

Appendix F

Observations and Comments on the Digital Transition

Previous Assumptions about the Digital Transition

In 1995, the radio industry expected that success for the digital radio transition would consist largely of migrating existing audiences and advertisers to a new delivery platform, based upon use of the Eureka/147 transmission standard, implemented in L-Band spectrum at 1452-1492 MHz. The incentive for migration was to be the much higher audio quality and improved signal reliability that L-Band DRB can offer, along with its ability to handle Program Associated Data (PAD) and other ancillary services that enhance the listening experience. It was hoped that some new services and advertising features would be possible in the digital age, and anticipate that only a small number of new entrants would be authorized as digital-only services.

The digital transition was originally designed as ‘replacement’ for the current system that would make the current system competitive in a digital age. Manufacturers had indicated that they would have receivers available within 18 months of transmitters going on the air, and it was expected that consumers would purchase them as replacements or additions to their current radios over a long period of time. A key advantage of this ‘new-band’ plan was that the DRB services would not in any way disrupt the ability of listeners to continue receiving existing analog stations.

It is now clear that the ‘replacement’ strategy has failed wherever tried – including the Canadian market – largely due to the arrival of new forms and models of consumer electronics. In general, manufacturers tended to ally with new players rather than with radio, as the business case of the new players included a willingness to subsidize the manufacture of receivers to ensure affordability and rapid rollout; costs would be recovered through subscription revenue. This was achieved while aggressively promoting their services to ensure sales, and offering significant amounts of new content and new functionality.

This became the model for the rollout of digital satellite television, digital satellite radio (DARS), and digital cable as well. While some still question the business models behind some of these services, they are the services that are creating the digital transition in North America, rather than free-to-consumers, over-the-air radio or television.

As we evaluate new digital radio options before us, the characteristics noted above remain as potential, underpinning principles to ensure consumer take-up of a new technology. But adapting over-the-air, advertising-dependent services is not easily

accomplished. The U.K. remains the only international market where over-the-air services have had any success with consumers, with the rollout of digital radio and television.

In the U.K. marketplace, DRB has enjoyed good growth and penetration of the market.¹ Importantly, the key reason for its success has been new content in combination with the development of attractively priced radios. Digital radio has introduced many new streams of content to a public that was largely starved of commercial radio given the FM frequency dominance of the BBC – which has also pursued the digital radio opportunity to expand its own programming offerings. Another unique characteristic of the U.K. marketplace is that price points for receivers have been achieved without the participation of major manufacturers and automobile companies. Instead, success has come in the form of portable and home radios, developed and manufactured by mid-sized firms based in the U.K. itself.

While it is clear that market differences prevent the wholesale adoption of the U.K. approach to DRB in Canada, the comparison nonetheless suggests that the digital transition can be successful if certain conditions are met, including (i) new programming content for consumers, (ii) attractively priced receivers, (iii) free or low-priced services and (iv) strength in marketing and promotion.

However, these ‘winning conditions’ for the digital transition also carry a new definition of ‘success’. It is simply not realistic to assume that a successful digital transition will be no more than the replacement of the existing business with minor additions and adjustments. Nor does digital transition necessarily mean the destruction of the old business and the creation of a new one.

Arguably, achievable goals for a digital radio transition should include the continuing evolution of the current, successful business model based on advertising revenues, with additional new revenues streams enabled by new technologies. This must be balanced over the long term against the costs of implementation, which may include new elements unfamiliar to radio broadcasters.

In other words, a strategy for digital transition must address this new definition of success that is beyond the replacement model. The strategy must meet the criteria necessary for consumer acceptance, while still delivering a net benefit for private radio.

¹ In the UK, there are 424 DRB stations, operating under 170 different “brands”. Penetration of DRB receivers is currently at 11 percent of homes. 20 million receivers are expected to have been sold by December 2009. The number of adults tuning digital-only radio services sits at 4.1 million listeners/week.

Criteria for success with consumers: Good Value Proposition

The four criteria required for a successful rollout – new content, affordable receivers, promotion, and competitive technical features – can be summarized in the single notion of a ‘good value proposition for consumers’. This in turn suggests four other principles that should be addressed in the digital transition, and ways in which they can be addressed by the commercial radio industry.

First, provide attractive new content that is available only through Digital Radio Broadcasting. There have been successful rollouts of consumer electronics that did not initially involve new content, such as the CD and DVD. Instead, they created a value proposition through a combination of markedly superior digital convenience and better quality. HDTV may prove to be successful based on quality alone – though it may also be that real HDTV will remain a premium product that does not completely replace SDTV.

However, these have proven to be exceptions to the rule: the provision of new content has been an essential element of rolling out new technology. This appears to be the case with the rollout of digital radio, where the superior quality of the Eureka/147 signal has not been sufficient to move receivers into the market or off the shelves; new content, whether free or paid for by consumers, has been necessary.

Second, ensure the availability of affordable receivers.

The evaluation of any technology platform necessarily includes a way to make receivers affordable. There are three generally accepted ways to achieve this affordability which are not mutually exclusive with one another: (i) manufacturer subsidies, (ii) combining radios with other popular devices and (iii) developing and enforcing receiver standards.

With respect to manufacturer subsidies, this has become a proven requirement on a per-radio basis in North America. But manufacturers are also interested in substantial promotion budgets, and without enough new content to convince them the new receivers will sell, these funds are difficult to come by. Even with the advantage of a North America-wide technology, it cannot be definitively concluded that a single model will be developed that will engage the cooperation of manufacturers with the commercial radio industry.²

² In the U.S., HD Radio™ (IBOC) continues to have difficulties attracting manufacturer and retailer support.

Combining devices is common practice, but has tended to occur when the technology is already standard and its chips are inexpensive, e.g. FM radios built into clocks, CD players, MP3 players, and other devices.

More recent examples include the integration of pay audio on the television set-top box, which removed the need for a dedicated receiver – and removed a huge cost factor from the Canadian business model. To assess a similar model for digital radio, mobile devices – phones, DVB-H receivers, WiFi or WiMax-equipped devices, iPods and MP3 players – would have to be evaluated to determine the viability of ‘building in’ a digital radio receiver.

The cost of the incremental elements needed for radio will be fundamental to prospects of doing this, as will the ‘fit’ between radio listening and the other functions of the device. For example, cell phones may at some point play a pivotal role for the delivery of radio programming, but a number of hurdles remain before this has mass market viability, from cost to battery life, from suitable antennas to the availability of integrated chips.

Developing and enforcing receiver standards is likely the most straightforward solution, but also the most difficult to achieve. For example, the issue of receiver take-up would be immediately resolved if there were digital radio standards that applied in both Canada and the United States. While not impossible, it is unlikely that standards will be developed in the U.S. in the near future.

Third, undertake an aggressive promotional campaign with consumers.

One of the ways in which the new business model will evolve from the old is the need for commercial radio to aggressively promote its chosen technology, both as a commitment to manufacturers and to ensure take-up by consumers. The question for the radio industry will be how to organize the promotion.

This is currently being attempted by U.S. broadcaster proponents of the In-Band On-Channel (IBOC) technology known under the trade name ‘HD RadioTM’. A significant on-air promotional campaign for L-Band DRB receivers was previously organized by Digital Radio Roll-out Inc (DRRI) but did not see much use because so few receiver models could actually be found in retail stores. If a comprehensive strategy for DRB rollout is developed in Canada, it can be expected that the broadcasting industry will support an aggressive campaign to familiarize the public with this new technology.

Fourth, ensure competitive technical features.

One of the aspects of a successful DRB rollout will be the ability of the specific transmission standard to provide a competitive consumer experience when compared with other media carrying similar services. Sound quality will likely be more or less equalized among most of the competing technologies; however, such factors as the robustness of the signal can be a concern. For example, it is a worthwhile question to consider whether DRB delivered via HD Radio™ will have the same reliability and freedom from signal degradation (e.g. multipath distortion) as those delivered via high-power L-Band DRB transmitters and S-Band DARS facilities.

Criteria for success with operators: positive cost-benefit

The other side of the equation from consumer acceptance is the cost and difficulty of rollout from the private radio point of view. In part, these are technology-dependent issues, in that platforms have different cost and coverage issues: some are more suited to different business structures to support the infrastructure.

HD Radio™ is generally considered to be a ‘one-owner one-transmitter’ model. Using Eureka/147 means there are multiple users per transmitter but generally only one transmitter owner (who need not be a DRB licensee). In several European jurisdictions, the development of DRB has required several classes of licensee, differentiating between those who are licensed to provide program streams over a given territory, those who are licensed to provide transmission facilities, and even those who are licensed to assemble program streams into packages for transmission.

In Canada, this differentiation was avoided since co-operative inter-leasing seemed likely to work. Moreover, the *MLO Policy* matched the apparent capacity of Eureka transmitters.

In the United States, the development of supplementary program carriage (multicasting) capacity within HD Radio™ has created concern that such capacity may not always be the exclusive property of the station operating the transmitter. That is, the FCC may wish to have some input into the use of a station’s multicasting capacity, especially where such capacity would be leased to an individual or company other than the licensee.³

³ This issue is likely to be addressed by the FCC in its decisions relating to rule-making on IBOC DRB in the US;

Reference: MM Docket No. 99-325; “*Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service*”; Further Notice Of Proposed Rulemaking And Notice Of Inquiry; April 20, 2004

Still other technologies create the possibility of Broadcasting Distribution Undertaking or BDU-like operators aggregating and reselling or re-transmitting radio stations, with implications for the business model of commercial radio. Under current copyright law, station owners would not be able to prevent such retransmission.

In summary, each technology presents multiple options for developing the business of transmission and determining the cost of rollout. Evaluation of the options will need to include estimates of their cost, capital and operating requirements, receiver subsidies and costs of promotion.

Revenue considerations

A number of initiatives have been suggested to support the investment and ongoing cost of the digital radio model, but the evolution and preservation of the existing radio model must be first considered.

In general, there are four types of revenue considerations in the evaluation of any new model:

- Maintenance of existing advertising revenues;
- New advertising potential;
- Potential subscription revenue for commercial radio; and
- Transactional revenues.

Maintenance of Existing Advertising Revenues

The development of new, competitive and largely mobile audio services for the consumer is widely expected to impact commercial radio by reducing advertising revenues as a consequence of listener loss. Investment in digital radio must therefore be partly rationalized for its ability to maintain audiences.

This in turn will depend on (i) the ability of the chosen platform to penetrate the market and attract audiences, (ii) the degree to which the plan proposes new content under current owners' control and (iii) the degree to which this or other successful platforms creates new competition from new entrants.

Past experience has demonstrated that any attractive new medium will contain new services/content and will increase audience fragmentation. To the degree that the chosen platform can maintain commercial radio audiences, it may prevent open entry to the Canadian marketplace, and the unprecedented and disruptive fragmentation this would bring.

At best, maintaining existing commercial radio advertising revenues will prove to be a very challenging, if not impossible, undertaking.

New advertising potential

The promising ability of DRB to carry data and the ability of the receiver and consumer to utilize that data may create new kinds of advertising inventory, such as coupons, other forms of qualifying buyers, etc. Most of these ideas are likely to work best in an appliance that contains some kind of return path, such as a mobile phone. The ability to access point-of-sale devices is a more complex technical and business problem, but could create real opportunity if resolved.

However, given the degree to which these notions are largely speculative, they carry little ascertainable weight in the evaluation of any business strategy.

Subscription potential

The potential of subscription radio to attract consumers is no longer in doubt. The ability of each technology and business organization model to support a successful subscription business plan for commercial radio operators, in a world already dominated by two satellite platforms, would require further evaluation.

Transactional Potential

Similar, but less advanced, is the potential for obtaining transactional revenue – largely for digital media content such as music – from the use of a new digital radio pipe. Again, different technologies will support different models, e.g. some technologies have a return path to authorize payment, and an existing billing system. Others might be able to function well with a card, pre-loaded credit chip, or on a monthly subscription model.

What are the technology choices?

As noted in above, the primary objective in the transition to digital radio should be to ensure that DRB services are:

- Provided without charge to anyone equipped with a suitable receiver;
- Able to deliver programming content that is national, regional and especially local in nature; and
- Capable of reliably delivering this content to fixed, portable and mobile receivers throughout authorized service areas.

These specific requirements focus attention on those DRB distribution systems that utilize local, terrestrial-based transmitters that operate in radio spectrum allocated to broadcasting and are therefore reasonably capable of providing service to larger populations. These may be powerful single transmitters or multiple lower-power transmitters all operating on the same assigned frequency, i.e. a Single Frequency Network or SFN).

The most practical models to consider for this type of operation are:

- Eureka/147, operating in the 1452-1492 MHz Band;
- iBiquity Digital Corporation's In-Band On-Channel (IBOC) HD Radio™ hybrid analog/digital system, operating in the 525-1705 kHz (AM) band or the 88-108 MHz (FM) band;⁴ and
- The Digital Radio Mondiale (DRM) full digital system, operating in the 525-1705 kHz band.

At present, the single technical standard for conventional terrestrial DRB transmission in Canada is the Eureka/147 system which, due to its wide bandwidth requirements, can only be implemented in new radio broadcasting spectrum.⁵

Industry Canada has provided 40 MHz of spectrum for this service at 1452-1492 MHz (L-Band) and has set up city-by-city frequency allotments for this purpose. The capacity currently exists in this band to provide DRB transmission capability

⁴ The National Radio Systems Committee (NRSC) has recommended that the FCC adopt the AM-band and FM-band versions of HD Radio™ as voluntary DRB transmission standards for the USA; Ref: "NRSC-5-A, In-Band/On-Channel (IBOC) Digital Radio Broadcasting Standard"; 2005.

⁵ Industry Canada has also authorized the use of non-compatible, proprietary technical transmission systems for the satellite & terrestrial components of the DARS digital radio services provided in Canada by Sirius & XM Radio; however, it would not be correct to call these "standards" as only a single licensee uses each one.

for every existing analog AM and FM station in Canada, with some spare capacity for future growth in all but the most congested radio markets.

In order for the HD Radio™ hybrid standard to be implemented on a permanent basis in Canada, regulatory action would need to be taken. Industry Canada would have to establish two domestic technical standards for IBOC transmissions, one for the AM band and one for FM. Usually, standardization occurs only after the Department is petitioned by an interested party and has conducted an investigation into the technical impact of such action on band utilization.⁶

In addition to this, Industry Canada may not be in a position to authorize permanent AM IBOC transmissions using any type of digital emissions unless and until the (ITU) Region 2 AM Agreement is amended. The wording of the current agreement, as well as the bilateral Canada/U.S. agreement respecting the AM band, appears to prohibit digital transmissions at present. Canada has already agreed to work with other Region 2 countries to amend the Agreement to allow for digital transmissions in this band. However, this may take several years to finalize.

As for FM IBOC in the U.S., one of its key advantages is that the technology allows the 96 kbits/sec digital multiplex to be split into two or more parts. This would enable a station to carry a simulcast of its main FM program on one part of the multiplex and originate one or two additional separate audio programs using the remainder. This multicasting option does not exist for AM IBOC, which has a much lower data capacity and can only be used for simulcasting the main analog audio programming.

But there are two key problems with this multicasting concept.

First, the digital IBOC signal is more fragile than the main analog FM service. When the digital signal fails, listeners will find that their receivers automatically fold back to the main analog program. There is no such protection for any secondary programs carried on the digital multiplex. When the digital signal fails, the secondary service disappears completely. Moreover, the extensive processing that occurs in FM IBOC receivers means that 5 to 8 seconds is required to 'lock-up' these subsidiary audio signals whenever the listener changes stations.

And second, receiver manufacturers are having difficulty managing the issue of how to design receivers that allow listeners to easily find and display any secondary audio services that are being transmitted.

⁶ Lab testing of AM HD Radio™ is now underway, to better understand both the interference and service potentials of this technology. IC has also acquired FM HD Radio™ equipment that can be used for similar lab testing. The Digital Radio Co-ordinating Group (DRCG) plans to conduct on-air field tests of AM and FM-band DRB systems this year, including the DRM full-digital system in the AM band.

It is also potentially problematic to add IBOC to an existing transmitter. That is, commercial radio broadcasters cannot assume that IBOC service is easily added to an existing AM or FM station without making significant technical modifications, especially at transmitter sites. And for AM in particular, it is far from certain whether older transmitters can be adapted at all; they may need to be replaced with hybrid analog/digital models.

In addition to this, a more substantial problem may arise in that many directional AM antenna arrays are inherently narrow-band. These systems may have problems transmitting, without severe distortion, the digital carriers located on the outer edges of the analog AM channel.

On the FM band, broadcasters who have not purchased an ‘IBOC-ready’ transmitter would have two basic implementation choices: purchase a new analog/digital transmitter or install a separate digital-only transmitter that will work in parallel with the existing analog unit.

In the latter case, the new digital signal would have to be injected into the existing FM antenna via an FM combiner, or else a new digital-only antenna will have to be added to the tower. Each of these concerns presents additional layers of complications and costs, involving such things as available building space, tower loading and electrical/air conditioning capacity.

In any event, each and every situation will be unique and implementation options will have to be assessed case-by-case. This means that there will be substantial variations in the cost of ‘going IBOC’, depending upon each station’s current equipment line-up and a number of other factors.

Receiver availability and listener take-up will be the key factors in any DRB implementation.

The successful rollout of DRB will be largely governed by receiver availability and use. While radio stations may try to create public demand by originating digital services (such as DRB-only programming) the effectiveness of this will be limited unless (i) manufacturers and retailers are prepared to make available a considerable quantity of DRB-capable receivers, (ii) consumers find programming and other features attractive, and (iii) acceptable/attractive price points are achieved.

U.S.-based broadcasters have concluded it will likely be those add-on features provided within the IBOC digital multiplex (e.g. secondary “multicast” audio programs, data services or surround-sound) that will persuade listeners to buy new

DRB receivers. However, this is problematic with respect to AM IBOC, which is unable to offer any of these features.

Moreover, the interference levels that AM IBOC signals will experience from adjacent-channel analog-only stations, especially at night, could result in many complaints from those who buy new receivers. This in turn raises questions about whether manufacturers will incorporate the necessary AM IBOC decoders within their new analog/DRB receivers. If they fail to do so, the AM version of IBOC broadcasting will likely be just another radio broadcasting technology that ultimately failed, like stereo AM and quadraphonic FM audio.

On the FM IBOC side, until there is a critical mass of new receivers in the hands of consumers, there may be little incentive to encourage Canadian broadcasters to make the necessary capital investments. By waiting to implement IBOC until the receiver issues become clearer, Canadian broadcasters will not lose the ability to implement the technology later. The spectrum will not be jeopardized by inaction because it cannot be used effectively by others.

Broadcasters must consider other delivery options as well

While the broadcasting industry is accustomed to thinking that its digital radio options are limited to technologies that can be controlled by radio station operators, the considerable difficulties attendant on launching a radio-specific platform compel analysis of a larger field of technologies.

That is, industry players need to evaluate new, unregulated audio distribution services to determine whether they may provide digital transmission opportunities as well as competitive threats. Most of these platforms are intended for subscriber-supported services and are therefore not true 'DRB' services.

Digital Multimedia Broadcasting (DMB) is an offshoot of Eureka/147 that can be transmitted within the L-Band channels already allotted for use in Canada's radio markets. Its more efficient coding enables the radio channel to be used for the delivery of multimedia – pictures and some video, along with high-quality audio services – to mobile receiving devices. Such services would not be backward compatible with current Eureka/147 transmissions, so specific L-Band channels would have to be set aside for any DMB services that might be authorized.

Television Mobile (DVB-H) is an open-standard variation of DVB – the European digital television standard – which can be received by mobile devices, especially hand-helds. This technology provides an exceedingly robust and reliable digital delivery platform as do other technologies such as the proprietary MediaFlo system; mobile TV technologies can also carry high-quality audio services. The relatively low-bandwidth requirements of audio suggest that these platforms could

carry large numbers of radio services – both subscriber-based and free. However, there is no spectrum currently allocated for this service in Canada.

WiFi and WiMax are rapidly rolling out across North America, including Inukshuk the recent announcement that Philadelphia intends to blanket its residents with wireless Internet coverage, as well as Toronto Hydro's Telecom's announcement of similar plans for downtown Toronto. There is clearly an emerging market for multifunction mobile Internet access devices that would have music downloading and streaming as part of their functionality. It is at this point where broadband radio would become a substitution threat for broadcast radio.

Entry to this marketplace would, in theory be as open as the Internet, proposing unprecedented audience fragmentation and a threat to all radio business models including subscription radio satellite services. One unresolved technical issue is the viability of these services in fast-moving vehicles. While fixed, fixed-portable, and slow-moving reception might prove possible throughout entire cities, it is not certain that complicated reception problems, such as multipath and Doppler interference would be resolvable.