GILDER TECHNOLOGY REPORT

BEYOND THE TV TEMPTATION

No development is so inevitable, so desirable, and so cornucopian in opportunities as the death of television.

When Bill Gates, chairman of **Microsoft Corporation** (MSFT), declared two years ago that he did "not have to take any more of this," got up and strode away from Connie Chung's on-air cameras, the **NBC** charmer seemed shocked. She was right to be shocked. A man without a television in his home, Gates' defiance offered an omen of a TV-free America within the next five years–an America where citizens rather than broadcasters control what they see and when.

For fifty years, TV has parlayed its rule of U.S. living rooms into dominion of the culture–defining the news, reshaping politics, reorienting family life, liberating sex, and remaking the social and artistic expectations of several generations of Americans. Now the reign of television is over. Bill Gates once seemed to know it. His majestic sweep past the cameras of NBC seemed to signal the beginning of an era of similar dominance by the personal computer that Gates pioneered and led to its current pinnacle.

But now, on the threshold of victory, Gates has lost his nerve. Collaborating with NBC, buying **WebTV**, wasting perhaps a billion dollars on TV oriented software, he is capitulating to old media and obsolescent technology.

Don't solve problems. You solve problems and you end up subsidizing your weaknesses, starving your strengths, and achieving expensive mediocrity. In a globally competitive economy, expensive mediocrity goes out of business. Don't solve problems; outsource problems; sell off problems.

Pursue opportunities. Then you can transform the competitive land-scape. Pursue opportunities and you create problems for your rivals and reshape your company to shape the future.

These propositions–inspired by the works of Peter Drucker–are the key to entrepreneurship and investment in the current era. Bill Gates may see TV as an opportunity. But he will soon discover that it is a problematic distraction.

A crucial corollary is *don't compete.* You compete, as W. Chan Kim and Renee Mauborgne point out in the *Harvard Business Review*, and you end up "regressing toward the competition." Web TV is a perfect case in point. It offers inferior Internet services on an inferior interlaced screen.

Chart 1

Household Penetration of PCs

All Households

Households with Children

Households with Income over $40,000

0% 10% 20% 30% 40% 50% 60% 70%

Source: Computer Intelligence

Competing in specs and features with digital settop boxes, Microsoft will finally find itself in another consumer electronics price war, in an arena where no one has really won in ten years.
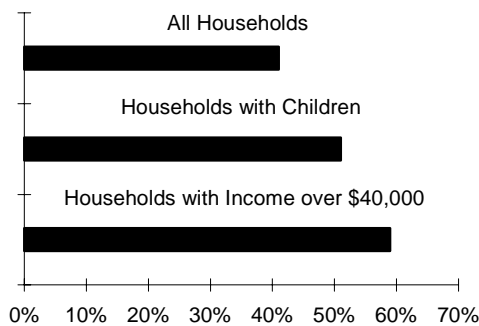
"The fatal flaw of **Silicon Graphics** (SGI), **3DO** (THDO), **AT&T** (T), **Raynet**, **Eon**, and **QVC** is that they are all trying to solve the problems of the telephone, TV, video game, and consumer appliance companies. But the problems of these separate industries are unsolvable in the face of the integrating sweep of the computer networking juggernaut."–*Life After Television*, Norton paperback, 1994. Along with **Philips** (PHG) and **Thomson**, **Time Warner** (TWX) and **Zenith** (ZE), these companies have already earned the dismal rewards of problem solving for TV.

Now Reed Hundt, Sumner Redstone, John Malone, Al Gore, Congress, the Supreme Court, and Gates all are competing avidly to solve the problems of television. All believe that because television is powerful today, it will be powerful tomorrow. All believe that its installed base of 200 million homes

Rather than being a barrier to entry for rivals, TV's installed base of 200 million homes is a barrier to entry for TV companies in the crucial new markets of the Internet.

represents a barrier to entry for rivals, rather than a barrier to entry for TV companies in the crucial new markets of the Internet. All these TV chasers will suffer a bruising fall when TV tumbles over the paradigm cliff.

A useful guide to the current era is the growth-share matrix invented by **Bain & Company** to optimize flow of capital in a conglomerate company. The growth-share matrix might be termed Fanueil Farm, after Bain's famous Fanueil Hall headquarters.

The dynamics of Fanueil Farm derive from the learning curve. The learning curve shows that workers increase productivity 20 to 30 percent with every doubling of accumulated output. The pioneer on the curve was Henry Ford. He knew he could double his wages to $5 per day without increasing his costs because higher pay would attract the best workers and keep them on the payroll while they moved down the curve.

Bruce Henderson of the Boston Consulting Group generalized the curve to all costs and renamed it the experience curve. Henderson's research detailed learning effects of 20 to 30 percent for every doubling of unit volumes, by industry, for cars, computers, crushed limestone, transistors, nylon, telephone calls, golf balls, silicon wafers, chicken broilers, paper bags, and insurance policies by value.

In the late 1980s, Michael Rothchild of the Bionomics Institute further generalized the curve to all biological evolution–showing the presence of the same 20 to 30 percent learning effects in everything from rain forest slime molds to Baja Californian ant hills. Using biological examples, Rothchild showed that the effect of competition in learning is not the constant eruption of brutal conflict but the efflorescence of diversity and specialization–Adam Smith's division of labor. As Rothchild wrote in his book *Bionomics*, "The hallmark of competition is not conflict but diversity." In nature or business, smart competitors do not "compete"–converging with their rivals in a market–but diverge and differentiate. In a particular market, defined narrowly, there is only room for one player who can win returns beyond the rate of interest.

Based on axes of market share and market growth, Fanueil Farm classifies businesses in a shorthand of animal names, marked according to their position on the experience curve–cash cows, dogs, wildcats, and stars. Stars hold a large share of a fast growing market. Cash Cows hold a large share of a mature market. Wildcats or question marks hold a small share of a fast growing market. In the kennel are the dogs, who hold a small share of a mature or declining market. When the system is working right, cash cows, dominant in a stagnant market, provide

cash or capital for launching the most promising wildcats, often technology based, into the stars.

Wildcats have dreams of glory (they share markets with stars), but they are small and hungry for funds. Stars discover that nothing grows to the sky (everyone has a car or TV or PC operating system) and in decline are pastured and milked for cash for launching of new stars. As a mature market begins to decline, cash cows join the doghouse, where they are harvested for their assets.

The matrix essentially plots companies and countries by their time horizons. A star with good long term prospects should go for growth and share. A cash cow in a mature industry has shorter time horizon. It should finance promising wildcats. A dog usually has no future. Its assets should be redeployed.

The Farm Problem is that the farmer constantly gets it wrong. Whether he is CEO of a star company or leader of a mature economy, he gives cash cows too much capital, and their return on capital drops. They become fat dogs. He tries to milk stars, giving them big profit targets that force them to stint on needed investment. They become wildcats. As a problem solver, he keeps wildcats going (fast growing markets), but fails to focus on any one and make it into a star. They become dogs.

Meanwhile, the kennel is always in an uproar. The dogs demand food to stay alive. The farmer, a compassionate sort, feeds them; often in the end they get more investment than the stars. This is a particular temptation of government industrial policy. Governments love dogs, particularly big fat dogs, which are regarded as a valuable source of jobs. Dogs in turn love government; politics, after all, offers more excitement than a big declining company. Governments are always thronged with lobbyists from the doghouse.

Also conspicuous in national capitals are canine losers in fashionable fields–broadcasters, high definition TV touts, vendors of synfuels, solar panels, windmills, gasohol. All are decked out like poodles and also find love. Governments tend to punish stars by high taxation, anti-trust suits, and legal action against price cutting aggressively on the curve. Thus large firms (the RBOCs and **IBM**) tend to price too high, creating a price umbrella for rivals. They become cash cows. Another name for cash cow in a growing market is a sitting duck.

Don't compete, *monopolize*. That is the entrepreneurial code. You wouldn't think Gates would have to learn that lesson. But it is a lesson which nearly no one understands very well, particularly in Washington, which is creating the environment in which the new technology will thrive or fail.

The key error made by the government is to foster competition. To politicians, "competition" means supporting a specific array of rivals on what
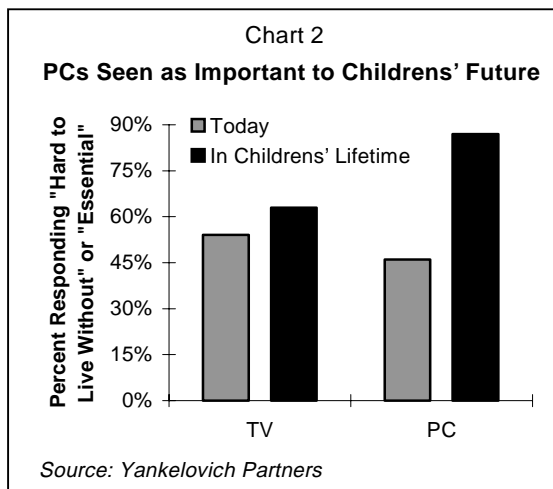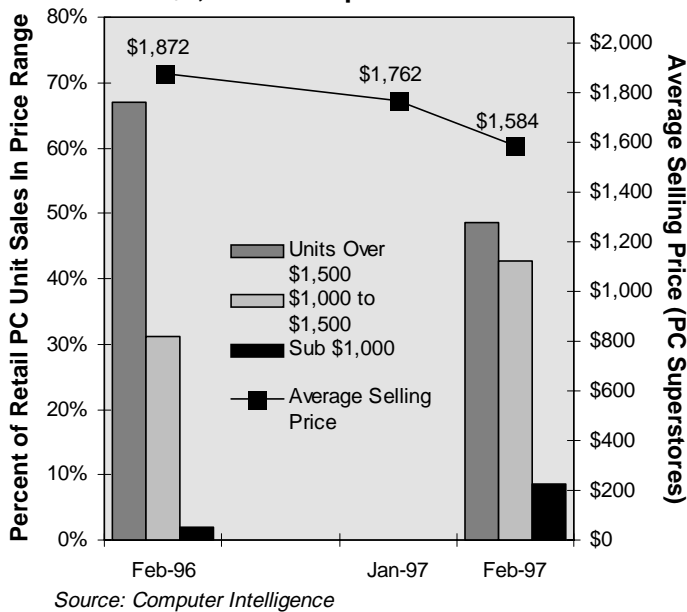
Chart 2

PCs Seen as Important to Childrens' Future

Percent Responding "Hard to Live Without" or "Essential"

- ☐ Today
- ■ In Childrens' Lifetime

(y-axis: 0%, 15%, 30%, 45%, 60%, 75%, 90%)

(x-axis: TV, PC)

Source: Yankelovich Partners

Chart 3
Sub $1,000 PCs Impact Retail Market

Source: Computer Intelligence

Despite 3 monthly declines in year-to-year growth in the US retail PC market from Nov-96 (-10%) through Jan-97 (-7%), Feb-97 saw a 6% increase in unit sales following the introduction of sub-$1,000 PCs by Packard Bell-NEC, Monorail and Compaq. The 329% year-to-year increase in unit sales of sub-$1,000 systems brought Feb-97 average selling prices in PC superstores down a dramatic 10.1% from the month earlier Jan-97 level—compared to the average monthly decline of only 0.55% from the Feb-96 to Jan-97 (Chart 3). In addition to Packard Bell-NEC which saw its market share in PC superstores more than double from 15.2% in Dec-96 to 30.5% in Feb-97, the prime beneficiary of the price declines will be the PC consumer. The latest CI Consumer Technology Index Study clearly shows that PC cost has been a factor influencing penetration of PCs into homes. While more than 40% of all households now have PCs, penetration rises to nearly 60% among households with income over $40,000 (Chart 1). The public perception of PCs as investments in the education and future of their children (Chart 2) is reflected in the finding that a majority of households with children now own PCs (Chart 1).
—KE

Transforming a PC into a TV is simple. You merely add one layer of functionality. But to transform a TV into a PC runs against the grain. It is a lost cause.

is called a "level playing field." But the only way to have a level playing field is to prohibit innovation. This has indeed been the chief effect of FCC regulation of telecom. It has reduced all participants, telcos and cable companies alike, to a sterile rivalry in existing services that customers already have: cable TV, long distance telephony, local telephony, and now, with Microsoft's entry into this dimwitted game, even limited HTML Web functions and slow speed Internet access. As **Intel** (INTC) Vice President Les Vadasz put it in a January speech, the new telecom reform "has become the foundation for dividing the existing market rather than spawning new markets."

You create monopolies through innovation. The best signal of innovation is the *upside surprise*, another key Drucker concept. Follow the upside surprise, the unexpected bonanza. It is the key to identifying opportunity. It conveys more crucial guidance to the future than all market tests and focus groups and opinion polls, which always tell you what customers used to say they want.

Similarly, for investors seeking promising wildcats, upside surprises signal opportunity far better than extended past performance, or strings of quarterly gains. At the same time, downside surprises offer valuable warning signs of dead ends ahead. The unexpectedly tepid response to every single interactive TV launch—from Orlando and Cerritos to WebTV—is a downside surprise that should alert smart executives and investors to the money pits ahead.

Looking at Microsoft's huge sales of Office 97, many observers believe that the company is impregnable. As I write, Bill Gates' net worth climbed five billion during one week in April. Microsoft's market share seems a barrier to entry for others rather than a barrier to entry for Microsoft. In Washington, FTC commissioners look banefully at the company's huge profits and dominance and contemplate new litigation.

Now, in purchasing WebTV—a striking downside surprise until Gates decided to buy it—Microsoft

is combining its huge installed base in PC software with the huge installed base of TV. It is accomplishing a new legacy lockin. Following on the launch of the **MSNBC** network, Microsoft is fleeing the stars to enter the dairy, while casting longing eyes toward the kennel.

The most crucial line in business and politics divides the TV killers from the TV coddlers. No development is so inevitable, so desirable, and so cornucopian in opportunities as the death of television. No strategy can succeed that fails to celebrate and accelerate this cataclysmic event. Any strategy that depends on the survival of television will share the throes of its decline and fall.

Faced by the spread of the Internet and the expansion of bandwidth, TV is a classic fat dog technology. Its advertising model, its user interface, its cultural impact, its news approach, its display technology, its top-down network structure, its terrestrial broadcasting gear are all obsolescent. No amount of investment can retrieve it. As Andy Grove put it two years ago, "the PC will reduce the TV to a minor peripheral"—a mere display option. For all the claims of television innovation, from HDTV to Web TV to digital TV, PC and Internet technology are moving at least 50 times faster than TV technology. There is only one reason TV seems to have any future at all: The politician is always the dog's best friend.

Today the local broadcasters are parading in Washington like poodles in heat, promising to supply more stultifying hours of children's programming, more prurient splashes of public service journalism, more free time for politicians. In exchange, they want "must carry" rules that force all other systems to recycle their trash. They want huge new spectrum subsidies. They want help with new technology. They want guaranteed markets. They want to be treated as public servants and benefactors for the poor.

There is a better way to view them, however. See

Chart 4

DRAM Chips and Bits
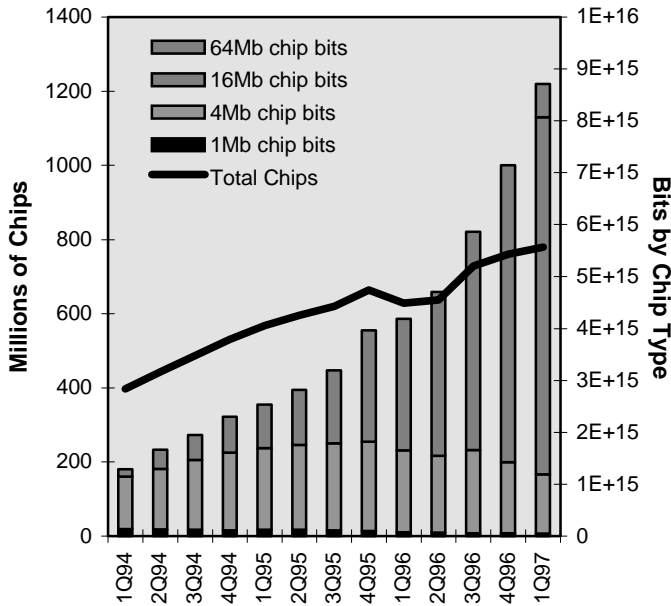
Chart 5

DRAM Price Per Bit

Source: ICE
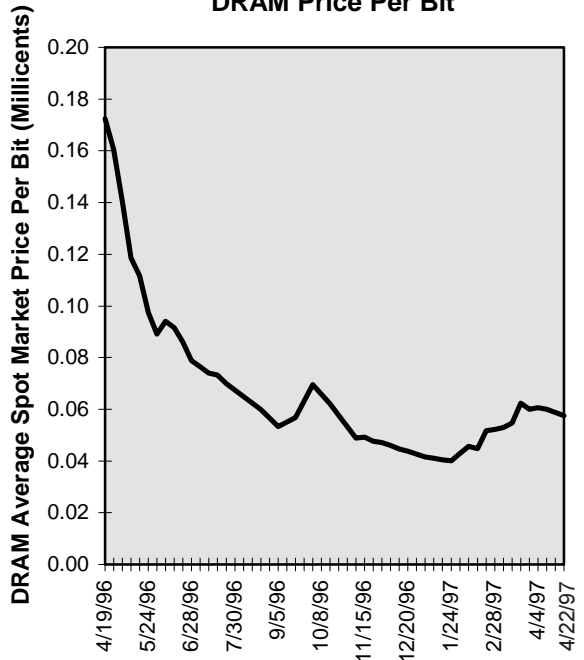
Source: Mission Electronics

DRAM Demand Doubles. *The number of DRAM bits shipped in 1Q97 was more than twice that of 1Q96. DRAM chip unit sales, which had suffered a 1H96 dip due to the transition from 4 megabit chips to higher density 16 megabit chips, also continued climbing despite the ramp up of 64 megabit chips, which shipped 10 million units in 1Q97 (Chart 4). Strong demand, word of Korean production cutbacks and firm pricing by suppliers drove up DRAM spot market prices in 1Q97. Declining DRAM spot prices in April are attributable to two factors, according to Tom Hopper, President of Mission Electronics. "First CPU confusion. Weak CPU prices from Intel and new products from AMD have made it difficult for smaller clone and custom PC manufacturers to commit to aggressive production plans. Secondly, third party SIMM (Single Inline Memory Module) demand is slowing in the channel as most new PCs ship with increased amounts of memory from PC OEMs" (Chart 5).*

Businesses Connect Locally. *While competition for the consumer dollar led AOL and other online services to drop their prices to match the $19.95 deals of local Internet service providers (ISPs), competition has also been heated in the potentially more lucrative market of providing business Internet connections. According to research by Computer Intelligence, local ISPs, taken as a group, now rival AOL in providing Internet access to US businesses (Chart 6). But among large corporations local ISPs dominate, providing access to 63% of business locations with 1,000 or more employers (Chart 7).*

LANs Expand. *In addition to the explosive growth of the Internet as a means of connecting computers across the city and around the world, the market for hubs and switches to connect computers directly via local area networks (LANs) has also seen impressive growth. Worldwide sales of shared hubs and LAN switches grew 50% from 1995 to $9.2 billion in 1996. Whether connecting computers to shared printers, common Internet gateways, into office workgroups, or company-wide intranets the demand for new connections rose to 70 million ports in 1996 (Chart 8).*

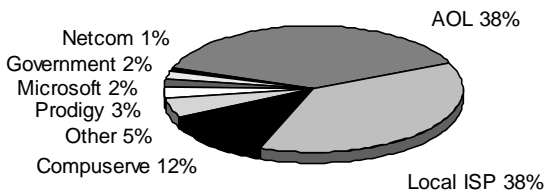*–KE*

Chart 6

Business Internet Access
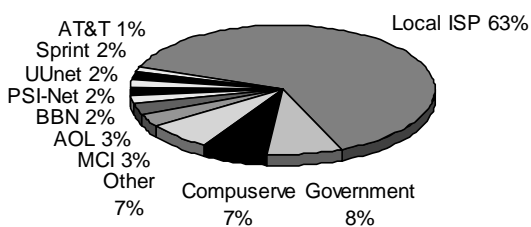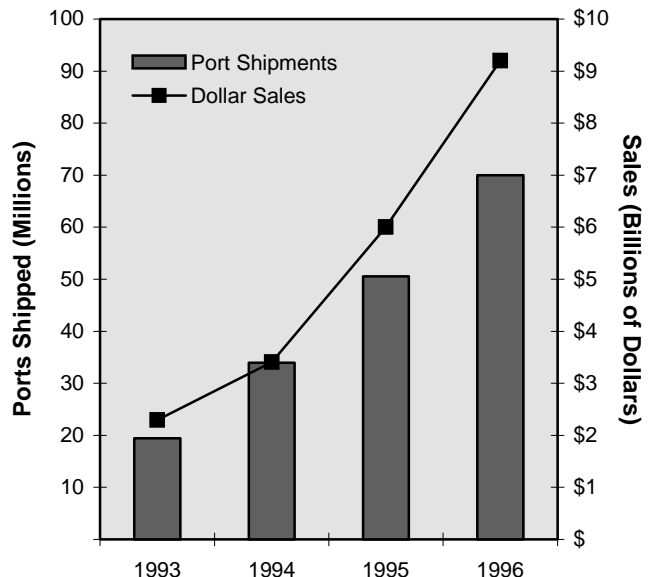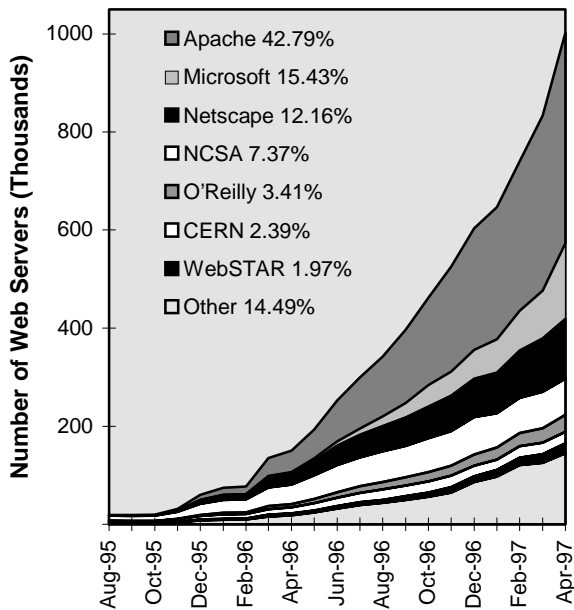

Chart 7

Businesses with 1,000 or more Employees
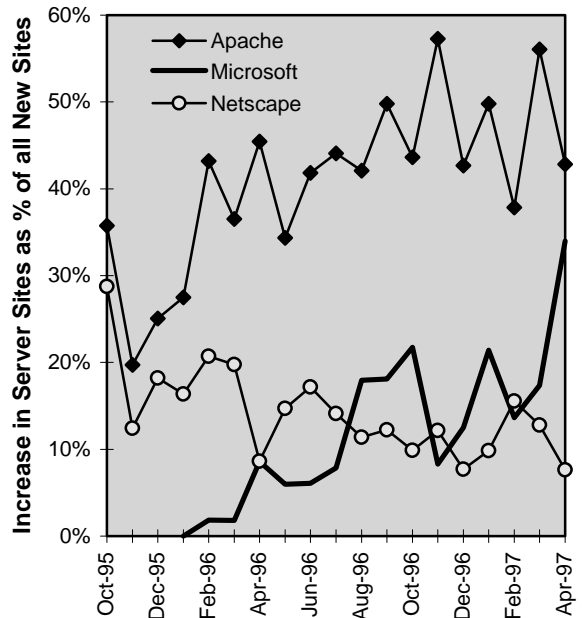

Chart 8

Shared Hubs and LAN Switches

Source: Dell'Oro Group

Chart 9
Web Server Software

- Apache 42.79%
- Microsoft 15.43%
- Netscape 12.16%
- NCSA 7.37%
- O'Reilly 3.41%
- CERN 2.39%
- WebSTAR 1.97%
- Other 14.49%

Source: Netcraft

Chart 10
Server Software Market Trends

- Apache
- Microsoft
- Netscape

Source: Netcraft

Microsoft Passes Netscape in Public Internet Web Servers. *Although it is not possible to directly count intranet servers running within companies' private networks (the source of some 80% of Netscape server software sales), web servers on the public Internet are being counted and polled monthly by Netcraft (www.netcraft.com/survey/). According to the results of their April survey, which polled over 1 million public Internet web servers to find out what server software they were running, Microsoft with 154,653 sites has climbed ahead of Netscape (121,870) and into second position behind nonprofit Apache Group's public domain software which remains the most popular web server software with 429,049 sites (Chart 9). Microsoft's upward trend is clearly visible in Chart 10, which shows the increase in the number of sites for each brand (including new sites and sites which have changed server software) as a percent of the total number of new sites surveyed. The Netcraft survey does not provide a one-to-one correspondence between its site counts and each software license sold because of the possibility of virtual hosting, in which one computer can host multiple domain names with their own ip addresses, and load balancing, in which several computers may handle the traffic for one domain. By way of comparison, our survey of Fortune 1000 web sites shows Netscape with 41% of sites leading Apache, NCSA and fourth place Microsoft (Chart 11). While Netscape is the leading server software among the F1000 sites, an examination of new F1000 sites added during 1Q97 demonstrates the gains being made by both Apache and Microsoft (Chart 12).*

Internet Traffic Continues Growth. *While measurable Internet traffic flowing through the major network access points (NAPs) and metropolitan area exchanges (MAEs) has continued with steady growth of 7%-9% per month over the last 5 months this growth rate should be considered as a measure of minimum growth (Chart 13). Since GTG began tracking NAP/MAE traffic, MAE East, MAE West and Sprint NAP have increased from 1 gigaswitch each to 4, 3 and 2 gigaswitches respectively. Unfortunately, at the present time, we are only able to calculate traffic through the first gigaswitch at each exchange. While the newest of the switches at each site only has a small number of ports and relatively light traffic loads, the total NAP/MAE traffic (excluding additional private and foreign exchanges) is likely to be more than double the measurable flow or some 1,200 terabytes/month.*
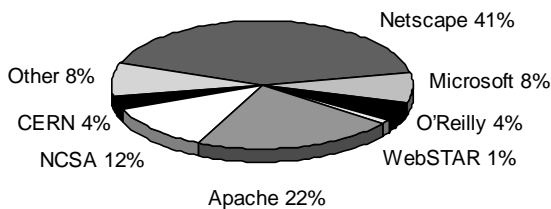
–KE

Chart 11

F1000 Web Server Software

- Netscape 41%
- Microsoft 8%
- O'Reilly 4%
- WebSTAR 1%
- Apache 22%
- NCSA 12%
- CERN 4%
- Other 8%

Chart 12

New F1000 Web Sites Added Since Dec-96

- Netscape 32%
- Microsoft 14%
- O'Reilly 5%
- WebSTAR 1%
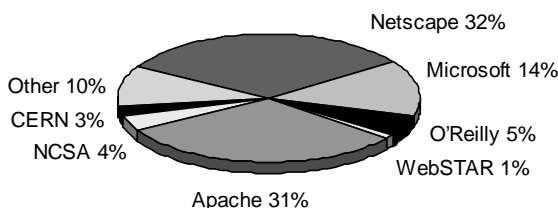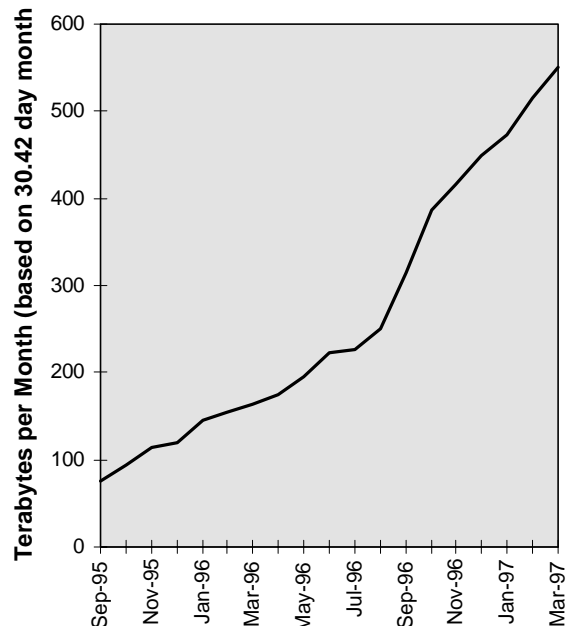- Apache 31%
- NCSA 4%
- CERN 3%
- Other 10%

Chart 13

Internet Traffic

Chart 14
With the increasing spread of satellite bandwidth, combined with the rapid rollout of cable modems, Intel stands ready to reduce the TV to a minor peripheral.

Cable Modem Availability Expands

Rogers Cablesystems and Shaw Communication's aggressive plans to expand their Wave cable Internet access from the more than 200,000 homes currently passed to 5 million Canadian homes, including 2 million passed by the end of 1997, got a boost on April 9. The Canadian companies announced that they would utilize the @Home Network's distributed network architecture and "parallel" Internet backbone to provide faster service to their subscribers. With this development, the @Home Network claims that its current partnerships will eventually give it access to nearly 50% of all homes passed by cable in North America. Telco return cable modems also received a boost from @Home and Comcast's announced plans for their use in a Philadelphia rollout during 3Q97. General Instrument SURFboard telco return cable modems are currently being used in Adelphia's Southeast Florida system reaching 250,000 homes. Time Warner has expanded its Road Runner cable modem service with the launch of service in Portland, Maine.
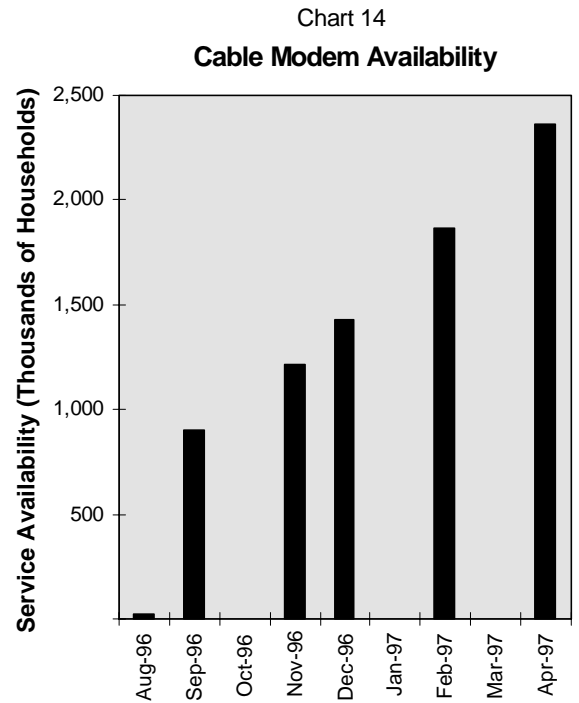
–KE

Cable Modem Availability

broadcasters as winners of nearly permanent new pollution licences, to befoul some 485 megahertz of the electromagnetic spectrum with obsolete high powered signals which block off all other uses. Look at their broadcast towers as industrial smokestacks belching toxic fumes across the landscape without filters and choking off all competitors in their space.

If they were smokers in a restaurant, they would be impolitely shown the door. If they were factories making some valuable product, their owners would still face deadly litigation and possible jail. Television is a demonstrable cause of the failure of US secondary education, the rise of crime, and the erosion of families. In the Internet, TV faces a far superior rival that can remedy most of these problems. None the less, as the broadcasters angle for effective nationalization–full of V-chips, mandated government services, expanding subsidies, and precious natters of "news"–the politicians will stop at nothing to accommodate them. But politicians cannot stop the future.

Last month I made a visit to the other side of the Wintel team–to the Robert Noyce Building in Santa Clara. There I found that whatever the mistakes of Intel, it remains on the right side of the great divide.

At Intel, nearly everyone is concerned with streaming video, three dimensional graphics, virtual reality, video teleconferencing, and other arresting new interface features. Preparing for full motion MPEG2 video, comparable to **DirecTV**, Intel has increased the bandwidth on a PC motherboard by a factor of four or more. The new system offloads high end graphics such as 3D onto a 32 bit AGP (advanced graphics port) which gives the graphics controller direct access to main memory, soon at a pace of 133 megahertz, for a total of some 400 gigabits a second. At the same time it integrates level 2 cache memory in the same cartridge with the Pentium, using a 400 megabit per second pipeline. With these huge bitstreams diverted from the central data path, the new PCs are freed to give ordinary video, WWW, and other I-O direct access to the full 1.2 gigabit per second of the PCI bus.

All these capabilities will languish without broadband connections. In the near term, Intel offers Intercast, which uses the vertical blanking interval of the TV signal to download bits at a rate of 80 kilobits a second in conjunction with **CNN** and other TV programming. Processing a stream of captions, the PC can in effect watch the TV for you and download programming that contains the key words or phrases that you prescribe. You can follow a sports event in a window on your screen or blow it up to full size at key moments. This system can even make CNN a useful news source, since you don't have to watch for 20 to 60 minutes for your story to turn up. Like all PC technology it enhances the customers control.

When Les Vadasz debated me on bandwidth last year (GTR, August 1996), he foresaw 64 Kbps ISDN as the most promising path to higher bandwidth and entirely ignored the ever expanding panoply of satellite options. Today Vadasz sees satellite as an early leader in available bandwidth. In early March, Intel joined with the **Societe Europeenne des Satellite** in launching a new company, the **European Satellite Multimedia Services S.A.** to enable direct delivery of multimedia content to personal computers in Europe. Called Astra-Net, it already reaches some 65 million homes in Europe (40 percent of the total) and now will offer two way broadband services to businesses through 20 cm dishes. It will use the Digital Video Broadcasting (DVB) standard that is offered in the US by **Echostar** (DISH) and which Intel sees as the most likely global protocol.

Intel probably missed the best vessel of broadband WWW delivery, DirecTV, which entered the market first with a proprietary form of MPEG2 technology. On the surface, DirecTV seems to be an enrichment of television. But by introducing and popularizing the first full digital video signal that

could be processed by PCs, DirecTV was in fact the first key step beyond television. Now satellite digital TV transponders are ready to enter service as sources of downstream bandwidth for the net.

But Intel's oversight will not matter. **Adaptec** (ADPT) and several other companies are making PC boards that allow computers to connect to the DirecTV system in the US, using phone lines or cable modems for the upstream link. A further source of upstream bandwidth and a dark horse telecom player is **Metricom** (MCOM), the spread spectrum wireless access company operating without a license at under one watt of power. In April, buoyed by a new MIT thesis that showed its potential capacity is essentially unlimited, Metricom announced plans to upgrade its service from the current 14 kilobits per second to an eventual 256 kilobits per second.

With the increasing spread of satellite and other wireless bandwidth, combined with the rapid rollout of cable modems, Intel's later versions of Intercast technology will eschew the vertical blanking interval and move to full digital reception. With an Intel video card, any PC can acquire all desired TV features without the top down control from broadcast central. It can become a full featured PC with incidental TV access rather than a TV with a crippled PC on board.

The key to robust video conferencing and the overthrow of television is the advance of real time digital video encoding technology. Required to deal with gigabits per second of raw video, real time encoders are one technology that will not be soon sucked up by the Pentium. With thousands of MIPS of processing power, well designed encoders can also perform decoding and other functions. By the turn of the century, such companies as **C-Cube** (CUBE), **Array Microsystems**, and **8X8** (formerly IIT) will be offering codecs that allow realtime encoding of digital images like DirecTVs for less than $100. An encoder now costs close to $10 thousand.

Driven by a design win with DirecTV, C-Cube is now a firm on a $400 million run rate and a goal to move the world beyond broadcasting. Early in April, C-Cube announced alliances with Adaptec to link C-Cube codecs with Adaptec "Firewire" video transport links, and with **Sun** (SUNW) to launch streaming video over Intranets.

Begun by members of **Texas Instruments'** (TXN) world leading DSP team, Array Microsystems is focusing its programmable videoconferencing technology on the PC space. Also focusing on video teleconferencing is 8X8. 8X8 recently hired the charismatic Joe Parkinson, who led **Micron Technology** (MU) to the heights as the world's lowest cost producer of DRAM bits. Today he wants to "ruin the market" for video conferencing chips by reducing their price and making them ubiquitous.

Meanwhile, such companies as **3Dfx**, **S3** (SIII), **ATI**, and **3D Labs** (TDDDF) are supplying full three dimensions on a Pentium MMX machine, providing an interactive game experience comparable to an arcade. WebTV is now in a few more than one tenth of one percent of America's homes. Pushed by Microsoft hype perhaps the machines can penetrate the one percent mark by 1999. By that time

an ordinary PC will run at 500 megahertz with full three dimensional capabilities and video conferencing powers, with a CMOS digital camera, and will link to satellite down stream digital video at some 20 megabits a second and upstream at perhaps 500 kilobits.

By contrast, WebTV is in essence a dancing dog. As Boswell's Doctor Johnson explained, you are amazed not by how well it dances. You are amazed that it dances at all. But you are unlikely to choose it for your partner at the prom. WebTV can display Web pages, but its resolution is inferior to a PC's super VGA. It offers Internet access, but without the most exciting visual effects and at a premium price. It can present text in a readable form. But not in as readable form as a PC, which in turn remains far inferior to paper. It can supply email, if you buy a keyboard, but it lacks the features of Eudora or other email programs. It is adopting a Java run time engine, but it is limited to the more primitive applets. Offering the form factor of HTML web pages frozen into the form factor of television, the system is obsolete even before it reaches its one hundred thousandth customer. The few score thousand buyers are mostly retired people, who find it a simple way to sample the net. They are not the wave of the future.

At Intel, they point out that transforming a PC into a television is simple. You merely add one layer of functionality. But to transform a TV into a PC runs against the grain. You have to add thousands of functions and features in a race with the fastest moving technology on the face of the earth, while retaining backward compatibility with one of the most sluggish. It is a lost cause.

WebTV is often mistaken for a network computer. But the network computer partakes of a different paradigm. Far from inferior to the PC, the network computer will offer a more robust and reliable access to the full resources of the net, embracing the ever increasing array of Java software components. As Andy Kessler of **Velocity Capital** in San Francisco says, the network computer paradigm is not a thin client, but a muscular client. Though eschewing operating system and application fat, its Java virtual machine will provide full functionality and upward compatibility with future forms of the Web, complete with VRML, real audio and video, and 3-D effects. Even the low end "thin clients" will outperform the average PC of today since they will benefit from the 10 megabit per second corporate networks and high end servers.

Outside of Intel, with its huge panoply of intellectual property, the chief concern about WebTV is its array of interactive television patents. Together with Microsoft, the two companies may be able to block off many other PC-TV initiatives. If Microsoft uses this power, it will merely blight still further the vast wasteland and drive still more creativity toward the Internet.

Unlike Microsoft, Intel is reacting to the death of TV by replacing it. That is the path to the prime opportunities of the era. Intel is even stressing the efficiency of its Pentiums for executing Java. Disparaging Java, Bill Gates is left to become a problem solver for Jack Welch and the TV industry. That

By the turn of the century, such companies as C-Cube, Array Microsystems, and 8X8 will be offering codecs that allow realtime encoding of digital images like DirecTVs for less than $100.

TELECOSM TECHNOLOGIES

ASCENDANT TECHNOLOGY	REPORT(S) Volume: No.	COMPANY (SYMBOL)	Initial Reference Price	Price as of 04/25/97
Erbium Doped Fiber Amplifiers, Telecommunications Infrastructure, Wave Division Multiplexing (WDM)	II: 2, 3, 4	*Alcatel* (ALA)	16 3/4	21 7/8
Analog to Digital Converters (ADC), Digital Signal Processors (DSP), Silicon Germanium	II: 3	*Analog Devices* (ADI)	22 3/8	23 3/8
Digital Video Codecs	II: 5	*C-Cube* (CUBE) +	23	23
Erbium Doped Fiber Amplifiers, Wave Division Multiplexing (WDM)	II: 2	*Ciena* (CIEN)	23 *	23 7/8
Low Earth Orbit Satellites (LEOS)	I: 2 II: 1, 3, 4	*Globalstar* (GSTRF)	43 1/2	48 7/8
Telecommunications Equipment, Wave Division Multiplexing (WDM)	II: 1, 2	*Lucent Technologies* (LU)	47 1/8	55 3/8
Internet Software	I: 1, 3, 4 II: 1, 4	*Netscape Communications* (NSCP)	53	25 5/16
Code Division Multiple Access (CDMA)	I: 1, 2 II: 1, 3, 4	*Qualcomm* (QCOM)	38 3/4	45 1/8
Java Programming Language, Internet Servers	I: 1, 2, 3, 4 II: 1, 5	*Sun Microsystems* (SUNW)	27 1/2	27 1/8
Servernet System Area Networks (SAN)	I: 1	*Tandem Computers* (TDM)	9 1/2	12 3/8
Optical Equipment, Smart Radios, Telecommunications Infrastructures	I: 1 II: 1, 2, 3	*Tellabs* (TLAB)	29 1/8	36 3/4
Digital Signal Processors (DSP), DRAM	I: 2, 3, 4 II: 5	*Texas Instruments* (TXN)	47 1/2	81 1/4
Gallium Arsenide Integrated Circuits (IC)	I: 2 II: 3	*Vitesse* (VTSS)	21 5/8	30
Code Division Multiple Access (CDMA) Testing Gear	II: 1, 2	*Wireless Telecom Group* (WTT)	10 3/8	8 7/8
Field Programmable Logic Chip	I: 3	*Xilinx* (XLNX)	32 7/8	46

+ New Addition   * Initial Public Offering

Note: This table lists technologies in the Gilder Paradigm, and representative companies that possess the ascendant technologies. But by no means are the technologies exclusive to these companies. In keeping with our objective of providing a technology strategy report, companies appear on this list only for these core competencies, without any judgement of market price or timing.

means that the best days of Microsoft lie in the past. It is in danger of becoming a fat cow.

Late in April, I was in Silicon Valley doing interviews for a future report on the state of the Java programming language and platform and appraising its coming impact on the industry. I found that it is a Tsunami wave that will sweep through the economy and leave a transformed landscape of problems and opportunities. The television companies will not know what hit them. But Microsoft also remains directly in the path of the change. Intel and other Silicon Valley companies too must reshape themselves to conform to the new patterns that are emerging far faster than anyone expected.

Then, before I left for home, I dropped in on a meeting of the Churchill Club, which was founded by *ForbesASAP* editor Rich Karlgaard and *Red Herring* editor Tony Perkins as a forum for discussion in Silicon Valley. Speaking was veteran Valley executive George Scalise, now at **Apple** (AAPL), who was deeply concerned with government policy. The world of the Internet was full of problems and only government planning could solve them.

Like many businessmen, Scalise falls for the fallacy of composition. Just as businessmen who know that they must balance their own budgets support policies focused on balancing the federal budget, Scalise knows

that he must plan his own company. Therefore he wants someone to plan the Internet. But as chemist-philosopher Michael Polanyi has shown, you cannot explain a higher order of activity in terms of a lower one. Rules applying to one firm do not apply to an economy of millions of firms or to a network of millions of users.

The Paradox of Planning is that only if government does not plan the economy can businesses be free to plan their own strategies. Only if the government does not solve the problems of the Internet, can companies effectively pursue the immense opportunities it offers. Only an open economy can escape political bondage to dogs and cash cows and aspire to the stars. Only an open economy can pursue the five trillion dollar opportunity to overthrow television and telephony by the Internet.

George Gilder, April 26, 1997