

## A NEW KNOWLEDGE OF REALITY

Janet Moore of Olin College reviews the National Research Council's report, *Preparing for the Revolution: Information Technology and the Future of the Research University*. National Academies of Sciences, November 2002. Review in press at *On the Horizon*.

Is it eccentric to propose that information technology is *fundamentally* changing the relationship between knowledge and people?

Apparently not. The claim motivates the National Research Council's (NRC) report, *Preparing for the Revolution: Information Technology and the Future of the Research University*.<sup>1</sup>

NRC recommends that research universities take the leadership role in the changing relationship. University culture itself—"a social institution of great importance to our economic strength, national security, and quality of life" (1)—is being challenged by information technology and by the NRC.

The United States allocates federal research funds to the 261 research universities that educate more than a quarter of the national enrollment, 4.24 million students, or 28%. Yet, while federal and state funding for university research has steadily declined in the past 15 years, the funds that industry devotes to research and development have markedly increased. Thus, universities' leadership of learning is in peril, according to NRC panel members who share "a sense that many of the most significant issues are not well understood by academic administrators, their faculty, and those who support or depend on the institution's activities" (1). People insufficiently understand the pace of change, the ubiquity of the internet, the relaxing constraints of space and time, the unparalleled access to information, and the managing of knowledge and of intellectual capital. Instead of embracing information technology as industry does, academic culture "sometimes allows the demand for consensus to thwart action" (22). Today, the slow pace of academic change collides with an unprecedented rate of technological change:

The extraordinary pace of information technology evolution is likely not only to continue for the next several decades but could well accelerate. It will erode, and in some cases obliterate, higher education's usual constraints of space and time. . . The impact of information technology on the research university will likely be profound, rapid, and discontinuous— just as it has been and will continue to be for our other social institutions. (2)

The report identifies technologies that will evolve within the next decade, transforming the form, the functions, and the financing of universities. For example, learning relationships already experience what has been called the greatest generation gap of all time. If 20% of today's college students used computers before they were 8 years old, if all of them used computers by the time they were 18,<sup>2</sup> and 90% of them go online every day,<sup>3</sup> communicating electronically is second nature for students who far more readily adopt technology than their professors do. Cybernatives are more comfortable with the Internet's democratizing influence, more open to new social dynamics that bring together widely dispersed people of many

cultures with convergent and divergent interests. The audience for learning is less formal and more accessible; many people enjoy access to remote libraries of digital knowledge, knowledge that used to be limited to the privileged few. The audience has changed, and so have the channels for learning. Designed as 360° immersive learning environments that can feature visuals, sound, smell, taste and texture and simulate face-to-face experience, interactive interfaces are already at work in specialized fields such as surgery. Thin, flexible electronic books; wearable computers; laser retinal displays; representational, non-text voice, video and graphical interfaces; telepresent, automatic knowledge gathering and managing agents; robotic sensors and actuators; multitudes of tiny, nearly invisible and inexpensive personal digital devices; fiber optic connections communicating quadrillion instructions per second—all these developments are expected to take effect within the next decade. Technology is creating an internet driven economy networked by a “global communications skin.”<sup>4</sup> Decreasing in cost, communications technology is expected to continue increasing in power, in reach and in speed a hundredfold each decade.

Implications are “profound, rapid, and discontinuous” for all sectors including research universities “whose central function is the creation, preservation, integration, transmission, or application of knowledge” (22). What will it mean to be educated in the 21<sup>st</sup> century? How will professors respond to plug-and-play learning that learners themselves can select, design, multitask and control? The report speculates that some academic traditions—lectures, sequence- and content-bound curricula, common reading lists—will recede. Intellectual span will grow in large-scale, far flung collaboratories; multidisciplinary research networks; real-time, consultative management; multimedia, multi-player interactive gaming, and merging disciplines. Simulation already offers “a fourth modality of research, on a par with observation, theory, and experimentation” (30). Increasingly popular, non-proprietary, open-source courseware and platforms make learning more accessible and more affordable. The library is becoming “a center for knowledge navigation” (13). For-profits can diminish non-profit monopolies on students. Customized degrees for corporate training are thriving. The global knowledge industry blends telecommunications, entertainment, and information services.

Can research universities develop sustainable business models? Yes, says the report:

It is therefore important that university strategies include: the development of sufficient in-house expertise among faculty and staff to track technological trends and assess various courses of action; the opportunity for experimentation; and the ability to form alliances with other academic institutions as well as with for-profit and governmental organizations (48).

*Preparing for the Revolution* recommends that universities “strive to become learning organizations by systematically studying the learning process and re-examining their role in the digital age. . . encouraging experimentation with new paradigms of education, research, and service by harvesting the best ideas, implementing them on a sufficient scale . . .” (24).

While the university as a physical place is not likely to disappear any time soon (22), rethinking its role may include deciding which operations to retain and which to

outsource. The faculty role itself may change from sole responsibility for course design and delivery to working side by side with instructional designers and students to create learning environments. Like students, faculty may become more mobile, disaggregating from any particular institution. Thus, universities may have difficulty maintaining mindshare, when faculty opt to act as freelance consultants for the learning design industry, much as they have traditionally opted to do as authors. In preparation, one of the most critical areas universities face is establishing policies for intellectual rights. In the *Chronicle of Higher Education's* online discussion of the report, Daniel Atkins suggests that part of the answer for retaining faculty "lies in stressing that technology can and should reinforce the faculty's role as members of a specific knowledge community. . . finding reinforcement between physical and virtual space communities rather than dichotomy. As usual, the answer will lie in finding areas of mutual self-interest."<sup>5</sup>

*Preparing for the Revolution: Information Technology and the Future of the Research University* persuades by understatement. The report illustrates hypotheses with examples; it is sensitive to its political, material environment. Its 97 pages sell for \$25.50 in paperback, less if ordered online, free to read it a page at a time at [www.nap.edu/catalog/10545.html](http://www.nap.edu/catalog/10545.html). Teachers will find its "new knowledge of reality" worthwhile.

In a poem about hope, Wallace Stevens concludes with a realization: "It was like a new knowledge of reality." Elsewhere, Wallace Stevens writes that "the whole race is a poet, writing down the eccentric propositions of its fate."<sup>6</sup> The NRC report repeats that its purpose is not to proscribe but to make possibilities more vivid, to persuade U.S. higher education to write the propositions of the future, to call research universities to lead learning.

People cannot change their behaviors as rapidly as technology changes. In the next phase of its study, Atkins promises that NRC will comprehensively inventory innovative research projects that link people, information, and instruments. Some collaboratories he mentions now are high-energy physics, environmental sciences, the National Virtual Observatory for Astronomy, and earthquake engineering research.

How will research universities affect the new human knowledge relationships? For now, NRC calls for greater dialogue among schools, foundations, industry, and government.

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<sup>1</sup> *Preparing for the Revolution: Information Technology and the Future of the Research Universities* (2002). Panel on the Impact of Information Technology on the Future of the Research University, Policy and Global Affairs, National Research Council. 97 pages, 7 x 10, pbk. October, 2002. ISBN: 0-309-08640-X. \$25.50. Viewable at: <http://www.nap.edu/catalog/10545.html>. Page numbers cited in parentheses in this review refer to the online version. In January 2001, 80 leaders from education, industry and foundations met at the National Academies of Sciences for a two-day workshop. Presentations from the workshop are broadcast by the Research Channel at: <http://programs.researchchannel.com>.

<sup>2</sup> The Pew Internet Project. *The Internet Goes to College: How Students Are Living in the Future with Today's Technology*. September 15, 2002.

<http://www.pewinternet.org/reports/toc.asp?Report=71>.

<sup>3</sup> Greenfield Online. 2000. "The Internet is 'Big Man on Campus.'" (press release). August 7. <http://www.greenfieldcentral.com>.

<sup>4</sup> *Newsweek*. April 9. Lucent Technologies. 2000. "Networking." Trends and Developments 4 (2).

<sup>5</sup> Daniel E. Atkins is a professor in the School of Information, a professor of electrical engineering and computer science, and director of the Alliance for Community Technology at the University of Michigan at Ann Arbor. The *Chronicle of Higher Education's* colloquy entitled "How Will Technology Change Research Universities?" met online on Friday, November 22, at 3 p.m., U.S. Eastern time. See the archived conversation at: <http://chronicle.com/colloquylive/2002/11/research/>

<sup>6</sup> Wallace Stevens, "Not Ideas about the Thing but the Thing Itself" and "Men Made out of Words." *The Palm at the End of the Mind*. Holly Stevens, Ed. New York: Alfred A. Knopf, 1971. Also, see the text of "Not Ideas about the Thing but the Thing Itself" at <http://www.newtrix.com/poems/wls-men.htm> and listen to Stevens read "Men Made out of Words" at <http://www.salon.com/audio/poetry/2002/04/22/stevens/>.