Broadband Technologies, Techno-Optimism And The 'Hopeful' Citizen

Matthew Allen
Internet Studies, Curtin University of Technology
(m.allen@curtin.edu.au)

Introduction: broadband and virtual learning environments

Using the Internet to promote or facilitate learning has a relatively long history. As early as the mid-1980s, at a time when the Internet itself was relatively experimental, a few early pioneers such as Hiltz were exploring the possibilities that networked computer communications technology could provide for education. Not only were universities the birthplace of the Intern et as research network; they also had both staff with interests in using technology for learning as well as critical infrastructure which might permit early development and adoption. But, with the widespread public uptake of the Internet from 1994 onwards, online learning has become much more widespread – both through traditional institutions of learning (schools, colleges, and universities), but also through the auto-didactic qualities of both the Internet itself and many who use it; and finally through the oppportunities which commercial 'providers' of education and training imagine might be embedded in this new technology to deinstitutionalise learning.

In some ways, while institutions of learning, and learners themselves have quietly got on with the business of education, delivered solely, primarily or with significant extension, through the Internet, commercial expectations of significant for-profit education, enabled by the Internet, have not been realised. While we might critically analyse some of the late 1990s enthusiasm for 'elearning' as yet-more dot.com hucksterism, it is also important to consider that there is some truth in the claim that commercial online learning demanded far higher bandwidth than was readily available to most potential clients. The coming of broadband access, which is the primary focus of this chapter, might then suggest that a new phase of development will occur for those kinds of learning environments which depend on high bandwidth connectivity.

The development of Internet-based learning has, until very recently, been specifically influenced by the narrowband access available to most teachers and students. For some, perhaps many, this influence has been positive, leading to a model of online learning that has been predominantly driven by textual information and communication between teachers and students, largely conducted within a constructivist paradigm of learning. In the absence of the more traditional kinds of 'classes' within which students mostly learn, teachers have developed – and students have enthusiastically adopted – modes of instruction that don't depend on the audio-visual re-presentation of lectures, or on awkwardly synchronous gatherings of many students, only a few of whom might be able to participate effectively in the time available. It might be argued that this approach was borne of necessity and has been a pale imitation of 'real' online learning involving the transposition into the virtual of all elements we might normally associated with 'classroom' learning. But, it would appear that, in fact, a new mode of learning which, while not replacing existing forms, provides important alternatives.

Broadband access, when widely available in society, might in time change this position, consigning the largely textual interactions of teachers and students in the past decade of online learning to an historian's footnote. Certainly, from a technologically determinist position, this outcome seems likely: those favouring it argue that bandwidth demands such development, as if the width of the channel will necessarily bring more and more extensive content. But it is not clear, however, whether broadband will indeed effect this change, although undoubtedly as broadband access becomes more 'natural' in societies it will encourage developments that utilise its capacity to allow distributed, audio-visually rich learning environments to emerge. To make reasonable predictions about the likelihood of this kind of development requires more than just a techno-fetishist belief in the pressure that technological change alone can bring. Rather it requires a more subtle understanding of the social, political, and economic contexts within which hardware and software are used.

This chapter provides just such a context, by way of an in-depth study of the deployment of broadband Internet access in Australia in recent years. Firstly this study demonstrates that the link between online education and broadband technology is not merely a matter of content meeting bandwidth. Indeed it has become clear in Australia that the obsession with richly graphical, televisual-style content (of the kind we might associate with education delivered over the Internet) has at best had little positive impact on broadband development. Rather, if broadband is to have a significant impact on improving or expanding virtual learning environments it is likely to come through changes in both the perception of Internet users about the Internet, sparked through the marketing and promotion of broadband, rather than the technology alone. It is also going to be heavily influenced by the embedded technological limitations and socio-economic conditions within which apparently neutral 'technological' development actually occurs. Second, this chapter exemplifies the kind of thinking that must also be applied to online education itself, taking seriously the role of government, market and consumer/citizen Internet users in making sense of technology. Broadband, whose absence is often imagined to be a 'barrier' against adoption of virtual learning environments actually emerges as far more than a technological capacity that will solve problems just by becoming available: similarly those learning environments themselves are not a given solution but, instead a site for further contests of meaning over the roles the Internet plays in society.

And, in Australia in 2003, nothing better represented the persistence of techno-optimism than the heavy promotion in print and electronic media of the 'Internet fridge' –an LG Electronics' product that features an Internet-linked touch-screen /processor, mounted in the shiny stainless steel front of a domestic refrigerator. In the advertisements, what the beautiful, hip urban digerati are gaining from possession of this piece of domestic ingenuity is unclear…except of course that they are more hip, more beautiful, more digital. The Internet fridge is a good example of the way that, in the twenty-first century and especially in developed nations such as Australia, Internet technologies exist within social and political life as the result of the intersection of the marketing of Internet access products, the development of new technological systems for access, and irregular government regulation and policy pronouncements of the 'need' for new forms of information and communication technology. My chapter explores this intersection by examining three cases, one each for marketing, government policy and regulation, and technology, that exemplify the issues of deployment and development of broadband in Australia.

Marketing broadband products

Three main advertising campaigns that aimed to sell broadband products, principally but not exclusively to residential consumers, were seen on Australian television in 2003. These advertisements were by no means the first, nor the last, for these services. Indeed, since January 2004 and some significant new service development by Telstra, such advertisements have become commonplace. But, in 2003, such advertisements were notable because they followed and are to some extent reflected recent changes in the telecommunications and pay-television regulatory framework consequent upon decisions by the Australian Competition and Consumer Commission (ACCC) on pricing and corporate agreements. These decision, put simply, required Telstra (the primary wholesale provider of DSL access) to reduce its prices to retailers; and permitted greater freedom of integration between the Foxtel pay-TV provider (part-owned by Telstra and by News Corporation) and Telstra itself (Velde, 2002; McGrath, 2002; see also McCarthy, 2001). The initial result, by the end of 2002, was a dramatic increase in the number of DSL connections, taking this kind of access past cable connectivity for the first time since residential broadband became available in Australia (Turner, 2003). The advertising examples that I discuss below are a reasonable sample of the marketing initiatives of the past two years in Australia, in the way that the needs and interests of likely customers are characterised by various Internet service providers (ISPs), and demonstrate some of the ways in which Internet-related information technology is constituted as a benefit in contemporary Australian society. They are also significant, for the specific conclusions in this paper because, as indicated previously, government policy making in relation to broadband is significantly influenced by perceptions of the lack of awareness among consumers about the advantages of broadband (the so-called information asymmetry in the marketplace). Thus these examples of major marketing campaigns provide an opportunity to identify the environment in which that policy making operates.

The first example promoted the iPrimus brand (owned by Primus Telecommunications Group). Primus is Australia's third-largest telecommunications company, behind Telstra and Optus (the local brand of the multinational corporation, Cable and Wireless). The advertisements consisted of a series of short, humorous scenes that have nothing to do with the Internet – a golfer sinking a long-distance putt, a couple of nervous teenagers about to kiss for the first time, and so on. Each one was an example of success in conditions of adversity or uncertainty; each was a variation on the classic literary theme of the promise of desire, fulfilled. In the advertisement, at the crucial moment – as the ball is about to sink, the lips are about to meet – the action freezes and the slogan 'disconnected' flashes on the screen, accompanied by sound effects of the kind of grinding noises that only a modem can make. These advertisements ran for at least three months, dispersed across various programs and channels and their central message continues to form the basis of the iPrimus marketing campaign, as stated on the website: "iPrimus Broadband also gives you Frustration Free Internet access with always on access and no unexpected dial-up disconnections or costly dial-up charges." (http://www.iprimus.com.au). By linking disconnection to games and romance, two primary reasons for online activity, the campaign zeroes in on one critical advantage of broadband over dial-up access. Clearly the campaign was designed principally to attract to iPrimus *existing* Internet users, for whom the frustration of Internet disconnection would be meaningful, rather than non-Internet users.

The second advertising campaign came from Telstra, Australia's dominant telecommunications company (the partially-privatised successor to the former national monopoly telephone provider Telecom Australia) and the owner of the vast majority of the infrastructure over which Internet services are delivered (for example, all local telephone exchanges belong to Telstra). The Telstra campaign, declared in May for July release (Sainsbury, 2003b) took place in two stages. Reflecting its enormous budget and market dominance, the campaign was clearly more expensive than that of iPrimus, both in terms of production values of the advertisements and in the fact that it was a two-stage campaign with longer advertisements. The first advertisement appears, until the very last moment, to be the story of a simple fisherman whose boat is at sea in a storm, then sunk by a whale and, upon washing up onshore, he is attacked by mediaeval knights, as well as experiencing many other unrelated and surrealistic phenomena in about 30 seconds of carefully crafted, digitally effected filmmaking. All is revealed in the end when he telephones his son and the scene changes to his son's bedroom where, as well as being on the phone, the child is doing is homework by finding information on the Internet about (we assume) whales, knights, and so on – and that this information has 'come to life' in some way because of the speed of downloading via broadband.

Promoting the 'Bigpond' brand that Telstra has used for many years for its Internet services, the advertisement (like iPrimus) provided no detail of costs or specific broadband arrangements. Rather the commercial created an aura of excitement and possibility that appears to make broadband (and more specifically Bigpond – hence the sea-based scenario) essential to a useful, entertaining and educational Internet experience. So rich in detail, the advertisement was a masterpiece of open signification, calling upon its viewers to interpellate themselves into the text and draw from it the meanings that make sense to them, but which all place Telstra, and broadband itself, in a positive light. The follow-up advertisements were quite different. They simply promoted bundling Telstra telephony, Internet, and pay-television subscription (repackaging an existing pay-TV service) to receive a modest discount each month (details that were repeated, prominently at http://www.telstra.com). The campaign was broad enough to attract many different kinds of new customers, or to retain existing customers; however it is also clear that, by emphasising the link between pay television and the Internet, Telstra appeared to be targeting those pre-identified customers (pay-tv subscribers) who are willing or able to prioritise media purchases (such as broadband access) in their household economies.

My third example is for Dodo Internet – a relatively new ISP that proclaims "Who says that the Dodo is extinct...Those people obviously don't know where we live. The truth of the matter is, we needed to stay low for a while whilst we became the very best Internet Service Provider (ISP)." (http://www.dodo.com.au). This company, named after a flightless bird, has a peculiarly incongruous slogan of "Dodo, Dodo, Internet that flies!" Its marketing in 2003 (which has continued into 2004) consisted of two low-budget television advertising campaigns – the first promising cheap dial-up access; the second promising cheap broadband access (using ADSL). The advertisements involve a cartoonish 'Dodo' character, dressed as a superhero, coming to the rescue of a person who just wants to know the simple answer 'can you get me a cheap connection to the Internet?' In both cases, and as repeated on the company's website, the emphasis was on lower cost. The website was, in comparison to other ISPs, simple, even childish in its approach and subtly reinforced the explicit messages that Dodo is cheap. In fact, it is not clearly cheaper and in some cases more expensive than other ISPs.

Dodo's marketing campaign was fundamental to its status as a developing business. As a new entrant into a market place with many hundreds of ISPs (though with only a few that are substantial in size), Dodo had to build brand recognition and, more importantly, distinctiveness. These advertisements were, it would appear, not designed to recruit existing Internet users. Such users would be pre-disposed and quite capable of checking, online, the price relativities and would be unlikely to churn to a company whose bright, simplistic website implicitly signals value, not quality, if it were not in fact cheaper. Rather, these advertisements promoted viewers to identify with the confused and uncertain – even fearful – Internet hopeful in the narrative, to whom Dodo came to the rescue. Not surprisingly, the advertisements drew on the tired, yet still persistent gendered representation of women as less-than-competent Internet users. More significantly, these advertisements did little to distinguish between broadband and dialup access, while selling both. Since the same slogan 'Internet that flies' was used to promote both products, they do not clearly communicate on the difference in speed of a broadband connection. Equally, the Dodo website barely distinguished the two, unlike dozens of other ISPs that clearly identified the differences between dialup and broadband in terms of speed, convenience, and so on – establishing it as a 'technological advance' and explaining how it might be cheaper than dialup in some circumstances. Thus, to a large extent, Dodo pitched its marketing at the novice user who might actually be confused by the technological decision-making required to choose from the complex array of products offered by more established ISPs.

Taken together, these three campaigns show the complexity of a highly competitive market and the diversity with which it can be approached by ISPs / telecommunications companies. The advertisements indicated the way ISPs were seeking to produce certain kinds of consumer-groupings to which they can appeal. iPrimus sought to churn users from existing dialup accounts. Telstra sought both the primary media-consuming customers as well as promoting the very idea of broadband (which would benefit Telstra since it is also a wholesale provider of broadband access). Dodo created a grouping of novice users concerned about price. Several key conclusions emerge, when these advertisements are linked with the overall state of the market for Internet access in Australia, the realities of the technology, and the perceptions of those, such as the government's Broadband Advisory Group, who are – effectively – engaged in their own policy advertising campaign to promote broadband at a national level.

One significant feature to emerge from these campaigns was that content is barely mentioned. While both Telstra and iPrimus offered some exclusive video content of the kind that would only be accessible for broadband users (for example, sporting packages on Telstra such as in-car camera footage from motor racing, and, for iPrimus, access to tropFest festival short films), neither company emphasised this content in the television advertising or on their websites. Telstra continued some key sports-content deals that were as much about Telstra's pre-existing commitment to sport through television broadcasting and part-ownership of the Foxtel pay television network, thus suggesting that this content was as much an advertisement for that other business. Yet, in 2003, it ended specialised content deals from previous years for 'unique' online content (Ferguson, 2003). Optus, which had previously emphasised an exclusive-content approach through its Optus@Home version of Excite@Home, did not emphasise content of this kind in its very limited marketing in 2003, even though it had previously engaged in one-off linkages with free-to-air television programs (such as the very popular *Big Brother* series) to provide some

exclusive video content. The reshaping of pay television provision in Australia, through a deal in which, effectively, the main pay-TV networks share content, promoting competition between packages and channels, rather than between discrete networks, and the opportunity for bundling of pay-TV, telephony and Internet meant that, from 2003, online content equivalent to the kinds of channels available by subscription was no longer relevant. Telstra and Optus would be competing against their own television products (see for example the comments of respected telecommunications commentator Paul Budde, 2003a). Instead (as indicated by recently released news of a linkage between Sony and Telstra for networked Playstation gaming [http://au.playstation.com/news/telstra.jhtml] and the existence of 'gaming' ISPs such as OzForces, [http://www.ozforces.com/]), 'content' for broadband is almost certainly to be interactive computer-based services rather than television-equivalent channels.

Dodo, as a cut-price re-seller of DSL access purchased from Telstra, operates deliberately outside of content deals, limiting its operations to extracting the greatest possible return from the simplest service. Of all the hundreds of ISPs in Australia, almost none are in a position to offer content: and what emerged in 2003 was recognition by the main providers, Telstra and Optus, that content was not, of itself, of great significance as part of the marketing message. Rather, in all three cases I have discussed (and in the rash of advertisements now appearing in Australia in 2004), speed, always-on connectivity, and cost-effectiveness were the identified motivational approaches to attract a positive response to the commercials. Indeed, since most ISPs operate like Dodo (reselling wholesaled ADSL from Telstra) cost-effectiveness, speed and reliability were the messages consistently communicated on the ISPs websites that explained the advantage of broadband. If content played any role in these website promotions, it was not 'exclusive' or television-like content but, rather, normal Internet non-exclusive content – software downloading, game playing, and file-sharing, as well as the end of the "world wide wait" (see for example http://www.iinet.net.au; and http://www.westnet.com.au, two of Western Australia's larger ISPs).

Secondly, these advertisements indicated the interrelationship, in business structures, of Internet and non-Internet business. Primus was one of the most successful of several new entrants to the deregulated telephone market in the late 1990s, utilising Telstra's infrastructure for consumer access to wired telephony and Internet services (and building its own mobile network), What distinguished Primus, however, was that it has no access to a cable network for broadband delivery. Optus, the other leading telephony provider, was not offering a DSL services in 2003, (pending at that time a satisfactory commercial deal from Telstra, now achieved in early 2004), Optus had an existing, well-regarded cable broadband service provided via its pay-TV hybrid fibre-optic/RF network (Sainsbury, 2003a). Primus could only offer a DSL technology offering. Thus Primus must rely on Telstra's monopoly network. Yet, while utilising Telstra's infrastructure for provision of DSL like the hundred or so retail broadband ISPs that do nothing but provide net access, Primus was and still is also attempting to compete at the much more general level as an all-in-one telecommunications carrier by offering bundled fixed and mobile telephone, with Internet service. Here, then, we see how a bundle, in which a Primus phone connection and DSL access work together, improves Primus' profitability by permitting phone calls to be at the same time. Always-on connectivity is, therefore, as much an advantage for a provider as for a customer. Similar arrangements also underpin Telstra's approach, with the added benefit for Telstra of its capacity to offer links to pay television. (Optus also agreed in 2003 that

most of its internet subscription business is now part of phone-internet bundles: Sainsbury, 2003b and, as with Telstra, benefits from phone and pay-TV bundling, AAP, 2003a).

Finally, only the first part of the Telstra campaign operated in anything but a pragmatic register. Other television advertisements (and most, if not all, of the related print and web-based advertising for broadband), focused on definable, current advantages such as speed connectivity, and price, and eschewed broader visions of the power of the Internet and information technology that might inspire or even bedazzle consumers. Oddly enough, Telstra's advertisement was similar to that of BT (British Telecom), another former-national monopoly provider that dominates its market because of control of local exchanges which must be enabled for DSL. This "high-profile campaign…revolved around the notion that there is so much content available on broadband – including dragons, pigs on motorbikes and Jarvis Cocker up a lamppost – that it burst the fat pipe and escaped onto the streets of London" (Sturgeon, 2002). While no doubt reflecting the greater marketing budget of such incumbent, dominant telecommunication companies, the similarity also suggests that since these companies benefit from an overall increase in broadband use, through their wholesale agreements, they are also conscious of the value of creating a general sense of enthusiasm for broadband, as well as specific arrangements relating to their own product line. These questions of how to typify the customers for broadband become particularly significant as I now turn to consider the second case, government policy.

Policy for broadband development

Governments around the world have, in one way or another, been heavily involved in the promotion of broadband technologies. In Australia, two key groups have been at work to consider these technologies and to promote a greater attention to them within government and in society generally. It was reported, by the Broadband Services Expert Group (BSEG), that "we see communications networks as a platform supporting, social interaction, education, health and government services, business relations, and our communications with the world"; that "During the next decade, the existing telecommunications network and broadband cable networks currently being established in major metropolitan areas will evolve to offer a range of interactive information and enhanced communication services"; that "Different technologies will be chosen for different areas, depending on the terrain, population density, the coverage required, and the type of service being delivered"; that rural and urban centres would become interlinked and that "Broadband services will probably be a key medium within our social and economic life within ten years"(from chapter 1, and chapter 4). Clearly, this committee believed that the interactivity enabled by broadband is critical for the national interest, as defined by Australia's place in an international environment. Using a metaphor uniquely suited to a land of beaches and ocean waves, it asserted: "Whether Australia catches the 'next wave' is up to Australians. If we are to remain internationally competitive, we must be willing to make the changes that will keep us at the forefront of new information and communication services". (chapter 3).

Another committee (Broadband Advisory Group – BAG) demanded that attention be paid to broadband because "Broadband communications technologies can deliver substantial economic and social benefits to Australia. They reduce the constraint of distance and greatly increase the quality of communications in many sectors. Their defining characteristics (fast, always-on) enable a paradigm shift in the way people or resources (such as computers) interrelate. In short, broadband technologies can transform the way

people live, work and do business." (p.1). This committee argued that "Broadband networks are a platform for enhancing social, cultural and national cohesion" (p.6), again, with particular reference to rural and regional Australia. This committee also indicated that, in future, health, education and government would operate quite differently when broadband becomes widespread. (p.1) Recognising the diversity of technologies and geographies, the committee mandates an approach that explores all options, both wired and wireless. And, as with the first report that I cite, this committee believes Australia is compelled to move quickly on broadband because of the economic imperatives - "Broadband will be the roads and railways of the 21st century" and "if we lose momentum, we may be left behind in the wake of countries whose policy makers are enthusiastically embracing these emerging technologies" (p.5; see also p.32).

What I have deliberately avoided revealing is that these reports are nearly a decade apart in age. BAG's *Australia's Broadband Connectivity* was released in January 2003; BSEG's *Networking Australia's Future* dates from 1994. And, inevitably, there are some differences: not least that the Internet is barely mentioned in 1994, that there is much more emphasis on direct government intervention through funding, and that the 'user / producer' plays a more significant role than the 'consumer' in the possibilities of network content development. Yet the degree of consensus between these groups is significant; and the language is almost identical, especially in the way that both reports express that indefinable sense of optimism mixed with fear – of opportunity and threat – that seems to have accompanied most of the policy documents and debates about the Internet and related services over the past decade or more (see Allen, 2001; Allen and Long, 2004).

Similar language can be found in the 'global' policy discussions and documents that are entwined with national policy formation. A recent ITU survey began by proclaiming:

> The development of broadband networks and services is a key issue for governments around the world. Broadband services are underpinning the development of e-commerce, and access to bandwidth at globally competitive prices is an increasingly important determinant of competitiveness in the global knowledge economy. Policies that encourage the provision of affordable broadband access to a nation's firms can put them ahead of global competitors. Those that fail to do so risk condemning their economies to secondary or subordinate roles. Access to broadband networks and services can also make important contributions to the quality of life, in terms of education, health services and social inclusion (Houghton and Morris, 2001).

This persistent theme, combining hopefulness with a dash of fearfulness, can be found elsewhere, too. In 1993, Mitch Kapor contributed a telling piece for the third issue of *Wired*, that neon bible of the optimistic digerati. Kapor, an early and consistent advocate for the value of a particular kind of broadband networking, based on (indeed no different to) the Internet as conceived by him and his Electronic Frontiers co-settlers. He wrote:

> First the visionaries sketched it out, then the computer literati caught on. Now the mainstream media is hyping it to the masses: a seamless high-speed network carrying voice, data, and video services to everyone. This information highway, we are told, will be used as a pipeline to bring an expanded universe of information and entertainment into the home and the workplace. …

This dream has been promoted extensively, but until recently little visible progress has been made toward its realization. In the past, political gridlock has snarled telephone companies, newspaper publishers, cable television operators, and other potential players in lengthy and fruitless congressional and court battles. A justifiable cynicism developed to fill the gap between vision and reality. (Kapor, 1993)

Current thinking, at least in the words of one *Wired* contributor, is rather different:

Ten years from now, when every PalmPilot can display video, a webcam is built into every monitor, and full-screen clips are commonly sent as email attachments, the broadband metamorphosis will be complete. At that time, the egalitarian Net will be a distant memory - but no one will care. Users won't reminisce about the equalizing effect of 28.8 modems any more than car drivers yearn for a time when everyone had to drive equally slowly, because dirt roads hadn't been paved with asphalt. The free ride online is over; but the ride ahead will more than compensate for anything we've lost. The Net is dead. Long live the Net. (Platt, 2001)

Perhaps the most clear statement of the environment into which policy-makers are now venturing again, with a similar mindset to the mid-1990s, is from the most comprehensive research report on broadband to date (at least in relation to the USA), *Broadband: bringing home the bits*:

Broadband, the darling of techno-sophisticates and an object of interest to a growing number of politicians and government officials, as well as to the general public, is often misunderstood. The term itself, originating in the characterization of a communications channel's capacity (in contrast to narrowband), has come to be used as, among other things, a marketer's label for advanced cable television service, the 21st-century incarnation of the early 1990s "information superhighway," and one element of the next stage in the development of the Internet. Broadband has been a beacon for investors and a stimulus for entrepreneurs and mainstream businesses, and it has intensified debates about the public interest in information and communications infrastructure. It is as an enhanced means of access to the Internet that broadband has begun to have real traction in terms of actual deployment and use, and it is in this sense that the term has become commonly understood. Years of assertions by technology gurus, business executives, and marketers about the potential promise of broadband have given way to a small but rapidly growing U.S. population who are using a first generation of broadband for faster Internet access from their homes (CSTB, 2003: 43).

Thus we can see that hopes and fears of this kind are not in opposition: they are two expressions of the same underlying quality of engagement with new technology, namely *desire*. And, in Australia, the government has now plunged again into the rhetoric of desire, prominently displaying a discourse of national hopefulness for an Internet and ICT-driven economic boom – after a period of relative inactivity in relation to ICT policy-making, coinciding with the dot.com bust (aside from some specific regulatory measures relating to pornography, gambling and, just-to-be-enacted legislation against spam). As the recently departed Minister for Communications stated, in a media release announcing the formation of the National Broadband Strategy Implementation Group: "all levels of government

realise the potential economic and community benefits that broadband can deliver" (Alston, 2003b).

The key themes within the current Australian policy regarding broadband remain as they were in the 1990s (Allen, 2001). The government, perhaps even more than in the 1990s, emphasises that it will not invest in networks directly – except in those special cases concerning research prototypes and to manage rural and regional political pressure. Thus, as explained in detail in the BAG report, the strategy to be pursued in the coming years involves a very limited role for the government, intervening only in the case of "market failures" and only then indirectly, by providing information to stimulate demand, or removing impediments to increased supply (BAG, 2003: 17). Indeed, "The principal strategy for the government is, as far as practicable, to rely on the private sector and market interactions as the primary vehicles for investment decisions and innovation" (p.40; also Estens, 2003: 125 for a similar evocation of current government policy), enabling that strategy through "regulatory certainty" that involves the least possible intervention in the market place except through established pro-competitive arrangements (see Lavey 2002, on the increased certainty that no regulation might bring).

Instead, the government proposes to play two active roles: as a consumer itself, utilising its massive size as a user of broadband (in concert with other levels of government both state and local) to drive demand Thus, the government's policy is not creating and managing the private sector so much as leaping in and controlling it from 'inside', by being the ultimate 'consumer' (BAG, 2003: 23-29. This approach has been warmly supported by other levels of government: see for example the recently published Western Australian state government follow up report WATIAC, 2003: xiv). The second role is to, once again, play marketeer. Just as, in the 1990s (through events such as Online Australia Day – Allen, 2001), the next few years will see the government promote and market broadband, especially to businesses (as consumers of this service), but also still to everyday residential users. Throughout the BAG report, there are repeated references to the lack of knowledge, the failure of people in Australia to understand the benefits of broadband (pp.3, 17, 55). Already, the government has begun a high-level promotional campaign in response, having funded what is, effectively, market research into consumer attitudes towards broadband (Alston, 2003a).

Just as the commercial promotion of broadband has increased in recent months, so too has governmental promotion. The National Office of Information Economy (NOIE) website [http://www.noie.gov.au] contains not just bureaucratic documents and the policy and political history of broadband development: it also has usable resources to assist users (should they even know that NOIE exists) to consider and utilise broadband more efficiently.

The ideological underpinnings of this policy initiative are critical if we are to make sense of the meanings which might be generated from a refusal to govern and an enthusiasm to consume and to promote. Fundamentally, the policy tries to be both global and national at the same time. While the details of the policy (i.e. what strategies to pursue) are deeply rooted in allegiance to the free market and the globalisation of capital, broadband is also constituted as an area of vital *national* significance. The linkage between these two is flagged, clearly, in the hubristic claim that "the Government's main objective for the digital economy should be to stake Australia's claim to a disproportionate share of the benefits of

the emerging global economy" (BAG, 2003: 16) – the global economy is an arena, thus, for national competition, even as the globalisation of capital further separates the economic environment from any real semblance of national control. Equally, where these technologies self-evidently link citizens around the globe in ways that 'nations' find hard to contain, broadband adoption is claimed to be essential for "national cohesion" (p.16) through bringing Australians more closely together, despite time and spatial separation.

It is worth noting, too, that media reporting in Australia leading up to the formation of BAG, and during the time of its deliberations, and even now tends to be critical of Australia as 'lagging' or 'slipping' in broadband uptake. This reporting was primarily driven by lobbyists or advocates of the ICT industry. For example, the CEO of Alcatel, in 2001, was reported to have said " 'Lack of broadband makes Australia's claim to be a clever country quite embarrassing'… Citing the example of Singapore and Korea, Mr Fowler said it was not too late for Australia to catch up" (Hayes, 2001). Obviously linked to the straitened circumstances of the ICT industry in recent years (and also driven by a critique by both IT advocates, consumers and industry of Telstra's pricing policies) it is moot as to whether it had a direct effect on government policy or not. In the BAG report, there is a strong emphasis on claiming that international measures of access and participation are not actually relevant and that "In terms of assessing Australia's performance internationally, there is an additional problem because no international benchmarking relates to the type of goals being envisaged in Australia" (43).

It was as if IT development in relation to broadband has been explained to Australians in terms of international sporting contests – that Australia is in competition with other nations and will be judged; that although Australia keeps being told it is not doing well, the government will try to change the rules, so Australia suddenly can do better! Within this policy discourse all Australians must, implicitly, accept this competitive challenge and attempt to get themselves connected to broadband: according to the government, being Australian once again (as it did in the 1990s) requires a degree of techno-optimism – of sharing the hopeful faith so that national desire can be translated into reality.

The Australian government, as well as considering broadband in 2003, also published a major report that is its guide to ICT industry policy for some years to come. Entitled *Enabling Our Future*, (Framework for the Future Steering Committee, 2003), it was not dissimilar to the contributor to *Wired* cited above and to many other examples of quasi-utopian promotion of the new economy, digital revolution and so forth. For example, "Many of the new business opportunities for Australian firms will depend on their capacity to develop new ICT-based products and services which respond to the expanding role of ICT across the economy and society" and "Advanced networks will underpin future business opportunities for the ICT industry, and the way in which ICT is used to achieve national objectives" (p.5). And, more generally, the report assumes, "The transformative role of ICT in society will continue, and accelerate over the next ten years." (p.6). Government policy and action in Australia was, I argued in the previous paragraph, constructed spatially around the desire of the nation to be a leader internationally. But the government's work on broadband was also constructed around *temporal* leadership: of achieving that international success by, rhetorically, arriving at the future faster than other nations. And here, of course, policy becomes even more about selling techno-optimism, establishing a vision of the future whose promises, as shown by the extent to which the 2003 BAG report repeats much of the 1994 BSEG report as if nothing has actually

changed, are by their nature unrealisable but serve instead like the promises made by iPrimus, Telstra, Dodo and others in building desire for broadband among their customers.

Technological characteristics of the broadband market

Broadband infrastructure in Australia, as in most other countries (with the notable exceptions of Singapore, to some extent, and South Korea), was not initially designed to support the kinds of fast internet-access services for which the term 'broadband' is now commonly (if rather misleadingly) used. Rather they were designed for various distinct purposes: the traditional PSTN providing telephone and related telecommunications services (i.e. facsimile and limited EDI for, say, EFTPOS communications between merchants and banks); the provision of pay television (through either cable or satellite); the operation of radio communications; and, more lately, specialised telecommunications control operations in some distributed industries or services (i.e. power generation, water services, railways); the newly emerging third-generation mobile phone networks; and, finally, a telecommunications backbone to integrate all lower-level traffic through a small number of cable and satellite links (see ACA, 2003: 8-11; also AIEAC, 1999: 47-71). This patchwork of technologies cannot realistically support the aspirations of technology pundits and promoters, whether industry or government or the general community, not only because the technologies were not designed for widespread use but were, instead, retro-activated enablers but also because each technology has developed and tends still to operate within quite distinct market-regulatory structures.

Each of these elements that, collectively, form the potential broadband network in Australia offers, essentially, a technological solution (current or potential) for particular consumers, but only rarely have been designed from scratch as a broadband data service. There are occasional one-off broadband service initiatives, such as the transACT network in the Australian Capital Territory or specific-purpose networks (normally in urban areas) for government departments, individual corporations, or research organisations (so-called 'dark fibre' – Pearce, 2002a), and some local cabling of new housing developments. These developments only serve, however, to demonstrate the extent to which the vast majority of the broadband infrastructure has emerged from circumstance, rather than by design. Moreover, since they are normally offered either on the basis of government subsidies, or on full cost-recovery of the creation of the network, they also highlight how substantial, planned development of the highest-quality fibre-optic broadband networks is unlikely to occur, leaving Australia instead with its patchwork networks.

Take, for example, cable services. Unlike the USA, with its long history of cable-based pay television, Australian pay-television services only arrived in the mid-1990s and were principally delivered through a limited cable rollout by Optus and Telstra at a time when, to most people, the Internet was not significant (either as a technological service or a cultural formation) and future interactive data services utilising cable were conceived as a limited addition to producer-distributed television viewing. As Telstra itself states:

> The other disadvantage for many Australians is that the Hybrid Fibre Cable Network is not available everywhere in Australia. It was purpose built to economically provide Pay TV services into densely populated residential areas. This means that in most regional centres, country areas and indeed in commercial and business areas in the major cities, it is not available. Simple economic realities have driven the distribution of this service. Nevertheless, some 2.1 million homes are

passed by the Hybrid Fibre Cable and have access to Telstra's cable modem service, Telstra BigPond Broadband Cable
[http://www.bigpond.com/broadband/access/cable/howitworks/
Optus' cable network is roughly the same in terms of homes 'passed', but only in Sydney, Melbourne and Brisbane.]

The original cable rollout was predicated on the inevitably over-enthusiastic predictions of pay television subscription, including Telstra's aim to cable 4 million homes by 1999; Optus had planned to include Adelaide. Pay television is now, in large part, being delivered by satellite service to those areas not cabled (see CIT, 1999). Moreover, the significant growth in housing development since the early 1990s, whether in inner city redevelopment or in outlying suburbs, means that the percentage of customers who can access cable is decreasing all the time: there are more than seven million households in Australia and Optus and Telstra cable sometimes passes both; while others, only a short distance away, receive neither. Furthermore, the cable network cannot sustain large numbers of users with high data traffic without slowing to a pace that, effectively, renders it the same or worse than dialup. In particular, the network design currently favours asymmetry – the reception of large quantities of data, with limited return traffic, and the network operators (Optus and, especially, Telstra) have utilised conditions of service to limit the capacity of the end-users of cable Internet to become producers or servers of content.

The enthusiastic desire for uptake of DSL in 2003 also revealed the difficulties of developing broadband without a broadband network, per se. DSL technologies, of various kinds, rely on the use of different frequencies to carry voice and high-speed data traffic over the same copper wires simultaneously. Two key problems have emerged in Australia as more and more users attempt to access this broadband technology:

- Distance from an exchange to a house that exceeds the reliable / possible operating limit of DSL
- Existing use of so-called pair-gain technology to provide two phone circuits from one twisted copper pair; a problem normally linked to RIMs (remote integrated multiplexers) either in exchanges or, worse, in roadside pillars) (see Chirgwin, 2002 for a very detailed explanation; Pearce, 2002b).

These problems, to some extent, reflect the original (and, for most consumers) ongoing primary purpose of the twisted copper-pair network: to provide voice telephony. As a Telstra spokesperson stated, in 2002, when the RIM/pair-gain problem began to emerge "these [systems] were built to cope with rising demand for voice rather than data services" (Sainsbury, 2002). The spacing of exchanges reflects the historical development of the telephone system, in some cases dating over 50 years; moreover, the expanding and changing urban topography has meant that cables often run longer distances than is optimum for ADSL telephony.

However significant problems exist in that ADSL may not be available at all. There are over 4,000 exchanges in Australia, of which 987 (predominantly in affluent, inner urban areas) are ADSL enabled. Telstra signalled, towards the end of 2003, that it will not equip any more exchanges past 1000, unless there is significant demand from consumers, and has established (like BT in the United Kingdom) a demand register to permit it to make decisions on which exchanges to upgrade based on a guaranteed level of demand (see AAP, 2003b). Moreover, recent evidence by Telstra to a Senate Committee on telecommunication revealed that "each ADSL-enabled exchange was provisioned to a maximum of seven to
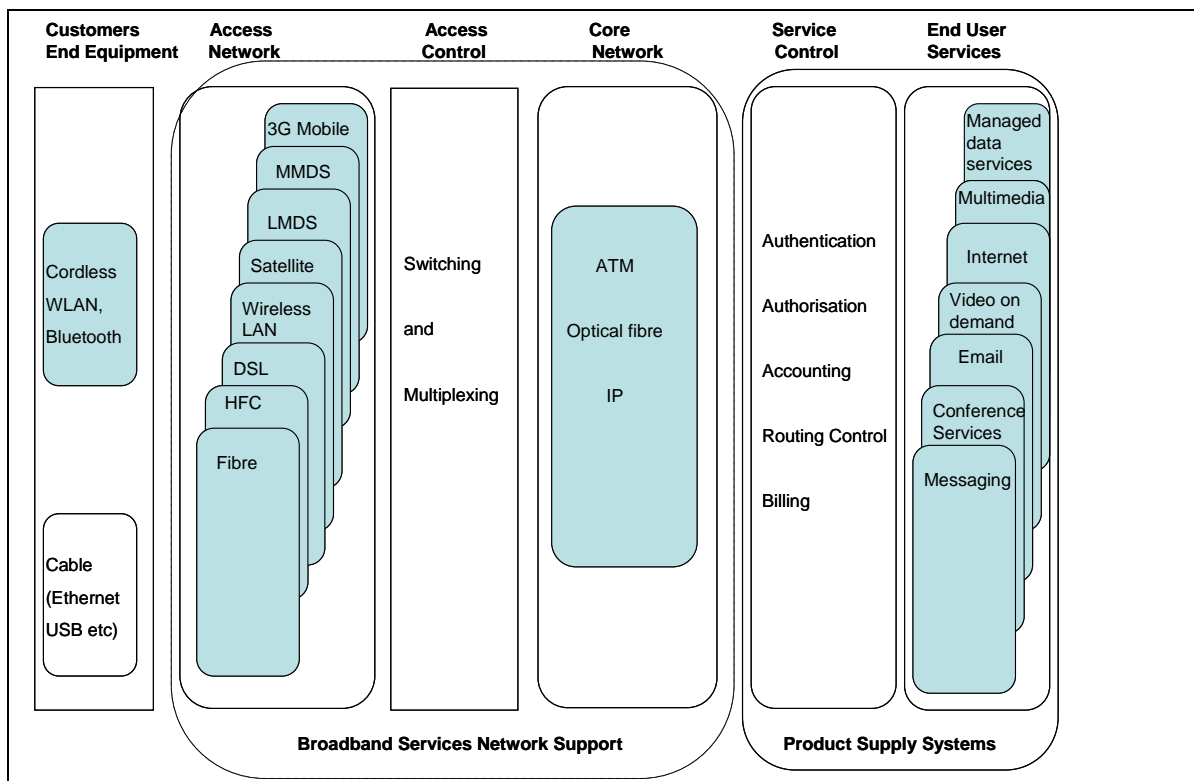
eight per cent" (Hayes, 2003). A recent move by Agile to install its own ADSL-enabling equipment in a Telstra exchange might suggest some mitigation of the likely slowdown in ADSL capability, though perhaps this approach will simply transfer responsibility from Telstra to other companies (MacKenzie, 2003). Perhaps most importantly, even if these exchanges are enabled and some solution is found to the distance-from-exchange problem, there may still be upper limits on access depending on the size of the building, and the quality and nature of the CAN [Customer Access Network].

While Telstra rather positively maintained that it "continues to work towards overcoming current technical constraints on high speed Internet access resulting from the historic deployment of network electronics" (Telstra, 2003), expert telecommunications analysts Budde Communications have concluded:

> We are now in a position where the physical twisted pair copper CAN [Customer Access Network] has almost reached the end of its useful life and it has to be replaced on a massive scale for several reasons including: bandwidth and distance limitations, cost, age, and rising repair / maintenance costs. Pair Gain Systems (PGS) that were introduced in the 1980s are now reaching the end of their low maintenance lives and because the content in the CAN now includes high-speed data (Internet) to a high percentage of households, PGS now impede the bandwidth required for Internet (Budde, 2003b)

Satellite communications, a staple for Australians in remote areas, are offered for broadband service only at considerable expense, and often with a limited back channel capability. While the availability of this kind of delivery technology allows Telstra to respond to criticism about the availability of broadband by asserting that satellite services provide 100% coverage, in actuality the technology is out of reach of most Australians, even with government subsidies for the most remote areas of country. Wireless developments, whether through mobile telephony spectrum, dedicated wireless, or wi-fi based WLANs, appear experimental at the moment, or limited in their capacity. Moreover, they raise significant regulatory questions, especially when they move from being essentially amateur or research-oriented projects to full-scale commercial services, and are likely to be carefully monitored by the Australian Communications Authority (ACA) – in part to ensure that existing radio spectrum uses do not suffer interference. And, finally, specialised networks (for example used in power generation control) are unlikely to be readily interconnected or used for all but the most limited public access, in light of significant security risks and the potential conflict between network uses.

What can we make of this technological jigsaw? The ACA has theorised, in a recent discussion paper on monitoring and quality assurance for broadband, that what makes broadband distinctive is the separation of the access points to the network, the core network itself, and the services and products available on that network. It represents this position thus:

Customers End Equipment	Access Network	Access Control	Core Network	Service Control	End User Services
Cordless WLAN, Bluetooth	3G Mobile MMDS LMDS Satellite Wireless LAN DSL HFC Fibre	Switching and Multiplexing	ATM Optical fibre IP	Authentication Authorisation Accounting Routing Control Billing	Managed data services Multimedia Internet Video on demand Email Conference Services Messaging
Cable (Ethernet USB etc)	**Broadband Services Network Support**			**Product Supply Systems**	

Broadband Service Delivery Architecture; (ACA, 2002: 9)

However, this theoretical architecture is very much a model that reflects a technologised view of how broadband services might develop, and does not reflect the operation of these technologies in a commercial environment, especially one in which one company (Telstra) exercises significant control over pricing, availability, and services of all manner of telecommunications and related services. In particular, this model does not demonstrate how certain network components have developed and now operate in close connection with a primary use that, even if might be said to require broad bandwidth (such as pay-TV), is hardly 'broadband' as it is popular understood (fast access to a complex array of data services and interactions, such as the Internet). Crucially, there has been all but no broadband development for the purposes of broadband because the investment required cannot be recouped, in a mass market, without a traditional 'content' package whose ongoing revenues amortise the cost of the service and (in the cases of media) create a fixed audience for on-selling to advertisers.

The weakness of the model can also be seen in the development, in early 2004, of a major argument between Telstra and other broadband retailers concerning the fact that a new entry-level broadband package is being offered by Telstra at a price *below* that which Telstra charges for wholesale distribution. That Telstra's package was released at the same time as its main rival Optus returned to the broadband service market for the first time in some years only added to speculation concerning Telstra's motives. Immediate action was taken by the anti-competitive behaviour regulator, the ACCC. While the outcome of this latest round of market-technological contestation is not clear (and will be discussed in a future article on this topic), what becomes clear is that any attempt to understand technology outside of commercial and regulatory pressures is impossible.

The model also does not account for the historical dimensions of the Internet. The existing primary elements of the broadband network are available only because of, in one case, nearly a century of telephone development which, even as late as the early 1990s, was driven by the needs of voice telephony (hence the problems with the over a million Australians unable to get broadband because of RIM/ voice-only pair gain technology); and, in the other, the peculiar arrangements for the introduction of pay television in Australia. It does not indicate how new network components might emerge, successfully, because it does not identify the service-network linkage noted above: only where some peculiar circumstance emerges (in, for example, the university sector) can specialised networks be developed for direct cost recovery. Finally, it does not include any real recognition of the regulatory work of bodies such as the ACCC (or indeed of the ACA itself), not only in relation to broadband networking but also such services as pay television which, because of the nexus between television cable just noted, effectively become moves that regulate, in one way or another, broadband service.

The exact same model could be applied to America and would not shed any light on the radical difference in the environment there, in which, with the same kinds of technological realities and possibilities, entirely different challenges develop because of the distinctive regulation of the services and infrastructures of communications, information services and television (see for example Frieden, 2003; Lavey 2002). Fundamentally, what the particular situation in Australia shows, in relation to the ACA description, is that technology-centred models do not actually describe technology, for technology is embedded in the world of commerce, use, and regulation. It is not distinct from the patterns of interaction between governments, corporations and citizens/consumers but, while having an independent and influential existence, primarily acts as a medium to express the particular arrangement of these three elements in a particular time and place.

Conclusion

What these cases reveal, when placed together, is that technologies of the Internet, such as broadband, are always more than just hardware and software. Such technologies are always the products of social and economic circumstances that, firstly, frame the meanings we make of them and constitute us as particular kinds of users and consumers of them; that secondly, create actual utility from hardware and software by permitting some kinds of services to become products, and not others; and that thirdly, are themselves the carriers of meaning.

The government imagines the 'citizen', that elusive and ideal character of much national policy development and implementation in three ways. The citizen is required to play their part in the development of broadband infrastructure; must be subject to the government's limited efforts to improve that infrastructure; and be the beneficiary of a future that is, through technological development, much richer and more satisfying than the present. Essentially, since many if not all of the promises made by the current government promoters of broadband cannot be realised for some time (and, implicitly, not until a very large proportion of Australians get broadband), a national duty emerges for the real people who are citizens of this nation. Australians, within this policy framework, must be hopeful for the future – to accept techno-optimistic attitudes that mean they will accept and use broadband services even when there is no apparent, overwhelming need to do so – so as to create a consumer infrastructure into which services might then develop.

Such people must also, of course, be hopeful that the commercial products which are available to them as the actual method to become broadband users will work, for them, in their location, despite the technological difficulties that emerge from a network of broadband networks that was not designed for that purpose. Moreover, the broadband products which are being sold to them are constituted as much by the existing regulatory and commercial constructs that have create the telephone and pay-television industries which dominate provision of broadband. And in the meantime, the providers themselves are engaged in the production of techno-optimism, but with the very different purpose of selling their specific product to specific groups of consumers. Commercial realities, and differential capacities to access and utilise the technology, mean that not all of these messages about what broadband will do, what it is for, and how it will bring the future closer are quite what the government might have hoped for. Thus, in conclusion, I would suggest that, just as consumer/citizens are choosing from among many different packages and services that provide broadband connectivity, they are also choosing what that particular instance of broadband connectivity means for them. What will actually emerge as the future of broadband will lie in the way these choices are constructed, for consumers, by the confluence of technology, regulation and commerce and which choices, from within this limited set of possibilities, are most successful in the marketplace.

And, within this realm of constrained broadband, governed by the operations of the market and the realities of technological infrastructure, the choices consumer/citizens will make shall influence the development and success of virtual learning environments. Such environments may not, as I indicated at the start of this chapter, depend on high speed. Moreover, the degree to which consumers may or may not imagine that broadband makes the Internet more 'suitable' for learning than a narrowband network, will depend heavily on the way the 'meaning' of broadband develops, guided by government enthusiasms for national adoption of ICTs and service providers' marketing campaigns. The availability of education online is likely to be partially influenced by the openness of access - across financial and physical constraints, and the 'product' itself will need to compete with existing learning opportunities made faster and more constantly available by 'always-on' broadband. Thus while more intensive learning environments might seem to fit naturally with the technological capacity of broadband, the regulated, socio-economic, cultural 'technology' of broadband may well hold surprise us in how it intersects with the further development of online education.

References

AAP. (2003a). Pay TV bundles a success. *Australian – IT News*. August 30, 2003

AAP. 2003b. Telstra introduces demand register for ADSL rollout. *Sydney Morning Herald*. October 2, 2003.

ACA [Australian Communications Authority]. (2002). *Proposal For Monitoring And Reporting Quality Of Service For Broadband And High Data Rate Services*. Accessed at: http://www.aca.gov.au/aca_home/issues_for_comment/discussion/archive/broadband.rtf [1 October 2003].

AIEAC [Australian Information Economy Advisory Council]. (1999). *Bandwidth: National bandwidth inquiry*. Canberra: DoCITA [Department of Communications, Information Technology and the Arts]

Allen, Matthew (2001). censorship.gov.au: Reviewing Internet censorship in Australia. *AOIR v2 Conference*, Minneapolis, USA October 2001 (Available at: http://www.curtin.edu.au/home/allen/papers/AllenAOIR2001.doc)

Allen, Matthew and Jane Long (2004). Domesticating the Internet: content regulation, virtual nation-building and the family. In Gerard Goggin (ed.), *Virtual Nation: The Australian Internet Reader*, Sydney, UNSW Press.

Alston, Richard (2003a). Broadband research grants awarded. *Media Release: Senator the Hon. Richard Alston, Minister for Communications, Information Technology and the Arts*. 13 August 2003. Accessed at: http://www.noie.gov.edu.au/publications/media_releases/2003/Aug/bband.htm [4 October 2003].

Alston, Richard (2003b). National Broadband Group marks a milestone in broadband strategy. *Media Release: Senator the Hon. Richard Alston, Minister for Communications, Information Technology and the Arts*. 13 August 2003. Accessed at: http://www.noie.gov.edu.au/publications/media_releases/2003/Aug/bband.htm [4 October 2003].

BAG [Broadband Advisory Group] (2003). *Australia's Broadband Connectivity*. Canberra: Commonwealth Government of Australia. Accessed at: http://www.noie.gov.au/publications/NOIE/BAG/report/index.htm [4 October 2003].

BSEG [Broadband Services Expert Group] (1994). *Networking Australia's Future*. Canberra: Commonwealth Government of Australia. Accessed at: http://www.dcita.gov.au/Article/0,,0_1-2_1-4_112166,00.html [4 October 2003].

Budde, Paul. (2003a). *Submission to Senate Inquiry into Competition in Broadband Services*. Accessed at: http://www.aph.gov.au/Senate/committee/ecita_ctte/broadband_competition/submissions/sub6.doc [1 October 2003]

Budde, Paul. (2003b). *Submission to the Senate Inquiry into the Australian Telecommunications Network: Telstra CAN – An Analysis*. Accessed at: http://www.aph.gov.au/Senate/committee/ecita_ctte/tele_network/submissions/sub150.doc [1 October 2003]

Chirgwin, Richard. (2002). Pairgain and DSL. Post to *Link* email list. 4 April 2002. Accessed at: http://mailman.anu.edu.au/pipermail/link/2002-April/017604.html [1 October 2003].

CIT (1999). *Datafile of Asia-Pacific Telecommunications*. Section: Satellite, cable and multimedia. CIT Publications. Accessed at: http://www.lynxtech.com/citpubs/dat/aus_d1.htm [1 October 2003].

CSTB [Computer Science and Telecommunications Board] (2001). *Broadband: bringing home the bits*. Washington DC: National Academy Press. (Available online at: http://books.nap.edu/html/broadband/).

Estens, D. (2002). *Connecting Regional Australia: Report of the Regional Telecommunications Inquiry*. Canberra: Commonwealth of Australia. Accessed at: http://www.telinquiry.gov.au/rti-report/rti%20report%20text%20f-a%2018.pdf [4 October 2003].

Ferguson, Iain (2003). Telstra reviews broadband strategy after dumping Beyond. *Zdnet Australia*, 5 May 2003. Accessed at: http://www.zdnet.com.au/newstech/enterprise/story/0,2000048640,20274234,00.htm [1 October 2003]

Framework for the Future Steering Committee (2003). *Enabling Our Future: A Framework for the information and communications technology industry*. Canberra: DoCITA [Department of Communications, Information Technology and the Arts]

Frieden, Rob (2003). Adjusting the horizontal and vertical in telecommunications regulation: A comparison of the traditional and a new layered approach. *Federal Communications Law Journal*. 55.2: 207-250.

Hayes, Simon. (2001). Roll out broadband or become a 'backwater'. *Australian* October 23, 2001: 34.

Hayes, Simon. (2003). Telstra caps ADSL expansion. *Australian – IT News* (at *News.com.au*), August 7, 2003.

Houghton, John and Peter Morris (2001). *Broadband The Case Of Australia* (A Case study for the Regulatory Implications of Broadband Workshop). Geneva: ITU. Accessed at: http://www.itu.int/osg/spu/ni/broadband/workshop/Australiafinal.pdf [4 October 2003].

Kapor, Mitchell (1993). Where Is the Digital Highway Really Heading? *Wired*. 1.03. Accessed at: http://www.wired.com/wired/archive/1.03/kapor.on.nii_pr.html [4 October 2003].

Lavey, Warren G. (2002). Making and keeping regulatory promises. *Federal Communications Law Journal*. 55.1: 1-60.

MacKenzie, Kate. (2003). Tables turned on ADSL coverage. *Australian – IT News* (at *News.com.au*), 3 October 2003.

McCarthy, Kieren (2001). Aussie watchdog slams Telstra ADSL roll-out. *The Register*. 11 September 2001. Accessed at: http://www.theregister.co.uk/content/archive/21612.html [1 October 2003].

McGrath, Catherine (2002). Optus, Foxtel share deal approved. *The World Today (ABC Radio)*, 13 November 2002. Accessed at: http://www.abc.net.au/worldtoday/s726019.htm [1 October 2003].

Pearce, James (2002a). Dark fibre broadband deal to light Aussie research. *ZDNet Australia*, 14 October 2002. Accessed at: http://www.zdnet.com.au/newstech/enterprise/story/0,2000048640,20269052,00.htm [1 October 2003]

Pearce, James (2002b). Telstra downplays broadband demand. *ZDNet Australia*, 25 November 2002. Accessed at: http://www.zdnet.com.au/newstech/communications/story/0,2000048620,20270166-1,00.htm htm [1 October 2003]

Platt, Charles (2001). The Future Will Be Fast But Not Free. *Wired*. 9.05. Accessed at: http://www.wired.com/wired/archive/9.05/broadband_pr.html [4 October 2003].

Sainsbury, Michael (2002). Telstra to fix ADSL problems., *Australian – IT News* (at *News.com.au*), November 12, 2002.

Sainsbury, Michael (2003a). Optus finalises Telstra DSL deal. *Australian – IT News*, July 17, 2003.

Sainsbury, Michael (2003b). Telstra's big push for broadband. *Australian – IT News*, May 13, 2003.

Sturgeon, Will (2002). Reviewing 2002 – A year in broadband (part 3). *Silicon.com*, 20 December 2002. Accessed at: http://www.silicon.com/news/500016/1/1036874.html [1 October 2003]

Telstra. (2003). *Submission to the Senate Inquiry into the Australian Telecommunications Network*. Accessed at: http://www.aph.gov.au/Senate/committee/ecita_ctte/tele_network/submissions/sub107.doc [1 October 2003

Turner, Adam (2003). Connection numbers rise but uptake slows. *The Age*, 25 March 2003.

Velde, Danielle (2002). Telstra launches campaign to sell Foxtel bundle. *B&T*, 20 November 2002. Access at : http://www.bandt.com.au/articles/39/0C012D39.asp [1 October 2003].

WATIAC [WA Technology and Industry Advisory Council] (2003). *Enabling Connected Community: Developing Broadband Infrastructure and Services in Metropolitan Western Australia*. Perth. Accessed at: http://www.wa.gov.au/tiac/broadband/broadband.pdf [4 October 2003].