

Research Report No. 1

**From Videotex to the
Internet: Lessons from
Online Services 1981-
1996**

Sandy Kyrish

August 1996

La Trobe University Online Media Program

The primary aim of the La Trobe University Online Media Program is to undertake social and policy research into the development of online media services. The Research Program has three research streams. They are:

Research Stream 1: New Media and Communication Environments.

Organisational, regulatory and technological change is occurring at such a rapid pace that it is difficult to decide on the outcome of change. Service providers are as uncertain as potential users about the viability or usefulness of new services. This stream of research examines the role of the new media in people's lives.

Research Stream 2: Emerging industry structures

The shape of the media, communication, publishing and computing industries is rapidly changing. Most of those changes are being brought about through strategic alliances between discrete elements of multi-functional and often competing organisations, and linkages with smaller start-up companies which have developed innovative products and services. For the first time "carriers" are having to pay attention to "content", software-based services and consumer electronics. These industry changes are occurring as the various industries "internationalise" and as governments remove layers of regulatory control. As a consequence the restructuring of media, communication, publishing and computing industries raise important questions for the industry participants and government policy makers.

Research Stream 3: Organisational innovations in research

New media and communications services have led to the emergence of organisations where management responsibilities are distributed globally. This stream of the program explores the use of online services in a national and international research context.

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About the Author

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Her work combines academic and industry-oriented approaches to telecommunications. Her professional career includes considerable experience in the design and installation of video, audio, and teleconferencing systems. She has drawn on her technical background and customer liaison experiences to provide consulting advice for a variety of telecommunications companies, including AT&T, Bell Communications Research, Hitachi Telecom Ltd., Northern Telecom Inc., and others.

Kyrish is active in research, having authored articles for academic and industry journals and a book chapter on videoconferencing technology. She has an affinity with, and strong interest in Australia; besides her research work for the Online Media Program, she has published in *Media Information Australia* and has presented at the Bureau of Transport and Communications Economics Communications Research Forum.

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Executive Summary

The rapid evolution of the Internet has been matched by a torrent of news and prediction about it, making it difficult to keep the medium in perspective. One way to envisage the Internet, and to speculate on its future development, is to think of it as part of a continuing history of online services rather than as a sudden and singular phenomenon.

This study analyzes predictions and outcomes between 1981 and 1996 for US residential online services, beginning with videotex and ending with Internet and World Wide Web. It looks for lessons in the similarities and differences between past and present expectations for, and iterations of, online services.

In this summary, the term 'online' refers generally to services that are delivered over a narrowband connection. The study distinguishes three intervals of narrowband services, called (1) videotex, (2) online services, and (3) the Internet.

The study first reports on a strong build-up of predictions about videotex in the early and mid-1980s. Videotex enabled customers to use a keypad to call up screens of content from a centralized database, for display on a home viewing screen. It was seen as a natural result of combining the television, the telephone, and computing power (the modern notion of convergence is only a new buzzword, not a new concept). This hybrid technology frequently evoked notions of social and technological 'revolution'. Predictions from this interval were often optimistic and technology-driven, though there was also significant pessimism in the business press.

Predictors presented a characteristic review of possibilities. Typically, these included references to shopping, banking, news, travel reservations, and messaging; they often suggested that videotex would 'change the way' we play, learn and work. Many predictions emanated from vendors offering or trialling such services.

Market researchers projected billions of dollars of revenue from equipment sales and service usage. But by March 1986, three U.S. videotex providers had ceased operation after consumer disinterest led to combined losses of over one hundred million dollars.

The study then reports predictions made about online services in the late 1980s to early 1990s. (At that time, the term 'videotex' largely disappeared as a database subject keyword and was replaced by 'online'.) Following the videotex failures, the boilerplate of many articles was to recast past predictions in a negative light or to recite lost investment dollars. Often the same writers or publications that had promoted videotex now took a skeptical view of the technology.

Although the launch of Prodigy in 1988 led to another round of optimistic predictions, overall the modest performance of online services dampened talk about their social impact in this interval. By 1993, three national online services claimed about three million subscribers, though Prodigy had already suffered cumulative losses of over one billion dollars.

Interestingly, as the luster of online services faded, similar-sounding technology predictions appeared concerning new possibilities for broadband applications. In the early 1990s, discussion of a residential broadband future included expectations for 'revolutionary' household change and enumerated many of the same services predicted for videotex. But by 1993, delayed or failed broadband trials slowed these predictions as well, particularly when the Internet and the newly-created World Wide Web came into prominence.

The study then reports predictions made about the Internet and World Wide Web, from the early 1990s to the present. By 1995, computer users across the world had created more than three million Web pages of information, entertainment, and advertising; there are more than twenty million Web pages today. The business press reacted rapidly to the phenomenon with reporting, analysis, and prediction. More than 1,700 business-press stories were referenced

about the Internet in 1995 alone, compared to a peak of about 120 articles about videotex in 1984.

Strongly optimistic predictions have come from a number of well-known individuals. The unifying theme is that networked computers will provide instant, on-demand access to unlimited information and communications possibilities, fundamentally changing personal habits, and therefore society, for the positive. However there is also significant skepticism, not only about the views of predictors such as Bill Gates, but about the desirability of a fully networked world.

Many of today's business-press predictions for the Internet seem to be a fusion of the two predictive intervals for videotex. Journalists seem unwilling to challenge the technological phenomenon of the Internet yet wish to sound distanced from the hype.

The study offers conclusions from this 'predictive history' of narrowband services. It considers two aspects: lessons from the architectural evolution of online services, and lessons from the predictions.

In this study, the three intervals of narrowband service development were based on historical demarcations, but they also demonstrate a pattern of progressive decentralization of the technology and content components. Videotex was a top-down model of centralized providers furnishing centralized services through a specialized terminal. The design reflected the technology of the time, but it also then emphasized centralized interactive services – ie transaction and information oriented. These services were assumed to be desirable, but consumers were not interested; predictors (and suppliers) confused technological capability with market demand. This suggests parallels to recent broadband trials and their problems, since the model for interactive TV has been identical to that of videotex; namely, centralized providers (ie telephone companies) offering centralized programming services (ie video on demand) through specialized set-top boxes.

In the late 1980s, Prodigy was also a centralized provider offering mostly centralized interactive services. But a key component changed with the use of consumers' own standards-based computers. The change in delivery device – from passive terminal to a multi-purpose machine – changed the assumed model for services, though Prodigy's marketers did not seem to take this fully into account. The PC as terminal now meant that online services such as encyclopedias and games were often more effective when run directly as a software package. More important, consumers followed the pattern of text-based online services such as CompuServe and showed greater interest in communicative services such as electronic mail and bulletin boards – something Prodigy was architecturally and strategically unprepared for.

Today, the Internet is an antithesis of the first model. It features decentralized content that can be created by anyone and accessed on a standardized platform. This is a new model of services, both in architecture and usage. If the original assumption was that householders would *consume* online services in their homes to save time, present indicators are that householders are more interested in using online services to *produce* or peruse content (Web pages, e-mail, newsgroups) as a new, enjoyable way to spend time.

The still-unsolved problem is that while service providers are stumbling over each other to win new residential subscribers, there is no evidence to show that reaching out beyond the core of already-converted computer users will be profitable.

Several lessons can be taken from the predictions themselves. First, although generalized predictions of sweeping social change are magnetic, they rarely seem to come true. From a business perspective, these predictions are difficult to empirically judge; they are also the most difficult to translate into concrete products and services to sell for profit.

And predictions of 'certain' change may encourage technology spending that is more defensive than strategic – an acknowledged fact in videotex spending, though none of the investors yielded benefits from this. This suggests that companies should not invest

significant capital in a large-scale venture that is based on amorphous concerns of being left behind. Companies might set up field trials or joint ventures whereby they can learn, observe, and be prepared to move when real market demand materializes – rather than creating a monster in order to tame it.

Second, general predictions of social change usually rely on an equally general belief in individual change. In other words, transformed societies require transformed individuals. But this vision of continuous self-improvement has not generally been borne out in other uses of media and technology, much less in past videotex and online service offerings and in today's recreational Web-surfing. Perhaps it is time to quit treating consumer disinterest in long-predicted services as a problem in implementation, and to see it as evidence that people may be more interested in doing new things with a new medium.

Indeed, although the architecture of online services is now fully changed from the fifteen-year-old model of videotex, it is almost distressing to note how similar the predictions are for its use. This study argues that 'visionary' thinking about technology is unimaginative when it simply repeats traditionally futuristic views of a changed society, especially since these visions have not been a useful road-map in the past.

Online services have found their success through decentralization – content is now more in the hands of users than providers, and communicative services such as electronic mail and newsgroups are highly popular. Given this evolved architecture and evidence of its power, it is time to move past the 'radio with pictures' thinking inherent in many predictions for the Internet. Then we can develop new and better models to assess future possibilities for residential demand for networked services.

From Videotex to the Internet: Lessons from Online Services 1981- 1996

Introduction

It is hard to cope with the phenomenon of the Internet, much less analyze it. Descriptions range from cosmic to slightly cynical: Nicholas Negroponte of MIT predicts that the impact of the Internet will 'register 10.5 on the Richter scale of social change' (Newsbyte News, 1995), while New York Times journalist Steve Lohr describes the World Wide Web as 'a full-fledged media star, hailed and hyped, part technology and part fashion accessory' (1995: D1).

This study is offered as a means to help make sense of today's snowballing expectations for the Internet, by positioning the Internet and the Web as part of a continuing history of narrowband service development. The study presents fifteen years of predictions about the likely development and impact of US residential narrowband services, beginning with past predictions for videotex and ending with present predictions for rapidly-evolving computer networks. It attempts to learn from both failed and successful visions and to apply those lessons to today's predictions.

A major difficulty in learning from the past is that we already know how it turned out. Normally, this is not seen to be a problem in research, and it is in fact the starting point for many different forms of retrospective analysis about media development. However, there are a number of limitations. One is that by definition, analysis is post hoc; the implications of past actions can only be confirmed through – and because of – the passage of time. A second, related limitation is that knowing about past outcomes makes it extremely difficult not to see those outcomes today as inevitable and therefore knowable. Fischhoff (1975: 297) contributes the term 'creeping determinism' to describe the human tendency to mentally reorganize historical outcomes into a linear and seemingly preordained process.

This study tries to base its analysis on treating past predictions as contextually plausible, based on then-current conditions of technology and society. Some of these predictions came true; some did not. A post hoc analysis that treats past predictions as fair and temporal representations, but looks for clues as to what made some better than others, can be a useful method for sorting among current 'good faith' visions of tomorrow.

Research goals

This study analyzes selected predictions for US narrowband services between 1981 and 1996. The research presents the following levels of analysis:

- a presentation of predictions for US residential narrowband services, from videotex to modern computer networks
- an explanation of how the terminology and architecture of residential narrowband services has evolved over time
- an examination of the technological and social assumptions implicit in past and present predictions, and their effect on the accuracy of predictions

Definitions

Narrowband vs broadband services: As signal transmission and compression technologies improve, the term *narrowband* becomes increasingly imprecise. This study uses the definition of a narrowband signal as one 'limited to that which can be contained within a voice channel of nominal 4-kHz bandwidth' (Newton's Telecom Dictionary, 1995: 684) – eg carried

over a dial-up telephone line. Given the miniscule penetration of residential ISDN circuits in the US in the past or present, 'dial-up telephone line' implies a standard analog circuit.

For analysis of narrowband predictions, *narrowband services* are by extension defined as content delivered or proposed to be delivered over standard analog dial-up telephone lines, with interactivity between the host and the user.

In contrast, the term *broadband* has in the past referred to any communications channel with more transmission capacity than a telephone line, though this definition can be expected to also become increasingly hazy with the advent of ADSL and other technologies that suggest delivery of at least 1.5 Mbps over standard telephone circuits.

Conjecture, prediction, and forecasting: It is important to distinguish between rigorous and non-rigorous assessments of the future (though rigor does not automatically lead to greater accuracy). Godet (1983) provides a useful way to classify statements about the future. In his terminology, 'forecasting' is a quantitative, deterministic assessment that is normally made with a degree of confidence. This presumably more analytical attempt to foresee the future can be contrasted with 'conjecture', which is defined as a probable hypothesis about the future, 'projection', which is an extension of the future based on past trends, and 'prediction', which is an oracular statement of fact before the event.

Most of the prognostications presented in this study were not the result of rigorous assessment but would likely be defined in Godet's matrix as conjecture, projection, and prediction. However, it should be noted that in public discourse, the distinction between 'forecasting' and 'prediction' breaks down almost completely. Some public pronouncements that would be defined in Godet's terms as predictions or conjectures are called forecasts.

Methodology and limitations of the study

To focus and limit the inquiry, predictions and forecasts were drawn primarily from the trade and business press, which provides both informative and speculative coverage of potential technology deployment, and from academic and business books.

The primary database retrieval tools were the ABI-Inform Business Periodicals database for magazine and journal articles, the online catalog of the library of Temple University in Philadelphia, Pennsylvania, and the Electric Library search service available through the World Wide Web. From the hundreds of citations that resulted from using particular search terms such as 'videotex', articles were selected that specifically included predictions or forecasts for future residential narrowband services. This process yielded dozens of predictions or predictive comments from individuals and institutions.

This study covers a broad base of public documents and spans a relatively long time frame. The quotations included here are not offered as a systematic content analysis, and the history included here is not a complete recapitulation of the narrowband services industry.

The rise and fall of 'videotex': Early and mid-1980s: Viewdata/videotex

Practical visions of retrieving information through a television screen are at least thirty years old. Case (1994) cites a 1964 prediction by MIT's Martin Greenberger that foresaw the use of a home terminal for financial transactions. He also notes that in 1966, Douglas Parkhill described the idea of shopping and information services available in the home.

In the early 1980s, two technologies were discussed: the provision of one-way services through the television set, commonly referred to as *teletext*, and provision of two-way services using a combination of the television and telephone. Teletext, which is not discussed in this study, can be transmitted to a television set within the normal broadcast signal. Teletext information is decoded as a series of video "pages" which continuously sequence from beginning to end. Teletext is one-way information only; persons can "grab" pages and read them, but they cannot interact with them. A videotex system, conversely, allowed a person to interact with a distant computer to access specific information.

Researchers John Tydeman et al (1982a) noted the extensive naming confusion that prevailed during this time for description of the second method, as different observers called it viewdata, videotex, videotext, interactive videotex, or any of the brand names of systems then in operation, such as Viewtron, Ceefax, and Oracle. Ultimately, the term selected by the CCITT, *videotex*, was commonly used to describe an interactive information system where a customer would use a hand-held keypad and television display screen to elicit screens of content from a centralized database, which would be transmitted into a home or office via telephone lines or two-way cable. Most early videotex systems used a numeric or alpha-numeric keypad to allow users to interact with the videotex system. The videotex system used a menu tree to allow users to select increasingly detailed levels of information.

In the early 1980s, the assumed model for videotex as a service offering was that a centralized videotex operator (ie Knight-Ridder, Inc.) would offer centralized content provided by different information and service providers (ie Citibank, The New York Stock Exchange). The display device was assumed initially to be the home television set; some regional trials tested specialized videotex terminals.

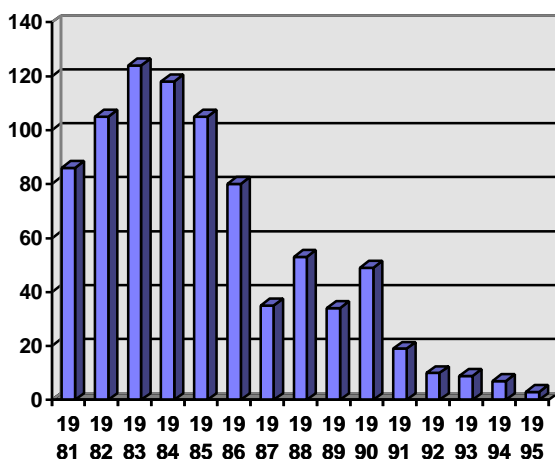
During this period, three major videotex service trials were launched which either used TV sets or specialized terminals. Knight-Ridder, the newspaper publisher, offered the Viewtron service in Florida beginning in 1983. In 1984, Times-Mirror Video Services, a division of the Times-Mirror publishing company, offered the Gateway videotex service in Southern California. Keycom, a joint venture between Centel, Honeywell, and Field, was launched in 1985 in Chicago, Illinois. The outcomes of these projects will be reported at the end of this section.

Predicted developments and rationales

In the 1970s, the British Post Office initiated development of its broadcast CEEFAX service – a teletext offering – and the French government tested its Antiope teletext service, which would evolve into the Minitel service. There was no significant activity on teletext or videotex in the United States until 1980, when, as Case (1994: 488) describes, ‘videotex fever finally took hold.’

Predictions and talk about videotex in the early 1980s represent a particularly circumscribed interval of expectation about a future communications technology. An informal yet revealing measure of the buildup and decline of videotex predictions can be seen in the number of articles and books indexed in various databases. Paisley (1993), in searching the ERIC social science database, notes that there were no articles on the subject between 1970 and 1974, five between 1975 and 1979, one hundred and forty-four between 1980 and 1984, eighty-three between 1985 and 1989, and twelve by 1990-1992.

In this study, the researcher found that the number of books printed on the subject of ‘viewdata’ or ‘videotex’ peaked between 1981 and 1984. The researcher’s keyword searches of the ABI-Inform business periodicals database followed a similar patterns, with results of the search “subject: videotex” shown below:



This informal measure demonstrates the attention paid to videotex in the US in the early 1980s. However, it is crucial to note that the term 'videotex' itself began to metamorphose around the mid-1980s. Many articles with the subject code 'videotex' in the 1990s refer to the French Minitel system and not to any US products or services. This subject will be discussed later in the study.

A strong technical rationale underlaid much of the expectation for the rise of videotex. Perhaps the first realization from videotex predictions is that the modern notion of 'convergence' is only a new buzzword, not a new concept. Many articles and books about videotex positioned the technology as the natural result of combining the television, the telephone, and computing power – an equation that would necessarily produce a new and powerful alloy (eg Chorafas 1981; Skarnulis 1982; Tydeman 1982b; Sigel 1983a). As James Martin wrote in Viewdata and the Information Society:

Most homes in industrial countries have a television set. Most have a telephone. If we connect the television set to the telephone we can create an on-line information service...the wedding of television to computerized services looks as though it could be the marriage of the century. It may have some precocious offspring (Martin 1982: 3).

The creation of this hybrid technology frequently evoked notions of a 'revolution' (cf Business Week 29 June 1981; Murray 1982; Tydeman 1982b). As Ledingham (1984: 31) and Case (1994: 485) have previously suggested, the development of videotex itself was probably spurred by the then-emerging notion of a social revolution stemming from an information society.

Certainly many of the predictors tied videotex into this phenomenon. Americans' increased willingness to adapt to and use electronic technologies was an often-suggested reason for the potential success of videotex (cf Waites 1982; Tydeman 1982b; Fisher 1982) – consumers were 'becoming more receptive to such space-age systems' (Business Week, 29 June 1981: 74).

Efrem Sigel, an editor at Knowledge Industry Publications who later formed a consulting company, published a book entitled 'Videotext: The Coming Revolution in Home/Office Information Retrieval', which tied the emergence of videotex to the 'electronic revolution' (1980: 5). Academics Godfrey and Chang positioned Canada's Telidon system as a 'social phenomenon' stemming from 'the telematics revolution...which is changing the way we play, learn and work' (1981: 1).

This review of predictions suggests two distinct themes. First, the most optimistic predictions for this interval were quite generalized, often presenting a characteristic 'boilerplate' review of possibilities in a single paragraph. Second, these 'boilerplate' predictions usually focused on the goal of enabling individuals to practically never leave their homes. For example, a

1981 Business Week article, 'Window on the World: The Home Information Revolution', offers a typical 'change the way we work and play' assessment early in the story:

This 'electronic cottage' technology will fundamentally change the way people shop, bank, work, and communicate, since it will permit them to do all of these things without leaving their living rooms. They will be able to call up on their video screens the news on any selected topic, as well as a wide variety of continuously updated information on such subjects as airline schedules, and stock and commodity prices (Business Week 29 June 1981: 74).

In 1982, writer and consultant Leanna Skarnulis observed in The Futurist:

Viewdata affords the great range of services we associate with the electronic cottage – electronic mail, banking, travel reservations, information retrieval, networking, marketing, bartering, and...electronic publishing (Skarnulis 1982: 42).

A 1983 Fortune magazine feature, 'Coming Fast: Services Through the TV Set', began with this opening paragraph:

At long last, after years of study and product testing, the business of providing computerized services in the home is finally bursting to life in the U.S. Publishers, banks, and retailers are about to begin selling services that enable people to make purchases, check bank balances, even buy and sell stocks – all without leaving home or talking to a human (Mayer 1983: 50).

A lengthy 1984 article in Marketing & Media Decisions, 'Videotex: Now, Later, or Never?' presented both optimistic and pessimistic assessments of the industry to date, yet actual services were compressed into this description:

The interactive, or two-way, nature of videotext makes possible a wide range of services, including shopping, banking, electronic messaging [electronic mail] and airline reservation booking (Reitman 1984: 56).

A 1985 article by journalism professors Lowenstein and Aller (who called videotex 'the quintessential medium of the twenty-first century' [1985: 22]) also included a somewhat somber assessment of slow growth to date, yet included a familiar recitation of possibilities:

What will the videotex era be like? Just imagine the advantages of having immediate access to books, magazines, major newspapers, and reference works from any library or publishing house in the world. Children will be able to retrieve a few pages from a continually updated encyclopedia, with their parents paying royalty costs only on those pages selected...Videotex subscribers will also be able to buy stocks, send messages home, make plane reservations, and receive simple medical diagnoses... What's more, they could do this – as well as perform tasks such as banking, booking hotels, and perusing a new novel – just as easily at 2 a.m. as in the early afternoon (Lowenstein and Aller 1985: 28, 22).

But although predictions from this interval appear to be naïvely optimistic, a review of the primary sources reveals that at least in the business press, there was also a significant amount of uncertainty and pessimism about the potential for videotex. The perception of optimism may have been accentuated by catchy story leads, punchy journalistic phrases such as 'hot new market', and continued references to the revolution. For example, 'Videotex: Now, Later, or Never?' presents numerous skeptical assessments of the 1984 videotex industry, but the story begins by quoting an advertising director in charge of videotex:

'Videotex involves the most massive social change since Gutenberg and the transition from illuminated manuscript to mass print,' declares Martin Nisenholtz, manager of videotex development for Ogilvy and Mather. 'We're talking about a change comparable to the emergence of a new literate class and the inception of the Industrial Revolution.' (Reitman 1984: 56)

Yet the same articles that employed dramatic leads often offered previews of the unsuccessful attempts to market videotex. The review of predictions suggests that in this interval, few predictors seemed willing to strongly challenge the expectation that a technology as promising as videotex might not find a market in the US. Pessimistic observations were therefore usually presented in second place. The 1981 Business Week article, for example, ironically embeds this ultimately prophetic sentence in a description of the reasons why videotex was expected to become a 'giant home information industry':

A stumbling block in developing videotex has been the inability of information providers to identify the services for which users would pay (Business Week 29 June 1981: 74).

Consultant Efrem Sigel reversed his initial optimism and began offering relatively sober predictions for residential videotex in 1983. He predicted that while business videotex could enjoy a strong market, the rationale for and cost of information purchase was different than that for the home:

(Business) information is either bought directly by the business or by an individual who can deduct it as a business expense. In contrast, the consumer market consists of individuals who use information at home and pay for it out of their own pockets. Although the information may be related in some way to the person's occupation, he or she is acquiring it out of personal interest or the desire for self-improvement, not to meet a specific business need....Consumers' need to acquire specific facts...is not by itself enough to support a computer-based videotext service (1983: 209, 211).

Researcher John Ledingham also drew a distinction between business-driven 'information age' changes in the workplace, and consumer preferences at home:

While an impressive percentage of potential consumers seem predisposed to adopt videotex...it is questionable whether that attractiveness is sufficiently strong to break established media habits, overcome fears associated with computers and computer technology, and break down reluctance to actually pay for the service.

The research shows that while society may be increasingly characterized by labor shifts to information-related industries, prediction of universal adoption of (residential) videotex – or even adoption by a mere majority of citizens – must be considered extremely optimistic at this time (1984: 36).

A variety of market research firms, as well as vendors, forecast the potential market for videotex. Many reported forecasts were considerably euphoric. They were often countered in articles by less-optimistic forecasts, but it is worthwhile to note that the higher numbers were almost always presented first.

Consulting firm Strategic Inc., estimated in 1981 that 45 million homes, or more than a third of US households, would use videotex services by 1990 – representing a \$19 billion equipment market and consumer spending of \$16 billion per annum (Business Week 29 June 1981: 76). The Institute for the Future forecast in 1982 that two-way videotex applications would be found in between thirty and forty per cent of US households by the year 2000 (Tydeman 1982b).

Whether because of the reputation of the consulting firm or the positive projections for future markets, the study that appeared to be the closest to conventional wisdom of the time was a

1983 multi-client study performed by Booz, Allen & Hamilton, Inc. Shortly after the study's release, Advertising Age reported that 'the industry has been buzzing with talk of the optimistic results' (Duffy 1983: M18). The Booz-Allen study, referenced across a number of periodicals (cf Business Week 25 April 1983; Mayer 1983; Vilardi 1984), forecast that within a decade, 17 to 30 million household would use interactive videotex services, producing \$30 billion in revenues by the mid-1990s.

However, not all forecasts or projections were quite as optimistic. In 1981, Business Week reported a 'conservative' forecast by AT&T that eight million homes, or 7% of US households, would have videotex terminals by 1990 (Business Week 29 June 1981: 76). In 1983, a Manhattan consulting firm, CSP International, forecast \$4 billion in revenues and a 17% household penetration by 1990. Link Resources was considerably more cautious, projecting only 240,000 users by 1988 (Mayer 1983: 55).

As noted above, predicted services were often presented as a generalized package of possibilities. Typically, these 'bundled' predictions included references to shopping, banking, news, travel reservations, and messaging. Reviewing the collection of predictions, as well as the larger set of articles about videotex drawn from the database search, this study concludes that the services that received any significant 'stand-alone' attention were home banking, home shopping, and news retrieval.

In many cases, these predictions emanated from vendors offering or trialling such services. John Fisher, a senior vice president at BancOne Corporation, strongly advocated electronic banking and videotex services. In 1981, he predicted that 'the consumer will accept them greedily' (Business Week 29 June 1981: 83). In 1982, he predicted the beginning of 'mass implementation' of home banking in 1984-1985, based on acceptance of consumer electronics and the automatic teller machine (1982: 29). In 1984, he foresaw that the 1990s would

...usher in the final development of videobanking technology, preceded in the 1980s by the initial introduction of the technology and development of the standalone home information appliance and the full network (in Myers 1984: 32).

AT&T executive Roy Sutherland predicted in a Futurist article:

In the very near future – perhaps as early as 1984 – people will be able to do all their banking at home. And home banking will mean more than simply being able to pay bills or transfer funds between accounts. It will mean the ability to shop for and pay for goods without leaving your living room; it will mean being able to keep your tax records electronically (and) to keep track of investments (Sutherland 1982: 13).

Several articles also described home shopping (cf Mayer 1983; Urbany and Talarzyk 1983). For example, George Murray, director of media for Ogilvy and Mather, speculated:

Instead of flipping through a thick and glossy book, consumers will call up the product categories they want to study on the screen, compare alternatives, and then even punch in their order, to be billed by the retailer through the cable facility at the end of the month...the catalog books...may survive in altered form...both the cable catalog, and the books, may be supplemented by video discs or tape cassettes...as a combined catalog, promotion, advertisement, and 'how-to' program (Murray 1982: 32).

The rationale for take-up of banking and shopping services, as well as other videotex services, was often based on the perceived time-saving benefits offered by such systems. This was described as 'an important advantage' for many people participating in the Booz-Allen prototype-videotex study (Business Week, 25 April 1983: 108). It was also a marketing cornerstone for Knight-Ridder's Viewtron system, which promised 'quick information (along with) freedom from long lines (and) surly salesclerks...' (Brenner 1983: 1).

The need to save time was often tied to the increased number of women working outside of the home. William Waites, an advertising executive with corporate links to Knight-Ridder's Viewtron system:

Then there is the growth in the number of working women – over 50 percent of American wives. These are many of the same people who are growing comfortable with electronic technology through their exposure to word processing. They have less time to shop in stores and less need for the social experience of store shopping (Waites 1982: 88).

Roy Sutherland, an AT&T executive, explained that the increase in working women would create a 'time-management squeeze' wherein consumers would likely be 'receptive to trading off income for free time':

...home maintenance and management activities will be concentrated into evening hours...Home information systems – and banking at home, specifically – can help consumers better manage their time, money, energy, and information in this changing environment (Sutherland 1982: 13).

Outcomes

By 1986, videotex had been modestly successful in some European countries, but American trials failed to spark mass interest. In March 1986, three U.S. videotex providers ceased operation after combined losses of over one hundred million dollars. At the same time, other intercorporate groups continued with plans to aggressively pursue videotex operations, as described in the next section.

The Viewtron system, sponsored by Knight-Ridder Newspapers, was launched in three South Florida counties in October, 1983. It offered news, current events information, and electronic shopping. Customers were initially required to buy a \$600 videotex terminal and pay \$35 a month for use of the service.

Three thousand people signed up for the first year, but this was not enough to support the system, which had cost \$35 million by December 1984. By 1985, Viewtron was offering the terminal and the services for \$39.95 a month, or for \$12 and communication costs if persons owned their own terminals. But subscribership remained too sporadic to hold advertisers' interest (Moran 1986), and the company finally called it quits in March, 1986. By then, Knight-Ridder had invested \$50 million in the project.

Gateway, a videotex offering from Times-Mirror Video Services, began in 1984 as a nine-month test among 350 homes in Los Angeles and Orange County. The services, similar to Viewtron offerings, were initially offered free of charge. When the time came to pay for them, half of the test group dropped the service. Times-Mirror continued, offering more services and better presentation at low costs (Benoit and Kindel 1984). By 1986, Times-Mirror had also invested \$50 million, but the subscriber base could not support the costs. Gateway ended in March, 1986, ten days before Viewtron. Keycom, a joint venture between Centel, Honeywell, and Field, ended in 1985 after only six months in Chicago. It had cost Keycom \$11 million to develop 100 paying customers.

These failed services had been aimed at so-called 'mass' audiences and did not link in any way with personal computers (though there was some discussion towards the end of the trials about adding videotex capabilities to PCs). Two services that were strictly text-based and directed at knowledgeable PC users, however, were holding their own in the mid-1980s. CompuServe and The Source (operated by Reader's Digest) offered text-only interactive systems featuring news, information and entertainment services. They also allowed users to access and download software programs.

Together, these services had approximately 325,000 subscribers by 1985. The Dow-Jones News Retrieval Service listed 185,000 subscribers by the end of 1985; subscribers were paying \$1.20 per minute to access informational databases. The service reportedly accounted for nearly ten per cent of Dow-Jones' annual revenues at that point (Lowenstein and Aller 1985).

The shift to 'online services': Mid- to late 1980s - the launch of Prodigy

In the mid-1980s, the expensive failures of US videotex services led to pessimism about that particular method of information delivery – yet this was also an interval in which PC-based 'mass market' videotex services were discussed and launched. In this interval, the technological model continued to be that centralized service providers would primarily offer centralized interactive content, but the display device was increasingly seen as the personal computer.

Case's history (1994) of videotex developments suggests no significant market developments in the US between the 1986 closings of Viewtron and Gateway, and the 1988 launch of the Prodigy network. The network was pre-announced in 1984 (during the peak of videotex expectations) as a joint venture of CBS, Inc., IBM and Sears. The joint venture was named Trintex, and the future product was dubbed Prodigy.

The idea behind the network was to take advantage of the growing home computer market by combining the unique strengths of each participant. Sears would provide a large customer base through its retail stores and subsidiaries. CBS, Inc. could provide information and entertainment programming, and IBM could provide hardware, networks, and operating software. CBS withdrew before Prodigy's launch; it had invested \$40 million in its research and development.

As described earlier, one measure of societal captivation with a technology is the amount of written material it generates. In the early 1980s, published mention of the term 'videotex' in the US peaked in 1983, and it steadily declined in the second half of the decade before practically disappearing in the 1990s.

However, the terminology for retrieval of content from distant computers for local display and interaction also changed between the 1980s and early 1990s. In the ABI-Inform business periodicals database, in the early 1980s the subject keyword 'online' referred to time-sharing and corporate data retrieval from industrial mainframe computers. In 1988, the number of citations more than doubled (from 170 the previous year to 353) as the subject keyword 'online' was attached to citations that referred to stories about CompuServe, Prodigy, and similar services. Until the early 1990s, the terms 'videotex' and 'online' were typically both included in these citations, but the term 'videotex' has steadily declined in index usage and now generally refers to the Minitel system or Bell Canada's disbanded Alex system.

Predicted developments and rationale

The predictive climate for videotex clearly changed across the decade. In the early 1980s, videotex was still an amorphous, future technology in the US, characterized by field trials and public discussions of future possibilities but absent any actual product.

When services were launched, videotex moved from a possibility to a market offering whose success or failure could be directly measured. And when the three videotex services (Viewtron, Gateway, and Keycom) failed, the tens of millions of dollars that had previously been referred to as investments abruptly turned into losses. A strong theme of the early 1980s was of how much money was expected to be made in videotex; an equally strong theme of the mid- to late 1980s was of how much money vendors had lost chasing the technology. Predictions of future profit were by necessity speculative, but proof of past losses was visible.

Following Fischhoff's notion of 'creeping determinism', many individuals or business publications that had previously touted the potential of videotex now took cautious positions. Martin Nisenholtz of Ogilvy and Mather, who had described videotex in 1984 as the most massive social change since Gutenberg and had compared it to the inception of the Industrial Revolution, was quoted in 1987 as saying, 'Videotext was born of technology, not of any particular need. The challenge is, and has been, to provide a service that is attractive to consumers. It is as simple as that' (Saporito 1987: 78).

This review of predictions suggests an interesting if perhaps natural rhetorical shift in predictors' assessment of the videotex market. In the early 1980s, when videotex had not yet encountered failure in the US, most stories led off with relatively (or extremely) optimistic outlooks and mentioned potential problems as secondary items. Sigel's later articles are a notable exception. Following the failures, it appeared necessary to take the opposite tactic – to begin with a skeptical review and proceed cautiously with the latest vendor projections. As a result, the 'boilerplate' requirement for many articles now seemed either to recast past predictions in a negative light or to recite lost investment dollars (or both).

A 1985 article entitled 'When, If Ever, is Video Banking Going to Take Off?' opens with these sentences:

Despite a track record that's littered with false hopes, dashed expectations, and broken promises, video banking still has a loyal cadre of proponents. These advocates staunchly stand by their contention that video banking is a product with a bright future in the industry (ABA Banking Journal 1986: 176).

A 1986 Industry Week article began with this rather deterministic view of early videotex:

For years the videotex industry has been pounding square pegs into round holes....media giants...poured millions into videotex experiments that ended up as mere technology traps. Poor products, high prices, few terminals, and little demand doomed most of the ventures from the start (Goldstein 1986: 73).

A Fortune article in 1987, discussing the upcoming Prodigy network, began by suggesting that the IBM-Sears 'gamble on the future...looks more like a bust than a bonanza':

A lot of companies with high hopes and deep pockets have lost money on videotex services over the years, and the few successes have been modest at best. The idea behind videotex is intriguing: Provide consumers with easy electronic ways to get information, buy goods and services, and pay their bills. (But there is) no great demand yet in sight (Saporito 1987: 74).

A 1988 analysis in Telephony magazine, 'Consumer Videotex: The Perilous Path', argued both sides of the videotex situation:

For some, videotex is like a wonderful hot air balloon, finally about to fly free and rise into the clouds. For others, videotex is like an out-of-control train hurtling toward a canyon pass – and the bridge is out....Videotex could generate vast sums of money for those who deploy mass market, on-line information services. And the societal effect of those information age services on the American economy and culture might be as fundamental in the 21st century as the car was to the 20th. Unfortunately, the operative words here are 'could' and 'might' (Booker 1988: 30).

A 1989 assessment entitled 'Poor Performance of Videotex Systems' in the Journal of Systems Management by two academics:

It all seemed so promising a decade ago. The 'information revolution' had arrived and a new technology – videotex – would bring the power of remote computers into the living rooms and offices of millions...videotex customers could call up thousands of pages of news, sports, travel schedules and other colorfully illustrated information, as well as on-line shopping and home banking (Grover and Sabherwal 1989: 31).

New rounds of discussion followed the launch of Prodigy in late 1988. Similar to previous predictions, the panoply of services was again generally presented in a single paragraph, and the services that received more in-depth attention were home banking and home shopping. It should be noted, however, that the presented services of this interval are not 'predictions'

per se but descriptions of available offerings. In this interval, what can be considered as 'predictions' are the speculations as to why Prodigy would succeed where past efforts had failed.

A 1989 Forbes article that interviewed the chairmen of IBM and Sears, for example, included the observation that 'in the elusive videotex business...a lot of people have lost a lot of money' (Chakravarty and McGlenn 1989: 118), yet again compressed the description of services into a few paragraphs:

What exactly is the Prodigy system? It's a network that allows subscribers at home to get information from a number of sources over telephone lines...hundreds of news stories, complete with fetching graphics... Subscribers can also shop at home, and send messages...There's more: access to 500 services, available with a few keystrokes. These range from direct access to American Airlines' Eeasy Sabre airline reservations, to grocery shopping to weather forecasts. From their screens, Prodigy subscribers can shop...They can bank-by-PC...ask questions on fitness or investments...(Chakravarty and McGlenn 1989: 118).

A 1989 Wall Street Journal article, which dubbed Prodigy as one of 56 companies to watch 'for their potential to bring vision and innovation to the marketplace of tomorrow', described the service in this way:

With Prodigy's software and a personal computer, you can shop from electronic catalogs, place orders with discount brokers, make your own travel reservations, bank from home – all through a modem hooking your computer to your telephone (Wall Street Journal 23 June 1989: np).

But because of past history, stories about Prodigy's introduction were often necessarily accompanied by predictive reasons that Prodigy could succeed where others had failed. These reasons primarily centered around four notions (the latter two of which were also offered in the first videotex interval): it was cheap, there were over 500 services to choose from, it would save time for busy consumers, and it was backed by large well-financed corporations (cf Bassett 1989; Burgess 1989). Interestingly, the cost and ease of use rationales were used both to predict Prodigy's success and to defend against its perceived lightweight offerings – sometimes simultaneously.

Even skeptical observers, such as market researchers Truet and Hermann (1989: 27), foresaw Prodigy's more 'natural' interface and flat rate charge as a driver for more frequent and heavier usage by consumers. In its press releases, Prodigy Services Company stressed the time-saving aspect of helping people cut the time spent on routine chores, ease of use, and the flat \$9.95 monthly fee (cf PR Newswire, 2 February 1989). These themes were echoed in news stories about Prodigy; for example, in the Wall Street Journal article cited above:

No time. That's the lament of career-driven baby boomers in the 1980s, and the trend is likely to continue. This new personal computer service wants to help....Sure, there have been other do-it-all services, but this one is cheaper. The software sells for a maximum \$49.95, and there's a monthly charge of just \$9.95 (Wall Street Journal 23 June 1989: np).

Outcomes

An historical review of the period between 1989 and 1993 suggests steady but hardly explosive growth in the narrowband field. By 1993, five years after the launch of Prodigy, there were three national online services marketed to residential PC owners: CompuServe, with approximately 1.5 million subscribers, Prodigy, with approximately one million subscribers, and America Online, with 285,000 subscribers. CompuServe, purchased in 1980 by tax-preparation firm H & R Block, offers services to home users but also strongly

targets business users who are willing to pay premium fees for instant access to information. This strategy developed into a highly profitable niche for the company; by 1993, CompuServe was contributing 20% of Block's total revenues (Schifrin 1993).

America Online (AOL) issued its first public stock offering in 1992. Its then-smaller but growing user base was also profitable in 1993 – primarily by emphasizing electronic mail and chat groups. Prodigy, however, had already suffered cumulative losses of over \$1 billion and was facing a slightly declining user base; its first chief executive was replaced, and 250 of Prodigy's 1,000 employees were fired.

A 1993 analysis in *Forbes* magazine, noting that CompuServe and AOL were prospering as Prodigy lost money, suggested that the previously-praised strategy of offering a basket of services was inherently flawed:

Blame (Prodigy's) mass market approach. It wanted to be big, and the way to be big was to be Everyman's data service. That meant selling computerized information – news and reference materials and brokerage and airline services – to hundreds of thousands of families that weren't already in love with computers...to the tune of \$30 million a year in television ads, money-back guarantees, and freebies for new computer buyers.

(CompuServe and America Online) let Prodigy educate the public about why everybody had to have a modem. Then they moved in to create more targeted audiences (Hutheising 1993: 220).

In this interval, the comparatively modest performance of online services seems to have dampened predictions about their social impact – or, similar to the pre-trial/post-trial intervals for videotex, once the technology was in place, perhaps it was no longer newsworthy to speculate about the possibilities.

Another explanation can be offered, however. Considering historical research conducted for a separate study (summarized in Kyrish 1994), perhaps as the luster of videotex wore off the discourse simply switched to another futuristic residential technology. In the early 1990s, predictions for electronically-delivered services into the home primarily centered around potential broadband, not narrowband, applications. These predictions were driven by new possibilities offered through two-way high-bandwidth transmission via fiber optic cabling, and by the interests of stakeholders in preserving or changing the existing regulatory environment.

The predictive interval for broadband is intriguingly similar to the first videotex interval. It too represented an especially circumscribed period of expectation about a foreseeable technology, both in terms of the amount of written material generated about it and the themes of the discourse. In the early 1990s, discussion of a residential broadband future frequently included expectations for 'revolutionary' change and for households to be essentially transformed by technology (Kyrish 1994).

The Internet phenomenon

Early to mid-1990s: 'discovery' of the Internet

If the predictive discourse was dominated in the early 1990s by broadband possibilities, the emphasis soon afterwards shifted back to narrowband. This change can partially be traced to failed, delayed, or otherwise unspectacular broadband trials that have been launched by telephone companies and cable companies, and to the collapse of several high-profile merger discussions (especially between telephone company Bell Atlantic and cable company Tele-Communications, Inc.). More important, as these trials were sputtering and companies were discovering how expensive and difficult it was to produce interactive television content (Landler 1996), the Internet suddenly came into public prominence after approximately 25 years of existence.

The outlines of the story are often re-told in business articles: the Internet's precursor, ARPANET, was first funded by the US government in 1968 as a means to develop a fail-safe data communications network in case of national emergency. The network was therefore designed to enable packet-switched traffic to be routed through any number or arrangement of computer nodes to reach its destination. Nodes are connected through leased telephone lines, and through agreements between Internet providers, usage is not measured or charged between nodes. As a result, Internet usage appears to be 'free' to users who are connected through flat-rate pricing or through their institutions.

The Internet grew steadily from the original four ARPANET nodes to encompass approximately four million host computers by 1993. By that time, the Internet had already attracted public media attention through the establishment of links to public and commercial networks, which enabled users on those networks to communicate and exchange information with users on the Internet.

However, the two significant events which transformed the Internet occurred in 1992 and 1993. In 1992, Tim Berners-Lee created the basis of the World Wide Web by developing the HyperText Markup Language (HTML), which enabled authors to build graphical documents and link words or pictures in those documents to documents stored on other computers. Almost immediately, thousands of HTML-based documents were created on host computers across the Internet, but there was no easy method for literally 'browsing' among the storehouse. In 1993, the first Web browser program, Mosaic, enabled users to easily search for and display HTML documents. In this interval, the technological model shifted towards decentralized content, with the personal computer as content creation and display device.

Predicted developments and current status

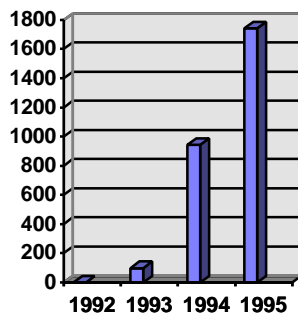
The effect of these developments was dramatic, as described by MIT research associate Michael Schrage in a 1993 Los Angeles Times column:

No one really 'owns' the Internet, and no one really 'manages' it. But over the past year, it has exploded into public consciousness as the multimedia phenomenon that merits serious attention from anyone who wants to understand what the future will look like.

In barely 12 months, the Internet has gone from a technonovelty to a chic media cliché. The Net became a front-page story in every major newspaper in America...cover story for magazines (and) a standing reference on CNN (1993: D1).

Within 18 months of the introduction of HTML, users created more than three million Web pages of information, entertainment, and advertising, characterized as 'glossy digital facades of the Fortune 500 (and the) audacious uselessness...of thousands of ego trips' (Economist 1995: np).

The business press reacted rapidly to the phenomenon with reporting, analysis, and prediction. A keyword search of the ABI-Inform business periodicals database shows that in 1993, there were no articles with the subject 'World Wide Web'; in 1994, presumably when the subject keyword was established, 155 articles were referenced, and in 1995, 756 articles were referenced. (In the peak year for videotex reporting – 1983 – 124 articles were referenced on that subject.) An even more impressive buildup can be seen in the results of the keyword search for the subject 'Internet':



Casting a wider net to all possible publications would probably yield astronomical results; Richard Schaffer's *Computer Letter* counted nearly 40,000 Internet stories during the first three quarters of 1995 (in Gilder, 1995). Systematic content analysis of Internet- and Web-related predictions is not possible in this research.

However, a review of selected primary sources reveals some familiar themes. Strongly optimistic (and world-changing) predictions for the networked future have come from a number of well-known individuals. The unifying theme of these predictors is that networked computers will provide instant, on-demand access to unlimited information and communications possibilities, fundamentally changing personal habits, and therefore society, for the positive.

Microsoft chairman Bill Gates, whose book *The Road Ahead* topped the *New York Times* best-seller list, describes the social changes that he foresees occurring through networked computers:

We are watching something historic happen, and it will affect the world seismically, rocking us the same way the discovery of the scientific method, the invention of printing, and the arrival of the Industrial Age did....

The information highway will transform our culture as dramatically as Gutenberg's press did the Middle Ages....When tomorrow's powerful machines are connected on the highway, people, machines, entertainment, and information services will all be accessible. You will be able to stay in touch with anyone, anywhere, who wants to stay in touch with you; to browse through any of thousands of libraries, day or night....Information that today is difficult to retrieve will be easy to find (1995: 273, 9).

Intel chief executive Andrew Grove also foresees a tight and positive relationship between computers and networks:

No question--the Internet is the best thing that could happen to our industry. Basically, every computer in the world is going to be connected to every other computer in the world, and the PC will be the canvas that creative people make their stuff on (in Kirkpatrick et al 1996: 60).

Author Howard Rheingold, in his book *The Virtual Community*, also believes that computer networks will strongly affect society, though his view is not benignly deterministic:

Because of its potential influence on so many people's beliefs and perceptions, the future of the Net is connected to the future of community, democracy, education, science, and intellectual life--some of the human institutions people hold most dear, whether or not they know or care about the future of computer technology. The future of the Net has become too important to leave to specialists and special interests....We need a clear citizens' vision of the way the Net ought to grow, a firm idea of the kind of media environment we would like to see in the future. If we do not develop

such a vision for ourselves, the future will be shaped for us by large commercial and political powerholders (1993: 6).

Gilder, who is a regular columnist for the business periodical Fortune ASAP, presented this view in 'Life After Television – Updated.' The original text, as with most of Gilder's writings in the early 1980s, revolved around broadband applications; the revised text shifted the emphasis to narrowband networks:

Computer networks are the pivotal technology of the new era...Unlike games and movies, computer networks endow people with new powers of self-improvement and wealth creation...The PC is a supply-side investment in the coming restoration of the home to a central role in the productive dynamics of capitalism, and the transformation of capitalism into a healing force in the present crisis of home and family, culture and community (1994: np).

In a familiar theme of his writings, Gilder foresees that networked computers will cause an absolute, inevitable, and positive change to entrenched structures. He is critical of those who question the societally-renewing force of computer-based networks:

...the Cassandras miss the centrifugal force of the Law of the Microcosm, overthrowing all monopolies, hierarchies, pyramids and power grids of established industrial society and endowing individuals with the power to be transcendent and free...Linking to millions of cultural sources, global networks provide a cornucopia of choices, like a Library of Congress at your fingertips. On the Net, as at a giant bookstore, you always get your first choice rather than a lowest-common-denominator choice. A culture of first choices creates a bias towards excellence and virtue (1995: 132).

Clifford Stoll, in his book Silicon Snake Oil: Second Thoughts on the Information Highway (1995), presents a significantly skeptical view:

I've listened to plenty of spoken and implied promises about computer networks. Each seems reasonable and well-grounded; most are simple extrapolations of the digital revolution that's happening over the Internet. Yet I claim these promises are myths, grounded in dreams of an information Shangri-La that can never be realized. And were it to happen, many of us would prefer to remain behind.

...there's the myth that our computer networks will bring diversity, culture, and novelty into our classrooms and homes...reminds me of the pronouncement, in 1939, of David Sarnoff, the CEO of RCA: 'It is probable that television drama of high caliber and produced by first-rate artists will materially raise the level of dramatic taste of the nation' (1995: 15, 21).

Stoll is particularly critical of the idea that computer networks are a superior social agora:

The popular mythos tells us that networks (are) the place to meet friends and carry on business. There's you'll find entertainment, expertise, and education. In short, it's important to be online.

It ain't necessarily so....For all the promises of virtual communities, it's more important to live life in a real neighborhood...real life and authentic experience mean much more than anything the modem can deliver. The culture of information isn't knowledge. Electronic networks erode important parts of our community (1995: 231-232).

Gates' and Gilder's broad visions have also drawn skepticism. Business Week senior editor Geoff Lewis, for example, summarizes Gates' book as a familiar restatement of predicted benefits:

Much of the book reads like a clip-job of recycled news and opinion: The I-way will bring sweeping changes to how we educate and amuse ourselves. It will replace old ways of doing business...(this is) a very conventional recitation of what is by now very conventional wisdom (1995: 13).

Economist Stephen Roach, in response to one of Gilder's Forbes ASAP columns, more specifically assesses the vision of 'average' consumers being transformed by an array of electronic resources:

Surfing the Net...takes considerable time. And that's the rub: Time-intensive surfing is in direct conflict with the harsh realities of a time-constrained era....The average US worker who has toiled under the burden of stagnant real wages for more than a decade will insist on measurable improvements in personal productivity before squandering ever-greater amounts of leisure and family time on an open-ended journey on the telecosm. However alluring the latest breakthroughs in electronic shopping, banking, and video selection may seem to be, my guess is that they don't meet the hurdle rate for the average American (Roach 1995: 178).

In the business press, there is a clear (and necessary) rhetorical shift in predictions. The first wave of videotex predictions were based on a planned but not existing technology; the second wave followed a round of expensive failed trials. Today's predictions for the Internet and World Wide Web are positioned amidst a technological phenomenon that is actively happening – a recent count estimates that approximately 200,000 Web servers are hosting nearly twenty million Web pages (Business Week 12 February 1996), and as Apple Computer's Larry Tesler writes, 'the browser is to the Internet what the spreadsheet was to the desktop computer' (1995: 166).

In fact, an unsystematic look at many Internet-related articles in the business press shows that there is not as much predicting going on as there is reporting about the phenomenon. But many articles (or articles across different issues of a magazine) appear to be contending with a self-referential problem: the often-mentioned 'explosion' of the Internet requires reporting about it, but continued reporting about the phenomenon in turn sets up journalistic musings about 'techno-fads' and the hoopla surrounding the 'information superhighway' (cf Baig 1994; Verity 1994; Emerson 1995). Many of today's business-press predictions for the Internet seem to be a fusion of the two predictive intervals for videotex: journalists seem unwilling to challenge the technological phenomenon of the Internet yet wish to sound distanced from the hype.

A lengthy 1995 article in The Economist, entitled 'The Accidental Superhighway':

The Net...may not change the world as much as cyber-Utopians would have us believe....But it is here to stay, and it will allow people to exercise one of their most basic desires: to communicate....How important this revolution will eventually turn out to be is as yet impossible to say. A reasonable guess might put it ahead of the telephone and television and behind the printing press and motor car (1995: np).

A 1994 Business Week article entitled, 'The Internet: How It Will Change the Way You Do Business,' speculating on the perceived inevitable development of home shopping via the Web:

...the Internet is still under construction. But with all the innovation, fresh thinking, and commercial zeal concentrated on the Net, it seems clear that this nebulous but vast setup will become one of the busiest business districts the world has ever known (Verity 1994: 88).

A 1995 article in Fortune entitled 'Whose Internet Is It, Anyway?':

...the real sensation of computerdom in 1995 is the Internet...demonstrating vividly what the elusive and overhyped information superhighway really means: that your primary vehicle on it will be your PC rather than your TV, that your computer will soon become as indispensable to your everyday life as your telephone, and that it will transform your leisure time as much as your work....Indeed, the Internet is already so big that it is almost a force of nature (Fortune 1995: 120, 142).

A 1995 Business Week article, 'Planet Internet', is far less cautious however:

...thanks to a powerful new software scheme called the World Wide Web, the Internet is beginning to eclipse – more accurately, to subsume – the PC. The Internet will soon be so ubiquitous, or 'transparent,' as experts say, that we'll take it for granted, as we do electrical power or the phone system today....As the Internet evolves, it's likely to take over your telephone, your fax machine, and maybe even your TV and stereo, too (Verity 1995: 118, 122).

Conversely, a 1996 Wall Street Journal article suggests that the current visions are unusually familiar:

Just three short years ago, the future seemed clear. Consumers would cruise down the information highway in their easy chairs, their eyes glued to the TV set and fingers fixed on the remote control, calling up video shopping, vast sitcom libraries and every movie ever made....A new dream has taken hold, as entertainment and media companies -- from giant studios to tiny software game creators -- have switched to a new mantra: the World Wide Web....Web magazines, Web shopping, Web sports betting, Web chatting -- the list is endless. Never mind that many of these touted offerings are starting to sound suspiciously like warmed-over pitches for interactive TV, which became the victim of runaway costs, immature technology and executive hubris.

...their new religion has a few disturbing similarities with the old order. For one, the Web is generating more hype than interactive TV ever did. And the Web, as a computer-based service, has a smaller potential audience from the outset. Only about a third of U.S. homes have personal computers, compared with nearly 100% that have televisions. It's questionable whether the Web ever will become a truly mass medium...nor has anyone yet found the killer "app" that will turn the Web into a real business (Ziegler 1996: R6)

New York Times technology columnist Denise Caruso also is skeptical of accelerating talk about the Web:

...stop letting visionaries set your agenda. Technology can be addictive, especially when it's attached to vast sums of investment money with the promise of exponential returns. But Wall Street's naïveté about what technology can deliver [and the mass media's parroting of this so-called expertise] have consistently fed nasty boom-and-bust cycles that make only a few people very rich, very quickly...look beyond the big money and hype to focus on the hard work it takes to build a real industry from the promises of vision (Caruso 1996: 47)

Analysis and observations

What conclusions can be drawn from this 'predictive history' of narrowband services? A purpose of this study is to learn from both successful and failed predictions, to understand the differences between more and less accurate visions of the future. One way to do this is to examine the core assumptions implicit in particular predictions, and to analyze how these assumptions influenced predictors' expectations. This study considers two aspects: assumptions about the technological environment for narrowband services, and assumptions about the social environment.

The relationship of technology to narrowband service development

In this study, the history of narrowband service development has been characterized in three intervals, summarized as: (1) videotex, (2) online services, and (3) the Internet. This demarcation was based on historical events. But it is also possible to demonstrate that the intervals follow a pattern of progressive decentralization of the technology and content components, as shown in the table below.

Interval	Primary nature of content	Primary retrieval device
Viewdata/videotex	Centralized interactive	Passive (TV or terminal)
Online services	Centralized interactive and communicative	Intelligent, standards-based computer
The Internet	Decentralized interactive and communicative	Intelligent, standards-based computer

In each interval, the available technology platform necessarily determines the type of services that providers offer, but it also seems to affect and perhaps constrain most predictors' views of potential services. This is not an indictment of predictors; it is important to remember that past 'good faith' predictions were usually based on what was considered plausible at the time. However, examining the technological structure and assumptions of the first two narrowband intervals may offer some insight into why those rounds of service offerings did not catch on.

In the early and mid-1980s, the initial model of mass-market videotex – both in prediction and in business practice – was based on a top-down model of centralized service providers furnishing a centralized set of services, often through a specialized terminal. Videotex was a custom package that one was expected to buy from a brand-name provider, described sometimes as similar in price and concept to one's cable television service.

This structure reflected the technology of the time. Computing was a mostly centralized and expensive technology, centered around mainframe applications and requiring some amount of technical competence to use. Graphics and transmission capabilities were constrained, and the personal computer was only beginning to make its way into households. Mass-market videotex services were therefore engineered for a non-computer-literate audience.

As a result of the architectural design, the predicted and tested services of that interval were assumed to be centralized interactive services (though some electronic mail services were predicted). Most predictions were based on the assumption that customers would rapidly adopt videotex for transactional services, ie home banking and shopping, and for centrally-distributed entertainment and information, ie games and news retrieval. Service providers expected to earn revenue from two sources – from advertisers' fees, and from residential consumers' willingness to pay each month to purchase a fixed package of electronic services.

And to pay a lot each month – the original pricing for Viewtron, for example, included purchasing a specialized terminal for \$600 (by comparison, a good videocassette recorder at that time cost about \$450), paying a monthly subscription fee of \$12, and paying \$1 per hour for the telephone hook-up (Sigel 1984). This model did not work (despite increasing rounds of price cuts) and cost videotex providers over \$100 million in 1980s dollars.

Although the architecture of videotex may now seem simplistic, when one reads the primary sources from that time it is clear that the technology appeared as fascinating and cutting-edge as today's technologies appear to us. Yet the predictions of this interval seem to have therefore been dominated by a familiar, if often misleading assumption: that technological capability equaled consumer demand.

This is an ever-recurring problem in technology development, but it is difficult to identify it while it is happening. With videotex, the assumptive pattern seems to have gone like this: it was possible to build the information-retrieval architecture described as videotex, so it would be built. The architecture could support certain obvious and normatively desirable applications, such as news retrieval and transaction processing, that would complement certain social trends such as increased time pressures and increased familiarity with technology. That sounded good. But although the emphasis then appeared to be on the applications, inevitably the applications were still driven by, and therefore secondary to, the architectural possibility of videotex.

Seen that way, the talk about consumer applications would obscure the fact that at the base, videotex was technology-driven and not market-driven. It is then possible to suggest that while the applications may have appeared to be the market-based drivers for the architecture, they were actually invented to follow the architecture.

This interval appears to carry more lessons for recent broadband experiences than for the current Internet predictions. It is interesting to note that although the narrowband model has evolved completely away from centralized content and specialized terminals, the model for interactive TV during the height of its predictive phase was identical to that of videotex; namely, centralized providers (ie RBOCs) offering centralized programming services (ie video on demand) through specialized set-top boxes. And it is possible to argue that the whole concept of the broadband superhighway is driven more by architectural possibility than by application potential.

In the mid- to late 1980s, the second round of narrowband service offerings was also based on centralized service providers offering centralized interactive services, though there was also now capability for electronic mail and bulletin boards. The delivery device was now the consumer's own computer using custom display software. Services were offered as unique brand-name packages, though now, in the case of Prodigy, with an emphasis on 'over 500 services to choose from' and a flat fee of \$9.95 per month (later raised to \$14.95).

This iteration also reflected contemporary technology trends and capabilities. Limitations on modem speeds (9600 baud access was rare) and on computer processing power constrained the graphics and interactivity. Marketers' assumptions about the technical competence of Prodigy's audience led to an interface that was also aimed at a non-expert audience.

Prodigy was first engineered to emphasize centralized interactive services, with revenue coming from user fees and from advertisers. The company had designed the network along what was by then a 'traditionally futuristic' model of videotex; ie it stored packaged services and information on centralized mainframes, in expectation that users would do significantly more downloading than uploading.

When residential users soon showed a clear preference for and interest in electronic mail and bulletin board services, this strained the architectural design. Oddly, though Prodigy was presented with clear evidence of real demand for communicative services, the company balked at reconfiguring the network and initially responded by surcharging users for sending more than 30 e-mail messages per month. (This was a public relations debacle which was effectively exploited by America Online.) The company was architecturally and strategically unprepared for the fact that what users really wanted to do was communicate with each other – ie literally create completely decentralized and non-custom content.

Prodigy's miscalculation seems to have come from an assumption that also limited other predictors. The first iteration of Prodigy, and predictions about it, continued to assume the desirability of a top-down model of electronic services – even though a central component of the model had changed with the use of consumers' own computers. It seems unusual in retrospect that there was not more willingness to consider that the change in delivery device – from an essentially passive terminal to an intelligent machine used for more things than Prodigy – might change the assumed model for services. Even if the company might not

have foreseen the demand for communicative services per se (despite that fact that other text-based services already had thriving electronic mail traffic), it is inexplicable that the company would resist following the evolution of demand.

Certainly one effect of the PC as terminal is that certain services that might have previously been uniquely attractive to offer online, such as encyclopedias, are also available in home software packages. The market analysis conducted by Booz-Allen in 1983 discovered that the most popular videotex test package included personal calendars, games, and education, which are all available in a variety of software packages today. And many of those applications, such as games and calendars, are more effective when run directly from a home computer than through a still-limited and dial-up transmission link.

The current round of narrowband service delivery is an antithesis of the first model. It is characterized by increasingly decentralized content that can be accessed on a standardized platform. The bulk of the content is out there on the World Wide Web, stored in more than 200,000 computers; individuals can access (and add to) this content by either connecting directly to the Internet or by going through a national brand-name service provider such as America Online. Although these providers still offer content that is unique to their services, they increasingly function as user-friendly gateways to the Web.

Precisely because no one 'owns' the Web, it is not simply a super-huge Prodigy service. That may be a prime reason for its success in the home market. Prodigy's initial centralized-interactive approach relied on offering 'over 500 services' in order to cater to a wide range of interests, but the net requirement was still that Prodigy Services Company had to create or contract for all 500 offerings. And customers had to continue to find value in the particular collection that Prodigy amassed. Conversely, the World Wide Web does not stand or fall on any particular package of services, and content is created without any central organizing intent.

This complete lack of centrality, much less organizing intent, has finally made narrowband services successful, at least in terms of consumer interest. However, it has led to a completely new model for services. On a residential basis, content is literally being generated by end users, both in the form of Web pages and in use of communicative services such as electronic mail and newsgroups. And it is surmised that most of the content consumption (ie Web-surfing) that is done from home is largely for recreational purposes. If the initial narrowband-services assumption was that householders would *consume* services in their homes to save time, the present indicators are that householders are more interested in using narrowband services to *produce* or at least peruse content as a new, enjoyable way to spend time.

The still-unsolved problem for the residential market is that while service providers are stumbling over each other to win new residential subscribers, there is no evidence to suggest that reaching out beyond the core of already-converted computer users will prove profitable in the short term. Prodigy is only now marginally profitable after years of well-publicized losses. America Online is adding subscribers at a rate of 300,000 per month, but it is suffering a turnover rate of nearly one-third and has yet to turn a profit (Business Week, 27 November 1995). The number of residential computer users interested in online access will continue to expand (particularly as college students graduate and lose their free Internet access), but there is not yet exponential growth in the residential market.

Lessons from the predictions

New rounds of communications technology often evoke the same patterns of expectation. Paisley (1993: 222) writes that 'although their features differ', the advantages claimed for new communications technologies today are highly similar to those of ten, twenty, and thirty years ago – and that these same heralded technologies often disappear or settle into smaller niche roles. Anderson (1995: 166) succinctly describes a 'sine curve of hype, backlash, then reality.' It is possible to suggest that in the US, there have been repeated waves of futuristic prediction for residential telecommunications services based on the technology most recently in ascent, including cable television, videotex, residential broadband, and now the World Wide Web.

It's useful to note that past predictions follow highly similar patterns. But without further analysis, this finding does not contribute much more than retrospectively graphing waves over time, waves that historically suggest that we are doomed to eventually plot today's ambitious prophecies along the same course of 'didn't quite happen.'

Doubts about today's possibilities will be countered by some with the response that these are especially technological times, infinitely more sophisticated than those of the past. But technological pinnacles have regularly been reached in past generations – and that we cannot measure whether the advancements of our generation are any more meaningful or revolutionary than those of previous times (Jewkes et al 1969).

The idea that we are at a new height of sophistication is not under dispute. A compelling point in Bill Gates' book (1995: 32) is his analogy about the doubling of microprocessor power every eighteen months. Gates tells the story of a king's minister who, when offered any reward, requested the doubling of a grain of wheat for each succeeding square on a chessboard. This seemingly modest request adds up to over 65,000 grains of wheat by the end of the second row, and nearly seventeen million grains by the end of the third row alone.

This demonstration of exponential doubling highlights the difficulty of comprehending how incredibly powerful computers will soon be in their ability to process and display visual and aural information and entertainment. It also makes it difficult to maintain a position of skepticism about future possibilities, particularly given the corresponding advances in transmission capabilities.

But it is the resulting standoff – historical outcomes versus clear evidence of dramatic technological advance – that requires new (or perhaps simply more disciplined) ways of thinking and analysis. Past near-utopian predictions about previous technological apices have generally not come true. However, radical improvements in processing power and transmission capacity do suggest that the world of ten or fifteen years from now will be technologically a much different place. How do we balance historical evidence with the indication that over the next decade, computers and networks will be vastly more powerful than today?

To make inroads on that question, it is important to return to the assumptions laid out at the beginning of this study – that one must view past predictions in the context of their times, not in the luxury of historically-informed retrospection. Past predictions of social change were also based on then-contemporary contemplation of the advancing state of the art – of trying to guess what technology and society would look like in a few years' time, and of trying to cash in on revenue opportunities or avoid being blindsided by technological change.

Past predictions were set in a then-unprovable future, just as today's predictions are set in a future that has not yet arrived. The difference is that the passage of time enables us to assess past projections, but we have no way of confirming current prophecies right now. However, the same conditions for prediction exist today that existed five, ten, and fifteen years ago – vendors sometimes present optimistic and overhyped views of their products and services, journalists sometimes attach onto blue-sky scenarios to enliven their copy, and skeptics sometimes offer sober pessimisms that may be factually or ideologically grounded.

Given that we are probably not a great deal smarter in our ability to foresee the future than we were fifteen years ago, what lessons do past predictions suggest? From an analysis of past failed and successful predictions, this study offers these conclusions.

First, generalized predictions of sweeping social change are magnetic, but they not reliable guides. As a society, we appear to continuously repeat the predictions that (1) are the hardest to empirically evaluate, and that (2) rarely seem to come true.

Not surprisingly, predictions of major transformation accompany the introduction of a technology, or a significant change in its usage. It is the uncertainty of the next interval that appears to inspire the more grandiose discussions of potential, as indirectly noted by journalist Judith Reitman in 1984:

...fervency is not atypical when the subject of videotex comes up. Few people seem to simply muse about the emerging medium, despite the fact that its amorphous nature defies definition of what videotex really is (1984: 56).

Generalized predictions are not only difficult to empirically judge; they are the most difficult to translate into concrete products and services to sell for profit. It is only possible to analyze and comment on individual services offered in the short term, and to suggest particular problems and opportunities. One can identify specific issues that would affect the take-up or profitability of home banking or home shopping. This helps to explain why otherwise optimistic articles would sometimes contain indicators of future failure (ie many home banking articles noted that consumers would probably balk at paying monthly fees to use the service, which they did).

A 1995 Datamation article, for example, speculates on the problems of actually using the Web for mass commerce:

...it's still not known how much it will cost to actually do *real* business on the Web – to have a Web server up and running 24 hours a day, seven days a week taking thousands of hits per minute, not to mention running high-transaction business processes like order entry and customer support. Concepts like international mirror server sites, fault tolerance, hot backup and restore, off-site management, and systems maintenance all come into play for a technology that is, in effect, just taking baby steps right now (Semich 1995: 41).

But it is not possible to factually assess a longer-term, generalized view of a transformed society, making it extremely difficult for businesses to use these predictions to take strategic steps towards the future. Predictions of 'certain' yet amorphous change appear to sometimes encourage technology spending that is knowingly more defensive than strategic. Much of the early videotex spending was based on concern that new technologies would reorganize existing structures and that companies that did not invest would be trampled.

For example, Knight-Ridder, Inc. invested in videotex as a deliberate offensive against the perceived threat of interactive technology. Norman Morrison, then Knight-Ridder's vice-president of research, explained in 1983 that if an interactive technology threatened to siphon away readers and advertising revenue, then Knight-Ridder wanted to control the interactive technology as well (Brenner 1983: 53). And as noted in a 1981 Business Week article:

Even those executives not yet convinced are spending for fear that their companies will not be ready to move when the market takes off. "You've got to go out there and get your nose bloody – get some field experience," declares Ben B. Smylie, general manager of Field Electronic Publishing, the subsidiary that is running the videotex experiment for Chicago's Field Enterprises Inc. Otherwise, he warns, 'you'll be left behind' (Business Week, 29 June 1981: 74).

One repeated notion in the early and mid-1980s was that companies needed to keep pouring money into videotex development, under the conviction that they would need to be 'ready' when the market hit – yet few of the persons or companies quoted are in the narrowband services market today. Defensive spending based on the generalized perception of future promise or threat does not appear to have yielded a competitive advantage for anyone in the narrowband services market.

In fact, a paradox occurred: Early videotex spending was based in part on the perception that since interactive technology was now possible, the resulting services would be popular with consumers and would threaten the profits of traditional media companies. So, these companies created videotex in order not to be caught unprepared by videotex.

Case (1994: 488) cites an unpublished analyst's report which estimated that unrecovered investments in US videotex projects had reached three billion dollars by 1991. Prodigy has now invested well over one billion dollars in its service, yet has only now begun to show a profit and is losing subscribers amidst market growth (Lewis 1996). America Online, which is also not profitable but has invested far less and has been in existence for less time, currently leads Prodigy in subscribership and general name recognition, so it is difficult to say at this point what Prodigy can show for its additional years of research and investment.

The experiences of the videotex trials and of Prodigy's struggles suggest some lessons. Namely, it may not be wise to invest significant capital in a large-scale venture that is based on amorphous concerns of being left behind. Predictions of 'sweeping change' to be wrought by an upcoming technology should be carefully considered. But companies may do better to set up arrangements (field trials, joint ventures) whereby they can learn, observe, and be prepared to move if necessary – rather than creating the monster in order to tame it. But if market demand does show clear evidence of changing, then companies should be prepared to let go of old models and follow the flow.

A second lesson from past predictions follows from the first finding: one reason that generalized predictions of massive change have not occurred is that individual, residential use of technology does not always follow normative expectations. Predictions that are based on conceptual, normative advantages of technology appear most likely to fail. While business adoption of technology may be increasingly linked to the need to improve a corporate bottom line through reduced costs or saved time, there is no indication that we apply rigorous cost-benefit or time-saving analyses to our domestic uses. As Ledingham (1984) observed, technology may force us to adapt our methods in the workplace, but this does not mean that we have to or choose to adapt our methods at home.

Generalized predictions of societal change often rely on a second tier of equally generalized predictions about individual change. In other words, transformed societies require transformed individuals. A repeated theme of narrowband service prediction is that busy consumers will turn to interactive technologies to help save time on routine chores (typically banking and shopping) and to accumulate information. Philosophically, these predictions imply a somewhat utopian version of the individual (or family) striving towards ever-increased efficiency and improvement, a notion that has not generally been borne out in other uses of media and technology.

Pragmatically, the situation is even more complicated. The conceptual advantage of saving time has to be translated into a specific market product or service that must make money for its provider *and* have a clear benefit for the customer. As suggested in BTCE research (1994:62), time-saving through technology may also only be a goal or a possibility for certain segments of the population – particularly if one has to spend money in order to save time.

And though the technology may have compelling advantages, it may still be rejected by certain groups based on demographic or personal factors (predisposition against automatic teller machines is a typical example). In-store shopping is a chore for one person but a pleasant leisure activity for another. Electronic banking is seen as a frightening and unwelcome service for many people who rely on the float or otherwise resist any computerized dealing with their money.

Continued disinterest in mass take-up of these often-invoked services inevitably suggests that we should first question the true nature and variety of residential demand for such services as opposed to seeing the failures only as problems in implementation of the services. In fact, Datamation reported in May 1995 that a market research firm had polled 7,500 households and discovered:

...a majority of American consumers just aren't all that interested in plugging into the lway....The three core info-highway services that are garnering the most developer and investor attention – movies-on-demand, home shopping, and information databases – elicited little more than a yawn from most consumers (1995: 15).

Progressive architectural changes are by definition creating new and unforeseen opportunities. It is argued that visionary thinking about technology is unimaginative when it echoes traditionally futuristic visions of a changed society. This is not only because these predictions seem to repeat themselves regardless of the level of technological accomplishment, but it is also because these visions imply that householders will inevitably adopt prescribed services rather than come up with new uses of their own.

Conclusions and suggestions for future research

This study concludes with a speculation: Did US videotex 'fail', or did it metamorphose into success? The original concept of videotex ultimately refers to retrieving information from computer databases for display on home viewing screens – meaning that today's use of the Internet could still be loosely called videotex, and that the 1982 IFTF forecast of thirty to forty per cent home penetration by the year 2000 was prescient.

And many of the services predicted for videotex are now available in some form on computer networks; consider Leanna Skarnulis' 1982 list of electronic mail, banking, travel reservations, information retrieval, networking, marketing, bartering, and electronic publishing. However, none of these services has completely replaced its non-electronic equivalent in the residential market – none appears yet to be the 'killer application' that will define the future network.

The review of predictions suggests that conventional predictions of dramatic change have not acted as a useful road-map in the past, and that conventional architectural models for narrowband networks are no longer being followed. Given that narrowband services have found success through a fully decentralized model, with content creation now being as much in the hands of users as providers, it seems necessary to come up with equivalent new models to assess the future possibilities for residential demand for networked services.

Visions like Gates' and Gilder's imply universal access to cheap and powerful computers, as well as universal interest in using them to pursue the predicted uses. Yet only about one-third of homes have computers today. Future analyses should take more fully into account the differences between the people likely to enjoy or benefit from using computer networks, and the people who do not now have interest or means to do so. Analyzing more sensitive categories than 'the mass market' should help to predict how content will develop – who will originate it and who will consume it, how much of it will be devoted to ways of spending spare time and how much of it will be devoted to self-improvement or other non-leisure activity. Clearly, generalized and euphoric predictions do not provide enough guidance in identifying short-term opportunities or trends, and overemphasis on technology obscures questions of real market demand.

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