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Radio’s Digital Challengers

‘Digital radio broadcasting will assist radio to compete in the future world of substantial competition from digital audio services delivered by other means.’ (ABA DRB Task Force 1996, 4) This was the view of the then Australian Broadcasting Authority’s (ABA) Digital Radio Broadcasting (DRB) Task Force more than a decade ago. Since then, Australia has got a lot of digital audio services delivered by other means but still no digital radio. That should change in May 2009 when the commercial, ABC, SBS and some community stations in the state capital cities launch digital terrestrial services. But they’ll be competing in an audio environment very different from the one that existed when the first decisions were taken about Australian radio’s digital future.

This article describes the early decisions taken about digital radio in Australia in the 1990s, the second round of decisions implemented in legislation in 2007 and subsequent developments, the state of digital terrestrial radio in what is generally to be considered its most successful market, the United Kingdom, and the challenges facing digital radio when it is introduced in Australia in 2009.

Early work and decisions in Australia

The Australian Broadcasting Authority (now the Australian Communications and Media Authority) established a DRB Task Force in 1994/95. Its work overlapped that of a Digital Radio Advisory Committee (of which this author was a member), set up in 1995 by the Labor communications minister, Michael Lee. The advisory committee published its final report in August 1997. (DRAC 1997) A few months later, the Coalition Government announced policy decisions about digital radio and television. (Alston 1998) Amid the first Internet boom, the digitization of the terrestrial transmission networks that took radio and television to their audiences was treated as an inevitable but urgent step to ensure these established electronic media could keep pace with opportunities emerging in online and portable digital media.
Like digital television, digital radio had taken different technical directions around the world. (Given 2003, 130-33) In 1987, the Federal Communications Commission (FCC) in the United States authorised experimental digital sound transmissions from Boston stations WGBH-FM and WGBX-TV. The same year, a joint project to investigate digital sound broadcasting technology was established by the European Broadcasting Union (EBU) and the European Community’s ‘Eureka 95’ audiovisual support scheme. It involved the mainly public service broadcaster full members of the EBU, like the BBC and Italy’s RAI, public telecommunications corporations like British Telecom, research institutes, universities, and equipment manufacturers like Nokia, Quantel, Thomson and Grundig. As the 147th Eureka project, digital sound broadcasting became ‘Eureka Project No 147’. (De Sonne 1990, 14-6) Support in Australia for the ‘Eureka 147’ system that came to be known as DAB (Digital Audio Broadcasting) was strong. The ABA and ministerial advisory groups both recommended its adoption, primarily using L-band spectrum. Minister Alston concurred, saying it was ‘likely’ that digital radio would be introduced with DAB and L-band spectrum, although there would be ‘consideration of VHF spectrum in regional areas’. (Alston 1998)

There was less unanimity about who should get the chance to offer digital radio. ‘Narrowcasters’ licensed under the new categories created by the 1992 overhaul of broadcasting legislation to provide tourist, racing and other specialist-information and non-English language services, dissented from the majority recommendations of the ABA’s Task Force. They ‘vigorously opposed any suggestion that digital broadcasting should be restricted to established broadcasters’. The history of FM radio in Australia, they argued, was:

highly instructive as to the policy dangers in allowing long established broadcasters to monopolise new transmission technologies, and of the advantages in fostering entrepreneurship, innovation and diversity through a policy of favoured access for new broadcasters. Established services have little incentive or motivation to develop a new medium, when their prime investment is anchored to incompatible technology.

As ‘the new force in radio in the mid-90s’, narrowcasters ‘possess the same qualities of enthusiasm, innovation and entrepreneurship that were so critical to the successful development of FM’. Since they couldn’t be fully accommodated on the AM and FM bands, they ‘should be accorded favoured access under any licensing or access regime established for digital radio’. Narrowcasters did not wish to deny established broadcasters access to digital capacity if it was available, but if there was insufficient capacity to accommodate them all, it thought ‘“new” operators, such as narrowcasters, should be given preference’. (Minority opinion by FANSS, Appendix C to ABA DRB Task Force 1996) This view found limited support on the ABA’s Task Force, whose majority noted ‘Broadcasters are aware of the lessons of history and do not wish to repeat the mistakes of the past. On this occasion they recognise digital radio broadcasting as the way of the future’. (ABA DRB Task Force 1996, 15)
The minister’s advisory committee hedged the very different views of its members. National broadcasters and licensed commercial and community broadcasters and narrowcasters ‘should have a right to automatic access to digital radio broadcasting … Detailed planning should provide capacity for other narrowcasters and other services as a next priority.’ It was described as a two-step process: ‘a developmental phase, where existing players would simulcast on analogue and digital technology and experiment with, and develop, the new … technology and services’ and ‘full service provision’, where new entrants could get access to frequencies. (DRAC 1997, vii-viii)

Alston announced existing national, commercial and community broadcasters, though not narrowcasters, would be able to convert to digital. They would be given the opportunity to share digital transmission multiplexes, each of which would carry five CD-quality stereo audio services. Transmission capacity of 256 kbits/sec would be available for each service, from the total of around 1.5 Mbits/sec available from each multiplex transmitter. Broadcasters would be required to simulcast on digital and analogue for a period ‘to ensure that listeners are not disadvantaged’. Beyond that, a Planning and Steering Committee, chaired by the minister’s department would develop ‘a comprehensive planning framework’. (Alston 1998)

The ABA did more work on VHF options, concluding that the 6 MHz-wide VHF Band III channel 9A could be used for three DAB multiplexes in metropolitan areas — or four if the difficult but not impossible job of retuning VHF TV Channel 10, 1 MHz upwards was undertaken. This would be enough for fifteen to twenty radio services of near CD-quality, or more of lower quality. There would, however, be serious problems finding sufficient VHF spectrum for country radio stations to convert. Consistent with the 1998 decisions, the ABA gave more focus to the L-band, where it concluded that ‘while vacant spectrum … was hardly super-abundant, there was substantial spectrum … still available and the potential exists for full conversion of existing services using L-band alone over time’. (Tanner 2002) The problem was that because of the propagation characteristics of signals in the two bands, more transmitters, and thus more dollars, would be required to cover the same area using L-band. This was potentially a major problem in regional areas.

There were plenty of disputes about the government’s digital TV policy, but its timetable remained on track and services launched in metropolitan areas in January 2001. Digital radio services did not. There was still much talk that a move to digital transmission was essential and inevitable, but the technical choices had become even more complex and the overseas experience was not encouraging. Commercial stations were not sure how the new technology would generate extra revenue to pay for itself; the Coalition Government was no friend of the country’s biggest radio broadcaster, the ABC; and many community stations were shoestring operations that struggled to make ends meet with the costs of FM, let alone new digital services. The Productivity Commission’s March 2000 report on broadcasting opposed the government’s conversion model. It concluded that ‘the costs to consumers of converting existing AM and FM stations to digital would be substantial, but the benefits in terms of freed spectrum appear to be relatively minor … Digital radio
should be allowed to augment, rather than replace, existing radio.’ (Productivity Commission 2000, 18)

The minister then appeared to retreat from the commitment to convert all commercial, community and national broadcasting stations to digital. (Alston 2000) The established industry was sending mixed messages about its commitment to digital transmission. Late in 2000, one of Alston’s senior officials demanded a consolidated view from industry. The government did not want to impose a technology or set of standards but did want certain principles to underpin any process for introducing digital services. These included: serving the public interest; minimising disruption to existing radio audiences; promoting increased diversity of service and service quality, especially in regional areas; ensuring that receivers are affordable; providing opportunities for new entrants; addressing issues of interoperability, compatibility and flexibility; and ensuring that spectrum was not just given away to commercial interests. (Holthuysen 2001) Reporting on its inquiry into regional radio in 2001, the House of Representatives Standing Committee on Communications, Transport and the Arts said the main elements of the submission it received from commercial radio were ‘ambit and…hardly likely to form the basis of responsible radio industry policy’. (House of Representatives 2001, 130-1)

A new Digital Radio Study Group was established in 2003 and later that year the ABA authorized trials using VHF channel 9A to be conducted in Sydney by Commercial Radio Australia and in Melbourne by Broadcast Australia. (‘Digital radio trials’ and ABA 2003) SBS and Broadcast Australia also ran a trial of another technology, Digital Radio Mondiale in Canberra. (Broadcast Australia, ‘Digital Radio’) Two years later, a new policy for digital radio was announced by new minister Helen Coonan. ‘With increasing competition from new digital platforms such as the Internet and mobile phones,’ she said, ‘the radio industry needs the certainty to plan and promote the potential benefits of digital radio’. (Coonan 2005)

**The New Policy**

Coonan’s 2005 framework, implemented in legislation passed in May 2007, differed from Alston’s in many important ways. First, although the expectation that digital services would eventually replace analogue was never as clear for radio as for television, the new policy made the distinction explicit. The second reading speech explaining the legislation stated: ‘The key premise of the framework is that digital radio will supplement existing analogue radio services for a considerable period, and may never be a complete replacement.’ (Johnston, 2007: 122)

Second, less ambitious coverage and newer technology were foreshadowed. The initial launch would occur only in the state capital cities. A review to be conducted by 2011 would reconsider the position in country areas. European DAB technology would still be used in metropolitan areas, but the government would consider adopting newer versions of what was now a ‘mature technology’ once approved by international standards bodies. DAB+ was subsequently endorsed. It employs the more sophisticated AAC+ or MP4
audio codec, rather than DAB’s MP2. Better compression allows two-three times the number of stations to be transmitted and more sophisticated multimedia content. Australia is one of the first countries to endorse the new version of DAB. (World DAB) Coonan said a version of DAB was, however, ‘unlikely to be a suitable platform to address the extended coverage requirements of some regional and remote services’. Developments with other systems, especially Digital Radio Mondiale, would be monitored as part of the development of policy about digital radio outside the state capitals.

Third, different spectrum would be used for the primary digital radio transmitters—VHF Channel 9A, not L-Band frequencies, although L-Band might be used ‘for infill, localised services and where VHF Band III spectrum is unavailable, or insufficient’. Some L-Band spectrum would also be reserved for satellite digital radio services. The choice of VHF 9A meant only three multiplexes could be accommodated. This limited the number of operators more severely than Alston had contemplated in 1998. There are two multiplexes for commercial and community stations in Sydney and Melbourne, and one in the other capitals. The ABC and SBS share a full multiplex (around 1.5 Mbits/sec) in each city. Coonan’s framework gave all the existing commercial stations and some city-wide community stations capacity of 128 kbits/sec to introduce a digital service, one ninth of the capacity of a multiplex transmitter. Some might get more, depending on the numbers of stations in different cities. The legislation passed in 2007 required joint venture companies to be established by the commercial and community broadcasters that are guaranteed transmission capacity in each licence area. Community broadcasters have to form representative companies, which in turn can acquire a 2/9ths stake in the joint venture multiplex companies. In practice, although the joint venture companies have been formed, community broadcasters have not yet taken stakes in them. The ACCC released a Discussion Paper about access undertakings for the transmission services offered by the commercial and community multiplexes in late October. (ACCC 2008)

Fourth, there was an explicit moratorium on further commercial radio competition. No new commercial stations will be licensed to use the broadcasting services bands within six years of the commencement of the first digital broadcasts. This commitment, given by the Coalition in the 2004 election campaign, was ‘consistent with the period of legislative protection provided for digital television’ and would ‘provide a measure of stability and certainty for the commercial broadcasters’. (Johnston 2007) There are not, however, any new restrictions on current or potential commercial digital radio services operating outside these bands. This would allow, for example, digital satellite radio services. (see separate article in this issue)

Fifth, there was no obligation to simulcast existing analogue services. On the contrary, the new policy stressed the importance of new content to encourage listeners to buy digital receivers. Broadcasters are able to provide multiple program streams and ‘digital program enhancement content’, defined to include text, still images and other forms prescribed by the Minister. This does not, however, include moving images. (More sophisticated versions of the DAB family of standards, DMB [Digital Multimedia Broadcasting] and DAB-IP, provide much more scope for multimedia applications even
than DAB+.) A new licence category was also established to enable non-radio broadcasters to use the digital radio platform to deliver services other than radio, including text, data and images.

Legislation setting out the scheme was passed in May 2007. (Broadcasting Legislation Amendment (Digital Radio) Bill 2007 and Radio Licence Fees Amendment Bill 2007 and see Johnston 2007) A very brief inquiry into the legislation by the Senate Standing Committee on Environment, Communications, Information Technology and the Arts, was described by Labor senators as ‘an abuse of process which shows complete disregard and contempt for the Senate’s role as a house of review’. Their minority report criticized the Bill’s omission of technologies other than DAB, despite the acknowledged need for technologies like Digital Radio Mondiale to get digital radio to country areas; the omission of animation and video clips from the definition of enhanced content able to be offered by digital radio broadcasters, despite already being available on mobile phones; and the onerous obligation for community broadcasters to have to form representative companies to hold shares in the joint venture multiplex operating companies. (Senate Standing Committee, 2007: 17-9)

In the 2007/08 Budget, the Coalition Government agreed to provide funds for digital radio to the ABC, SBS and community stations. The national broadcasters would get money to introduce digital radio services in the six state capitals on 1 January 2009 and then establish up to 57 in-fill translators. The precise amount would be determined by tender. The community sector would get $10.5 million, to be distributed by the Community Broadcasting Foundation. (Coonan 2007) Minister Coonan indicated when announcing the new policy framework in 2005 that the Government would consider offering financial assistance to regional commercial radio broadcasters, as they did for regional TV broadcasters. (Coonan 2005)

The incoming Labor Government subsequently agreed to defer the 1 January 2009 start-up date to no later than 1 July. Legislation was passed by the Parliament in October giving effect to this. The same legislation relieved Hobart broadcasters of the obligation to start services at the same time as the mainland state capitals, and extended by 12 months the period for community radio representative companies to join the joint venture multiplex licensee companies. (Broadcasting Legislation Amendment (Digital Radio) Bill 2008)

**UK experience**

The United Kingdom is generally seen as digital terrestrial radio’s most successful market. Regular DAB services were started by the BBC in 1995. A national commercial digital operator, Digital One, began services four years later. (Given 2003, 134) In the third quarter of 2008, 29 per cent of people aged 15 and over claimed to own a DAB receiver, up from 22 per cent a year earlier. Just 11 per cent of radio listening, however, was to DAB, up from 9 per cent a year earlier. (RAJAR 2008)
In February 2008, less than a year before digital radio services were due to launch in Australia, the major shareholder in Digital One, GCAP, announced it was quitting the medium. In its view, DAB was ‘not an economically viable platform for the Company’. (GCAP 2008) As well as its 63% stake in Digital One, GCAP owned two digital-only stations, Planet Rock and theJazz, and analogue FM and AM radio stations in more than 40 cities. Britain’s commercial digital radio pioneer thought it had a future in analogue FM radio and online audio, but was selling its shareholding in Digital One for ‘a nominal sum’ and closing Planet Rock and theJazz. This seemed to be a vote of no confidence in digital radio by a commercial organisation uniquely placed to understand its possibilities, operating in a market where the medium had been relatively successful.

Some interpreted GCAP’s plans primarily as a defensive response to a takeover bid from Global Radio, and the personal mission of a new chief executive who departed soon after. That takeover was completed in June, theJazz closed and Planet Rock was offloaded, but the latter was acquired and saved by passionate fans of its ‘rock aristocracy’ format (Led Zeppelin, Pink Floyd, AC/DC). No further public announcement has been made about Global’s plans for GCAP’s stake in Digital One (pers comm., 10 October 2008). The February Strategy Presentation given by its now departed chief executive has been removed from GCAP’s website, which now states the company is focusing on ‘platforms that generate revenues and profit (FM, broadband, innovative mobile digital technologies)’. (GCAP 2008a)

A licence to operate a second commercial digital radio multiplex was awarded to a consortium led by television broadcaster Channel 4 in 2007, which saw radio as a way of diversifying its business. 4 Digital planned to introduce ten new radio stations when the service launched in 2008. But doubts about the likely speed of commercial returns from a move into digital radio, especially for an advertiser-funded broadcaster like Channel 4 already confronting declining revenues, slowed the plans. In early October, Channel 4 announced it was closing its radio division, leaving 4 Digital’s fate to its other, minority shareholders. Chief Executive Andy Duncan said the decision had been taken ‘very reluctantly’. He continued to believe DAB had a ‘strong future’, but Channel 4’s plans ‘have been overtaken by a drastic recent downturn in our revenues’. It could not afford the short-term investment and would ‘have to forego this future profit stream’. (Plunkett 2008. See also Sweney 2008; Plunkett and Brown 2008)

A particular reason UK digital radio developments are important to Australia is the close relationship between broadcast transmission providers in the two countries. Broadcast Australia, the current incarnation of the national network of ABC and SBS transmitters privatized in 1999, and the UK’s dominant broadcast transmission provider Arqiva are both parts of the Macquarie Communications Group. The Group’s chairman, former Telstra and ABC executive Gerry Moriarty, is chairman of Broadcast Australia and deputy chairman of Arqiva. Also on the Group’s board are former Telecom managing director Mel Ward and former SBS managing director and now part-time ACMA member, Malcolm Long. Arqiva’s Executive Chairman is former Telstra executive, former Foxtel director and former Unwired Chairman and CEO, Peter Shore. He is now
Executive Director, Macquarie Capital Group in London, responsible for the telecoms and technology sector within the Macquarie Capital Funds group. (Macquarie; Arqiva)

**Challenges and challengers**

Digital radio has always promised three main benefits: better sound quality, more listening choices, and extra features. There are, however, a lot of factors complicating the experience listeners will actually get in the many different environments where they might tune in.

Choosing DAB+ rather than DAB will enable services of a given quality to be delivered at much lower bit rates. Some say CD-quality will require 128 kbits/sec. The ABC says high quality music transmission will be possible at 56 kbits/sec and is likely to adopt 64 kbits/sec for music and 40 kbits/sec for speech. The audio quality listeners actually hear, however, will still depend on the decisions the broadcasters make about how to use this capacity. In the meantime, the digital audio competition is not standing still. Internet radio stations generally use MP3, Windows Media Audio or RealAudio. The ABC offers MP3 at 128 kbits/sec for its music channels Triple J, Classic FM and the ‘dig’ stations, and Real and Windows at up to 132 kbits/sec, depending on the speed of the user’s connection.

A still more basic factor is ensuring adequate signals can be received right across the service areas. Maps drawn up in late 2007 and leaked to *The Australian* in early July showed coverage of just 50% of the population in Sydney and ‘only slightly better coverage in other cities’. Commercial Radio Australia’s Joan Warner says the maps were out of date, and more recent testing shows 80-90% of all the state capital cities will be covered when services commence. (pers comm., 20 August 2008) But even if these levels are achieved, there are a lot of people in places where they won't be able to listen in to radio’s future when it gets underway in 2009. The ABC’s head of transmission, Mark Spurway, says a lot of progress has been made by the national and commercial broadcasters and ACMA, but he was not prepared to comment on expected coverage levels until ACMA releases a further draft plan in October. (pers comm., 20 August 2008)

The extra listening choices likely to be made available are not yet clear. The public broadcasters are more open about their plans than the commercial stations at this stage. SBS wants to extend its second radio network beyond Sydney, Melbourne and Canberra, use another two channels for time-shifted versions of both its networks, and expand its late-night/early-morning youth program Alchemy into a whole channel and introduce new channels for different language groups over the next few years. (SBS 2008) The ABC has its three ‘dig’ stations already available online, able to be included in a suite of digital radio services. It also has content that could sustain standalone services rather than being squeezed into broadcast slots, like sport, specialist music, health talks and children’s radio. Some of this will be possible within existing funding but the more
ambitious plans will require extra money from a Government facing an increasingly perilous budgetary task.

Among the commercial stations, which account for three-quarters of radio listening in Australia, the Australian Radio Network already has a PureCountry station streaming online. Departing Austereo chief Peter Harvie told *The Australian* his Triple M and Today Network stations will each introduce an extra station, plus data, still pictures and interactivity. (Tabakoff 2008) Some of the metro-wide community stations are working together within and across cities to develop plans for new services, and infrastructure and services already exist to share programs within this sector. Britain’s gay and lesbian Gaydar Radio, Digital Station of the Year at the last two British commercial radio awards, launched its online service in Australia in September in partnership with the Melbourne-based GoConnect, and is likely to be interested in opportunities for terrestrial transmission.

The terrestrial digital radio services will have competition from a subscription radio service delivered over 3G mobile phone networks and online, launched in October 2008 by music and commercial FM radio pioneer Glenn Wheatley. Subscribers will pay $7.95 a month for 30 commercial-free music channels initially. (Donovan, 2008) Stripe is an Australian version of the digital subscription radio services delivered by satellite and terrestrial rebroadcast in North America. Two competing services, Sirius and XM, have just merged, hoping to stem the huge losses both have been suffering since their launch several years ago. They expect to have a total of 19.5 million subscribers by the end of 2008 paying a little over US$10 a month (Sirius XM 2008), but costs are high for both the operators and customers, who have to buy special receivers.

The extra features offered by digital radio start with small things, like locating stations by name on a screen, rather than frequency on a dial. The same small screen can display song titles and artists. More expensive digital receivers with hard drives can pause, rewind and record live radio. Some receivers sold for the subscription digital radio services in the US feature a ‘Love Button’, enabling one-touch recording of individual songs. But that requires record companies and other rights-holders to authorize downloading as well as live streaming.

DAB+ expands the visual possibilities of radio beyond static and scrolling text to include features like ‘slide-show’. Radio listeners can become radio viewers, although the receivers that let them do it will be more expensive. Radio broadcasters also hope to offer location-based services, either to ‘radios’ or to the increasingly popular GPS devices in cars. The Australian Radio Network’s stations already transmit traffic information on their FM side-bands for the Suna Traffic Network. This data, describing incidents, locations, likely delays, detouring options and estimated arrival times, can be received on suitable sat-navs. These present it as graphics or spoken word, or re-route around the delay. The service currently operates across 8000 km of road in Melbourne, Sydney and Brisbane. Ford has introduced sat-navs that work with it as an option on the new Falcon. The new version of the transmission standard used by Suna will allow the same service to...
be offered via DAB+, but there are other competitors eager to offer greatly expanded location-based services.

Perhaps the biggest challenge for Australian radio broadcasters is that the long delays in adopting digital transmission have allowed a different kind of audio world to be built. In 2008, the sound quality, extra listening choices and new features long promised by digital radio seem much less exclusive. Many radio broadcasters contributed enthusiastically to the transformations of internet radio and podcasting. Now they have to find investment dollars to build new terrestrial transmission networks at a time when the share market is tumbling and banks are struggling to find money even to lend to each other.

For optimists, these circumstances provide opportunities. In 2007, the number of mobile phone services overtook the number of people in Australia. (ACMA 2008) Customers upgrade their handsets regularly to get more features and smoother operation. If the radio industry can convince the manufacturers to incorporate DAB+ receivers, opportunities to sell the newly-enabled devices will come quickly. Nielsen Media Research data supplied by Commercial Radio Australia shows nearly half of all Australians aged 14 and over owned an MP3 device in May 2008. For people aged 14-17, the figure was nearly four in five. GfK says there were more digital media players (2.6 million) sold in Australia in 2007 than any other product tracked for its Canon Digital Lifestyle Index—more than DVD players and recorders (2.4 million), digital still cameras (2.2 million), games consoles (1.5 million) and LCD and plasma TV sets (1.4 million). In the December 2007 quarter alone, digital media player sales reached 1.15 million. With DAB+ receivers in them, they become part of the radio industry’s solution instead of its problem.

The interests of radio broadcasters and the manufacturers and retailers of mobile phones and digital music players, however, are not necessarily aligned. Apple wants users to buy music from iTunes rather than listen to it for free from radio broadcasters. Mobile phone companies investing heavily in 3G networks, WiFi hotspots and handset subsidies want their customers to use their portable devices to consume bandwidth. Telstra, like Apple, wants them to buy from its music store.

The global economic downturn creates a crisis for investment, but radio broadcasters with long memories might recall that their medium dealt well with the depressed times it faced soon after its birth in the 1920s. Cinemas and recorded music crashed, but radio thrived, a source of cheap entertainment amid financial and political trauma. Broadcasters contemplating the launch of digital radio next year might not like the comparison. They also know well that the affordable competition they offered so successfully three-quarters of a century ago is already here, via the internet and portable audio devices. This time, it is broadcast radio that faces the challengers.
**References**

Alston, Senator the Hon Richard. 2000 (25 February). Remarks to the Inaugural Members Conference of ASTRA


ABA. 2003 (28 October). ‘ABA digital radio trials policy’, Media Release

ABA. Digital Radio Broadcasting (DRB) Taskforce. 1996 (October). Developing DRB for Australia. Canberra: ABA


Australian Communications and Media Authority [ACMA], 2008 (April), Communications Report 2006/07. Canberra: ACMA


Coonan, Senator the Hon Helen (Minister for Communications, Information Technology and the Arts). 2007 (8 May). ‘$10.5 million for community and national digital radio broadcasting’. Media Release


GfK Mrketing Services Australia. 2008 (February). Canon Digital Lifestyle Index, July-December 2007 (North Sydney: GfK)

Given, Jock. 2005 (21 October). ‘Finally, Australia embarks on the road to digital radio’. The Canberra Times, p. 13


Robinson, James. 2008 (24 August). ‘Channel 4 bid to rule airwaves may just be pie in the sky’, The Observer.


Senate Standing Committee on Environment, Communications, Information Technology and the Arts. 2007 (May). Report on Broadcasting Legislation Amendment (Digital


