Further, ADSL2+ will improve speeds for those already able to receive high-speed access (that Telstra chooses to provide), but will not be a solution for others further from the exchange.

[2] FTTN would eliminate this issue.

[3] Lines with filters employed suffer reductions when telephone calls are made.

[4] The computer and operating system effect on the 'reassembly' of packet data.

FIGURE 3: THE DISTANCE EFFECT



Source: Internode Systems 2006

The main alternatives to wired solutions are wireless. Solutions around the world include WiMax, use of the 3G spectrum, and WiFi rolled out on a neighbourhood basis. In outlying areas, use of satellite becomes the more viable alternative.

What all this suggests is that *broadband improvements and the appropriate technology are highly location-specific*. Consequently, there can be no national plan based on a single technological solution.

2.2 Consumer constraints

The other side of the broadband equation is consumer demand. How do Australian consumer adoption rates for basic broadband (200kbps or above) compare with those of other countries?

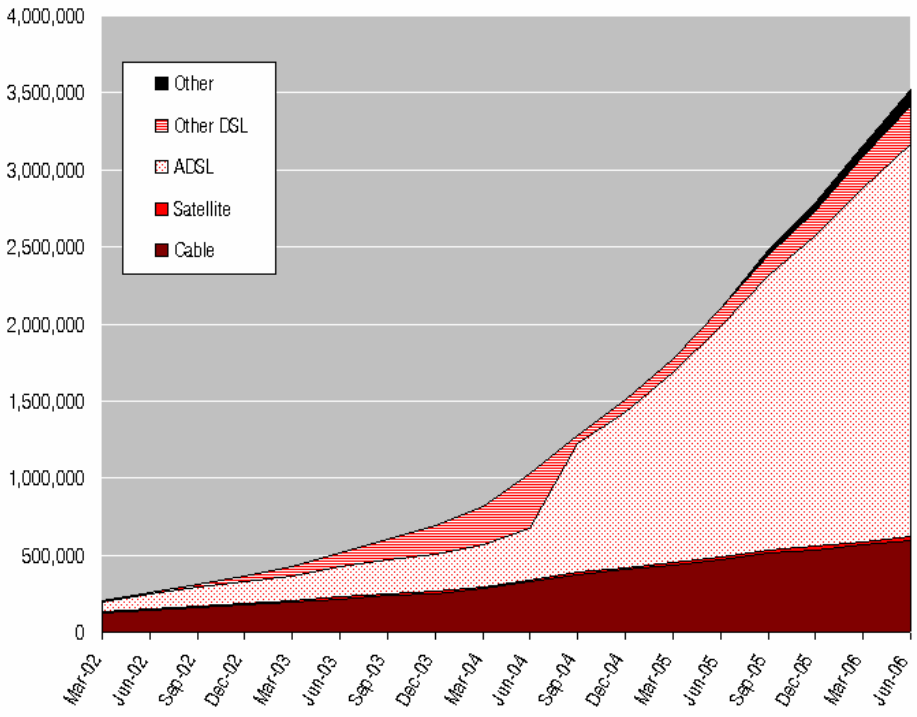
2.2.1 Broadband penetration

It is useful to consider the take-up of broadband in Australia using the traditional definition (speeds greater than 200kbps). According to the ACCC (ACCC 2006), 3,161,600 households had purchased broadband services as at March 2006, an increase of 78 per cent over the previous year. The majority of services purchased have been ADSL (2,295,200) and approximately 40 per cent of all Australian households now have broadband.

Figure 4 depicts this growth and shows that broadband appears to be at the beginning of the 'take-off' phase in the diffusion of new technologies, a pattern common to household technological services (figure 5) (Leigh &

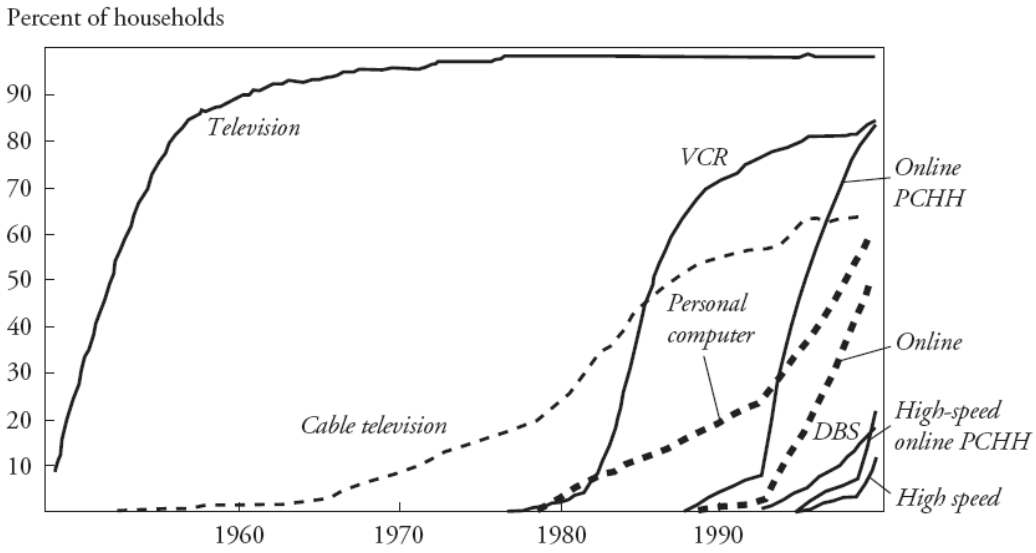
Atkinson 2001). On these predictions, the overwhelming majority of Australian households will have a broadband connection by 2010.

FIGURE 4: AUSTRALIAN HOUSEHOLDS WITH BROADBAND



Source: ACCC 2006

FIGURE 5: DIFFUSION OF HOUSEHOLD TECHNOLOGIES



Note: PCHH = personal computer households; DBS = direct broadcast satellite

Source: Owen (2002, p. 19).

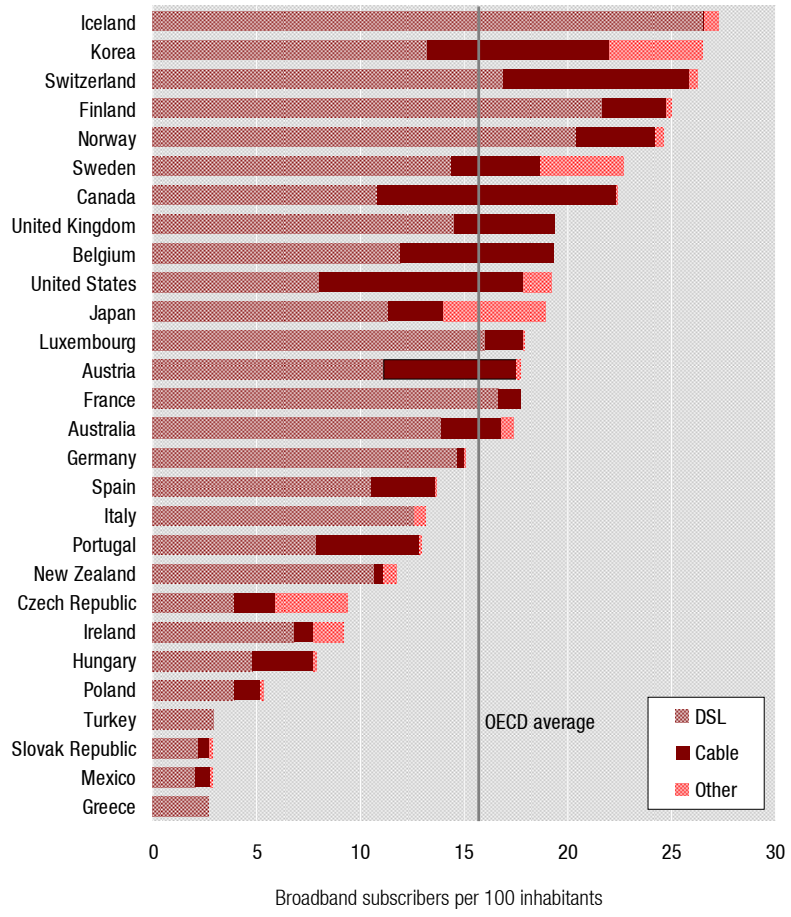
Most of the penetration is in the lower bandwidth range of broadband, about 256 kbps maximum. This provides enough bandwidth for fast

viewing of regular web pages, movement of larger documents, reasonable download of music and viewing of low-quality videos. It is a marginal improvement on dial-up services and has the advantages of being 'always on' and not requiring a second telephone line.

2.2.2 Overseas comparison

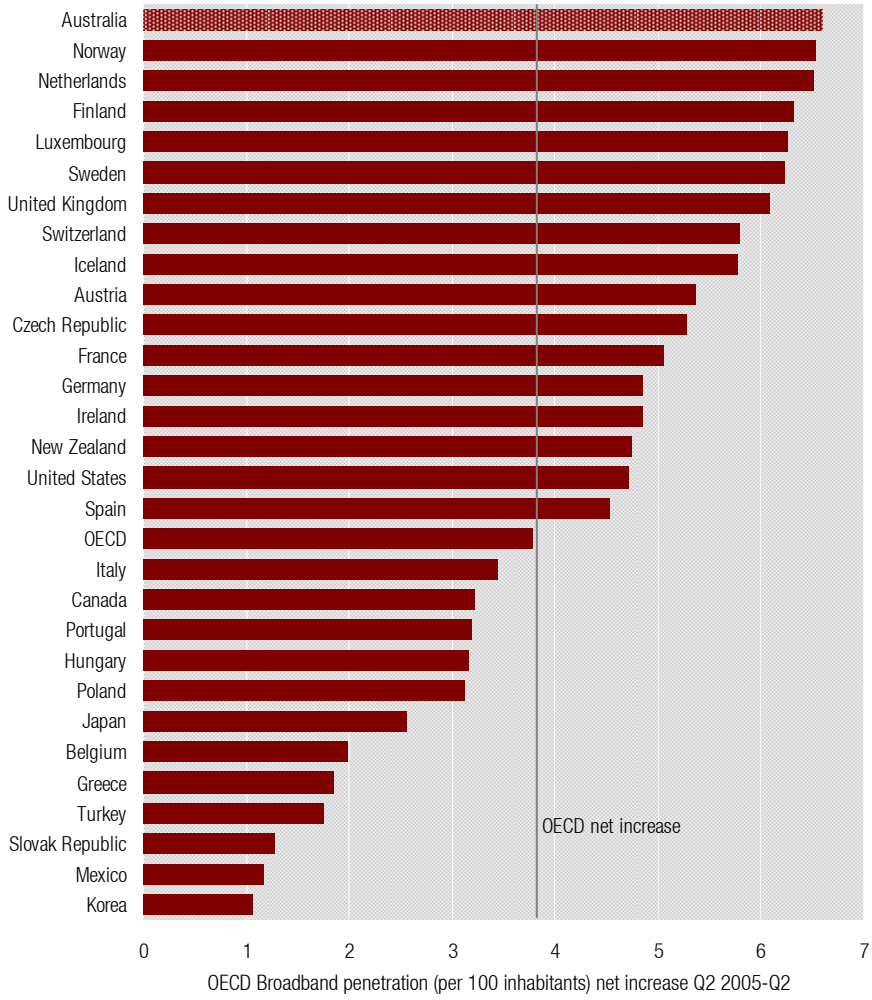
The adoption of broadband services in Australia is about average for OECD countries, although it is below the median (figure 6A). Australia has, however, experienced greater growth than most nations in recent times (figure 6B). Moreover, Australia's standing does not appear to be due to its per capita income (figure 6C); other countries with similar income levels generally have greater broadband penetration.

FIGURE 6A: OECD BROADBAND SUBSCRIBERS PER 100 INHABITANTS, DECEMBER 2005



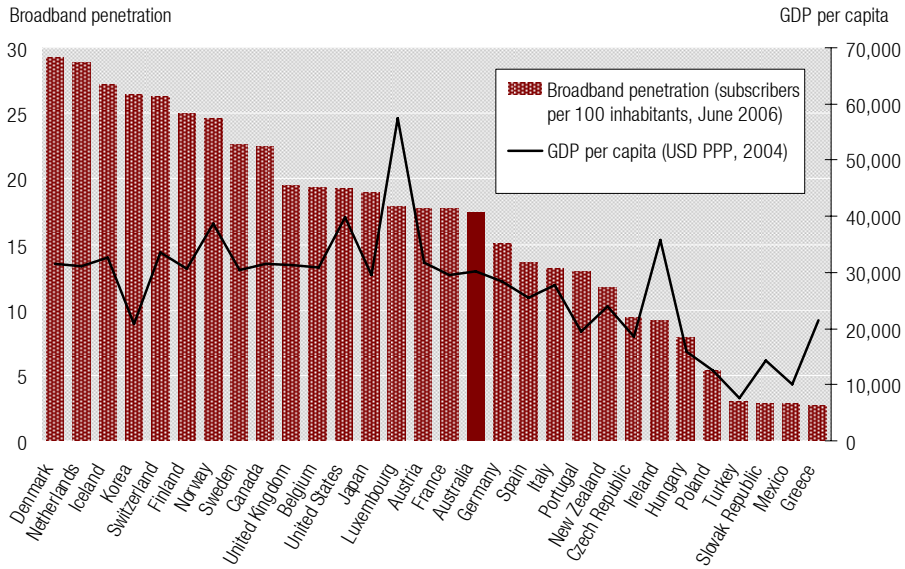
Source: OECD

FIGURE 6B: INCREASE IN BROADBAND PENETRATION



Source: OECD

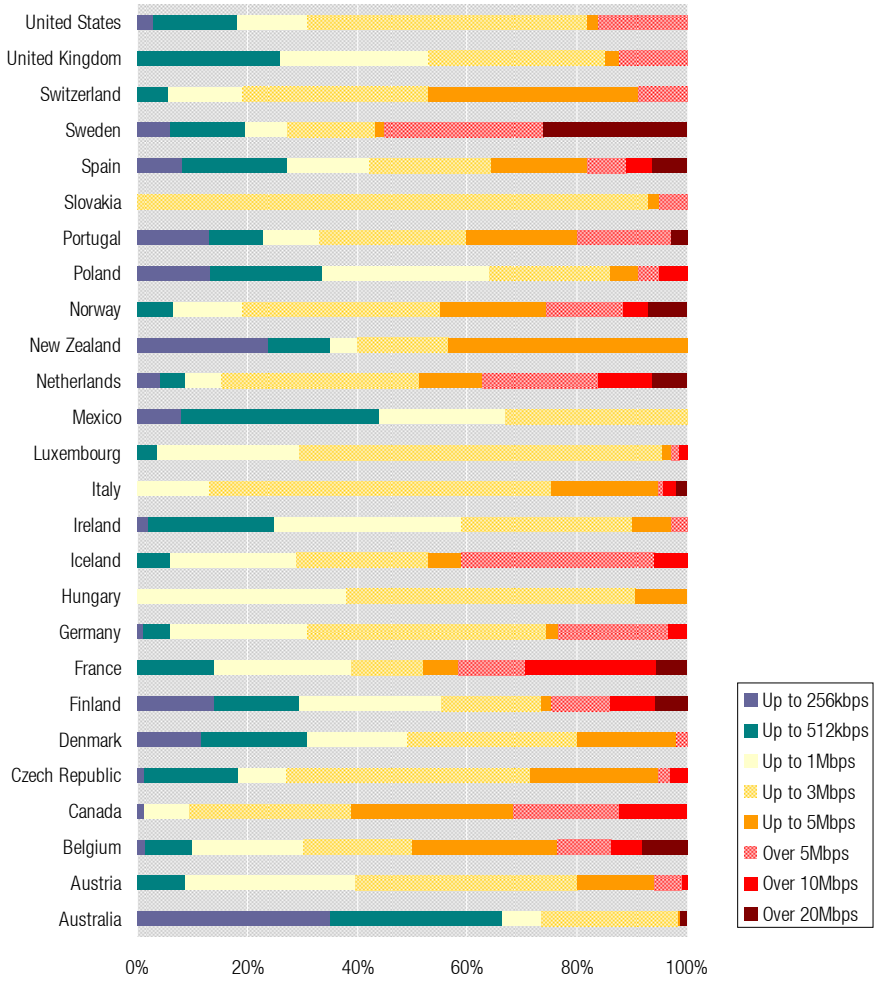
FIGURE 6C: BROADBAND PENETRATION AND GROSS DOMESTIC PRODUCT PER CAPITA



Source: OECD

Australia's low penetration may be caused by and causing, the low level of service that its broadband supplies. Figures 1 and 2 above demonstrate that countries with greater broadband performance have greater broadband penetration. Figure 7 confirms that the bulk of Australian subscribers connect at relatively low speeds. Thus, it is not simply the low average but also the relatively small share of high bandwidth service that characterises Australia's broadband take-up.

FIGURE 7: DISTRIBUTION OF DOWNLOAD SPEEDS



Source: Wairua Consulting 2006

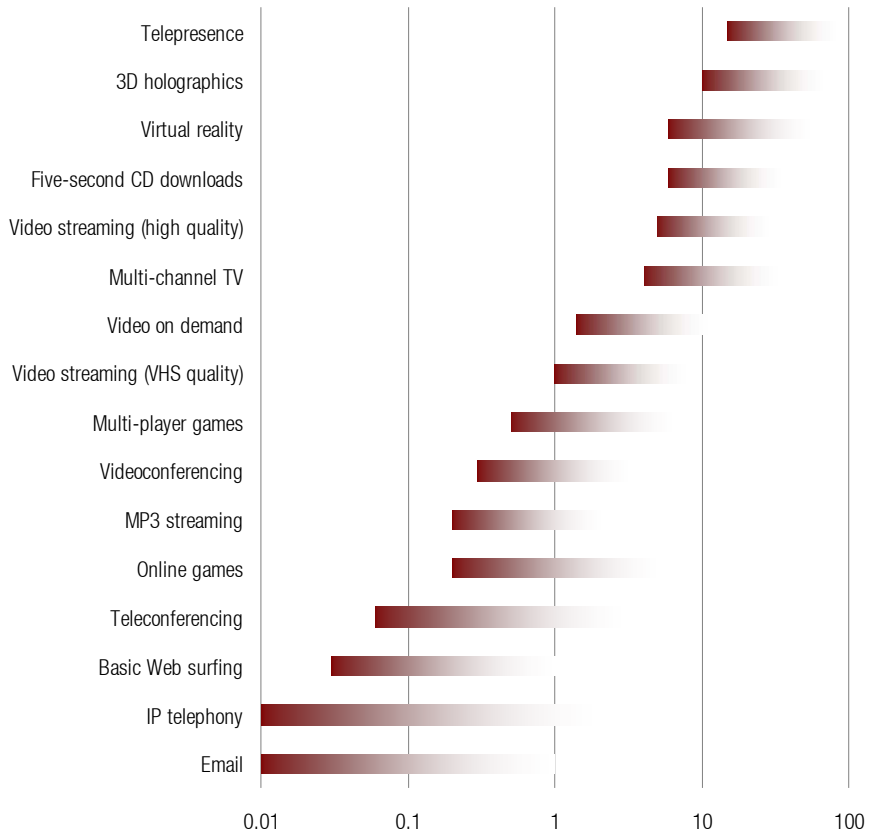
3 What will broadband deliver?

The next section in the usual broadband reports discusses the services that higher-speed broadband can deliver. And for good reason: unless one can identify how one is going to use a higher-speed connection, it is difficult to assign a value to it that may outweigh the cost.

This section of the report is therefore devoted to a discussion of the applications that improved broadband might allow consumers to use. Ultimately, new applications – as well as improved quality for existing ones – are what broadband investment is all about.

It is typical for analysts to consider these by ranking activities according to bandwidth requirements. Figure 8 provides an example of such ranking.

FIGURE 8: INDICATIVE APPLICATION BANDWIDTH DEMANDS



Left-hand side of bar indicates minimum required bandwidth

Source: Internet Industry Association, 2006

However, it is precisely this type of view of the world that it is worthwhile to challenge here – because this view misunderstands broadband. In

particular, it fails to take into account the substitutes that users have or might have for many broadband activities, and the ways in which broadband differs from many of the existing technologies which it may eventually replace.

3.1 Broadband competes with substitutes

Broadband access is defined by the US Federal Communications Commission as 'the capability of supporting at least 200 kbps in the consumer's connection to the network' in at least one direction.[5] But while speed is important, an emphasis on this characteristic alone obscures the value of broadband as an economic good. Broadband as a consumer service offers a spectrum of features in competition with other communication technologies. It competes with these substitutes on at least five non-price factors:

1. Bandwidth – the amount of data that can be transmitted in a given time
2. Latency – the delay in moving data from source to destination
3. Ease of data storage
4. Convenience of use
5. Availability of data.

The range of services with which broadband competes is remarkably wide. Indeed, one of broadband's defining characteristics is that it substitutes for an enormous range of other services:

- Dial-up Internet access has higher latency (in particular, the time taken to connect to the Internet) and provides lower bandwidth and convenience. But it is important to note that dial-up access can provide many of the same qualities as broadband where immediate access to data is not an issue. If you are willing to wait for a day before viewing it, even a dial-up connection will allow you to download a large video file.
- Courier and postal services have extremely high latency (from half an hour to several days) but can nevertheless provide – in one sense – extremely high bandwidth. As Andrew Odlyzko (2003) points out, a 300 GB portable hard drive or a collection of 40 DVDs containing a similar amount of data can be couriered across a city in an hour for $A50.
- Systems such as MovieBeam (box 2) are improving the convenience of video rental – at some cost in availability – by distributing movies via broadcast to a local set-top box.

[5] US Federal Communications Commission 2003, High-Speed Services for Internet Access: Status as of December 31, 2002, June report.

- Television recording via VCRs provides cheap storage but has relatively high latency and low availability: the program must be broadcast and must finish downloading before you can watch it. PVRs – personal video recorders with hard disks – can remove the latency and minimise the inconvenience of recording, storage and playback, which accounts for much of their rising popularity.
- The voice telephone system provides extremely low latency for voice calls and a high degree of convenience. Low latency is particularly important for voice calls, since almost no delay in delivery of the signal is acceptable in a two-way conversation. Latency has proved a major hurdle for the adoption of broadband voice communications via the protocol known as Voice Over IP or VOIP.

Box 1: How long does it take to download a movie?

The time to download a standard TV-quality DIVX movie (700 MB) varies with connection speed:

Connection speed	Transfer speed	Transfer time
56 kbps	7 KBps	28 hrs 27 mins
128 kbps	16 KBps	12 hrs 27 mins
256 kbps	32KBps	6 hrs 13 mins
2 Mbps	256 KBps	47 mins
10 Mbps	1.25MBps	12 mins

Source: http://www.divxmovies.com/video/

For a DVD-quality movie, these times would have to be multiplied by four. Thus, on current ADSL standards in Australia, a DVD-quality movie would take one day to download. On the best Australian standards using cable broadband, this is reduced to about one hour. In Korea and Japan with 100 Mbps, a DVD-quality movie download will take less than 10 minutes.

Broadband competes with each of these media and with many others (from faxes to voicemail to DVD rental and purchase) with varying degrees of effectiveness.

Consider video-on-demand – watching what you want when you want. This application is being touted as 'the next big thing' should broadband be substantially improved in Australia. At present, broadband users can stream low-quality video, or they can download larger files (usually illegally) for later playback. Improved broadband would effectively deliver increased bandwidth (and hence improved quality) for streamed video, and reduce the latency of file downloading so that a file of given quality would be available faster.

But what additional value would be delivered to users by the higher availability of broadband video-on-demand? The answer is less obvious than it at first appears. VCRs and PVRs, rental stores and services, and DVD purchases already offer video-on-demand in a variety of forms. With sufficient storage, a user of broadband downloads can have much the same experience by selecting what they want to watch from previously stored files. Other technologies such as MovieBeam (box 2) are also providing additional options. This means it is not clear that the reason to invest in broadband is to enable the instantaneous downloads that would constitute television-on-demand.

Box 2: MovieBeam

A consumer using the US MovieBeam service spends US$200 for a set-top box and then pays per-view for movies they watch after that ($4 for new releases, $2 for old stuff, $1 extra for high definition). For 24 hours, they can watch as much as they want; including pausing and rewinding. So it is exactly the same as renting a video without the trip to the video store or the late fees.

It works like this. The movies are downloaded to the hard drive in a set-top box, which has plenty of capacity for 100 movies. But they get there via broadcast. MovieBeam pays PBS (public television) to piggy-back on an unused part of its spectrum, exploiting a resource with a zero opportunity cost.

In June 2006, Unwired announced a similar initiative for Australia, Reeltime (Unwired 2006).

This discussion suggests that many of the services frequently cited as reasons to accelerate the spread of broadband can be, and frequently are, delivered by other means.

3.2 Broadband's real power: high-bandwidth, low-latency, two-way

Improving broadband will have the largest impact on applications where both high bandwidth and low latency are required. An example of this is video conferencing. A high-quality image of the person to whom you are talking is important to the video conferencing experience. But because video-conferencing involves two-way real-time exchange, delays in transmission are not acceptable.

Other broadband applications requiring a combination of high bandwidth and low latency include a number of potential medical and educational uses. The medical uses centre on diagnosis. Accurate medical imaging

involves large transfers of data, while any interactivity (that is, 'show me this or that') makes delay a potential issue.

The educational uses again centre on remote interactivity, particularly between students and teachers. The start-up Aplia.com, for example, allows students to engage in online market experiments to assist economic learning. These can be conducted in classrooms or labs to take advantage of high-speed networks. However, improving broadband would reduce the need for such coordination and allow larger groups of students to engage in the activity at the same time.

Finally, a new set of tools is being developed by the likes of Microsoft and Google. These tools allow for greater collaboration in a variety of work processes[6] that could be conducted at the work place over existing networks. However, more distributed collaboration will again require high bandwidth with low latency.

It is useful to note that the types of applications described above are driven by a distinct social element. The need to deal with other people in real time means that there is little compromise on delay. Combine that with the need for high-quality information and you have a strong form of social interactivity. It is these activities that improvements to broadband will foster, far more than those that allow existing content to be pushed to users in one direction.

Interestingly, Andrew Odlyzko points out (Odlyzko 2004) that this type of social connectivity has driven the majority of new telecommunications technology adoption in the recent past:

> The primacy of connectivity over content explains why, on the Internet, it is email that is still the true 'killer app.' Ask people whether they would rather give up email or the phone, and the responses will typically be split. However, when a similar choice is offered between the Web and email, there is no contest: email wins by a mile. (And this isn't just true of the home market, it's even more true for large organizations. Intranets are all the rage, but it is email that makes them truly valuable.)
>
> The telecom hits of recent years back this up. Phenomena that have taken industry observers by surprise, such as the enthusiastic embrace of IM (Instant Messaging) on personal computers and SMS (Short Message System) text messaging on cellphones, show the primacy of communication over content in the consumer's set of priorities. By contrast, delivering content to mobile phones via WAP (Wireless Application Protocol) has been a disappointment despite enormous industry hype and considerable marketing efforts. Providing pop videos or movie trailers for consumers to watch on 3G cellphones has provoked a similarly underwhelming reaction from end users. What does appear to be more popular in the new generations of cellphones is the ability to

[6] These include online word processors and spreadsheets and also an enhanced ability to hold interactive conferences and meetings online.

take pictures and send them to friends and family, a typical connectivity application.

Odlyzko argues convincingly that while it is true that content is required to move across the Internet, this does not imply that the creation of content and the provision of Internet access are one and the same thing. *Interactivity means that the content providers and the content users are the same people*. Data flows between them. Moreover, it is here that the need to minimise latency becomes critical. When content flows one way (as with television or newspapers) then users can choose to wait. When there is a social element, that waiting becomes an issue. Enable high-speed data transfer, and we can reasonably expect that the greatest growth will come not from one-way pushed content (such as video clips currently being pushed by mobile companies) but from two-way interactivity (such as is now provided by SMS and Blackberries). It seems likely, therefore, that the 'killer' applications from improved broadband will be those applications that offer a social element. It is important to note that the current emphasis on network configurations that allow quick downloads but slow uploads is thus completely misplaced. Symmetry rather than asymmetry is required for interactivity.[7]

In this respect, improving broadband is not simply an entertainment or even an 'informational divide' issue. It is a social network and productivity issue. We may not know precisely which applications might take off if broadband is improved. But regardless, broadband infrastructure investment should be seen as an investment in social capital, rather than knowledge capital.

[7] This asymmetry currently affects user-driven content including content provided through blogs and other sharing sites such as YouTube (for user-videos) or Digg (for user-tagged content). This call is noted by the Internet Industry Association.

4 The national broadband call

The current debate in Australia centres on a call for a national plan to improve broadband services and access. It is a very simple argument comprising three steps:

1. Australia's broadband performance as a nation is poor (see section 2).
2. National supply – broadband investments need to be made nationally, and ensuring investment cost recovery requires protection from competition[8] or a government subsidy,[9] or both.
3. National demand – the applications that will drive consumer broadband adoption are national in scope and need to be addressed that way so as to close an 'information divide'. In other words, potential developers of useful applications will only develop them if there is sufficient national broadband access and adoption, and unless this is done there will be an increasing gulf between the information haves and have-nots.

The logical conclusion from this argument is that Australia needs a *national* plan for broadband:

> We need to ensure that as a nation the economic and social transformation that is taking place due to the internet will continue to be maintained.
>
> If we can agree at least on national targets…we can have some idea where we are going and why.[10]

and

> …the National Broadband Plan is an important foundation for national development. It is an opportunity for national infrastructure leadership that delivers next generation communications to all Australian businesses and families.
>
> Telecommunications is a national responsibility.
>
> Modern telecommunications infrastructure accessible to all Australians benefits the nation and consumers.[11]

This section demonstrates that each of the three steps set out above is based on a fallacy, and that there is no need for a national broadband

[8] Telstra 2005, p. 6; Allen Consulting Group et al 2006.

[9] ibid., p. 7 (brochure) and p. 9 calling for government funding of $2.6 billion.

[10] Internet Industry Association 2006

[11] Telstra 2005, p. 3 (brochure); emphasis in original.

solution. Instead, all indicators point to local solutions for what is fundamentally a local problem.

4.1 Where is the performance poor?

Section 2 demonstrates that if we take a national perspective, broadband performance lags behind our peer group of economies. Such national aggregation, however, masks a significant amount of geographical variation within Australia.[12]

First, higher-speed broadband connections are available across Australia. The cable network passing over two million households now offers speeds for up to 17 Mbps, and DSLAM (Digital Subscriber Line Access Multiplexer) investments in exchanges allow faster ADSL2+ connections to many establishments.

Second, there are even better options for business. Most central business districts have high-speed broadband access with fibre connections right to the establishment, offering Internet access comparable with the best overseas services. Indeed, for researcher networks, AARNet provides 10 Gb connectivity linking key health and education centres.

What this means is that where economic activity relies on high-speed broadband access, Australia has options. As in the early days of the Internet, it may be that businesses need to consider carefully their location to exploit them (Greenstein 2005). But if a business needed connectivity to compete, they could procure it from within Australia.

Broadband access is, however, an issue for households and businesses outside the central business areas. But this has very different implications for national economic growth and competitiveness.[13]

4.2 Where are the economies of scale?

The recent debate over a possible Telstra FTTN roll-out in Australia has centred on the vexing issue of 'economies of scale'. Its advocates argue that FTTN requires a substantial lump of investment. And unless private firms can be assured of earning a decent rate of return on that entire lump, it is not worth investing. For this reason, therefore, no such investment is supposedly taking place.

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[12] See the statement by Helen Coonan, Federal Minister for Communications, in 'Broadband's Tangled Web,' *The Age*, 9 August.

[13] In addition, business uses for the Internet could be quite different from households. For larger corporations, they will invest in their own networks to maintain connectivity. For medium ones, they can come to arrangements with carriers to make investments from the exchange. For some smaller businesses, their issues will be related to household issue but, again, if it is truly critical, their location choice will be tied to Internet access.

It is very easy to be seduced by this argument. But one should be sceptical about equating plans for lots of investment with an argument based on economies of scale. Indeed, the early history of the Internet demonstrates the danger of assuming the existence of scale economies. A dial-up connection could be provided relatively easily and affordably to a small set of users. The end result: dial-up ISPs emerged all over the place (Greenstein, 2005).

Access to broadband poses a tougher task. However, it is not a national endeavour. If you want to build, say, a large base-load power plant, you need to be assured of demand from a million or more households or establishments. With broadband, each investment required is in the tens of thousands of users, in a very limited geographic area. With enhanced broadband, each investment (for example, a FTTN connection) requires revenue from several hundred customers. And when we get down to FTTH, it is one connection per home.

"… the chief bottleneck (at least in non-regional areas) appears to be on investment in the last mile connecting households with the broader network."

What this means is that to justify improvements to broadband infrastructure, a firm does not require a return over all areas. Instead, it must make an adequate return on an area-by-area basis. Not surprisingly (as with similar services), the prospects of making a return will vary from one location to the next. For the same reason, we should expect broadband infrastructure investments to vary between locations.

Such variation has an important implication for calls for universal service obligations for broadband. Put simply, to oblige or encourage any one company to make ubiquitous investments in broadband across the country would be foolish. This is not to say that a desire for universal access might not be warranted. It is just to say that obligating a single company to do this is unwarranted and unnecessary (Downes & Greenstein 2005).

If there are economies of scale that justify government protection from competition and/or funding, they are not national in scope. Indeed, for the investments needed to connect most households to higher-speed connections, the economies (if they exist) are local in nature, at the level of exchanges or even streets.

It is worth noting that one 'national economy of scale' argument that does not appear to be proffered is the idea that one technology will fit all locations. It appears that when it comes to this choice, the geographical issues are hard to ignore. Essentially, the chief bottleneck (at least in non-regional areas) appears to be on investment in the last mile connecting households with the broader network. As noted in section 2, many different technologies can be used, and the best technology is likely to depend on – and has costs based on – local conditions. Consequently, the appropriate solution may differ from exchange to exchange. Efficient investment decision making will require mechanisms responsive to local conditions. This will be expanded on below.

“ … investment decision making needs to be devolved. ”

It should be noted that such arguments lead us away from relying on central methods of deciding on broadband infrastructure – whether by the federal government or the national telecommunications carrier. Even if the funding were centrally provided, decisions about broadband investments would need to take into account local information. That likely means that investment decision making needs to be devolved.

4.3 Are the applications national?

Even if the investment required is not national, it is often argued that adoption needs to be national to encourage the development of applications that give value to Internet access and use. The argument is one that often seems rather compelling. First, without content, the Internet is just lines and equipment. Second, content development has economies of scale. Hence, it is argued that without sufficient access, content will not be developed – that the value of broadband adoption is subject to *network effects*.

Network effects have played a role in the adoption of many general purpose technologies including electricity and telecommunications. In the case of the latter, there were doubts that the need was there. When the first long-distance telegraph was introduced, Henry David Thoreau said ‘They tell us that Maine can now communicate with Texas. But does Maine have anything to say to Texas?’ Not then, but soon enough it did, and the actual communications was the chicken that followed the egg of pre-emptive investment in telecommunications (Rosenberg 1979). Similarly, it was the development of reliable electric power flows that eventually convinced businesses to reorganise themselves around electric power (David 1990).

Network effects mean that early adopters may require subsidies because the full benefits of adoption only arise as more users come online. Network effects also mean that infrastructure providers will need to be patient because returns will be ‘back-loaded’ over time. There are, however, several layers of network effects. And the impact of these network effects determines how long the network providers will have to wait for adopters to place full value on broadband improvements.

To see this, consider the layers of network effects. The first layer is global: an application that utilises the Internet and the content available on it is ‘world wide’ in its network effects. The more adopters there are around the world, therefore, the greater the case for an Australian to adopt. Similarly, for applications that require higher bandwidth, the more users there are with that bandwidth, the more likely it is that appropriate applications will be developed.

The good news for Australian investors is that Australia is a laggard. That means that if there are global network effects, they will already be realised

as a result of demand and adoption elsewhere. Thus, there will be no reason to wait and subsidise early users. The value is already there. Indeed, it is well known that Australians are among the more prolific downloaders of music and video content. While this does not benefit copyright owners, the ability to do this can drive broadband adoption. This is how a global network effect can be exploited without the usual cost associated with delayed adoption.

Similarly, gaming applications that have grown with higher-speed broadband investments in Korea and Japan are available now, and with similar investments here, Australian residents would be able to access these applications. However, the value of that is person by person and not national in scope. Hence, the development of such content does not require high national broadband take-up within Australia.

The proponents of a national broadband plan have recognised this and have argued that, in fact, the network effects are national in scope. For this reason, high-definition television, video-on-demand and movie download services are often touted as reasons to improve Australian broadband. Proponents argue that without sufficient adoption, those services would not be possible. But as noted earlier, the case for such instant content provision to drive or justify broadband improvements is weak.[14]

"The best contender for a national layer of network effect relates to the use of e-commerce."

The best contender for a national layer of network effects relates to the use of e-commerce. The more businesses that offer online services to consumers in particular country, the greater the value of adopting reliable Internet connections in that country. The issue is, however, that it is difficult to see these benefits as being substantially improved by improving broadband beyond current levels. Put simply, there is little evidence to suggest that bandwidth is the critical constraint here. The data flows required for transactions can be achieved without broadband.

If there are to be new network effects within Australia from better broadband, they are likely to be highly localised. As noted earlier, the applications most likely to make improvements in broadband valuable are social in nature. For activities such as video conferencing and business collaboration, these applications may appear to be largely independent of distance. Social Internet interactions, however, are likely to be driven by people you know and who are most likely located close to you:

> Most communications are local, and the Internet is likely to increase the locality of its transmissions. (This phenomenon has happened in the past with some other services, such as the mail.) 'The death of distance' is greatly exaggerated. Some of the venture capitalists who proclaim 'the death of distance' the loudest are among those who insist that startups have to be based in easy driving distance of their offices on Sand Hill Road. An interesting

[14] Leigh & Atkinson (2001) argue similarly and suggest that adoption of Internet access would proceed (subject to geographic access issues) broadly along the lines of other appliances (such as television).

> example … was the tech branch of an investment bank that moved from San Francisco to Menlo Park, because San Francisco was too far from the scene of the action in Silicon Valley! The value of locality is diminishing in some jobs (which are then migrating to India and other places) but is getting ever more important in other jobs. Broadband is encouraging the evolution, but there are no clear-cut rules for how it will evolve. As just one example, broadband is often promoted as a way to keep populations in rural areas from declining, by enabling telecommuting. Yet if a job can be exported to a farm in Manilla, Iowa, why couldn't it be exported at even lower cost to an office building in Manila, The Philippines? (Odlyzko 2003)

"Most email exchanges occur between people located in the same city."

Most email exchanges occur between people located in the same city. Teenagers who are engaging in instant messaging are doing so with their friends who attend the same local school. Thus, it would not be surprising that a medical diagnosis conducted over the Internet would be with your local doctor (to avoid waiting rooms), even if what we imagine is the greatest social value will be longer-distance diagnosis. Collaboration and conferencing tools will also assist in telecommuting, which will largely take place between users in the same city.

There is evidence that supports local effects from the adoption of home computers. Goolsbee and Klenow (2002) studied consumer purchasers of computers in the late 1990s, and found that a household was more likely to buy its first computer in local areas where lots of households already had them, or when a large share of friends and family already owned one. Purchases were not related to any particular computer program but the effects appeared to be tied to the use of email and the Internet. It is not unreasonable to expect that this same effect would continue for the adoption of higher speed broadband.

Consequently, when improved broadband services become available, the best predictor of adoption will be local rather than national or global adoption. One way to test this prediction would be to examine individual adoption of a MySpace Web site or of blog readers, examining whether adoption is by users scattered around the globe or by a number of users united by a common locality. Such examination might provide an indication of what will drive socially oriented applications.

In summary, there is a case that the network effects from the adoption of improved broadband services are likely to be local. It is for this reason that countries that have led in the investment in these services have also led in the adoption of them. If the network effects were global, adoption would have lagged.

4.4 Summary

The case for a national broadband plan and roll out is fundamentally flawed. On the supply side, the investments that need to be made and the technologies chosen are fundamentally local. On the demand side, there is little case for a national approach – and if there is a case, it is community-based around localities. Thus, it is take-up within a locality that will drive the development of content and applications rather than overall national adoption.

What this means is that broadband improvements are not a national public good logically deserving national government intervention. They are in fact local public goods. They share more in common with garbage collection than with defence. Yet the rhetoric of the debate obscures this important fact. As is demonstrated here, the way we go about formulating broadband policy fundamentally changes when a proper local perspective is adopted.

5 The way forward

This section sketches a potential way forward that takes into account all of the considerations discussed in the previous sections. The goal here is not to justify improvements to broadband but to outline a framework for decision making and targeted subsidies that will lead to efficient outcomes.

A caveat is in order. The proposal here is no more than a proposal, put forward as a way of promoting debate about innovative solutions to our current broadband dilemmas. It is not definitive. Various alternatives can be imagined to fine tune each element of the proposal.

The core of the proposal is a framework to enable local decision-making on broadband investment. This requires:

- ensuring cost-effective connectivity of localities to the broader network
- empowering local groups such as councils to encourage competitive local solutions to broadband access and speed issues
- ensuring that where there are gaps, the federal and state governments step in to fill them.

5.1 Cost-effective connectivity

The main task in obtaining broadband improvements is to encourage investment in customer connection to the Internet. As noted earlier, this is a problem for households and establishments outside the central business districts of major capital cities.

Whether it is by improving Internet access from the exchange (in suburban areas) or from trunk lines (in outlying areas), any infrastructure provider will need to access existing telecommunications networks on efficient pricing terms. In this regard, it is instructive to focus on *access to the exchange*. For a provider to serve an area out of an exchange, it will need to be able to set up equipment at that exchange and pay a reasonable rate for data transportation. Because exchanges are owned by one company – Telstra – this means regulation. These services are regulated at present by the ACCC. But my contention is that moving forward will require effective regulation, and encouragement of exchange-to-the-customer solutions.[15]

It is worth noting the reasons national telecommunications carriers are unlikely to represent the solution to local infrastructure investment for improved broadband. While network unbundling has led to investment in infrastructure in central business areas and to competing billing platforms for DSL in households, Telstra remains the dominant provider of wireline

[15] See Wallsten (2006) for a review of such regulations across the OECD.

broadband services and certainly the dominant investor in infrastructure. What this means is that broadband infrastructure investment is largely in Telstra's hands and will take place according to its objectives.

The key problem with this situation is that Telstra's integrated nature gives rise to conflicts. The clearest example of this comes from the threat that VOIP poses to Telstra's (and Optus's) fixed line revenues. If FTTN or better was implemented around Australia, the bandwidth it would allow would permit VOIP of mobile telephone quality or better. However, VOIP essentially minimises revenue to telecommunications carriers. Even where VOIP is costly (as in calls to mobiles), this is largely due to the high prices charged by mobile carriers. What this means is that ubiquitous broadband at 20 Mbps or better may remove fixed-line revenues entirely.

" … it appears logical to suppose that the fixed-line telecommunications carriers will strongly resist higher-bandwidth broadband. "

Of course, these revenues would be replaced by revenues accruing to broadband providers. However, this would represent a different business model and would be more commonly subscription rather than usage-based. For that reason, it appears logical to suppose that the fixed-line telecommunications carriers will strongly resist higher-bandwidth broadband.[16]

The lack of competition and the potential conflicts of interests of existing telecommunications providers mean that the cost of encouraging them to invest in broadband infrastructure is much higher. As Hausman, Sidak and Singer (2001) have shown, cable television providers have been a stronger force for investment in broadband in the US than elsewhere (see also Hausman 2003). One reason for this is that they have not been engaged in telecommunications and instead have the complementary incentive of competing for viewer attention. Australia lacks this separation between alternative communications modes, and this has limited the development of cable as an alternative to DSL services (Gans & Hausman 2006).[17]

It is worth pointing out here an inadequacy in the G9 proposal for FTTN. The good thing about this proposal is that it will result in investment from the exchange to the node. The problem with it is that the connection from the node to the customer will require access to the Telstra copper lines. There remains considerable uncertainty about those services, and hence the G9 proposal really only gets us half way to the type of broadband investment we need. Moreover, it creates a serial monopoly situation with two complementary parts of a service owned by different monopolists. That is generally worse than a single monopolist.

[16] The lack of competition combined with this is what is giving rise to a conflict. In the US, wireline companies make investments in high speed broadband in competition with one another. Here in Australia, the lack of competition adds up to investment inertia.

[17] In areas where both Telstra and Optus cables are rolled out, the need for regulation might be diminished, but only if it were clear that both firms were providing viable competition. This would likely require separation of Telstra's cable and copper network ownership, something unlikely to happen in the wake of the third Telstra share offer.

It would be a different matter if customers either owned their own copper pair right to the node or paid Telstra a fixed rental amount for that copper pair to the node. Customers could then use that line however they chose. That would break the serial monopoly situation by placing the customer as a decision-maker further up the network.

What we want to encourage is exchange-to-the-customer solutions. Note that these need not be wired, but could be wireless solutions. We need to ensure that the declared services support such solutions. Specifically, clear *access to interconnection at the exchange needs to be given long-term certainty*.[18]

5.2 Local competition

Having established a clear means of interconnection with the Internet at the exchange, as noted above, the investments that must be made and the technologies that are optimal are highly location-specific decisions. This means that those investments do not require Telstra, or even an existing telecommunications carrier as providers. They could be undertaken by others.

The primary issue is coordination. One option is to let the market operate largely unmediated, with potential providers assessing demand in a location and investing accordingly. Because these providers would be subject to competition via any alternative option into the home from Telstra, there would be no need to regulate them. A simple market test might then determine viability.

"This opens up a scenario where local governments play a role in procuring local broadband access."

One problem with a purely market solution is that these investments will potentially have other impacts on the local area. We should not forget the broadband infrastructure build-out of a decade ago when Optus rushed to string cable across power lines – a build-out which was frequently thwarted by local governments, and which eventually left Optus without options to extend its network (Telstra controlled the other conduits). Regulations and conduit ownership may, therefore, limit the ability to provide a market solution, and local governments and others will have to be part of the picture.

This opens up a scenario where local governments play a role in procuring local broadband access. In this scenario, local governments would put to tender the task of providing broadband connectivity to households in an exchange area. Where that area crossed local government boundaries, a joint tender would have to be organised. As with any other procurement activity, the local authority could rely on competing bids to keep costs down and on local area submissions to assist in finding what households

[18] See Hall & Lefr (2002) for a similar view.

and businesses might really want. The local authority could also engage in solutions to maintain aesthetics, including coordinating fibre roll outs with the movement of power and other lines underground.

The economics of broadband provision are such that the coordination of broadband provision falls naturally to local government. Some direction from the federal government could aid in this process, and targeted subsidies may have a role. Issues of conduit ownership would also need to be resolved.

Interestingly, state and local governments around Australia are exploring initiatives along these lines. In each case, they are taking advantage of new developments to bring fibre into the home as a solution for telephony and Internet services (box 3). They have also sought to resolve conduit and backhaul issues. With these pilot cases, they are moving precisely in the direction advocated in this report.

Box 3: The Aurora FTTH project

A new development at Aurora in Victoria is showing how local solutions to broadband issues might work. As part of the new development of residential land, FTTH connections are being built in at a cost of $1800 per household to provide Internet and telephony services. Along with good introductory rates for basic broadband (free initially), residents will be able to have world-leading 100 Mbps connections.

The project has involved competitive tendering, developer coordination, conduit ownership issues, and issues associated with backhaul (in some cases beyond local exchanges and to the Melbourne central business district). The project demonstrates local solutions that are possible but also the constraints currently in place.

Like many other local public goods – parks, sanitation, child care and good schools – improved and cost-effective broadband access will affect land values. This has been shown to be the case for business Internet access in certain circumstances (Greenstein 2005). Home Internet access could have a similar effect, especially if the types of social applications discussed earlier become increasingly important. If Internet access influences the marginal purchaser of property in an area, it will have an impact on land values. This will in turn affect council rates and provide a means of competition between local councils. Such competition already works to improve the local quality of many public facilities, and there is reason to consider that the local public good of broadband Internet access could have a similar effect.

This decentralises the responsibility for making decisions on broadband, bringing that responsibility closer to the people most affected by the decisions. It encourages local solutions that match local conditions and local needs. And it provides a means of expanding competition for Telstra in local areas.

5.3 Subsidies

While the previous section advocates increased local level involvement in finding and procuring broadband solutions, as with all telecommunications services, regional disparities exist and arguments could be made that universal coverage is desirable. Indeed, the federal government has already accepted this argument and is currently subsidising broadband provision in regional areas through its Broadband Connect program.

The Broadband Connect program provides a payment for the provision of a broadband service to customers who do not currently have access to that service. It is for 'basic' broadband (256 kbps down and 64 kbps up) with a cap on the pricing of that service over the first three years, although the cap is generous by metropolitan standards. It is available for connecting households, small businesses and not-for-profit organisations.

"From an economics perspective, new connections have the biggest bang for the efficiency buck."

The good thing about this policy is that it targets new connections. From an economics perspective, new connections have the biggest bang for the efficiency buck (Goolsbee 2003). They provide a new good, and new goods provide the greatest increment to consumer surplus. By providing a connection rather than a usage subsidy, the policy provides maximum incentives for potential providers to convince users to agree to take connections. Invariably, this involves making usage cost-effective and charging consumers a connection or subscription fee to cover other costs. Finally, it encourages local technological solutions for local conditions.[19]

A key issue is whether a similar type of scheme could be used to improve broadband services across the country. As with basic broadband, there is a case for universal coverage. But there is also a case for a more gradual roll out. By securing regulation and encouraging local competition, urban and suburban areas could gain the broadband services that best suit their needs. Only later, when those services and applications have become clearer, will it be possible to set subsidy rates for the rest of the country.

[19] The Queensland Government has recently proposed similar subsidies for improved broadband across the state. It is unclear whether the roll out will be state-wide or whether it will reflect local considerations.

6 Conclusion

In industries where there is an economic justification for government intervention, economists look to find what are called positive spillovers. These are consequences of individual actions that create benefits for others. This is important: if we rely on individuals to bear the costs of their adoption choices while benefits flow to all, we will drive adoption at a socially suboptimal rate. Thus, there is a case for government intervention to alleviate those adoption costs and generate a socially optimal level of adoption.

But as this report has outlined, higher-speed broadband is unlikely to create national spillovers. One individual's choice to adopt a higher-speed connection has almost no impact on the national economy, economic growth, or the benefits to other individuals in other parts of the country. We do not need to share at a national level either the costs of the necessary infrastructure or of the applications that run on it.

Instead, if there are spillovers from individual acquisition of higher-speed broadband, those spillovers are limited to the area connected to the local exchange or node. Almost certainly, if more households in a locality can adopt high-speed broadband, this will defray the local investment costs of connections from the exchange to the home. In addition, the benefits realised from greater connectivity are predominantly local and are social. If your friends, family and neighbours adopt broadband, this is more decisive in your own decision. For these reasons, any government intervention should occur at a local rather than a national level.

> "… we need local solutions – and with them, the prospect of local competition."

This perspective significantly reformulates the current debate on broadband. Without a national imperative, there is little need for a national roll out plan, and little need to subsidise or protect national telecommunications carriers. And without national spillover effects, there is unlikely to be an 'informational divide.'

Instead, we need local solutions – and with them, the prospect of local competition.

Local councils represent one potential institution for organising the local provision of broadband. If they do it correctly, house prices and rate collections will rise. If they do it efficiently, they will win votes. And regardless of how it is done, the timing of investment is more likely to reflect local need and local costs. We may ultimately want a national solution to fill in gaps that emerge. But right now, we need a national strategy to empower local solutions.

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