The Sound, the Fury, and the Significance

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Cambridge, Massachusetts

An incidental paper of the Program on Information Resources Policy.

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January 1995, I-95-2

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Viacom Broadcasting
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Contents

*A brief history of the "Information Highway" hype
and what it can tell us about the reality behind it.*[1]

An Ancient Tale

I was an eager young professional starting to build a career in the '60s. And I did the obvious thing—I looked around to see what was there and what was new.

What did I find but something called the "information highway," or sometimes "Superhighway."

Just what it was seemed a little fuzzy and perhaps subject to change over time; but it could be described pretty well, and so could its benefits. It was the linking up of every useful location to the telephone network and the appearance of intelligence along with the communications.

In the "smart home," for example, you could dial in to turn up the heat, start the oven, and make sure the place hadn't caught fire. Hardly a concern, because the house would already have called the fire department. The smart home was featured in *Reader's Digest.*[2]

More important, went the claims, the highway could make schooling more flexible. Students could access materials and teachers any time, anywhere. Encyclopedic information services could enrich the quality of the mind and of life. Doctors could deliver health care to remote villages. The Open University in the United Kingdom and "classes without walls" in the United States started up in the '60s.

The celebrity aspects of the highway were its personal and domestic sides—services for the householder and the home. Industrial, military, and government dimensions never got much press.

Many of the pieces of the highway were already in place. There was explosive growth of telephone penetration after World War II. Time-shared computing and workable microchips

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[1]Adapted from an invited presentation given in several financial forums in Europe August 1994.

[2]"Home, Sweet Electronic Home," *Reader's Digest*, August 1967, 113-115.

were spreading fast. But the thrust of the publicity was "this is about to happen!" or "we can make it happen! (given some resources)."

When I looked more closely, I saw that the inner workings of the "information highway" were different from the image. The recent technical and commercial developments were pretty striking for the mid-'60s. They weren't yet transforming everyday life, but they looked as if they might provide a platform for something new and exciting. A lot of companies smelled an emerging market, and a lot of labs smelled a development grant. But, in fact, the publicity far outran the actuality. Nothing much was happening for the householder (and didn't), but real applications without publicity seemed to be taking off (and did) among the early-adopter communities. These were by and large well funded organizations.

Does any of this sound familiar? Oddly enough it did then, too. The "information highway" concept and phrase had been endemic for quite a while. But they were having a flare-up.

And this has been the pattern ever since. The information highway has simmered along within a coterie of concerned industries, academics, and groupies. It breaks out into the wider consciousness from time to time when there's a push from an external event. Each time it pops up it is stronger, carried forward by the ever increasing power of computers and communications. Each time it offers a bit more (no pun intended) with a lower price.

The smart home popped up again in major popular magazines in 1971, 1975, 1976, and 1978.[3]

Which lets me phrase the point we'll explore here a little more precisely. Why did the information highway flare up right now? What do the timing and the details tell us about the key players and what's really happening?

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[3]S. Ingersoll, "Computer House: A House to Fit Our Age," 45-55; "Well-Built House; How They Built the Computer House," *House Beautiful*, February 1971, 45-55, 104-106; W.J. Hawkins, "Our Electronics Editor's Incredible Electronic House (and Car)," *Popular Science*, September 1975, 100-102ff.; J. Berger, "Home Sweet Computerized Home," *Popular Mechanics*, September 1976, 112-113; "Living: Pushbutton Power," *Time*, February 20, 1978, 46-49.

The Hype (or, More Politely, "Publicity")

The information highway was snatched from its slumbers around the turn of 1991–1992 by the cable television industry. In a recent interview with *Wired* magazine, John Malone affirmed that industry's central position:

> Let me ask you this: Who started the information superhighway? Who really talked about new technology allowing interactive two-way information and entertainment services? We did. It wasn't the telephone companies.[4]

Why then? Why interactive? The key lies in looking at what else was going on at the same time.

At least two things, is the answer:

For some time there had been a growing outrage[5] about the rise of cable prices and the decline of service quality since deregulation. In 1992 Congress began to get serious about some form of reregulation that could limit rates and restrict flexibility. The cable business was eager to equate its own well-being with the promise of the information highway. Any limitation on the industry's income could then be seen as cramping the highway's development. Legislation was passed in the autumn nonetheless and became the first piece to override a veto by President Bush.

Also in the early 1990s a new wave of competitors appeared on the horizon (no pun intended): the satellite broadcasters. About ten of them published business plans, and two got financial backing—the standard test of reality vs. dreaming. These companies posed the most serious attack on the cable industry since the 1950s, when it had established itself in face of opposition from television broadcasters. To the customer, a satellite broadcast looks just like a cable connection.

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[4]*Wired,* July 1994, 88. Malone is Chief Executive Officer (CEO) of Telecommunications, Incorporated, the largest cable operator.

[5]The expression of this outrage to legislators was spontaneous. It had much greater impact than the orchestrated letter writing campaigns mounted by the telephone industry from time to time. One Congressman told me, "It's easy to tell the difference."

Except that if cable wants to, it can—at least in theory—add something that broadcasters can't: "interactivity" or "two-way information flow." And sure enough, the cable industry pounced on just that feature. In essence it said, "The future is interactive and broadband. It will bring revolutionary benefits to society. So let's steer the money, the customer's attention, the entrepreneur's focus, and government benefits in that direction."

Wholesale adoption of this vision might cause all sorts of things: funds to dry up for noninteractive technologies; wariness by possible content providers; and reduced priority for the painful government processes of spectrum allocation, anti-trust approvals, protection from competitor lawsuits, and the like.

Although in the interview with *Wired* Malone didn't name it, "broadband," in a slightly more tentative way, was another prominent feature of the cable rhetoric. Broadband was aimed at another hot debate of the moment: Who can get there first with broadband interactive service, cable companies or telcos? Telcos were given credit for having interactive switchable connectivity, but needed to implement broadband. Cable companies were given credit for broadband, but lacked interactivity and switchability. Needless to say, it was to the advantage of cable companies to promote the virtues of "broadband."

Whether the cable publicity was meant as war with the telcos or not, it fed right into a telco need and made telcos into allies, at least on the information highway hype front. Thus, a second major player jumped on the bandwagon.

Actually, the telcos might better be called the first major player. As an industry, they're ten times as big and three times as old as the cable business. Their record of producing grand visions of what communications can do for society is so high-tone as to involve the most distinguished members of many professions. Some of the visions are so venerable as to have already been unrealized many times.

In the mid-1980s, for example, the California Public Utilities Commission was unable to find an economist who had not gotten significant money from the telephone industry. In frustration, it deliberately hired a foreigner. At one time AT&T Bell Laboratories created and maintained an entire branch of economics that demonstrated the superior efficiency of monopoly utilities.

Seeing an opening, the telephone industry, especially the local telephone industry, flooded the public and government forums with new studies and lobbying efforts. These calculated, for example, that each dollar spent to develop the telephone infrastructure would return many dollars to the economy; that electronic access could cut the cost and raise the quality of health care; the same for education; and so forth.

Why now? Why infrastructure development? The answers are complex and penetrate to the heart of this critical, fascinating, and difficult industry. Digging around in them is a chore, but one that has a payoff in understanding.

The contemporary telco era can be said to date from January 1, 1984, when AT&T, the largest company ever to have existed, was split up. The new AT&T got the long distance and equipment businesses, most of Bell Labs, 50 percent of the revenue, 20 percent of the costs, a vague promise of deregulation, and all the favorable publicity. The Regional Bell Operating Companies (RBOCs) got 50 percent of the income, 80 percent of the costs, the local exchange business, and a presumption of continued regulation and a boring utility future. Almost without public awareness, the RBOCs got the only remaining monopoly, a huge but unstable revenue patch (access charges amounting to nearly 50 percent of revenue), almost all of the lobbying capability, and four big subtle long-term time bombs. These bombs are what we need to understand.

The first time bomb was nascent but guaranteed competition. The MFJ[6] supposedly divided the competitive part (AT&T) from the uncompetitive parts (RBOCs) of the business. But that line wasn't bright at the time, nor was it stable. The RBOCs' best customers, large organizations, have subsequently built their own communications capabilities and partly defected to other carriers. Even the household monopoly is under threat from emerging alternative carriers (including the cable companies) and mobile alternatives.

The second time bomb was the inherent instability of the access revenue. Access revenue served well the purpose of making everyone's phone bill look unchanged until the next election but was otherwise the unwanted political stepchild of all affected parties. It built in a

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[6]The "Modification of Final Judgement," which took effect on 1 January 1984, is the name of the consent decree that established the terms of the breakup or "divestiture." It also prohibited the RBOCs from entering the manufacturing and long-distance businesses and from offering information content over their own lines. Oversight has been aggressively pursued ever since by Judge Harold Greene.

huge incentive for customers to get off the public switched network. Almost every stakeholder wanted to get rid of it, each for its own reasons. Access revenue is down dramatically at this time, and most rhetoric runs to phasing out the rest. The RBOCs must constantly scramble for new revenue just to stand still.

The third bomb was the continuation of the regulatory regime, which combined arcane cost-allocation machinery with rate-base regulation (RB/ROR).[7] In essence it limits earnings to a government-determined percentage of the book value of the plant.

The fourth bomb is a dramatic ongoing improvement in the cost and performance of electronic and optical equipment. On the surface, this doesn't look so bad. But in combination with the other three time bombs, it can be. It allows the competition to use much more flexible depreciation schedules than the RBOCs, for example. Most significant, it mates with RB/ROR to produce a declining rate base, hence declining earnings.

To their credit, the RBOCs perceived these problems very quickly and responded with vigor. The first two telco campaigns were:

> Get into new businesses that don't have these problems, and if necessary out of the telephone business.

> Get rid of RB/ROR or better yet, regulation.

Within five years, the RBOCs had about a hundred subsidiaries each, collectively pursuing a great variety of businesses. Most RBOCs had ordered (and "incented") their public policy executives to get rid of RB/ROR in favor of price caps, incentive, banded, or social contract regulation or to eliminate regulation itself.

To condense many volumes into a paragraph, many executives got their bonuses, but real results have been minimal—and often negative. By the companies' tenth anniversary, most of those new businesses were gone.[8] Staffing, budgets, and lines of code in the

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[7] Rate Base/Rate of Return Regulation, or RB/ROR is based on the accounting equation
$$RR = OE + d + T + r(V-D),$$
where OE is operating expenses, d is depreciation expense, T is taxes, V is gross valuation (original cost), D is accrued depreciation, and r is the allowed rate of return. V-D represents the rate base, and r(V-D) is the earnings return allowed by the regulator.

[8] Interestingly, when Pacific Telesis split off its "unregulated" subsidiaries into a separate company, the chairman went with them. This could be seen as a form of getting out of the telephone business.

regulatory bodies are way up. Many of the new regulatory schemes are RB/ROR in drag. The test for the others is that the telco can't do better than it would have under the old regime.

These first two campaigns are moving on to new battles, but they now carry some unhappy historical baggage.

Hence a third campaign:

Build so much plant that you prosper even under RB/ROR.

In a seemingly mature market how do you do that? Answer:

By growing a big new business on top of your existing one.

And hence the enthusiasm for the information highway and all the new benefits (read "revenue streams") it will bring.

With the hypeway now rolling along, yet another constituent chimed in, lending a new kind of credibility—the personal computer industry and, in particular, John Sculley, then head of Apple Computer. Apple has traditionally shunned government involvement, building a strong following and an image as a maverick. To this, the company added the credential of stunning success. Sculley went public with a "vision" of the electronic future. He portrayed a future convergence of the computer, telecom, office equipment, information vendor, media and publishing, and consumer electronics businesses. This convergence would create a single huge on-line marketplace, soon to generate $3 trillion annually.[9]

Why Apple? Why now?

Apple, it turns out, was experiencing its deepest downturn and first downsizing ever. It was increasingly seen as losing the competition with DOS-based machines for the personal computer market, which it had virtually created. With its superiority in human interface and multitasking, who better than Apple to be at the center of the new marketplace, pulling it all together and making it possible!

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[9]Sculley acknowledged his debt to our Program for the visual centerpiece of his presentation: diagrams built on our "Information Business Map."

Sculley did something else novel for Apple. He got involved in politics.[10] Specifically, he pitched into the 1992 presidential campaign on the side of the Clinton-Gore ticket and subsequently became a media star in their Administration's information highway program.[11]

The Administration?

Our Program has worked with every administration since our founding in 1973, and we've seen a very consistent pattern:

Each new administration brings in a new White House staff, made up mostly of bright people with a political background. Three to nine months later we get a call from whoever's got the communications portfolio. The conversation goes like this:

White House: "This is a tremendously complicated business—the most complex and confusing item on our plate in fact—and everyone is trying to sell us something. We need to talk to someone who understands it and who isn't partial."

The Program: "OK, let's talk." We point out that there is no voter interest in communications, probably no White House decisions that would affect the national interest, and the industry is a very aggressive bunch with hopelessly divided stakes. Any Administration stance will have vocal opponents.

After a little thought, all administrations have come to the same conclusion: "This area has no political gains and a lot of possible losses. Keep the Administration's head down in the foxhole and stay away from it."

Not so the Clinton Administration, specifically, Vice President Albert Gore, Jr. The information *superhighway* and the National Information Infrastructure (NII) have played a

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[10]Apple began with a strong counterculture mentality. In its early years it refused to do business with the federal government at all; and for a while afterward refused to do business with the Department of Defense.

[11]He sat beside Hillary Clinton at the first State of the Union address.

central role in Gore's vision for American economic and cultural advancement and American world leadership.[12]

Why now? Why Gore?

Vice President Gore is a graduate of Harvard College.[13] Furthermore, he did his senior thesis on information policy development.[14] We presume that he knows what he's getting into. Flying in the face of political difficulties may mark the freshness of a new generation, for which this Administration has been both praised and berated. My own best guess is that Mr. Gore is personally inspired by his father. Senator Albert Gore, Sr., is best remembered as a prime mover of the Interstate Highway System.

The Pinnacle and the Decline

The event that brought the information superhighway hype to its greatest frenzy and to the public eye was the announcement on October 13, 1993, that Bell Atlantic and Telecommunications, Inc., would merge. This was to be the largest merger ever in the information business, and one of the largest in all industrial history. It was front-page news worldwide. It dominated the print and television headlines even in Kuwait, where I happened to be that week. It was billed by the press, governments, and Wall Street as the deal of the century.

It was followed by a frenzy of merger announcements among counterpart companies and by a lot of hand wringing among telco executives who wished they'd done it instead of Ray Smith.[15] The merger seemed to bring the information superhighway from the realm of vague promise to a very concrete example, with specific next steps.

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[12]For the reasons cited, this emphasis on a telecommunications agenda does not seem to be rational political behavior. However, it is becoming more rational over time. The Administration has already retreated from rhetoric about building and owning the NII to encouraging industry to do it. Most recently, the rhetoric has quieted down even more and sounds more like "getting ourselves out of the way."

[13]This, of course, both inhibits our Program from saying anything bad about his abilities and background and disqualifies us from endorsing them.

[14]Albert Gore, "The Impact of Television on the Conduct of the Presidency," unpublished thesis (A.B., Honors), Harvard University, 1969.

[15]Raymond Smith is Chairman and CEO of Bell Atlantic.

In governments, the announcement sparked a sharp debate over whether it would hasten the highway by encouraging competition (telcos and cable companies head to head) or retard it by discouraging competition (two monopolies merging to restrain trade).

And on Wall Street it brought on a new scrutiny from the financial analysts and due-diligence experts. By and large, what they found looked less like the millennium coming and more like the apocalypse. For example:

- TCI had emerged from the leveraged-buyout '80's, like most of the cable industry, with debt—lots of debt. So much debt and of such low quality that it could seriously dilute Bell Atlantic's cash flow and lower its own debt rating. TCI hadn't shown a profit in four years.

- Cable company plant was indeed broadband, but it was also well below telco quality. By key measures such as percent of down time, mean time to failure, and ghost and echo suppression (signal quality), it was between two and three orders of magnitude below standard.

- Cable companies were the opposite of the kind of bedfellows the telephone companies need in the political environment. Their behavior since deregulation had provoked a genuine popular outrage and the virtual certainty of more government wing-clipping.

- Perhaps most important, there were no signs of a market for the information highway's services. The only prudent business conclusion was that cable companies and telcos could go after nothing more than each other's existing revenue streams. These were not big enough to cost-justify upgrade of either system. Prudent business forecasts did not show income that could pay interest on the merger debt, much less pay for expansion or cope with increased competition.

The rest, as they say, is history. The merger fell apart four months later, and the "copycat" mergers copied shortly. The price of cable stocks declined sharply. The share price of RBOCs with cable holdings declined, while the others rose.

Since then, the words information highway have seldom been seen without the words "much vaunted," "much hyped," or "so-called."[16] There has been a quiet but substantial parade of negative stories on the topic.

The volume was turned down almost to its traditional background level.

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[16]For example: "Now the notion of telephone or cable-TV networks' delivering vast amounts of video, data and voice traffic is dubbed the 'superhypeway.'" From "Communications Bill's Death Knell Hurts Baby Bells the Most, Analysts Say," *The Wall Street Journal*, September 26, 1994, A3.

And What All of This Tells Us about Reality

The simplest observation is that the hype was driven not by the strengths of the players, but by their weaknesses. In that sense, the enthusiastic statements of what was happening were not pointers to industries taking off, but to industries fearing for their future. This behavior is neither new nor unusual. A display of bravado is often a symptom that something is wrong.

A second observation is that, of course, much less was happening than was claimed. To understand how much less requires a look at some gross numbers:

On the government side, the amount of money to be spent on the information highway depends on what you count and when you look.

The Administration's most official document to date[17] gives a total number and breaks out some of the pieces: "The Administration's ambitious agenda for investment in critical NII projects (including computing) amounts to $1-2 billion annually."[18] "The Administration has requested $1 billion for the HPCC (High Performance Computing and Communications) Program in fiscal year 1994."[19] "We have also requested an additional $96 million in the FY 1994 budget to create a new component of the HPCC Program–Information Infrastructure Technologies and Applications (IITA)."[20] "$1.1 billion for the HPCC"; "$50 million for NTIA grants to demonstrate the applications of the NII for non-profit institutions such as schools, hospitals, and libraries"; "The President recently endorsed increasing the funding of the TRP (The ARPA-led Technology Reinvestment Project) to $600 million for FY 1994."[21]

When these numbers are broken out by agency, program, and date,[22] they suggest much smaller initiatives. Budgets for the NII amount to $114 million (FY 1993), $171 million

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[17]*The National Information Infrastructure: Agenda for Action*, Information Infrastructure Task Force, September 15, 1993.

[18]Ibid., 6.

[19]Ibid., 8.

[20]Ibid., 9.

[21]Ibid., 23.

[22]Committee on Physical, Mathematical, and Engineering Sciences, Federal Coordinating Council for Science, Engineering and Technology, Office of Science and Technology Policy, *High Performance Computing and Communications: Towards a National Information Infrastructure*, Washington, D.C., February 1994.

(FY 1994) for NREN (National Research and Education Network), and $96 million (FY 1994) for IITA.[23]

Total expenditure (all programs) to come through the National Science Foundation (NSF) is $225 in FY 1993 and $341 million in FY 1994. The appropriate Senate bill, 1993 S. 4, however, authorizes for the same NSF programs $20 million for FY 1993 and $40 million for FY 1994. The bill does not appropriate this money.

At the time of Gore's keynote speech on the subject,[24] informal estimates of what these numbers might really mean ran up to about a billion dollars over three years[25] (yet to be raised and allocated). About two-thirds seemed likely to be earmarked for academics. Although we are fond of academics, we know that this money doesn't produce short-term economic returns. In fact, the returns on academic research and competence-building are notoriously hard to quantify. Even its most enthusiastic proponents only assert that they are very long term. That leaves only about $100 million for each of three years.

Contrast that figure with some measures of how much money is normally spent in these industries, and you will get a sense of the likely consequence. 1993 capital spending of the three largest long-distance carriers totalled $6 billion. For the local exchange companies, the comparable figure was $20.4 billion.[26] For the cellular industry, it was $3.1 billion,[27] and for the cable industry, $1.89 billion.[28] 1994 revenue of the U.S. computer industry is projected to be $66.2 billion.[29] R&D expenditures normally run smaller than capital development by an order of magnitude. R&D numbers for 1992 are calculated to be $7.96 billion in the electrical and electronics industries, $17.2 billion in office equipment and

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[23]Ibid., Table titled "Agency Budgets by HPCC Program Components," 25.

[24]Gore presented the Administration's program for the "National Information Infrastructure" (NII) on January 11, 1993, in a speech at Royce Hall, UCLA.

[25]Number compiled by the author after research in faculty clubs and bars.

[26]The United States Telephone Association, "1993 Estimates—Forecast for the Local Telephone Industry," *1994 Telephone Industry Directory* (Potomac, Md.: Phillips Business Pub., 1994).

[27]Cellular Telecommunications Industry Association.

[28]National Cable Television Association.

[29]U.S. Department of Commerce, Bureau of the Census, International Trade Administration, "Trends and Forecasts: Computers and Peripherals," *1994 U.S. Industrial Outlook* (Washington, D.C.: U.S. Dept. of Commerce, 1994), 26–1.

services and $3.7 billion in telecommunications.[30] It is estimated that about $375 million will be spent in 1994 for research into asynchronous transfer mode (ATM) alone.[31]

We're not talking about a significant government budget. It scarcely even meets Everett Dirksen's criterion: "A billion here and a billion there and pretty soon you're talking about real money."[32]

On the industry side, there have also been some pretty grand claims about money to be put into the information highway. But these monies, too, are less than they seem. First of all, they look suspiciously like the conventional construction budgets. Second, they are being committed in increments. The first pieces to be built have a conventional current demand—not a novel information highway one—that will cover the cost. If they don't pay off, then the next pieces don't have to be built at all. Finally, it is widely stated that *all* of the new construction can be financed by cost savings from maintenance budgets. I'm inclined to view the RBOCs' behavior as prudent management and a standard effort to get credit for something that happens on your watch.

Unfortunately for them, the telcos' plans were scrutinized in a pair of highly visible articles on the same page in *The Wall Street Journal*.[33] One was entitled "They'll Spend Lots, But Lots Less Than They Say." It had only one graphic, titled "Hype and Reality." The caption was "Companies brag about spending huge sums, but their announcements are padded with money they would spend anyway." The other article was titled "Interactive Trials Are Trials Indeed—Tough to Start and Tough to Judge." Its only graphic was titled "Big Plans, Little Action."

On October 19, 1994, Sumner Redstone, CEO of VIACOM and Paramount, said, "It seems apparent that the information superhighway, at least to the extent that it is defined in extravagant and esoteric applications, is a long way coming, if it comes at all."[34] These

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[30]"In the Labs, the Fight to Spend Less, Get More: R&D Scoreboard," *Business Week*, June 28, 1993, 102-127.

[31]Patrick Flanagan, "Future Industry Directions: the 10 Hottest Technologies in Telecom," *Telecommunications*, May 1994, 31.

[32]He was, of course, talking about much more valuable preinflation dollars.

[33]*The Wall Street Journal*, May 18, 1994, B1.

[34]Sumner Redstone, speaking at the National Press Club, October 19, 1994.

sentiments were echoed within the next few weeks in speeches by Bill Gates, CEO of Microsoft, Craig McCaw, founder of McCaw Cellular Communications, and Marc Porat, CEO of General Magic.

And A Brief Word About Those Other Nine Lives

In media articles and conversations these days, the information superhighway is usually treated as a has-been or a discredit to its promoters.[35] Yet nobody has quite stood up and said, "it was just a fraud. Let's forget it and get back to business as usual." That recantation would make people just as nervous as did the full-blown hype. There is a strong suspicion that something might be missed. And indeed it would be.

While we were gazing up at all those stunning announcements, a great deal has been happening right under our noses. Life, as the saying goes, is what happens while you're making other plans.

Let's look more closely at "business as usual."

We are living amidst a phenomenal march forward in the performance (soaring) and cost (plunging) of information technology. Almost anything you can measure in electronic and optical goods is improving by about an order of magnitude every five years. This progress looks as if it will continue indefinitely, and it's been doing so long enough to yield some patterns:

It breaks down barriers to entry.

It drops the cost of doing anything.

It makes new things possible, then easy.

It eliminates the priesthoods of suppliers and experts.

It puts the power in the hands of users.

It makes previously unimagined products and services commonplace.

It leads to a sense that we are on the threshold of a grand and unpredictable future.

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[35]"If you're sick of all those information revolutions, press 1." From "Slow Mo—Changing the Wiring Takes Time," "The Week in Review" (Section 4), *The New York Times*, Sunday, October 30, 1994, 1.

It guarantees that nothing in this realm will stand still.

There are more, but you get the idea.

This progress also produces a seeming paradox. If so much is happening, how come so many of the major players seem to be threatened, and how come they're producing so much rhetoric in response?

To understand this, we need to accept that the paradox is not only "seeming." It's also real. These contradictory things are all happening. Worse: there are several independent forces and trends, each operating on its own time scale.[36]

However, there is a very powerful theme running through much of it. I can describe it best by telling a story.

In the mid 1980s, one of the Boston suburbs put its library out for an automation bid. There were seven respondents, and they had four properties in common:

They were all small.

They were all using DEC hardware platforms as "value-added resellers (VARs)."

They were all in the municipal library automation business only.

They were all run by librarians.

At the same time, DEC had become concerned that its computers were turning into commodities and its margins were shrinking to commodity margins. Higher margins and growth rates were flourishing out in the applications niches. DEC responded by reducing its VAR discounts and trying to move out into the niches itself. This turned out to be a costly mistake. DEC couldn't learn enough about enough niches to be credible (or, alternatively phrased, it couldn't do so cost-effectively).

Traditional computers and communications—big company stuff—are turning into platforms. Prices are becoming commodity prices, and products can be used without the provider's help. That makes thousands of niche applications affordable and easy to do. Every

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[36]For more elaboration of this paradox, see our Program's *Telling Ripe from Hype in Multimedia: The Ecstasy and the Agony*, an Incidental Paper by Anthony G. Oettinger, with a preface by myself.

year, thousands more spring to life. And the key to success is shifting from knowledge about the technology to knowledge about the application.

Three things are happening:

> The information business is booming and transforming the world. Anybody can see this.

> The big traditional players are getting pinched.

> The action—good growth, good margins, and visibility of value to the users[37]—is out there in the applications, which are dividing into more and more niches.

The key to the paradox is to look in the right places for the action. Yes, there is a lot going on. But it is no longer driven by the big players and rolled out in twenty-year plans. It is instead driven by the smaller players, built on commodity platforms from the big players. It is rolling out in a thriving and brutal Darwinian survival-of-the-fittest regime. Nobody is planning the route or even steering the ship—nor is this possible. These are the most dynamic and user-responsive industries the world has ever seen, and no longer because AT&T and IBM are managing it that way.

The Economist's "Survey" section in the September 17, 1994, issue was about the computer industry. The lead caption read, "A New Age of Computing, Writes Peter Haynes, Will Be Heaven for Consumers—But Hell for the Industry."[38]

On Looking in the Right Places

Let me touch on three more ways in which looking in the right places helps understand the reality, and also why the hype happened. I'll put these in front of you without justification. Each is worth a book of its own.

Not a mass market. The information highway has been billed as a mass market, complete with the appropriate rollout, revenue, and public awareness. Well, maybe some day,

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[37]Translating this observation into a successful business or investment strategy is more difficult than just investing in niche players. A fuller exploration of the dynamics of success and failure is outside the scope of this paper.

[38]Haynes, "Survey—The Computer Industry: The Third Age," *The Economist*, September 17, 1994 [n.p. but "After page 60"].

but not in its first incarnation. No technology has ever sprung directly from first appearance into mass market: not the telephone, the computer, the fax, the automobile, the VCR, or the railroad. Instead, there is a string of consecutive adopter groups, each laying the way for its successor by exploring what can be done with the technology, working out bugs, and paying down the development costs. Until you see healthy early and secondary adopter markets, forget the mass market.

Doesn't Do Those High-minded Things. We haven't seen the information highway yet, but we have seen enough new developments in communications and information to know what is promised for them and then what actually happens. Witness television, Minitel, Prodigy, and the Internet. The pattern is consistent:

Benefits Promised During Promotion and Government Hearings
Education
Health Care
Information services
Commercial and economic development

Applications That Drive Large-Scale Development
Entertainment
Games
Chat lines and bulletin boards
Pornography

Look to the real revenue streams to justify development.

Government Isn't a Promotor/Builder. Government is a fair and open forum. On occasion, government can be a vehicle to develop national consensus and implement it on a grand scale. Witness the interstate highway system and the space program. In the information industries today the competition is too bloody for consensus. Instead, the competitors use the fair and open forum as another tool to stymie one another. Such use is a recent development in these industries.[39] Consensus, when it is reached at all about the information highway, is at the most general level of grand goals (or "hype"). When government processes aim for

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[39]Actually, the "fair and open forum" processes of the federal government have served from the beginning for both the development of grand consensus and projects and to allow special interests to cripple their opponents. I am referring to a dramatic shift in these specific industries that has occurred during the twenty-one year life of our Program.

specific outcomes, they generate mutual paralysis. Don't look to the government to be a creative factor—only a rule setter.

And As We Move Forward

The information highway is but one of the dazzling and often confusing developments that seem to pour forth from the information and communications industries almost daily. Some live in the realm of reality, others only in the realm of theater. Some are surface manifestations of the larger forces at play.

As suggested here, the future is being shaped, not by a grand plan, but by myriads of "grass-roots" business and government decisions.

A wonderful example came to hand just as this paper was being revised for publication. These quotations are from an article titled "State Urges 23% Cut in NYNEX Rate," in *The Boston Globe* of January 13, 1995:

> Accusing NYNEX Corp. of unfairly using telephone customers to pay for its expansion into cable television, the state attorney general [Scott Harshbarger] yesterday asked regulators to slash phone rates in Massachusetts by 23 percent, or $400 million a year.
>
> NYNEX spokesman Jack Hoey disputed Harshbarger's claim, saying it "ignores the realities of the telecommunications industry" and "jeopardizes" NYNEX's ability to build a piece of "the information superhighway" that would benefit the entire commonwealth.

If this paper has helped you decide how to vote on this one, I count it as a success.

Acronyms

ATM	asynchronous transfer mode
ARPA	Advanced Research Projects Agency
CEO	chief executive officer
FY	fiscal year
HPCC	High Performance Computing and Communications Program
IITA	Information Infrastructure Technologies and Applications
MFJ	Modification of Final Judgement
NII	National Information Infrastructure
NREN	National Research and Education Network
NSF	National Science Foundation
RB/ROR	rate-base regulation
RBOCs	Regional Bell Operating Companies
TRP	Technology Reinvestment Project (led by ARPA)
VAR	value-added reseller