

Outlook for home use video terminals

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Abstract

The broadcasting industry is on the brink of a change as significant as the introduction of the VCR: The Internet and the World-Wide Web (www) promise to revolutionize the distribution of information – and perhaps even entertainment.

Businesses involved in broadcasting – particularly the broadcasters themselves – should plan for an upheaval.

Impact of the VCR upon broadcasters

Broadcasting underwent immense changes upon the introduction of the VCR:

- Individual consumers gained control over the times at which they watched programs.
- Consumers became able to record programs for future use.
- The buying, selling, and renting of programs was enabled, including programs other than those offered by broadcasters.

Although consumers have benefited from these aspects of the VCR, broadcasting itself has suffered. One reason is that the base of viewers has been eroded. Another reason is that advertising revenue has traditionally supported program production, but much of the consumers' use of the VCR does not involve advertising. I will argue that the introduction of the Internet to consumers is as significant as the introduction of the VCR.

© 1995-09-12, Charles Poynton. Published in *Proceedings of International Broadcasting Symposium '95, Broadcasting in the Multimedia Age*, Tokyo, Japan, Nov. 1995, p. 285–290. When this paper was presented, the author was affiliated with Sun Microsystems Computer Corp., Mountain View, Calif.

Home computing

During the first ten years of the PC business, predictions of home computing went unfulfilled. PCs failed to be adopted for home computing for three main reasons: high cost, difficulty of use, and lack of content. As I will explain, all three of these barriers have now been removed.

During the first decade of PCs, computers had a cost of perhaps ten times that of a typical piece of consumer electronic equipment. The high cost did not deter the application of PCs in business, but kept PCs out of the hands of consumers. But a home computer is now reasonably inexpensive – perhaps only twice the price of a high-end 27 inch television receiver – and many millions of consumers now own computers.

During the first decade of PCs, software was difficult to install and difficult to use. The introduction of the Macintosh computer in 1984 changed this: although the high cost of the Mac limited its penetration, the innovations of the Mac were copied by other computer hardware and software companies, and as a result, today's computers are reasonably easy for a consumer to use.

So the cost of computers has reached a level low enough for consumer purchase, and software has become sufficiently easy for a consumer to use. But until just two or three years ago home computing still failed to grow for the third and most important reason: lack of content. When a consumer took a new computer out of its shipping box and turned it on, it was entirely empty. The

consumer had to purchase rather expensive application software in order just to write a letter or balance his checkbook, and even that software did not come with any real information, it merely enabled the consumer to originate his own information.

Content for PCs

During the last two or three years, content for home computing has been provided by two new businesses that have seen rapid growth: online services, and CD-ROM publishing.

As I write this, CompuServe (CIS) has approximately three million subscribers; America Online (AOL) has a similar number. Roughly ten million people now have access to an online service of some sort. This is a small but significant fraction of the number of television viewers in America.

Consumers can now purchase CD-ROM products that provide entertainment and information. Several months ago the announcement was made of Encyclopedia Britannica being put up for sale. An argument is made in the business press that the failure of this company to stay healthy was due to competition from the CD-ROM version of the Grolier Encyclopedia. CD-ROM makers talk about "titles." Creators of CD-ROM products have attained the status of entertainers – in some cases almost "stars" – and production budgets now approach those of television shows.

Unit volumes

Last year, the unit volume of PC shipments exceeded the unit volume of television receiver shipments. The average selling price (ASP) of a PC is many times the ASP of a television receiver or a VCR. The computer industry has total revenues well over an order of magnitude larger than the consumer electronics industry. The source of

this revenue is shifting from businesses to individual consumers.

There are roughly one hundred million installed PCs, ten million Macintosh computers, and well over a million workstations. This is a small but appreciable fraction of the number of television receivers in America.

Online services

Online services store tens of thousands of files that have been uploaded by their individual and corporate subscribers. Those files are accessible to their subscribers for downloading.

The online services have generally operated on a monopolistic business model. When you post information to an online service, your information is available only to the limited audience of subscribers to your particular service: If you upload a file to CIS, your file is available only to CIS subscribers and not to subscribers of AOL, other services, or to the Internet community at large.

The advent of easy access to the Internet has forced the online services to abandon this monopolistic model. CIS and AOL have both taken steps to open access to the Internet to their subscriber base, and during the last year both CIS and AOL have acquired companies involved with Internet services and technology. It is likely that the main business of both of these companies will shift in the next few years, from being repositories of information uploaded by individual and corporate subscribers, to being suppliers of communication channels.

The Internet

The word *Internet* refers to the interconnection of computer networks. Over the last decade, Internet technology has interconnected hundreds of thousands of computers

worldwide into a vast electronic library. But until very recently, access to this information has been restricted to workstation-class computers having permanent high-speed network connections. Recent developments in desktop computers and high speed modems now make it easy to access the Internet from an ordinary PC or Macintosh.

At this moment, it is somewhat difficult to obtain and configure software to gain access to the Internet from a PC or Mac. But Internet access is now being built into general purpose operating system software. Several months ago IBM's OS/2 WARP operating system was introduced with *Internet Connection* as a standard feature. Microsoft's Windows 95 system, and Apple's System 7.5, have certain Internet access capabilities.

World-wide Web

The Internet has historically been rather hard to use, but development of the World-Wide Web (www) has suddenly made the Internet easily accessible. The protocols of the web integrate text, graphics, continuous-tone full-color pictures, and links among web pages. Web pages can be visually attractive, and easy and fun to use.

The web offers ease of use, content with depth, and commercial potential.

Although the web *per se* does not offer typographic quality, Adobe's Acrobat technology is being used to distribute typographic-quality documents on the Internet. Acrobat technology is now widely used in professional applications, but is finding its way into consumer use. A consumer with access to an online service or to the Internet can today obtain tax forms of typographic quality, digitally, direct from the United States Internal Revenue Service. Adobe has announced *Acrobat Player* technology that is designed

for incorporation into consumer products. Acrobat technology is expected to be built into the next generation of web browser software, so it will become an even more significant force.

Already, web technology is capable of transmitting information securely. Web technology companies have announced contracts and projects with banks and credit card companies. Digital cash will soon traverse the Internet. When commerce on the Internet becomes widespread, this will attract great interest from advertisers.

Entertainment and information

For the past forty years, the focus of broadcasting has been on the delivery of entertainment, through television receivers, to consumers. Today, despite movie rentals having eroded the broadcasting business somewhat, television still excels at the delivery of entertainment. The delivery of entertainment will not change rapidly with the introduction of computer networks to consumers.

But apart from the nightly news and CNN, broadcasting has little to offer in the provision of *information*. It is this the lack of provision of rich, varied information that makes broadcasting vulnerable to computer networks. During the next ten years, I believe that computer network technology will offer consumers easy access to a vast amount of information. The time that consumers will spend accessing information will be subtracted from the time they now spend being passive viewers of entertainment.

Erosion of advertising

Much of the information on the web today comes directly from companies that have business directly with the consumer. Today, at no charge, without leaving my home, and

without talking to anyone on the telephone, I can obtain information about airline destinations and fares. This information comes directly from the responsible airline company, and is "published" directly by the airline company. The demographics of the customer of an airline company is a good match to the demographics of a home computer user: it is especially effective for an airline to offer services on the Internet. I believe that companies will offer such services as an alternative to advertising: advertising expenditures will be diverted to provision of services like this one.

In addition to companies directly providing their own information on the Internet, there will be a place for independent organizations to gather, organize, and present information. Already, magazine publishers are experimenting with providing services on the Internet. As the Internet becomes capable of transmitting moving pictures, this area is fertile ground for today's broadcasters.

Advertising on the web

In traditional television broadcasting, the linkage between advertiser and the customer has been very indirect. On the web, when a page provides advertising, the advertisement can provide a link to the advertiser's site. By activating the link, the consumer takes an immediate and active role in obtaining information from the advertiser. This sort of involvement on the part of the consumer is much more valuable to the advertiser than the passive consumer of conventional broadcast television.

Access to the Internet

At the moment, access to the Internet by consumers is mainly by dialup connection through Internet service providers (ISPs). Most ISPs today are small, local businesses. But several large corporations now offer worldwide Internet access; among these are

IBM, MCI and Sprint. Within the next five years, I expect local telephone companies to offer Internet access.

The web is characterized by a large amount of data capacity being required from the server to the consumer, and a relatively small data capacity in the reverse channel from the consumer back to the server. There is no concept in today's Internet protocols of communications channels having different capacities in the forward and reverse directions; there is not even a notion of *upstream* and *downstream* directions! The communications channels that are used for broadcasting – terrestrial VHF/UHF, cable television, and DBS – have very high capacity in the direction toward the consumer, and this could potentially be useful.

A marriage of television broadcasting and the web seems most promising in cable television. In cable, a switch or server can be installed that economically serves as few as several thousand consumers. In terrestrial VHF/UHF, or in DBS, a single switch or server must necessarily serve the entire customer base, and the amount of data capacity accorded to each consumer would be too small to be useful.

Outlook for home-use video terminals

I take the title of my paper from the name of this session at IBS'95. In my view, the home-use terminal will evolve during the next decade from being an entirely passive receiver to being an active communication device. I see computers and consumer electronic devices adopting virtually identical components. For video compression, both information technology (IT) and CE equipment will use MPEG, and I think that in many cases they will use exactly the same devices. But the devices will be packaged into different products, and put to different use. I do not foresee a television being built

inside a computer, or a computer built into a television receiver.

We can expect certain use to be made of consumer information in business applications, and in home computing where the display device sits on top of a desk instead of in a console in the living room. We can expect cable modems to access high data-rate information transmitted through cable. Cable modems will be plugged into PCs.

What is a CE manufacturer to do?

In some aspects, computers remain very difficult to use. But speaking generally, the user interface of a modern computer is remarkably simple compared to the underlying complexity of the device. In comparison, the human interface to a typical CE device is remarkably complicated despite the conceptual simplicity of the underlying device.

Consumer electronics manufacturers should learn some lessons from the computer industry concerning how to make CE devices easier to use. The lack of intelligence evident in a typical VCR makes computer-based equipment very attractive to the consumer by comparison. Consumers continue to be amazed that VCRs do not even keep proper track of time – this feature could be implemented using a battery-backed clock. Every time AC power fails in my home, I must command my television and my VCR to scan the spectrum to determine the channels that are available. When I do this, call signs are not determined automatically; if I want call signs to be displayed, I must re-enter them by hand. The situation could be remedied in a receiver or a VCR by using battery-backed channel memories. At the same time, my VCR provides a facility to leave messages on-screen to my family members, but this feature is impossibly difficult to use compared to a pencil, a scrap of paper, and a refrigerator magnet!

If CE devices are to become easier to use, cooperation among companies will be necessary, and standards will have to be created. The VCR Plus system has made it easier for the consumer to record a particular television program, but it would be easier if every broadcaster were to insert digital data into his signal to convey the complete program schedule. A receiver would allow the consumer to view the schedule and choose programs to record. Implementing such a system would require cooperation among broadcasters, studio equipment manufacturers, and CE manufacturers. If the television industry does not take steps like this, I believe that we will soon see computer-based services that provide such services to consumers.

CE manufacturers have not in the past engaged in the systems engineering that is common in the computer industry. Instead, CE manufacturers have generally optimized particular products. When compact disc digital audio (CD-DA) was introduced, even though the data capacity of the disc was over 600 megabytes, no provision was made to set aside a few hundred bytes to store the title of the disc, the name of the artist, the titles of the tracks, or the "liner notes." It was easy to foresee the usefulness of this information, but it is difficult or impossible to add such features after introduction of the products. No provision was made to identify a disc as carrying audio, so when a CD-ROM is inserted into a CD player, its digital data is interpreted as audio and plays back a buzz, instead of simply informing the user through the LCD panel that the disc is a CD-ROM. CE manufacturers should appreciate that the appeal of their products is increased when they pay attention to the development of systems over the course of time, and to the relationship of a product with other products.

What is a broadcaster to do?

Part of the business of today's broadcaster is the packaging of information, and broadcasters are well equipped participate in the information revolution providing they view emerging computer networks as alternate channels to the consumer. But many non-traditional companies are ready to fulfil this function if the broadcasters fail to do so.

Broadcasters today use nonlinear editing in the process of producing all kinds of television programs. In the production of a typical program, much material is "left on the cutting room floor." In a dramatic production this material is of little use. But in an information program, that material represents a valuable resource to viewers interested in exploring the subject in more depth than can be provided in the fixed length of the show in a typical broadcast situation. Broadcasters are beginning to use video servers to originate programs for distribution, and the combination of nonlinear editing in production and video servers for distribution seems natural to provide a complex and interesting mix of information for the consumer to choose from.

Every person has something interesting to say, some interesting stories to tell. Neither broadcasting, nor the online services, nor the Internet have offered an easy way for a consumer to offer his own information for public access. But a user of the web can make a *home page* that contains information that he wants to share. Today there are perhaps 100,000 home pages giving information about people and serving as a new form of expression. These numbers will climb into the millions as the online services accommodate not only access to the web but also origination of information onto the web. I urge broadcasters to pay attention to this phenomenon.

Author's biography

Charles A. Poynton is a Staff Engineer at Sun Microsystems Computer Corporation, where he works to integrate video technology – particularly digital video compression, high definition television (HDTV), and accurate color reproduction – into computer workstations. Prior to joining Sun, he designed and built the digital video equipment used at Johnson Space Center in Houston to convert video from the Space Shuttle into NTSC for recording, processing, and distribution.

Mr. Poynton is a Fellow of the Society of Motion Picture and Television Engineers (SMPTE), and is an active participant in several SMPTE standards committees. In 1994 he was awarded the Society's prestigious David Sarnoff Gold Medal for his work to integrate video and computing technology. At the moment he is on leave of absence from Sun, finishing his new book *A Technical Introduction to Digital Video* to be published by John Wiley & Sons in 1995.