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T Matter

to Higher Education?

By Jack McCredie

Does information technology matter? This question may seem rhetorical in *EDUCAUSE Review*, a magazine with a masthead declaring that its primary purpose is to explore “Why IT Matters to Higher Education.” However, it is certainly not rhetorical to Nicholas G. Carr, editor-at-large of *Harvard Business Review (HBR)*. He recently wrote “IT Doesn’t Matter,” an article with the following summary of its central theme: “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.”¹

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Just one month later, the June *HBR* contained more than a dozen letters commenting on Carr's assumptions, assertions, conclusions, and recommendations.² Letters about the article also appeared in several other publications, while Howard Smith and Peter Fingar published a monograph offering a comprehensive analysis of Carr's article.³ Whereas some observers see the article as "important, perhaps even seminal,"⁴ two Harvard Business School professors commented: "Couple not knowing that you don't know with fuzzy logic, and you have the makings of Nicholas Carr's article."⁵

How does Carr's assertion apply to higher education? Neither his article nor the many responses it generated explicitly consider any of the unique issues facing higher education or research organizations. Although Carr presents several excellent observations and recommendations about IT in today's business climate, the singular message transmitted by his catchy title is misleading and even dangerous, particularly to educational institutions. By publishing both the complete text of his article and my comments about it, *EDUCAUSE Review* hopes to continue the vigorous debate that Carr generated in so many places and to encourage an ongoing dialogue about how to assess the strategic value of information technology in higher education.

How Could IT Not Matter?

Carr compares IT to several broadly adopted transformational technologies that have had historic impacts on industry and society at large, "from the steam engine and the railroad to the telegraph and the telephone to the electric generator and the internal combustion engine." He argues that as the availability of these older technologies increased and as they became much more affordable, they became strategically unimportant—"they no longer mattered." The values of these infrastructure technologies, or commodity inputs, accrue to entire industries, countries, and society at large rather than to individual companies.

He argues that information technologies, like older infrastructure technologies, have become ubiquitous as costs decline and standards emerge. Therefore, they are now *strategically unimportant* be-

cause no particular organization can gain a competitive advantage from IT. He notes that executives often fall into the trap of assuming that opportunities for competitive advantage will be available indefinitely. But competitors can easily replicate systems and processes based on mature, low-cost infrastructure technologies. Even the protection that accrues from a patent eventually expires. Organizations that risk scarce capital to deploy new technologies must recognize that the successes they achieve will ultimately become ubiquitous. Their advantage will quickly dissipate as standards emerge and costs decline. An example in higher education would be those early-adopter colleges and universities that developed successful student-recruiting strategies based on universal access to personal computers on their campuses. Whatever advantage these pioneers gained was quickly lost as the same success became available to all campuses that wanted to adopt the strategy.

Infrastructure technologies offer far more value when shared than when hoarded in individual organizations. Metcalf's law of networking—that the value of a network increases in proportion to the square of the number of people who are using it—is a good illustration of this observation. As networks become larger, their importance becomes more evident to all observers. Ask any network manager whether "it matters" if the network is up or not. This spring, when the University of California, Berkeley, had an unfortunate hardware outage, the central IT organization had a vivid reminder of how much "it matters" to our constituents to have their e-mail system constantly available. Or ask the 50 million victims of the August 2003 electrical power grid failure whether electricity is a strategic source of energy.

Carr does not dispute such observations; in fact, he makes them himself when he compares IT to electricity, railroads, and the internal combustion engine. He states that *IT is a crucial infrastructure technology* that is required for the continued operation of modern organizations: "For most companies, just staying in business will require big outlays for IT." Every organization can—and, in fact, must—use IT to remain competitive. This

fact certainly applies to higher education, whose central mission is the creation, integration, preservation, transmission, and application of information and knowledge. Carr argues, however, that IT, like electricity, is becoming *strategically invisible* because individual organizations can no longer gain a competitive advantage by using it.

Carr does not say that IT is dead, that IT is unimportant, that we should stop investing in IT, or that IT will not continue to be a driving force behind dramatic change. He does argue, quite reasonably, that an organization needs a lot more than a good IT environment or energy source to have a winning strategy. But if a solid, reliable information technology infrastructure is *required* simply to be in the game and to compete, IT certainly matters a great deal.

Staying in Business

Organizations that do not incorporate new transformational infrastructure technologies simply go out of business—some sooner than others. The examples are many, but it is worthwhile highlighting a few drawn from Carr's discussion of classic infrastructure technologies. Recall how steamships displaced the great sailing ships, how railroads put the canal companies out of business, how electricity superseded waterpower, and how telephones obviated the telegraph. More recently we are witnessing the replacement of analog media, such as tape cassettes, with CDs and DVDs. Companies that are not making use of digital technologies in the entertainment field are being left in the dust. The impact of digital photography on traditional industry leaders such as Kodak is devastating. Carr notes the strategic winners that adopted new technologies but adds that their advantages can be quickly overcome as other firms adopt the same technologies. The upside of innovation is clear, and the strategic downside of not adopting transformational new technologies is extinction.

The research arena of higher education has rapidly adopted advanced information technologies. Without a consistent IT architecture and infrastructure, and an appropriate IT governance model, modern colleges and universities are simply not able to recruit and retain first-rate



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scientists and scholars in most disciplines. Without a competitive IT infrastructure, they cannot win in the increasingly complex competition for research grants and contracts. A similar observation applies to today's students. They have grown up using the Web, PCs, and fast-paced interactive games. They expect a good IT environment at the school of their choice. An inadequate IT infrastructure in higher education will result in a decline in the quality of students, faculty, and research in the short term and probable extinction in the long run. If staying in business is not a *strategic concern*, I do not understand the meaning of the term.

IT's Adolescence

After more than fifty years of remarkable growth, IT is still in its adolescence. Its underlying silicon technology continues to evolve according to Moore's law—the 1965 observation by Gordon Moore, the co-founder of Intel, that the density of components on chips, and therefore the power of computing devices available at a given price, doubles approximately every eighteen months. Almost every aspect of digital technology, not just microchips, has been improving in price performance at approximately this rate, or even faster, for decades. Some technologies, such as wireless and optical communications, are advancing significantly more rapidly.

Such remarkable performance curves mean that many IT metrics improve by a factor of approximately 1,000 every decade. Compare the characteristics of a mid-level personal computer sold in a campus store ten years ago with what students and staff are purchasing today. In 1993, systems priced in the \$1,500 range came with an 8-megahertz CPU, 4 megabytes of primary memory, 40 megabytes of hard disk, and 1.4 megabytes on floppy disks for external storage and file exchange. Today's \$1,500 PCs are exceedingly more powerful with 2.4-gigahertz CPUs, 256 megabytes of primary memory, 60 gigabytes of hard disk, and read/write CD-ROMs. The campus network at the University of California, Berkeley, was connected to the Internet in 1993 by links having a maximum data-transfer rate of about 3 megabits per second. Today, the campus external network connection has a peak capacity of approximately 3 giga-

bits per second. Improvements of a thousandfold in a decade are not just theoretical possibilities; they are the realities we plan for in every system we design and implement.

The Apple Macintosh burst on the scene only twenty years ago. Originated by Tim Berners-Lee, the World Wide Web debuted on the Internet in 1991. The Mosaic browser was introduced at the University of Illinois in April 1993. At that time, there were only about 200 sites on the Web. Today, there are more than 40 million Web sites indexed regularly by popular search engines. The pace of IT innovation remains incredibly rapid. There is no evidence whatsoever to support the notion that significant IT developments have leveled off; some experts argue that the pace of change is actually accelerating.

Academic institutions that are smart and nimble enough to take advantage of such advances will be able to serve their many constituencies better than those that are not. True, such service advantages may not be long-lasting or *strategically* important in the sense that Carr uses the word. Carr looks for the strategic breakthrough that makes one firm stand out significantly from the rest of the pack—an advance that enables it to corner a major share of the market the way that eBay or Amazon.com utilized information technology to develop entirely new business models. Without such a breakthrough, he argues, IT simply doesn't matter. But the higher education market consists of thousands of independent institutions competing on many levels—for students, faculty, staff, research support, gifts, grants, tax dollars, athletes, etc. The advantages gained by those that success-

fully incorporate information technology will probably not enable any institution to corner the market on National Merit Scholarship winners or National Science Foundation grants. However, the advantages will be real—and they will matter in the day-to-day operational environment and culture that sets one institution apart from another. These smaller tactical advantages will be very important for institutions that want to remain competitive in the coming years.

Information technology is not close to being mature; we can expect the rapid advances of the past five decades to continue. We don't know that a technology is mature until it has been superseded by a new and better technology. The cumulative effects of IT advances will be additional thousandfold improvements in many dimensions. For example, we can expect terabytes of local storage and gigabit networking speeds to be available on our desktops. Carr is certainly correct when he states that such IT advances, by themselves, will not produce strategic, or even tactical, advantages. Smart people, however, can and will use these new tools to develop departmental and organizational strategies and tactics that will give leading institutions significant competitive advantages.

IT-based Industry Transformations

Carr mistakenly observes: "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. . . . It may well be that, in terms of business strategy at least, the future has already arrived." This pronouncement sounds a good deal like the belief held, more than a century ago, by



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some prominent physicists, who stated that all of the important work in their field had been completed. In a recent *Nature* article, A.M. Bradshaw explained: “A list of the important remaining problems in physics compiled at the dawn of the twentieth century might not have been very long. Several noted physicists, including Albert Michelson, Lord Kelvin and Philipp von Jolly, had already agreed that the cathedral of physics was virtually complete, with only a few turrets and pinnacles to be added, a few roof bosses to be carved. Reality turned out quite differently: quantum mechanics, relativity, elementary-particle theory and cosmology became some of the greatest scientific (and cultural) achievements of the twentieth century.”⁶

The dot-com phenomenon of the 1990s certainly raised expectations—to unrealistic, unsustainable, stratospheric levels—about how easy it is to create successful business models based on the Internet. Yet the excesses and overinvestments during this business fiasco should not overshadow the many solid achievements and successes of companies that developed creative e-business strategies. Despite the many failures during this shakeout period, we are rapidly becoming a digitally connected society. Online shopping, for everything from books to cars to homes, is now common. Many businesses have formed strategic, worldwide supply-chain and marketing partnerships based on digital technologies, and many more such partnerships are sure to be developed in the coming years. Some will likely be transformational. For example, the prices of energy resources will increase as they become rarer, and

travel expenses will follow closely. During this same period, the costs of ever-more-powerful networking technologies will continue to decline, and better online collaboration tools will evolve. This combination will present innovative companies with profitable opportunities to reinvent the ways in which national and international business meetings occur. Such strategic opportunities based on IT have probably passed the adolescent stage, but it is hard to believe that they are as mature as Carr argues.

For example, the transformation to an Internet-based economy has certainly not yet happened in the entertainment industry, where a staggering clash in cultures is under way between corporations and their customer base—the general public, particularly the younger generation. As the industry fights to maintain the established order, young people by the millions are sharing and trading music and video files over the Internet. Rather than using information technologies to create new and highly profitable business models, the industry has been fighting a losing battle based on suing customers for copyright infringements. Such strategies will not win in the long run; they will only disenfranchise a shrinking customer base.

Does anyone doubt that new, Internet-based models for entertainment will emerge in the next few years? The tragedy of the current situation is that the vacuum caused by the lack of a viable model from industry leaders causes millions of consumers who do not understand the nuances of the Digital Millennium Copyright Act to become lawbreakers, often unknowingly so. We in higher education

are placed in the middle of this ugly struggle between cultures as we process “take down” complaints and subpoenas from the industry on the one hand and as we try to educate our constituencies on the other.

Educating people about what is legal and what is not in this domain is only a partial answer to the problem. An innovative Internet-based business model will eventually transform the entertainment industry. Apple’s announcement this spring about its iTunes Music Store—an online store where users can search for, buy, and download individual songs—is an encouraging step.⁷ Other entrepreneurs are beginning to package entertainment bundles that can be sold on campuses through site licenses. In any case, the traditional entertainment industry is just one example of a market that has yet to understand how information technologies will strategically transform its business. Ironically, a sometimes illegal and often overlooked dimension of this industry—sex and pornography—has understood the enormous profit potential of the Internet for many years. Perhaps mainline entertainment corporations need to learn something about marketing and pricing from their disreputable relatives.

Transforming Learning Environments

How many additional “IT-spurred industry transformations” are waiting to happen may be a debatable question. However, one thing seems certain: the teaching and learning dimensions of higher education have yet to be transformed. Information technologies have definitely changed much of the modern research enterprise. New fields—such as computational chemistry and biology—are blossoming. New technologies—such as Grid computing, extremely large databases, and very high-speed networks—continue to transform how a great deal of today’s research is conducted. Additionally, many colleges and universities have invested significantly to modernize their administrative environments in order to meet the standards required by regulatory and oversight bodies.

But the classroom is another case altogether. By and large, higher education is still a lecture-based enterprise, with only

What Others Are Saying:

"Industry partisans who have read it but can't accept much of it as true are either awash in denial or so obsessed with self-preservation that they're blinded to facts."

—John Taschek, "IT Does Matter," eWEEK, July 14, 2003

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

—John Seely Brown, Former Chief Scientist, Xerox, Palo Alto, California, and John Hagel III, Management Consultant and Author, Burlingame, California, Letter to *Harvard Business Review*, June 2003

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

—Mark S. Lewis, Executive Vice-President of New Ventures, Chief Technology Officer, EMC Corporation, Hopkinton, Massachusetts, Letter to *Harvard Business Review*, June 2003

"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."

—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, Letter to *Harvard Business Review*, June 2003

"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."

—Steven Alter, Professor of Information Systems, University of San Francisco School of Business and Management, San Francisco, Letter to *Harvard Business Review*, June 2003

a few faculty members experimenting with innovative new models. There are not many campus experimental learning environments to compare and evaluate. Those of us in higher education have not yet reengineered the core of the academic enterprise. James Duderstadt, Daniel Atkins, and Douglas Van Houweling make this case exceptionally well in their recent book *Higher Education in the Digital Age*: "To date, the university stands apart, almost unique in its determination to moor itself to past traditions and practices, to insist on performing its core teaching activities much as it has done in the past. Our limited use of technology thus far has been at the margins, to provide modest additional resources to classroom pedagogy or to attempt to extend the physical reach of our current classroom-centered, seat-time-based teaching paradigm. It is ironic indeed that the very institutions that have played such a profound role in developing the digital technology now reshaping our world are the most resistant to reshaping their activities to enable its effective use."⁸

Learning is a universal activity that is ripe for the type of strategic transformation envisioned by Carr. The two main reasons this has not yet happened are probably (1) envisioning and then implementing innovative interactive learning environments that really work is clearly difficult to do, and (2) educational institutions resist change very effectively. But transformation is coming, and it will be fueled by information technologies. An interesting feature of the higher education IT community is the high degree of collaboration and sharing that is common among its members. EDUCAUSE is dedicated to fostering this collaborative culture. Colleges and universities collaborate because they share a belief that by working together, they can accomplish IT projects, such as Internet2, that are strategically important for the entire education community and that would not happen if each institution acted alone. Such strategic partnerships occur when the participants know something is so important that its potential success transcends the pressure to act independently and competitively.

Several colleges and universities continue to experiment with

distance-learning models that free students from space and time constraints. Some of these models have been successful, and some have failed, but the experimentation continues. Competition is heating up as corporations, such as the University of Phoenix, put pressure on traditional colleges and universities. Profits and enrollments at the University of Phoenix are rising at a compound yearly rate of approximately 20 percent. Currently, there are more than 100,000 students enrolled in its programs, with almost 20,000 students participating in online offerings. As network bandwidth increases to people's homes, and as more successful learning models emerge, change in both new and traditional educational institutions will accelerate.

"Boring" IT Management

Carr's clever, provocative, and easily remembered title may be at the core of much of the fuss about his article. Had he used a stodgy, academically respectable title, his article would likely have generated much less attention and debate. A significant risk exists if the only thing that senior managers remember about the article is a superficial catchphrase.

Another example of how Carr's style may have caused more heat than light is his assertion that IT management should become boring. "In the long run, though, the greatest IT risk facing most companies is more prosaic than a catastrophe. It is, simply, overspending. . . . 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." Later, in his June 2003 *HBR* reply to the many letters he provoked, Carr apologized "for suggesting that rigorous cost control and risk management are 'boring,'" noting that it was "an unfortunate word choice." He added: "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."⁹

Conclusion

Several of Carr's specific recommendations for managing IT resources in

today's changing economic environment are actually right on target, especially given the significant budgetary restrictions facing most higher education institutions. He notes: "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 to manage IT as a commodity input, seeking to achieve competitively necessary levels of IT capability at the lowest possible cost and risk."¹⁰

Carr states that many experts have compared the overinvestment in information technology in the 1990s to the overinvestment in railroads in the 1860s. He also calls our attention to the fact that there is no relationship between the amount of money that a particular company spends on IT and its performance in an industry. Often, companies with the least spending on IT post the best results. These observations lead him to recommend that organizations should become defensive and adopt the following basic rules for IT management: (1) spend less; (2) follow, don't lead; and (3) focus on vulnerabilities, not opportunities.

For many organizations whose business models depend on low-margin, high-volume, static environments, Carr's conservative approach may work well, particularly in times of severe budget difficulties. Higher education institutions need to determine whether their long-term goals are served best by an innovator, early-adopter, or follow-the-pack approach to their information technology environment. This decision should be made by the senior leadership of the campus as part of its overall strategic planning effort.

Professor Martin Trow, of the Goldman School of Public Policy and the Center for Studies in Higher Education at the University of California, Berkeley, has been studying the consequences of new IT advances for higher education for many years. In the mid-1990s, he predicted that IT would lead to the creation of organizations that would differ significantly from existing institutions. After several years of research and comparative

analyses, he made the following observation: "It is a clouded crystal ball into which we peer to see the future of our universities and colleges, cloudy because of the uncertainties of the development of the new technologies of information and communication. The only thing we can be sure about is that these developments will have large and cumulative effects."¹¹

Even though the crystal ball may still be cloudy, there are in fact several things about which we can be reasonably sure as we plan for the future. First, organizations with an inferior IT infrastructure will be at a competitive disadvantage and will find it difficult to stay in business. Second, IT technology is still in its adolescence and will continue to evolve rapidly. Third, higher education has yet to transform its core learning environments. And finally, IT management is not likely to become boring in our lifetimes. Carr is wrong: at least in higher education, *IT certainly matters.* *e*

Notes

1. Nicholas G. Carr, "IT Doesn't Matter," *Harvard Business Review* (May 2003), 5–12. The complete article is reprinted in this issue of *EDUCAUSE Review*.
2. For the response letters, see <http://harvardbusinessonline.hbsp.harvard.edu/b01/en/files/misc/Web_Letters.pdf;jsessionid=5U355YCSKTCVMCTEQENB5VQKMSARWIPS> (accessed August 23, 2003).
3. Howard Smith and Peter Fingar, *IT Doesn't Matter—Business Processes Do* (Tampa, Fla.: Meghan-Kieffer Press, 2003).
4. John Seely Brown and John Hagel III, letter to *Harvard Business Review*, June 2003.
5. F. Warren McFarlan and Richard L. Nolan, letter to *Harvard Business Review*, June 2003.
6. A. M. Bradshaw, "Physics from the Inside," *Nature* (July 12, 2001), 121.
7. See Apple's iTunes Music Store Web site: <<http://www.apple.com/music/store/>>.
8. James J. Duderstadt, Daniel E. Atkins, and Douglas Van Houweling, *Higher Education in the Digital Age: Technology Issues and Strategies for American Colleges and Universities*, ACE/Praeger Series on Higher Education (Westport, Conn.: Greenwood Press, 2002), 18. See also their chapter "The Development of Institutional Strategies," reprinted in *EDUCAUSE Review* 38, no. 3 (May/June 2003): 48–58.
9. "Reply from Nicholas G. Carr," *Harvard Business Review*, June 2003.
10. *Ibid.*
11. Martin Trow, "Some Consequences of the New Information and Communication Technologies for Higher Education," in *The Virtual University? Knowledge, Markets, and Management*, ed. Kevin Roberts and Frank Webster (Oxford: Oxford University Press, 2001), available online at <http://ishi.lib.berkeley.edu/cshe/mtrow/ICT_for_UK_wfn.pdf> (accessed August 25, 2003).