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As information technology's power and ubiquity have grown, its strategic importance has diminished. The way you approach IT investment and management will need to change dramatically.

IT Doesn't Matter

by Nicholas G. Carr

With Letters to the Editor

Included with this full-text *Harvard Business Review* article:

IT Doesn't Matter

The Idea in Brief

To beat your competitors, are you devoting more than 50% of your capital expenditures to information technology? If so, you're not alone. Businesses worldwide pump $2 trillion a year into IT. But like many broadly adopted technologies—such as railways and electrical power—IT has become a commodity. Affordable and accessible to everyone, it no longer offers strategic value to anyone.

Scarcity—not ubiquity—makes a business resource truly strategic. Companies gain an edge by having or doing something others can't have or do. In IT's earlier days, forward-looking firms trumped competitors through innovative deployment of IT; for example, Federal Express's package-tracking system and American Airlines' Sabre reservation system.

Now that IT is ubiquitous, however, we must focus on its risks more than its potential strategic advantages. Consider electricity. No company builds its strategy on its electrical usage—but even a brief lapse in supply can be devastating. Today, an IT disruption can prove equally paralyzing to your company's ability to make products, deliver services, and satisfy customers.

But the greatest IT risk is overspending—putting your company at a cost disadvantage. The lesson? Make IT management boring. Instead of aggressively seeking an edge through IT, manage IT's costs and risks with a frugal hand and pragmatic eye—despite any renewed hype about its strategic value. Worrying about what might go wrong isn't glamorous, but it's smart business now.

The Idea in Practice

To avoid overinvesting in IT:

SPEND LESS.

Rigorously evaluate expected returns from IT investments. Separate essential investments from discretionary, unnecessary, or counterproductive ones. Explore simpler and cheaper alternatives, and eliminate waste.

▶ Example:
 Businesses buy 100 million+ PCs annually—yet most workers use PCs for simple applications that require a fraction of their computing power. Start imposing hard limits on upgrade costs—rather than buying new computers and applications every time suppliers roll out new features. Negotiate contracts ensuring long-term usefulness of your PC investments. If vendors balk, explore cheaper solutions, including bare-bones network PCs.

 Also assess your data storage, which accounts for 50%+ of many companies' IT expenditures—even though most saved data consists of employees' e-mails and files that have little relevance to making products or serving customers.

FOLLOW, DON'T LEAD.

Delay IT investments to significantly cut costs *and* decrease your risk of buying flawed or soon-to-be obsolete equipment or applications. Today, smart IT users hang back from the cutting edge, buying only after standards and best practices solidify. They let more impatient rivals shoulder the high costs of experimentation. Then they sweep past them, paying less while getting more.

FOCUS ON RISKS, NOT OPPORTUNITIES.

Many corporations are ceding control over their IT applications and networks to vendors and other third parties. The consequences of moving from tightly controlled, proprietary systems to open, shared ones? More and more threats in the form of technical glitches, service outages, and security breaches. Focus IT resources on preparing for such disruptions—not deploying IT in radical new ways.

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IT Doesn't Matter

With Letters to the Editor

In 1968, a young Intel engineer named Ted Hoff found a way to put the circuits necessary for computer processing onto a tiny piece of silicon. His invention of the microprocessor spurred a series of technological break-throughs—desktop computers, local and wide area networks, enterprise software, and the Internet—that have transformed the business world. Today, no one would dispute that information technology has become the backbone of commerce. It underpins the operations of individual companies, ties together far-flung supply chains, and, increasingly, links businesses to the customers they serve. Hardly a dollar or a euro changes hands anymore without the aid of computer systems.

As IT's power and presence have expanded, companies have come to view it as a resource ever more critical to their success, a fact clearly reflected in their spending habits. In 1965, according to a study by the U.S. Department of Commerce's Bureau of Economic Analysis, less than 5% of the capital expenditures of American companies went to information technol-ogy. After the introduction of the personal computer in the early 1980s, that percentage rose to 15%. By the early 1990s, it had reached more than 30%, and by the end of the decade it had hit nearly 50%. Even with the recent sluggishness in technology spending, businesses around the world continue to spend well over $2 trillion a year on IT.

But the veneration of IT goes much deeper than dollars. It is evident as well in the shifting attitudes of top managers. Twenty years ago, most executives looked down on computers as proletarian tools—glorified typewriters and calculators—best relegated to low level employees like secretaries, analysts, and techni-cians. It was the rare executive who would let his fingers touch a keyboard, much less incor-porate information technology into his strate-gic thinking. Today, that has changed com-pletely. Chief executives now routinely talk about the strategic value of information tech-nology, about how they can use IT to gain a competitive edge, about the "digitization" of their business models. Most have appointed

chief information officers to their senior management teams, and many have hired strategy consulting firms to provide fresh ideas on how to leverage their IT investments for differentiation and advantage.

Behind the change in thinking lies a simple assumption: that as IT's potency and ubiquity have increased, so too has its strategic value. It's a reasonable assumption, even an intuitive one. But it's mistaken. What makes a resource truly strategic—what gives it the capacity to be the basis for a sustained competitive advantage—is not ubiquity but scarcity. You only gain an edge over rivals by having or doing something that they can't have or do. By now, the core functions of IT—data storage, data processing, and data transport—have become available and affordable to all.[1] Their very power and presence have begun to transform them from potentially strategic resources into commodity factors of production. They are becoming costs of doing business that must be paid by all but provide distinction to none.

IT is best seen as the latest in a series of broadly adopted technologies that have reshaped industry over the past two centuries—from the steam engine and the railroad to the telegraph and the telephone to the electric generator and the internal combustion engine. For a brief period, as they were being built into the infrastructure of commerce, all these technologies opened opportunities for forward-looking companies to gain real advantages. But as their availability increased and their cost decreased—as they became ubiquitous—they became commodity inputs. From a strategic standpoint, they became invisible; they no longer mattered. That is exactly what is happening to information technology today, and the implications for corporate IT management are profound.

Vanishing Advantage

Many commentators have drawn parallels between the expansion of IT, particularly the Internet, and the rollouts of earlier technologies. Most of the comparisons, though, have focused on either the investment pattern associated with the technologies—the boom-to-bust cycle—or the technologies' roles in reshaping the operations of entire industries or even economies. Little has been said about the way the technologies influence, or fail to influence, competition at the firm level. Yet it is here that

history offers some of its most important lessons to managers.

A distinction needs to be made between proprietary technologies and what might be called infrastructural technologies. Proprietary technologies can be owned, actually or effectively, by a single company. A pharmaceutical firm, for example, may hold a patent on a particular compound that serves as the basis for a family of drugs. An industrial manufacturer may discover an innovative way to employ a process technology that competitors find hard to replicate. A company that produces consumer goods may acquire exclusive rights to a new packaging material that gives its product a longer shelf life than competing brands. As long as they remain protected, proprietary technologies can be the foundations for long-term strategic advantages, enabling companies to reap higher profits than their rivals.

Infrastructural technologies, in contrast, offer far more value when shared than when used in isolation. Imagine yourself in the early nineteenth century, and suppose that one manufacturing company held the rights to all the technology required to create a railroad. If it wanted to, that company could just build proprietary lines between its suppliers, its factories, and its distributors and run its own locomotives and railcars on the tracks. And it might well operate more efficiently as a result. But, for the broader economy, the value produced by such an arrangement would be trivial compared with the value that would be produced by building an open rail network connecting many companies and many buyers. The characteristics and economics of infrastructural technologies, whether railroads or telegraph lines or power generators, make it inevitable that they will be broadly shared—that they will become part of the general business infrastructure.

In the earliest phases of its buildout, however, an infrastructural technology can take the form of a proprietary technology. As long as access to the technology is restricted—through physical limitations, intellectual property rights, high costs, or a lack of standards—a company can use it to gain advantages over rivals. Consider the period between the construction of the first electric power stations, around 1880, and the wiring of the electric grid early in the twentieth century. Electricity remained a scarce resource during this time, and those manufacturers able to tap into it—by, for

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example, building their plants near generating stations—often gained an important edge. It was no coincidence that the largest U.S. manufacturer of nuts and bolts at the turn of the century, Plumb, Burdict, and Barnard, located its factory near Niagara Falls in New York, the site of one of the earliest large-scale hydroelectric power plants.

Companies can also steal a march on their competitors by having superior insight into the use of a new technology. The introduction of electric power again provides a good example. Until the end of the nineteenth century, most manufacturers relied on water pressure or steam to operate their machinery. Power in those days came from a single, fixed source—a waterwheel at the side of a mill, for instance—and required an elaborate system of pulleys and gears to distribute it to individual workstations throughout the plant. When electric generators first became available, many manufacturers simply adopted them as a replacement single-point source, using them to power the existing system of pulleys and gears. Smart manufacturers, however, saw that one of the great advantages of electric power is that it is easily distributable—that it can be brought directly to workstations. By wiring their plants and installing electric motors in their machines, they were able to dispense with the cumbersome, inflexible, and costly gearing systems, gaining an important efficiency advantage over their slower-moving competitors.

In addition to enabling new, more efficient operating methods, infrastructural technologies often lead to broader market changes. Here, too, a company that sees what's coming can gain a step on myopic rivals. In the mid-1800s, when America started to lay down rail lines in earnest, it was already possible to transport goods over long distances—hundreds of steamships plied the country's rivers. Businessmen probably assumed that rail transport would essentially follow the steamship model, with some incremental enhancements. In fact, the greater speed, capacity, and reach of the railroads fundamentally changed the structure of American industry. It suddenly became economical to ship finished products, rather than just raw materials and industrial components, over great distances, and the mass consumer market came into being. Companies that were quick to recognize the broader opportunity rushed to build large-scale, mass-production factories. The resulting economies of scale allowed them to crush the small, local plants that until then had dominated manufacturing.

The trap that executives often fall into, however, is assuming that opportunities for advantage will be available indefinitely. In actuality, the window for gaining advantage from an infrastructural technology is open only briefly. When the technology's commercial potential begins to be broadly appreciated, huge amounts of cash are inevitably invested in it, and its buildout proceeds with extreme speed. Railroad tracks, telegraph wires, power lines—all were laid or strung in a frenzy of activity (a frenzy so intense in the case of rail lines that it cost hundreds of laborers their lives). In the 30 years between 1846 and 1876, reports Eric Hobsbawm in *The Age of Capital*, the world's total rail trackage increased from 17,424 kilometers to 309,641 kilometers. During this same period, total steamship tonnage also exploded, from 139,973 to 3,293,072 tons. The telegraph system spread even more swiftly. In Continental Europe, there were just 2,000 miles of telegraph wires in 1849; 20 years later, there were 110,000. The pattern continued with electrical power. The number of central stations operated by utilities grew from 468 in 1889 to 4,364 in 1917, and the average capacity of each increased more than tenfold. (For a discussion of the dangers of overinvestment, see the sidebar "Too Much of a Good Thing.")

By the end of the buildout phase, the opportunities for individual advantage are largely gone. The rush to invest leads to more competition, greater capacity, and falling prices, making the technology broadly accessible and affordable. At the same time, the buildout forces users to adopt universal technical standards, rendering proprietary systems obsolete. Even the way the technology is used begins to become standardized, as best practices come to be widely understood and emulated. Often, in fact, the best practices end up being built into the infrastructure itself; after electrification, for example, all new factories were constructed with many well-distributed power outlets. Both the technology and its modes of use become, in effect, commoditized. The only meaningful advantage most companies can hope to gain from an infrastructural technology after its buildout is a cost advantage—and even that tends to be very hard to sustain.

When a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantages it provides.

That's not to say that infrastructural technologies don't continue to influence competition. They do, but their influence is felt at the macroeconomic level, not at the level of the individual company. If a particular country, for instance, lags in installing the technology—whether it's a national rail network, a power grid, or a communication infrastructure—its domestic industries will suffer heavily. Similarly, if an industry lags in harnessing the power of the technology, it will be vulnerable to displacement. As always, a company's fate is tied to broader forces affecting its region and its industry. The point is, however, that the technology's potential for differentiating one company from the pack—its strategic potential—inexorably declines as it becomes accessible and affordable to all.

The Commoditization of IT

Although more complex and malleable than its predecessors, IT has all the hallmarks of an infrastructural technology. In fact, its mix of characteristics guarantees particularly rapid commoditization. IT is, first of all, a transport mechanism—it carries digital information just as railroads carry goods and power grids carry electricity. And like any transport mechanism, it is far more valuable when shared than when used in isolation. The history of IT in business has been a history of increased interconnectivity and interoperability, from mainframe timesharing to minicomputer-based local area networks to broader Ethernet networks and on to the Internet. Each stage in that progression has involved greater standardization of the technology and, at least recently, greater homogenization of its functionality. For most business applications today, the benefits of customization would be overwhelmed by the costs of isolation.

IT is also highly replicable. Indeed, it is hard to imagine a more perfect commodity than a byte of data—endlessly and perfectly reproducible at virtually no cost. The near-infinite scalability of many IT functions, when combined with technical standardization, dooms most proprietary applications to economic obsolescence. Why write your own application for word processing or e-mail or, for that matter, supply-chain management when you can buy a ready-made, state-of-the-art application for a fraction of the cost? But it's not just the software that is replicable. Because most business activities and processes have come to be embedded in software, they become replicable, too. When companies buy a generic application, they buy a generic process as well. Both the cost savings and the interoperability benefits make the sacrifice of distinctiveness unavoidable.

The arrival of the Internet has accelerated the commoditization of IT by providing a perfect delivery channel for generic applications. More and more, companies will fulfill their IT requirements simply by purchasing fee-based "Web services" from third parties—similar to the way they currently buy electric power or telecommunications services. Most of the major business-technology vendors, from Microsoft to IBM, are trying to position themselves as IT utilities, companies that will control the provision of a diverse range of business applications over what is now called, tellingly, "the grid." Again, the upshot is ever greater homogenization of IT capabilities, as more companies replace customized applications with generic ones. (For more on the challenges facing IT companies, see the sidebar "What About the Vendors?")

Finally, and for all the reasons already discussed, IT is subject to rapid price deflation.

Too Much of a Good Thing

As many experts have pointed out, the overinvestment in information technology in the 1990s echoes the overinvestment in railroads in the 1860s. In both cases, companies and individuals, dazzled by the seemingly unlimited commercial possibilities of the technologies, threw large quantities of money away on half-baked businesses and products. Even worse, the flood of capital led to enormous overcapacity, devastating entire industries.

We can only hope that the analogy ends there. The mid-nineteenth-century boom in railroads (and the closely related technologies of the steam engine and the telegraph) helped produce not only widespread industrial overcapacity but a surge in productivity. The combination set the stage for two solid decades of deflation. Although worldwide economic production continued to grow strongly between the mid-1870s and the mid-1890s, prices collapsed—in England, the dominant economic power of the time, price levels dropped 40%. In turn, business profits evaporated. Companies watched the value of their products erode while they were in the very process of making them. As the first worldwide depression took hold, economic malaise covered much of the globe. "Optimism about a future of indefinite progress gave way to uncertainty and a sense of agony," wrote historian D.S. Landes.

It's a very different world today, of course, and it would be dangerous to assume that history will repeat itself. But with companies struggling to boost profits and the entire world economy flirting with deflation, it would also be dangerous to assume it can't.

When Gordon Moore made his famously prescient assertion that the density of circuits on a computer chip would double every two years, he was making a prediction about the coming explosion in processing power. But he was also making a prediction about the coming free fall in the price of computer functionality. The cost of processing power has dropped relentlessly, from $480 per million instructions per second (MIPS) in 1978 to $50 per MIPS in 1985 to $4 per MIPS in 1995, a trend that continues unabated. Similar declines have occurred in the cost of data storage and transmission. The rapidly increasing affordability of IT functionality has not only democratized the computer revolution, it has destroyed one of the most important potential barriers to competitors. Even the

most cutting-edge IT capabilities quickly become available to all.

It's no surprise, given these characteristics, that IT's evolution has closely mirrored that of earlier infrastructural technologies. Its buildout has been every bit as breathtaking as that of the railroads (albeit with considerably fewer fatalities). Consider some statistics. During the last quarter of the twentieth century, the computational power of a microprocessor increased by a factor of 66,000. In the dozen years from 1989 to 2001, the number of host computers connected to the Internet grew from 80,000 to more than 125 million. Over the last ten years, the number of sites on the World Wide Web has grown from zero to nearly 40 million. And since the 1980s, more than 280 million miles of fiber-optic cable have been installed—enough, as *BusinessWeek* recently noted, to "circle the earth 11,320 times." (See the exhibit "The Sprint to Commoditization.")

As with earlier infrastructural technologies, IT provided forward-looking companies many opportunities for competitive advantage early in its buildout, when it could still be "owned" like a proprietary technology. A classic example is American Hospital Supply. A leading distributor of medical supplies, AHS introduced in 1976 an innovative system called Analytic Systems Automated Purchasing, or ASAP, that enabled hospitals to order goods electronically. Developed in-house, the innovative system used proprietary software running on a mainframe computer, and hospital purchasing agents accessed it through terminals at their sites. Because more efficient ordering enabled hospitals to reduce their inventories—and thus their costs—customers were quick to embrace the system. And because it was proprietary to AHS, it effectively locked out competitors. For several years, in fact, AHS was the only distributor offering electronic ordering, a competitive advantage that led to years of superior financial results. From 1978 to 1983, AHS's sales and profits rose at annual rates of 13% and 18%, respectively—well above industry averages.

AHS gained a true competitive advantage by capitalizing on characteristics of infrastructural technologies that are common in the early stages of their buildouts, in particular their high cost and lack of standardization. Within a decade, however, those barriers to competition were crumbling. The arrival of personal computers and packaged software, together with

What About the Vendors?

Just a few months ago, at the 2003 World Economic Forum in Davos, Switzerland, Bill Joy, the chief scientist and cofounder of Sun Microsystems, posed what for him must have been a painful question: "What if the reality is that people have already bought most of the stuff they want to own?" The people he was talking about are, of course, businesspeople, and the stuff is information technology. With the end of the great buildout of the commercial IT infrastructure apparently at hand, Joy's question is one that all IT vendors should be asking themselves. There is good reason to believe that companies' existing IT capabilities are largely sufficient for their needs and, hence, that the recent and widespread sluggishness in IT demand is as much a structural as a cyclical phenomenon.
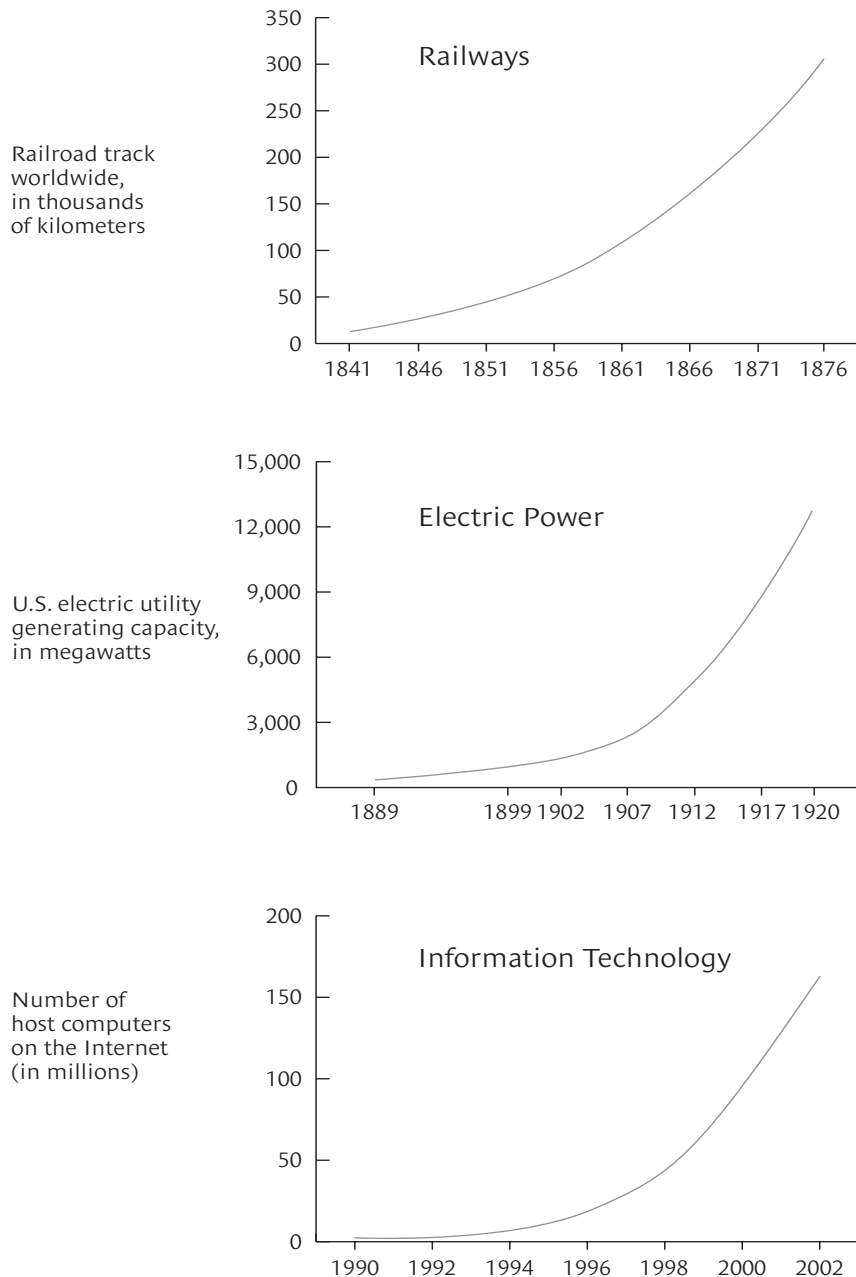
Even if that's true, the picture may not be as bleak as it seems for vendors, at least those with the foresight and skill to adapt to the new environment. The importance of infrastructural technologies to the day-to-day operations of business means that they continue to absorb large amounts of corporate cash long after they have become commodities—indefinitely, in many cases. Virtually all companies today continue to spend heavily on electricity and phone service, for example,

and many manufacturers continue to spend a lot on rail transport. Moreover, the standardized nature of infrastructural technologies often leads to the establishment of lucrative monopolies and oligopolies.

Many technology vendors are already repositioning themselves and their products in response to the changes in the market. Microsoft's push to turn its Office software suite from a packaged good into an annual subscription service is a tacit acknowledgment that companies are losing their need—and their appetite—for constant upgrades. Dell has succeeded by exploiting the commoditization of the PC market and is now extending that strategy to servers, storage, and even services. (Michael Dell's essential genius has always been his unsentimental trust in the commoditization of information technology.) And many of the major suppliers of corporate IT, including Microsoft, IBM, Sun, and Oracle, are battling to position themselves as dominant suppliers of "Web services"—to turn themselves, in effect, into utilities. This war for scale, combined with the continuing transformation of IT into a commodity, will lead to the further consolidation of many sectors of the IT industry. The winners will do very well; the losers will be gone.

The Sprint to Commoditization

One of the most salient characteristics of infrastructural technologies is the rapidity of their installation. Spurred by massive investment, capacity soon skyrockets, leading to falling prices and, quickly, commoditization.

Railroad track worldwide, in thousands of kilometers

Railways

U.S. electric utility generating capacity, in megawatts

Electric Power

Number of host computers on the Internet (in millions)

Information Technology

Sources: railways: Eric Hobsbawm, *The Age of Capital* (Vintage, 1996); electric power: Richard B. Duboff, *Electric Power in Manufacturing, 1889–1958* (Arno, 1979); Internet hosts: Robert H. Zakon, *Hobbes' Internet Timeline* (www.zakon.org/robert/internet/timeline/).

the emergence of networking standards, was rendering proprietary communication systems unattractive to their users and uneconomical to their owners. Indeed, in an ironic, if predictable, twist, the closed nature and outdated technology of AHS's system turned it from an asset to a liability. By the dawn of the 1990s, after AHS had merged with Baxter Travenol to form Baxter International, the company's senior executives had come to view ASAP as "a millstone around their necks," according to a Harvard Business School case study.

Myriad other companies have gained important advantages through the innovative deployment of IT. Some, like American Airlines with its Sabre reservation system, Federal Express with its package-tracking system, and Mobil Oil with its automated Speedpass payment system, used IT to gain particular operating or marketing advantages—to leapfrog the competition in one process or activity. Others, like Reuters with its 1970s financial information network or, more recently, eBay with its Internet auctions, had superior insight into the way IT would fundamentally change an industry and were able to stake out commanding positions. In a few cases, the dominance companies gained through IT innovation conferred additional advantages, such as scale economies and brand recognition, that have proved more durable than the original technological edge. Wal-Mart and Dell Computer are renowned examples of firms that have been able to turn temporary technological advantages into enduring positioning advantages.

But the opportunities for gaining IT-based advantages are already dwindling. Best practices are now quickly built into software or otherwise replicated. And as for IT-spurred industry transformations, most of the ones that are going to happen have likely already happened or are in the process of happening. Industries and markets will continue to evolve, of course, and some will undergo fundamental changes—the future of the music business, for example, continues to be in doubt. But history shows that the power of an infrastructural technology to transform industries always diminishes as its buildout nears completion.

While no one can say precisely when the buildout of an infrastructural technology has concluded, there are many signs that the IT buildout is much closer to its end than its beginning. First, IT's power is outstripping most

of the business needs it fulfills. Second, the price of essential IT functionality has dropped to the point where it is more or less affordable to all. Third, the capacity of the universal distribution network (the Internet) has caught up with demand—indeed, we already have considerably more fiber-optic capacity than we need. Fourth, IT vendors are rushing to position themselves as commodity suppliers or even as utilities. Finally, and most definitively, the investment bubble has burst, which historically has been a clear indication that an infrastructural technology is reaching the end of its buildout. A few companies may still be able to wrest advantages from highly specialized applications that don't offer strong economic incentives for replication, but those firms will be the exceptions that prove the rule.

At the close of the 1990s, when Internet hype was at full boil, technologists offered grand visions of an emerging "digital future." It may well be that, in terms of business strategy at least, the future has already arrived.

From Offense to Defense

So what should companies do? From a practical standpoint, the most important lesson to be learned from earlier infrastructural technologies may be this: When a resource becomes essential to competition but inconsequential to strategy, the risks it creates become more important than the advantages it provides. Think of electricity. Today, no company builds its business strategy around its electricity usage, but even a brief lapse in supply can be devastating (as some California businesses discovered during the energy crisis of 2000). The operational risks associated with IT are many—technical glitches, obsolescence, service outages, unreliable vendors or partners, security breaches, even terrorism—and some have become magnified as companies have moved from tightly controlled, proprietary systems to open, shared ones. Today, an IT disruption can paralyze a company's ability to make its products, deliver its services, and connect with its customers, not to mention foul its reputation. Yet few companies have done a thorough job of identifying and tempering their vulnerabilities. Worrying about what might go wrong may not be as glamorous a job as speculating about the future, but it is a more essential job right now. (See the sidebar "New Rules for IT Management.")

In the long run, though, the greatest IT risk facing most companies is more prosaic than a catastrophe. It is, simply, overspending. IT may be a commodity, and its costs may fall rapidly enough to ensure that any new capabilities are quickly shared, but the very fact that it is entwined with so many business functions means that it will continue to consume a large portion of corporate spending. For most companies, just staying in business will require big outlays for IT. What's important—and this holds true for any commodity input—is to be able to separate essential investments from ones that are discretionary, unnecessary, or even counterproductive.

At a high level, stronger cost management requires more rigor in evaluating expected returns from systems investments, more creativity in exploring simpler and cheaper alternatives, and a greater openness to outsourcing and other partnerships. But most companies can also reap significant savings by simply cutting out waste. Personal computers are a good example. Every year, businesses purchase more than 100 million PCs, most of which replace older models. Yet the vast majority of workers who use PCs rely on only a few simple applications—word processing, spreadsheets, e-mail,

New Rules for IT Management

With the opportunities for gaining strategic advantage from information technology rapidly disappearing, many companies will want to take a hard look at how they invest in IT and manage their systems. As a starting point, here are three guidelines for the future:

Spend less. Studies show that the companies with the biggest IT investments rarely post the best financial results. As the commoditization of IT continues, the penalties for wasteful spending will only grow larger. It is getting much harder to achieve a competitive advantage through an IT investment, but it is getting much easier to put your business at a cost disadvantage.

Follow, don't lead. Moore's Law guarantees that the longer you wait to make an IT purchase, the more you'll get for your money. And waiting will decrease your risk of buying something technologically flawed or doomed to rapid obsolescence. In some cases, being on the cutting edge makes sense. But those cases are becoming rarer and rarer as IT capabilities become more homogenized.

Focus on vulnerabilities, not opportunities. It's unusual for a company to gain a competitive advantage through the distinctive use of a mature infrastructural technology, but even a brief disruption in the availability of the technology can be devastating. As corporations continue to cede control over their IT applications and networks to vendors and other third parties, the threats they face will proliferate. They need to prepare themselves for technical glitches, outages, and security breaches, shifting their attention from opportunities to vulnerabilities.

Studies of corporate IT spending consistently show that greater expenditures rarely translate into superior financial results. In fact, the opposite is usually true.

and Web browsing. These applications have been technologically mature for years; they require only a fraction of the computing power provided by today's microprocessors. Nevertheless, companies continue to roll out across-the-board hardware and software upgrades.

Much of that spending, if truth be told, is driven by vendors' strategies. Big hardware and software suppliers have become very good at parceling out new features and capabilities in ways that force companies into buying new computers, applications, and networking equipment much more frequently than they need to. The time has come for IT buyers to throw their weight around, to negotiate contracts that ensure the long-term usefulness of their PC investments and impose hard limits on upgrade costs. And if vendors balk, companies should be willing to explore cheaper solutions, including open-source applications and bare-bones network PCs, even if it means sacrificing features. If a company needs evidence of the kind of money that might be saved, it need only look at Microsoft's profit margin.

In addition to being passive in their purchasing, companies have been sloppy in their use of IT. That's particularly true with data storage, which has come to account for more than half of many companies' IT expenditures. The bulk of what's being stored on corporate networks has little to do with making products or serving customers—it consists of employees' saved e-mails and files, including terabytes of spam, MP3s, and video clips. *Computerworld* estimates that as much as 70% of the storage capacity of a typical Windows network is wasted—an enormous unnecessary expense. Restricting employees' ability to save files indiscriminately and indefinitely may seem distasteful to many managers, but it can have a real impact on the bottom line. Now that IT has become the dominant capital expense for most businesses, there's no excuse for waste and sloppiness.

Given the rapid pace of technology's advance, delaying IT investments can be another powerful way to cut costs—while also reducing a firm's chance of being saddled with buggy or soon-to-be-obsolete technology. Many companies, particularly during the 1990s, rushed their IT investments either because they hoped to capture a first-mover advantage or because they feared being left behind. Except in very

rare cases, both the hope and the fear were unwarranted. The smartest users of technology—here again, Dell and Wal-Mart stand out—stay well back from the cutting edge, waiting to make purchases until standards and best practices solidify. They let their impatient competitors shoulder the high costs of experimentation, and then they sweep past them, spending less and getting more.

Some managers may worry that being stingy with IT dollars will damage their competitive positions. But studies of corporate IT spending consistently show that greater expenditures rarely translate into superior financial results. In fact, the opposite is usually true. In 2002, the consulting firm Alinean compared the IT expenditures and the financial results of 7,500 large U.S. companies and discovered that the top performers tended to be among the most tightfisted. The 25 companies that delivered the highest economic returns, for example, spent on average just 0.8% of their revenues on IT, while the typical company spent 3.7%. A recent study by Forrester Research showed, similarly, that the most lavish spenders on IT rarely post the best results. Even Oracle's Larry Ellison, one of the great technology salesmen, admitted in a recent interview that "most companies spend too much [on IT] and get very little in return." As the opportunities for IT-based advantage continue to narrow, the penalties for overspending will only grow.

IT management should, frankly, become boring. The key to success, for the vast majority of companies, is no longer to seek advantage aggressively but to manage costs and risks meticulously. If, like many executives, you've begun to take a more defensive posture toward IT in the last two years, spending more frugally and thinking more pragmatically, you're already on the right course. The challenge will be to maintain that discipline when the business cycle strengthens and the chorus of hype about IT's strategic value rises anew.

1. "Information technology" is a fuzzy term. In this article, it is used in its common current sense, as denoting the technologies used for processing, storing, and transporting information in digital form.

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Harvard Business Review
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In this article, Porter builds the conceptual framework for understanding why IT is no longer a source of strategic advantage. He explains the dynamics of **strategic positioning**—and the forces dulling a company's competitive edge—by examining strategy through the lens of operational effectiveness. Companies can reap enormous advantages from operational effectiveness—creating, producing, selling, and delivering their offerings faster or better than rivals. But best practices are easily copied. As competitors adopt them, their *industry* enjoys absolute improvement in operational effectiveness. But individual *companies* see no relative improvement.

To maintain their strategic positioning, companies must perform different activities from rivals, or perform similar activities differently. Three principles can help: 1) *Adopt a unique position.* Will you, for example, serve few needs of many customers? (Jiffy Lube provides only auto lubricants.) Broad needs of few customers? (Bessemer Trust targets only high-wealth clients.) 2) *Make trade-offs between incompatible competitive activities.* Neutrogena positions its soap as a medicinal product—marketing directly to doctors and in medical journals rather than through supermarkets and price promotions. 3) *Create "fit" across all of your company's activities.* When activities mutually reinforce each other, competitors can't easily copy them. When Continental Lite tried to match several of Southwest Airlines' activities, but not the whole interlocking system, the effort failed.

Six IT Decisions Your IT People Shouldn't Make
by Jeanne W. Ross and Peter Weill
Harvard Business Review
November 2002
Product no. R0211F

These authors concur that investing in IT for technology's sake erodes your company's competitive advantage. Before spending, clarify your company's strategy, then ensure that all your IT decisions support that strategy. How? Reclaim six crucial decisions about strategy and execution from your IT managers.

Strategy decisions: 1) "How much should we spend on IT?" Define crystal-clear goals, then set IT funding to achieve them. 2) "Which business processes should receive IT dollars?" Fund only IT initiatives that will further your company's strategy. 3) "Which IT capabilities should be firmwide?" Weigh trade-offs between money saved by centralizing IT capabilities—and flexibility lost.

Execution decisions: 4) "How good must our IT services be?" Don't let IT managers demand "Cadillac" service when a "Buick" will do. 5) "What security and privacy risks will we accept?" Weigh trade-offs between privacy versus convenience. 6) "Whom do we blame if an IT initiative fails?" IT managers' responsibility is to deliver systems on time and within budget. Your job is to make organizational changes that generate business value from those systems. Designate "sponsors" to assign resources to IT initiatives, establish success metrics, and oversee implementation.

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Does IT Matter?
An HBR Debate

E-mail us at hbr_letters@hbsp.harvard.edu

Every magazine has an ideal, or an idealized, reader. For *Harvard Business Review,* he or she is an executive of uncommon intelligence and curiosity: the brightest CEO you know or can imagine, perhaps. We like to pretend that our ideal reader has chartered us to prepare a briefing every month. On the agenda, we've been told, should be three kinds of items.

First, our reader says, bring me important new ideas, research, or insights: "Boss, here's something you should know."

Second, bring me important eternal truths, rediscovered and refreshed: "Boss, here's something you shouldn't forget."

Third, bring me into the picture about important issues and arguments: "Boss, here's something you will want to know about."

New ideas, truths, and disputes: When we do our job well, HBR is a forum where you get some of each, and all of it is important. Nicholas G. Carr's "IT Doesn't Matter," published in the May 2003 issue, falls into the third category. It takes one side of an argument that's undeniably urgent and important to business leaders.

In 2000, nearly half of U.S. corporate capital spending went to information technology. Then the spending collapsed and the Nasdaq with it, and in every boardroom–and in every technology company–people began to wonder: What happened? What was that spending about? What's changed? What has not? And what do we do now? What is our technology strategy, and how does it affect our corporate strategy?

Forcefully, Carr argues that investments in IT, while profoundly important, are less and less likely to deliver a competitive edge to an individual company. "No one would dispute that information technology has become the backbone of commerce," Carr says. "The point is, however, that the technology's potential for differentiating one company from the pack–its strategic potential–inexorably diminishes as it becomes accessible and affordable to all."

Unsurprisingly, "IT Doesn't Matter" has generated an enormous amount of controversy. Our ideal reader wants that give-and-take, argument and counterargument, the better to understand the issues. Always in such cases, people are more likely to write to us when they disagree with an article's point of view than when they agree with it. Always

in such cases, a few people mistake the argument. (In this instance, the most common misperception is that the article says that IT is dead and that it will not continue to be a source of dramatic, even transformational change. It doesn't say that. Instead, it says the odds are that the benefits of such changes will inure to whole industries rather than any one competitor. Instead of seeking advantage through technology, Carr argues, companies should manage IT defensively – watching costs and avoiding risks.)

And always in such cases, some very smart, thoughtful people present urgent, cogent, and forceful challenges to the article's conclusions.

We have received so many thoughtful letters that we have decided to publish them here, together with Carr's reply. That decision reflects – among other things – one way in which the ubiquity of IT has created new opportunities for us and for all publishers to interact with readers. It also reflects HBR's continuing commitment to offer readers a forum full of thoughtful voices, bringing you what's newly learned, what's fiercely argued, and what truly matters.

Thomas A. Stewart
Editor

Letter from John Seely Brown and John Hagel III

John Seely Brown, *Former Chief Scientist, Xerox, Palo Alto, California*

John Hagel III, *Management Consultant and Author, Burlingame, California*

Nicholas Carr's article "IT Doesn't Matter" (May 2003) is an important, perhaps even seminal, piece. It effectively captures the zeitgeist among senior managers of large enterprises and gives eloquent voice to the backlash that has swept through management suites regarding IT's business value.

As Carr's article says, businesses have overestimated the strategic value of IT. They have significantly overspent on technology in the quest for business value. They need to manage large portions of their IT infrastructures more rigorously to reduce capital investment requirements and operating costs. As companies become more dependent on IT platforms for their day-to-day operations, they must focus on potential vulnerabilities and more aggressively manage for reliability and security. But such ideas are not inconsistent with the view that IT remains a profound catalyst for the creation of strategic differentiation.

In capturing today's management mood so effectively, Carr provides a valuable service. And yet his article is potentially dangerous, for it appears to endorse the notion that businesses should manage IT as a commodity input because the opportunities for strategic differentiation with IT have become so scarce. By giving voice to this perspective and making it so compelling, Carr is likely to perpetuate a misguided view.

The choice of article title is even more unfortunate. It may grab readers' attention, but it is misleading: Carr is not claiming that IT does not matter; rather, his main assertion is that IT is diminishing as a source of strategic differentiation. Unfortunately, given today's business climate, many readers will remember the article's title and forget its nuance.

The lesson to be learned from the past several decades is that IT by itself rarely, if ever, confers strategic differentiation.

Yet, IT is inherently strategic because of its indirect effects – it creates possibilities and options that did not exist before. Companies that see, and act on, these possibilities before others do will continue to differentiate themselves in the marketplace and reap economic rewards. IT may become ubiquitous, but the insight required to harness its potential will not be so evenly distributed. Therein lies the opportunity for significant strategic advantage.

The experiences of the past several decades suggest three broad lessons regarding IT:

Extracting value from IT requires innovations in business practices. Companies that mechanically insert IT into their businesses without changing their practices for exploiting the new capabilities will only destroy IT's economic value. Unfortunately, all too many companies do this. For that reason, the research findings by Alinean and Forrester – that IT spending rarely correlates with superior financial results – are not surprising.

In October 2001, the McKinsey Global Institute published a study on "U.S. Productivity Growth, 1995–2000." That study was the first disciplined attempt to look at the correlation between IT investments and productivity by industry sector. The results were revealing. The study found a significant positive correlation between IT investments and productivity in only six out of 59 industries. The other 53 sectors, accounting for 70% of the economy, in aggregate saw negligible productivity improvements as a result of their IT investments.

Why only six industries? In each of these sectors, one or more companies introduced significant innovations in business practices to leverage their IT capabilities. This set into motion competitive pressures that forced other companies

in the sector to implement comparable business practices. The classic example was retailing, where Wal-Mart innovated continuously around new generations of IT. Even as competitors adopted Wal-Mart's practices, the retailing giant focused on the next wave of innovations, preserving a significant productivity advantage (on the order of 40%) relative to competitors.

Significant opportunities for innovation continue to occur because advances in IT create possibilities not previously economically available. With few exceptions, companies have tended to think too narrowly about the possibilities. In particular, many companies have become locked into the view that IT can reduce transaction costs but then think of transaction costs as encompassing only the transfer of bits and data from one place to another. Viewed more broadly, transaction costs encompass such challenging business issues as the creation of meaning, the building of trust, and the development and dissemination of knowledge. These dimensions of transaction costs often represent significant bottlenecks to performance improvements and competitive advantage. Companies like Cisco in their e-learning initiatives are just beginning to explore the innovations in business practices required to exploit IT's potential for addressing such business challenges.

Companies also think too narrowly about IT's possibilities when they focus so heavily on business practices within the enterprise. In fact, many opportunities for business-practice innovations extend beyond the walls of the enterprise to include relationships with other companies. Rather than think in narrow transactional terms, as evidenced by the first wave of business-to-business marketplaces, executives would be far better advised to think in terms of opportuni-

ties to build long-term relationships with companies possessing complementary assets and capabilities. Companies like Li & Fung, with its orchestration model based on a loosely coupled approach to process management spanning thousands of companies, suggest opportunities for redefining relationships among companies and, in the process, creating significant differentiation.

In short, many executives have started to view IT as a commodity because they have not thought aggressively enough about how IT can bring about new business practices. The differentiation is not in IT itself but in the new practices it enables. IT does indeed matter. Although IT may be ubiquitous and increasingly less expensive, the insight and ability required for it to create economic value are in very short supply. It is far different from commodities like wheat and aluminum, where the processing operations are well understood and the economic advantage lies in being able to source the commodity at lower cost.

IT's economic impact comes from incremental innovations rather than "big bang" initiatives. In highlighting the significant opportunities for new business practices enabled by IT, we do not want to be misinterpreted as advocating big bang efforts to transform companies overnight. If we've learned one thing from the 1990s, it's that big bang, IT-driven initiatives rarely produce expected returns; they are complicated and expensive, take a long time to implement, and are fraught with risk. Rather than create economic value, more often than not they destroy it.

The companies most successful in harnessing IT's power typically proceed in waves of relatively short-term (often six to 12 months) operating initiatives designed to test and refine specific innovations in business practices. Changing

business practices creates unintended consequences. By "chunking up" innovations in business practices and tying these initiatives to explicit operating performance metrics, management can create tighter feedback loops and accelerate the learning process. If done right, these

innovations can also reduce the financial risks by generating near-term returns that can help fund subsequent waves of operating initiatives. Politically, this kind of incremental approach, with its relentless focus on tangible near-term returns, also helps deepen organizational support for new business practices while neutralizing potential opposition.

The strategic impact of IT investments comes from the cumulative effect of sustained initiatives to innovate business practices in the near term. If IT's economic value comes from very tactical near-term initiatives to innovate business practices, aren't we in fact conceding that IT has lost its power to provide strategic differentiation? Aren't we just saying that IT can provide tactical advantage that will be quickly copied by competitors? Far from it. The strategic differentiation emerges over time, based less on the specific innovations in business practices at any point in time and much more on the ability to continually innovate around IT's evolving capabilities.

To understand this point, it is essential to differentiate the characteristics of IT as an infrastructure technology relative to the variety of other infrastructure technologies cited by Carr – steam engines, railroads, electricity, and telephones. In each of those prior areas, the underlying technology burst forth in one relatively concentrated innovation. While the tech-

nology's performance continued to improve after it was introduced, the rate of improvement was far more modest and reached a point of diminishing returns much sooner than we have seen in the decades since the introduction of digital technology. Thus, the ability to contin-

If we've learned one thing from the 1990s, it's that big bang, IT-driven initiatives rarely produce expected returns.

ually innovate business practices around these technologies also reached a period of diminishing returns. Another result was that these prior generations of technology produced a dominant design or architecture relatively quickly – for example, the standardization of railway gauges or alternating-current specifications. The emergence of these dominant designs or architectures catalyzed the various industry shakeouts and helped to further standardize the use of these technologies.

IT thus far has followed a very different path. Improvements in processing power, storage capacity, and bandwidth have continued at a rapid and sustained pace. Indeed, these performance improvements have had a multiplicative effect, coming together, for example, to form entirely new ways of storing, distributing, and accessing data. Not only are smart things getting smarter, but this technology is also being used to make dumb things smarter through such extensions as MEMS, RFID, and telematics. IT is also extending its reach to biological organisms, redefining the ways we diagnose, treat, and even design life forms.

This sustained pace and expanding range of digital technology innovation continues to precipitate fundamental new opportunities for thinking about how we organize such technology. We are now on the cusp of a shift to distrib-

Rather than help companies understand that IT is only a tool, technology vendors have tended to present it as a panacea. "Buy this technology and all your problems will be solved."

uted service architectures that will unleash entirely new capabilities at least as significant as the shift from proprietary and centralized mainframe architectures to more distributed client-server architectures. Far from settling down into a dominant design or architecture, IT has crashed through several generations of architectures and continues to generate new ones. In fact, the emerging service-oriented architectures enable a kind of radical incrementalism that transcends what one might expect from simple incrementalism. Coupled with a strategy focused on both short-term wins and long-term goals, this new incrementalism is a source of competitive advantage.

The underlying technology components may be widely and cheaply available, but the skills required to organize them into high-value architectures are still in very short supply, and a new generation of skills must be developed with each new generation of architecture. These new architectures amplify the possibilities enabled by the performance improvements in the underlying technology components.

The gap between IT's potential and business's realization of that potential has not narrowed. Instead, it has steadily widened over the past several decades. This gap creates enormous instability in the business world. Wherever there is so much potential for instability, there is also fertile ground for new strategies.

To further amplify the effect of these performance improvements in terms of real business-practice innovation and to convert tactical advantage into strategic advantage, something else is required. Companies need to align themselves around a long-term view of the challenges and opportunities brought about by IT. Senior managers need a shared but high-level view of the kinds of markets they are likely to be operating in

and the kinds of companies they will need to become if they are to continue creating economic value. This long-term view helps to focus and prioritize near-term innovations in business practices, thereby helping to build a sustainable strategic advantage across multiple waves of initiatives. It is exactly this kind of long-term view that guides Dell and Wal-Mart in their ongoing use of IT to create strategic advantage.

Without this view, even the most aggressive near-term incremental initiatives run the risk of becoming dispersed over too many fronts. The continuing performance improvements of IT create far more possibilities than any company can or should pursue. The temptation in this kind of environment is to launch too many initiatives. The result is that few, if any, of the near-term initiatives produce the expected results. Without focusing on the long-term, companies will have difficulty building momentum across multiple waves of operating initiatives. Each new wave responds to the events of the moment rather than driving toward a common destination. The focus remains entirely on near-term initiatives rather than on building a more sustained capability to innovate and leverage IT's new capabilities. Short-term tactical advantage remains just that – tactical and transitory. In such a world, it is easy to see why management could come to believe that IT does not produce significant strategic differentiation.

Paradoxically, technology vendors themselves are somewhat responsible for the widespread belief that IT doesn't produce significant strategic differentiation. For too long, they have built their businesses around big bang, IT-centric selling propositions. Rather than help companies understand that IT is only a tool, technology vendors have tended to present it as a panacea. "Buy this tech-

nology and all your problems will be solved." It is a seductive proposition. Rather than focusing on the enormous challenge of innovating in business practices and creating the discipline required to generate economic value from these innovations, vendors have convinced many companies that signing a purchase order would deliver the required value. They even managed to convince companies, for a while, that they needed to buy a lot of the technology because the only way to stay competitive was through massive IT implementations. When the anticipated results didn't materialize, the backlash began to gather force in executive suites. Executives swing from one extreme to the other. If IT doesn't solve all their business problems, then it must not matter, at least in terms of strategic value. We still need it to run our business, but let's buy as little as we can and squeeze the vendors as much as we can.

It has never been true that IT matters in isolation. It only matters in the context of a concerted effort to innovate based on new possibilities and opportunities created by the technology. Then it matters – and will continue to – a lot.

That's a far more difficult message for IT vendors to communicate to customers. It's an even more difficult message for the vendors to execute against. It means changing their economic model, selling model, organizational model, and product strategies in fundamental and very painful ways. Yet, the alternative for technology vendors is to cope with the growing belief that IT really doesn't matter, at least in terms of its potential for strategic differentiation. In the end, that will be a far more painful world for them to confront. It will also be a tragedy for businesses that continue to miss the opportunities IT creates.

John Seely Brown
and John Hagel III

Letter from F. Warren McFarlan and Richard L. Nolan

F. Warren McFarlan, *Albert H. Gordon Professor of Business Administration, Harvard Business School, Boston*
Richard L. Nolan, *William Barclay Harding Professor of Business Administration, Harvard Business School, Boston*

In no other area is it more important to have a sense of what you *don't* know than it is in IT management. The most dangerous advice to CEOs has come from people who either had no idea of what they did not know, or from those who pretended to know what they didn't. Couple not knowing that you don't know with fuzzy logic, and you have the makings of Nicholas Carr's article.

Carr's examples of railroads and electric power played out over 80 years, (not 40, as he suggests), turning society, business organizations, and lifestyles inside out. The deeper societal impacts came during the second 40 years, as society's insights on how to use the technology changed. It is worth noting that although these technologies mutated significantly (for trains, it meant moving from 15 miles an hour to 80 miles an hour), the mutation was on a totally different and much smaller scale than IT's.

The cost performance of IT technologies over the first 40 years changed by roughly 10 to the seventh, and for the foreseeable future will continue to evolve at the same rate. That is in sharp contrast to a train, which after 80 years moved six times faster than it had in the earlier period. This is impressive, but not nearly as dramatic as a computer produced in 2000, which runs 10 million times faster than a 1960s' computer.

Carr's graph on information technology stands as a subject lesson for Darrell Huff's well-known book *How to Lie with Statistics.* Carr's chart would look very different if he had tracked the number of MIPS or CPU cycles on the network from 1990 to 2002. Even using a log scale on the vertical axis would be barely enough to tilt a vertical straight line enough to create something resembling the curves of the other two schematics in

Carr's article. With this explosion of cost-effectiveness has come the ability to do things truly differently. American Hospital Supply's distribution software and American Airlines' SABRE reservation system are examples of victories in past technologies. The firms were the first in their industries to see technology's transforming potential, they had the courage to invest in its performance, and they used it to gain a significant competitive edge. It is naive to assume that other sharply discontinuous technologies will not offer similar transformation opportunities in the future.

In our view, the most important thing that the CEO and senior management should understand about IT is its associated economics. Driven by Moore's Law, those evolving economics have enabled every industry's transaction costs to decrease continually, resulting in new economics for the firm and creating the feasibility of products and services not possible in the past. The economics of financial transactions have continually dropped from dollars to cents. New entrants have joined many industries and have focused on taking strategic advantage of IT's associated economics. Company boundaries have become permeable, organic, and global in scope through IT networks and the Internet.

As the pace of doing business increases, the CEO and senior management team must be aware of how IT can change rules and assumptions about competition. The economics of conducting business will likewise continue to improve—providing opportunities for businesses to expand the customer value proposition by providing more intangible information-based services. For example, the automobile value proposition continues to expand with technology

that continuously senses road conditions and applies the appropriate wheel traction and suspension system pressures.

CEO and senior management must understand that historical constraints of every kind continue to be knocked off IT because it is a "universal information-processing machine." Before e-mail and the Internet, the cost of communications was seen as limiting IT's wider use. Packet switching was invented as a way to digitize voice, data, and video in a matter that enabled digital computers (and its associated economics) to communicate, and the cost of communication sharply and suddenly dropped. Similar situations have transpired with the advent of digitized photography, use of radio frequencies for various handheld IT appliances, and the development of such products as elevators that call in to the service center or to a computer that automatically dispatches collective software or people when a part or system is about to fail. Often, only the senior management team's imagination limits new IT-based opportunities.

Our research suggests the following:

New technologies will continue to give companies the chance to differentiate themselves by service, product feature, and cost structure for some time to come. The first mover takes a risk and gains a temporary advantage (longer if there are follow-on possibilities). The fast follower is up against less risk but also has to recover lost ground. Charles Schwab versus Merrill Lynch and Walgreens versus CVS are examples of this playing out over the past decade. Our advice to the CEO is to look at IT use through several different lenses. One lens should be focused on improving cost savings and efficiencies. Another should be focused on the incremental

improvement of organizational structure, products, and services. Still another should be focused on the creation of strategic advantage through extending com-

The jobs of CTO and CIO are and will be of unparalleled importance in the decades ahead.

petitive scope, partnerships (customers and other parties), the changing of the rules of competition, and the provision of new IT-based services to extend the customer value proposition.

Unless nurtured and evolved, IT-enabled competitive applications, like many competitive advantages, don't endure. Even historic strategic systems like American Hospital Supply's (after a decade of financial malnourishment) may wind up turning into a strategic liability. Others, however, like American Airlines' SABRE have shown extraordinary robustness and have permitted the survival of otherwise doomed organizations.

Evaluating these opportunities as well as thinking through their implications and timing, is vitally important, nonboring work. The new technologies will allow new things to be transformed in nonlinear ways. Radio-frequency identification devices for grocery stores, smart cards, and automated ordering systems for hospital physicians are all examples of new process targets that technologies will soon address. In the more distant future we will see the improved creation of drugs and treatments through the ability to rapidly and more deeply analyze huge databases. Understanding the potential and then deciding when the time is right to seize these transformative applications will be neither routine nor boring for the CEO or CIO.

Grid computing, standardization of components, and open systems, far from stifling differentiation, provide a stable platform to build on and offer new ways of differentiating, either by cost structure, product, or service. Just as literacy stimulated innovation, so do open systems and grids.

Outsourcing the commodity infrastructure is a great way to control costs, build competence, and free up resources, which can be used to combine data bits in creative ways to add value. Relatively bulletproof operational reliability will be a key part of the price of success. Back-office or server farms, help desks, and network operations will be outsourced to specialists to attain this reliability (at rock-bottom costs). Packages like SAP further help remove commodity maintenance activities and allow firms to better analyze customer information and provide service at the sharp end. The package of skills needed inside an organization is changing very fast for competition in the information age.

The jobs of the CTO and CIO are and will be of unparalleled importance in the decades ahead. Max Hopper of American Airlines and Paul Strassmann of Kraft and NASA are not the last of a dying breed of dinosaurs, but prototypes of the leadership skills needed for survival.

If you take 1955 (with the IBM 701) as the start date and use 80 years as a technology cycle, 2035 may not be far off the mark for playing much of this out. Even then, the special recombinant nature of this technology makes us uncomfortable calling an end date. We wish Carr were right, because everyone's golf handicap could then improve. Unfortunately, the evidence is all to the contrary.

F. Warren McFarlan
and Richard L. Nolan

Letter from Jason Hittleman

Jason Hittleman, *IT Director, RKA Petroleum Companies, Romulus, Michigan*

I largely agree with Nicholas Carr's suggestions on how companies should respond to the unbearable reality that IT is becoming more of a commodity. But why does Carr suggest that IT management should become boring? Are leadership tasks such as managing risk and reining in costs any less engaging or challenging than seeking competitive advantage is?

Competitive advantage should never be the sole objective of IT. Rather, managing costs and assessing risk must become standard objectives as well. By focusing on systems and processes, more so than on just technologies, and by coupling the suggestions outlined in the article with an approach that embraces the mission of the company, IT management can remain challenging and rewarding.

IT will always matter–it will just matter in different ways now. IT must continue to support the business–not just through the logical application of technologies but also through the logical application of common sense.

Jason Hittleman

Letter from Paul A. Strassmann

Paul A. Strassmann, *Executive Advisor, NASA; Former CIO of General Foods, Kraft, Xerox, the Department of Defense, and NASA*

Nicholas Carr pronounces information technology strategically irrelevant to businesses and recommends adoption of the following policies: Cut IT budgets; do not invest in information technology innovations; invest only after others have succeeded (follow, do not lead); delay IT investments because prices are dropping and everything will be less expensive later; refocus from seeking opportunities to managing vulnerabilities and risks; disregard innovative offerings because vendors are seeking added revenues and are therefore suspect; and delay innovation as the preferred way for cutting IT costs. These recommendations are a departure from policies that have been pursued for the past 50 years. Therefore, each of the assertions Carr makes to support them warrants a commentary.

Assertion: IT has lost its strategic value. Carr argues that IT is no longer strategic because it has ceased to be a scarce good, and he contends that profit margins on IT-related innovations will consequently disappear. He does not support this argument with research findings (except for a reference to my own research and a misunderstood example from the Alinean Corporation). He bases his conclusions entirely on his reasoning, by analogy, that IT must follow the patterns that arose as businesses adopted steam engines, railroads, telephones, electric generators, and internal combustion motors. But any proof that rests entirely on analogies is flawed. This technique was used to uphold medieval dogma, and it delayed the advancement of science by centuries.

Carr's logic is defective because his examples deal exclusively with capital-intensive goods. Capital investments in machinery do indeed exhibit diminishing returns as markets saturate and the difference between marginal costs and marginal revenues disappears, but information goods are not subject to such effects. The marginal cost of information goods – especially of software, which now accounts for the dominant share of information technology costs – does not rise with increased scale. It drops asymptotically toward zero. Therefore, any firm that can steadily reduce marginal costs by deploying IT can make information technology investments enormously profitable and can generate a rising strategic value.

Assertion: IT is a commodity that does not offer a competitive distinction and therefore does not provide a competitive advantage. It is true that Microsoft desktops running on Intel processors have become widespread, but they account for less than 12% of IT budgets, and that number is declining. Most IT products are diverse – they certainly are not commodities. And while many business processes do rely on standardized desktops, are those processes therefore doomed to uniformity? In other words, does partial standardization wipe out opportunities for gaining competitive advantage? The evidence does not support such a conclusion.

Competitive advantage is not the result of personal computers. It is the result of effective management by skilled and highly motivated people. Since 1982 I have shown (in numerous publications) that firms using identical information technologies and spending comparable amounts on IT display an enormous variability in profitability. My research, now confirmed by other investigators, has demonstrated that profitability and IT spending are unrelated, even if identical technologies are used.

Assertion: Because IT is an infrastructural technology that is easily acquired and copied, it cannot offer a competitive advantage. Easy availability of information technology makes it increasingly valuable. E-mail, fax, and cell phones gain in utility as they become more widely used, because they can be acquired on attractive terms. I have spent 40 years of my career implementing information technologies; for the first 30 years, that was a great pain. The technology was expensive, faulty, insecure, hard to manage, and unstable. I finally see the advent of an era in which low-cost ownership of information technologies is possible. This will be accomplished through services in which the vendors assume most of the risks of failure while increasing ease of use for billions of people.

Carr's advice to back off from information technologies just as they emerge from a long gestation period is mistimed and abortive. Information technology must be easily acquired and made available to everyone so that the global community can increase the standard of living through easier communications and lower-cost business transactions. Widespread availability creates new business opportunities.

Assertion: The influence of IT will henceforth be macroeconomic and not a means for competitive differentiation. The proposition that IT benefits will flow to consumers and not to firms is a contradiction. Sustainable profits materialize when benefits accrue to customers. There are as yet enormous gains in value to be delivered in health, education, entertainment, business services, and especially government. Extending the benefits of the global division of labor and the inclusion of billions of new consumers into the global marketplace will generate trillions of dollars of new revenues. Enabling the global marketplace to function effectively will require enormous new IT investments by individual firms. Surely there will be millions of enterprises that will be able to take advantage of such opportunities. The lower entry costs for using the

power of information technologies will make that feasible. Carr completely disregards the explosive growth of small businesses, a development made possible by the Internet. Information technology is a killer of bureaucracies and a reducer of overhead expenses; those qualities increase its microeconomic viability. Asserting that benefits will accrue only to the economy at large and not to individual firms is a prescription for opting out of the information-based competitive races in the years to come.

Assertion: IT is primarily a transport technology, and because it is open to everyone, it offers no advantage. This proposition is a misunderstanding of what IT is all about. Message transport is *not* the primary reason why organizations deploy IT. Information technology adds value mainly by improving the management of information intelligence and collaboration among individuals, groups, and organizations. The transport function is essential, but IT's importance as a conduit is only tertiary. The value is in the message itself, not in the means of conveyance!

Information technologies now provide the primary means for extending the value of a firm's knowledge capital. They help companies manage the exploding accumulation of scientific, research, customer, engineering, property, and intellectual assets. Computers are the repositories of intelligence about customers, suppliers, and products; those repositories constitute the most valuable knowledge assets for any firm that realizes returns greater than its cost of financial capital. It is noteworthy that information technology is now recognized as the means for waging information warfare – a term that I apply not only to the military but also to commercial confrontations.

I have shown in published articles how and why firms' knowledge capital is now worth more than the assets reported on conventional financial statements. I have shown how people become enormously empowered when aided by information technologies because these tools magnify their ability to perform complex tasks. By trivializing information technologies as electronic messengers, Carr would prevent organizations from understanding how to deploy IT in such a way that it can be the weapon of choice in competitive contests.

Assertion: IT functions will be homogenized, and proprietary applications are therefore doomed. Citing the proliferation of off-the-shelf, standard applications, such as Microsoft Office, Carr predicts that information practices will march inexorably toward homogeneity. In such an environment of sameness, he says, no companies will be able to realize competitive gains.

The use of a standard software package does not doom an organization to homogeneity that destroys value. I suspect that Carr used the same software to write his essay that I did to write this critique, yet we have arrived at opposite conclusions! I consider the standardization of communication protocols, Web services, database languages, and applications to be a value-enhancing development, not a value detractor. I am particularly in favor of open systems that will make systems integration – now an enormous, resource-sapping burden – easy and financially attractive. Standards spare IT executives from unceasing difficulties in assuring the interoperability of routine business processes.

After 50 years of cyclical growth, there is not a shred of evidence that IT developments have reached a plateau, as did innovations in industrial-age machinery.

With standards in place, the IT staff can finally concentrate on what is indeed value enhancing for the enterprise, such as applications that reflect the firm's distinctive characteristics and allow it to share information easily with customers and suppliers. Applications that were completely custom-designed in the past – and that Carr praises – inhibited the economic contributions of IT.

Assertion: Corporations will adopt generic applications; business processes will therefore be uniform and without competitive advantage. This assertion can be contradicted by anyone who has had experience with one-code-fits-all "enterprise" software suites that claim to deliver answers to most business-systems problems. Even the most tightly controlled generic application suite (SAP's enterprise resource planning application) can deliver completely different results for look-alike firms.

For routine business processes, generic applications can be useful in reducing the total cost of ownership of computer systems. But such applications have also been known to destroy firms that have attempted to squeeze unique company processes into generic molds. Carr's prediction that generic applications will take over is not supported by firms' rising reluctance to install comprehensive enterprise solutions. In fact, by insisting on data and protocol interoperability, firms are seeking greater freedom to combine applications from a growing diversity of software offerings.

Assertion: Existing IT capabilities are largely sufficient for corporate needs. It is hubris to assert that we have

already attained the pinnacle of what is ultimately achievable. The history of that assertion is a history of failures. The Chinese burned their fleet when they thought nothing further could be gained from overseas trade. The leaders of the Soviet Union retained their bankrupt central planning system because they considered it perfect for managing the economy.

Corporations are confronting increased uncertainty about markets, competition, resources, employee attitudes, and the impact of legislation. The corporate environment requires more complex coordination than ever before, and there is less time for taking corrective measures. As a result, there is a need for

and greater adoption of information technologies. The arrival of a new information-based best practice is usually seen by the more aggressive leaders as a signal to commence yet another round of more expensive competition with more, not less, IT.

Assertion: IT is arriving at the end of its growth cycle and is reaching saturation. After 50 years of cyclical growth, there is not a shred of evidence that IT developments have reached a plateau, as did innovations in industrial-age machinery. Physical mechanics impose limits on the size and performance of locomotives, turbines, airplanes, refrigerators, and trucks; there are no such confinements to information technologies,

an enterprise architecture or alignment with a strategic plan. And I share Carr's concerns about information security, network reliability, and systems corruption. But cutting off innovative investments is not the way to address those problems. The cure for most of the so-called "legacy" systems is radical innovation, such as shifting the accountability for systems performance to vendors, who will then have to face up to the responsibility of delivering reliable and robust applications. I have examined such options. An examination of a large collection of applications shows that the most financially attractive way of dealing with existing risks is to replace the systems. Instead of feeding the increasingly costly IT infrastructure and throwing money at rising software maintenance costs, companies should be ready to engage in yet another IT investment cycle to replace old systems.

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Carr's assertions and recommendations could inhibit the most innovative and value-creating means available for increasing the economic benefits to enterprises and customers. Information technologies are too important to be pronounced irrelevant.

Paul A. Strassmann

The dissemination of business best practices means survival today requires speed and innovation – and greater adoption of information technologies.

more and better information technologies. Carr's view that the time has come to arrest further IT developments and take a static posture is a prescription for inaction as challenges keep rising.

Assertion: Widespread adoption of best-practices software makes IT-based advantages disappear for everyone. The dissemination of information about best business practices is indeed gaining, and competitors are therefore getting smarter and faster. But Carr's view – that wins cannot be sustainable if everyone has access to the same means for engaging in contests – disregards the dynamics of competition. The proliferation of knowledge about how to design ever faster sailing boats has jacked up the cost of participating and increased the difficulty of winning, but it has not discouraged races. The dissemination of business best practices means survival today requires speed and innovation –

as far as we can tell. Software can endow computing devices with unrestricted variability in features and functions. The capability of a software-enriched global network has no boundaries. The current cyclical correction to the excesses of the past decade is a crucible for generating more and better innovation.

Assertion: IT risks now exceed advantages, requiring shifts in executive attention. The need to pay more attention to IT risks is indisputable, but I do not agree that the risks exceed the advantages. Carr advises executives to adopt a reclusive posture – to withdraw from the search for new opportunities. He recommends pursuing cost reductions through cutting off IT instead of searching for opportunities in the steady stream of new ideas.

I favor cost cutting, especially for any bloated computing capacity that was acquired in a frenzy of hype without

Letter from Marianne Broadbent, Mark McDonald, and Richard Hunter

Marianne Broadbent, *Group Vice President and Gartner Fellow, Global Head of Research, Executive Programs, Gartner*
Mark McDonald, *Vice President and Research Director, Executive Programs, Gartner*
Richard Hunter, *Vice President and Gartner Fellow, Executive Programs, Gartner*

Nicholas Carr's well-written article takes the view that IT is now like other infrastructures and that, on average, the companies that are the biggest investors in IT are not the most successful in terms of business performance. He contends that firms should now focus on carefully managing costs and risks and not get carried away with IT's strategic role.

Carr is correct that hardware and network connectivity are commodity businesses and that some IT infrastructure services have evolved into commodity services. But the article misses a big part of the story. IT does matter, but not because of hardware or even standard commercial software. It is because the intelligent and innovative application of information solves business problems and creates customer value at high speed, low cost, and the right scale. To put it simply, it's not about the box; it's about what's inside the box.

Carr is right that the simple possession of infrastructure technology was for a time a source of competitive advantage. In the 1970s, the Dallas Cowboys' Tex Schram used a computer to manage information on NFL draft choices, assess the strengths of other football teams, and perform additional tasks that increased the Cowboys' ability to use information competitively. But the advantage disappeared when other teams began using computers. The source of competitive advantage shifted from simply having a computer to knowing how to use it.

Carr's examples are of companies looking for competitive advantage from the intrinsic performance characteristics of the hardware. In the case of American Hospital Supply, the characteristic was connectivity; at American Airlines, it was management of large amounts of complex data. In high tech, whenever you rely on hardware capability as a competitive technology, it's only a matter of time before others catch up.

The differentiation is about information, business processes, and applications. Sustainable advantage comes from consistently delivering greater value to customers. This comes from the "information" in information technology – that is, it comes from better understanding the customer, applying that understanding to your products, services, and processes, and integrating these to deliver on an improved value proposition.

That's what Wal-Mart and Dell have done. They have continuously used information better and with greater alignment to their value proposition. It's true that these companies have also continuously reinvested in new hardware and software platforms. But the sheer scale of their investment in infrastructure isn't the most important factor. Why have competitors been unable to copy Wal-Mart's and Dell's successes? The answer lies in large part in Wal-Mart's and Dell's ability to integrate IT into business processes – their "benefit conversion" ability.

It has been known for many years that the biggest investors in IT don't get the most value from the technologies. It is a key message in the Weill and Broadbent book *Leveraging the New Infrastructure: How Market Leaders Capitalize on Information Technology* (Harvard Business School Press, 1998) and in much subsequent work. What makes the difference is a set of benefit conversion factors that influence how well investments in IT-enabled business initiatives are turned into real business value. These factors include clear decision rights, accountability for IT-related decisions, integrated business and technology planning and execution, and the existence and reinforcement of strong collaborative behaviors. Many of these are not about IT as such but about effective executive processes, effective accountabilities, and business focus.

The major messages we have been giving CIOs over the past two years have been that they should manage costs and risks aggressively and work with business colleagues to design IT governance thoughtfully. Beyond that, as in any business area, executives must understand the need for risk-managed innovation.

Innovation through electronically enabled services, processes, and products has only just begun. As in the past, the benefits will go to firms where the business focus is clear and disciplined and where there is well-informed and integrated decision making across the organization. The danger is that by scanting the fantastic potential for innovation that lies ahead in IT, Carr will lead executives to focus only on controlling IT costs. That is a necessary discipline, but it is not the route to real business advantage.

<div align="right">
Marianne Broadbent,
Mark McDonald,
and Richard Hunter
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Letter from Bruce Skaistis

Bruce Skaistis, *President, eGlobal CIO, Tulsa, Oklahoma*

In "IT Doesn't Matter," Nicholas Carr is essentially issuing a warning: Organizations need to get realistic about what IT can and cannot do for them. In spite of all the hype, wireless systems and other exciting new computer technologies aren't going to create lasting strategic advantages.

I also think Carr is trying to help us learn from the mistakes we made during the late 1990s, when companies were making huge investments in e-business initiatives in an attempt to achieve competitive and strategic advantages. Many

> *Now that some of the IT mystique has been eliminated, corporate IT has to play by the same rules as everyone else.*

of those investments never produced significant benefits–many of the initiatives were never completed. With the benefit of hindsight, Carr is telling us most of those gigantic efforts were never going to deliver real strategic advantage, even if they had been successful.

IT does matter, and organizations should do the following to make sure their IT efforts and resources continue to matter:

Aim your IT efforts and resources at helping the business achieve its strategic objectives. Use IT to optimize and streamline critical business processes; speed up access to accurate information about operations, customers, and competitors; and integrate systems with customers and suppliers. Establish an active, effective IT management or governance structure, so leaders companywide can participate in establishing technology priorities, allocating resources, and monitoring performance.

Focus on using IT to respond quickly to changing conditions and requirements. Everything in business today has to be done faster than ever, and every-

thing is subject to immediate change. Therefore, IT decisions have to be made more quickly. Put critical IT initiatives at the top of the priority list. And slot them on a fast track; they need to be completed in the shortest time possible and updated frequently. (After all, your competitors are probably just a few steps behind.)

Focus on optimizing the cost effectiveness and performance of IT resources. Despite the fact that IT investments are typically among the largest a company makes, IT resources haven't always been under the same pressure as other functional areas to improve overall corporate performance and reduce costs. Now that some of the IT mystique has been eliminated, corporate IT has to play by the same rules as everyone else. That means refocusing the entire company on the importance of IT performance and cost effectiveness; creating new IT management structures to monitor performance and cost effectiveness; consolidating resources; and streamlining processes.

Focus on minimizing IT risks. Carr rightfully concludes that minimizing IT risks is a critical issue for all companies. Almost every day there is a new story about a major company or government agency having their networks hacked or their Web sites attacked. Every company should have some of its most talented people worrying about how to manage its IT efforts and outsourcing relationships; protect its networks, systems, and information; and mitigate other IT risks.

In a very straightforward way, Carr has put a stake in the heart of the misdirected thinking about IT that flourished in the free-spending 1990s. It's time for enterprises to be realistic about IT's role in their future. IT can produce significant strategic and competitive benefits for an organization–but only when it is used effectively.

Bruce Skaistis

Letter from Vladimir Zwass

Vladimir Zwass, *Distinguished Professor of Computer Science and MIS, Fairleigh Dickinson University, Teaneck, New Jersey, zwass@fdu.edu*

Two of the other articles in your May 2003 issue best refute Nicholas Carr's claim that "IT Doesn't Matter." As Gary Loveman describes in "Diamonds in the Data Mine," Harrah's Entertainment "has outplayed its competition" by basing its deep service orientation on how valuable its different kinds of customers are. The firm determines this value by mining the multifaceted and voluminous transactional information in its database. This is a textbook example of the strategic deployment of information technology to gain competitive advantage. Daniel Corsten and Nirmalya Kumar report in their Forethought article, "Profits in the Pie of the Beholder," that the suppliers that comprehensively adopt the IT-based "efficient consumer response" practices in their relationships with Sainsbury's Supermarkets attain higher levels of economic performance than do their peers. This is an excellent example of the successful use of interorganizational systems for competitive advantage.

The hardware and software components of information technology do indeed provide the infrastructure for data storage, communication, and processing. This basic aspect of IT is certainly being commoditized. However, as these and other examples show, information systems can be embedded in a company's organizational and interorganizational processes and combined inextricably with other capabilities and assets to produce superior performance. Dell's pull-based order processing and Wal-Mart's supplier-relationship management come to mind. The implementation of these IT-based systems does not come cheaply and requires continual retargeting, yet it underlies the success of many firms.

Vladimir Zwass

Letter from Mark S. Lewis

Mark S. Lewis, *Executive Vice President of New Ventures, Chief Technology Officer, EMC Corporation, Hopkinton, Massachusetts*

I agree with Nicholas Carr that the competitive edge gained by companies through IT in the past was not due to the fact that they had IT and others did not. It was due to *how* they used it, to the innovative business processes and models they created around new information technologies. Now, Carr tells us, best practices are being built into the infrastructure itself. He writes off any further strategic differentiation by arguing that IT is like other "infrastructure technologies" that lost their competitive potential once they became "accessible and affordable to all."

Carr's historical analogies to other infrastructure technologies are not convincing. Information technology has infinite and constantly expanding functionality, while Carr's other technologies – steam engines, railroads, electricity, telephones – have narrow functionality.

Electricity, for example, is simply a source of energy; it hasn't changed much since we found a way to harness it. And it can, and probably will, be replaced by another source of energy. Unlike electricity, IT is very different from what it was 30 or even ten years ago. The technologies used for processing, storing, and transporting information continue to expand. Also growing is the demand for IT, with more businesses and types of organizations, more processes and activities, and more and more consumers at home and on the go in need of its productivity-enhancing functions. Should we believe Carr, who says that the buildout is over, or should we listen to Alan Greenspan, who argues that "there are still significant opportunities for firms to upgrade the quality of their technology and with it the level of productivity"? Or perhaps we should listen to genomics expert Craig Venter, who says that at least a decade or two will go by before computing can catch up with the current needs of biological

investigation. Or maybe we should observe the millions of businesses and people around the world who are currently without affordable access to IT.

The key difference between IT and Carr's other "infrastructure technologies" is that the latter perform functions that lie outside human capabilities. By contrast, much of IT mirrors and amplifies the brain's key information-handling activities: processing, storage, and transmission. In addition, IT is a tool that automates and facilitates activities that otherwise would be done manually. Strategic advantage comes from how we

IT never mattered. What matters are the people who invent technologies and who deploy and use them.

apply IT, the unique and differentiating ways in which we marry information technologies with our intellectual capital: our business models, our organizational cultures, our creativity.

IT never mattered. What matters are the people who invent information technologies and who deploy and use them. Like any other human endeavor, IT has its share of failures, foibles, and fads. Computer scientist Michael Dertouzos reminded us that "IT acts like a magnifying lens, amplifying management's strengths but also its weaknesses." Carr's advice to avoid "waste and sloppiness" applies to any investment or purchase we make. A few years of over-investment followed by a few years of under-investment due to general economic and psychological conditions cannot change the nature of information technologies nor the industry built around them.

In my job, I talk with a lot of business executives and IT managers around the world. These conversations paint a very different future from the one Carr predicts. Rather than "ceding control" to a few large IT utilities guaran-

teed to use their monopoly status to raise profits and squash innovation, the executives I've spoken with are demanding more choice, more flexibility, and more advanced IT. They, unlike Carr, do not confuse the way they buy IT – increasingly moving toward a consumption-based model – with a lack of strategic importance.

In the next generation of IT, there can be no compromises. The use of IT is analogous to innovations in transportation, not power utilities. Common standards like roads and airports exist, but the cars we choose to drive and our methods of travel are based on individual preference. IT utilities will exist, but businesses will derive unique benefits from how they leverage specific technologies.

The greatest improvements in IT economics have come when customers were able to take control from "full-solution" providers and utilize the most cost-effective technology applicable for their needs. There is no going back. In the foreseeable future, customers will require the simplicity and affordability of complete IT solutions but will still want to be creative and use their brains to do more with IT and, yes, gain competitive advantage. I just think of walking into our living room and telling my kids that we now have a "TV utility" and the only channel we get is C-SPAN. I don't think they would consider this a step forward.

Mark S. Lewis

Letter from Tom Pisello

Tom Pisello, *CEO and Founder, Alinean Corporation, Orlando, Florida*

How a company manages its information technology – aligning investments with core business goals – is more strategic now than ever. Nicholas Carr's article "IT Doesn't Matter" draws attention to the very heart of the question CIOs and CFOs struggle with most: "What's most important when it comes to IT investments?" With dollars being scrutinized, the question merits closer examination.

In specific market segments and over the long term, it is true that companies

There is no consistent correlation between IT spending levels and financial performance.

spending frugally on IT are demonstrating superior overall results. But dig deeper and you'll find that there is no consistent correlation between IT spending levels and financial performance; two companies investing the same amounts in identical technologies will yield vastly different results.

What does this mean? What a company invests in, and how well it is applied to improve business practices, counts far more than how much is spent.

On the flip side, the worst-performing companies – those delivering the lowest return on shareholder investment – are equally penurious in their IT investment. Our research indicates that this laggardly group spends well below the industry average of 3.7% of revenue on IT (as do the top performers).

Examination of industry averages reveals certain best practices of companies deriving strategic impact from IT investments; one of these is the ability to quickly adapt plans to shifting market conditions. Best-performing companies have been able to scale back spending in this slow economy. When and if a shift occurs back toward favoring innovation, these same companies are likely to be adept at scaling back up.

Unfortunately, commoditization of technologies does not translate into making the best IT implementations easily replicable. That's because every organization has unique needs and priorities. However, one trend in particular holds great promise: Cheap, standards-based hardware and software are the single biggest driver of innovation, precisely because the heavy lifting can now be focused on activities that deliver much more value. (From databases, for instance, has sprung the promise of truly individualized customer contact; from the rudiments of factory planning come supply chains that can shift production within days of changes in customer demand or of geopolitical turmoil.)

Information technology is expected to manage companies' most vital and valuable intellectual assets and is the only tool companies have to turn this knowledge into the kind of competitive weapon that redefines industries – and its leaders. For this very reason, IT will continue to play an important role in our personal lives and in the companies that employ us. Those who recognize the importance of good management, not spending levels, will ultimately reap the rewards.

Tom Pisello

Letter from Roy L. Pike

Roy L. Pike, *Vice President of Information Technology and CIO, Millennium Chemicals, Hunt Valley, Maryland*

Everyone will agree with Nicholas Carr that the storage, transmission, and processing of digital information has become a utility service. We outsourced our global enterprise software data center in 1998. The problem is that since most executives think of IT in much broader terms, many readers may be misled unless they read the definition of IT he provides in the footnote.

In its broadest context, information technology is all about productivity. And nothing can be more strategic right now for manufacturing and service industries than improving productivity. During the 1980s and 1990s, IT gave rise to huge improvements in productivity by changing the way individuals work – providing direct access to information and eliminating hordes of information gatherers and intermediaries who added no value to their businesses.

What Carr misses completely is that, after having improved the productivity of individual workers, IT still has the potential to improve productivity dramatically, this time by changing the way businesses work together. The new strategic task for IT is all about creating integrated business relationships in which suppliers, producers, and customers act as if they were in one company, sharing information on inventories, production, demand forecasts, lead times, and maybe costs and pricing. For decades, the solution to supply chain inefficiencies was inventory. Today, inventory is the problem. The savings in material inventories and streamlined delivery that IT can deliver will dwarf the efficiencies that have already been achieved.

Linking intercompany business processes is not using IT as a utility. A few standards have emerged in some industries, but there are practically no inter-industry standards. By linking business processes, IT is and will remain of strategic importance for the next ten years.

Roy L. Pike

Letter from Vijay Gurbaxani

Vijay Gurbaxani, *Faculty Chair, Professor of Information Systems, Director of the Center for Research on IT and Organizations, Graduate School of Management, University of California, Irvine*

Nicholas Carr's article makes many of the same points that Max Hopper made in HBR in 1990. In "Rattling SABRE – New Ways to Compete on Information" (May–June), he also argued that computing was becoming a utility. So these arguments aren't new. Nevertheless, while many of Carr's arguments are sound, the situation is subtler than he would like us to believe.

The scarce resource never was technology, as Carr assumes; it was always the set of managerial capabilities needed

The move to a common infrastructure is inevitable. But it does not reduce opportunities for competitive advantage. It increases them.

to create value with that technology. These capabilities involve more than just managing the technology itself. They also encompass the ability to understand how investments in organizational capital complement and magnify the payoffs from technology and the ability to produce relevant information from the systems through sophisticated decision-making techniques. Recent research has demonstrated that companies spend five or ten times as much on management practices that accompany technology introductions as they do on the technology itself. What's more, as technology evolves and becomes increasingly complex, these management skills become ever scarcer.

Most companies struggle to implement a sophisticated information-based strategy. One has only to read two other articles in the May 2003 HBR – Gary Loveman's insightful "Diamonds in the Data Mine," which describes how Harrah's mined its customer information to dramatically improve its performance, and Eric Bonabeau's "Don't Trust Your Gut," which demonstrates the value of sophisticated decision-support tools – to understand why so much of what companies can do with information technology will never be found in a standard software package and why some companies will pull it off while others won't.

Carr argues that companies don't need to develop their own technology management capabilities: They can just buy computing services that embody best practices. But that assumes, first of all, that such utilities exist. Check out the current utility-computing models of the technology service providers – they are a long way from being utilities.

And when they are developed, the economics of software dictates that such shared systems must focus on a common denominator so they can be widely used. These common systems will not fit a company's processes out of the box; the firm will either need to customize the systems or change its business processes to accommodate the software. Neither approach is straightforward or always desirable. And as anyone who uses software knows, software is far from ideal.

What's more, even if companies share infrastructure and common application systems, they will not necessarily end up with identical systems or use them in similar ways. Executives will face a multitude of choices as to how they want to structure their databases and applications, what data they will collect, what information will flow out of their systems, and how they will manage it.

Still, I agree with Carr that the move to a common infrastructure is inevitable, though it will take a lot longer than he implies. Wal-Mart refuses to join industry exchanges because it believes its supply chain practices are unparalleled. And look how long it has been taking General Motors, DaimlerChrysler, and Ford to build their business-to-business exchange, Covisint, to provide the shared infrastructure and systems that will facilitate trade in the automobile industry. After investing billions of dollars, the exchange has gained only limited traction; the technological challenges and organizational changes needed are massive.

But the fundamental point is this: The move to a common infrastructure does not reduce the opportunities for competitive advantage; it increases them. Using these shared platforms, all firms will have the opportunity to build customized applications that exploit complex technological capabilities to give rise to new business strategies. When much of our investment in technology goes into shared infrastructure, the investments that we make in customization will be much more valuable.

Vijay Gurbaxani

Letter from Steven Alter

Steven Alter, *Professor of Information Systems, University of San Francisco School of Business and Management, San Francisco, alter@usfca.edu*

The argument in "IT Doesn't Matter" goes roughly like this: Kidneys don't matter. Kidneys are basically a commodity. Just about everyone has kidneys. People with one kidney often lead full lives with no problems. There is no evidence that CEOs with superior kidneys are more successful than CEOs with average kidneys. In fact, CEOs who spend more on their kidneys often don't do as well.

The title "IT Doesn't Matter" conveys a fallacy. An accurate but less catchy title would have been "IT Is Not the Headline." In my executive MBA courses on information systems, I use a similarly mistitled HBR case study to demonstrate why IT is essential but is not the headline. The 1997 case "The IT System That Couldn't Deliver" concerns management lapses in developing a new laptop-based tool for life insurance salespeople. The students read the case study before class and e-mail me a brief statement identifying "the system" and describing what it produces and how well it operates. Their answers are typically all over the map. As the discussion unfolds, it becomes clear that "the system" is neither the software itself nor the information system being created. Rather, it is a work system of selling insurance that has not been improved as hoped. The students usually realize that the mistakes in the case might not have happened if the CEO, CFO, and CIO had understood that the headline was the new work system, not the information system.

Still, while IT is not the headline, it certainly matters (just like kidneys) because the work systems cannot operate without IT.

Steven Alter

Letter from Cathy Hyatt

Cathy Hyatt, *IT Consultant, San Francisco*

If Nicholas Carr's article were correct, every CEO would get the same answer to the question "What is the cheapest IT solution?" Just as with electricity, companies' needs would vary only in quantity, not quality. However, those of us who have spent our careers in IT know that the answer to this question is always, "It depends."

And what it depends on, more than anything else, is the company's strategy. Typically, competitive strategy leans toward one of two forms: being the low-cost provider of a commodity product or service, or being a value-added provider of a differentiated product or service. Because of the variety and complexity of IT, there is a vast number of "correct" IT solutions and investment strategies for either of these approaches – but the set of solutions that works for one will not be the same as the set that works for the other. This, I think, makes IT management, which includes the selection, maintenance, and deployment of new and ongoing IT capability, a key strategic issue.

Carr says the main problem with IT management is overspending. If only those IT managers would get together and put pressure on their vendors, he says, this could be controlled. But he misses an important point related to the strategic use of IT. Let's say a business wants a particular new IT capability that would dramatically boost its differentiation or cost advantage. If the new product or service is incompatible with the outdated hardware and software that IT management has frugally kept in service past its vendor-supported life cycle, the firm will lose out on a key strategic advantage. Those of us who have experienced this problem know that a company's hardware and software can be intricately intertwined; sometimes a single piece of outdated software can derail the deployment of important new functionality with real strategic value.

Finally, Carr's analogy comparing the ubiquity of IT with that of electricity is only effective up to a point. The complexity and variety of IT, its evolving standards in many important areas, and its incredible innovation argue against his premise that its ubiquity eliminates its strategic value. IT's history of innovation undermines his assertion that technology-related business transformations are complete. The fact that IT

> *Hardware and software can be intricately intertwined. Sometimes a single piece of outdated software can derail the deployment of important new functionality with real strategic value.*

spending does not correlate with financial success may be related to this, as effective business-process changes are frequently made after the initial deployment of technology. An example might be a business where CRM software delivers real advantage over a competitor that, although equally able to purchase the same package, is unable to successfully deploy or use it.

To improve the business results gained from IT, corporate leaders must continue to increase its alignment with strategy. To do this, most will need to gain a greater understanding of IT, better integrate IT leadership into their strategic planning processes, and insist on greater and greater strategic and leadership capability from their IT professionals. Getting IT "right" is a difficult problem that many executives face, and while some will appreciate the silver bullet Carr offers, most, I expect, will find his naïveté discouraging.

Cathy Hyatt

Letter from Chris Schlueter Langdon

Chris Schlueter Langdon, *Assistant Professor of Information and Operations Management, Marshall School of Business, University of Southern California, Los Angeles*

I am an information systems strategy professor, so it would be expected that I would disagree with Nicholas Carr's provocative assertion that IT doesn't matter. Indeed, I do. While I agree with much of Carr's excellent – but incomplete – analysis, I disagree with his conclusion.

Certain areas in IT have become commoditized and continue to be commoditized. Just like the phone system: A business user does not have to be a network engineer to use it; the phone is a plug-and-play utility available to anyone. The same is basically true for office-productivity software and computer networks – although many would argue that it is still much easier to plug in a new phone or fax machine than it is to hook up a PC to the Internet at home or to share a printer.

The analogy with the phone system breaks down at the point where Carr's analysis stops. Information systems, and software applications in particular, differ in versatility and adaptability. To exaggerate somewhat – but only a little – anything is possible with software, if not today, then tomorrow.

Increasingly, value added is being shifted from mechanical systems and their operations into software. For instance, much of the value added in the phone system is being provided by voice-over-IP software. The history of modern production is intimately tied to the automation of business processes. First, companies used steam engines, then conveyor belts, and today we use information systems, and especially software, to automate business activities. We might call it "softwarization." Companies in many industries now use ERP and CRM software to automate back-office and customer-related activities. And this softwarization is not a one-step affair, like flipping a switch, but an ongoing process. Value added is constantly being shifted into or embedded in software, with mature areas obviously becoming commoditized. Examples include computerized antilock brakes, credit

> *To exaggerate somewhat – but only a little – anything is possible with software, if not today, then tomorrow.*

cards and calling cards, airline ticketing, and yield-management systems.

Why would this process stop? Why would there suddenly be only mature areas? Are there not enough business activities left to be automated? Would it be too difficult or expensive to automate the remaining ones? The very commoditization of mature infrastructure technology reduces unit cost, which in turn frees up funding for continued softwarization without necessarily increasing total IT budgets.

Two trends ensure that the sky is the limit for softwarization. Carr mentioned the popular one – Moore's Law, which establishes that hardware will become more powerful and cheaper over time. Even more important are advances in how increased processing power can be used – which leads us into the world of systems and software architecture design, with its fast-growing jungle of acronyms and ideas. One key advance in this field has been the recent breakthrough of object-oriented programming. The concept and some tools, such as the Smalltalk programming language, have been around for decades, but only very recently has the concept been turned into commercially viable implementations.

The bottom line is that powerful hardware combined with more flexible software will continue to fuel a process in which value added is increasingly achieved with information systems. While mature areas do indeed get commoditized and probably outsourced, new softwarization should receive more, not less, of top management's attention. Why? As Michael Porter argues, "[Business] activities are the basic unit of competitive advantage." As these activities get automated using software, top management's attention should shift to information systems architecture design.

Chris Schlueter Langdon

Reply from Nicholas G. Carr

First and most important, let me thank these correspondents (and the many others I've heard from) for taking the time to so clearly and thoroughly express their points of view. Whatever the broader merits of my article, it has at least succeeded in setting off an important and long overdue debate about the role of information technology in business. That debate can only be constructive.

Let me quickly restate the gist of my argument, which at times gets lost in the responses. As IT's core functions – data processing, storage, and transmission – have become cheaper, more standardized, and more easily replicable, their ability to serve as the basis for competitive advantage has steadily eroded. Given this continuing and indeed inexorable trend, companies would be wise

a strategy. Many companies have taken that approach in the past, and most have come to regret it.

At the same time, I would disagree with Mark Lewis's suggestion that "IT never mattered." In the past, proprietary computer systems could indeed be the basis of long-lasting advantages, as the story of American Hospital Supply in my article shows. Dismissing the former strategic relevance of IT makes it too easy to ignore how IT's role in business has changed. And that can lead to strategic miscalculations. As Warren McFarlan and Richard Nolan point out, the value of being a first mover hinges on the speed with which fast followers catch up. As IT's power and presence have grown, fast followers have been able to catch up – or spring ahead – ever more quickly. Given the high cost of being an

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to manage IT as a commodity input, seeking to achieve competitively necessary levels of IT capability at the lowest possible cost and risk.

I find nothing in these letters to contradict that argument. As many of the writers point out, the way companies organize processes and use information plays a critical role in their ability to distinguish themselves from competitors. That's always been true and always will be true. But that does not mean that the information systems involved in managing processes and information are the source of the distinctiveness. It is better, I would argue, to start with the assumption that the technology is generic – that its functionality can be easily and quickly copied – and that the more tightly an advantage is tied to the technology, the more transient it will be. I would certainly be wary of following Paul Strassmann's recommendation that executives "be ready to engage in yet another IT investment cycle," as if spending more money on IT is itself

early investor in new IT functionality, a first mover strategy becomes harder to justify. Just because we continue to see new innovations in IT does not mean that it pays to be a pioneer.

Finally, I want to say that Jason Hittleman is right to chide me for suggesting that rigorous cost control and risk management are "boring." I used the term as a contrast to what John Seely Brown and John Hagel call "big bang" thinking in IT management – the "IT changes everything" school of thought that distorted so many business decisions during the 1990s. It was, however, an unfortunate word choice, and I apologize to the many dedicated IT professionals whose hard and valuable work is leading to a more efficient and pragmatic use of information systems – and to a more realistic understanding of those systems' limitations.

Nicholas G. Carr