Chapter 9.
Your Technological Radar

"The concern for man and his destiny
must always be the chief aim
of all scientific endeavor.
Never forget it amidst your
diagrams and equations."

- Albert Einstein

The purpose of the technological radar is to understand the effects of technological developments that can create or destroy opportunities for growing your business.

Spotting Winners: Corporate Binoculars or Blindfolds?

The history of technological forecasting is not very impressive overall. Many sophisticated attempts since World War II to anticipate major technological developments have been wide of the mark. While some highly optimistic predictions have failed to materialize, other significant developments have surfaced without warning.

Further, few large organizations can mobilize the energy and commitment needed to turn new developments into applications. Having a new idea and not acting upon it can be as bad as not having it. With a few notable exceptions such as 3M Corporation, large companies tend to drift into a kind of intellectual menopause which limits their capacity to innovate.

For example, the history of Xerox Corporation is one of technological opportunities lost and found. When Chester Carlson, an obscure inventor and entrepreneur, succeeded in building a gadget in his kitchen that would transfer an image onto a piece of glass, he knew he had the basic idea for a photocopier, but he was still light years away from having a viable commercial product. He knew he would need the resources of a large firm to make his concept a reality. He approached dozens of major corporations,

among them the household names of American industry. RCA, General Electric, Westinghouse — every one turned him down.

Carlson finally found a partner in Battelle Memorial Institute, a research foundation in Columbus, Ohio. Battelle's scientists provided funds and advice, and arranged a joint venture with Haloid Corporation, a small firm that made photographic products. They named Carlson's process *xerography*, from a Greek term meaning "dry writing." Haloid, renamed Xerox Corporation, introduced the Xerox 914 copier in 1959, and launched the hugely profitable photocopying industry. Carlson lived to see his invention become spectacularly successful and died a wealthy man. Battelle Memorial Institute got a huge block of Xerox stock, worth a sizable fortune.

In the late 1960s, researchers at RCA's Sarnoff Research Center began playing with a peculiar electrical effect in transparent plastic films. When they treated certain types of films with certain chemical processes, the films became *photoreactive*, i.e. they suddenly became opaque when a tiny electrical current passed through them. The researchers realized that, by building the films in various patterns, they could make them display information — alphanumeric characters — in response to electrical signals.

Until that time, so-called digital information displays used large glass-bodied vacuum tubes, one per digit, which needed substantial amounts of electricity. Suddenly it became possible to create digital display units that used very little energy, and which could fit into very small displays — such as digital watches. They knew that, with additional research, they could develop ways to manufacture these "liquid crystal" displays cheaply.

Remarkably, when the researchers went to RCA's management and proposed commercializing the liquid crystal technology, they got blank stares. They knew they were looking at a technology that would ultimately be worth billions of dollars, but they never succeeded in making a business case for the development. As word of the discovery began to circulate in the research community, Japanese firms, particularly Sharp Electronics, became keenly interested. They signed agreements for the rights to the technology, which RCA did manage to patent, and a key part of the digital electronic revolution got under way. RCA made huge profits on licensing fees, but never brought a profitable product to the market itself.

The liquid crystal display, or LCD, played a key part in the design of digital watches as well as many other consumer electronic products. Early on, Japanese firms such as Casio and Seiko took the lead in designing and marketing low-cost digital watches. Despite the fact that the technology originated in the US, American firms were slow to exploit it, and quickly lost the battle to the Japanese.

Hewlett Packard pioneered the handheld electronic calculator, and marketed a series of quality products that set a high standard for features and functions. Yet the firm never achieved the dominance many people expected when the calculator went mainstream and became a hugely popular consumer product.

This pattern of “invented here, appreciated elsewhere” happens often in the history of major technological developments. The company presumably best positioned to carry a new technological concept forward is often not the one that takes the lead.

For example, although Swiss firms had virtually dominated the watchmaking industry for decades, they were very slow to move to electronic technology. Indeed, it appears that Swiss designers had design concepts for digital watches on their drawing boards well before the Japanese got interested, but never put them into serious production. Only with the low-cost fashion watch, the Swatch, did Swiss designers regain significant influence in watch design. After a number of years, the fashion pendulum swung back toward expensive-looking two-handed watches, and the traditional Swiss strengths in design and aesthetics became an advantage again.

Another peculiar story of missed opportunity lies buried in the early history of the personal computer. Although many people have the impression that Microsoft Corporation appropriated the visual “look and feel” of the Windows operating system from Apple Computer Company’s Macintosh, few seem to know that Apple itself did not create that design concept. The “iconic” style of presenting information, i.e. using visual symbols, cartoon-like graphics, and the mouse as an intuitive means of instructing the computer what to do, was born in a quiet research lab in northern California, operated by Xerox Corporation.

At Xerox’s Palo Alto Research Laboratories (PARC), engineers had thoroughly developed the icon-based user interface, in the form of an early prototype computer code-named Star. For a variety of reasons, mostly organizational, the company never moved the product from the laboratory to the marketplace. However, Steven Jobs, one of the cofounders of Apple, happened to visit PARC one day, saw the Star concept, and immediately decided to “borrow” it for his company’s new product, which became the Macintosh.

IBM also displayed a curious “ho-hum” attitude toward the new personal computer. In some ways, the “IBM PC,” introduced in 1980, gave legitimacy to this new gadget. People began to feel that, if IBM endorsed it, then it was probably no longer a toy, and might be worth trying. Yet IBM never moved with the speed or energy of which it was clearly capable, and failed to gain a lock on the PC market as many people had expected.

For at least the first five years, IBM’s management gave only lip service to the new product. The path to career success in the company continued to be the “big iron,” i.e. the mainframe computer products and the corporate market. A number of the original advocates and architects of the company’s PC product line became frustrated with the firm’s lack of enthusiasm for the product and left.

Of course, IBM was not the only large firm to miscall the future of the PC. Before Steve Jobs and Steve Wozniak, founders of Apple Computer Corporation, found their mentor and backer Mike Markkula, they approached a number of firms with the idea of a commercial version of the personal computer. Firms like Hewlett Packard and Atari

turned them down, reckoning that a couple of college dropouts could hardly walk in the door with anything earth-shaking.

Kodak Corporation was appallingly slow in moving into the new technology of digital imaging. Despite holding a dominant position in the photographic film industry for decades — or possibly because of it — the company made little response as PC chips became faster, graphics software became more sophisticated, digital scanners became better and cheaper, and more and more people wanted to put pictures into their documents. By the time the company began seriously investing in digital imaging, particularly the digital camera, the field was already crowded with large and small firms offering bits and pieces of the solution.

In the early going, Kodak had a number of options, such as partnering with a firm like Apple, which was crusading to sell computer users on a visual style of operating. It could have seriously entered the scanner market. It could have made a serious foray into graphics software, possibly by acquiring one of the more promising companies in that sector. Unfortunately, by the time it came to the party the hors d'oeuvres were mostly gone.

There is plenty of evidence to indicate that the dominant firm in an industry is seldom the one to dominate the next wave, or the technology that drives it. For example, hindsight suggests that one or more of the major telecom players, such as AT&T, MCI, or British Telecom could have conceived of the Internet, and virtually owned it as an adjunct to the transmission networks they already had in place. Instead, the Internet grew in a topsy-turvy fashion almost on its own. In the short run, the firms making the most money from the on-line phenomenon will be the telecoms who carry the traffic. However, they have done little to shape the development of the phenomenon itself.

Indeed, the newcomer may actually have a definite edge over the established dominant player, because its leaders are much more likely to overturn the assumptions that made the dominant firm so successful. The organization that's best at doing something for the millionth time is typically the worst one at doing something for the first time.

To the extent that your technological radar shows opportunities for exploiting new technology, you have to ask yourself how wedded your organization is to the current way of operating. Is your enterprise constitutionally able to abandon old mindsets, see the implications of new technologies, and seize the opportunities they present?

Although information technology enjoys the spotlight these days, there are many other dimensions of science and technology to consider in scanning your technology radar across the business landscape.

For example, medical research is an obvious candidate for attention; new techniques in medical practice can radically change the severity, outcomes, and costs of various diseases. Pharmaceutical research is also a strong driver of economic and social

change. Lifestyle medications that treat problems such as obesity, impotence, and hair loss can create huge markets virtually overnight if they work well enough.

Research into food chemistry can create possibilities for new products and threaten existing ones. Success in dealing with various crop-threatening pests can have far-reaching effects on world supply and demand for various food products. These outcomes can change the opportunities for businesses that sell agricultural machinery, fertilizers, and food products.

Energy research may also become an important driver of economic and social change. A serious commitment by major auto manufacturers to a viable electric vehicle, combined with meaningful government sponsorship, could radically change the transportation options available to the market. Occasionally, engineers revisit the concept of long-range dirigibles as a means of transporting cargo. New technologies for construction and propulsion could make such options feasible. A new emphasis on supersonic travel, which languished in the wake of the disappointing success of the Concorde, could change options in air travel and the industries connected to it.

Ecological research can also turn up results with important political and social impacts. The continuing debate about global warming, i.e. the gradual rise in the Earth's benchmark temperature, seems to be tilting, especially under the weight of findings such as 1998's average rise of 0.58 degrees Centigrade, the biggest change on record. Laws, lawsuits, and international policies can arise from these controversies. For some businesses these events might seem very remote; for others they could have a direct and immediate effect.

Technology is Selective in its Effect

It pays to be skeptical of glittering generalities about how this or that technology "will revolutionize such-and-such an industry" or "will completely change the way we do business." These kinds of heroic pronouncements tend to obscure more than illuminate. The simple truth about all technological developments is that they are highly selective in their effect. They help some people, set others back, and have little effect on others.

Farmers use various types of technology, including sophisticated machinery, chemical preparations, and even computers for resource planning. Yet farmers are some of the lowest-paid workers in modern economies.

Law enforcement agencies, ranging from national and international agencies down to the local level, have used advanced weapons technology, forensic techniques, and information technology increasingly in recent years. However, professional criminals and terrorists have matched them at almost every turn with advanced technology of their own.

Medical technology has reached near-miracle status in saving lives and restoring

people to normal function, particularly in America. Yet the American Medical Association reports that over 120,000 people die per year in the US, due to simple errors in diagnosis, treatment, and medication.

Technological advances create industries and destroy others. The legendary *Encyclopedia Britannica*, long an icon of the American culture, is no longer published as the familiar set of beautifully bound books. Now one orders the encyclopedia on a plastic disk less than five inches in diameter.

In a later discussion we shall explore some of the ways in which technological changes can open new business opportunities and close off others. Each individual business experiences the benefits and threats of technology in its own unique way. Tracking the broad waves of change in technology is important, but it is much more important to translate them into their specific effects on your enterprise.

The Age of Cheap Information

Understanding the so-called information age, or the Third Wave, is less a matter of following the latest digital technology and the latest Internet terminology, and more a matter of understanding a few very basic effects. And the most basic effect of information technology will be *cheap information*.

From the standpoint of information, and the role it plays in a developed economy, the single most influential development in world history was probably the creation of the binary number system. On a par with the wheel and axle, the binary system made possible the standardization of every kind of information into digital form, i.e. simple pulses — on/off, yes/no, one/zero — which could be manipulated, analyzed, stored, transmitted, captured, and converted back into familiar forms like numbers, words, sounds, and pictures.

The binary system rested in technical obscurity for decades until the arrival of the silicon chip — the hardware capable of doing remarkable things with it. Coupled with telecommunications, which created the ability to transmit this new digital information, the chip has created a new ecological surrounding for human beings. We now live in, and can no longer escape from, an environment of cheap and abundant information. This new information ecology will be a mixed blessing.

The so-called information revolution has become so all-pervasive and so complex in its effects that it deserves careful study by all executives as a key business topic in itself. Even a competent summary of the topic and its implications are beyond the scope of this book, and every business leader needs to undertake his or her own education on the topic. For this discussion, however, we can highlight certain key elements of the topic relevant to the environmental scan.

Cheap chips. Microchip manufacturers can now turn out microchips in huge quantities at very low prices. Indeed, cheap chips hidden away in watches, TV sets,

children's games, telephones, microwave ovens, automobiles, hotel doors, and countless other everyday devices have already turned them into "things that think." Their thinking may be very primitive and limited to a single use, but indeed the gadgets around us are getting smarter. Chipmakers can now produce chips so cheaply that we will think of them as disposable. We will very soon see cheap, single-purpose chips embedded in a huge variety of commonplace objects. So-called "smart cards," i.e. simple credit-card like devices with embedded chips will almost certainly become widely used as identification cards, medical records, driver licenses, and other "packages" of individual information. Cheap chips could replace printed labels on cargo shipments, consumer products, and warehouse pallets, containing a complete inventory of the items inside. Requiring no electrical power, they can simply store information burned into them by simple appliances that spit them out and affix them to packages. Chips that speak, i.e. respond to a radio signal pulse, can recite their stored data to a handheld scanner passed over a package. In addition to the very sophisticated and expensive microprocessor chips found in computers, low-end cheap chips may ultimately become one of the most important drivers of information logistics.

The networking of everything. Cheap chips will mean that more and more everyday devices will exude information. The cash register that a century ago was basically a box to hold money is now a participant in a network that measures sales, forecasts demand, restocks inventory, and incidentally manages cash. The theory of the Network Economy, compellingly articulated by Kevin Kelly, editor of *Wired* magazine, holds that cheap chips and cheap ways to move information around will create a world in which just about everything can talk to everything else.[1] To the extent that someone decides to put a chip in touch with other chips, they become part of a worldwide network, driven by ever-expanding connections and ever-falling costs. The real value of a fax machine, he points out, depends on the number of other fax machines it can communicate with, as with telephones, networked computers, and the Internet. The more entities that participate in a network, the greater — exponentially — the value of the network becomes. Far beyond the familiar networks of computers, fax machines, telephones, and their companions, ordinary objects will have chips that measure things, store information, and speak their memories when asked. This view rests on the questionable assumption that every additional participant in a network has something of value to offer, but the premise calls for serious study. Intel's Chairman Andy Grove speaks of the daunting intellectual challenge of understanding a world with "a billion connected computers." Kelly and other fans of the "net culture," which at times swerves unnervingly close to looking like a cult without a leader, speaks of a world with trillions of connected cheap chips.

Productivity fueled by falling information costs. Experts debate about whether the PC and its friends have actually made business more productive overall, or may have actually retarded it. Some claim that the falling cost of information equipment such as PCs, telephones, copiers, and fax machines have offset rises in other costs, holding down inflation and producing greater overall productivity, as well as growth in gross domestic product, without the usual growth in the labor force normally needed to drive

it. Others argue that the PC and the Internet are huge time wasters, encouraging otherwise productive workers to dawdle over routine correspondence, reports, and calculations. Does spending two days producing a report using a half-dozen type fonts, eye-catching graphs, embedded tables and spreadsheets, scanned-in photographs, and color printing actually create more value than spending a half-day getting the information right and printing it in a mundane, "vanilla" format? Those who argue that computer games, Internet porno sites, and Email used to exchange jokes and recipes siphon off valuable employee time during work hours do have a point. Presumably, however, as information costs continue to fall, and handling information cheaply gets a higher priority than making it pretty, we might reasonably expect productivity benefits. However, we still have no reliable way to measure information productivity, or the productivity of knowledge workers. Until we do, the gains will be speculative, and the arguments will probably continue.

Information dependency. The US, as the most computerized country in the world by far, is also the most computer-dependent. The ever-increasing integration and complexity of the information infrastructure makes it disturbingly vulnerable to failures in various subsystems. Other developed countries face this problem as well, but not nearly to the extent the US does. We can expect to see data outages become more common than electrical power outages, and more severe in their impact. Beyond the infamous Y2K problem, the failure of a communication satellite, a major Internet backbone system, a credit card processing center, all or part of the air traffic control system, or a major stock exchange could bring tens of thousands of businesses to their knees. Perhaps more worrisome is the threat of attack on the information structure by highly motivated terrorists or enemy states acting through third party cyberterrorists. Historically, designers of data systems have given security and data protection a relatively low priority, typical of the perceived level of threat at the time. Now, however, a determined enemy might well be able to cause havoc with the US economy, its defense system, and the public sense of safety. Ironically, since such enemies typically have rather primitive information structures of their own, the developed countries cannot reply in kind. The US federal government, including the Department of Defense, the CIA, and the FBI, have launched high-priority programs to define the nature of the cyberterrorist threat and plan for the developments needed to counter it. Other advanced countries are rapidly following suit.

Information glut, garbage, and pollution. One of our biggest problems of the information revolution will be how to get rid of information, not how to create more of it. We are well past the point of information pollution in the advanced societies, and certainly in the US. Television, radio, magazines, newspapers, music, junk mail, bank statements, telephone bills, computer disks and CD-ROMs, Email messages, data files — all swirl around us in a rising tide of dataglut. Like compulsive people who save string, we save too much information. We need to learn to dispose of information, not cherish and hoard it. The simple fact is that we don't have the capital capacity to store all of the information being produced, and we're falling further behind every second. The ecological downside of the PC is much like that of the automobile. Just as every additional car imposes costs on the transportation infrastructure, throws

off pollution, and eventually requires an additional investment to recycle it to the environment, so every PC imposes costs, throws off more information — much of it polluted — and has to be recycled when it becomes obsolete in about three years. The same reasoning applies to the Internet. Every new Web site makes its creator feel a part of the cyber-revolution, but it also adds to the pollution the rest of us have to inhale. The much-vaunted Internet search engines like Yahoo!, Alta Vista, Excite and others will become less and less useful, as they degenerate into card catalogs for useless information. Information quality will become a major issue for business in the next decade. Indeed, we may see another "quality revolution," this one focused on *information quality assurance*.

The cyberparadox: technology vs. humanity. There is a developing ideological dilemma, which I believe will more and more shape cultural and commercial attitudes toward the information revolution. Like it or not, we will come to the point of asking: Which is more important, culture or technology? Notwithstanding the soothing assurances offered by fans of the digital future, the digitizing of society will pit human values against techno-values. We will begin to see the psychological and cultural downside of the digital society once it begins to cause pain. The cyberparadox will be:

The more "wired" humans beings become,
the more isolated they feel.

The notion that people who sit for hours at keyboards typing at one another around the world constitute any kind of community will become increasingly bankrupt. The increasing atomization of society and the severing of personal connections to real communities will cause psychological stress and a sense of "connected anonymity." The "digital society" is a concept embraced and promoted mostly by people with a particular psychosocial orientation, that of the *social isolate*. To the extent that the rest of us permit a minority with a particular sociopolitical ethos to dictate the design of our relationships, we will experience the stress that comes with a sense of dehumanization. We will very likely opt for enclaves of humanity, i.e. places and circumstances to which we can turn for a genuine sense of contact and community. Once we have "wired" the world, we can never "un-wire" it again.

Y2K: The Biggest Wildcard of Them All?

[This section has been deleted in the new edition.]

Dehumanizing the Customer Interface: the Digital Moat

Many organizations, and most large ones, are making what I believe to be an important mistake in one particular use of information technology, namely the *electronic customer interface*. Beginning in the mid-1990s many firms, particularly in America, began installing automated telephone "menu" systems which would route customer calls through a series of decision points to the proper department. Some,

such as AT&T, even began using digital speech-recognition technology to try to figure out how to route the customer's call by having a synthesized voice ask for a spoken response and then deciphering the possible options from the caller's statement.

Still others have attempted to manage customer calls completely by automatic response, with no human contact of any kind. I recently had occasion to call a city department to arrange for an inspector to visit my home and verify that some remodeling work met with city building code requirements. When I called the proper telephone number, I was dragged through a procedure in which I keyed in various elements of information by pushing buttons on the telephone dial, including the permit number I had been given. After I had completed my task, a computerized voice announced the day of the week on which the inspector would visit. Then the computer hung up the phone.

I was both impressed and appalled by the experience. Confirmed digital citizens will no doubt smile approvingly at this latest triumph of technology. Others may experience a sense of dismay in knowing that one more large organization, in this case a city government, has decided that human contact is too costly and not a worthwhile investment of its resources.

There is a clear and probably unstoppable trend on the part of large organizations, toward using information technology to depopulate the customer interface and reduce the costs of managing customer relations. Banks do it, insurance companies do it, telephone companies do it, local utilities do it, airline companies do it, and so do many, many others. I believe this is a pernicious and destructive trend, for several reasons.

First, it's a clear statement to the customer that says "We're too busy to bother with your particular idiosyncrasies, so we're handing you over to the computer. You will be allowed to do whatever it's been programmed to do." It tells the customer that standardization, efficiency, and cost savings are more important than any feelings or special needs the customer might have. It also says that any variation in the customer's need or problem that doesn't fit into the software algorithm is not important and will simply not be tolerated. In the case of the city inspector, the computer simply announced the date of the inspection. I would have expected a human to verify that someone would be home on that day, and to negotiate a more suitable date if not.

It's as if the executives of many companies have decided to build a kind of digital "moat" around their organizations, to keep the customers at a comfortable distance. By refusing to have a human being answer the telephone, not only do they save money, but they avoid having to interact directly with an upset customer or one who has a complicated or time-consuming problem. The computer cannot — yet — hear and respond to the anger, frustration, or apprehension in the voice of the caller, so nobody at the firm has to deal with his or her feelings. Further, since nobody knows which customers are disgruntled and which are satisfied, it can be assumed that all customers are basically happy.

It's abundantly clear that many people find this digital barrier offensive, off-putting, and often frustrating when it prevents them from completing their missions. Yet, just as most people have accepted the proposition of doing part of the service employee's job themselves, such as operating the automated teller machine and filling their own gasoline tanks, most will probably passively accept the digital customer interface. Indeed, what choice will they have, if this becomes the standard? What number do you call to tell someone the computer gave you lousy service? Where do you go to complain about the complaints department?

This tendency to digitize, standardize, and depersonalize service interactions with customers will turn out to be a mixed blessing for many large companies, I believe. At the same time they are driving down their costs with information technology, they will be dooming themselves and their service products to the status of standardized commodities, which will be under constant threat of replacement by other, cheaper information processes.

When a person can call a computer and purchase automobile insurance without ever speaking to a human being, how can the firm hope to differentiate its value package from those of its competitors? When banking has become a purely standardized process of conversing with a computer, either by telephone or by on-line computer access, what makes any bank different from another? In this standardized, digitized world, the only competitive weapon will be a cheap infrastructure with plenty of cash flow, with which to battle other low-cost, anonymous competitors.

Not surprisingly, new and inexperienced firms in the pure information industries, such as Internet service providers (ISPs), depend heavily on the digital moat to distance themselves from their customers and keep their operating costs as low as possible. With over 4,000 ISPs in the US alone, all trying to lure customers with lower and lower prices, many simply do not want to face the fact that their customers need and want something more than an on-line sign-up procedure and a local telephone number. Curiously, Internet service and Web site hosting are industry sectors that could benefit greatly from customer-focused differentiation of their service packages. We may see more and more attention paid to the customer's state of mind as they realize that simply connecting two computers is not necessarily a high-value service.

For the smaller firm, the big-company trend toward digitizing customers may present special opportunities for competitive advantage. By creating a customer experience that is unique, differentiated, and valuable, the more service-oriented firm may be able to mark off a part of the playing field that the digital Goliaths are not interested in, or capable of, dominating. It remains to be seen whether jaded consumers would respond favorably to a renewal in personalized, individualized service, especially when the largest providers are all pushing toward commoditized products at ever lower prices. However, it makes little sense for the smaller firm to resort to the digital moat as a cost-reduction option, since it typically enjoys very few others, and could well be passing up its best avenue for differentiation.

At a deeper level, we may well see a consumer backlash against the arrogant anti-

customer attitudes that prevail in most of the software industry. The computer is no longer a toy, no longer an oddity, no longer a gadget. It's a necessary part of business life and a popular artifact of most economically developed cultures. Consumers are increasingly fed up with the exploitive ethos of forced obsolescence that forms the core precept of the industry. Software products have become increasingly unreliable as they've become ever more complex and ever more short-lived.

If the advocates of the software industry hope to see the computer accepted universally in the culture, on a par with, say, the automobile, then they will have to live up to the same customer expectations applied to the automobile. How many people would put up with a car that stopped running at least once a day, stranding them on the way to or from work? How would they react to finding out they have to replace their car with a new one, even though there's nothing wrong with it?

The same types of government regulations and controls that apply to cars and other consumer products could well become the fate of computers. Presently, the designers of a commercial software product feel free to do just about anything they like to the customer's computer. Why shouldn't the software supplier be required to disclose exactly what the product does to the customer's computer, i.e. what files it adds to the hard disk and where, which files it modifies, and which files if any it deletes? Drugs and over-the-counter medicines come with warnings about their side effects; why not require the same of computer software?

If such a consumer backlash takes hold, it could create real problems for companies that can't adapt, and real opportunities for those that can. The computer culture will have to learn a whole set of attitudes and social skills to cope with it. Technical people will have to learn to express themselves in the language of ordinary people, not "geek-speak." They will have to learn to cater to all sorts of non-technical priorities in order to sell their products to increasingly reluctant and demanding customers. And, if the forced-obsolescence dynamic begins to fail, they will have to learn a bit of humility, as they find it necessary to focus on real customer value as the S-curve flattens out and the computer's gee-whiz phase fades into history. It will certainly do them good.

Internet Mythology: What the Internet Will and Won't Do

If you want to form your own perspective on the future of computers and the Internet, and their effect on society, the first thing to do is stop listening to geeks. It's hard to imagine any source more biased and less likely to be accurate about the future than that peculiar subculture of socially disconnected souls who base their self-definition and self-esteem on a relationship with an inanimate object. That is, if you don't count the bemused journalists who mindlessly tout their agenda.

Computers and information networks are definitely here to stay, and they've brought huge benefits to business, education, and private life. The real benefits — and problems — yet to come will surely surpass our imagination. Yet few developments in our culture have enjoyed such wide exemption from logical scrutiny as the current

Internet craze. Despite clear signs that the Internet will not survive as a single, monolithic information structure, the fad rolls on like some relentless juggernaut, devouring everything in its path.

The confluence of special-interest promoters of the Internet theology, better known as the "gee-whiz conspiracy," has had remarkable success in selling it to journalists, political figures, and much of the general public. But their theology is fundamentally flawed, distorted by the dual filters of technological thinking and upper-middle class values, and not informed by a broader view of culture, human needs, and business reality.

Most of the benefits touted for the current Internet structure by the gee-whiz conspiracy will probably fail to materialize. The real benefits will be different, and probably greater. The Internet craze is living on borrowed time, and the sooner we pass through the current puberty phase and into a more realistic concept of the role of the on-line experience, the sooner we can take advantage of what it has to offer.

In characteristic contrarian form, I offer a few assertions about the nature and future of the Internet.

Assertion #1: Internet users are segmented by motive. One of the biggest mistakes newswriters constantly make is referring to Internet users as a single category of people. The few references to demographic segmentation one reads seem carefully chosen to support one of two conclusions: either everybody is doing it, in which case they pretty well match the general US population, or Internet marketing has a great future, in which case they're highly educated and affluent. Of course, every kid in America is surfing the Web every day after school, so they're also very young. The simple fact is that nobody knows who the "typical" Internet user is, what he or she looks like, and why he or she plugs in. The few serious attempts to understand people as users of the on-line experience seldom find their way into the media.

When you consider the chaotic nature of on-line activity, the fact that few Internet service providers have any kind of demographic information about their users, and that many people share accounts and log in from schools, colleges, and libraries, you can quickly conclude that any attempt to characterize Internet users statistically is little more than a wild guess. Yet, busy or lazy journalists will swallow and dutifully recite just about any plausible-sounding statistic if they think it comes from someone in the know.

This concept of Internet user as everyman (and woman) tends to hijack any serious, critical inquiry about what the on-line experience really does for people, how it can serve different needs for different people, and what its growth prospects really are. We need a better segmentation model, based on how and why people use the on-line experience. I modestly nominate the following possible role-based segments:

1. ***Academics*** - students at all levels, as well as academic researchers who use the Internet to exchange technical information and locate information related to their

specialized fields. This is probably a much smaller segment than most of the others.

2. ***Business and professional people*** - aside from those with computer-based jobs, many business people use the Internet, or at least the Web, as a source of specific business-type information related to current needs or problems. They typically sign on, look for what they need, and sign off. They tend not to relate to the Internet as an all-purpose hobby shop.

3. ***Computer professionals*** - people with computer-based occupations, such as hardware and software engineers, programmers, Web site designers, computer consultants, and many others in the actual computer industry. Many of them operate the structure of the network itself. There are probably several million of these highly specialized people, most of whom use the Internet often for specific computer-related purposes.

4. ***Consumers and "computer moms"*** - people who sign up for consumer-type services like America Online, largely because they've heard it's "cool" and it's something they should know about. Parents also may want to keep up with what their children are seeing and doing on the Internet. This may be the largest group of users overall, but it may also be the most fickle. Once the first novelty of "going on-line" has faded, how often and for how long will they log on? As newcomers join this group, others may fade out. America Online's total membership may continue to rise, but the bulk of on-line use may center on new arrivals.

5. ***Kids*** - unbiased estimates of the number of children going on-line are difficult to find, although the "gee-whiz" contingent that touts the Internet implies that there are many. Younger children seem to view the computer and the Internet as a play experience; adolescents and teen-agers seem to want a combination of a game-like experience with the experience of mastering the use of the medium itself. And, of course, many teen-agers find searching for pornographic material on the Internet exhilarating and engrossing.

6. ***Junkies*** - people with addictive personalities who use on-line activity as an escape from everyday life and spend a great deal of time engaging in it. These may be serious technophiles; people mildly or seriously addicted to computer games; socially withdrawn people who are more comfortable with limited contact, mostly with others like them; and pathologically isolated people who simply use their computers to occupy their time. Many of them spend hours every day in chat rooms, playing games, and exchanging messages with newsgroups of various types. This group may constitute a significant portion of the general population, say as many as five percent of adults, which would be equivalent to about ten million people just in the US. This category probably also includes people with eccentric political views, as well as free-speech ideologues, i.e. people who rabidly promote the Internet almost as a cult, and lobby constantly to prevent control or regulation of any form of Internet activity. They may be the main reason why Internet opinion polls are notoriously unreliable.

7. ***Misfits*** - the socially maladjusted, disaffected, bewildered, and seriously

disturbed. This group is potentially the most destructive. The Internet will probably amplify the "nut" factor, i.e. it allows people with socially unacceptable ideas, impulses, and behavior to find one another, and to feel validated in their pursuits. Consider that, if all the on-line anarchists, hate groups, militia groups, pedophiles, stalkers, hackers, and scam artists in America total only one-half of one percent of the population, we're still talking about more than a million people. For them, the Internet is not only fascinating, but a useful avenue for expressing anti-social impulses..

No one knows for sure if this is a valid set of categories either, but it seems to me it makes sense to try to understand Internet users in terms of the why of their activity, in order to guess how they may affect the future of the medium. Of course, there is probably considerable overlap in these categories, even if they turn out to be valid. Some misfits are also junkies, and vice versa. Business people, academics, and even computer moms can also be misfits. Knowing the motivation that brings a particular type of person to the on-line experience may help to know how the medium may respond to their demands and interests.

Assertion #2: Internet use will obey the S-curve, leveling off, surprising many people, and ruining some. Contrary to the most sacred precept of the Internet ideologues, the whole world won't be on-line — ever. This is the hardest possibility of all for them to accept, yet it is really the least arguable. The S-curve concept, explained in Chapter 5, dictates that the growth of anything levels off in an S-shaped pattern as the energy fueling it gets tapped out. In this case, what gets tapped out will not be the data capacity, or "bandwidth" of the world networks. It will simply be the supply of people whose mental habits and personal activities dispose them to go on-line. And the supply of such people is probably much smaller than many experts assume.

Internet promoters claim an on-line population of [XX] million or more people. I don't believe that figure for a minute. Without substantiation, it's hard to validate any such claim, although most seem to accept it without question. Does it count active Internet accounts, or all people who could possibly connect? What pattern of activity defines a user? Daily? Weekly? Monthly? Once in a lifetime? Anybody with a PC and modem? The whole family, if there is a PC in the house? Even Intel's chairman Andy Grove, a respected thought-leader in the digital revolution, conceded in a recent interview that he logs on "maybe two hours a month." Omnipresent news coverage conveys the impression that every adolescent and teenager in America surfs the Net. We're a long way from that.

MIT's director of media technology, Nicholas Negroponte, predicted in 1997 "There will be *one billion people* on the Internet by the year 2000." These "by the year 2000" predictions have been coming back to haunt their authors. The flawed assumption is that the ecological niche feeding the S-curve of Internet use consists of the entire population of the Earth. As a practical matter, not be more than one-tenth of the Earth's people will even qualify economically for at least 20 years, and only a fraction of them will actually have the necessary interest. Of those, very few will ultimately average more than a few hours on-line per month.

The first noticeable effect of the S-curve will be that most users, except the base population of junkies, will spend less and less time connected, as the novelty fades and as they locate their favorite sources of the specific information they want most. A large number of business users, for example, typically log on to a service for a matter of seconds, retrieve stock market data or certain news items, and then hang up. As the rate of new, high-time users joining the on-line services slows down and existing users reduce their time, total message traffic on the network will level off and actually decline. This will come as a huge shock to the Internet ideologues.

Internet-only marketing firms such as the legendary amazon.com and others, whose business plans rest on the assumption that the population of active users will rise almost without limit for many years, will be hung out to dry.

Assertion #3: Internet marketing will be the big failure story of the decade. The information superhighway will be littered with the remains of firms that bet their investors' assets on the "TV model" of on-line marketing, i.e. selling things cheaply or even giving them away in order to draw enough users to sites subsidized by paid advertising. By early 1999, some start-up firms were announcing that they would sell products on-line at cost, and would make fabulous profits from the advertising revenues supplied by firms eager to sell other things — presumably for a profit — to the hordes of users who stampeded to their sites. One firm announced that it would give away thousands of computers for free; all the recipients had to do was agree to accept advertising messages that could not be removed from their screens. Journalists knowingly hailed this move as "a brilliantly conceived strategy," and "the logical next step in Internet marketing."

Driven by these kinds of *kamikaze* marketing ventures, the Internet has already become a no-profit zone. Indeed, the Internet will be a destroyer of profits as new firms rush headlong to lose money under the presumption that an infinitely rising volume of users will somehow make them whole. Many naive investors have already parted with their skins by gambling on over-hyped stock offerings for "profitsomeday.com" businesses, as one analyst dubbed them. Many more investors will be caught when the bubble bursts. Indeed, the volume of money being thrown at Internet startup firms, and the atmospheric prices paid for their stocks, will work out to a fairly sizable wealth transfer across the US economy. Every share of an Internet-only marketing firm should come with a tulip bulb.

The autopsy of the Internet marketing model will eventually reveal death by fatal assumption — three fatal assumptions, in fact. The first is that the number of people on-line will rise to the sky, or at least vastly higher than current levels. Without this assumption, the necessary advertising revenues won't be attracted away from other channels.

The second assumption is that a large enough universe of advertisers will bring a large enough total investment to this channel to make the giveaway model profitable. Conversely, successful sites will have to attract an enormous population, not just junkies who visit Web sites for fun, but actual buyers. Few will succeed; most will go

broke trying. Even assuming that only a small number of sites will survive as the channels of choice, those sites will have to cannibalize enough advertising investment from other channels to cover the costs of attracting the buyers. Ironically, they will probably have to use conventional channels of advertising, i.e. print and television, to attract buyers to their sites; the Internet itself is a notoriously poor advertising medium for Web sites.

And the third assumption is that the advertising messages on the "magnet" sites, e.g. giveaway businesses, search engines, portal sites, and the like, will be phenomenally productive. Presumably, the firms paying for advertising time will see irrefutable evidence of greater sales and profits from the users who see their ads. There is no reputable evidence available, so far as I know, that Web site ads pull more sales for the money invested than conventional channels, except for the traditionally successful products of pornography and software. Without this assumption, they will concentrate their investments in those channels that do show adequate results.

If any one of these three critical assumptions fails to pan out, the model collapses.

Assertion #4: Most businesses will use the Web site to support existing methods of doing business. The "page" concept for presenting information over networks, based on the Hypertext Markup Language, or HTML, has gained phenomenal acceptance. The Web page structure, including on-line forms and embedded mini-programs such as Java, has become a useful standard model for packaging ideas. It's hard to imagine that it will not become even more widely used. As Web software technology develops and becomes easier to use, creating a Web page layout of information will likely become no more difficult than using a word processor or graphics package.

In 1989, when Hewlett Packard decided to become the most "wired" company in the world, its experts chose the Internet technical protocols as the basis for its internal network. When the Internet became popular, and the Web page concept caught on, the company was already matched to the world information environment. Employees there have long been comfortable filling in on-line forms for reimbursement of travel expenses, and exchanging documents with their counterparts all over the world. This trend will almost certainly take over in more and more corporate environments. Eventually, many firms will operate with information structures that are virtually indistinguishable from the Worldwide Web.

As an intelligent alternative to trying to force an entire business operation onto the Internet, more and more firms will use the Web site concept as an extension of the basic business structure. On-line ordering works very well, once you can attract the customer to your site. Customer-service procedures can often be implemented more effectively on line than through service employees answering telephones. You can make almost infinite amounts of information available to your customers on line, once they know where to find you.

Customer-service Web sites offer a way to share labor with customers. Just as the ATM allows the bank to have the customer do part of the teller's job, the Web site can put the customer in charge of tasks that used to require a telephone call to a service clerk. In some cases the interactive Web page may even involve fewer errors and better solutions than those provided by a human operator.

A conversation with a human is typically a *linear, sequential procedure*, i.e. asking one question at a time and getting one answer at a time. For example, the telephone company's customer who calls seeking a change in service may not know what services are available, or how to describe what he or she wants. Working with the *two-dimensional* visual structure of a Web page, the customer has a multi-dimensional view of the possibilities, and works through menus and pathways of his or her own choosing. Further, if the Web page contains the correct version of the price list, policy, or procedure, it's correct for every customer. Employees who don't have the proper job knowledge or misunderstand the policies will make mistakes or give some customers the wrong information.

Assertion #5: Content segmentation will reduce the appeal of brute-force search engines. Although the physical structure of the Internet will probably continue to be monolithic, i.e. an enormous distributed network of transmission lines, its information structure will become ever more compartmented. The segmentation of users by motivation described in Assertion #1 above is driving the segmentation of information. In other words, pedophiles know where to go for the information they want. Medical people learn where to find the information they need. Stock market investors learn which sites suit their needs best. Kids find out where the best games are. Students and academic researchers learn where to find the data they need.

As Internet users transition from curious newcomers to routine users, they will probably have less and less need for brute force methods of finding information. This may mean that search engines will remain the method of choice for junkies and others who surf the web for amusement, and become less appealing to others who have specialized needs. Once an attorney, for example, discovers the Web sites of the various legal associations, law schools, and legal databases, he or she is less likely to start searching for information at a general-purpose search engine.

We will probably see a proliferation of special gateway sites, i.e. portals to certain kinds of subject matter of interest to certain kinds of people. This could mean less "high-quality" traffic for the general search sites, and less justification for their advertising charges. Those who have been adopting the "pay for position" policy, i.e. moving certain sites up the list in exchange for listing fees, could find their practices less and less salable as the listed sites find their way into the architecture of special-interest areas.

These assertions, admittedly contrary to the prevailing popular view of the Internet, may intrigue some people, confirm others in their suspicions, and enrage others. In any case, I'd prefer to base my guesses on some definitive form of logic rather than the "gee-whiz" proposition that has exempted the Internet craze from critical scrutiny

for too long.

CyberPolitics: the Battle for Control of the Desktop

A funny thing happened on the way to the computer revolution: it got hijacked by big business. What began in the mid-1970s as a technical oddity of interest to a small band of hobbyists and technophiles slowly caught on with normal people, went uptown, and spawned a constellation of lucrative industries. In the early days of the computer revolution, “entreprenerds” set up small firms with clever names and hawked all kinds of gadgets and software programs, typically to one another but increasingly to business people who began to see their possibilities. The computer business then virtually epitomized the entrepreneurial free market. However, as a few of these firms grew to alpha size, the game began to change.

There is now a fierce battle underway for control of the look and feel, and the basic functioning, of the software on the desktop. Every firm directly connected to the information industry will be affected, and many others will be hit by stray bullets from the battle. Even those who think of themselves as merely software users have a big stake in the outcome of this ideological war. The use of information technology is now so all-pervasive that no firm can afford to ignore the implications of the competitive developments that will play out over the next five years.

In recent years, the phenomenal growth and profitability of Microsoft Corporation, under the direction of cybercult hero Bill Gates, has made it a favorite target of resentment, as it has increasingly become characterized as a corporate bully. The technophile culture came to see Microsoft, and by implication Bill Gates himself, as representing the epitome of Big Business greed and arrogance. The firm earned a reputation as not only a ruthless competitor, but an unfair one as well. Rivals accuse Microsoft of using the monopoly market power of its Windows operating system to twist the rules for competition to favor itself at every turn. With its corporate headquarters outside of Silicon Valley, far to the north in Redmond, Washington, the company increasingly diverged from the original culture and ethos of the Valley.

The source of the growing animosity toward Microsoft and its cofounder Bill Gates lies in the basic ideology of the computer culture. As Microsoft’s Windows product steadily displaced the Apple Macintosh as the computing concept of choice and went on to become virtually the only plausible choice for the vast majority of computer users, software products of every kind became heavily dependent on the design of Windows. The market began to center around Microsoft’s operating system, and other entreprenerds found their innovative options sharply limited.

Silicon Valley entrepreneurs developed a cynical expression to describe those who embraced Microsoft’s all-encompassing Windows-based world view, to the exclusion of contradicting ideologies. “That guy,” they would say, “drank the Kool-Aid.” This macabre reference to the legendary Jim Jones cult that committed mass suicide in Guyana by drinking cyanide-laced Kool-Aid, describes a person considered unable to

think independently, and overly willing to buy the “Microsoft solution.”

With the dominance of Windows, Gates and the other Microsoft executives soon realized that they held the ace card in the battle to control what the computer screen of the future would look like. And the holder of the ace card, they also realized, could dictate the terms of the competition to virtually everybody in the game.

Each new version of the Windows operating system, released by Microsoft with great fanfare and enthusiastic promotion by computer magazine editors and even consumer media such as *USA Today*, brought millions of dutiful customers to the computer stores to “upgrade” their systems. It also brought more and more software firms, including Microsoft’s potential rivals, to their knees, as they had to rewrite their products to keep them compatible with changes in Windows. Soon, Microsoft was driving virtually the entire PC software industry, and to a great extent the hardware industry as well.

PC makers wanted to offer their products with pre-installed software and, since all of the most popular programs required Windows to be present on the computer, they began to purchase the Windows system directly from Microsoft. Once all PC makers were offering a Windows-based software setup on their products, none could turn back. Microsoft now had the entire PC hardware industry in thrall. Large and powerful firms like IBM, Compaq, NEC, Hewlett-Packard, Gateway, and Packard Bell all dutifully accepted Microsoft’s terms and prices for the right to market Windows to their customers.

When the Internet and the World Wide Web burst into the public consciousness about 1995, Microsoft began to move aggressively and ruthlessly to dominate this new world of computing as well. Its blatant attempt to exterminate Netscape Corporation, the creator of the Web browser and one of the most admired pioneer firms of the Internet, became for many in the industry the last straw. They concluded that Microsoft intended to dominate and control all aspects of the computer industry, including the Internet, and that it would stop at nothing to achieve its ends.

As anti-Microsoft fervor began to build, more and more stories came to light, involving alleged attempts to destroy, cripple, or take over smaller companies who seemed to have products or technologies that might threaten Windows’ dominance. The US Justice Department filed an unprecedented lawsuit in federal court, claiming that Microsoft had used its monopoly position as practically the only supplier of operating systems to bully both PC manufacturers and software makers into yielding the competitive turf.

Further, various members of the powerful Silicon Valley fraternity of business founders, such as Oracle’s Larry Ellison, Sun Microsystems’ Scott McNealy, and Netscape’s Jim Barksdale began to gang up on Bill Gates, Microsoft, and Windows. All participated enthusiastically as witnesses in the Justice Department’s lawsuit. Indeed, executives from Apple, Compaq, Hewlett Packard, Intel, and America Online all testified — or hinted — that Microsoft had tried to bully them into abandoning

various products and developments that might weaken the Windows hammerlock on the industry. They also began to support alternative technologies such as Java and Linux, which were promising software alternatives to the Windows style of computing.

Ultimately, if Microsoft falls from its lofty perch as the alpha firm in the software industry, it will probably be because it lost touch with the culture, ideology, and value system that put it there. Bill Gates has become, to the Silicon Valley subculture, a traitor to his own kind. In his rise to fame, legendary fortune, and unbridled corporate power, he violated one of the most sacred canons of the geek culture: *inclusiveness*. The early culture of computers cherished the notion that anybody with an idea and a garage could make it, and make it big. Some of them obviously did, and Bill Gates and his cofounder Paul Allen were two of them. But somewhere along the way, Gates parted with the geek value system and went over to the Dark Side. He joined the aristocracy. He became a destroyer of opportunities instead of a creator, and for that he can probably never be forgiven.

Chapter Notes (9)

1. Kelly, Kevin. “New Rules for the New Economy: Twelve Dependable Principles for Thriving in a Turbulent World.” *Wired*, September 1996, p. 140.

2. For a feisty, contrarian view of the Internet and the whole “wired” philosophy, see Stoll, Clifford. *Silicon Valley Snake Oil.* (New York: Doubleday, 1995).

3. For a review of the impacts of the “connected economy,” see Davis, Stan and Christopher Meyer. *Blur: the Speed of Change in the Connected Economy.* (Reading, MA: Addison-Wesley).