



## PREPARING FOR THE REVOLUTION INFORMATION TECHNOLOGY AND THE FUTURE OF THE RESEARCH UNIVERSITY (2002)

Our society is being reshaped by rapid advances in information technologies—computers, telecommunications networks, and other digital systems—that have vastly increased our capacity to know, achieve, and collaborate. This rapid evolution of digital technologies is creating not only new opportunities for our society but challenges to it as well, and institutions of every stripe are grappling to respond by adapting their strategies and activities. Corporations and governments are reorganizing to enhance productivity, improve quality, and control costs. Entire industries have been restructured to better align themselves with the realities of the digital age. It is no great exaggeration to say that information technology is fundamentally changing the relationship between people and knowledge.

Yet ironically, at the most knowledge-based entities of all—our colleges and universities—the pace of transformation has been relatively modest in key areas. Although research has in many ways been transformed by information technology, and it is increasingly used for student and faculty communications, other higher-education functions have remained more or less unchanged. Teaching, for example, largely continues to follow a classroom-centered, seat-based paradigm.

Reflecting their broad interest in the health of America's research enterprise, the National Academies launched a study in 2000 through the National Research Council on the implications of information technology for the future of the nation's research university—a social institution of great importance to our economic strength, national security, and quality of life. The NRC issued its report—*Preparing for the Revolution: Information Technology and the Future of the Research University*—in November 2002.

## **TECHNOLOGY FUTURES AND THEIR IMPLICATIONS**

It is difficult to appreciate just how quickly information technology is evolving. From the average user's point of view, the exponential rate of information-technology advance dictated by Moore's Law will drive increases of 100 to 1,000 fold in computing speed, storage capacity, and bandwidth every decade. At that pace, today's \$1,000-notebook computer will, by the year 2020, have a computing speed of 1 million gigahertz, a memory of thousands of terabytes, and linkages to networks at data transmission speeds of gigabits per second. This extraordinary pace is not only expected to continue for the foreseeable future but could well accelerate.

Advances in information technology hold tremendous implications for the research university and its primary intellectual missions—education, research, and outreach. We can now use powerful computers and networks to deliver educational services to anyone—any place, any time. Technology can create an open learning environment in which the student, no longer compelled to travel to a particular location in order to participate in a pedagogical process involving tightly integrated studies based mostly on lectures or seminars by local experts, is evolving into an active and demanding consumer of educational services. Similarly, scholarly communities are shifting from physical campuses to virtual ones, globally distributed in cyberspace.

The research university's organization, management, governance, and financing will also require serious reevaluation. Information technology could enable (or force) a restructuring of traditional disciplines and disaggregation of university services, ranging from student housing to health care to teaching itself. Colleges and universities will increasingly face the question of whether they should continue their full complement of activities or outsource some functions to lower-cost and frequently higher-quality providers. Similarly, universities will face a major challenge in retaining instructional "mindshare" among their most accomplished faculty.

Technological innovations are stimulating the growth of powerful markets for educational services and the emergence of new for-profit competitors, developments that could reshape the higher-education enterprise. Technology may also amplify the impact of non-technological shifts, such as growing linkages between academia and the commercial world, the erosion of public support for higher education in many states, and the growing demand for ubiquitous education.

## **IMPERATIVES FOR THE FUTURE**

How can the research university survive and thrive in an environment characterized by rapid, unpredictable, and discontinuous technological change?

The NRC report concludes that procrastination and inaction are dangerous courses for the university during a time of rapid technological change, although institutions will also need to avoid making hasty responses to current trends. Just as in earlier periods of change, the university will have to adapt itself to a radically changing world while protecting its most important values and traditions, such as academic freedom, a rational spirit of inquiry, and liberal learning.

For at least the near term, meaning a decade or less, the research university will continue to exist in much its present form. But it must devote itself during this interval to anticipating the needed changes, developing appropriate strategies, and making adequate investments if it is to prosper

thereafter. Over the longer term, the basic character and structure of the research university may be challenged by the technology-driven forces of aggregation and disaggregation..

Although it is difficult to predict future impacts with any precision, higher education must develop mechanisms to at least *sense* the potential changes and to aid in the understanding of where the technology may drive it. 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.

## CONTINUING THE DIALOGUE

Many individual institutions and groups are effectively grappling with the issues outlined in the NRC report. Yet intensified efforts and dialogue are needed. Given the complexity and breadth of the issues, the panel was only able to scratch the surface with this initial effort. Continuing dialogue will be needed to develop common approaches among various internal constituencies of the research university (students, faculty, administrators, and governing boards) and to build linkages with external stakeholders (state and local governments, federal agencies, industry, foundations). New mechanisms are required to promote communication across disciplines, build support for needed changes within institutions, and help universities track and anticipate technological shifts more systematically than they would on their own.

The National Academies are launching a second phase effort aimed at facilitating continued dialogue on issues related to information technology and the future of the research university. The Forum on Information Technology and the Research University will organize a series of national conferences and summits, facilitate campus-based discussions, and catalyze focused initiatives and demonstration projects to aid universities and their stakeholders as they develop new strategies for the digital age.

We are on the threshold of a revolution that is making the world's accumulated information and knowledge accessible to individuals everywhere. It has breathtaking implications for us all, but the challenge is particularly great for the academic community. Our mission—our responsibility—is to develop a strategic framework that enables us to understand this extraordinary technology and shape its impact with skill and imagination. If we are successful, the research university can remain a major source of sustenance for a free and spirited democracy, a vibrant intellectual life, a healthy economy, and other national values.

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**PANEL ON THE IMPACT OF INFORMATION TECHNOLOGY  
ON THE FUTURE OF THE RESEARCH UNIVERSITY**

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Copies of *Preparing for the Revolution: Information Technology and the Future of the Research University* are available for sale from the National Academies Press; call (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area), or visit the NAP home page at [www.nap.edu](http://www.nap.edu). The full text of this report is also available at the NAP site.