

*Incidental Paper*

**The Internet: Is It a Bird?  
Is It a Plane? Will It Fly?**

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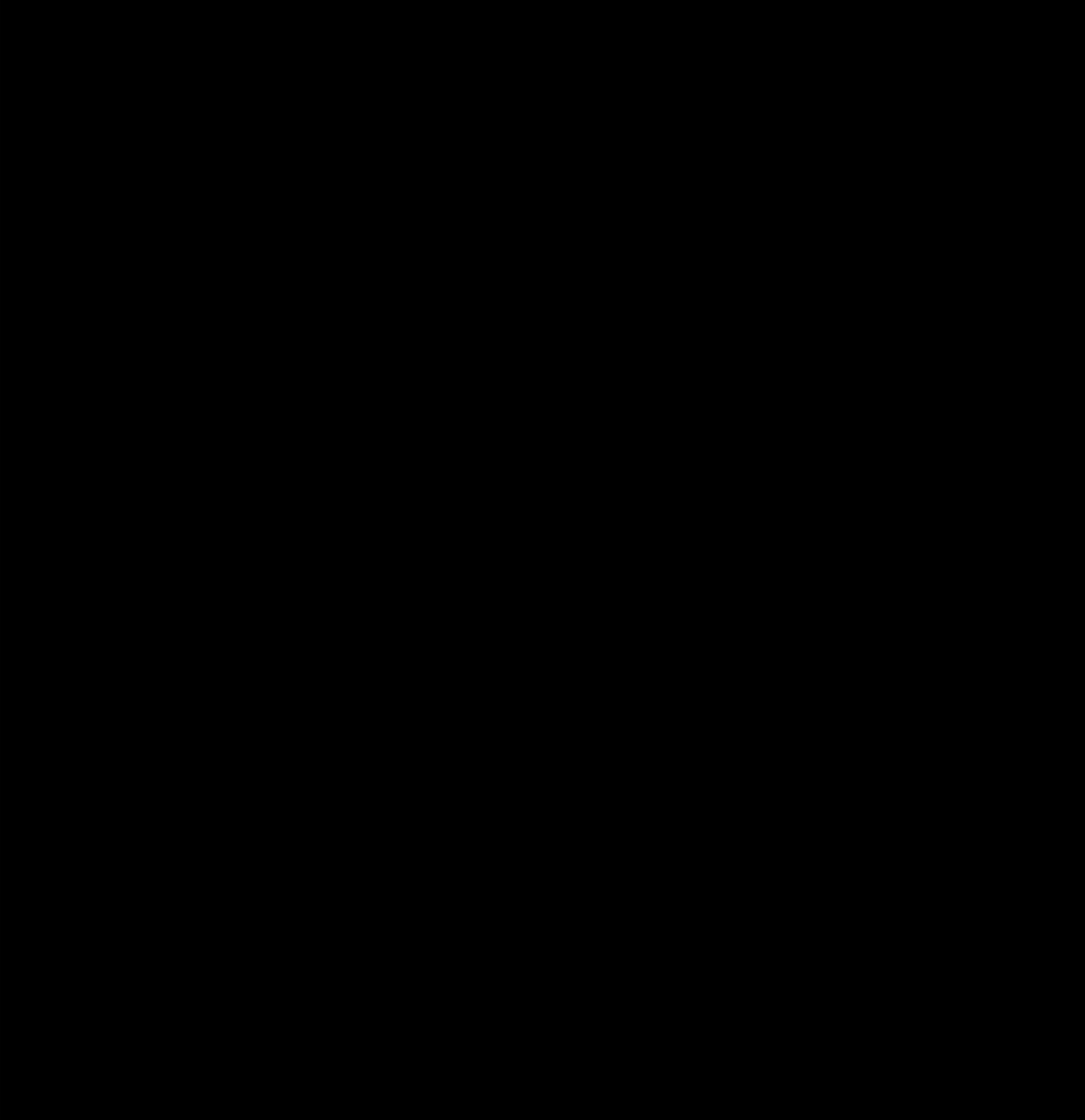
Center for Information  
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Viacom Broadcasting  
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### **Note**

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Of all the confusing developments in modern communications—and many would call the phrase “confusing developments” redundant—the Internet probably takes first place for the number of conflicting interpretations of what it is and where it is going. Here we aim to make a start on those questions by attacking another question: will it fly? To bring this question down to earth (so to speak) we will focus on the present moment. We’ll take a snapshot of the Internet, rather than a movie. We will scrutinize this snapshot for, among other things, the forces and trends we can discern in it. We’ll use it the way a scientist uses a snapshot of a bird in flight or a horse in midair over a fence.

Let’s start with one of the less controversial questions about the Internet: to what does the word refer?

An “internet,” usually spelled with a small “i,” is a network of networks. The concept is well defined at the philosophical and technical levels and means about what it sounds like it means. There are lots of internets. There are lots of companies making the parts out of which they are built, helping with their construction, and running them. Internets are a thriving segment of the communications universe at the moment.<sup>1</sup>

Despite their success, or perhaps because of it, internets are less sharply defined at operational levels than at philosophical and technical levels. In many cases, for example, networks that are connected by an internet are themselves internets. Suppose we build internet A, which connects internets B and C. Have we turned A, B, and C into a single internet? Is the answer “no” for billing purposes but “yes” for maintenance and development? Are the wires, routers, or hubs that connect them part of the internet and the network, and, if so for what purposes? Is any information in transit over an internet part of the internet? Does the internet have responsibility if information is lost? How about if the information is pornographic? Is the responsibility shared by the network and the host machine? Does the internet have a right to “read” the information as part of managing its transfer? Questions of this ilk have obvious implications in the technical, operational, philosophical, legal, regulatory and other arenas. By and large, they are being coped with in the internet world. But with success comes the first shadow of difficulty. And with the most successful internet shadows come soonest.

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<sup>1</sup>Cisco Systems, Inc., is believed to supply about 65 percent of the routers used on the Internet. According to the 1995 annual report, Cisco’s net sales picture looks good: (in millions) July 1993, \$649; July 1994, \$1,243; July 1995, \$1,979.

The Internet with a capital "I" is one of the oldest internets and is probably the largest of the family. It grew by a long evolution, only some of it planned, from the ARPANET, which was conceived in the 1960s as a mechanism to share advanced computer resources at ARPA-funded<sup>2</sup> research sites. Its allure for this discussion lies in its explosive growth, evolving nature, and confusing potential.

The Internet gets a lot of attention as something completely new and different on the communications scene. Just four years ago, in 1991, researchers at Arthur D. Little, Inc.,<sup>3</sup> describing principal trends in communications didn't mention the Internet. Just two years ago, the World Wide Web (WWW) didn't even exist. Statistics (most of them of uncertain verity) abound to show astonishing growth in usage and change in character. What will be there in two more years that we can't foresee today?

But if the Internet can appear from nowhere, can it as quickly disappear into nowhere? The evidence points clearly both ways.

Here's the case that the Internet will die. It has three dimensions:

The first dimension has to do with the "wild-west" "anarchic" nature of the Net. Many Cyberians cite this as among its greatest virtues. The Net is characterized as "liberating" its denizens from the unwelcome constraints of society, including centralized planning, public school curricula<sup>4</sup>, and the telephone pricing apparatus.<sup>5</sup> But lack of structure can have unfortunate side effects, some of which may inhibit future growth or even cause shrinkage:

- *Sexual misbehavior.* Pornography is a boon to the Net, as it has been to most growing media. It provides content that enlarges the audience, and it helps with cash flow. Many Net users argue vehemently against efforts to limit it. But pornography also repels users—particularly parents and religious and educational institutions. Less ambiguous are the few cases where persons (usually children) have been lured into a kidnapping or rape through Internet contacts.

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<sup>2</sup>ARPA—the Advanced Research Projects Agency—originally (1958) was part of the Department of Defense. In 1972 the name was changed to DARPA, and in 1993 back again to ARPA. ARPANET was launched in 1969, and the National Science Foundation (NSF) network joined in 1986.

<sup>3</sup>Norman Weizer et al., *The Arthur D. Little Forecast on Information Technology and Productivity: Making the Integrated Enterprise Work* (N.Y.: John Wiley and Sons, 1991).

<sup>4</sup>For a good introduction to this belief system, see Paul Keegan, "The Digerati," *The New York Times Magazine* Sunday, May 21, 1995, 38.

<sup>5</sup>"But there is a third reason [why the Internet is cheaper than a phone call]: telecoms pricing is a notorious scam." "Survey: The Internet," *The Economist*, July 1, 1995, 9; hereafter "Survey: The Internet."

- *Privacy and security* (especially commercial). It is widely presumed that the Net is too risky a place to use a credit card number. The new International Business Exchange (IBEX)<sup>6</sup> has announced that it will not use the Internet because of security fears. Retail credit card clearing links avoid it today for the same reason.

- *Destructive hacking*. Hackers have broken all efforts thus far to provide security on the Internet. They are also penetrating corporate and government databases, sometimes altering them. Theft of information and money is a rapidly growing problem. The Computer Emergency Response Team reported 130 Internet break-ins in 1990, 1,300 in 1993, and 2,300 in 1994.<sup>7</sup>

- *Viruses*. Our own Program has picked up so many viruses from the Internet that we now isolate the machines that use the Net from the rest of our machines. Not so much as a diskette passes between them. Commercial users have reported that "a firewall" is necessary around computers on the Net.

- *Nebulous intellectual property rights*. A document, such as a copyrighted book or piece of software, can easily be entered on the Internet. From there, duplication and transmission are very easy. Rights are not well defined on the Net, and enforcement seems close to impossible thus far.

- *Inaccuracy of information about the Internet itself*. Consider some statements about the number of users in mid-1995 (in millions):

37.5	<i>Montreal Gazette</i> <sup>8</sup>
38	IDC <sup>9</sup>
3-5	Find/SVP <sup>10</sup> (households with Internet access)
5-8	<i>The Economist</i> <sup>11</sup> (WWW only)
20	SRI International <sup>12</sup>

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<sup>6</sup>IBEX has been created by the Global Business Alliance, a group including the US Chamber of Commerce, AT&T, Dun & Bradstreet, GE Information Services, Chase Manhattan Bank, Digital Equipment, and Simon & Schuster." Louise Kehoe, "US Groups Launch Electronic Market for Desktop Trading," *Financial Times*, Sept. 27, 1995, 20.

<sup>7</sup>Wade Roush, "Hackers: Taking a Byte out of Computer Crime," *Technology Review*, April 1995, 33.

<sup>8</sup>Matthew Friedman, "Who you gonna call," *The Gazette (Montreal)*, July 31, 1995, S3.

<sup>9</sup>Quoted in "Net Gains," *Marketing Week*, July 28, 1995, 33.

<sup>10</sup>Quoted in Steve Creedy, "Who's at Home with the Computer?" *Pittsburgh Post Gazette*, July 25, 1995, C3.

<sup>11</sup>"Who Can Measure the Net?" *The Economist*, July 22, 1995, 61.

<sup>12</sup>Quoted in Mark John, "Cyberspace Gridlock Threatens Internet," *The Reuter European Community Report*, July 11, 1995.

13.5	Matrix Information and Directory Services <sup>13</sup>
45	World Paper <sup>14</sup>
5.8	O'Reilly & Associates <sup>15</sup> (U.S. direct access)
24	Dun & Bradstreet <sup>16</sup> (North America)

Or of the number of computers connected (in millions):

30	<i>Time Magazine</i> <sup>17</sup>
5	<i>The Economist</i> <sup>18</sup>
28	<i>The Economist</i> (for 1987) <sup>19</sup>
6.64	Network Wizards <sup>20</sup>

Comparable uncertainties abound concerning the kinds of people connected, their level of activity, their interests and intentions, etc., etc. Uncertainty usually limits the commitment of traditional businesses.

The second dimension of the case for the Internet disappearing concerns who is actually using the Net. There are few solid data on this subject, but there are fragments and a lot of anecdotes that suggest that the population may be skewed in inconvenient ways.

As seen by this author, the community of users is comprised of five main groups:

(i) *Serious scientists*, the descendants of the ARPANET community. Computer and communications pioneers built the ARPANET as a device to connect ARPA computer sites and share scarce advanced computing resources. Those sites served other data-intensive scientific disciplines, such as meteorology, demography, and genetics.

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<sup>13</sup>Graeme Browning, "World Wide Web: Who's Using It?" *The National Journal* 27, 27, July 8, 1995, 1782.

<sup>14</sup>"Networks Linked to the Internet," *World Paper*, May 1995, 4.

<sup>15</sup>"This study was the first to employ Random Digit Dialing (RDD) into U.S. households.... Sampling error is less than 1% based on having completed screening interviews with 29,901 individuals. Previous studies of Internet users have been based on estimated numbers of user per host, or have employed self-selecting samples. Neither of these methods produces accurate, projectable results.... A further 3.9 million use commercial online services only." Press release, O'Reilly & Associates, Sebastopol, Calif., Sept. 28, 1995.

<sup>16</sup>Quoted in Jared Sandberg, "On-Line Population Reaches 24 Million in North America," *The Wall Street Journal*, Oct. 30, 1995, B3.

<sup>17</sup>Quoted in Joshua Quittner, "Vice Raid on the Net," *Time* April 3, 1995, 63.

<sup>18</sup>"Survey: The Internet."

<sup>19</sup>"Survey: The Internet."

<sup>20</sup>"Every three months Network Wizards runs a program over the Internet that counts the number of mainframes, minicomputers and workstations connected to it all over the world." "Network Wizards Survey Finds 6.6 Million Internet Hosts," *EMMS Electronic Mail & Messaging Systems Newsletter*, Aug. 21, 1995, 1.

Scientific use has been growing on the Internet. But there is reason to believe that some of these users may now be dropping off or seeking other media as a result of intrusion by crowds of amateurs.<sup>21</sup>

(ii) *Aficionados*, the crowd called nerds, junkies, geeks, hackers, wonks, and the like. There are lots of them, and they love the Net. Some of them are conspicuously helpful, such as the people who gave away the original WWW software and got the Web going. Some are conspicuously harmful, such as those who destroy commercial records for sport. Most are simply dedicated users.

(iii) *Children*, who with each new generation are more and more at home with computers and communications and more sophisticated at using them. At Harvard, the undergraduates are way ahead of the graduate students, not to mention the faculty.<sup>22</sup> A generation seems to take about four years these days.

(iv) *The curious*, for whom personal computer and modem ownership is growing rapidly. Many new owners—and established owners enticed by the growing publicity about the Internet and ease of access—are snooping around to see if there's anything worth their while.

(v) *Companies* wondering whether it's the wave of the future. Communications and financial services providers, among many others, are testing for that wave or a detectable current they can swim with. What do they have in common? They're all losing money.<sup>23</sup>

From a "we need to make money to be involved" corporate point of view, this population has some good news and some bad news. Some of that population is probably brand-loyal (assuming the Internet is the brand). It is strongly skewed toward the higher levels of education. Of the major Values and Lifestyles "VALS (tm)" groupings used by SRI, for example, the "actualizers" make up 50 percent of the Web population but only 10 percent of the general population. The "achievers," however, are strikingly absent, making up only 6

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<sup>21</sup>Julie Chao, "Internet Pioneers Abandon World They Created," *The Wall Street Journal*, June 7, 1995, B1.

<sup>22</sup>"The dramatic growth of the Internet has created a miniature generational divide among students at Harvard. Last year, 97 percent of first-year students had e-mail accounts by the end of the year, compared with 88 percent among graduating seniors and 61 percent among graduate students." Thanh Nguyen, '96, "The Internet Generation," *Harvard Magazine*, October 1995, 74. The article did not offer a comparable percentage for faculty.

<sup>23</sup>"Are most of these eager investors fated to be disappointed? If technology takes its usual path, the answer is almost certainly that they will be disappointed with a capital 'D'.... The real revenue shows up a decade or two later." David C. Churbuck, "Where's the Money?" *Forbes*, Jan. 30, 1995, 100.

percent of the Web population but 13 percent of the general population.<sup>24</sup> “Making the Internet relevant to this time-constrained and socially oriented segment is a key to sustained growth,” says Adam Gross, of the Media Futures Program.<sup>25</sup> “Believers, makers and strugglers” are 49 percent of the general population but only 2 percent of the Web population.<sup>26</sup> What’s more, the Internet population has shown strong resistance to advertising and is often hostile to commercialism in general. “Flaming” of advertisements—in which ads are buried in electronic hate mail—is an example.

Regardless of who they are, a recent survey suggests that most Internet users’ commitment to the Net is at best tentative. “Millions of people are flocking to cyberspace, but most aren’t sure why.... ‘People are putting their toe in the water,’ says Andrew Kohut, director of the Times Mirror Center for the People and The Press, which surveyed 3,603 adults in May and June.”<sup>27</sup>

How active they are may be wildly overstated by the methods of measurement. Counting “hits,” the standard unit, may overstate activity by as much as a factor of 20.<sup>28</sup>

If the quality and quantity of consumers out there are in doubt, so is the quality of marketers.

Many of these corporate outposts—“home pages” in Web parlance—serve up little but the on-line equivalent of junk mail. Filled with turgid company profiles, hokey product pitches, and bland marketing material, these come-ons wouldn’t make it from the mailbox to the kitchen counter of most homes if they arrived via the Postal Service.<sup>29</sup>

In the words of one anonymous marketer, “there are no real people out there.” None of these is the kind of market segment that industry lusts after. All those companies could have a hard time converting their money-losing experiment into a money-making business. Without profit-driven growth, they’ll drop off, or at least limit their financial commitment to the “experiment” level. The present explosive growth could turn out to be ephemeral.

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<sup>24</sup>“World Wide Web Study Points to Significant Differences Between ‘Online’ and ‘Real World’ Consumers,” *PR Newswire Assoc., Inc.*, June 9, 1995, Financial News Section.

<sup>25</sup>Ibid.

<sup>26</sup>Ibid.

<sup>27</sup>Quoted in Leslie Miller, “On-line Surfers Mostly Exploring,” *USA Today*, Oct. 16, 1995, 1A.

<sup>28</sup>For a quick look at this problem, see Lou Dolinar, “Hot Sites or Hot Air,” *Newsday*, July 4, 1995, B19.

<sup>29</sup>Bart Ziegler, “In Cyberspace the Web Delivers Junk Mail,” *The Wall Street Journal*, June 13, 1995, B1.

But if growth is in doubt, there would seem to remain a solid core of Internet types. Are they the basis for at least a continuing, steady growth of the Internet? Well, maybe.

A large percentage of users—a widespread rumor says 80 percent—when asked what the Internet costs, say “it’s free.” A survey once done on the “free” MiniTel suggested that more than half its users would drop off if a charge of \$2.00 per month were imposed. Cyberians may agree.

In other words, the whole thing could evaporate if confronted with a little sound accounting of the most conventional sort. And that could happen.

The third dimension to the case for the Internet disappearing is the financial structure holding it up. The 80 percent who think the Internet is free wittingly or not depend on someone else picking up the bill. In this way the Internet is like the health care system. But the disconnection between user and payer has one more step.

At Harvard, typically the user is a student, faculty member, or staffer. The payer is the Dean’s budget. But the Dean doesn’t see a line item the way a health insurance company does. Instead, it’s buried in the overhead of a zillion different government research grants. Actually, the situation is even worse than that. Some overhead is siphoned off by the University administration before it gets to the Dean. Some of it finds its way back to the Internet via a central function called the Office for Information Technology.

Incentives and mechanisms to evaluate or control these costs are minimal. But the Internet is growing, and so are its mysteriously buried costs. At the same time, government is in cost-cutting mode, and research is on the list. Judging by the mood of internal memos, the day of reckoning could be rushing toward us.<sup>30</sup>

Now here’s the case for an Internet takeoff.

First, of course, is all that growth. There may be doubts as to what is happening and how much is happening, but there is no doubt that a lot is happening.

Second, it is widely asserted that the Internet is making a transition from “government” to “private.” Public funding of the Net has (supposedly) ended, the formal barriers to commercial usage have been dropped, and management has made the transition to private

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<sup>30</sup>“That is a brief summary of the good news about the network. As the network expands and dependencies increase, I am obliged to also use this column to report some of the concurrent issues and risks we are facing and thereby help you avoid the negative impact of any problems, whatever the cause.

First, at the request of the Deans, we have to stop subsidizing the growth and operation of the data network....” “From the Director,” *Harvard Technology Window*, October 1995, 1.

hands. Commercial sites have been growing faster than any other kind: The .com domain became the largest single domain in 1994 and had 50 percent of all hosts by July 1995.<sup>31</sup>

But the Internet has not yet established a sound foundation. Businesses fail, and for the Internet to succeed it has to be *good* business. The problems described above have to be overcome. Fortunately, there are some positive signs:

A step-at-a-time transformation is starting in the financial structure. Until recently, the typical user would sit down at a machine paid for by a research grant and sign on through a "free" port. However, more and more users are sitting down at computers for which they have paid. More and more are getting connected via Prodigy, America OnLine, CompuServe, or one of the six hundred plus<sup>32</sup> companies specializing in Web access. For access these users pay a fee. Some of that fee goes back to the Internet as a connection charge—in other words, revenue in return for service. Normal business practice could be the fiscal fresh air lacking in the past.

Furthermore, several entrepreneurs have lately appeared with the same story. They are going to offer the world some service or another at a reduced price. But how? By using the Internet as a communications backbone. The services are blindingly unoriginal—things that are old hat to the market, such as fax transmission. The customers may never know they're on the Internet and needn't come from the existing Internet community.

Perhaps the ultimate old-hat service is plain old telephone service (POTS). NetComm offers a version, but it's half duplex (one way at a time). VocalTec of New Jersey is improving its POTS product to allow full duplex conversations. Quarterdeck of Santa Monica, California, is offering "WebPhone," which uses a standard phone line for POTS with a purchase price of about \$50.<sup>33</sup>

Recent headlines suggest that conventional, as opposed to exotic, applications will at least be given a chance:

Internet Coverage of Football Kicks Off<sup>34</sup>

Internet Telephone Products Emerging<sup>35</sup>

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<sup>31</sup>"Network Wizards Survey Finds 6.6 Million Internet Hosts," *EMMS Newsletter*, Aug. 21, 1995, 1.

<sup>32</sup>Another dubious figure, of course. This one comes from "Survey: The Internet."

<sup>33</sup>"Industry News: Quarterdeck Corp.," *Telecommunications Reports*, Sept. 1, 1995, 3.

<sup>34</sup>Rebecca Quick, *The Wall Street Journal*, Sept. 13, 1992, B7.

<sup>35</sup>*Telecommunications Reports Daily*, Sept. 1, 1995, 3.

Cybersalesmen Plug into New Bazaar<sup>36</sup>

BC Puts Dorms on Info Highway<sup>37</sup>

Head Count Looms for Cyberspace. Nielsen, Partner to Track Number of Internet Surfers<sup>38</sup>

Lexis-Nexis and CNN Announce "Tell Me More" Available on the World Wide Web<sup>39</sup>

VeriFone Expected to Announce System For Purchasing Goods on the Internet<sup>40</sup>

Some Banks Bet the Internet Will Be the Medium<sup>41</sup>

6 Newspapers Put Help-Wanted Ads On Line<sup>42</sup>

There also are headlines going in the opposite direction:

Infighting Unravels Alliance Seeking Standard to Protect Internet Services<sup>43</sup>

Discovery of Internet Flaws Is Setback for On-line Trade<sup>44</sup>

But there are many more ventures forming than dissolving at this time.

If pay-as-you-go<sup>45</sup> usage takes off, then both the oddball community problem and the financial underpinnings problem begin to be addressed. It's ordinary people doing ordinary things and paying from budgets they already have: the marketers dream.

If the fee-for-service revenue ramps up faster than the research-overhead payments ramp down, the Net could show some real staying power. Some long-range trends would work strongly in its favor:

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<sup>36</sup>Aaron Zitner, *The Boston Globe*, July 13, 1995, 37.

<sup>37</sup>Johnny Diaz, *The Boston Globe* Sept. 6, 1995, 75.

<sup>38</sup>Susan Moran, *The Boston Globe*, Sept. 6, 1995, 45.

<sup>39</sup>PR Newswire, Aug. 30, 1995.

<sup>40</sup>"A number of high-profile companies have been developing methods for electronic payments over the Internet. Notably, Microsoft Corp. and Visa International teamed up to develop one payment system, while MasterCard International and Netscape Communications Corp. jointly developed another system." Jared Sandberg, *The Wall Street Journal*, Sept. 11, 1995, B8.

<sup>41</sup>Jared Sandberg, *The Wall Street Journal*, June 8, 1995, B1.

<sup>42</sup>William Glaberson, *The New York Times*, Oct. 18, 1995, D9.

<sup>43</sup>Jared Sandberg, *The Wall Street Journal*, Sept. 28, 1995, B10.

<sup>44</sup>John Markoff, *The New York Times*, Oct. 11, 1995, 1.

<sup>45</sup>Or, alternatively, payment by third parties, such as advertisers. This, too, is being tested.

- Children (number three of my five categories in the user community) will grow up, enter the economy, make money, and bring their habits and skills to the marketplace. They will migrate from being a fringe group to being everybody. "Respect the young," says my colleague Tony Oettinger, "for they will win in the end."
- The demographics of the user community will evolve to approach those of the population at large. This change is already starting<sup>46</sup> and should broaden the Internet's functionality as well as its size.
- The ever improving performance and price of electronic and optical technology will work the usual wonders on the Internet. Everything will become smaller, faster, cheaper, better, and easier to use.
- Some of the "wild west" anarchy will give way to structure. The Web brought some order to the Babel of formats and made better graphical interaction possible. Other anarchy problems include data protection and security, safe billing mechanisms, intellectual property uncertainty, sexual misconduct, and fear of viruses, all of which are being addressed today.

The Internet may be at a turning point, and there may be some "basic identity" and even "make-or-break" elements to it. If so, the outcomes may not matter much. Here's why:

The collapse or redefinition of this particular i(I)nternet doesn't kill off internets in general. Others are there to pick up the pieces. Indeed, if this Internet were to vanish magically tomorrow, others would quickly grow to fill its economically viable functions.

Standing behind internets is the whole juggernaut of the information (r)evolution. If not internets, then private networks, public networks, the information superhighway, etc., etc. If the capability or the price aren't suitable this year, try again next year. It's entirely possible that we'll look back on the Internet as a temporary frontier (or, more exactly, one of many temporary frontiers) of our prodigious and complex advance in information and communications.

Now let's come back to those questions of what the Internet is and where it might be going. One thing the Internet clearly is is a dynamic, not static, entity. Its growth (explosive for now), and evolving technology (such as the WWW) are obvious on the surface. Also obvious, but less clear as to their nature and meaning, are the changes in the kind of people

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<sup>46</sup>Two articles in the *EMMS Newsletter* are revealing on that point. The Aug. 21, 1995, issue states "And Now the Bad News. The Internet remains largely a privileged place for the elite, wealthy industrial countries" (page 2); but the Sept. 4, 1995, issue has the headline "Study of Cybercitizens Shows More Women, Minorities" (10).

and companies connected and what they are doing. Likewise the modes of equipment ownership and ways in which things are funded.

Another clear observation about the Internet is that it is multifaceted. It is different things when examined from different angles. From the point of view of underlying technology, for example, it looks like a public telephone company. Yet from the point of view of regulation, it looks like a uniquely enterpriseless enterprise network. From the point of view of architecture, it looks like other internets. But most other internets have restricted access or unitary ownership and funding. For funding, ownership, and access, the Internet looks less like other internets and more like the nation's transportation infrastructure.<sup>47</sup>

A third clear observation is that no matter which facet of the Internet we examine, it, too, is dynamic. Nothing is standing still, and the different aspects of the Net are not moving in harmony. The Internet looks like a kind of electronic primordial broth, a seething mix from which many different life forms will evolve and in which many will die. Such a Darwinian process seems to be at work on the Net.

A fourth clear observation takes us back to the questions raised here at the start. There aren't single answers to "what is it?" "will it fly?" and "where is it going?" because these are really multiple questions, depending on which facet we are looking at.

Despite all this complexity, there are some identifiable "this-could-be-happenings." For example:

- The Internet could be a temporary frontier as the information/communications juggernaut moves forward. It is reasonably safe to say that the Internet of ARPA/NSF days was such a frontier. It was replaced by the Internet without the WWW, which, in turn, was replaced by the Net with the Web. These are three different animals. What kind of animal will we have in a few more years?
- The Internet could be a temporary omnibus of functions too disparate to remain together. By a kind of parthenogenic division, for instance, commercial activities might migrate to a more secure, more restricted subset or even a separate internet.<sup>48</sup> Such a move would parallel the earlier history of the public switched networks, from which enterprise networks eventually broke off.

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<sup>47</sup>A companion piece to this paper in preparation, "The Five Models of Communications Development and How They Are Fighting It Out," compares different telecommunications models by various traits.

<sup>48</sup>Retail credit card transactions today are processed through private Internet Protocols not connected to the Internet.

- By contrast, the Internet could be a giant cyber-vacuum-cleaner sucking ever more communications out of other modes into itself. Before that can happen, however, the wild-west anarchic problems would have to be well under control.
- The Internet could be a (even *the*) principal model for future telecoms development, in both the developed and the developing worlds. “Model” here could mean different things. By comparison with traditional switched networks:
  - As an architectural model, the Net suggests a flat-packet-routed approach instead of a hierarchical circuit-switched one.
  - As an industry structure model, it suggests substantial control by users instead of by telecommunications companies.
  - As a *location-of-intelligence* model, it suggests more intelligence at the ends and less in the middle.
  - As a planning model, it suggests minimal central involvement and facilities planning and no planning at all of features and applications.
  - As a financial model, it suggests a major ownership role for users—which is the opposite of the traditional telephone company model.
  - As a regulatory model, it clearly rejects monopoly, except perhaps for the suppliers of the connecting lines.

Observations such as these expand the question “what is it?” The Internet can’t be addressed by looking only at the Internet. Answers also depend on what is happening and what will happen with other modes of telecommunication and on how the Internet relates to them.

The same is true of the question “will it fly?” For example: If the Internet survives and grows, it may evolve into something partly or wholly different from what we see today. If it survives and shrinks—an option that might result from a contraction of the current financial structure and the migration of commercial activity to a “retailnet” or “commercialnet”—it would be a different entity from the one we now know. Whether the Internet “flew” or “did not fly” will depend on context.

We started this inquiry with some simple-sounding questions. But in the course of addressing them, we have ranged over a very complex collection of topics. Let’s finish by looking at what we’ve accomplished.

First, as is so often the case, we’ve had to scrutinize the questions. What does it mean to ask “what is the Internet?” Each question has turned out to be a bundle of questions (or

perhaps a bundle of bundles), focused on one of the Net's facets. Were we asking about the underlying technology, the architecture, the financial structure, the types of folks connected, etc., etc.? We have made no effort to exhaust these categories. The ones to examine are the ones *you* consider important. Any list of the Internet's facets will soon go out of date anyway. Analyzing the questions, we have come up with a tool, rather than answers.

We have also taken a tour of The Internet with the questions as tour guide. The Net has revealed itself as a thing of many facets, each changing according to its own rules, often with little regard for the others. The Internet seems subject to powerful cross currents, with some forces pushing it strongly toward growth and success while others push it strongly toward contraction and failure. It seems to be going through a redefinition. It is filling up with users who resemble the population at large and suppliers who look like the conventional business world. Whether the Internet will succeed for these populations remains very much in doubt.

Finally, we have discovered that the Internet cannot be seen fully outside its context(s). Will it grow at the expense of other modes of communication? Will it fracture into other modes of communication? Will it be absorbed into other modes of communication? The information (r)evolution is no less dynamic than the Internet and is vastly bigger.

Did we expect to analyze the Internet into something laid out dead in a researcher's laboratory and fully and neatly dissected? Of course not—to do so would miss the point. As an anonymous anagrammer said of the information superhighway, "Oh, wormy infuriating phase!"<sup>49</sup>

Other helpful anagrams for "information superhighway" also seem to describe the Internet:

Hi-ho! Yow! I'm surfing ARPANET!  
New Utopia? Horrifying sham.  
Oh-oh, wiring snafu: empty air.  
Hey, ignoramus—win profit? Ha!  
Inspire humanity, who go far.  
Waiting for any promise, huh?  
When forming, utopia's hairy.

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<sup>49</sup>This and the following anagrams all appeared in Don Willmott, "Abort, Retry, Fail?" *PC Magazine* 14, 16, Sept. 26, 1995, 400.

## Acronyms

<b>IBEX</b>	<b>International Business Exchange</b>
<b>NSF</b>	<b>National Science Foundation</b>
<b>POTS</b>	<b>plain old telephone service</b>
<b>RDD</b>	<b>Random Digit Dialing</b>
<b>VALS (tm)</b>	<b>Values and Lifestyles groupings used by SRI</b>
<b>WWW</b>	<b>World Wide Web</b>



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