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14 Broadcasting in the Internet Age

Emerging Business Models for Broadcasting

Richard V. Ducey

AS GREGOR SAMSA awoke one morning from uneasy dreams he found himself transformed in his bed into a gigantic insect . . .

Franz Kafka, *The Metamorphosis*

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14.1 INTRODUCTION

The radio and television broadcasting industries, like most other industries that have anything to do with communication and information, have embarked on a digital metamorphosis. Our dawning consciousness of digitally induced change forms a restless bridge between the "uneasy dreams" of society's wizards of technology and the determined entrepreneurs who turn what is possible into what is done. Broadcasters will be waking up in the next decade to find, like Gregor, that their corporate bodies have undergone massive and magical transformations. To paraphrase the car ad, "this is not the radio and television your parents grew up with."

What is changing and what new business models will result? It is a far simpler job to identify change drivers than it is to understand their ultimate impacts on industry and society. Clearly, a major change driver is the Internet and its relentless appetite for connectivity and interoperability among information and systems. Contemporary society places a preeminent value on intellectual capital as an intangible asset. This is in contrast, for example, to the Industrial Revolution when value was placed on physical assets. The whole notion of not just destroying old technology barriers that create gulfs between information systems but actually to *erect* new and empowering means of accessing, creating, and sharing all information in whatever form is incredibly revolutionary. This notion, at its core, is what the Internet is all about. And the Internet is the logical culmination of humans operating technology, for it embodies the most human of our behaviors – the desire to communicate. At this level, the Internet is as much a metaphor for human connectivity as it is any description of networking protocols.

The magnitude of the Internet's unfolding influence upon society may be framed by considering how much radio and television broadcasting has meant to the world. Beginning with the introduction of radio broadcasting in the twenties, the average person had the ability to receive a constant stream of electronic, real-time information, entertainment, and news – all professionally created, collected, edited, and presented – and all for no cost to the end consumer. Radio and television broadcasting keep people informed, involved, and entertained at a level of service and consumption no alternative has matched. Today, the average person in the U.S. watches almost three hours of television and listens to about three hours of radio *every day*. Certainly, radio and television consumption varies around the world, but the typical pattern is that the broadcast media form the bulk of the media diet.

Internet technologies provide extensions to what we can do with *data* and *information* (i.e., usefully structured data). The Internet is open and free to all. There are decreasing requirements for accessing Internet services. Service to the home is available at very low cost (for far less than basic cable) and the equipment needed to get to the Internet is getting less expensive all the time – about the price of television sets. Rather than dozens of radio, television, and cable options, the Internet opens up to every person on the planet literally tens of millions of destinations with hundreds of millions of web pages – regardless of a person's physical, spatial, or temporal circumstance. And the Internet is interactive and increasingly personalized via sophisticated navigational and user configurable profiles.

The magical thing about the Internet is that for some reason it has become the *lingua franca* of machine communications. Any device that can speak the TCP/IP (Telecommunications Control Protocol/Internet Protocol) Internet language can become part of the whole. That means personal computers, personal digital assistants, set-top box-equipped television sets — and in the near future, digital phones, pagers, and even household utilities — can all be accessed and controlled via Internet connections. The Internet is wired and wireless. It is becoming the ultimate in anytime, anything, anywhere, anyone communications.

Given this backdrop, conventional services such as radio and television must change – there simply is no choice. For broadcasters, this is at once a very frightening and very exciting moment. They are beginning to realize they compose their messages for presentation on speakers and screens, and these need not be confined to television and radio receivers. No longer must people gather themselves around television sets and radio receivers to receive these messages. No longer must they wait until the message is composed and delivered. Instead, as broadcasters leverage their business and information assets onto Internet-enabled platforms, they begin to view their assets as resources for their listeners and viewers to tap into, interact with, and shape their own interactive and personalized experience.

The Internet permits broadcasters to hitch the economic engine of their mass production efficiencies to the ability to individualize the navigation, production, and consumption of data and information. Broadcasters bring many inherent advantages to this business premise. Facing up to the challenges and opportunities will require a broad understanding of enabling technology, emerging market directions, and viable business models. For example, several major radio companies (Jacor, Westwood One, Capstar, and Chancellor) announced a deal valued at over $30 million with National Advertising to create an entity that "will link infomercials and e-commerce, operating across the Internet, television and radio."*

14.2 CONVERGENCE

Convergence is a wonderfully ambiguous and hopeful term of art. Like a palette of oil paints, convergence is a reservoir of conceptual opportunity. The moving parts of technology, the product and service ideas, and the consumer response must all come together for digital convergence to be successful. In practice, convergence may be best circumscribed by defining it to mean the erosion of barriers to entry driven by digital communications, or, in other words, digital technology drives new business opportunity. Those pursuing this opportunity must be responsive to existing consumer demand or successfully convert unmet needs into marketplace demand in order to win – hardly a trivial undertaking.

The computing, media, entertainment, and telecommunication industries have been rather distinguishable in the past. From the consumers' viewpoint this was easy to understand because they paid their bills to different companies and used different means for consuming the services. Today, with a device like Microsoft's WebTV Plus (www.webtv.com), a consumer can watch television, browse the web, get television

* "Radio Execs Sign Definitive Agreement with National Media," *Inside Radio*, August 13, 1998, p. 1.

listings and program descriptions, send and receive e-mail, read the newspaper (on a web site), and even make a telephone call (using IP telephony technology).

As the devices and service offerings become increasingly integrated, service providers and content owners will be driven to establish a compelling presence in each of these product spaces. In fact, newspapers have been some of the early adopters of interactive technology, and now the Internet, because they foresaw a strong challenge to their cash cow business of classified advertising. Now they can offer instantly updateable, personalized, and detailed multimedia classified ads via their Internet platforms. Of course, their abilities to provide news services, including streaming *audio* and *video*, is greatly facilitated by Internet technologies and rapid deployment in the consumer market. Broadcasters are certainly not ignoring this burgeoning marketplace.

14.2.1 Broadcasters Enter the Convergence Marketplace

14.2.1.1 Three Revolutions of Television

Columbia University's Professor Eli Noam offers his vision of the television marketplace in terms of three revolutions.* The first revolution was the introduction of television itself. This era was characterized by the presence of relatively few broadcast television outlets in any given market. Noam calls this the *privileged television* stage. Only a few privileged operators were able to operate these services and competition in programming and advertising was constrained. The second revolution was the move toward *multichannel television* fostered largely by cable television and also by other services, such as microwave and direct-to-home satellite operations. An explosion in outlets, program choice and diversity, and new entry characterizes the second revolution. It also accustomed consumers to paying for what they once got for free – television.

The third revolution of television is the era we are just entering now. This is *cyber television*. Cyber television is driven by client-server and networking technologies such as video servers, switches, routers, high capacity telecommunications links, personal software agents, and integrated PC/TV types of client devices. These technologies transcend the *privileged* and *multichannel* television revolutions by mooting the whole point of counting channels. Rather than assessing marketplace progress by counting channels, the paradigm shifts to considering how much relevant data and information is connected to "me" – i.e., the *Me Channel*.

Consumers tend not to care whether they have 50, 100, or 500 channels. They care only that "what is on" is interesting to "me." That is the key value proposition, and this is the premise on which the Internet can deliver. Media companies that desire to be successful in the future need to be sure they are organized around this premise. This is the key insight Noam offers to those willing to listen.

The transition to digital television, now well underway with the first couple dozen stations coming online in Fall 1998, will infect traditional broadcasters with the convergence like never before. Current policy calls for the end of analog television in the year 2006. Once television broadcasters go digital, they will be deep into convergence and be driven to consider new business models offering incremental revenue streams.

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* Noam, Eli M., "Towards the Third Revolution of Television," Symposium on Productive Regulation in the TV Market, Gütersloh, Germany, December 1, 1995.

14.2.2 Valuing Convergence

14.2.2.1 Convergence Icons versus Upstarts

For those in the media industry who are a little slow to read the changing landscape, the daily bible of traditional capitalism, *The Wall Street Journal*, ran a very interesting article.* The stock market exists as a form of legalized gaming where the participants are essentially betting their money on the future success of companies in which they purchase equity. While often criticized for being short-term rather than long-term in valuations which leads public company executives to manage for quarterly performance, Wall Street is at least an indicator of where things are going.

So where are things going in the media, entertainment, and communications businesses? Are you familiar with the two bookstores Barnes and Noble ($3 billion market capitalization) and Borders ($2.9 billion)? These are icons in the publishing business; they define much of the consumer experience in browsing and purchasing books. Yet a bookstore, Amazon.com, that exists *nowhere else but the Internet* has now achieved a market capitalization ($6.2 billion) that exceeds the market caps of Barnes and Noble and Borders *combined*. When Wall Street values a four-year old Internet-only bookstore company that turned in a $29 million *loss* (on $87 million of revenues) in its most recent year of operations, clearly the betting is that a change is in store for this market segment. Amazon.com went public on May 15, 1997 at $18/share and was trading in mid-August 1998 at over $121, yielding a *net loss* of $1.23/share. This company is definitely not trading on its current value.

Let's consider another American business icon in the media business. When we think of news and influence, surely *The New York Times* will rank high on most people's list. This $7.6 billion (market capitalization) company is a defining influence in American and international society. However, Yahoo!, an upstart company and the brainchild of two Stanford University graduate students, at $8.2 billion exceeds the market capitalization of the venerable *New York Times*.

Let's come a little closer to home for broadcasters. According to the *Wall Street Journal*, America Online, with a market cap of $26 billion, is worth more on Wall Street than ABC, CBS, and NBC *combined*. America Online has begun to reposition itself away from simply just another online service and more as an information and entertainment company. In fact, America Online likes to cite that its evening usage rate puts it on a par with the ratings of some cable networks!

14.2.2.2 Inflection Points

Mapping the media landscape leads one to look for the inflection points that Noam so thoughtfully considers. The seeds of *cyber television* are being sown as stations install video servers, LANs, and Internet connectivity and move into digital television. By *inflection point* I mean the ramp-up point in the classical innovation adoption S-curve that has been observed so often in the social science and marketing

* *Wall Street Journal*, July 14, 1998, page A18.

literatures.* It is the point when a product or service moves from the innovator/early adopter category to the mass market.

In consumer electronics, the first million units sold is a relevant benchmark for assessing a make-it-or-break-it product introduction. Others suggest that a ten percent market penetration rate is relevant.** In any case, the inflection, or ramp-up, point usually comes quite a bit after the product introduction as many more elements than the technology must come together to create success. Even the Internet was around for decades before it became an *overnight success*.

Clearly, this is arbitrary territory and the key is what type of consumers are adopting new products, and ultimately the penetration rates and impacts on society.

There is a clear demarcation between the privileged television and multichannel television eras in terms of the supply side (i.e., when the services were launched). However, the launch of new service offerings by cable, satellite, and microwave multichannel services did not lead to immediate acceptance by consumers. Indeed, marketplace impacts in terms of consumer penetration lagged these service introductions by a fair amount. Often the inflection point does not occur until the right mix of price, product, and perception come together in the consumer psychology.

For example, cable television was introduced in the fifties but did not become much of a factor until the seventies and the roll-out of satellite-delivered television and the roll-out of Home Box Office (HBO). Aided by changes in policy that facilitated urban penetration, cable take-up rose relatively quickly in the next decade to break the 50% penetration level to settle where it is now with about two of every three U.S. households subscribing. Satellite-delivered television and particularly pay-TV in the form of HBO *made a difference to consumers,* so they responded in the marketplace by subscribing to cable in ever greater numbers.

Home VCRs offer the benefit of *time-shifting* to consumers (fair-use taping, legally endorsed by the Supreme Court, of broadcasts or cable networks for subsequent private viewing).*** VCR penetration took off after the Supreme Court decision, fueled particularly by the video rental business. Hollywood unsuccessfully fought VCRs, but, despite that defeat, they ultimately won because the video rental and sell-through businesses now generate more revenues than the theater ticket office. The ability to record and especially to play movies inexpensively drove VCR penetration and use.

Another inflection point was probably IBM's entry into the personal computer market in the early eighties. IBM, in a sense, legitimized this product class with its status as a blue chip company and paved the way for business and home adoption of the technology. The Internet itself faced a major inflection point in the early nineties with the introduction of the HTTP technology that created the World-Wide Web,**** developed by the Swiss nuclear research facility, CERN. Of course, the University of Illinois development team led by Marc Andreessen, now of Netscape

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* Sachs, William S. and George Benson, *Product Planning and Management*, Tulsa, OK: Pennwell Books, pp. 335-338.

** Sachs and Benson, p. 337.

*** Sony Corp. v. Universal City Studios, Inc., 464 U.S. 417 (1984), 464 U.S. 417.

fame, brought this to a new level with the Mosaic graphical browser. The Internet has been growing at phenomenal rates ever since.

Now we are at another watershed period. TVs and PCs are developing new capabilities to the point where the boundaries separating them are beginning to blur. Early attempts at integrating these devices have not gone particularly well, at least not in terms of consumer response. These mostly high-end devices are abandoned in favor of lower cost, standalone TVs and PCs. However, the U.S. introduction of digital television by a couple dozen stations in the top markets is fostering some potentially late change on this topic.

14.3 THE CHANGING BROADCAST MARKETPLACE

Both radio and television are going digital. They are proceeding on different courses and at different paces. In each case, a much higher quality traditional service will be offered, but it will require new equipment. Additionally, the transition to digital will support new business models for broadcasters.

14.3.1 RADIO

In the broadcast radio business, there are three vendors offering so-called in-band/on-channel (IBOC) solutions for existing broadcasters: Digital Radio Express, Lucent Technologies, and USA Digital Radio. This set of IBOC solutions allows current broadcasters to continue providing their analog service while converting unused portions of the spectrum allocated to the radio broadcast service for digital operations. All three companies are proposing market roll outs by late 1999, and at least two of them, Lucent and USADR, have proposed a full digital transition (i.e., moving from IBOC plus analog to a fully digitized signal and the elimination of analog service). The radio data broadcasting business will expand with the full use of the radio broadcast service's digital capacities. There is no fixed timeframe for radio's rollout of digital services in the U.S.

Even with today's analog radio, particularly with FM stations, a fairly healthy data business (using FM subcarriers, pagers, background music, reading for the vision impaired, etc.) has emerged. A version of the European *Radio Data System* (RDS) technology for FM stations is now deployed with some success in the U.S. Approximately 600 FM stations are using this technology for data, broadcasting relatively simple information for display on radio receivers. This information includes, for example, station call letters, telephone numbers, traffic and weather information, and commercials. The display in early receivers is fairly limited in its abilities, although European work is underway to transmit graphic files and HTML pages. In addition to the RDS initiatives, there has been some other work with developing FM high speed subcarrier services to further expand radio's data-

**** The hypertext transport protocol (HTTP) and the associated hypertext markup language (HTML) forming the basis of the World Wide Web was proposed by Tim Berners-Lee in 1989 at the European Center for Nuclear Research (CERN) in Geneva. Originally, it was meant as a means for nuclear scientists to conveniently exchange information, even if they were using different computer environments and were located around the globe.

carrying capacities. It appears that further aggressive development is not in the cards at the moment.

On the other hand the television industry, while proving to be somewhat a moving target, has a firm timetable for conversion to digital operations. The remainder of this chapter regards broadcast television case as moving to digital more quickly than is radio. However, radio shares some of the same capabilities and market competitiveness of digital television broadcasting, so much of what is said for television extends to radio.

14.3.2 TELEVISION

14.3.2.1 Traditional Business Lines

Broadcast television is a *public good* in that it is free (nonexclusionary) and there is no incremental cost to the broadcaster for adding incremental viewers. Broadcasters produce and air programs for the purpose of collecting audiences at specific points in time (for specific broadcast programs). Audience estimates provided by the Nielsen company are used, along with other market value indicators, to produce advertising-generated revenues paid to the broadcasters who collect the audiences for their broadcast programs. Broadcasters provide different types of news, information, and entertainment programming with local, regional, and national appeal. That is the traditional broadcast business in a nutshell. It is a good business and generates about $40 billion per year in advertising revenues, which is essentially the only revenue source for commercial broadcasters.

14.3.2.2 Nontraditional Business Lines

Both commercial and public television broadcasters have been exploring nontraditional business lines. Using the natural advantages of wireless data communications capacity, and ubiquitous distribution in local, regional, and national markets with the added benefit of being able to cover operating costs with traditional business lines, television broadcasters could quite competitively enter the data broadcasting, bandwidth, or Internet market spaces.

14.3.2.3 Data Broadcasting

Convergence between the television and Internet worlds is still being built in terms of the underlying standards. While the digital television standard has been set in the U.S., the data broadcasting portion of the standard is still in a degree of flux. This is true even for the analog television data broadcasting service.

The Advanced Television Systems Committee (www.atsc.org) has efforts underway to standardize data broadcasting in the analog and digital television domains. There are several approaches to such a standard and no final decisions have been made. Several groups are working on standards solutions: the Internet Engineering Task Force (www.ietf.org) working on IP over VBI, the ATSC T3/S17 Data Broadcast Protocols subcommittee (http://toocan.philabs.research.philips.com/misc/atsc/t3s13/), and the ATSC Digital TV Application Software Envi-

ronments (DASE) subcommittee (http://toocan.philabs.research.philips.com/misc/atsc/dase). There now is another relatively new group, the Advanced TV Enhancement Forum (www.atvef.com). This work is at least loosely coordinated and will likely result in some very useful solutions to advance the television data broadcast business.

There are a number of prominent examples of television broadcasters entering the high speed mobile data broadcast market. In each case, the otherwise unused vertical blanking interval capacity of the television signal is used for data broadcasting. The vertical blanking interval (i.e., the equivalent of 10 horizontal lines out of 525 lines transmitted in NTSC television) yields over150 kbps of data capacity.*

As a point of reference, this unidirectional data capacity exceeds that of ISDN basic rate interface (128 kbps) which is the telephone industry's answer to providing high speed data bandwidths to the consumer and business marketplace. Therefore, this is not trivial data capacity, but an economic opportunity for television broadcasters to exploit. It is also an incredibly cost-effective means for providing data access to millions of homes, schools, offices, cars, and other places people find themselves – even walking down the street. Television signals are among the country's most ubiquitous data service available.

Commercial ventures are testing the market for television data broadcasting. For example, the Public Broadcast System (www.pbs.org) has teamed with WavePhore (www.wavephore.com) to create the for-profit subsidiary, PBS National Datacast. Other examples include the Intercast consortium (www.intercast.org), Datacast, LLC, WinkTV (www.wink.com), and Norpak, the Canadian firm responsible for much of the data broadcasting technology installed in stations. There are also some international efforts, pioneered by companies such as IO Research (www.iores.com.au) and the Japanese work by NHK (www.strl.nhk.or.jp) on *Integrated Services Digital Broadcasting* (ISDB).

14.3.2.4 Program-Related and Nonprogram-Related Data

Data broadcasting services fall into two broad categories – program-related and nonprogram-related. The data broadcasting services that are related to on-air programming are typically broadcast in real-time – i.e., enhanced content relevant to the program is broadcast in the VBI simultaneously with the program itself. The display device for the data broadcast service would typically be the television receiver connected to a set-top box of some sort and destined for a target group of *viewers/users* (or as Gary Arlen, of Arlen Communications prefers, *viewsers*). That would put the traditional television service and the enhanced broadcast service in the same user environment, on the same platform – a consumer plus!

For program-related data broadcasting there are many possibilities. So-called *enhanced broadcasting* is a way to add value to the traditional television viewing experience. One option is to use crossover links that send the URL (Uniform Resource Locator) of a web site via the VBI to a properly equipped device (TV, PC,

* There are 21 vertical blanking interval lines. Lines 10-20 are used for data. Line 21 is reserved for closed-captioning and TV program rating codes. Each VBI line has a data rate of about 15,000 bits per second, or 150,000 bits per second (150 kbps) for all ten lines.

etc.). This device then connects a viewer to the web site.* To signal the viewer that such crosslinks are available, some kind of icon or onscreen clue would be provided. Broadcasters and advertisers can broadcast their crossover links to enhance the experience of watching a program or an advertisement.

Producers of programs such as *Baywatch*, and companies such as Disney and N2K are experimenting with the use of crossover links in the production process. Advertisers can also use this technology for viewers to crossover between an on-air commercial directly to a web site for additional information – or to make a purchase. During sports broadcasts, for example, an "I" icon might appear and offer the viewer an opportunity to travel to a web site where in-depth statistical information is available. Or a viewer of a car ad could link to a dealer's web site, find what is in inventory, see sticker prices, and even make an appointment with a sales representative.

Nonprogram-related data broadcasting refers to data not necessarily dependent (temporally or contextually) on main channel television program content. Typically, the PC is used as the display device for these services. Microsoft has been working with a number of broadcast and cable groups, including companies such as Cox Broadcasting, Capitol Broadcasting, Sinclair Broadcast Group, Media General Broadcast Group, and some public stations for proof-of-technology and market tests. PBS has again partnered with WavePhore, Inc. to rollout the new service WaveTop (www.wavetop.com), a value-added, content aggregation service delivering branded content, advertising, and software updates. It requires a PC card that is available for approximately $100, and the PC software capability is bundled into Windows98. This service is initially available in the top 100 television markets.

14.3.2.5 Bandwidth

The raw data-carrying capacity of analog television is at least 150 kbps, in addition to traditional television service, yet few television stations in the U.S. make commercial use of this capacity. In digital television, the data-carrying capacity leaps to a minimum of 1 Mbps and can extend to nearly 20 Mbps. In a marketplace where data communications bandwidth is an increasingly valued service, particularly for mobile applications, this carrying capacity gives broadcasters a serious competitive advantage. Even if broadcasters want nothing to do with data broadcasting, they could at least rent this capacity to someone who does!

Broadcasters have killer advantages in the bandwidth marketplace. They have little incremental expense to incur in developing a *bandwidth for hire* business line and 100% market penetration, with 24 × 7 availability (often with standby redundancy), T-1 or better data rates, and mobile access. Moreover, the network is already built and operating now – there is no deployment wait time. This situation makes data broadcasting very attractive to anyone considering ISDN, T-1, cable, microwave, or a satellite platform alternative.

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* The Consumer Electronics Manufacturers Association (CEMA) along with several major companies has proposed a standard for crossover links, EIA 746. This standard uses VBI line 21 for transporting Uniform Resource Locators (URLs).

Broadcasting is, of course, a unidirectional service. This works great for things such as software updates, catalog downloads, database updates, and e-mail distribution. However, if a return path is required, typically it is asymmetrical in its requirements. In other words, the downstream data path needs to be broadband to include large files such as graphics and streaming media. However, the return or upstream path is usually fairly limited in bandwidth requirements.

It takes just a few bits for a user to *click* on a URL, but that click might trigger a tsunami of streaming and multimedia data back downstream. Marrying television data bandwidth capacity to return links like wireless telephony (cellular phones, PCS, satellite phones), unregulated radio frequency applications (such as Metricom's Richochet service, www.ricochet.net), or wired alternatives (like the public, switched telephone network) can easily and affordably extend the commercial value and business utility of this service.

The bandwidth marketplace is headed toward integrated services and commodity pricing. Indeed, Sprint's (www.sprint.com) recent announcement of its Integrated On-Demand Network (ION) foretells the day when users simply order whatever bandwidth they need for a particular application when they need it, rather than maintaining high overhead, fixed-cost data pipes. The Sprint ION solution integrates various bandwidth services now, whether frame relay, IP, voice, data, etc., into a single platform. A market extension of this could be to marry wireless platforms such as TV VBI or DTV bandwidth to enable huge mobile downstream data pipes at a highly attractive price point.

14.3.2.6 Internet

What is the Internet marketplace worth? The numbers are incredible. Companies such as MindSpring (www.mindspring.com) have increased in value over 1000% in a year's time. Microsoft and Compaq each invested over $212 million for 10% stakes in the RoadRunner cable modem service, which values that business at over $2 billion. With about only 100,000 subscribers, this valuation is *well over $20,000 per-subscriber basis.* For broadcasters considering entry into the Internet marketplace, these numbers should be very encouraging.

What role can broadcasters play in the Internet services market? IBM's William Beckmann joins others in cautioning about the Internet infrastructure, particularly overburdening the backbone. He argues for staged infrastructure deployment to facilitate risk avoidance. In his view, the key strategic market is *bandwidth to the end user.* In this regard, he argues that *broadcasters* have the lead for at least 18 to 24 months. At this point, telephone deployment of digital services networks will start to reach critical mass.*

The threat to the Internet backbone is already evident and will get worse with the rollout of more streaming media relying on unicasting protocols. There is work underway by the IP Multicast Initiative (www.ipmulticast.com) to get the industry off its reliance on unicast streaming applications, but this will likely take time.

* Beckmann, William H., "How to Offer New Interactive Broadcast Services," Vice President, IBM Video Enabled Solutions, IBM Corporation, USA, *BroadcastAsia98 International Conference,* Singapore, June 1–4, 1998.

Beckmann and others argue that local backbone caching to avoid international or national backbone traffic is a wonderfully appealing solution. The move toward IP multicasting enhances this practice all the more.

When one goes looking for a *local* ISP capable of caching and downloading large data files, streaming media sessions, etc. to fixed and mobile users, the synergy television broadcasting offers is very compelling. The broadcast infrastructure, through standards development work to enable both analog and digital television to push IP packets, can easily become part of the Internet local caching solution.

14.4 CONCLUSION

Like Gregor, broadcasters are waking up to the fact that they have more legs to stand on and will start to look quite a bit different in the next age of broadcasting – the age of Internet broadcasting. As commercial analog television passes its 50th birthday, the path to the next decade of digital television is emblazoned with new opportunities for revenues, services, and advancing the convergence paradigm. The way things are adding up, broadcasters and their *viewsers* have a compelling and enriching next decade. Let the millenium roll in!