One of the most interesting social phenomena of the past 20 years has been the “mobilization” of the commercial workforce. Cellular telephony, wireless networking, personal digital assistants, notebook computers, pagers, and other devices and technologies make it possible to liberate work from traditional workplaces and to move the locus of work from producer sites to customer sites.

The benefits of increasing work mobility are somewhat less obvious in higher education, where for centuries investment priorities have been placed on physical locations—specifically campuses, research centers, medical centers, and the like. The emergence of e-learning as a robust element of postsecondary pedagogy, telemedicine, global research teams, and shared research instrumentation suggests that mobility will be an increasingly important capability and social behavior in higher education, too. For this reason, information technologists throughout higher education are investigating and investing in new infrastructures and standards to support wireless connections to the Internet and to institutional information resources. In turn, this investigation and investment activity makes it important for the EDUCAUSE Center for Applied Research (ECAR) to study these investment patterns and technical trends to inform the community of ECAR readers about trends, directions, risks, and effective practices.

ECAR was established to create research to support users and managers of information technologies in higher education. ECAR accomplishes this mission through an ambitious applied research agenda and through symposia designed to convene researchers and higher education practitioners for discussion of consequential topics of current interest. ECAR research includes

- research bulletins—biweekly executive analytical treatments of pressing management and technology issues;
- case studies—detailed documentary analyses of campus-based activities designed to offer insight into decision processes, effective practices, and pitfalls; and
- research studies—substantial and rigorous analyses of problems and technologies of enduring interest.

This report reflects ECAR research on wireless communications, an area of increasing interest among colleges and universities.

One of ECAR’s unstated objectives is to attract the interest of world-class research organizations and individuals to problems of interest to higher education IT and administrative practitioners and executives. In the summer of 2001, ECAR conducted an
evaluation of proposals submitted pursuant to its request for proposals for research on topics related to the selection, development, deployment, management, socialization, and use of information technologies in higher education. In September 2001, ECAR selected IDC to conduct focused research on wireless networking’s adoption, use, and directions in higher education.

Between November 27 and December 12, 2001, more than 1,300 U.S. and Canadian colleges and universities were asked to participate in a survey. Detailed written surveys were completed by 392 institutions of higher learning. Additionally, more than 100 individuals at more than 20 institutions participated in interviews conducted between January and May of 2002. Six institutions agreed to allow researchers to make campus visits with students, faculty, and various campus IT and functional administrators. Adoption levels and plans for wireless networking were examined, as were the pace and nature of the expected rollout.

This research study addresses the motivation for moving to wireless networking solutions and the roles of the different participants in the acquisition process, as well as the challenges associated with wireless networking and the extent to which wireless solutions are meeting expectations.

IDC and ECAR have concluded that wireless networking has grown from an interesting curiosity to an appealing technology alternative for potential users in higher education. This research suggests that successful pilot projects are encouraging a growing number of institutions to move toward major wireless commitments. Over the past 18 months, wireless implementations have spread from the relatively small realm of early adopters to a larger group of institutions that are using the technology to expand networking capabilities and enhance their appeal to both student applicants and prospective faculty.

**The State of Wireless Networking**

While only 7 percent of the institutions surveyed have implemented comprehensive wireless networks, most of those surveyed have at least limited wireless networks in place. Fewer than 15 percent of those institutions that have not implemented some wireless capability indicated that they have no future plans for the technology. Much of the interest and activity is recent. Most institutions have moved to implement wireless local area network (LAN) solutions in the past two years.

Interestingly, wireless networking appears to be a highly accessible technology. Institutions with an FTE of fewer than 10,000 students in fact seem more likely to implement campus-wide wireless networks than larger institutions, which are more likely to implement this technology in specific campus locations. Wireless networking is also seen as a technology that supports the primary mission of higher education. Core academic venues are most likely to be chosen for both current and future wireless LAN implementation. Libraries and classrooms are the locus of campus wireless deployment, and a vast preponderance of campus adopters list students and faculty as early beneficiaries.

The ECAR study reveals a number of practical problems that must be overcome as wireless networks are introduced and expanded. The challenge cited most often is security. Support is another challenge, especially support for students who may be using a variety of wireless connections in different ways. While most colleges and universities reported having help desk and other support resources in place, wireless networks are an added strain on these resources, and ongoing incremental investment to support the added capabilities associated with wireless networking has not yet occurred.

Another challenge appears to be standards. Wireless standards are still developing.
Managing the standards for wireless LANs means allowing for almost continual refinements. While 90 percent of EDUCAUSE survey respondents currently use IEEE 802.11b as their wireless network standard, 53 percent of those with new networks are already planning for 802.11a. In addition, 18 percent are looking to implement Bluetooth solutions. Setting standards for network interface cards has been more problematic, and only slightly more than half of the survey respondents have established standards in this area. For large and complex institutions, it is likely that once again the institutional IT organizations will be expected to support a range of equipment, resulting in more managerial complexity and higher support costs.

Planning and installing a wireless network is a complex process because no systematic approach is yet available for placing access points. Building architecture and age, construction materials, channel allocation, transmission range, antenna placement, and other variables conspire against one-size-fits-all solutions. Wireless planning and policy at the institutional level is also critical, including the evolving need to create policies for managing the institution “air space.”

Happily, wireless networking appears to be one of the most successful new technologies introduced into higher education. IT leaders and users reported remarkable satisfaction with network results. In fact, 14 percent of survey respondents reported that their expectations have been met, and an additional 14 percent noted that theirs have been exceeded. Wireless networking does indeed seem to promote student collaboration inside and outside the classroom. In some cases, institutions now use wireless as a competitive differentiator. Professional schools in particular find that wireless networking seems not only to facilitate the academic process and student experience, but also to prepare students for their postgraduate careers.

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The EDUCAUSE staff continues to invest their commitment to excellence in ECAR, as in all activities. From management of the survey technology and communications, to the production of this report, many of the EDUCAUSE staff have made quiet but essential contributions. Our partners at Visual Science in Boulder, Colorado, who provide design and layout services, also deserve our thanks.

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Richard N. Katz