Forecasting the Internet:

A Retrospective Technology Assessment

By

Constance Ledoux Book, Ph.D.

Elon University

With:

Michael Frontani, Ph.D.

Elon University

<u>Elon University Students</u>

Tiffany Avery

Shannon Bonnezi

Allison Dieboldt

Eric Kastendike

Kristen Kerr

Jessica Rivelli

Brian Sentman

Betsy Snavely

Erica Stanley

Elizabeth Sudduth

Maggie Sullivan

Kate Wodyka

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Predictive statements reported in the press, from the deployment of the first consumer-friendly Web browser in 1993 to what can be considered the maturation of the Internet in 1995, were examined using a content-analysis structure established by Ithiel de Sola Pool in his 1983 examination of predictions about the telephone.  Predictive statements, N=244, were cataloged using a spreadsheet, sorted by discipline and author.  An analysis of the predictive statements established the following major themes visionaries anticipated about the social impact of the Internet:

- The Internet Will Transform Society
- The Internet Will Transform Economies
- Content Will Drive the Internet's Success
- The Internet's Security and Privacy Concerns
- The Internet's Growth is Dependent on an Efficient and Reliable Infrastructure
- The Internet Will Spawn a New Generation of Hardware and Software
- The Internet Will Create a Smaller World
- The Internet Will Transform America's Schools
- The Internet Will Impact Professions

The following narrative addresses these themes in an effort to retrospectively understand the early phase of the Internet's deployment and its anticipated impact on society.

INTRODUCTION

Less than a decade ago, a software invention that created a way to catalog a hierarchy of information begat another invention which begat hundreds of inventions. In what felt like implosion, erupted the World Wide Web (WWW), and today a majority of Americans connected to the Internet spend, on average, more than an hour a day online recreationally, educationally, professionally, and shopping (Horrigan & Rainie, 2002).

What did those closest to the technology in its earliest days forecast we would do with the Internet? This is of vital importance, as predictions and forecasts (the words do have subtle but important definitional differences[1]) fostered an agenda among inventors and visionaries. This agenda led and continues to lead to consumer products that determine how we use the Internet and, subsequently, this agenda helps define the social impact of the Internet.

Utilizing Ithiel de Sola Pool's work regarding technology forecasts related to the telephone as a guide, a retrospective technology assessment was conducted in regard to the Internet. The predictive statements examined were made between the deployment of the first consumer-friendly Web browser in 1993 and what can be considered the maturation of the Internet in 1995 – by that time a mature Internet system was in place in the United States. Pool, in his telephone assessment, determined that visionary consideration to the telephone stopped when telephones penetrated a significant number of American homes. He described this phenomenon as "technology maturity." Other scholars have also noted this period in the birth of a new technology; one described it as the "awe" stage (Hamm, 1995). As a communication technology matures, the nature of forecasts and predictions changes from the visionary to the pragmatic.

In 1995, federal funding of the Internet ceased in the United States because it was determined that the Internet could sustain itself through commercial investments (Hudson, 1997). Between 1993 and 1995, the presence of "servers," a required component for the delivery of data over wires, grew from 130 nationwide to 100,000 (Abbate, 2000).

---

[1] The word *forecast* implies that the predictive statement was made with consideration to scientific modeling. A forecast would be rooted in economics with special attention paid to time. The word *prediction* is more loosely defined and does not imply that any science was used to create the prediction, merely vision related to the future. In this analysis, we found both forecasts and predictions were made between 1993 and 1995 about the Internet. See, Armstrong, S. (2001). *Principles of Forecasting*. Kluwer Academic Publisher: Norwell, MA.

THESIS

The study of forecasting and predictions is not an exact science. Pool found in his study of the telephone that some forecasts were "done well and some were done badly" (Pool, 1983, p. 1), and what distinguished those capable of making the better forecasts was somewhat elusive. Pool found that the "best" forecasts and predictions were tied to the ability of the predictor to consider market and technical analyses simultaneously (Pool, 1983). Researchers, in an effort identify the people best suited to making accurate forecasts, recently administered a study of predictive ability to a group of industry experts, academics and high school seniors. To the dismay of those who have dedicated a lifetime to a discipline, high school seniors were found to be as likely to anticipate the success of a technology, as were highly trained (and often highly paid) industry experts and academicians (Armstrong, 2001).

The reality is that high school seniors, while equally able to make forecasts, are not given a platform in which those forecasts are published and thus made available to the general public. The more exposure predictions and forecasts receive, the more likely they are to stimulate those able to bring ideas to fruition. This particular examination of Internet predictions (in step with Pool's work on the telephone) was focused at the point in which predictions and forecasts are made public on the most visible platform with the longest-lasting impression: print media. We considered two influential sources in the United States for this study of Internet forecasts and predictions, *The New York Times* and *Wired* magazine. Both publications played key roles in informing the community about the Internet between 1993 and 1995.

Launched in 1993, *Wired* magazine desired to be to the Internet what *Rolling Stone* was to music. While critics may argue that *Wired* became a voice for the select few or the "digital elite," there is no question that Americans turned to *Wired* as a leading source on the future of the Internet (Rossetto, 1993). Editor Louis Rossetto took a unique editorial approach to *Wired*, blurring the line between reporter and expert. Consistently, Rossetto hired experts to write features on experts and, quite frequently, themselves. *Wired* quickly became an influential platform for anticipating the future of the Internet, with publication in the magazine seen as a coup among Internet stakeholders (Valovic, 2000; Hudson, 1997).

In addition to *Wired* and *The New York Times*, this study examined predictions made in other popular consumer publications such as *Newsweek* and *Time* magazines, as well as other major newspapers. One other influential piece of literature was included in our assessment, Nicholas Negroponte's 1995 book, *Being Digital*. Because of the frequency with which his book was mentioned in consumer and trade press, it was of considerable influence during this period of "dreaming" about the future of the Internet.

Predictive statements, N=244, were cataloged using a spreadsheet sorted by discipline and author. When Pool conducted his similar telephone assessment, he found little market analyses used in forecasts and predictions. Instead, Pool found a majority of the predictions were made in regard to the:

- availability of the technology

- potential use of the technology

- side effects of that use

- interaction of the telephone with other technologies

- telephone's ability to help meet social goals.

<div align="center">(Pool, 1983, p. 2)</div>

Our Internet assessment finds emphases elsewhere. While there were predictions related to the timetable of how many Internet users would be online regulars and when, a number of Internet predictions and forecasts were related to the significance of information being placed in a public forum. Anticipating the availability of this information, predictions and forecasts were frequently made on how:

- information would change the democratic process

- information would be packaged and sold on the Internet

- information would change global relationships

- information would change economic structures.

THE VALIDITY OF RETROSPECTIVE TECHNOLOGY ASSESSMENT

The value of retrospective technology assessment merits discussion. Communication science remains a relatively young discipline. Pool described communication studies as in search of identity, and he dedicated a significant portion of his career to studying the processes of communication as a science that could be explained using mathematical modeling. One of his contributions has gained considerable popularity thanks to an Internet game about the film star Kevin Bacon called the Six Degrees of Kevin Bacon (Watts, 1999). The underlying concept, which took Pool and a colleague from 1957-1978 to express in a measurable fashion, was that there exists a series of connections between any two events, people, or diseases. Pool argued, and demonstrated mathematically, that there would rarely be more than seven degrees of separateness between any communication phenomena. This notion would later be called "the small-world method."

To communication scholars, Pool's work offered a quantifiable approach to the flow of information. While the measures of separateness did not offer a measure of the social impact of a message, it did offer communication scholars a mathematical model to understand the flow of information. Later, Pool would begin to count and measure these interactions. At one time, he had manually cataloged 19,553 editorial concepts in newspapers in five countries over a period of 60 years, looking for 416 key concepts. Eventually, Pool was forced to abandon that project because of the unmanageability of the dataset. Fortunately, his assessment of the telephone was more manageable, spanning 65 years and offering 186 predictions for analyses. Pool's retrospective technology assessment, would create a snapshot that provided a more meaningful understanding of how the telephone came to be in the United States and its subsequent social impact.

Technology has made our assessment of Internet predictions and forecasts much less of a manual burden. The database Lexis-Nexis provided a more efficient way to search for our key terms: Internet and (predict, predictions, forecast, forecasts) between 1993-1995. Because the term Internet was not as universal in 1993 as it is today, we also searched using

key words such as computer, Network, and information superhighway. In other words, technology has created a more reliable and valid means in which retrospective technology assessments can be undertaken.

When studying technology-related forecasts and predictions, researchers have found that the younger the technology, the more likely the predictions and forecasts will create a vision of what the technology can become (Mindich, 1998; Mitchell, 1998). At the same time, forecasts and predictions about young technologies tend to be too large and reactive to the potential of the technology. We find evidence of this phenomenon in earlier studied communication predictions. In Plato's *Phadreus*, the disciple of Socrates attacks the invention of writing, arguing that the ability to write would eventually weaken memories and in that process we would lose wisdom and truth (Febrve & Martin, 1976). The printing press was also initially thought to create ignorance because people would no longer have to commit important facts to memory (Mitchell, 1998).

The forecasts and predictions detailed in the following pages are characteristically like forecasts and predictions related to other technologies. Internet predictions were frequently made that describe progress and a better society, but there were also critics who predicted the "dumbing down" of society, a lack of motivation to enjoy the outdoors, and an overstated emphasis on knowing how to use the Internet in relation to other areas of knowledge such as history, biology, and art (Dicken-Garcia, 1998).

Previous studies have shown that amazingly accurate forecasts and predictions have been made about technology prior to the technology's existence. Pool (1983) notes that the word "telephone" was used by visionaries throughout the 19th century, people who could dream of the telephone and its social uses, yet could not build one. Pool's own thoughts about the future of a world connected by wires for the purpose of digital communications were written between 1979 and 1984 and posthumously published (Pool, 1990). In 1993, forecasts regarding the Internet correctly predicted the future importance of accessing our personal bank records, buying airline tickets, and successfully employing real-time data communications.

In this study of Internet forecasts and predictions, we do not attempt to grade past forecasts as right or wrong or to measure in a scientific way if the prediction has come to pass. Most of the forecasts and predictions are stated in a manner that would make them

impossible to measure. For example, Negroponte predicted that Internet users would program virtual agents to go out into the World Wide Web and find information of personal interest and create a personalized, electronic newspaper (Negroponte, 1995). While some Internet users have done exactly that, rather than focus on the penetration of such an Internet feature, this study focuses on the nature of each prediction using Pool's procedural content analysis, encompassing a three-step process.[2]

First, we cataloged the person who made each prediction; Negroponte, for example is a professor at MIT. Because of our selected sources for this study, the overwhelming majority of Internet predictions were made by stakeholders who had insights into Networking issues but were not necessarily engineers. We found Internet visionaries among several traditional occupations.[3]

Second, we cataloged the discipline in which the forecasts and predictions were related. For example, specific forecasts were made in regard to banking and the Internet. These predictions were placed in a subcategory: banking. While a majority of predictions were cataloged in such a manner and are reported in subsequent narrative by discipline, we did find that general statements regarding the Internet and its future impact on society were frequently made, thus our largest set of forecasts and predictions rests in this area. A complete listing of categories by discipline is found in the appendix of this report.

Third, we cataloged forecasts and predictions by type, using Pool's earlier work of telephone forecasts and predictions. We adopted his four-part taxonomy of forecasts and predictions:

Type A: The Internet will be used in manner x.

Type B: The Internet will be used in manner x and society will be changed in manner y.

Type C: With wide use of the Internet, society will be changed in manner x.

Type D: Other propositions.

---

[2] While this study of Internet predictions has a qualitative focus, as noted by Pool in his telephone study, enumerating content often sheds new light during an analysis. The numbers offered in this section are done so in attempt to provide further perspective on Internet forecasts and predictions.

[3] We considered cataloging visionaries by academicians, industry experts, engineers or journalists; however these categories were rarely mutually exclusive so we abandoned the effort.

Negroponte's prediction that Internet users would create a personalized, electronic newspaper, for example, was logged as a Type A.[4]

When considering Pool's sample of telephone predictions against our sample of Internet predictions by typology, the data demonstrates that while there were no significant differences by category, Internet predictions tended to focus more on manners of use, rather than changes in society as a whole.

**Predictions by Type**
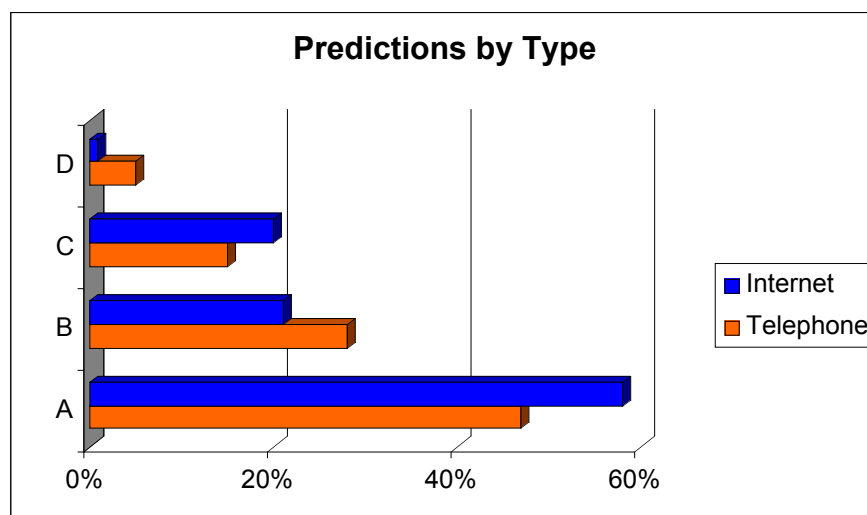


(A = The Internet will be used in manner x. B = The Internet will be used in manner x and society will be changed in manner y. C = With wide use of the Internet, society will be changed in manner x. D = Other propositions.)

One characteristic of our dataset of forecasts and predictions sets itself apart from Pool's previous work with the telephone. Pool found that the economics related to telephone service permeated a majority of his predictions. Most visions of the future of the telephone were rooted in the economic impact of such service and fewer were rooted in the social impact of the telephone in creating opportunity for two-way interactivity. We find the opposite to be true in regard to our technology assessment. While several predictions about economics and the commercial viability of the Internet have been found, we discovered more forecasts and predictions related to the exchange of ideas and opportunity offered by a dynamic knowledge base that grows with every user. Two frequently quoted Internet visionaries, John Perry Barlow and Esther Dyson, write about the potential of the Internet to

---

[4] Because of the team effort nature of this project, intercoder reliability was tested at each stage of analysis and ranged between (89-100%).

find truth through the free and textual exchange of information. Tim Berners-Lee (1996), founder of the World Wide Web, envisioned that efficient access to seminal information when presenting new information would speed the flow of information and as a result lead to more meaningful thinking and innovation. These forecasts and predictions might be more closely related to the printing press than a modern technology in that the "sharing" of information, rather than economics, was the more significant overriding principle that guided future visions and perhaps pragmatic deployment of the Internet.

## INVENTORY OF FORECASTS AND PREDICTIONS

Two very different ideas about the Internet significantly impacted the period in which we examine predictions, 1993-1995. More interestingly, the Internet as we know it today would not exist unless the two visions related to its potential and purpose were simultaneously at work.

The two conflicting, yet synergistic ideas were:

1. The Internet was an important academic and thoughtful medium, where everyone had an inherent right to participate as writer and reader, and that the use of the Internet should remain free and in the public domain.

2. The success of the Internet rests in its ability to be a mass medium. The delivery of information whether corporate or publicly driven, required a usable (and entertaining) mechanism in which to arrive to the consumer's home.

Understanding the ideology of the Internet from inception to the time period of our reflection, provides an important foundation from which forecasts and predictions can be examined.[5]

Vinton Cerf, an engineer who rejects the title of Father of the Internet although it is sometimes given, was chairman of the 1972 Internetworking Working Group that helped bring the National Science Foundation-funded Network online during the 1980s (NSFNet).

---

[5] Science fiction enthusiast and writer, Bruce Sterling, received much attention for his article, "A Short History of the Internet." The article remains a seminal work in the documentation of the fast-paced events between 1990 and 1993. Sterling, B. (February, 1993). "A Short History of the Internet." The Magazine of Fantasy and Science.

The new Network was more efficient than its 1969 Advanced Research Projects Agency Network (ARPAnet) which was established to connect four universities heavily involved in government and military research:  Stanford, UCLA, UC Santa Barbara and the University of Utah.  By 1981, that Network had expanded from four sites to 213 sites. As more universities came online, the military had concerns about the security of the Network and moved to establish its own in 1983, Milnet.

The NSFnet was subsequently established as a part of the thinking that the military and government Network operations should be separate from the Network being used by professors.  As a result, subnetworks (distinguished by their hardware) began to operate on the NSFnet and ARPAnet backbones.  In 1979, BITNET was established at Yale University using an IBM mainframe and grew larger in three years than ARPAnet had in a decade.  Within this same time period, UseNet was established using a UNIX mainframe in North Carolina.  Before long, several more Networks emerged, each offering bulletin board systems that allowed users to post messages, send e-mail, and exchange documents.

The lightning quick growth of the Internet is in the numbers.  In 1987, host sites numbered 10,000 and in 1989, 100,000. Berners-Lee, an engineer with a nuclear research think tank (CERN) in Geneva, Switzerland, was using the Internet, like his colleagues, to exchange work documents.  In 1990, he established a publishing system to the Internet that allowed the layering of information.  The new computer language was called hypertext mark-up language (HTML) and worked using a protocol (hypertext transmission protocol or HTTP) running on previously established Internet Protocols (IP).  Berners-Lee was interested in using the Internet to organize information, linking new documents to old ones, in an effort to allow scientific endeavors to be cumulative and systematic.  The user interface created by Berners-Lee allowed a user to move easily from one document to another; he called it the World Wide Web.  Using Berners-Lee's design, an entity could establish a "Web" server and a user could go to that server from any computer by typing in a Uniform Resource Locator (URL).  What was exciting about the Web is that while it introduced new material created with HTML, Berner's-Lee wrote the software so that previous Internet innovations, such as Gopher and File Transfer Protocol (FTP) worked with his new design as well.

An important ideology of Berners-Lee that would ultimately dictate the form of content of the World Wide Web, was the notion that Internet users should be as free to

publish as to access information. His trial-and-error efforts with building the software were most often due to his effort to make publishing on the Web as simple accessing the Web. The CERN think tank was government and grant funded, and all the materials created by Berners-Lee in essence part of a larger public domain. As Berners-Lee developed software, he shared his effort on the Internet and thus a chain reaction of sorts among Network users began to evolve. He had 10,000 users download his WWW tools in the first month. Without commercial interests at play, thoughtful Network engineers and computer scientists shared their knowledge in public forums, at conferences and of course, over the Internet.

Experimental user interfaces to the Internet began to surface throughout the United States, building off the hypertext protocols established by Berners-Lee. At the University of Illinois, a team of professors and student assistants began attempting to create a user interface at the National Center for Supercomputing Applications (NCSA). Undergraduate lab assistant Marc Andreessen was helping on the project. He thought Berners-Lee's work was still too complex and kept Internet use within the hands of academics and the computer-savvy. In Andreessen's mind, the World Wide Web's real potential lay in creating an interface for the mass consumer. In order to engage the masses, Andreessen thought the WWW needed images and graphics. Trying to keep up in his coursework and show due diligence to the full-timers at NCSA, Andreessen worked many late nights creating the Web browser Mosaic for the NCSA. The graphical interface was first posted in the winter of 1993 on a UNIX-based system.

Tim Berners-Lee, was concerned that Mosaic utilized a graphical interface that would create traffic jams on a limited supply of Internet bandwidth. Berners-Lee also was concerned about the recreational use of what he perceived to be a serious medium. The WWW was not intended as an entertainment forum, but as a place for the exchange of important ideas, a venue for creating a more thoughtful, insightful world.

Andreessen disagreed and he continued to work with the NCSA team until he graduated in December of 1993. His work on Mosaic had been a federal grant work for hire, and as a result it was part of the public domain.

As of the spring of 1994, there were still few commercial interests on the World Wide Web. Andreessen's early vision of the Web was to create a mass medium that could be used recreationally as well as educationally. This new vision of the Internet had inherent

commercial interests.  Backed with funding from one of the most powerful companies in Silicon Valley, Andreessen returned to the University of Illinois and offered money that reasonable people can't turn down to the NCSA Mosaic staff. Just about everyone involved in the creation of the initial Web browser moved with him to California.

On October 13, 1994, Andreessen's team launched Netscape Mosaic, the first commercial browser.  Within hours, the established Netscape download server was going non-stop.  Within 10 months, Netscape reported 1.1 million users and $17 million in revenue. Andreeseen had successfully brought the WWW to the American people.

THE INTERNET WILL TRANSFORM SOCIETY

We begin our assessment with forecasts and predictions related to the impact of the Internet on society. Three common themes emerged in these predictions: The Internet will change the world; those without access to the Internet will live in a world much different than people with Internet access; and the commercialization of the Internet will change the Internet's form and content. And of course, a discussion about the Internet forecasts and predictions wouldn't be complete without the doubters.

1.1 The Internet will change the world.

Early visionaries forecast that the Internet and its ability to provide an efficient platform for the exchange of information and subsequently knowledge, would impact every facet of the world. *Time's* Board of Economist would simply predict, "The Internet will transform nearly everything, mostly for good."

Frequently, predictions about the Internet changing the world would be made by comparing the Internet to other inventions, such as the printing press.

For example, Al Gore, former vice president of the United States and Internet visionary, predicted that the Internet's impact would be as significant to this generation as mechanical machinery was to the industrial age. Quoting engineers in the magazine *Scientific America*, Al Gore told readers of the *Washington Post*:

> The developed world is experiencing a transforming convergence of computing and communications technology whose impact will rival that of the replacement of muscle power by machines.

Adding a time frame to his prediction, engineer Bob Smith told *Wired* magazine:

> It's impossible for me to imagine contemporary life in 2015 without the global Net; living without the Net would be like trying to live without electricity.

The forecasters and predictors that added time frames to their statements, took the risky route. Numbers are measurable, and with them, forecasts and predictions can be evaluated in years to come. During this analysis, we found most forecasts and predictions

were made with general time frames, such as "we will begin to see…" or "in the years ahead…"

MIT professor and visionary Nicholas Negroponte became much criticized and publicized for adding a number to his "guess" on Internet adoption, saying, "My guess is that one billion people will be connected by the year 2000."

The man often called the Father of the Internet, Vinton Cerf, also attempted to put numbers to Internet usage, but found it to be a dynamic prediction, rather than a static one. Cerf was more modest in his numbers forecasting than Negroponte. In 1992, Cerf predicted:

> There will be 100 million United Sates Internet users by the end of the decade, and there will be tens of millions more users abroad. You have to imagine that this kind of reaching out from anywhere in the world to anywhere else in the world, at your fingertips has got to change the way we think about our world.

Two years later, Cerf would combine global and U.S. Internet use and put the number of users at 300 million:

> By the end of the decade there will be 300 million users.

Another set of forecasts and predictions focused on the ability of the Internet to combine text, pictures and people. These new combinations were predicted to bring together people who had been previously separated by distance and ideology.

Industry expert and writer, Adam Sah wrote:

> The data superhighway will change all of our lives, creating a vast virtual environment with unlimited potential.

Paul Saffo, an industry expert and visionary who founded the Institute of the Future, focused his forecasts and predictions on the "culture" of the Internet and the impact of that culture on general society. He saw that computer "tekkies," as he would later call them, would come to be considered not at nerds but as leaders of the world's information revolution:

The digital counterculture will reject this bleak vision of a future in which technology enlarges the human spirit as a new tool for consciousness in much the same way that the hippies appropriated the psychoactive chemical spin-offs of the military-industrial complex. This new movement will be cyberpunk imbued with human warmth, substituting a deep sense of interdependence in place of a lone wolf.

The new interdependence of general society with the computer culture was also envisioned by Negroponte. He would forecast:

The information superhighway is more than a shortcut to the Library of Congress. It [Internet] is creating a new, global social fabric.

Of which Gore would note:

Simultaneously, we are witnessing the emergence of a truly global civilization based on shared knowledge in the form of digital code. The ability of nations to compete will depend on their ability to handle knowledge in this form.

This new world wouldn't always be rosy according to engineer Bob Smith's predictions.

Violent conflicts between virtual and actual communities [will] have become a permanent feature of the cultural landscape by 2015.

Other large predictions, gave the Internet human-like qualities and a symbiotic relationship with the computer. According to several recorded forecasts and predictions, separation of man and computer would become increasing difficult in the future. Scientist Giles Bowkett wrote in *Wired* magazine:

If anything humans and computers will grow together, becoming increasingly difficult to separate. Computers may evolve, but their evolution isn't shaped by natural selection, it's shaped by human computer markets… Instead of replacing us, computers will become a secondary symbiotic species,

enhancing our lives in specialized but powerful ways.  In the process, they will transform what it means to be human.

1.2  <u>The Internet will have the potential to connect and disconnect society.</u>

The Internet's inherent ability to provide users a meeting ground became the focus of many early forecasts and predictions.  A majority of these predictions considered the impact of the like-minded and like-interested being able to "meet" and "share" ideas on the Internet. For the most part, a majority of these predictions were positive.

Sociologist, James Cappio, predicted in *Wired* that the excitement about the Internet was rooted in this collective mind:

> Its real payoff, its visionary promise, would be the possibility of an "Athens without slaves" in which people can provide information as easily as they consume it.  A Networked world offers the possibility of many-to-many communication, permitting widely separated individuals to bind themselves into collectives.

Internet visionary Dyson focused a majority of her early forecasts on these collectives of human thought:

> Just as shopping malls offer rides and cafes as not only places to buy lattes, but places where people can meet, so will cyberspace real estate provide environments for engaging social interaction.

According to Dyson, already existing social units, were predicted to use the Internet as another form of communication:

> Every family will have its own mailing list carrying contributions from its members.  At that point, actually long before it, we will have to triage our mail still further.

Once groups of people were gathered together on the Internet, Negroponte, envisioned that their collective thoughts could be shared and enlighten others about their group:

The 30 million members of the American Association of Retired Persons, for example, constitute a collective experience that is currently untapped. Making just that enormous body of knowledge and wisdom accessible to young minds could close the generation gap with a few keystrokes.

Saffo, argued that the presence of new communities might not always be a positive:

In terms of social consequences, the Web is a great experiment. Its going to deliver us community with vengeance – and we may find we don't want it.

Saffo also forecast that even though the ability to publish on the Internet was inherently indiscriminate, that there would be "superstars" that emerged:

Individuals with unique points of view could become the superstars of cyberspace, their personalities immortalized in software traveling the Web.

While a majority of the forecasts about the emergence of "collective thought" were positive, several predictions were made that the inherent costs associated with participating in any Internet "conversation" would deepen the divide between the "haves" and "have nots" in American society. Mitch Kapor wrote in *Wired* magazine:

Content supplied only by a carefully chosen set of provider barriers to entry will be created, for everyone else programming will still seek the least common denominator and the population will be divided by income information haves and have-nots.

Computer scientist Dave Hughes described a new social currency – information:

We're heading for a division between the information rich and the information poor.

Several forecasts were made in an effort to do something about the potential divide during the early stages of the Internet deployment. MIT computer science professor Michael Dertouzos said:

The gap between the rich and poor is increasing as a result of these technologies, widening differences between the rich and poor nations and rich and poor people within individual nations. Left to its own devices, it will increase much more.

Cerf wrote:

It will become critical for everyone to be connected. Anyone who doesn't will essentially be isolated from the world community.

Some visionaries doubted that the Internet would create a larger, deeper divide. Industry expert, Robert Coover predicted:

Will everyone have equal and universal access to this magical new real? No, they will not. But the gap between the haves and the have-nots already almost unimaginably vast in our time, will not necessary widen.

1.3  The Internet's commercial applications will transform society.

Unlike most commercial entities in the United States, the Internet began as a public forum and moved gradually to a commercial forum. Many early predictions anticipated how mass consumers might use the Internet and how Internet companies might provide access to these anticipated uses. Without a clear business model for the Internet, many visions were associated with how this new device would ultimately make money.

Coover predicted that, unlike the entertainment industry in which a few Networks control a majority of the audience, the Internet would have many vendors:

Early developers of this new communications arena are hoping to turn it into a vast worldwide marketplace and to take their cut by renting stalls, as it were, but exclusive access has never been a principle of the ether, home of the computer Nets. If telephony and cable put a lock on the hard-wiring, watch for pirate satellite ships.

Andreessen of Netscape agreed:

I don't see a Netscape-controlled future for the Net. The Internet is too dynamic and innovative. No single company will control everything.

Dyson focused her commercial predictions on what genre of produced content would lead to commercial success. She forecast that quality content may be in short supply on the commercialized Internet.

In the new communities of the Net, the intrinsic value of content generally will remain high, but most individual items will have a short commercial half-life. Creators will have to fight to attract attention and get paid. Creativity will proliferate, but quality will be scarce and hard to recognize.

Other visionaries were concerned about the quality of an incorporated Internet. Industry analyst Mitch Kapor told *Wired* readers:

Hopefully the good things about the Net will remain as we move toward Internet, Inc.

In the worst case, we could wind up with Networks that have the principal effect of fostering addiction to a new generation of electronic narcotics; their principal themes revolving around instant gratification through sex, violence or sexual violence; their uses and content determine by mega-corporations pushing mindless consumption of things we don't need and aren't good for us.

The ability of the Internet to move commercial exchange into the hands of the many-to-many, excited industry expert James Cappio. He argued the ability of many to talk to many would change the marketplace (commercial and ideas) and as result our notion of entertainment:

As the existence of a true many-to-many Network implies, everybody has the power to make artistic products of any kind and to distribute them to anybody on the plaNet essentially for the asking, the need for an entertainment industry suddenly disappears.

Engineer and industry expert Smith told *Wired* that the ability to conduct business in a virtual world would mean the end of a physical home for many commercial entities:

> Because of the Internet it is now possible to carry out transactions entirely in cyberspace, many information entrepreneurs in 2015 will have simply given up any physical home.

1.4 <u>Doubting the Internet would transform society</u>.

While industry experts, analysts, scientists, and academicians were forecasting and predicting a world significantly changed by the Internet, there were doubters, and this assessment wouldn't be complete without mention of their influential forecasts and predictions.

Most frequently, the doubters were those in the press assigned to cover the visionaries' remarks. Doubtful statements of the future of the Internet and its growth are used to create tension in reporting the story, a reminder to the reader that the quote was only a prediction, not a statement of fact. Unfortunately, in the case of the Internet, the standard journalistic practice of countering with alternative opinion frequently left the writer or editor underestimating the significance of the Internet.

*The Washington Post* ran an editorial in 1993 that predicted a slow roll-out of the Internet:

> The information superhighway may or may not become a truly transforming technology… But if it does, the event is many years, and perhaps decades, away.

A *New York Times* writer questions the time frame of the Internet as well:

> Someday, the visionaries tell us, we will be able to communicate with just about anybody by sending an electronic message; no matter where they are, the bundle of bits will find them. On the information superhighway, the literature of the world and the videos too, will be just a point and click away. So will anyone we want to hear from. Someday perhaps, but not yet.

Another *New York Times* business writer deemed the United States not ready for the Internet:

> In reality, the country is neither technologically nor economically ready.

In other stories, news reporters even mocked predictions.  For example, a *Newsweek* writer takes sarcastic aim at Negroponte's visions of an Internet future:

> Yet, Nicholas Negraponte, director of the MIT Media Lab, predicts that we'll soon buy books and newspapers straight over the Internet.  Uh sure.

This same writer tells the readers of *Newsweek* that the truth is:

> No online database will replace your daily newspaper, no CD-ROM can take the place of a competent teacher and no computer Network will change the way the government works.

In these well-publicized instances, the journalists were wrong.

THE INTERNET WILL TRANSFORM THE ECONOMY


The advent of "Internet Inc.," as one visionary described it, would ultimately impact the structure of our economy, the manner in which we trade, the exchange of cash. and our banking system. These four key areas conceptually emerged among early Internet forecasts and predictions. And, of course, there were those individuals who doubted the Internet would have a profound economic impact.


2.1     The Internet will challenge the current economic structure.

Internet forecasts and predictions anticipated that as the exchange of goods commenced on the Internet, it would challenge the current marketplace. Former Vice President Gore anticipated that the government would continue to play a role in the early marketplace by providing funding for the build-up of the Internet's infrastructure. A reliable Internet was predicted as the pivotal requirement for an electronic marketplace:

> At first the Network would be supported by the federal government; but user fees would make it viable as a private enterprise that would grow exponentially. Eventually, it could reach into homes, providing anyone with a personal computer access to a whole universe of electronic information.


While visionaries agreed the government would play an important role in beginning the Internet economy, the government's early withdraw from the system was viewed as critical. In the *New York Times,* telecommunications attorney and visionary Peter Huber forecast that for the Internet economy to succeed, the government should remove itself as soon as possible:

> We'll see a revolution in the infrastructure of the marketplace. We should see the markets accelerating and improving beyond recognition, but only if the government steps out of the way and allows the process to follow its natural course.

News reporter George Church predicted in the business section of *Time* magazine that the Internet economy would change the U.S. economy as a whole and change the manner of business operations in the United States:

> The effects of the Internet are only a foretaste of what could change the economy and the way business is conducted, almost beyond recognition.

A key characteristic of the new Internet economy would be competition. With the ability to publish equally distributed among potential Internet vendors, a level playing field rich with competition was forecast. In the *New York Times*, an academician forecasts:

> For every greedy guy who shows up on the Network trying to make a buck, there will be people around with something of equal value that's available for free.

Dyson also predicted that the new Internet marketplace would be rich with competition, but added that some companies would retain advantages over others:

> Unknown vendors that can guarantee functionality will squeeze the prices of the market leaders. Of course, the leaders, such as Microsoft, will continue to win because they can use almost-free content to sell ancillary products or upgrades, and because they've reinvested in loyal distribution channels.

The real competition, some visionaries argued, would be to create traffic on one's Web site. Industry expert Donna Hoffman would write in *Wired* magazine:

> In the explosively evolving Internet environment, we expect that the novelty of many commercial sites will soon fade, and then the real competition to attract visits to commercial sites will begin.

Kevin Kelly, *Wired* writer and visionary, would forecast a then-unique business model for the Internet. Services and products offered on the Internet would move from being free services to paid for services according to Kelly:

> Right now Net vending machines are free, but some time in the near future some will accept a form of electronic money for commercial material.

Other characteristics of the Internet, were forecast as being instrumental in changing business economics. Technology journalist Steven Levy predicted that businesses would seek out one-to-one contact with their customers:

> Indeed, as a higher share of the population gets wired, business will reshape itself to take advantage of the instant communication with customers the Net will provide.

2.2     The Internet will be driven by e-commerce opportunities.

The exchange of goods between businesses and consumers via the Internet was the most frequently forecasted activity. Internet shopping was forecast to be a common Internet activity by the year 2000. Dave Chalk, industry expert, would predict:

> Online retailing will be big in a few years—by decade's end…5 percent of all retail purchases will be made on-line.

Chalk's forecast of a 5 percent e-commerce marketplace was kept intentionally low. He predicted that the on-line shopping mall would never replace a physical mall. Instead, Chalk forecast that on-line shopping would be more about information gathering prior to a visit to the local mall:

> The Net will never replace shopping trips. You'll just get prepared, read product reviews, look at components. The retail side will still be there, but you won't have to go run around looking for depth of information.

Early e-commerce participant Randy Adams, founder of the Internet Shopping Network, forecast a much larger shopping audience:

> This is just the beginning of electronic shopping on the information highway. Our future plans call for the addition of many new 'stores,' providing an endless array of customer products.

A1992 *Newsday* feature on e-commerce said:

Within the next year or two, Internet experts also predict a surge in commercial services, such as multimedia catalogs online.

The ability of the small-business owner to increase his or her potential audience was also touted by visionaries:

The Internet, like a railroad, could bring jobs and markets to Montana. We could be engaging in international trade and swapping Montana alfalfa cubes with products from other countries, potato vodka from Estonia, whatever…

Other economists predicted the opposite pattern, arguing that the ability to electronically shop would mean an end to small, local businesses. Public policy specialist Richard Sclove forecast:

Cyberspace is going to finish what Wal-Mart started. Interactive shopping via computer Networks is going to put more traditional downtowns and more mom-and-pop stores out of business.

The potential of business-to-business e-commerce over the Internet was mentioned less frequently. When this form of economic activity was brought up, security issues were often raised. One economist observed:

Due to corporate reluctance to entrust sensitive and commercial information to cyberspace, very little commerce has occurred.

Another forecast was more positive regarding the potential growth in business-to-business e-commerce.

I believe that in two to three years we will see as many as 100,000 companies using the Internet as a principal sales and service channel…to reach out to other businesses. CommerceNet {the forecaster's company) will be handling business transactions for as many as 3,000 companies by the turn of the century.

While most were predicting the demise of our middleman marketing structure that relies heavily on individual salesmen, Dyson predicted that the intermediaries between the consumer and the Internet, whether real or computerized, would become more important as consumers ventured out to e-commerce on the World Wide Web:

> Contrary to the notion that the Net will be a disintermediated world, much of the payment that ostensibly goes for content, will go to the middlemen and trusted intermediaries who add value, everything from guarantees of authenticity to software support, selection, filtering, interpretation and analysis.

2.3     The Internet will offer the first glimpse of a cashless society.

While not the focus of many forecasts or predictions, e-money, digital money, and cashless societies were mentioned on occasion during the early days of the Internet.  A writer for *Wired* magazine, considered the future of "digital money" in 1994.  He forecast a cashless, virtual banking system:

> Commerce on the Net will reproduce the process in cyberspace:  you will download money from your bank, put it in a virtual wallet and spend it on-line.

Even employers were predicted to go the "paperless" route and pay their employees online, and it was forecast you could borrow money from friends – electronically:

> You will also be able to receive money from your employer, someone who buys something from you, or a friendly soul who lends you a virtual sawbuck until payday.

2.4     The Internet will change the process of  banking.

Banking was forecast as being "transformed" by the Internet.  The Internet was predicted to provide banks with a new means to reach customers and in the process empower customers to have more immediate control over their money.  An unknown number of new, individually tailored customer products were predicted:

> Customers and their bankers will have access to more information than ever.
> This will allow banks to customize their services to the individual and will
> give customers a far greater choice of products, services and vendors.

One banker predicted that a significant number of banking customers would quickly adopt Web-based banking:

> Ten percent of the population will be using home-access banking by the
> middle of the decade.

In response to customer demand, banks were forecast to change the customer/teller relationship and perhaps not even establish a local, physical office:

> Banks won't rely on new residents for customers.  Banks will run the gamut
> of high-tech to high-touch.  Customers will be able to access banks that don't
> have branches with computers or choose branches staffed with customer-
> activated computers instead of people.

2.5     Doubting the new Internet economy.

While a majority of published Internet predictions and forecasts described an economy stimulated by the Internet, there were those close to the industry and those reporting on the industry who doubted that the transformation was looming or that it was in the picture at all.  The above-mentioned economy predictions had an element of cheerfulness to them, but the more doubtful scenarios cast a somewhat grayer picture.  One economist quoted in the *New York Times* forecast:

> The rise of electronic commerce isn't going to be painless.

Another industry expert, forecast that without establishing a better customer-tracking and measuring system for Internet-interested business, e-commerce activity would come to a standstill:

> The Internet may not evolve further without careful measurement of its users.

A boom-then-bust economy for the Internet was also forecast:

In the explosively evolving Internet environment, we expect that the novelty of many commercial sites will soon fade, and then the real competition to attract visits to commercial sites will begin.

Newspaper and magazine reporters and editors assigned to cover the visionaries offered most doubtful forecasts. Perhaps in an effort to provide a "reality check" (as a *Wired* column is titled), these writers became Internet cynics. One *Newsweek* essayist wrote:

Then there's cyberbusiness. We're promised instant catalog shopping – just point and click for great deals. We'll order airline tickets over the Network, make restaurant reservation and negotiate sales contracts. Stores will become obsolete. So how come my local mall does more business in an afternoon than the entire Internet handles in a month? Even if there were a trustworthy way to send money over the Internet – which there isn't – the Network is missing a most essential ingredient of capitalism: salespeople.

CONTENT WILL DRIVE THE INTERNET'S SUCCESS

A significant number of forecasts and predictions focused on the Internet's digital capacity to deliver content. Early visionaries predicted information stakeholders, such as libraries and publishing companies, would see a change in supply and demand created by the Internet.

## 3.1 The Internet will be text driven.

Paul Saffo predicted that text would become the most reliable medium, not newspapers or television, but new conceptual thinking about – text:

> We will no longer trust our eyes when observing video-mediated reality. Text will emerge as a primary indicator of trustworthiness, and images will transit the Net as multimedia surrounded by a bodyguard of words, just as medieval scholars routinely added textual glosses in the margins of their tomes.

Another visionary wrote in *Wired* that the printing press would no longer be the prime knowledge delivery device, but that the Internet would provide what the printing press once did. Professor Seymour Papert described the Internet as a "Knowledge Machine" :

> It will take time for the vast quantities of information available in print to be recast for such a machine. But it will happen; and when it does, the Knowledge Machine (a metaphor for much varied forms of media) will provide easier access to richer and fuller bodies of knowledge than can be offered by an print encyclopedia.

Others predicted that, while it would take considerable time, all printed text would be converted into digital text. Saffo even went as far as to predict that this was an intermediate solution to another form of communication – brain to machine.

> Until physical brain-to-machine links become a reality, text will offer the most direct of paths between the mind and the external world.

3.2  <u>The Internet will not be subject to current copyright and property laws</u>.

Another well-documented visionary John Perry Barlow, a lyricist for the Grateful Dead and Wyoming cattle rancher, became fascinated with the Internet and worked toward utilizing this new "Knowledge Machine" to deliver a greater diversity of ideas in the marketplace.  Barlow predicted that the free exchange of ideas would create a more informed democratic electorate and globalize our world.  He, along with Mitch Kapor, previously quoted in this analysis, established the Electronic Frontier Foundation, which began dedicating itself to preserving the freedom of the Internet.  Barlow believed that as ideas were exchanged, the new owners of the idea transformed the idea into something new, something more meaningful:

> While the Internet may include every CPU on the planet, it is more than doubling every year and can be expected to become the principal medium of information conveyance, and perhaps, eventually the only one.  Once that has happened, all the goods of the Information Age, all the expressions once contained in books or film strips will exist as pure thought; voltage conditions darting around the Net at the speed of light, in conditions that one might behold in effect, as glowing pixels or transmitted sounds, but never touch or claim to own in the sense of the word.

As a result of this ephemeral viewpoint, Barlow forecast that current copyright laws would not be adequate:

> Intellectual property law cannot be patched, retrofitted or expanded to contain digitized expression any more than real estate law might be revised to cover the allocation of broadcasting spectrum.

The complexity of interconnectivity on the Internet allows for the distribution of copyrighted material with such ease that Negroponte wondered if that such activity would pass for copyright infringement at all:

> In the digital world it is not just a matter of copying being easier and copies more faithful.  We will see a new kind of fraud, which may not be fraud at all.

When I read something on the Internet and, like a clipping from a newspaper, want to send a copy of it to somebody else or to a mailing list of people, this seems harmless. But, with less than a dozen keystrokes, I could redeliver that material to literally thousands of people, this seems harmless. But, with less than a dozen keystrokes, I could redeliver that material to literally thousands of people all over the planet (unlike a newspaper clipping). Clipping bits is very different from clipping atoms.

One form of content Negroponte paid considerable attention to was traditional art on the Internet. He predicted that art would be able to tap into the power of the Internet more easily than other forms of content:

Artists will come to see the Internet as the world's largest gallery for their expressions and as a means of disseminating them directly to the people.

What constitutes art was also predicted by Negroponte to change:

The digital superhighway will turn finished and unalterable art into a thing of the past. The number of mustaches given to Mona Lisa is just child's play. We will see serious digital manipulation performed on said-to-be-complete expressions moving across the Internet, which is not necessarily bad.

3.3  The Internet will be a meeting ground for all forms of media.

Fiber optics was forecast to be the technology that would bring all forms of media to our homes, and the Internet was forecast to be the conduit. In the convergent technological world, the Internet was forecast to be a master entertainment source.

Kevin Kelly, industry expert and frequent contributor to *Wired,* predicted that the Internet would be a gateway for traditional media:

The Net will include TV, radio, all the cash register data in the world, every traffic sensor in the world. It won't be just people talking to each other. It will be people talking to machines, and machines talking to each other.

A reporter for the *St. Louis Dispatch*, in an editorial to his readers, forecast that the content on the Internet would change the democratic balance of power in the United States:

> Thanks to fiber optics, the average American will soon have greater command over information about events on the planet Earth than the president of the United States had today. This will have a tremendous impact on our political system, promoting a much higher level of participatory democracy.

Industry expert Dyson and David Coursey forecast a different scenario for Internet content. Both of these industry experts believed that the content on the Internet would quickly turn to that of mass entertainment in a form that could be packaged and sold. Dyson predicted advertising opportunities would drive Internet content:

> Net content will serve as advertising for services, such as support, aggregation, filtering, assembly, and integration of content modules, or training of customers in their use. Intellectual property that can be copied easily, will likely be copied. It will be copied so easily and efficiently that much of it will be distributed free in order to attract attention or create desire for follow-up services that can be charged for.

David Coursey forecast for a reporter from the *Los Angeles Times* that mass consumption of content on the Internet would shift its purpose from creating opportunity for knowledge to that of entertainer:

> There is every likelihood the Internet will soon be about as enriching as television, at least as far as the mass consumption of the Net is concerned. [And he doesn't mean that as a compliment.]

## 3.4 The Internet will change America's traditional content-providing entities.

Prior to the advent of the Internet, libraries and newspapers were common content providers. Forecasts and predictions were made about both as a way to illustrate the impact of the Internet as an alternative source for content.

The Internet was described as a great libraries vision for the world by one forecaster. However, industry expert David Pescovitz predicted that instead of replacement, the Internet would join forces with the library and create a new service:

> No software application will replace a good human reference librarian any time soon. In 10 years, almost all public libraries will provide free access to the most eclectic information dump in the world, the Internet.

It was predicted that books would be scanned into computers and "made available to anyone, anywhere, almost instantly over high-speed Networks."

One forecaster warned book publishers to prepare themselves for the Internet:

> The commercial consequences of electronic libraries could be huge and publishers' trade associations are already closely watching libraries with a watchful eye.

The newspaper industry, unlike a majority of America's libraries, is completely dependent on its ability to sell content. The Internet was predicted to have a significant impact on the newspaper industry. Some industry experts went as far to predict that the Internet would kill America's print-media industry. Michael Crichton, an industry observer and writer of popular fiction, wondered how newspapers would compete with the Internet's ability to create content tailored to users' interests:

> I will have artificial-intelligence agents roaming the databases, downloading stuff I am interested in and assembling for me a front page, or night news show, that addresses my interests. I'll have twelve top stories that I want. I'll be able to double-click for more detail. How will Peter Jennings or MacNeil-Lehrer or a newspaper compete with that?

Others predicted that newspaper companies would embrace the Internet as an alternative delivery mechanism for their content:

> By the end of this year nearly 3,000 papers will offer some electronic or interactive services.

3.5  <u>The Internet's unwelcome content will be censored.</u>

John Perry Barlow predicted that Internet censorship was technically impossible and Dyson forecast that companies that could create reliable filtering software for Internet content would be highly sought after.

The Internet's ability to deliver content inevitably meant that some of that content would be undesirable.  Engineer David Hayes predicted that software would be created to combat unwelcome information:

> What people will probably do is invent site-kill files that would UseNet administrators to block any messages from a certain computer or certain parts of the Network.  My fear is that this will be a cyber-revisiting of the blacklisting that was prevalent in the 1950s.  Eventually, I predict that such site-kill files will be used to censor politically unpopular views.

These ideas reflect the common notion that no matter how much information is available to us, we will only expose ourselves to ideas of interest, furthering the cliché that we know much about that with which we agree and very little about that with which we disagree.

SECURITY AND PRIVACY CONCERNS


The public nature of the early Internet equated postings on the Internet to be the equivalent of making a speech on a public park bench. Perhaps for this reason little was predicted in the area of security or privacy. In fact, early predictions were more likely to lament that the purity of the early Internet would be changed by evil forces and that little could be done to prevent such activity.


4.1  The Internet will be changed by those who attempt to control it.

Industry expert Stewart Baker predicted that many entities would look for ways to control the Internet:

> As foreign governments come to understand the power of the Net, they will search quite unapologetically for ways to control it.


The potential "for mischief on the Information Superhighway" was described as profound, and Negroponte predicted that he did "not believe there will be a bit police." Other industry experts forecast that universal Internet policy would be an impossible achievement:

> Certainly, there will never be any consensus to establish a regulatory body for UseNet. And no, the existing defenses to spamming by advertisers and other unsavory business practices are clearly not adequate. So what will happen? The Net as we know it will die.


David Pescovitz predicted in *Wired* in 1994 that there would be a "virtual war with the sole intent of destroying or protecting information, not property."


4.2  The Internet will not provide privacy protection.

The design of the Internet left little hope among early forecasters that a secure system for transmission could be created and as result of insecurity, little hope was forecast for the protection of privacy. Brock Meeks, computer consultant, told John Perry Barlow, "If

privacy isn't already the first road kill along the information superhighway, then it's about to be."

While hackers were frequently predicted to destroy privacy, industry expert Stewart Baker predicted that users would be their own worst privacy foe:

> The biggest threats to our privacy in a digital world will come not from what we keep secret, but from what we reveal willingly.

While there were concerns related to maintaining the privacy of financial information and medical information, spam became the focus of early predictions. Spam is jargon used to describe an unwanted posting or e-mail. Neil Guy would predict in the *New York Times* that spam growth would be enormous:

> I'm beginning to think this sort of UseNet abuse is going to continue growing exponentially as the medium itself grows. The abuse will continue to grow, various mechanisms to control it will be installed to prevent a collapse of the system and the openness and freedom of ideas exchanged upon which UseNet was based will become something rather different.

One engineer predicted that if spamming were to become commonplace, the Internet's infrastructure (already being used to a maximum) would fold:

> If spamming becomes widespread it will destroy the Network. The Internet allows massive replication and transmission of information, and if everyone engaged in that kind of conduct, it would bring it down to its collective knees.

Another type of posting, referred to as flaming, was also the focus of several predictions. Flames are personal, negative public postings about another person on the Internet. One industry analyst forecast that instead of dealing with the legal issues surrounding slander and libel that are a result of negative flames, service providers would begin to shut down list serves and discussion groups:

> If they (flames) become routine, and there's very little technical or legal reason why they won't, then the whole Net will basically collapse through flame-wars, the closing of e-mail discussion groups to outsiders and whatever.

THE INTERNET'S GROWTH IS DEPENDENT ON
AN EFFICIENT AND RELIABLE INFRASTRUCTURE


The ability of text, video and images to arrive on demand to the home is dependent on a transmission system.  From the onset of the Internet, engineers turned their attention and subsequent visions to the characteristics of the wires that would create the wired home.


5.1  The Internet will rely on an existing residential infrastructure.

Early predictions by engineers turned to the two companies that maintained residential Networks, the telephone industry and the cable television industry.  With wires already in place, engineers forecast that with some modifications that these two industries, not the federal government, would provide a gateway to the Internet. Kapor, engineer and industry expert, forecast a rebirth in the cable television industry:

> With some modification to the existing infrastructure, hybrid Networks can deliver a full range of high bandwidth interactive services at a fraction of the cost of fiber to the home.  To accommodate an interactive Network, cable television's infrastructure will be reinvented and reimplemented.


As the Internet gained popularity, Kapor predicted that cable television's infrastructure would be upgraded to accommodate the transmission of high-speed Internet service:

> Existing cable systems will be replaced by high-capacity, noiseless, fiber-optic cable that will reach from the system's headend into each neighborhood. This fiber-to-the-node architecture will serve groups of 200 to 1,500 homes. The last segment of the Network, from node to the home, will use existing coaxial cable.


One financial analyst predicted in the *New York Times* that upgrading America's infrastructure would cost between $100 and $300 billion, but if built at that time (1993) the technology would be relatively unsophisticated.  In addition, the analyst predicted, there was

no current economic pull and no clear forecast on what future economic advantages rest in building a fiber Network.

Frequently, forecasts related to the infrastructure would be stated and then future applications predicted. For example, writer Crichton forecast live video feeds:

> Once Al Gore gets the fiber optic highways in place, and the information capacity of the country is where it ought to be, I will be able, for example, to view any public meeting of Congress over the Net.

Not all engineers predicted a government-supported Network infrastructure. Kapor forecast that private industry would surpass the government in Network enhancements:

> The private sector, not the government, will build and operate the NII (National Information Infrastructure). Telephone and cable companies will be the principal carriers of traffic into the home.

5.2 The Internet's demand will dictate the design and capacity of America's infrastructure.

While engineers could predict and forecast a wired infrastructure with the ability to transmit enormous amounts of digitized video, text, audio, and graphics, many acknowledged between 1993 and 1995, that compression and fiber-optic technology was not yet able to realize these forecasts. One widely quoted engineer and visionary was George Gilder. He forecast that demand for larger bandwidth capacity and speed would simultaneously put pressure on engineers to develop fiber optic technologies:

> The same thing is on its way in fiber optics. We're going to gain access to the 25,000 gigahertz of capacity that's in each of the three windows in infrared spectrum that work with fiber optics.

Gilder also anticipated that dumb Networks would carry much of the load related to interactivity. Internet users hungry for interactivity would step off of the Internet into one of these dumb Network pockets, utilize the content made available there and then return for travel over the Internet:

You'll have intelligent devices of various sorts that are easily reachable from the Network, but aren't part of the actual fabric of the Network.

Financial analyst Michael Botein cautioned that the infrastructure's design should slow down and respond to demand rather than create supply before Internet demand existed:

Global data highways are likely, if not inevitable, within the next 20 years, but to build them now would be premature. Moving too soon would be likely to leave America with the world's first, but worst, fiber-optic system.

Botein forecast upgrades of the infrastructure based on demand:

In the near term, relatively inexpensive technological upgrades can thus give virtually all users access to new technologies and databases. This creates a window of opportunity, during which research can fully develop fiber's capabilities. This would make sophisticated technology available to business, educational and government users at low prices – but not for a generation. Fiber-optic superhighways? Yes. Now? Absolutely not.

THE INTERNET WILL SPAWN A NEW GENERATION
OF HARDWARE AND SOFTWARE


Without large corporate media companies present in the early stages of the Internet, many of the forecasts and predictions were rooted in the energy of small, entrepreneurial companies. Visionaries imagined a new series of consumer electronics, introduced by smaller companies in order to fill future demand for Internet-driven applications. The first challenge would be to end traditional thinking about established forms of media.

6.1  The Internet will challenge traditional computer and television applications.

Negroponte predicted that our television sets would become something more than a device for watching television programming:

> Your receiver, no less a computer than a TV, will digest and process a broadcast of that model. It will convert the model to sound or image, hard copy or soft copy, in greater or less detail at your discretion.

> As intelligence in the television system moves from the transmitter to the receiver, the difference between a TV and a personal computer will become negligible. All personal-computer vendors are adding video capabilities, thereby creating the de facto TV set of the future.

Barlow challenged traditional thinking about computers and all the internal and external devices in personal computers:

> Even the floppy disks, CD-ROMS to which we've become accustomed to will disappear as all computers jack-in to the global Net.

6.2  The Internet will launch data-driven devices and applications.

Beyond reconsidering the traditional role of television sets and personal computers, many of the hardware and software forecasts were related to a new generation of products. Scientist Arthur Clarke imagined that personal digital assistants, designed to allow for data on the go, would find a home in the Internet marketplace:

> About this emerging technology [PDAs, as he opens a Sony Data Discman and calls up an entry under the letter C]…this display is not very good, but that will be improved.  PDAs will be made smaller and lighter too.

Engineer Marc Portat predicted a handheld device that would allow me to "talk" from one hand held device to another:

> Think of it, you can dash off a note on a personal digital assistant (PDA), touch send and voila, it appears on the recipient's PDA.  All through the magic of a standard programming language called telescript and General Magic's MagicCAP interface.

Advances in software led to forecasts regarding bulletin board use and the Internet's chatting features.  Industry expert Jack Rickard predicted that bulletin board growth would control a significant portion of the Internet's interactivity:

> Of the 45,000 bulletin boards in operation at the end of 1992, over half will not be in operation at the end of 1993, but most likely an additional 30,000 systems will have gone online to bring the total close to 60,000 systems in the U.S.  The total seems to double every 18 months.

Between 1993 and 1995, our catalog of predictions included only one related to the Internet phenomenon of chat.  Computer consultant and analyst, John Markoff, forecast in the *New York Times* that chatting online would not replace physical meetings:

> I don't think this (chatting) could ever be a substitute for my in-person meetings.  Words just seem more sensitive when they come from the heart and the mouth.  The whole thing moves too slowly because you can talk a lot faster than you can type.

Our catalog of predictions also only found one related to Internet Service Providers.  Industry expert John Evans forecast that it was only a "matter of time" before ISPs began to offer content beyond their own and provide consumers with access to other services, such as gopher, WAIS, ftp, telnet, and simple e-mail:

New software developments were predicted by computer giant Bill Gates to be provided by individuals and Internet start-up companies:

> Most of the software that runs on the information highway will be written by smaller companies.

Industry expert Adam Sah anticipated consumers would demand that the next generation of software code be written for speed:

> With the increasing speed of the computers themselves, software latency is bound to drop.

THE INTERNET WILL CREATE A SMALLER WORLD

Satellite technology created a global path for the Internet, and a handful of the predictions and forecasts between 1993-1995 were related to the impact of Internet communication in creating a global culture.

7.1  <u>The Internet will create a global and more democratic society.</u>

Communication was forecast to lead to the global exchange of ideas and subsequently a more democratic and possibly capitalistic world.

Industry expert Fred Hapgood predicted that the Net would alter our sense of distance:

> The Net will further erode the relevance of geography in human relations.

Computer engineer Dertouzos forecast that the infrastructure of the Internet would make it impossible to determine who was online, and that citizens from around the world would be "talking" to each other:

> There are so many Networks and subNetworks on the Internet, nobody knows who's on it.  It could mean that there is no longer any meaning to international boundaries.  People in China and Iraq are talking to people in the United States without any of their governments knowing about it.

Internet financier George Soros forecast that the ability to communicate globally via the Internet would have far-reaching social implications, and forecast a breakdown of international commerce and diplomacy.  Soros said international divisions in social class would be challenged by the Internet's democratic access to information.  However, he predicted that the Third World may be further left behind:

> The super highway may bestride the Western world, but it still has a long way to go in the Third World.

THE INTERNET WILL TRANSFORM AMERICA'S SCHOOLS

The Internet in America's schools became the focus of early forecasts and predictions. The ideas embraced by Berners-Lee in his development of the World Wide Web were clearly related to the educational benefits of the Internet. The Internet would bring students to scholars, historians, professionals, and anyone else from whom they might be seeking an answer. One forecaster predicted that the traditional teacher would go away once the Internet became widely available and everyone online became a teacher of sorts.

Negroponte predicted that children on the Internet would be *heard and not seen,* and this characteristic would challenge the balance of power associated with age and knowledge. Negroponte also predicted that keyboarding skills would be introduced at the same time the alphabet was introduced, so students would be prepared to create content in a textual world where writing and reading are dominant skills.

8.1 The Internet should be available in every classroom.

Early predictions painted a picture of a wired classroom and centered on the notion of access. The "knowledge machine" had significant business applications and few were concerned that those would be realized, but clear in this assessment were concerns about schools and that the commitment be made from the onset to bring the Internet to schoolchildren.

Filmmaker George Lucas believed the potential of the Internet should first be realized in America's schools and as soon as possible:

> Telephone lines should connect every classroom to the Internet and other electronic services. Students would then gain access to resources few schools can afford; they could communicate with students and experts around the world.

Senator Bob Kerry forecast in a *Wired* article he co-wrote with Lucas that by supplying schools with Internet access, providers would guarantee a knowledgeable Internet workforce:

> Telephone lines in the classrooms would enable teachers to use the telephone and electronic services like other professionals do: to access information and communicate with community members, peers, parents, students, and experts.

Gore forecast in a *Washington Post* editorial what the Internet would bring to American schoolchildren:

> If we had the information superhighways we need, a school child could plug into the Library of Congress every afternoon and explore a universe of knowledge jumping from one subject to another, according to the curiosity of the moment.

8.2  The Internet will provide an opportunity for educational excellence.

Beyond access to the Internet, the capacity of the Internet to transform and lead America's schools to excellence was frequently predicted.  Jacques Leslie, an industry expert, believed that online technology could reform the school system and Senator Bob Kerry forecast that the information superhighway was the road to "educational excellence in America."

> Leslie predicted that the Internet in schools would be like a mythical Trojan horse:

> Telecomputing can become an agent of educational reform, a kind of Trojan horse that quietly, but thoroughly rearranges classrooms.  Schools will become true learning centers, linked to information resources throughout the world.

Educator Ed Lyell predicted students would log on in the same way they now raised their hand:

> In the case of education, it means a student is able to long onto a computer to learn about whatever he or she is interested in learning about at that particular point in time.

In a slight twist to that theme, industry expert Connie Guglielmo believed that not only would the student be able to tap into world, but the world would be able to tap into the student, opening the window on America's schools:

> A telecommunications Network that links students together and supports everything from data to video exchange would take education out of isolated classrooms, allowing computer-based systems to be set up at home, in local businesses, and at new community-based learning centers around Colorado.

Computer specialist Daniel Max, based in London, said that education in cyberspace could rival that in schools. But at the same time, he predicted that the traditional structure of the school (teacher to student) would change as a result of the Internet:

> There will be no teachers, the controllers of information, no censors, no editors and studio executives – all will disappear. The gates of public discourse will wing open before everyone who can get online. Anyone can publish; anyone can read what is published; anyone can comment on what he or she has read.

According to Max, the new balance of power will create a "messy" classroom:

> The classroom will be messy, the sense of information as an orderly retrievable quantity will decline and you won't necessarily be able to find what you are looking for in cyberspace at any given time.

MIT professor Seymour Papert forecast that the ability to read would still be needed, but "reading will no longer be the dominant consideration in the design of the school."

8.3  <u>The Internet will provide more efficient continuing education for classroom teachers.</u>

One isolated, but interesting, prediction dealt with the Internet's ability to improve the teacher and subsequently, improve the classroom. Jacques Leslie forecast that school teachers would go online and continue their own education:

Teachers would be in close contact with both colleagues and vast amounts of data, enabling them to grow intellectually, and in doing so model life-long learning for their students.

THE INTERNET WILL IMPACT PROFESSIONS

As Internet stakeholders began to consider the impact of the Internet on specific occupations, several predictions and forecasts appeared in the press in regard to how the Internet would transform different professions. The most frequently discussed professions were medicine, content providers, and those within the entertainment industries. Also given consideration was the American culture of work, with forecasts that the traditional work week of Monday through Friday from 8-5, would go by the wayside as wired interactivity between work and home became more commonplace.

9.1  The Internet will improve the quality of life of the sick and disabled.

Shared information between doctors separated by distance was frequently forecast by industry experts as a strong example of how the Internet would improve care of the sick through shared knowledge. Industry expert Nick Beard wrote in *Wired* that the state of Oklahoma's Medical Information Network would one day offer radiology, library, and reference services to remote sites via a wired Network:

> Instead of moving patients (or their X-ray images) to a doctor, or vice-versa, the information will be transmitted digitally.

Gore wrote in an editorial in the *Washington Post* that rural healthcare would dramatically improve with the resources provided by the Internet:

> A doctor in Carthage, Tennessee, could consult with experts at the Mayo Clinic in Minnesota on a patient's CAT scan in the middle of an emergency.

Gore also forecast that the digital processing of information would allow for early diagnosing of genetic disease.

The disabled were also predicted to take advantage of Internet technology. Gareth Branwyn wrote in *Wired* that the future would see technology intermingle with brain operations:

Whatever the date, the technology will eventually become a common enabling option for the disabled, and at that point, people will surely start talking about using the same technology for elective human augmentations.

The Internet was also predicted to be a major cost saver for healthcare organizations, savings that could eventually work their way back to the consumer. Medical records expert Arthur Little forecast the savings:

The U.S. could save $15 billion every year just by digitizing everyone's medical records and put them online, available to anyone with the right pass codes anywhere in the country.

9.2  The Internet will make the practice of journalism easier.

Negroponte believed that the ability to "talk" to experts and the effected over the Internet would make the job of field reporting much easier:

E-mail can be a terrific medium for reporters. E-mail interviews are both less intrusive and allow for more reflection. I am convinced that e-interviews will become a terrific medium and a standard tool for a large amount of journalism around the world – if only reporters can learn some digital decorum.

E-interviews will happen more and more, ultimately becoming a standard tool for journalism around the world.

9.3  The Internet will become a key player in the entertainment industry.

The Internet was forecast to take its place as a cultural phenomenon as significant as other forms of media. Industry writer John Markoff wrote in the *New York Times* that the Web would not replace current forms of entertainment, but rather become its own form of entertainment with its own features:

The Web is poised, not to replace its predecessors, but to take a place alongside them as a social, cultural, and economic force in its own right.

Negroponte forecast that traditional forms of media would feel under threat by the year 2000:

> In the year 2000, more people will be entertaining themselves on the Internet than by looking at what we call the television Networks today. The Internet will…[…]…start to serve up a broader range of entertainment.

Forms of entertainment, such as the music industry and the gaming industry, were forecast to be recreated with the Internet. Evan Schwartz told *Wired* magazine that, "for better or worse, cyberspace was gambling's next frontier:

> Transposed to the Net, gambling could be everywhere and nowhere at once. You could belly up to the crap table in secret whenever you want, without having to put up with the other fools doing the same. It could be done anonymously, so you could avoid the shame your friends and family impose on you when you lose.

Gaming was a "vice" that was predicted to drive "masses of people to interact in virtual worlds." Net gambling was anticipated to be only second in popularity to Internet pornography:

> In fifteen years, online gaming will probably be the norm rather than the exception.

MTV's Adam Curry predicted digital music would find a natural marriage with the Internet and provide music consumers a direct route to purchase:

> A virtual record company would distribute music over the Net, cutting out the middleman by delivering music directly to a consumer's stereo.

9.4  The Internet will provide new physical and virtual work environments.

With the Internet, the physical culture of America's work habits were predicted to change. The ability to telecommute was forecast as diminishing the importance of where a

company was physically located.  One research employee in North Carolina's Research Triangle Park forecast a means of creating virtual lab environments:

> The new system would be able to carry video conferencing, enabling scientists to work as though they were all in the same room.

Gore predicted that the Internet would allow "teams of scientists to work together in a co-laboratory environment if their supercomputers were linked."

Not all visions of the future Internet work world were as promising.  *Wired* writer Sah predicted telecommuting to be a feature not immediately within our grasp:

> Interactive telecommuting will be uncomfortable for many years to come, and for many applications it may not be viable in our lifetime.

CONCLUSIONS

Two underlying themes are clearly rooted in the early Internet predictions and forecasts made by industry experts, politicians, economists, journalists and others:

- The Internet as an information-sharing device that should remain free and in the public domain in order to bring about a better society.
- The Internet as an information and entertainment device that should remain free by way of advertising and its success will be driven by market forces.

These two synergistic ideas drove the success of the Internet between 1993 and 1995 and created a road map for those most involved in dreaming about what the Internet would become. The notions are synergistic in that without each view at play, the roll-out of the Internet would more than likely not be what it is today – a communication tool that brings together information in hopes that the cumulative information will create something better and a tool that entertains users on 24 hours a day, 7 days a week.

While Pool (1983) did not analyze the predictions and forecasts that were not made regarding the social impact of the telephone, we have done so in this study regarding the Internet because we find it beneficial to consider what was absent in forecasts and predictions.

Only one prediction in the dataset discussed the emergence of Internet Service Providers (ISP) as the key middle agents in the Internet arena. There was no mention of early ISPs or forecasts that one ISP would emerge as more powerful than any other ISP. This is of significance because ISPs have become the Internet's gatekeepers for a vast majority of Americans. Americans interact first with an ISP provider such as AOL, then the Internet. Predictions related to the success of such ISPs or their failures are notably absent.

Little reference is made in early predictions that the Internet would become important ground for advertising. Only one reference is made to spam, and it is described in that forecast as a nuisance that would eventually be controlled by user-installed software. While spam can be controlled at some level, intrusive advertising that pops-up and pops-under, as well as graphical interfaces that confuse Internet users into clicking into advertising domains, are notably absent from early discussions of the Internet.

Early predictions also forecast a direct link between consumers and products, changing the way in which a majority of Americans do business. Esther Dyson was the only early forecaster who predicted Americans would actual prefer doing business using middlemen/women and that Internet users would seek these agents out as they used the Web to make purchases.

This area of predictions is significant because of the impact such economic patterns have on society. America's economy is reliant at many levels on the salesman or woman as a bridge for the consumer to the product. A dramatic shift away from this pattern would have significant economic impact.

Also missing from early predictions and forecasts is the effect the Internet would have on other communication technologies. No one predicted the financial crisis of the United States Postal Service, however they did predict we would be e-mailing family and friends. No one predicted the enormous success of package-delivery services as a result of e-commerce. No one predicted the dramatic drop in long-distance phone bills for corporate America as everyone got online.

The successful predictions far outweigh what is absent. Forecasters were right, the Internet has transformed the flow of information in our society, has made us more global, has empowered special-interest groups, and we do buy books and airline tickets over the Web.

REFERENCES

Abbate, J.  (2000)  Inventing the Internet.  Cambridge, Massachusetts:  The MIT Press.

Abrahamson, D. (1998).  The visible hand:  Money, markets and media evolution.  Journal of Mass Communication Quarterly, 75(1), 14-18.

Altschiller, D. (Ed.).  (1995).  The information revolution.  New York:  H. W. Wilson.

Armstrong, J. (1991, September).  Prediction of consumer behavior by experts and novices.  Journal of Consumer Research, pp. 251-256.

Berners-Lee, T.  & Fischetti, M.  (1999).  Weaving the Web:  The original design and ultimate destiny of the world wide Web by its inventor.  San Francisco, CA:  Harper San Francisco, HarperCollins.

Brockman, J.  (Ed.).  (2000).  The greatest inventions of the past 2000 years. New York:  Simon & Schuster, Inc.

Burke, D. & Morrison, A. (2001, November & December).  Road kill on the superhighway.  Journal of Business Strategies, p. 5.

Cairncross, F.  (1997). The death of distance.  London:  The Orion Publishing Group.

Carey, J.  (1998).  The Internet and the end of the national communication system:  Uncertain predictions of an uncertain future.  Journal of Mass Communication Quarterly, 75(1), 28-34.

Clarke, A.  (1962).  Profiles of the future.  New York: H.M.H. Publishing Co.

Cothran, H.  (Ed.).  (2002).  The Internet.  San Diego, CA:  Greenhaven Press, Inc.

Corn, J.  (Ed.).  (1986).  Imagining tomorrow.  Cambridge, Massachusetts:  The MIT Press.

Crowley, D. & Heyer, P.  (1999).  Communication in history:  technology, culture and society.  New York:  Longman, Inc.

Davey, T.  (1993, December 31).  Tech firms have revolution on their agenda for new year.  San Francisco Business Times, p.  10A.

Deady, T.  (1994, December 26).  High-tech industry to focus on multimedia ventures.  Los Angeles Business Journal, p. 14.

Dicken-Garcia, H.  (1998).  The Internet and continuing historical discourse.  Journal of Mass Communication Quarterly.  75(1), 19-27.

Ebiri, B.  (2000, December).  Distant prophet.  Yahoo!  Internet Life,  pp. 123-125.

Etheridge, L.  (1997).  What next?  The intellectual legacy of Ithiel de Sola Pool.
     www.mit.edu/m-i-t/articles/etheridge.

Febvre, L. & Martin, H.  (1976).  The coming of the book:  The impact of printing:  1450-
     1800. Trans. by Gerard, D.  London:  N. L. B.

Gergen, D.  (1991, April 1).  America as a techno-colony.  U.S. News and World Report, p.
     88.

Gilder, G.  (2000).  Telecosm:  How infinite bandwidth will revolutionize our world.  New
     York:  The Free Press.

Golson, B.  (2000, December).  Nuts about the future.  Yahoo! Internet Life, p. 28.

Greene, M.  (1990, April 13).  Computer Networks open new worlds [Letter to the editor].
     The New York Times, p. A30.

Halal, W.  (2000, July).  The top 10 emerging technologies.  The Futurist, pp. 1-7.

Hamilton, M.  (1979, October 29).  Scientists fears U.S. regulation of electronic data.
     Washington Post, p. D10.

Hamm, B. (1995).  From awe to entertainment:  Audience expectations of radio in the 1920s.
     National Media Literacy Conference.  Boone, North Carolina.

Harvey, M.  (2000, June).  You've got (a whole lot of) mail.  Forecast, p. 3.

Horrigan, J. & Rainie, L. (2002).  Getting serious online.  Washington DC:  Pew Internet and
     American Life Project.  www.pewInternet.org.

Hudson, D.  (1997).  Rewired.  Indianapolis, Indiana:  Macmillan Technical Publishing.

Johnson, S.  (1997).  Interface culture.  San Francisco:  Basic Books, Perseus Books Group.

Jones, D. (1994, March 7).  High hopes for high-tech fall short for lack of mentors.
     Pittsburgh Business Times, p. 16.

Kahin, B & Nesson, C.  (1997).  Borders in cyberspace:  Information policy and the global
     information infrastructure.  Cambridge, Massachusetts:  The MIT Press.

Karpinski, R.  (2001, January 8).  Forecasting all about specifics.  B to B,  pp. 10-12.

Kehoe, B. (1994).  Zen and the art of the Internet (3$^{rd}$ ed. ) .  Englewood Cliffs, New Jersey:
     Prentice Hall.

Kiesler, S. (1997). Culture of the Internet. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Kirkpatrick, D. (2001, December 10). The Internet is dead – long live the Internet. <u>Fortune</u>, pp. 239-241.

Long, P. (2002, February). Weaving semantics into the Web. <u>Syllabus</u>, pp. 8-10.

McGrath, P. (1999, September 20). Potholes on the road ahead: tense about the future? You're not alone. High tech can create high anxiety. <u>Newsweek</u>, p. 78.

McKnight, L. & Bailey, J. (Eds.). (1998). Internet economics. Cambridge, Massachusetts: The MIT Press.

Mindich, D. (1998). The future of the Internet: a historical perspective. <u>Journal of Mass Communication Quarterly</u>. 75<u>(1)</u>, 7-8.

Montagu-Pollock, M. (2000, June). Standby for the Internet explosion. <u>Asiamoney</u>, p. 40.

Papert, S. (1996). The connected family. Marietta, Georgia: Longstreet Press, Inc.

Pool, Ithiel de Sola (1983). Forecasting the telephone: A retrospective technology assessment of the telephone. Norwood, New Jersey: Ablex Publishing corporation.

Pool, Ithiel de Sola (1990). Technologies without boundaries: On telecommunications in a global age. Cambridge, Massachusetts: Harvard University Press.

Rayport, J. (1991). Knowing more and more about less and less. <u>Regional Review</u>, <u>1</u>(2), p. 26.

Reid, R. (1997). The architects of the Web: 1000 days that built the future of business. New York: John Wiley & Sons.

Richman, J. (1993, December 15). Superhighway mapping; think transaction and entertainment when approaching the electronic future. <u>Inside Media</u>, p. 30.

Rossetto, L. (1993, March). Premier issue of Wired editorial. San Francisco: Hotwired.

Saracco, R., Harrow, J. & Weihmayer, R. (2000). The disappearance of telecommunications. New York: The Institute of Electrical and Electronics Engineers, Inc.

Staff. (2002, February). Lippman on learning. <u>Syllabus</u>, pp. 12-14.

Staff.  (1997, March 29).  Caught in the Net:  too early for customers?  <u>The Economist</u>, pp. 16-19.

Staff.  (1997, August).  Forecast: long-term growth.  <u>PC Magazine</u>, p. 10.

Standage, T.  (1998).  The Victorian Internet:  The remarkable story of the telegraph and the nineteenth century's on-line pioneers.  New York:  Walker & Company.

Stephens, M.  (1997). A history of news.  New York:  Harcourt Brace College Publishers.

Stephens, M.  (1998).  Which communications revolution is it, anyway?  <u>Journal of Mass Communication Quarterly</u>, <u>75</u>(1), 9-13.

Sterling, B.  (1993, February).  Short history of the Internet.  <u>The Magazine of Fantasy and Science Fiction</u>, pp. 9-16.

Stoll, C.  (1995).  Silicon snake oil:  Second thoughts on the information highway.  New York:  Anchor Books Doubleday.

Stone, A. (1997).  How America got on-line.  Armonk, New York:  M.E. Sharpe.

Sussman, L.  (1994, January 4).  The world is smaller than we think.  <u>Los Angeles Times</u>, p. B7.

Tenner, E.  (2000, January 3).  We the innovators.  <u>U.S. News & World Report</u>, p. 74.

Thomas, H.  (1999, November).  Censory deception.  <u>Reason</u>, p. 66.

Thomson, G.  (1955).  The foreseeable future.  Cambridge:  The University Press.

Valovic, T.  (2000).  Digital mythologies:  the hidden complexities of the Internet.  New Brunswick, New Jersey;  Rutgers University Press.

Wagner, C.  (2001, November).  Will humans be obsolete in 2050?  <u>The Futurist</u>.  p. 3.

Weiners, B. & Pescovitz, D. (1996).  Reality check.  San Francisco:  Hard Wired Books.

Wetzel, R.  (2001, October 8).  No keyboards, just talk:  kids' desires and predictions for the Internet's future.  <u>Interactive Week</u>, p. 30.

Young, G.  (Ed.).  (1998).  The Internet.  New York:  H.W. Wilson Company.

APPENDIX

Banking

| *St. Petersburg Times* | Norris | Kim | Business | November | 19 | 1990 | Norris | Kim | While it may not be possible now to have your bank at your fingertips, the technology is not far away, banking experts say.  It's only a matter of time before the two-pound notebook computers become the size of videotapes and as ubiquitous as mobile telephones. |
|---|---|---|---|---|---|---|---|---|---|
| *St. Petersburg Times* | Norris | Kim | Business | November | 19 | 1990 | Russell | John | Ten percent of the population will be using home-access banking by the middle of the decade. |
| *St. Petersburg Times* | Norris | Kim | Business | November | 19 | 1990 | Russell | John | Banks won't rely on new residents.  Banks will run the gamut from "high-tech to high-touch."  Customers will be able to access banks that don't have branches with computers or choose branches staffed with customer-activated computers instead of people. |
| *St. Petersburg Times* | Norris | Kim | Business | November | 19 | 1990 | Russell | John | The distinction among banks will blur as customers are able to use any bank they choose, regardless of location. |
| *St. Petersburg Times* | Norris | Kim | Business | November | 19 | 1990 | Russell | John | Customers and their bankers will have access to more information than ever.  This will allow banks to customize their services to the individual and will give customers a far greater choice of products, services and vendors |

Books

| *Wired* | Browning | John | Premier Issue | 1993 | Browning | John | Books once hoarded in subterranean stacks will be scanned into computers and made available to anyone, anywhere, almost instantly over high-speed networks. |
|---|---|---|---|---|---|---|---|
| *Wired* | Rickard | Jack | September/October | 1993 | Rickard | Jack | The commercial consequences of electronic libraries could be huge and publishers' trade associations are already closely watching libraries with a watchful eye. |

Brain

| Wired | Branwyn | Gareth | September/October | 1993 | Branwyn | Gareth | An inherent confusion between fantasy and reality is to be expected. |
|-------|---------|--------|-------------------|------|---------|--------|----------------------------------------------------------------------|
| Wired | Branwyn | Gareth | September/October | 1993 | Branwyn | Gareth | For the near future, the bulk of elective interface options will continue to be softwired ones, mainly via the sophisticated neural transducers we already have: our five senses. |

Bulletin Board

| *Wired* | Rickard | Jack | September/October | 1993 | Rickard | Jack | Of the 45,000 bulletin boards in operation at the end of 1992, over half will not be in operation at the end of 1993 - but most likely an additional 30,000 systems will have gone online to bring the total close to 60,000 systems in the U.S. The total seems to double every 18 months. |
|---------|---------|------|-------------------|------|---------|------|---|
| *Wired* | Kreth | Will | January | 1994 | Aboba | Bernard | OneNet will become the largest Macintosh-oriented bulletin board network. |

Censorship

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *San Diego Union-Tribune* | Lewis | Peter H. | May | 24 | 1994 | Hayes | David NASA-Pasadena | What people will probably do is invent site-kill files [that would allow UseNet administrators to block any messages coming from a certain computer or certain parts of the network]. |
| *San Diego Union-Tribune* | Lewis | Peter H. | May | 24 | 1994 | Hayes | David NASA-Pasadena | My fear is that this will be a cyber-revisiting of the blacklisting that was prevalent in the '50s [. . .].  Eventually, I predict that such site-kill files will be used to censor politically unpopular views [. . .]. |

Chat

| NYT | Foderaro | Lisa | Metro | March | 22 | 1995 | Markoff | John | "I don't think this (chatting) could ever be a substitute for my in-person meetings," John Markoff said. "Words just seem more sensitive when they come from the heart and the mouth. The whole thing moves too slowly because you can talk a lot faster than you can type." |
|-----|----------|------|-------|-------|-----|------|---------|------|---|

## Community

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Wired* | Dyson | Esther | July | 1995 | Dyson | Esther | In the new communities of the Net, the intrinsic value of content generally will remain high, but most individual items will have a short commercial half-life. Creators will have to fight to attract attention and get paid. Creativity will proliferate, but quality will be scarce and hard to recognize. |
| *Wired* | Dyson | Esther | July | 1995 | Dyson | Esther | Just as shopping malls offer rides and cafes are not only places to buy lattes but places where people can meet, so will cyberspace real estate provide environments for engaging social interaction. |

Content

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Wired* | Dyson | Esther | July | | 1995 | Dyson | Esther | Net content will serve as advertising for services such as support, aggregation, filtering, assembly and integration of content modules, or training of customers in their use.  Intellectual property that can be copied easily likely will be copied.  It will be copied so easily and efficiently that much of it will be distributed free in order to attract attention or create desire for follow-up services that can be charged for. |
| *Wired* | Barlow | John Perry | March | | 1994 | Barlow | John Perry | While the Internet may include every CPU on the planet, it is more than doubling every year and can be expected to become the principal medium of information conveyance, and perhaps, eventually the only one.  Once that has happened, all the goods of the Information Age, all the expressions once contained in books or film strips will existing as pure thought, voltage conditions darting around the Net at the speed of light, in conditions that one might behold in effect, as glowing pixels or transmitted sounds, but never touch or claim to own in the sense of the word. |
| *Los Angeles Times* | Weber | Jonathan | Nov | 25 | 1995 | Coursey | David | There is "every likelihood the Internet will soon be about as enriching as television, at least as far as the mass consumption of the Net is concerned."  And he doesn't mean that as a compliment. |

Copyright

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Wired* | Barlow | John Perry | March | | 1994 | Barlow | John Perry | Intellectual property law cannot be patched, retrofitted or expanded to contain digitized expression any more than real estate law might be revised to cover the allocation of broadcasting spectrum. |
| *Wired* | Barlow | John Perry | March | | 1994 | Barlow | John Perry | Direct interaction will provide a lot of intellectual property protection in the future. |
| *Wired* | Jennings | Tom | June | | 1994 | Barlow | John Perry | The same culture that led to widespread hacker penetration of copy protection schemes will lead to defeat for technology-based copyright protection. |
| *Being Digital*. New York: Alfred A. Knopf, Inc., *1995*. | Negroponte | Nicholas | | 59 | 1995 | Negroponte | Nicholas | In the digital world it is not just a matter of copying being easier and copies more faithful.  We will see a new kind of fraud, which may not be fraud at all.  When I read something on the Internet and, like a clipping from a newspaper, wish to send a copy of it to somebody else or to a mailing list of people, this seems harmless.  But, with less than a dozen keystrokes, I could redeliver that material to literally thousands of people all over the planet (unlike a newspaper clipping).  Clipping bits is very different from clipping atoms. |

Digital Art

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Being Digital*. New York: Alfred A. Knopf, Inc., 1995. | Negroponte | Nicholas | 204 | 1995 | Negroponte | Nicholas | The digital superhighway will turn finished and unalterable art into a thing of the past. The numbers of mustaches given to Mona Lisa is just child's play. We will see serious digital manipulation performed on said-to-be-complete expressions moving across the Internet, which is not necessarily bad. | Digital Art |
| *Being Digital*. New York: Alfred A. Knopf, Inc., 1995. | Negroponte | Nicholas | 224 | 1995 | Negroponte | Nicholas | Artists will come to see the Internet as the world's largest gallery for their expressions and as a means of disseminating them directly to the people. | Digital Art |

E-Commerce

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *NYT* | Markoff | John | Ideas/ Trends | Jan | 2 | '94 | Markoff | John | Soon it will be possible to glide electronically through the vast virtual shopping malls or turn your television into a digital cineplex. |
| *NYT* | Markoff | John | Ideas/ Trends | Jan | 2 | '94 | Sclove | Richard | "Cyberspace is going to finish what Wal-Mart started," said Richard Sclove, the executive director of the Loka Institute, a public policy research center in Amherst, Mass. "Interactive shopping via computer networks is going to put more traditional downtowns and more mom-and-pop stores out of business." |
| *Wired* | Dyson | Esther | | July | | '95 | Dyson | Esther | Unknown vendors who can guarantee functionality will squeeze the prices of the market leaders.  Of course the leaders, such as Microsoft, will continue to win because they can use almost-free content to sell ancillary products or upgrades, and because they've reinvested in loyal distribution channels. |
| *Profit* | Portsmouth | Ian | | Fall | 32 | '95 | Chalk | Dave | Online retailing will be big - in a few years. [. . .]  By decade's end . . .5% of all retail purchases will be made online. |
| *Profit* | Portsmouth | Ian | | Fall | | '95 | Chalk | Dave | Net will never replace shopping trips.  "You'll just . . . Get prepared, read product reviews, look at components. The retail side will still be there, but you won't have to run around looking for depth of information." |
| *Business and* | Bronson | Gail | | Feb | 13 | '95 | Hogan | Edward [Master- | Internet commerce could become quite |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Industry* | | | | | | | | Card's senior VP] | substantial in the very near future. |
| *Newsweek* | Levy | Steven [w/ Katie Hafner and Adam Rogers] | | Dec 25/ Jan 1 | | '96 | Levy | Steven | Indeed, as a higher share of the population gets wired, business will reshape itself to take advantage of the instant communication with customers the Net will provide. |
| *Financial Times (London)* | Kehoe | Louise | | June | 6 | '94 | Kehoe | Louise | Due to corporate reluctance to entrust sensitive and commercial information to cyberspace, very little commerce has occurred. But that could be about to change. |
| *Financial Times (London)* | Kehoe | Louise | | June | 6 | '94 | Tennenbaum | Marty | I believe that in two to three years you will see as many as 100,000 companies using the Internet as a principal sales and service channel.[. . .] |
| *Financial Times (London)* | Kehoe | Louise | | June | 6 | '94 | Tennenbaum | Marty | CommerceNet itself will be handling business transactions for as many as 3,000 companies by the turn of the century. |
| *Arizona Republic* | Bloomberg Business News | | | April | 17 | '94 | Adams | Randy | This is just the beginning of electronic shopping on the information superhighway. [. . .] Our future plans call for the addition of many new 'stores,' providing an endless array of consumer products. |
| *Newsday* | Quittner | Joshua | News | Nov | 1 | '92 | Experts | | Within the next year or two, Internet experts also predict a surge in commercial services, such as multimedia catalogues |
| *Newsday* | Quittner | Joshua | News | Nov | 1 | '92 | Experts | | Odasz says the Internet, like a railroad, could bring jobs and markets to Montana. "We could be engaging in International Trade and swapping Montana Alfalfa cubes with |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | products from other countries, potato vodka from Estonia, whatever," he said. |
| *Newsweek* | Stoll | Clifford | | Feb | 27 | '95 | | | Then there's cyberbusiness. We're promised instant catalog shopping - just point and click for great deals. We'll order airline tickets over the network, make restaurant reservations and negotiate sales contracts. Stores will become obsolete. So how come my local mall does more business in an afternoon than the entire Internet handles in a month? Even if there were a trustworthy way to send money over the Internet - which there isn't - the network is missing a most essential ingredient of capitalism: salespeople. |
| *NYT* | Lewis | Peter | Tech-nology | Aug | 25 | '95 | Rothschild | Michael | The rise of electronic commerce isn't going to be painless. |
| *NYT* | Lewis | Peter | | May | 11 | '94 | Agre | Phil | If such events [the interjection of advertisement into the communal resource of UseNet] become routine - and there's very little technical or legal reason why they won't - then the whole Net will basically collapse through flame-wars ["flames" are scornful messages transmitted over the Net], the closing of e-mail discussion groups to outsiders and whatever. |
| *Being Digital*. New York: | Negroponte | Nicholas | | | 228 | '95 | Negroponte | Nicholas | As the business world globalizes and the Internet grows, we will start to see a seamless |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Alfred A. Knopf, Inc., 1995. | | | | | | | | | digital workplace. Long before political harmony and long before the GATT talks can reach agreement on the tariff and trade of atoms (the right to sell Evian water in California), bits will be borderless, stored and manipulated with absolutely no respect to geopolitical boundaries. In fact, time zones will probably play a bigger role in our digital future than trade zones. |
| *Financial Times (London)* | Rawsthorn | Alice | | Nov | 21 | '94 | John | Sara | There's no doubt that at some stage digital diffusion will become a major part of the music market. My personal opinion is that is could happen very, very quickly. |
| *Newsweek* | | | | May | 2 | '94 | Curry | Adam [former MTV VJ] | The future lies in cyberspace |

Economics

| NYT | Markoff | John | Ideas/ Trends | Jan | 2 | 1994 | Roberts | Michael | Despite the land-rush mentality, some network pioneers believe that the vibrant cyberspace communities are resilient enough to resist the flood of commercial services. "For every greedy guy who shows up on the network trying to make a buck, there will be people around with something of equal value that's available for free," said Michael Roberts, a vice president of Educom, a consortium of university network users. "That will do a lot to thwart the greed." |
|---|---|---|---|---|---|---|---|---|---|
| Wired | Hoffman & Novak | Donna & Thomas | | Nov | | 1994 | Donna & Thomas | Novak | The Internet may not evolve further without careful measurement of its users. |
| Wired | Dyson | Esther | | July | | 1995 | Dyson | Esther | Contrary to the notion that the Net will be a disintermediated world, much of the payment that ostensibly goes for content will go to the middlemen and trusted intermediaries who add value - everything from guarantees of authenticity to software support, selection, filtering, interpretation and analysis. |
| Profit | Portsmouth | Ian | | Fall | | 1995 | Portsmouth | Ian | You can make money in cyberspace - but probably not today, and maybe not tomorrow. |
| Wired | Kelly | Kevin | | July/ Aug | | 1993 | Kelly | Kevin | Right now Net vending machines are free, but sometime in the near future, some will accept a form of electronic money for commercial material. |
| Wired | Hoffman & Novak | Donna & Thomas | | Nov | | 1994 | Donna & Thomas | Novak | In the explosively evolving Internet environment, we expect that the novelty of many commercial sites will soon fade, and then the real competition to attract visits to commercial sites will begin. |
| Washington Post | Gore | Al | Outlook | July | 15 | 1990 | Gore | Al | At first, the network would be supported by the federal |

| | | | | | | | | | government; but user fees would make it viable as a private enterprise that would grow exponentially. Eventually it could reach into homes, providing anyone with a personal computer access to a whole universe of electronic information. |
|---|---|---|---|---|---|---|---|---|---|

Economy

| TIME | Church | George | Business | October | 4 | 1995 | Church | George | The effects of the Internet are only a foretaste of what could change the economy and the way business is conducted, almost beyond recognition. |
|---|---|---|---|---|---|---|---|---|---|
| TIME | Church | George | Business | October | 4 | 1995 | Sinai | | But without the Internet, Sinai adds, by now "we probably would have an inflation problem we couldn't handle." He senses an enhanced source of instability - the frenzied pace of stock and real estate trading, speeded up by the Internet and intensified by the enthusiasm of the investors may result in a bubble of inflated prices for some Internet and IT companies ending in a crash. |
| NYT | Lewis | Peter H | Technology | August | 25 | 1995 | Huber | Peter W | "We'll see a revolution in the infrastructure of the marketplace," said Peter W. Huber, a telecommunications lawyer who was one of the two dozen panelists. As explained by Mr. Huber and an array of economists and technologists at the conference, computer networks will act as the grease for all markets, enabling producers and consumers to communicate directly. By eliminating the middleman sector of the economy, the Internet will enable global markets to be more efficient than ever before. Once that happens, many of the functions now performed by government, from air traffic control to the monetary system itself can be handed back to the private sector. The result: "We should see the markets accelerating and improving beyond recognition," Mr. Huber predicted - but only if the government steps out of the way and allows the process to follow its natural |

| | | | | | | | | | course. |
|---|---|---|---|---|---|---|---|---|---|

Education

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Lucas & Kerry | George & Sen. Bob | | Sept. | | 1994 | Lucas | George | Telephone lines should connect every classroom to the Internet and other electronic services. Students would then gain access to resources few schools can afford; they could then communicate with students and experts around the world. |
| *Wired* | Lucas & Kerry | George & Sen. Bob | | Sept. | | 1994 | Kerry | Bob | Telephone lines in the classrooms would enable teachers to use the telephone and electronic services like other professionals do: to access information and communicate with community members, peers, parents, students, and experts. |
| *Wired* | Lucas & Kerry | George & Sen. Bob | | Sept. | | 1994 | Kerry | Bob | The information superhighway is the road to educational excellence in America. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | Online technology can reform our schools. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | Telecomputing can become an agent of educational reform, a kind of Trojan horse that quietly but thoroughly rearranges classrooms. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | Schools would become true learning centers, linked to information resources throughout the world. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | Teachers would be in close contact with both colleagues and vast amounts of data, enabling them to grow intellectually, and in doing so, model life-long learning for their students. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | Students would have access to a substantial portion of the world's |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | potential mentors and potential friends. |
| *Wired* | Leslie | Jacques | | Nov. | | 1993 | Leslie | Jacques | In the end, the machines themselves would recede from notice, taken for granted, while the links they forge deepen and multiply. |
| *Wired* | Guglielmo | Connie | | Dec | | 1993 | Lyell | Ed | In the case of education, it means a student is able to log onto a computer to learn about whatever he or she is interested in learning about at that particular point in time. |
| *Wired* | Guglielmo | Connie | | Dec | | 1993 | Guglielmo | Connie | A telecommunications network that links students together and supports everything from data to video exchange would take education out of isolated classrooms, allowing computer-based systems to be set up at home, in local businesses, and at new community-based learning centers around Colorado. |
| *Washington Post* | Gore | Al | Outlook | July | 15 | 1990 | Gore | Al | If we had the information superhighways we need, a school child could plug into the Library of Congress every afternoon and explore a universe of knowledge, jumping from one subject to another, according to the curiosity of the moment. |
| *The Guardian (London)* | Max | Daniel | | Jan. | 3 | 1995 | Max | Daniel | Cyberspace will be like a better kind of school. |
| *The Guardian (London)* | Max | Daniel | | Jan. | 3 | 1995 | Max | Daniel | The classroom will be huge: the linking of information worldwide will cause a democratic explosion in the accessibility of knowledge |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *The Guardian (London)* | Max | Daniel | | Jan. | 3 | 1995 | Max | Daniel | The classroom will be messy: the sense of information as an orderly and retrievable quantity will decline, and you won't necessarily be able to find what you're looking for in cyberspace at any given time. |
| *The Guardian (London)* | Max | Daniel | | Jan. | 3 | 1995 | Max | Daniel | There will be no teachers: the "controllers of information"- censors, editors and studio executives - will disappear, and the gates of public discourse will swing open before everyone who can get online. Anyone can publish; anyone can read what is published; anyone can comment on what he or she has read. |
| *Being Digital*. New York: Alfred A. Knopf, Inc., 1995. | Negroponte | Nicholas | | | 20 2 | 1995 | Negroponte | Nicholas | Today kids are getting the opportunity to be street smart on the Internet, where *children are heard and not seen*. Ironically, reading and writing will benefit. Children will read and write on the Internet to communicate, not just to complete some abstract and artificial exercise. [. . .] The Internet provides a new medium for reaching out to find knowledge and meaning. |
| *Wired* | Papert | Seymour | | May/ June | | 1993 | Papert | Seymour | Admitting the prospect of Knowledge Machine does not imply that people will no longer need to read. But reading will no longer be the dominant consideration in the design of school. |

E-Money

| *Wired* | Levy | Steve | Dec. | 1994 | Levy | Steve | Commerce on the Net will reproduce the process in cyberspace: you will download money from your bank, put it in a virtual wallet, and spend it online. |
|---------|------|-------|------|------|------|-------|-----------|
| *Wired* | Levy | Steve | Dec. | 1994 | Levy | Steve | You will also be able to receive money from your employer, someone who buys something from you, or a friendly soul who lends you a virtual sawbuck until payday. |
| *Wired* | Levy | Steve | Dec. | 1994 | Levy | Steve | Everything you do could be known to anyone else, could be recorded forever. |
| *Wired* | Levy | Steve | Dec. | 1994 | Levy | Steve | Cyberspace is destined to be the first battleground of the digital money wars. |

Entertainment

| *Wired* | Goldberg | Michael | Jan | | 1994 | McCracken | Ed | I think the biggest application of the superhighways will be entertainment. |
|---|---|---|---|---|---|---|---|---|
| *Being Digital*. New York: Alfred A. Knopf, Inc., 1995. | Negroponte | Nicholas | | 182 | 1995 | Negroponte | Nicholas | In the year 2000, more people will be entertaining themselves on the Internet than by looking at what we call the networks today [i.e., television networks].  The Internet will evolve beyond MUDs and MOOs [. . .] and start to serve up a broader range of entertainment. |

Family

| *Wired* | Hapgood | Fred | Dec. | 1994 | Hapgood | Fred | Every family will have its own mailing list carrying contributions from its members. At that point-actually long before it - we will have to triage our mail still further. |

Federal Government Issues

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Kelly | Kevin | | Sept../Oct. | | 1993 | Gilder | George | The Clinton administration is going to have 50,000 technology programs and lo and behold, a million technologies will bloom and they will take credit for it all. |
| *Newsday* | Quittner | Joshua | News | Nov | 1 | 1992 | Experts | | There is a widespread belief that many of the obstacles limiting Internet growth will disappear if the Democratic ticket of Bill Clinton and Al Gore win this Tuesday. |
| *Wired* | Spence | Kristin | | May/June | | 1993 | Rose | Charlie | Through landmark legislation called the Window Bill, Rose hopes to have all public information-including congressional records and hearings-transferred into cyberspace for public access. |
| *Washington Post* | Burgess | John | Financial | Sept. | 12 | 1991 | Gore | Al | The network would enable the United States to "leap-frog competitors like the Japanese in a number of key areas and make the most productive use of the talents of our people," said Sen. Al Gore (D-Tenn.) the bill's author. |
| *Wired* | Barlow | John Perry | | April | | 1994 | Barlow | John Perry | The national security state, with the backing of the Clinton-Gore administration, is attempting a stealth strike on our rights, if they succeed, we could shortly find ourselves under a government with the automated ability to log the time, origin and recipient of every call and e-mail message, to monitor our most private communications, to track our physical whereabouts continuously and to keep better account of our financial transactions than we do, all without a warrant. |

Internet Gaming

| *Wired* | Schwartz | Evan | October | 1995 | Schwartz | Evan | For better or worse, cyberspace is gambling's next frontier. Transposed to the Net, gambling could be everywhere and nowhere at once. You could belly up to the crap table in secret whenever you want, without having to put up with the other fools doing the same. It could be done anonymously, so you could avoid the shame your friends and family impose on you when you lose. |
|---|---|---|---|---|---|---|---|
| *Wired* | Schwartz | Evan | October | 1995 | Herschman | David | It's a vice that will drive masses of people to interact in virtual worlds. |
| *Wired* | Schwartz | Evan | October | 1995 | Herschman | David | When politicians realize that money flowing offshore could be routed into taxable U.S. economy, Net gambling could well become like pornography on the Internet. |
| *Wired* | Kelly | Kevin | Jan | 1994 | Wright | Will | In fifteen years, by then online gaming will probably be the norm rather than the exception. |

General Predictions

| *NYT* | Markoff | John | | Aug. | 24 | '93 | Shrader | William [Performance System's president and chief executive] | We believe that this activity [i.e. the availability of LOC catalogue, National Weather Service satellite images, cable connections carrying e-mail and other information] is small compared to the grand visions of the future data highway. |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Hoffman & Novak | Donna & Thomas | | Nov. | | '94 | Donna & Thomas | Hoffman & Novak | Surveying the size of the Net will be difficult, complex, and costly. |
| *Wired* | Hoffman & Novak | Donna & Thomas | | Nov. | | '94 | Donna & Thomas | Hoffman & Novak | Today's e-mail newbie is tomorrow's Web surfer. |
| *TIME* | Church | George | Business | Oct. | 4 | '95 | Time's Board of Economist | | TIME's board says the Internet will transform nearly everything, mostly for good. But don't take it for granted. |
| *TIME* | Church | George | Business | Oct. | 4 | '95 | Newman | Berry | You're going to see the Internet become a core portion of every business, of the way youth think about entertainment, communication and information. |
| *TIME* | Church | George | Business | Oct. | 4 | '95 | Romer | Paul | People will put a higher value on their time off as well as on the job, Romer continues, and this will promote and be aided by the accelerating growth of the Internet. |
| *Washington Post* | Gore | Al | Outlook | July | 15 | '90 | Gore | Al | Scientific American recently reported that experts in the field have concluded: "The developed world is experiencing a transforming convergence of computing and communications technology whose impact will rival that of the replacement of muscle power by |

| | | | | | | | | | machines." |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Kapor | Mitchell | | July/ Aug. | | '93 | Kapor | Mitchell | This information highway, we are told, will be used as a pipeline to bring an expanded universe of information and entertainment into the home and the workplace. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | '93 | Kapor | Mitchell | Thousands of movies, mail-order catalogs, newspapers and magazines, educational courses, airline schedules, and other information databases will be available with a few clicks of a remote control. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | '93 | Kapor | Mitchell | In the worst case, we could wind up with networks that have the principal effect of fostering addiction to a new generation of electronic narcotics; their principal themes revolving around instant gratification through sex, violence, or sexual violence; their uses and content determined by mega-corporations pushing mindless consumption of things we don't need and aren't good for us. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | '93 | Kapor | Mitchell | Content supplied only by a carefully chosen set of provider barriers to entry will be created for everyone else programming will still seek the least common denominator and the population will be divided by income information haves and have-nots. |
| *Wired* | Steinberg | Steve | | Sept./ Oct. | | '93 | Kapor | Mitchell | Hopefully the good things about the Net will remain as we move toward Internet Inc. |
| *Wired* | Sterling | Bruce | | Sept./ | | '93 | Smith | Bob | It's impossible for me to |

| | | | | Oct. | | | | | imagine contemporary life in 2015 without the global Net; living without the Net would be like trying to live without electricity. |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Sterling | Bruce | | Sept./ Oct. | | '93 | Smith | Bob | Because of the Internet it is now possible to carry out transactions entirely in cyberspace, many information entrepreneurs in 2015 have simply given up any physical home. |
| *Wired* | Hughes | Dave | | Jan. | | '94 | Hughes | Dave | I'll bet the Internet as we know it will be passe' in five years. |
| *Wired* | Stahlman | Mark | | Mar. | | '94 | Stahlman | Mark | There will be no convergence. |
| *Wired* | Saffo | Paul | | Mar. | | '94 | Saffo | Paul | Individuals with unique points of view could become the superstars of cyberspace, their personalities immortalized in software traveling the Web. |
| *Wired* | Godwin | Mike | | April | | '94 | Godwin | Mike | When the information superhighways are all built, they say, and we're able to transmit live, full-motion video to each other, we will enter a Golden Age of Telepresence, and online misunderstandings will evaporate. |
| *Wired* | Negroponte | Nicholas | | April | | '94 | Negroponte | Nicholas | By the turn of the century almost everyone will be using e-mail, not fax |
| *Wired* | Cappio | James | | June | | '94 | Cappio | James | Its real payoff, its visionary promise, would be the possibility of an "Athens without slaves" in which people can provide information as easily as they consume it. A networked world offers the possibility of many-to-many communication, permitting widely |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | separated individuals to bind themselves into collectives. |
| *Wired* | Cappio | James | | June | | '94 | Cappio | James | As the existence of a true many-to-many world Network implies, everybody has the power to make artistic products of any kind and to distribute them to anybody on the planet essentially for the asking, the need for an entertainment industry suddenly disappears. |
| *Wired* | Godwin | Mike | | June | | '94 | Godwin | Mike | What most of us will want in cyberspace in the future is a place where we've known and accepted on the basis of what Martin Luther King Jr. called "the content of our character." |
| *Wired* | Bowkett | Giles | | Oct. | | '95 | Bowkett | Giles | If anything, humans and computers will grow together, becoming increasingly difficult to separate. Computers may evolve, but their evolution isn't shaped by natural selection it's shaped by human computer market. |
| *Wired* | Bowkett | Giles | | Oct. | | '95 | Bowkett | Giles | Instead of replacing us, computers will become a secondary, symbiotic species, enhancing our lives in specialized but powerful ways. In the process, they will transform what it means to be human. |
| *Wired* | Bayer | Chip | | Dec. | | '95 | Andreessen | Marc | Instead of having Open Doc containers, or OLE containers, you're going to have HTML documents containing all these different things: Java objects, Macromedia Director files, different types of audio formats, video |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | formats, portable document formats, just about everything. |
| *Wired* | Bayer | Chip | | Dec. | | '95 | Andreessen | Marc | | I don't see a Netscape-controlled future for the Net. The Internet is too dynamic and innovative. No single company will control everything. |
| *Newsday* | Quittner | Joshua | News | Nov. | 1 | '92 | Experts | | | The Internet is nearing critical mass and is about to take a giant leap in size and importance, experts say. This grand experiment is heading from the realm of science into the domain of ordinary life |
| *NYT* | Botein | Michael | Financial | Mar. | 14 | '93 | Botein | Michael | | In reality, the country is neither technologically nor economically ready. |
| *NYT* | Johnson | George | Ideas/ Trends | Oct. | 24 | '93 | Johnson | George | | Someday the visionaries tell us we will be able to communicate with just about anybody by sending an electronic message; no matter where they are, the bundle of bits will find them. On the information superhighway, the literature of the world and the videos, too, will be just a point and click away. So will anyone we want to hear from. Someday, perhaps, but not yet. |
| *NYT* | Johnson | George | Ideas/ Trends | Oct. | 24 | '93 | Coover | Robert | | Early developers of this new communications arena are hoping to turn it into a vast worldwide marketplace and to take their cut by renting stalls, as it were, but exclusive access has never been a principle of the ether, home of the computer Nets. If telephony and cable put a lock on the hard- |

| | | | | | | | | | wiring, watch for pirate satellite ships. |
|---|---|---|---|---|---|---|---|---|---|

Global

| *Wired* | Hapgood | Fred | | Dec. | | 1994 | Hapgood | Fred | The Net will further erode the relevance of geography in human relations. |
|---|---|---|---|---|---|---|---|---|---|
| *Boston Globe* | Radin | Charles A. | National/ Foreign | Dec. | 26 | 1992 | Dertouzos | Michael | "There are so many networks and subnetworks on the Internet, nobody knows who's one it," Dertouzoa said. "It could mean that there is no longer any meaning to international boundaries. People in China and Iraq are talking to the people in the Unites States" without any of their governments knowing about it." |
| *The Guardian (London)* | Judge | Peter | | July | 7 | 1994 | Soros | George (Internet Financier) | Soros sees Internet as helping to break down divisions within countries, and allow them greater participation in international commerce and diplomacy. |

Growth

| *Wired* | Browning | John | July/August | 1993 | Berners-Lee | Tim | As more and more client software becomes available, Berners-Lee expects more and more information to be woven into the Web. |
|---------|----------|------|-------------|------|-------------|-----|---|

Hardware Issues

| *Wired* | Barlow | John Perry | March | 1994 | Barlow | John Perry | Even the floppy disks, CD-ROMs to which we've become accustomed to will disappear as all computers jack-in to the global Net. |
|---------|--------|-----------|-------|------|--------|-----------|----|
| *Wired* | Negroponte | Nicholas | May/June | 1993 | Negroponte | Nicholas | Your receiver, no less a computer than a TV, will digest and process a broadcast of that model. It will convert the model to sound or image, hard copy or soft copy, in greater or less detail, at your discretion. |

Information

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Newsweek* | Levy | Steven [w/ Katie Hafner and Adam Rogers] | | Dec. 25/ Jan 1 | | 1996 | Kelly | Kevin | The Net will include TV, radio, all the cash-register data in the world, every traffic sensor in the world [. . .]. It won't be just people talking to each other. It will be people talking to machines, and machines talking to each other. |
| *St. Louis Post-Dispatch* | Baltzer | John | Editorial | Oct | 2 | 1991 | Baltzer | John | Thanks to fiber optics, the average American will soon have greater command over information about events on the planet Earth than the president of the United States had today. This will have a tremendous impact on our political system, promoting a much higher level of participatory democracy. |
| *NYT* | Markoff | John | Business | Nov | 20 | 1995 | Felker | Clay | "We are poised on the edge of a new medium," Clay Felker, director of the magazine program at the University of California at Berkeley's graduate journalism school, said. "And its going to change the nature of how we acquire information." |

Infrastructure Issues

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| <u>Wired</u> | Negroponte | Nicholas | | May/ June | | 1993 | Negroponte | Nicholas | In the near future, bits will be assigned to a particular medium by the broadcaster at the point of transmission. This is usually what people mean when they talk about digital convergence or bit radiation. But in the more distant future, bits won't be confined to any medium, as such, but will instead constitute a digital model that is transcoded into audio, video, or print by an intelligent receiver. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | The same thing is on its way in fiber optics. We're going to gain access to the 25,000 gigahertz of capacity that's in each of the three windows in infrared spectrum that work with fiber optics. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | The future is dumb networks. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | You'll have intelligent devices of various sorts that are easily reachable from the network but aren't part of the actual fabric of the network. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | So for computing functions I still think that electronics will prevail; but for communications, photonics will prevail. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | The information and communication infrastructure of the future, based on fiber optics, will provide the principal conduits for global entertainment, commerce, information, and communication in the next century. |
| *Wired* | Kapor | Mitchell | | July/ | | 1993 | Kapor | Mitchell | The private sector, not |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Aug. | | | | | the government, will build and operate the NII. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | Telephone companies and cable television operators, not the government, will be the principal carriers of traffic into the home. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | Networks that reach into the home will be hybrids of the fiber-optic cable and existing copper wire and coaxial cable used by telephone and cable television companies. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | With some modification to the existing infrastructure, hybrid networks can deliver a full range of high-band-width interactive services at a fraction of the cost of fiber to the home. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | Digital compression, storage, and transmission will reduce the cost of rewiring a neighborhood to a manageable burden. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | To accommodate an interactive network, cable television's infrastructure will be re-invented and re-implemented. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | Today's separate cable systems will be joined via regional hubs, which, in turn, will be interconnected to form a national network. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | Existing cable systems will be replaced by high-capacity, noiseless fiber-optic cable tat will reach from the system's head into each neighborhood. This "fiber-to-the-node" architecture will serve groups of 200 to 1,500 homes. The last |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | segment of the network, from node to the home, will use existing coaxial cable. |
| *NYT* | Botein | Michael | Financial | March | 14 | 1993 | Botein | Michael | Global data highways are likely, if not inevitable, within the 20 years, but to build them now would be premature. Moving too soon would be likely to leave America with the world's first, but worst, fiber-optic system. |
| *NYT* | Botein | Michael | Financial | March | 14 | 1993 | Botein | Michael | Creating a fiber system in the next few years could be costly - estimates vary from $100-$300 billion - but would also use relatively unsophisticated technology. In addition there is no strong economic pull. |
| *NYT* | Botein | Michael | Financial | March | 14 | 1993 | Botein | Michael | In the near term, relatively inexpensive technological upgrades can thus give virtually all users access to new technologies and data bases. This creates a window of opportunity, during which researchers can fully develop fiber's capabilities. This would make sophisticated technology available to business, educational and government users at low prices - but not for a generation. Fiber-optic superhighways? Yes. Now? Absolutely not. |
| *Wired* | Crichton | Michael | | Sept./ Oct. | | 1993 | Crichton | Michael | Once Al Gore gets the fiber optic highways in place, and the information capacity of the country is where it ought to be, I will be able, for example, to view any public meeting of Congress |

| | | | | | | | | | over the Net… |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Negroponte | Nicholas | | May/ June | | 1993 | Negroponte | Nicholas | In the near future, bits will be assigned to a particular medium by the broadcaster at the point of transmission. This is usually what people mean when they talk about digital convergence or bit radiation. But in the more distant future, bits won't be confined to any medium, as such, but will instead constitute a digital model that is transcoded into audio, video, or print by an intelligent receiver. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | The same thing is on its way in fiber optics. We're going to gain access to the 25,000 gigahertz of capacity that's in each of the three windows in infrared spectrum that work with fiber optics. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | The future is dumb networks. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | You'll have intelligent devices of various sorts that are easily reachable from the network but aren't part of the actual fabric of the network. |
| *Wired* | Kelly | Kevin | | Sept./ Oct. | | 1993 | Gilder | George | So for computing functions I still think that electronics will prevail; but for communications, photonics will prevail. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | The information and communication infrastructure of the future, based on fiber optics, will provide the principal conduits for global entertainment, commerce, information, and communication in the next century. |
| *Wired* | Kapor | Mitchell | | July/ Aug. | | 1993 | Kapor | Mitchell | The private sector, not the government, will |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | build and operate the NII. |
| *Wired* | Goodstein | David Henry | | July | | 1994 | Warnock | John | Networks are getting to the complexity point where humans are not capable of dealing with them any more. |

Interactivity

| Wired | Barlow | John Perry | March | | 1994 | Barlow | John Perry | Newsletters, magazines and books will be supplemented by the ability of their subscribers to ask direct questions of authors. Interactivity will be a billable commodity even in the absence of authorship.  As people move into the Net and increasingly get their information directly from its point of production, unfiltered by centralized media, they will attempt to develop the same interactive ability to probe reality that only experience has provided in the past. |
|---|---|---|---|---|---|---|---|---|
| *NYT* | Tierney | John | June | 20 | 1993 | Tierney | John | The vision of a data highway into every living room is still based mainly on faith: [. . .]  there is already evidence that the public is interested in interactive television, and there are even early examples of how people will use it. |
| *Wired* | Negroponte | Nicholas | June | | 1994 | Negroponte | Nicholas | Imagine a future where your interface agent can read every newspaper and catch every broadcast on the planet, and then, from this, construct a personalized summary.  Wouldn't that be more interesting than pumping more and more bits into your home? |
| *Wired* | Kelly | Kevin | July/ August | | 1993 | Kelly | Kevin | The obvious next step: e-mail the vending machine and have the Coke delivered to your room. |
| *Wired* | Barlow | John Perry | March | | 1994 | Barlow | John Perry | Newsletters, magazines and books will be supplemented by the ability of their subscribers to ask direct questions of authors. Interactivity will be a billable commodity even in the absence of authorship.  As people move into the Net and increasingly get their information directly from its point of production, unfiltered by centralized media, they will attempt to develop the same interactive ability to probe reality that only experience has provided in the past. |

ISP

| Wired | Garfinkel | Simson | Jan | 1994 | Evans | John | It is only a matter of time before the other services offer telnet, ftp, gopher, and WAIS in addition to simple e-mail. |
|-------|-----------|--------|-----|------|-------|------|------------------------------------------------------------------------------------------------------------------------|

Journalism

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Being Digital*. New York: Alfred A. Knopf, Inc., 1995. | Negroponte | Nicholas | | 192 | 1995 | Negroponte | Nicholas | E-mail can be a terrific medium for reporters. E-mail interviews are both less intrusive and allow for more reflection. I am convinced that e-interviews will become a terrific medium and a standard tool for a large amount of journalism around the world - if only reporters can learn some digital decorum. |
| <u>Wired</u> | Negroponte | Nicholas | Nov | | 1994 | Negroponte | Nicholas | E-interviews will happen more and more, ultimately becoming a standard tool for journalism around the world. |

Libraries

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Wired* | Rickard | Jack | September/ October | 1993 | Rickard | Jack | The technology is on the verge of transforming the great libraries' vision of paradise into a global reality |
| *Wired* | Pescovitz | David | Dec | 1995 | Pescovitz | David | No software application will replace a good human reference librarian any time soon. |
| *Wired* | Pescovitz | David | Dec | 1995 | Pescovitz | David | In 10 years, almost all public libraries will provide free access to the most eclectic information dump in the world, the Internet. |

Media

| NYT | Markoff | John | Business | Nov | 20 | 1995 | Markoff | John | And yet, the Web is poised not to replace its predecessors but to take a place alongside them as a social, cultural and economic force in its own right. |
|-----|---------|------|----------|-----|-----|------|---------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

Military Use

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| <u>Wired</u> | Kelly | Kevin | Nov | 1993 | Toffler | Alvin | Computers are going to drive down the cost of the money system. Computers are going to make possible microtrade, they're going to make possible microinvestments, and microcultures. The dangerous and difficult part of this is that it also makes possible micro-weaponry. |
| *Wired* | | | Premier Issue | 1993 | Military | Experts | They want the deliberate expansion of the American military-industrial complex into the virtual world. They want a wired, digitized, military-post-industrial complex, reformed and repeated to suit their own terms and their own institutional interests. |
| *Wired* | Rheingold | Howard | July/ August | 1993 | Rheingold | Howard | If MediaMOO and Jupiter are successful, expect to see serious-minded MUDs (Multi-User Dungeons)proliferate on the Net. |
| *Wired* | Rheingold | Howard | July/ August | 1993 | Rheingold | Howard | The dawn of commercial MUDs (multi-user dungeons), where virtual goods can be bought and sold, or political MUDs, where lobbyists and politicians schmooze in virtual hallways, can't be far away. |

Music Industry Use

| *Wired* | Fisher | Adam | Jan | 1994 | Curry | Adam | The next step will be virtual record companies |
|---------|--------|------|-----|------|-------|------|---|
| *Wired* | Fisher | Adam | Jan | 1994 | Curry | Adam | A virtual record company would distribute music over the Net, cutting out the middleman by delivering music directly to a customer's stereo. |

Newspaper Industry

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| <u>Wired</u> | Crichton | Michael | Sept./Oct. | 1993 | Crichton | Michael | And I will have artificial intelligence agents roaming the databases, downloading stuff I am interested in, and assembling for me a front page, or nightly news show, that addresses my interests. |
| *Wired* | Crichton | Michael | Sept./Oct. | 1993 | Crichton | Michael | I'll have the twelve top stories that I want, I'll have short summaries available, and I'll be able to double-click for more detail. How will Peter Jennings or MacNeil-Lehrer or a newspaper compete with that? |
| *Wired* | Katz | Jon | Sept. | 1994 | Newspaper | Analysts | By the end of this year, nearly 3,000 papers will offer some electronic or interactive services |
| *Wired* | Steinberg | Steve | May | 1995 | Pundits | | Internet would kill print media |

Number of Users

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Hafner | Katie | | Dec | | 1994 | Cerf | Vint | By the end of the decade, there will be 300 million users. |
| *Boston Globe* | Radin | Charles A. | National/ Foreign | Dec | 26 | 1992 | Cerf | Vinton | There will be 100 million US Internet Users by the end of the decade, and that there will be tens if millions more users abroad. "You have to imagine that this kind of reaching out from anywhere in the world to anywhere else in the world, at your fingertips, has got to change the way we think about our world," Cerf said. |

PCTV

| *Wired* | Negroponte | Nicholas | Premier Issue | 1993 | Negroponte | Nicholas | As intelligence in the television system moves from the transmitter to the receiver, the difference between a TV and a personal computer will become negligible. All personal computer vendors are adding video capabilities, thereby creating the de facto TV set of the future |
| --- | --- | --- | --- | --- | --- | --- | --- |

PDA

| *Wired* | Battelle | John | May/June | 1993 | Porat | Marc | Think of it: you can dash off a note on a personal digital assistant (PDA), touch Send, and viola! It appears on the recipient's PDA. All through the magic of a standard programming language called Telescript and General Magic's MagicCAP interface. |
|---------|----------|------|----------|------|-------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *Wired* | Greenwald | Jeff | July/August | 1993 | Clarke | Arthur | About this "emerging technology"- (as he opens a Sony Data Discman and calls up an entry under C) The display is not very good, but that will be improved. It will be made smaller and lighter, too. |

Policy

| Wired | Negroponte | Nicholas | May/June | 1993 | Negroponte | Nicholas | I do not believe there will be a Bit Police. |
|-------|------------|----------|----------|------|------------|----------|-----------------------------------------------|

Political Activity

| *Wired* | Poster | Mark | | Nov | | 1995 | Poster | Mark | We must remember that the Net is something entirely new, and its effects on democratic politics can't be predicted using historical precedent. The Internet threatens the government, mocks private property and flaunts moral propriety. |
|---|---|---|---|---|---|---|---|---|---|
| *San Francisco Chronicle* | | Anonymous | Editorial | Dec | 10 | 1994 | Anonymous | | Of all the challenges and promises of modern communications technology, nothing holds greater prospects for the future than the worldwide Web of private and public computer networks known as the Internet.[. . .] [The] global Internet . . . Has a potential to democratize information in ways that were unimaginable scarcely a decade ago.[A22] |

Printing

| *Wired* | Papert | Seymour | May/June | 1993 | Papert | Seymour | It will take time for the vast quantities of information available in print to be recast for such a machine. But it will happen; and when it does, the Knowledge Machine (a metaphor for much more varied forms of media) will provide easier access to richer and fuller bodies of knowledge than can be offered by any print encyclopedia. |
|---|---|---|---|---|---|---|---|

Privacy

| *Wired* | Barlow | John Perry | April | 1994 | Meeks | Brock N. | If privacy isn't already the first roadkill along the information superhighway, then it's about to be. |
|---|---|---|---|---|---|---|---|
| *Wired* | Baker | Stewart A. | June | 1994 | Baker | Stewart A. | The biggest threats to our privacy in a digital world will come not from what we keep secret, but from what we reveal willingly. |

Research Use

| *Washington Post* | Gore | Al | Outlook | July | 15 | 1990 | Gore | Al | Teams of scientists and engineers working on the same problem in different geographic locations could work together in a "co-laboratory" if their supercomputers were linked. |
|---|---|---|---|---|---|---|---|---|---|
| *Washington Post* | Burgess | John | Financial | September | 12 | 1991 | Lee | Lawrence | The new system also would be able to carry video conferencing, enabling scientists to work "as though we were all in the same room," Lawrence Lee, executive director of the North Carolina Supercomputing Center in Research Triangle Park, NC. |
| *Washington Post* | Burgess | John | Financial | September | 12 | 1991 | Lee | Lawrence | The program would help set up a network of high-capacity communications lines between computers in government and private labs throughout the country. This would allow researchers to trade findings freely, perhaps sending in a second data that now might take hours. |

Security Issues

| Wired | Baker | Stewart A. | | Sept. | | 1995 | Baker | Stewart A. | As foreign governments come to understand the power of the Net, they will search quite unapologetically for ways to control it. |
|---|---|---|---|---|---|---|---|---|---|
| *San Francisco Chronicle* | | Anonymous | Editorial | Dec. | 10 | 1994 | Anonymous | | The potential for anonymous mischief on the Information Superhighway is profound. |
| *San Diego Union-Tribune* | Lewis | Peter H. | | May | 24 | 1994 | Botz | Jurgen [computer consultant] | Certainly, there will never be any consensus to establish a regulatory body for UseNet. [. . .]  And no, the existing defenses [to spamming by advertisers, and other unsavory business practices] are clearly not adequate.  So what will happen?  The Net as we know it will die. |
| Wired | Pescovitz | David | | Aug. | | 1994 | Johnston | | A virtual war "with the sole intent of destroying or protecting information, not property." |
| *Wired* | Wolf | Gary | | Nov. | | 1994 | Wolf | Gary | The new CIX policy may ultimately increase the number of times in our Internet sessions we see the words "connection refused." |

Social Predictions

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| <u>Wired</u> | Sah | Adam | | Dec | | '93 | Sah | Adam | The data superhighway will change all of our lives, creating a vast virtual environment with unlimited potential. |
| *Wired* | Sah | Adam | | Dec | | '93 | Sah | Adam | The dream is to disconnect your physical location from your "virtual" location - to be able to work with colleagues in Minneapolis from that beach in Maui. |
| *Wired* | Saffo | Paul | | Sept./Oct. | | '93 | Saffo | Paul | The digital counterculture will reject this bleak vision of a future in which technology enlarges the human spirit as a new tool for consciousness in much the same way that the hippies appropriated the psychoactive chemical spin-offs of the military-industrial complex. This new movement will be cyberpunk imbued with human warmth, substituting a deep sense of interdependence in place of lone wolf isolationism. |
| *Wired* | Saffo | Paul | | Sept./Oct. | | '93 | Saffo | Paul | The digital counterculture thus is likely to appropriate an older term for its own, in the same way that the hippies appropriated and turned "hipster" into something entirely new. I'll bet that they call themselves something like "tekkies" consciously adopting the scornful '80s slang for nerds. |
| *Wired* | Saffo | Paul | | Sept./Oct. | | '93 | Saffo | Paul | The tekkies will arrive sometime in the mid-'90's, if not sooner. |
| *Wired* | Hapgood | Fred | | Dec | | '94 | Hapgood | Fred | The Net will allow us to spend more and more time with a smaller and |

| | | | | | | | | | smaller number of people. |
|---|---|---|---|---|---|---|---|---|---|
| *NYT* | Markoff | John | Business | Nov. | 20 | '95 | Saffo | Paul | "It terms of social consequences, the Web is a great experiment. Its going to deliver us community with vengeance - and we may fund we don't want it," said Paul Saffo, a computer industry consultant at the Inst. Of the Future, a Menlo Park, Calif., research firm |
| *Wired* | Leslie | Jacques | | May/ June | | '93 | Hughes | Dave | We're heading for a division between the information-rich and information-poor. |
| *Wired* | Baker | Stewart | | Sept. | | '95 | Baker | Stewart A. | The wisdom of the day is that global information networks will be a force of freedom, breaking down barriers to information even in closed societies. |
| *Boston Globe* | Doten, Patti And Globe Staff | Patti | | May | 14 | '94 | Resnick | Mitchel [MIT Media Lab Prof.] | While computer is currently viewed as an antisocial activity, in the future. . .]there will be more and more interaction among people on the computer. People sharing interests and networking within a community. Just look at the Internet [where use of the Internet is viewed as a social activity.] |
| *Being Digital*. New York: Alfred A. Knopf, Inc., '95. | Negroponte | Nicholas | | | 182 | '95 | Negroponte | Nicholas | My guess is that 1 billion people will be connected by the year 2000. |
| *Being Digital*. New York: Alfred A. Knopf, Inc., '95. | Negroponte | Nicholas | | | 183 | '95 | Negroponte | Nicholas | The user community of the Internet will be in the mainstream of everyday life. Its demographics will look more and more like the demographics of the world itself. As both Minutel in France and Prodigy in the United |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | States have learned, the single biggest application of networks is e-mail.  The true value of a network is less about information and more about community.  The information superhighway is more than a short cut to every book in the Library of Congress.  It is creating a totally new, global social fabric. |
| *Newsweek* | Stoll | Clifford | | Feb. | 27 | '95 | Stoll | Clifford | The truth is no online database will replace your daily newspaper, no CD-ROM can take the place of a competent teacher and no computer network will change the way government works. |
| *Newsweek* | Stoll | Clifford | | Feb. | 27 | '95 | Stoll | Clifford | Yet Nicholas Negroponte, director of the MIT Media Lab, predicts that we'll soon buy books and newspapers straight over the Internet.  Uh sure. |
| *Los Angeles Times* | Weber | Jonathan | | Nov. | 25 | '95 | Coursey | David | There will soon be one genre of Internet experience for subscribers to @Home and other cable-based services, another for people who dial into the Net to get information, and still another for those who enjoy "chat" rooms and other types of on-line socializing.  There will be large, sophisticated commercial Web sites that won't be free and will bear almost no resemblance to the individualistic cacophony of home pages that dominate the Web today.  There will be an enormous variety of private sub-Networks offering only rudimentary electronic |

| | | | | | | | | | mail connections to the Net. |
|---|---|---|---|---|---|---|---|---|---|
| *Boston Globe* | Radin | Charles A. | National/ Foreign | Dec. | 26 | '92 | Cerf | Vinton | Cerf said, "it will become critical for everyone to be connected. Anyone who doesn't will essentially be isolated from the world community." |
| *Boston Globe* | Radin | Charles A. | National/ Foreign | Dec. | 26 | '92 | Dertouzos | Michael | Professor Michael L. Dertouzos, director of MIT's labortatory for computer science, says, "the gap between the rich and poor is increasing as a result of these technologies" - widening difference between the rich and the poor nations and rich and poor people within individual nations. "Left to its own devices, it will increase much more." |
| *Daily Telegraph* | Hodgkinson | Tom | | Nov. | 24 | '94 | Hodgkinson | Tom | One day, converts argue, the computer will be the nerve center of every household. |
| *TIME* | Church | George | Business | Oct. | 4 | '95 | Time's Board of Economist | | They did note that the Internet, like electricity, is insinuating itself in ways that make the future unthinkable without it. |
| *TIME* | Church | George | Business | Oct. | 4 | '95 | Romer | Paul | Paul Romer. Professor of economics at the Stanford Graduate School of Business and an expert in economic growth theory predicts that "the Internet will reshape society, but also that society will reshape the Internet through its decisions on taxation, antitrust policy, support for new types of standards organization, protections of privacy and intellectual property, and the regulation of bandwidth connections to the home." |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Washington Post* | Gore | Al | Outlook | July | 15 | '90 | Gore | Al | Simultaneously, we are witnessing the emergence of a truly global civilization based on shared knowledge in the form of digital code. The ability of nations to compete will depend on their ability to handle knowledge in this form. |
| *Being Digital. New York: Alfred A. Knopf, Inc., 1995.* | Negroponte | Nicholas | | | 203 | '95 | Negroponte | Nicholas | Over time, there will be more and more people on the Internet with the time and wisdom for it to become a Web of human knowledge and assistance. The 30 million members of the American Association of Retired Persons, for example, constitute a collective experience that is currently untapped. Making just that enormous body of knowledge and wisdom accessible to young minds could close the generation gap with a few keystrokes. |
| *Wired* | Sterling | Bruce | | Sept./ Oct. | | '93 | Smith | Bob | Violent conflicts between virtual and actual communities have become a permanent feature of the cultural landscape in 2015. |
| *NYT* | Johnson | George | Ideas/ Trends | Oct. | 24 | '93 | Coover | Robert | Will everyone have equal and universal access to this magical new realm? No they will not. But the gap between the haves and the have-nots, already almost unimaginably vast in our time, will not necessarily widen. |
| *Washington Post* | Samuelson | Robert J. | Editorial | Dec. | 25 | '93 | Samuelson | Robert | The information superhighway may or may not become a truly transforming technology [. . .]. But if it does, the event is many years, and perhaps decades, away. |

Software

| *Wired* | Sah | Adam | Dec | 1993 | Sah | Adam | With the increasing speed of the computers themselves, software latency is bound to drop. |
|---|---|---|---|---|---|---|---|
| *Wired* | Editors | | Dec | 1994 | Gates | Bill | Most of the software that runs on the information highway will be written by smaller companies. |
| *Wired* | Steinberg | Steve | May | 1995 | Steinberg | Steve | By the end of the year, IPNG should become the official Internet standard. |

Spam

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *NYT* | Lewis | Peter | Business | May | 11 | 1994 | Guy | Neil | "I'm beginning to think this sort of UseNet abuse is going to continue growing exponentially as the medium itself grows," Neil K. Guy of Simon Frazier in Burnaby , B.C. wrote in an electronic posting to his Network colleagues. "The abuse will continue to grow, various mechanisms to control it will be installed to prevent a collapse of the system and the openness and freedom of ideas exchanged upon which UseNet was based will become something rather different." |
| *NYT* | Lewis | Peter | Business | May | 11 | 1994 | Guy | Neil | If (legal advertisements are posted) and they become routine - "and there's very little technical or legal reason why they wont' - then the whole Net will basically collapse through flame-wars, the closing of e-mail discussion groups to outsiders and whatever." |
| *NYT* | Lewis | Peter | Business | May | 11 | 1994 | Rutkowski | Tony | If spamming becomes widespread "it will destroy the Network," said Tony Rutkowski, a lawyer and engineer who is executive director of the Internet Society. "The Internet allows massive replication and transmission of information, and if everyone engaged in that kind of conduct, it would bring it down to its collective knees." |
| *NYT* | Lewis | Peter | Business | May | 11 | 1994 | Hayes | David | "My fear is that this will be a cyber-revisiting of the blacklisting that was prevalent in the 50's." David Hayes wrote. "Eventually, I predict that such site fill files will be used to censor politically unpopular views (like mine, for example)." |

Telecommunicating

| *Wired* | Sah | Adam | Dec | 1993 | Sah | Adam | Interactive telecommuting will be uncomfortable for many years to come, and for many applications it may not be viable in our lifetime. |
|---------|-----|------|-----|------|-----|------|------|

Telemedicine

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Wired* | Sah | Adam | | Dec | | 1993 | Sah | Adam | Remote surgery from Tokyo to Zaire will probably be off-limits, as will virtual sports games between real users. |
| *Wired* | Branwyn | Gareth | | Sept./ Oct. | | 1993 | Branwyn | Gareth | The future will be wired. Hardwiring of neural prosthesis is already here and will continue to develop towards completely implantable systems controlled by the user's brain. Most researchers, perhaps over-cautiously, contend that these advanced systems are 10-20 years in the future. Whatever the date, this technology will eventually become a common enabling option for the disabled, and at that point, people will surely start talking about using the same technology for elective human augmentation. |
| *Washington Post* | Gore | Al | Outlook | July | 15 | 1990 | Gore | Al | A doctor in Carthage, Tenn. could consult with experts at the Mayo Clinic in Minnesota on a patient's CAT scan in the middle of an emergency |
| *Washington Post* | Gore | Al | Outlook | July | 15 | 1990 | Gore | Al | Medicine will benefit enormously. Before the end of the century, doctors will routinely use this digital information to diagnose genetic-based diseases. |
| *Wired* | Beard | Nick | | July/ | | 1993 | Beard | Nick | The Oklahoma |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Aug. | | | | | Medical Information Network will offer radiology, library, and reference services to remote sites via a network that provides real-time or near-time video teleconsultation services. Instead of moving patients (or their X-ray images) to a doctor, or vice-versa, the information will be transmitted digitally. |
| *Wired* | Beard | Nick | | July/ Aug. | | 1993 | Beard | Nick | Patients will be able to visit a clinic in their home country-say, Greece- and have tests performed there. The results-images, chemical values, videotape-may be wired to Scotland for interpretation by experts there, or even further a field, perhaps to an affiliated US teaching hospital. |
| *Wired* | Flower | Joe | | Jan. | | 1994 | Little | Arthur | The U.S. could save $15 billion every year just by digitizing everyone's medical records and putting them online, available to anyone with the right pass codes anywhere in the country. |
| *Wired* | Flower | Joe | | Jan. | | 1994 | Little | Arthur | Vast amounts of clinical information online will lead to n-dimensional queriable research databases. |
| *Being Digital*. | Negroponte | Nicholas | | | 166 | 1995 | Negroponte | Nicholas | In the future, we will have the |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| New York: Alfred A. Knopf, Inc., 1995. | | | | | | | | | telecommunications and virtual reality technologies for a doctor in Houston to perform a delicate operation on a patient in Alaska.  In the nearer term, however, a brain surgeon will need to be in the same operating theater at the same time as the brain; many activities, like those of so-called knowledge workers, are not as dependent on time and place and will be decoupled from geography much sooner. |

Text

| *Wired* | Saffo | Paul | May/June | 1993 | Saffo | Paul | Historians needn't worry: paper may be on the skids, but text is eternal. |
|---------|-------|------|----------|------|-------|------|------|
| *Wired* | Saffo | Paul | May/June | 1993 | Saffo | Paul | Until physical brain-to-machine links become a reality, text will offer the most direct of paths between the mind and the external world. |
| *Wired* | Saffo | Paul | May/June | 1993 | Saffo | Paul | We will no longer trust our eyes when observing video-mediated reality. Text will emerge as a primary indicator of trustworthiness, and images will transit the Net as multimedia surrounded by a bodyguard of words, just as medieval scholars routinely added textual glosses in the margins of their tomes. |

## Third World Countries

| *The Guardian (London)* | Judge | Peter | July | 7 | 1994 | Soros | George (Internet Financier) | The superhighway may bestride the Western world, but it still has a long way to go in the Third World. |
|---|---|---|---|---|---|---|---|---|

Virtual Reality

| *Wired* | Van Der Leun | Gerard | Premier Issue | 1993 | Rheingold | Howard | His vision of a network that will actually hook some sort of tactile feedback devices onto our bodies so that the fantasies don't have to be so damned cerebral. With it, you'll have a virtual reality coupled with the ability to construct your own erotic consort for work, play or simple experimentation. In time robotics will deliver household servants and sex slaves. |
|---|---|---|---|---|---|---|---|
| *Wired* | Stahlman | Mark | March | 1994 | Stahlman | Mark | There will be no virtual sex. |