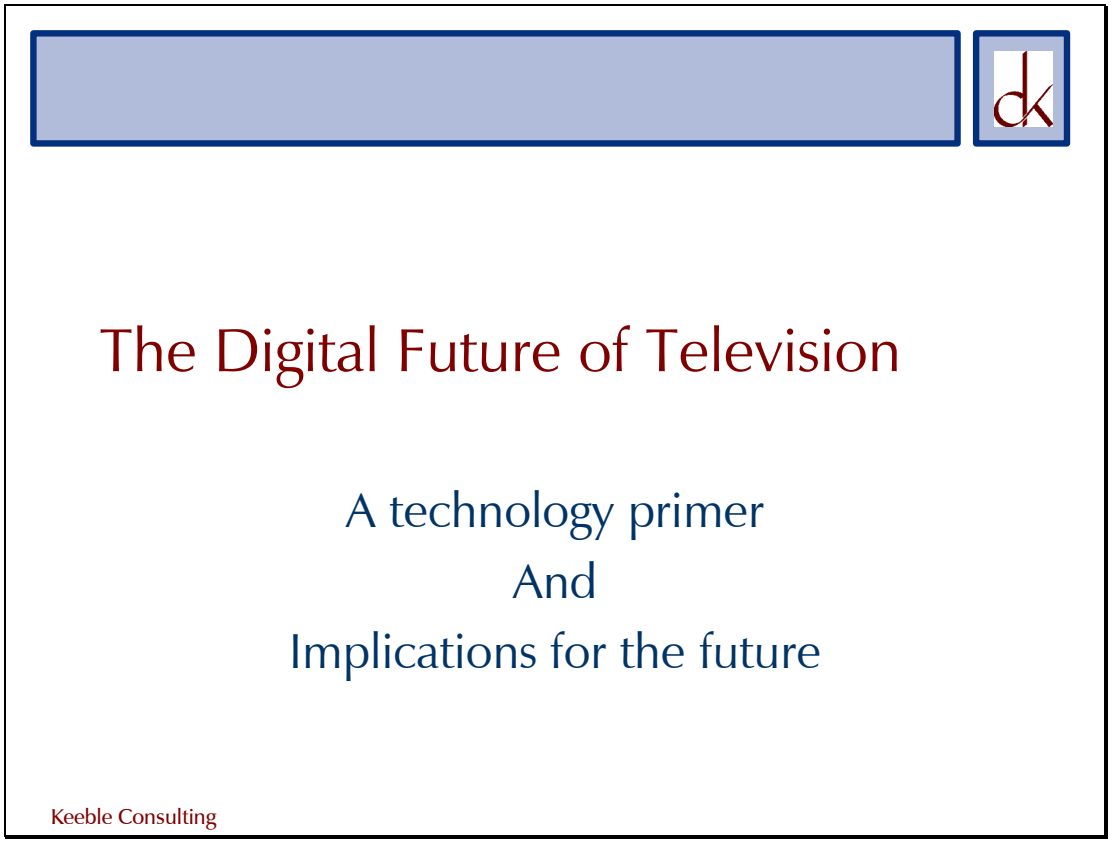


A paper by David Keeble

For the Parliamentary Standing Committee on Heritage

June 4, 2002

Introduction

This submission is about digital television and its impact on the Canadian broadcasting system.

It begins with a discussion of how the technology works. This discussion is needed because the impact of digital television on public policy stems directly from its nature. Understanding the building blocks of the technology clarifies what the technology will do to the business.

Make no mistake: digital television is, without doubt, a disruptive technology. While it will ultimately be the replacement for analog television, it will also change the nature of the television business in ways that are important to public policy. At the end of this paper, we will therefore look at the implications for the TV business and Canadian viewers.

It should be clear that the scope of the paper is not limited to the current implementations of digital television technology: high-definition TV, satellite TV, or digital cable. Rather, it will approach the subject from the ground up, and look at the building blocks behind all of these products and services.

The Basic Building Blocks

The first thing to understand about digital television is that it's a merger of two older technologies: analog television and the computer.

"Merger" is the appropriate metaphor because the process resembles a corporate merger – when the two are put together, parts of each are kept to make the whole, but some parts - the parts that are duplicated – may be discarded. And the hope is that the combination of the two "sets of parts" will be much more powerful than either of the original two separate entities.

The Parts of Analog Television

The first analog TV sets had only two parts: the display component – that is, the picture tube and the speakers – and contained within the set itself, a tuner.

Tuners

In the late nineteen-sixties, when cable television began to take hold in Canada, the tuner in TV sets could only tune 12 channels – 2 to 13 – the ones that could be received over the air in the VHF band. And at first, that's all that cable provided. But as time went on, cable needed more room to sell more services. As it happened, there were frequencies available inside the cable that weren't available over-the-air, since they were in use by taxi companies, police departments, etc. So cable operators began to use these additional frequencies. For their viewers to receive them, it was necessary to provide a new tuner – one that sat on top of the set and converted the additional channels to channel 3 or 4 so the set's tuner could receive them.

This device had big implications for the whole industry, of course, since it hugely expanded the number of channels available. Now these expanded tuners are built into the set itself.

De-Scramblers

At roughly the same time, the concept of a de-scrambler was developed to enable the business of Pay-TV. That is, to get viewers to pay to receive a service, there had to be a way to deny the signal to people who didn't pay. So the idea of scrambling signals was born. A scrambled signal was changed in such a way that a regular TV set couldn't see it, but a de-scrambler could re-assemble it. Only people who paid could get a de-scrambler; and those people now had two set-top boxes on their sets – and lots of wires.

Unfortunately, the initial scrambling techniques were fairly simple, so people began to build "pirate" de-scramblers to decode Pay-TV without paying for it. Some of these were sold commercially. The pay-TV companies responded with more secure systems, and the whole cat-and mouse game between the services and the hackers began.

VCRs

At the same time that these technologies were developing, another one, just as revolutionary, was being created in the form of the VCR. With the spread of the VHS tape standard through the 1980s, most homes became equipped with a device that could record and store television programs. This was widely felt to be a marvellous idea to free viewers from the time constraints of the broadcasters' schedule – now viewers could tape favourite programs, and time-shift their viewing to a more convenient hour.

Two things got in the way of that vision of the VCR. The first was that recording programs proved to require more learning than most viewers were prepared to undertake. While some worked through the issues in order to ensure they could see their soaps or the West Wing late at night, most never used this feature. Nor was it as compelling as originally thought, because of the explosion of viewing choices.

That is, the huge expansion of channels and the changes it brought to the industry ensured that almost every program would be repeated – not just in the old "summer re-runs" but continuously throughout the year and on many different channels. And if that wasn't enough choice, movies were available from the corner store that could play on the VCR.

The result of all these developments was that energetic viewers had a set and two or three boxes on it, and a lot of wires. And, as time went on, multiple remote controls to make the boxes perform their specialized functions. Connecting a TV set became a headache.

At this point, however, the limits of what could economically be done with analog technology were reached. And that's when the idea of blending computer parts into the TV set began.

The Parts of a PC

Display and Input

PCs have displays that look much like TV screens, although of much higher quality. But since PCs are used interactively, they must have quite a few parts that a simple TV doesn't need – starting with a keyboard and a mouse – input devices that are much more general and adaptable than the remote control.

And inside the PC box there are dozens more components – but they can be simplified for the purposes of this discussion.

Processing and Storage of Information

The key component of a PC is its processor. This is a chip that can be programmed to perform a wide variety of functions. It's needed to do anything. Even if all the user wants to do is type a key on the keyboard so it shows on the screen, a processor is needed to receive the information from the keyboard and instruct the screen to display the letters.

But of course the user does more. To manipulate that word – to highlight it or underline it – it must be stored so the processor can get it and make the changes. For immediate purposes it's stored on chips called RAM memory. This memory works very fast, but unfortunately its ir contents are lost when the machine is turned off. To store the word indefinitely, it's recorded on a disk – either the fast hard drive inside the computer or a portable storage medium like a floppy disk or a CD-R.

That's the essential hardware of a PC – devices for input, display, processing, and storing information.

Communication

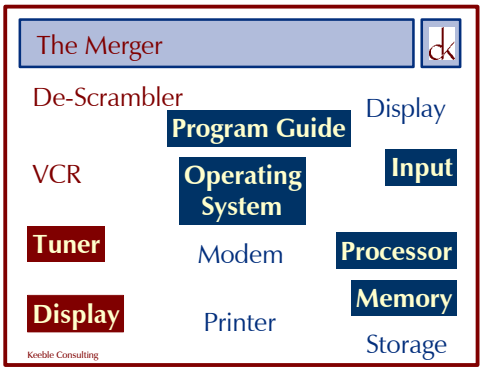
For the PC to communicate beyond its own screen, it needs additional hardware for output and communication: a printer, and a modem of some kind – high-speed (which people call broadband) or slow-speed – to connect to other computers and to sites on the Internet. These communication connections will turn out to be very important when the computer merges with the television.

Software

But the most important thing to remember is the software. Somewhere there must be a set of instructions that tells the processor how to connect all this hardware and make it work. This is called an operating system. Windows is one such program, and so is the Mac operating system, but there are many others, each built to handle the needs of a particular device. There are operating systems in elevators, cars, and television set-top boxes.

The "OS", as it's called, is not the only software. To do anything useful with a computer, applications are needed – word processors, spreadsheets, graphics design programs. These run simultaneously with the operating system to accept what we type or draw with the mouse, print it, send it over the Internet, and so on.

The Merger



So those are the parts to consider when the TV is merged with the computer:

- display, tuner, de-scrambler and recorder;
- display, input devices, a processor, storage, communication hardware, an operating system, and applications.

What parts are needed to create digital television? Clearly, we'll keep one display, and that will be the TV set, because almost everybody has one. We'll keep the analog TV tuner too, because analog signals are still used. For input, we'll use a remote control for ease of use.

From the computer side, we'll add the processor, some memory, an operating system, and some application software. We'll use these to do things that are needed to watch TV:

- to add to that analog tuner, and also tune digital television signals
- to de-scramble PAY-TV signals that have been digitally scrambled – what we now call "encryption".
- and probably, to display a simple program guide.

Simple Set-Top Boxes (STBs)

What we've just created is a digital set-top box. As described, it's the simplest form of digital television.

To perform its simple functions, the set-top doesn't have to be a powerful machine. It doesn't need the fastest processor, or very much memory. It's nowhere near as powerful as a typical desktop PC, but it still contains the essence of a computer – it's just a simple one that can't do a lot.

But what it can do is revolutionary, and has already introduced profound changes into the broadcasting system.

Let's start with the first thing it does: decode digital TV signals. This is revolutionary because digital signals can occupy much less space than analog signals, and the result is that the system can provide many more channels. Where we once could transmit seventy signals on a cable system, we can now send hundreds more.

A Digression on Compression

Here's why: imagine a very simple picture – like the closing credits of an animated series like "the Simpsons". This is a simple still picture that may stay on the screen for about 3 seconds. In an analog system, this picture occupies the full capacity of the transmission channel for the full time. It has to, because the analog receiver can only display the picture it's receiving, and it needs 30 complete pictures every second. So about 90 identical pictures are transmitted.

In digital, we don't transmit the picture as such. Instead we turn the picture into numbers, each of which represents one coloured dot in the picture. We transmit those numbers. In the receiver, the processor places them in memory, and recreates a picture from the numbers, which it sends to the screen. But since it has the picture in memory, and the picture hasn't changed, we don't need to transmit it again. We just send a simple command to the processor to display the picture repeatedly. Because we aren't transmitting 90 pictures, but only one plus the command to repeat it, there's a great deal of capacity available in our transmission channel.

An analogy for compression

It's like shipping desks from a furniture factory. Desks can be shipped already assembled – but they take a lot of space. If shipped in their component pieces, along with instructions to re-assemble them, many more can be loaded in a truck. But there must be someone equipped with knowledge and tools to re-assemble them at the receiving end. That's what the computer part of the set-top box does.

The example above used a simple picture – a complex picture with lots of motion can also be compressed, using some sophisticated math, and new transmission technologies. On average, between six and ten digital television signals will fit in the space needed for one analog signal – as long as there's a digital receiver at the other end to decode and re-assemble them.

Fragmentation

What does compression mean for the television system?

An upgraded cable system has room for approximately 120 analog television channels. If it uses 80 of those to provide analog channels, and converts the other 40 to digital, it can provide between 240 and 400 digital channels in that space – for a possible maximum of 480 TV services on that system.

This increase in choice is a radical change that is gradually spreading through the viewing population. At the end of the 1960s, most Canadians could receive about 3 or 4 channels, with rooftop antennas – and around 20% of households are still in that state. As cable spread and the number of channels grew, another 60% entered the 40 to 80 channel universe. Now approximately 20% of households are in the digital universe, with potentially hundreds of channels – and that number is growing daily.

We now have three different kinds of viewers: a minority in the 4 channel universe, a shrinking majority in the 60 channel universe, and a growing minority in the 200 channel universe. Television services, like other businesses, depend for their survival on market share. They must assemble enough viewers and subscribers from this highly fragmented market to pay for their operations and programming.

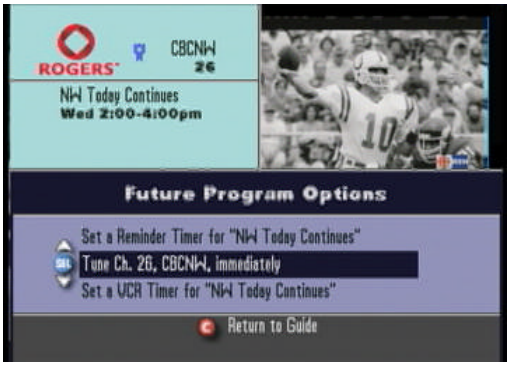
This is difficult for all Canadian services, because their reach is limited to our domestic market. For those digital services who can reach only the viewers in the 200 channel universe, surviving with 199 competitors may prove to be an impossible task.

Program Guides

Of course, once viewers have hundreds of channels, they need help to find programming. This is provided with an electronic interactive program guide, something to help them sort through all the program offerings and find what they want. EPGs are an essential part of digital television.

The Rogers digital guide, shown at right, is fairly easy to navigate, with a list of channels down the side, times across the top, and programs listed in the grid.

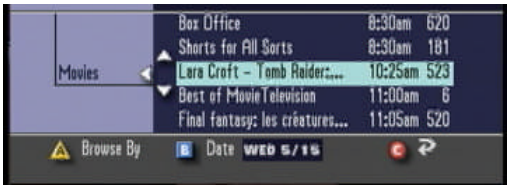
The viewer can use the remote control, scrolling down to see what's on different stations and to the right to see programs in the future.



Clicking "select" on a future program, the set-top can be instructed to tune that show when

the time comes, record it (if one has a special link to properly equipped VCRs) or just change to that channel now.

The viewer can also leave the "grid" and sort the programs in the guide by theme, instead of by time and station. The screen-shot at right shows a viewer scrolling through the movies for the next two days (all the set-top can hold in its memory). If the viewer chooses a channel they can't receive, the set-top offers them the chance to subscribe.



All of this can be done with only the basic computer additions to the TV set – the processor, some memory, the operating system – and this one piece of software, the program guide application.

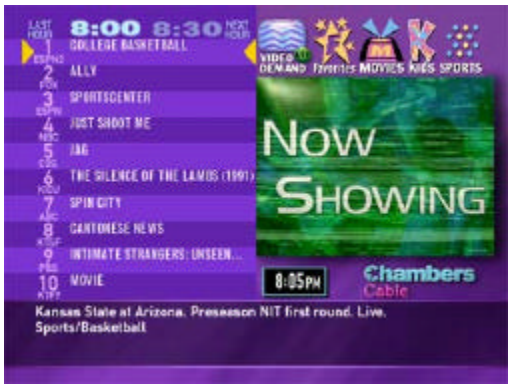
Video-on-Demand

By adding one more device, a modem, the set-top box can communicate. Of course, the set-top can receive all kinds of information from satellite or over the cable, but sending information back requires some kind of response device.

The simplest form of two-way communication is a normal telephone line modem. This is not very fast, and it is slow to respond to viewer actions since it must dial a number and receive an answer before the user can begin to communicate. It's useful nonetheless – satellite companies use it to perform billing operations; the set-top box dials in periodically to report on the subscriber's use of pay-per-view movies.

Cable companies prefer methods that communicate through the cable itself. The most powerful set-top boxes use the same kind of modem that cable companies use for high-speed Internet access – but unfortunately, none of these boxes are deployed in Canada. Instead, the existing set-tops use much slower communications devices. Right now, they are used for internal control purposes by the cable company – and in a limited way, for Rogers' Internet-on-TV service.

They'll become much more useful when a new digital television application is launched, video-on-demand.



For VoD, the viewer's program guide will show them not just what's playing on the "live" channels, but also what programs have been digitally stored on computers at the cable company's head-end – the centre of the cable network.

The viewer can then request one of these shows - usually movies – using their remote control. Their set-top box will then use its modem to send a request to the cable company for that show, and the computer at the head-end will start to play that program – but only for the viewer that requested it. And it adds a charge to the bill at the end of the month.

Adding the TV into a Computer

The examples given above show how new ways of using TV, and new opportunities for the television business can be created by adding a few bits of computer hardware to a television set. But these examples only scratch the surface. The set-top is useful, and available from the cable or satellite company at a low price. But if one wanted to truly use the power of the merged computer and TV set, one could take a different approach, and put the tuner inside a full-fledged PC.

There are several kinds of off-the-shelf hardware for this purpose; the "All-in-wonder Radeon" is one from ATI Technologies of Toronto. This plug-in card is a TV tuner and an advanced graphics display card. Using this card and its software as the centrepiece, one can build a unit that:

- will play DVDs, with surround sound and all of the features of a DVD player, implemented in software on the computer.
- will tune analog TV stations from the cable or an antenna plugged into the card
- will act as a home entertainment centre, able to hold digital copies of a user's entire record collection (up to 15,000 songs on a typical hard drive)
- will act as a game machine – with much more power than the usual game console that is found in the family living-room.

Such a computer belongs, not on the desk, but in the entertainment centre of the home, where it can replace many other devices:

- The CD player
- The DVD player
- The VCR
- The game machine
- Hundreds of CDs, tapes and DVDs.

It also replaces the TV tuner, though it will only tune analog channels. Plug-in cards exist that will tune digital over-the-air or European standard digital signals, but there are none for North American digital cable or satellite signals, for two reasons:

(a) Satellite and cable signals are encoded in secret proprietary formats, so that only the boxes built by specific manufacturers will tune these signals, and

(b) all of them are encrypted in order to prevent pirating. These technologies are not available to the manufacturers of PC tuner cards.

As a result, our PC/TV will only tune analog signals.

New Entertainment Functions

The PC described above replaces other entertainment devices, but the power of the computer allows it to go well beyond that, providing new entertainment and information functions that the old devices can't perform at all.

For example,

- The software contains a program guide, much more powerful than that of the set-top box. It can be set to record up to 7 days of information, rather than two. In fact, it could go well beyond that, but the listings change too much to make more time useful. The information is downloaded automatically from the TV Guide Internet site using the computer's modem. Not only can one search by many more themes (including subgroups like "movie/comedy" but one can also search by actor's names and other parameters.
- Since the device records directly to the computer hard-drive, there is no need for a VCR, or tapes, or labels – the viewer simply clicks on a show in the program guide and tells it to record.
- Software is available to edit the recorded program, to copy it onto a CD-R for future storage, or to send the program to a friend over the Internet. That may not seem like a practical idea, since the video file would be very large, but in fact, people are already exchanging pirated digital copies of movies over the Internet.

Internet-delivered audio and video

- The PC/TV will play audio and video sources from the Internet – radio and TV stations from around the world, or clips from Canadian and US websites – using the high-speed modem. Many people can do this on their computers now, but the advantage with this set-up is that it is connected to the TV set. Theoretically, then, Internet channels become as accessible as any Canadian TV or radio service, though one must note that in current practice, the quality of live broadcast video provided over the Net is not close to the quality of broadcast stations, and for many uses, would still be considered unacceptable. Live hockey games or movies from Los Angeles are not really viable on my computer in Ottawa just yet.
- Internet Radio, on the other hand, is generally of excellent quality. The limitation on audio services is not technical, but economic. It's easy to transmit and receive the signal, but it's not easy to sell enough advertising on Internet stations to pay for the cost of the connection.
- One can share video files over the Internet. Many people trade pirated music and movies over the Internet. With this set-up, these sources become part of the home entertainment centre very easily.

The Computer as PVR

- With the ATI tuner card, the hard-disk and the software supplied with the unit, the computer can act as a personal video recorder (PVR). That is, using the remote control that comes with the unit, one can:
    - "pause" live TV. While watching a program, the viewer can hit "pause" and the program will freeze where it is. But it continues to record in the background, so when one is ready, one hits "play" and the program resumes where it left off.
    - Since it is always recording, one can rewind live programs to see part of a show over again. Instant replays, under user control, including frame-by-frame advance on a disputed goal, for example.

- and one can fast-forward through the program too – for instance, through a stoppage in play – or through a set of commercials. It's not hard to see the disruptive implications of this feature. If viewers can skip over TV commercials, then commercials have to change to become something that the viewer chooses to see, or they will lose their economic value.

The computer as TV information-gathering device

The power of computer software is also evident in the way that it can handle data transmitted with the television signal.

Let's take closed-captioning, for example. The computer takes the text that is normally transmitted for the benefit of the hearing-impaired and turns it into a useful tool for many purposes.

- It can be shown off-screen in a separate window.
- It can be saved in a text file – so the viewer can have a complete instant record of a program or an interview, for example.
- Viewers can even set it up so that the computer monitors the closed-captioning of a particular channel, looking for words that are interesting to them, and starts recording when it sees the word.

It's easy to see how that would be useful to someone in business or, for that matter, in politics. The viewer tells the computer to monitor CPAC, Newsworld, RDI, or RoBTV, and look for the name of a riding, or a business, then record that section of the TV program, and save the closed captioning text for future use.

So television becomes a source of text as well … and viewers no longer have to watch it to use it as a source of information.

Interactive Television

What about supplementing television by combining it with content delivered over the Internet – to create interactive television?

This sequence of still frames is from interactive software that Rogers has licensed and deployed, called "Wink." This software doesn't access the Internet for its data – it uses digital data that is transmitted inside the television signal.

This example allows viewers to see short news headlines on CNBC; within that offering viewers can also browse stock market reports – and even make purchases – Wink is very focused on e-commerce on the TV set.

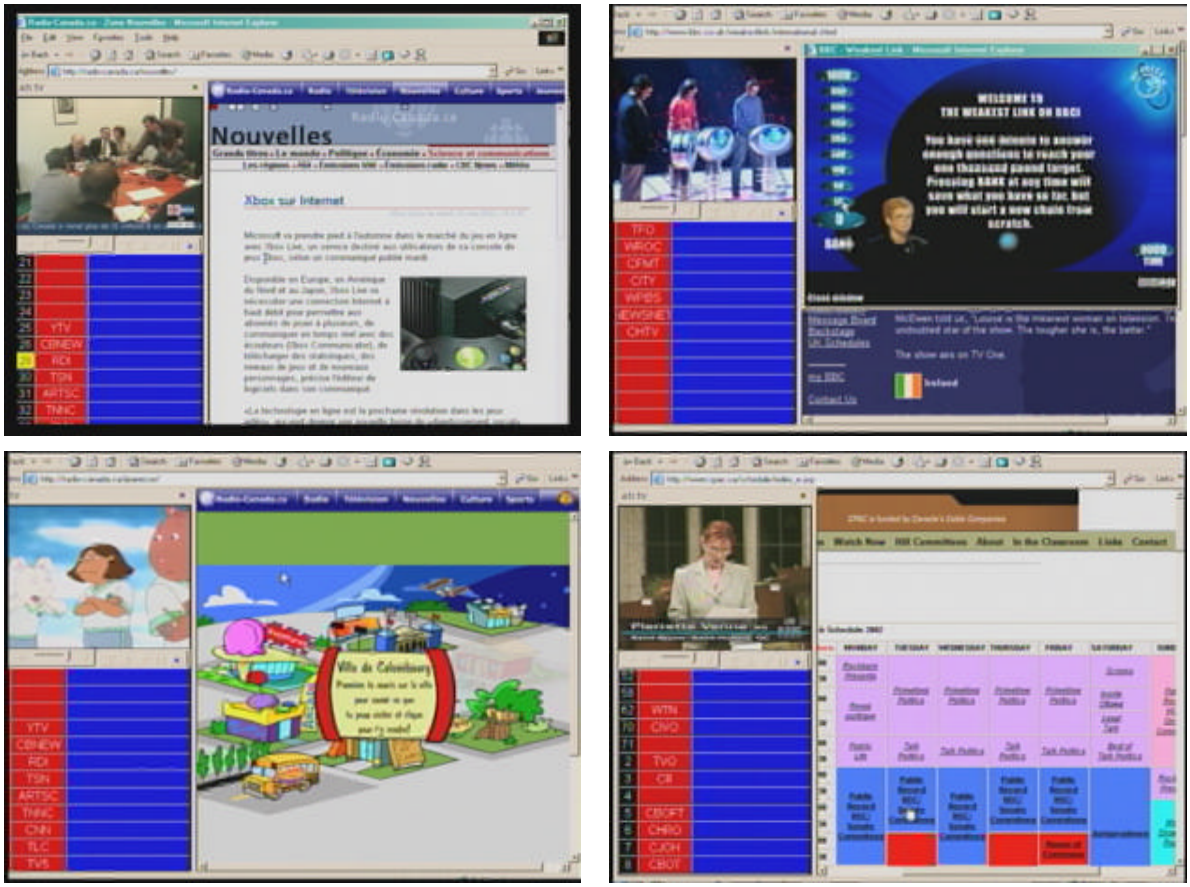
Because of the limited power and communications abilities of the current set-top boxes, this kind of interactivity doesn't provide anything visually exciting, and its information capacity is limited – it can't compete with what's available on the Web.

As a result, many broadcasters still focus on interacting with their audiences through what is known as a "two-screen" experience. That is, viewers must use their TV and their computer separately to have both the program and the interactive experience. There is evidence that many computer users keep it in the same room as the TV set, so this approach is viable.

However, using the computer we've described above, we can put the two experiences together. The software provided with the ATI card allows the viewer to put a TV picture in one corner of the program "internet explorer", which is designed to access web sites.

Using this ability, we could, for example:

- Access more information on a news story that we've just seen on the hourly news
- Compete against other viewers for prizes on a game show while it runs
- Play a game on a children's web site while watching the associated program
- Access the schedule of Parliamentary Committee meetings while watching CPAC.



The experience that one can have on the computer is currently limited by the lack of agreement on software standards for interactivity. While users can use the browser and the TV at the same time, they are not currently linked so that the browser could go, for example, automatically link to a new web page when the viewer changes the channel. To do that, the television signal itself must carry data to enable interactivity, as it does in the "Wink" example given above. A number of US programs carry such interactivity in their signals now.

However, almost all of the software in this area is

- proprietary – that is, secret, so that no one but the owners can create software that will work with signals encoded to the proprietary standard, and
- incompatible with all of the other interactive software.

In short, there is currently no open standard solution that can be deployed by all programmers and used on all digital television receivers, including current set-tops and

devices like the computer described above. This is an area where intervention may be required to help the Canadian production industry exploit the new technology.

Advanced Functions on Set-Tops

Interactivity

To some degree this kind of interactivity can be achieved on current set-top boxes. “Degrassi: the Next Generation” is a series on CTV which has a very popular online experience for its fans. They experimented in its last episode of the year with an interactive program that could be received by viewers with the latest ExpressVu set-top.

However, as mentioned above, the software used by ExpressVu and CTV to encode their interactivity into that show’s signal is proprietary, so that the interactive elements could not be experienced by subscribers to Star Choice, Rogers, Videotron, Shaw, et cetera.

Games and Information Services

ExpressVu also runs an interactive weather service. In the United Kingdom, the satellite broadcaster Sky Digital offers a range of games that can be played on the set-top box, as seen at right. These games are not as sophisticated as a current game console or a PC-based game.

New Business Based on Interactivity

Interactive Television also introduces new businesses to TV. Right now, people in the TV business can sell two things – advertising, and subscription services. Interactive TV creates new products – for example:

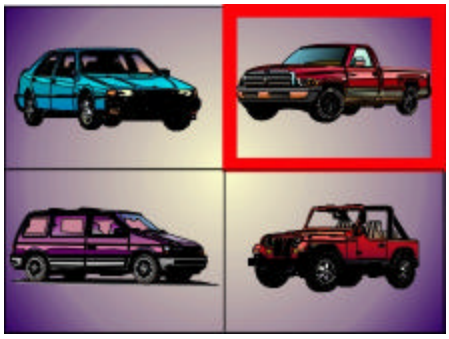
Electronic Coupons: If viewers click on this text, they will receive a coupon for a discount on the product.

TV-Commerce: Click on this and buy the video

Sales Leads: Click on this and your name will be sent to the nearest dealer for a test drive of the car.

Deep Information Service: use the TV to get more information on a story, your local weather, sports scores, etc.

Personal advertising: Choose to see the ad for the car that interests you



Multi-angle programming: choose the camera angle on the game; this screen shot is from the interactive service offered in the U.K. by BSKyB.

Deployment of New TV Functions

All of these new products – with the exception of personal advertising - can and are being implemented in digital television services, somewhere in the world. But there are limitations on the growth of these services.

First of all, there are weaknesses in the infrastructure, as noted above:

- A lack of standards for the software to perform these functions,
- Limited power in the set-top boxes, and
- In the case of personal advertising, storage and bandwidth issues – i.e. to provide four commercials at once, the provider needs either four channels on the system, or some way of storing the commercials in a computer available to the viewer, so they can be played "on-demand".

Second, we can't expect rapid deployment of the kind of powerful receiver we've described above, for three reasons:

- The first is cost. This PC/TV is still beyond normal price points, even when one considers what it does.
- The second is complexity. It's close to being user friendly, but it's not there yet.
- And the third is that it's an open platform. By that, I mean that it's a device that receives any analog TV signal and viewers can buy their own software to program it.

Why is being an open platform a limitation on growth? Principally because growth in set-top box deployment is being driven by subsidies from distributors of digital signals, and these distributors have built their business model on proprietary technologies. That is, cable and satellite operators subsidize the cost of the hardware in return for the exclusive right to supply the software.[1]

Cable and Satellite Units

Because of cost, convenience and standards issues, most Canadians are likely to enter the digital universe through set-top boxes marketed by or for a broadcast distributor. The current digital set-top boxes are now in approximately 20% of homes – a growing number. These, as noted earlier, have some computer parts and can perform some new functions, but not many.

Some of them can support interactive TV software like OpenTV; they have fast enough processors and enough memory to do that. Some of them can only support simpler interactive software like Wink. And many can't support any interactive TV – only a program guide and Video-on-demand.

Since 2001, there have been STBs in Canada that can do more. The ExpressVu 5100 has added a hard disk and new software to the processor and memory of the simpler boxes, and is effectively a PVR.

[1] Viewers can't supply their own software for set-tops provided by cable and satellite operators; the program guide, interactive TV software, games, etc. will all come with the service, and the service provider will ultimately control what services viewers can access.

ExpressVu's competitors will likely offer similar products in this calendar year.

Bell ExpressVu has also announced – but not yet distributed – a product they call the "combo box", which has a hard drive for storage and a Sympatico high-speed internet connection. Until they introduce it to the market, we won't know what it will be set up to do – it could support Web browsing on the TV, complex interactive television, and a number of other functions.

Retail Units

PVRs are available for retail purchase over the Internet. For example, TiVo and Replay have both offered these units for several years, but they have had limited use in Canada because they lack Canadian program guides. Nonetheless, the Replay 4000 is worth looking at, because of its high-speed Internet connection.

This device can record as much as 320 hours of TV - from analog sources – and is set up to allow its users to share their programs over the Internet. As a result, its makers have been the target of a lawsuit in the United States, on the grounds that they are encouraging their users to violate the copyrights of the program producers.

It also has the ability to record a program while automatically skipping commercials. It's not hard to see how a device like this could totally disrupt the economic model for television if it became widespread.

Summary

For this description, it's clear that digital television will bring a television environment quite different from what we've grown up with.

We should not conclude that Canadian viewers will spend all their television time interacting with the set. Most of us expect that the dominant activity will remain sitting and watching – the classic "couch potato" is not going away soon.

But remember that young people have grown up with video games and computers and are comfortable interacting with their entertainment. If they see interactive content that is interesting or useful, they will use it.

The overall lesson is that television will no longer be a single, simple experience. It will be many experiences, depending on the power of the receiver that is in each home, and the way the viewers choose to use that power.

In the medium term, we can expect some homes to have all the features, a larger number to at least have digital television, and a shrinking majority to have simply the television of today.

The Impact of Digital Television

So what will this new behaviour mean for the television system?

I can put it in a few themes:

- Difficult industry relationships around "gatekeeping" issues
- Increased fragmentation of markets
- De-patriation of audiences
- Issues around rights and copyright
- With consequent impact on investment in Canadian programming

Gatekeeping

Of these issues, gatekeeping is probably the one that will present the greatest difficulties for the system. "Gatekeeping" means the use of technology by a distributor to prevent competitors from getting full access to its subscribers without its permission. The ability to gatekeep allows the gatekeeper to demand compensation for access, and in the worst case, to impose conditions of unfair competition on competitors.

To be fair, we've used gatekeeping for public policy in this country. Cable monopolies were established in a given area so that regulation could control what services would be available to subscribers. Without such gatekeeping, the broadcasting system would be much less Canadian.

But the new digital gatekeeping is more subtle. "Gates" can exist in several ways.

1. First of all, subscribers are captured, not by the area they live in, but by the use of proprietary technology.

> Viewers can't buy a standard digital receiver, buy a subscription from one distributor, and then decide later on that they want to switch to the other satellite company or to digital cable. All they can get with that receiver is the service they bought it for, so they are captured subscribers, unless they pay for a new receiver.

2. In addition, a digital distributor can use the technology to alter or remove data from programmer's television signals.

> That is, a TV broadcaster provides a signal that contains the usual picture and sound – but also contains data, for example, the button noted earlier that allows a viewer to click and buy a product. This interactive data should normally pass through the set-top to the viewer, whose response can be sent to the Widget company's site on the Internet.
>
> But the distributor can buy tools that recognize that data as it passes through the system and simply strip it out so it never reaches the viewer.

3. And of course, the software in the set-top is provided by the distributor – it's not purchased by the viewer. If that software isn't designed to use the data properly, the viewer never sees it.

4. A proprietary set-top might also be designed so it doesn't access the open Internet. It might be restricted to content in the distributor's own site – what's called a "walled garden" of content. So if the Widget company wants to make any sales, it must rent space from the distributor.

These tools give digital distributors enormous potential control over the choices of their subscribers and over the economic models for broadcasting, unless restricted by regulation. We can therefore expect that the first impact of digital television will be head-to-head conflicts between distributors and broadcasters in the policy arena.

Fragmentation

Fragmentation is already severe because of the number of channels offered to digital subscribers. Now there will be further segmentation of the audience into technical "haves" and "have-nots".

That is,

- some people will have the ability to interact and some will not;
- some will have hard-disk recorders or
- high-definition screens and some will not.

Add to that the fragmentation caused by the proprietary technologies deployed by distributors.

That is, a subscriber on one side of a street, using a set-top box with Wink software in it, can't see and use interactive programs encoded with OpenTV's software – and vice-versa for the subscriber on the other side of the street, whose set-top uses OpenTV. In terms of interactivity, each home is in a different audience segment.

Programming will have to be designed so that it works for all groups.

We can clarify this by extending the analogy about shipping disassembled desks from a furniture factory - and having the receiver re-assemble them at the far end. In this case, it's as if some distributors are only equipped to re-assemble the desks with hammers, some with screwdrivers, and some with hex wrenches. That means the shipper has to provide nails, and screws, and special bolts with each desk, because he doesn't know what tools will be available at the far end.

So what do programmers do? If they want to reach the same audience they did before, they have no choice but to make several different versions of the same program. Currently Canadian distributors have deployed or announced 6 different kinds of software. This multiplies the cost of creating interactive Canadian programs.

Unless a standard is adopted for interactive television, the Canadian market will be further segmented by technology and by distributor. Instead of addressing two markets, one English, one French, programmers will have to meet the needs of many small divisions.

This also has become a policy issue, with U.S. and international groups working on standards for interactivity, and with regulatory processes in both the US and Canada considering how to deal with interactivity.

De-Patriation

Another issue is that some sections of the fragmented audience are simply unavailable to most Canadian broadcasters, because the people in them are using grey or black market US dishes to receive television. Except for what they can get on over-the-air antennas, these viewers are essentially outside the Canadian broadcasting system.

It's impossible to know how many people are engaged in this practice, and it's possible that the number will decline, depending on the outcome of all the legal activity around these questions. But it is also possible that the number is quite substantial right now, as much as 5% of households.

A similar phenomenon exists within Canada as well, with small local stations losing viewers to stations from larger cities offered on satellite – and now on digital cable as well.

Protecting Program Rights

The loss of viewers to US services is also an example of the issues over program rights.

Two sets of rights are being violated – in the case of the black market, viewers are quite simply stealing signals. And even when they pay for the signals, the rights of Canadian broadcasters – who have purchased Canadian exhibition rights for US programs – are also being violated.

Technical solutions to the rights problem are being sought, but are of doubtful effectiveness. Once content, whether music, a film or a book, is in digital form, it's easy to copy it and exchange it. Copy protection schemes don't seem to put the code-breakers more than one step behind the code-makers. The protection for DVD movies was "cracked" some time ago, and certain users are now firmly in the habit of exchanged pirated copies.

Canadian television programs are not the prime targets of the hackers who re-distribute pirated video – but the activity has an impact on the Canadian system, since it is the resale of foreign programming that creates much of the profit that sustains Canadian programming.

It is probably impossible to stop the dedicated hobbyist hacker from breaking the protections placed by rights holders on their product. But when piracy becomes a commercial activity, and when that commercial activity grows to the point that it endangers our cultural industries – as is already the case with music – then it's necessary to consider what remedies can be applied.

The remedies are of two kinds. The first type is education and enforcement. As a society, we have not communicated, particularly to young people, the criminal nature of this activity. Clarification of these laws, combined with stricter enforcement, is a necessary step.

However, this is not a sufficient step in itself.

We must also investigate the business models that will reduce the temptation to steal. Most people in the industry are convinced that the great majority of consumers will buy legally if the model compares reasonably to the illegal activity in terms of convenience, the viewer's expectations of continued use, and reasonable cost for the product that the user wants. Models that restrict personal use, or that force purchase of a bundle of products at high cost, encourage piracy.

Around the world, the media business is struggling to find new models of digital distribution, simply to reduce theft of their product. In Canada, we have the additional consideration that our cultural policy is to some degree built on a kind of gatekeeping that has required Canadians to buy packages of services. As we try to find new models, the additional dimension of sustaining the Canadian services which support Canadian programming must be factored in.

Investing in the Future

As the new features of digital television become more widespread in Canadian homes, we are going to want our own programming to have these attractive features. In fact, it may be necessary for broadcasters to adopt these features to counter the disruptive effects of the technology on existing revenue models, particularly advertising.

What does that mean for Canadian programming? A substantial subsidy program is already in place for some types of programming, and broadcasters subsidize others out of their returns on foreign programs. This stems from the simple fact that the market for distinctive Canadian programs is relatively small.

As we look ahead, then, we can see a need for additional investment in the new features of digital TV; but

- the domestic market is not getting larger - on the contrary it is becoming more and more fragmented,
- there is a threat that revenues will be diverted to new players in the system,
- and protection of program rights is a major issue.

In short, the business model for Canadian programming in the new formats and with the new features is doubtful.

Timing the Transition

How long do we have before the system sustains substantial impact from the disruption caused by these new technologies? There is no simple answer to this question, but here are some notes:

We're not ready yet for rapid adoption of the more advanced features of digital television. In terms of simple digital television, we're already there. People understand the proposition of more channels for more money, and digital television is growing in both satellite and cable.

But we're still in what I would call the "invention phase" for the interactive television products I described. And that's because all the distributors are going their own way – they all have different hardware and software.

Until there is standardization, programmers will find it difficult to make compelling content. And until there is standardization and compelling content, viewers will have little reason to adopt the new technologies, and will be nervous about obsolescence. The only opportunity at the moment seems to be for distributors to develop their own walled gardens of content, and even that is doubtful.

So there is a continuum of issues:

- The impacts of fragmentation, de-patriation and protection of program rights, are upon us already, and are accelerating.

- Gatekeeping has also been an issue for some time, but it is too early in the adoption of interactive technology for this to have had substantial commercial impact in the system as a whole yet. For individual services, the timetable may be faster.
- The disruption anticipated from PVRs is still some distance in the future, but as distributors offer these devices we can expect some impact in the medium term (5 years)

The Digital Transition Outside Canada

As we grapple with the policy implications of the digital transition, we should keep a close eye on the experience of other countries.

So far, experience in places such as the United Kingdom, Spain, Australia, Sweden and the United States shows us that the transition is difficult. Clearly, the disruption – even that of simple digital television – has been greater than the governments involved anticipated. Some of the chosen policy/business models have met with outright failure, and the expectations of governments for an orderly transition have had to be rethought. For example, in some jurisdictions, terrestrial digital television networks were structured as competitors to satellite services – a model that has met with apparent failure. In others, spectrum auctions, established as part of the transition, have had to be postponed.

In addition, the regulatory experience of these countries may hold lessons for Canada. In the European Union, concerns about fair competition – arising from the anticipation of gatekeeping activity and market dominance due to consolidation – have resulted in anticipatory regulation to prevent abuses. We should examine these precedents.

Conclusion: Areas of Potential Government Activity

The key concern is to find new, workable models for the creation and promotion of Canadian programming – in the face of fragmentation, de-patriation, gatekeeping and program piracy. Government will have several roles to play in this effort.

The first key to any successful model is the existence of technical standards. It is preferable for industry bodies to define standards, but it may be necessary for government to intervene, as has been the case with the European Union, to encourage that effort and to ensure that those standards are respected throughout the system: to protect purchasers, to further cultural policy, and to ensure fair competition in the marketplace.

The second component of a policy is regulation to manage the relationship between distributors and broadcasters. A fair and open marketplace for Canadian services is necessary to any strategy in which private sector broadcasters and producers contribute to Canadian programming. Both the CRTC and the Competition Bureau may need to concern themselves with this relationship, since both cultural and competition policies are affected.

Thirdly, program subsidy and promotion policies will need to be re-examined in the light of the investment required and the nature of the revenue opportunities in the market.

And the final component is a better understanding of how to deal with digital copying of content and signals, involving both education/enforcement and the development of new ways of serving the public that will meet viewer expectations in a digital age, while preserving the underpinnings that support Canadian programming.

This process could involve government in many ways – understanding the role of regulation and subsidy in such models, clarifying program rights and enforcing their protection, and contributing to public education on these issues.

That concludes this submission to the Committee. As a final note, I offer my thanks for this opportunity to contribute to the Committee's process.

Yours Sincerely,

David Keeble, Keeble Consulting