# Respondent Summary

# Wireless Networking in Higher Education in the U.S. and Canada

Wireless networking has moved from an interesting curiosity to an appealing technology alternative for potential users in higher education. Successful pilot projects are encouraging a growing number of institutions to move toward major wireless commitments. Over the past 18 months wireless implementations have moved 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, both to student applicants and to prospective faculty.

This Research Study examines the state of wireless network implementation in higher education, based on completed surveys from 392 EDUCAUSE member institutions, collected between November 27 and December 12, 2001. Adoption levels and plans for wireless networking are examined, as are the pace and nature of the expected rollout. This 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.

## The State of Wireless Networking

The majority of the institutions surveyed have at least limited wireless networks in place, though only seven percent of those surveyed have implemented comprehensive wireless networks. One-quarter of the institutions surveyed are in the planning stage, with 17 percent having moved to the pilot stage.

| Status of Plans for Wireless | Percentage |
|---|---|
| Comprehensive implementation | 7 |
| Limited implementation | 52 |
| Pilot implementation and planning | 17 |
| Planning phase, no pilot yet | 8 |
| Intend to implement | 10 |
| No plans to implement | 6 |

The past two years have been especially active for wireless local area network (LAN) implementations. Three-quarters of those institutions that have moved forward with pilot programs and larger scale wireless solutions have done so in the past two years. While some universities have been using wireless networks for four or five years, these are the early adopters. Most institutions view wireless as a technology that has only recently reached a level of development that warrants serious consideration. Given the continuing advances and forecasts for wireless applications, the time for wireless networking on campus is at hand.

Institutions vary in their approaches to networking depending on enrollment. Smaller colleges and universities (those with fewer than 10,000 student full-time equivalents) are more likely to implement campus-wide wireless networks from the start. Larger institutions are more likely to implement wireless technology in specific buildings, consistent with a desire to move forward at a modest pace, as resources and comfort with the technology allow.

As illustrated in Figure 1, academic venues are most likely to be chosen for both current and future wireless LAN implementation. Libraries and classrooms are cited most often as having wireless coverage today (2001) and are most likely to benefit from wireless networks in the future (2003), based on our projections. In keeping with this orientation, three-quarters of institutions using wireless networks indicated that undergraduates use the network, and almost three-quarters cited faculty as users. Only 53 percent cited administrators as current or prospective users of wireless networks, perhaps due to the lower presence of wireless networks in administration buildings.

**Figure 1. Buildings with Wireless Network Coverage**



% of respondents mentioning coverage

■ 2001    □ 2003
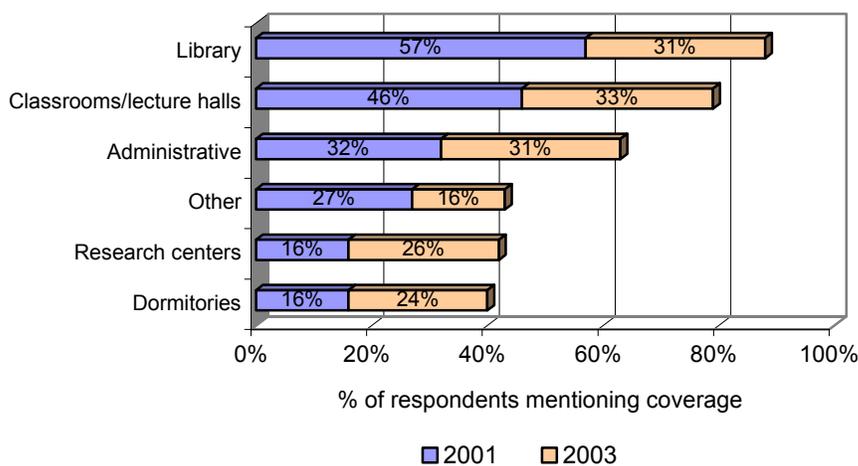
### Planning and Evaluating Wireless Networks

In order for a wireless network implementation to succeed, various constituencies of the institution must support the effort. Almost 90 percent of those moving forward with wireless LANs indicated that their IT departments are involved in planning, as would be expected. Beyond that critical group, a diverse range of other participants—faculty, students, administrators—are involved, with various people initiating the planning process.

The diverse groups involved in network planning often have varied interests and goals, so naturally a range of factors is cited as influential in the decision to implement a wireless network (see Figure 2).

The factor mentioned most often is easier student access to the network, but the ability to grow the network more easily and to provide classroom access to the network are also cited as important by more than 40 percent of respondents. Easier faculty access was also indicated as important by 41 percent of respondents.

**Figure 2. Factors Considered Important in the Decision to Implement a Wireless Network**



% of respondents rating factor 8-10 importance (scale of 1-10)
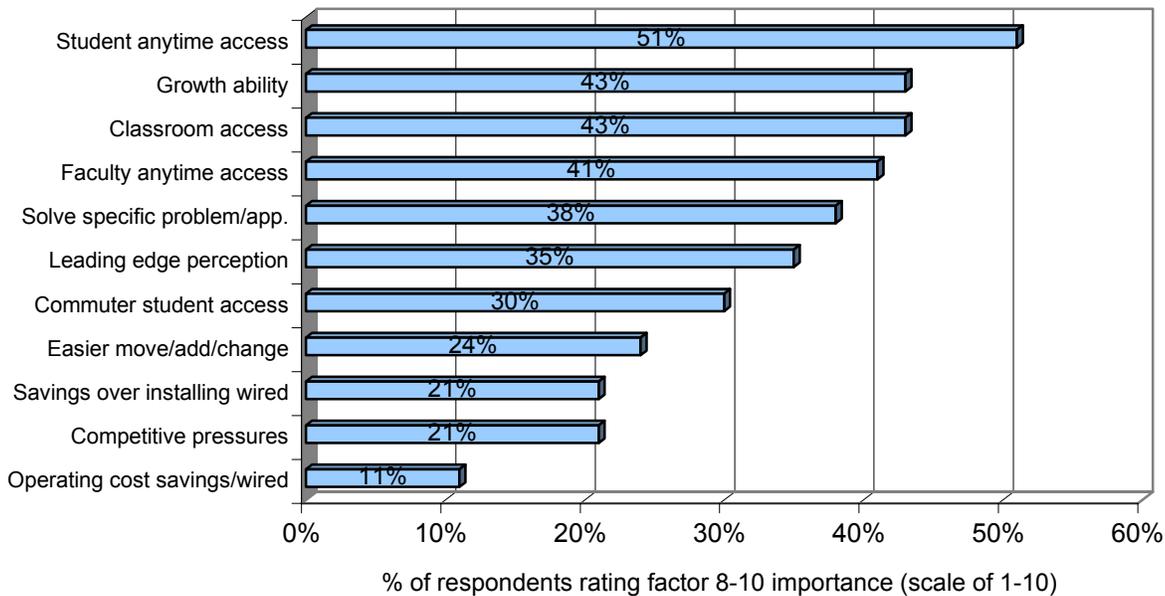
While the practical needs of the IT staff almost always influence decisions related to wireless network implementation, institutions have been taking care to ensure that the needs of other offices are also addressed. Many of the factors cited as important in the decision to implement a wireless network reflect concerns of different campus constituencies, such as improved network access for commuter students, easier moves for the IT department to implement, and support for ubiquitous faculty network access. While not every group will have all concerns addressed, it is clear that participation of different groups in the decision process is more than cosmetic.

Many practical problems must be overcome as wireless networks are introduced and expanded. The challenge cited most often is security, mentioned by almost 70 percent of respondents as a factor in implementing a wireless network. Concerns were typically associated with protecting the network through the use of effective authentication and authorization procedures. Support is another challenge, especially support of student users who may be using a variety of wireless connections in different ways. Institutions already have support for network users in place, but updating this support to handle wireless users means additional training and increased help-desk requests, especially as networks are introduced to new users.

| Issues Affecting Wireless Implementation | Percentage |
|---|---|
| Security issues | 69 |
| End-user support | 43 |
| Higher than expected costs | 18 |
| Support for printing | 16 |
| Interoperability problems with wired networks | 11 |
| Other | 13 |

Although wireless networks bring different value to various user communities, survey respondents indicated remarkable satisfaction with network results, even those at an early stage of implementation. Almost three-quarters (74 percent) of those with wireless networks indicated that their expectations have been met, and an additional 14 percent noted that their expectations have been exceeded. This is an exceptionally high level of satisfaction for a new technology, even considering that initial expectations may have been very reasonable.

| Extent to which Wireless Networks Have Met Expectations | Percentage |
|---|---|
| Exceeded expectations | 14 |
| Met expectations | 74 |
| Fell short of expectations | 7 |
| Don't know/no answer | 5 |

## What It Means to Higher Education

Higher education will continue to invest in technology infrastructure. Just as the physical plant—the buildings and grounds—of a college or university can never really be considered "finished," so also the technology infrastructure remains very much a work in progress. The introduction, refinement, and updating of college and university networks represents a user-centered shift, providing students and faculty with greater access than ever before. As institutions and individuals come to rely more heavily on networked information, facilitating flexible access becomes especially important. Even though wireless networking is at an early stage of deployment, institutions preparing for a move to wireless can benefit from the experience of those that have been down that road.

PCs are indeed at the heart of wireless networks today. Although the device most commonly connected to a wireless network is the notebook PC, 46 percent of wireless networks also support desktop PCs. PDAs are most likely to be added to the mix of products supported by the wireless network; twenty-seven percent of those with wireless networks plan to support PDAs in the future. Cell phones and other handheld devices can also provide network access and are far more portable than traditional notebook PCs. Clearly wireless LANs will be far more ecumenical in the future. As a result, the best advice for those planning a move to wireless is to think beyond PCs. Wireless networks and devices with smaller form factors allow individuals to increase their mobility. Both students and faculty are becoming more mobile in their uses of technology.

**Figure 3. Current and Future Devices Accessing Wireless Networks**
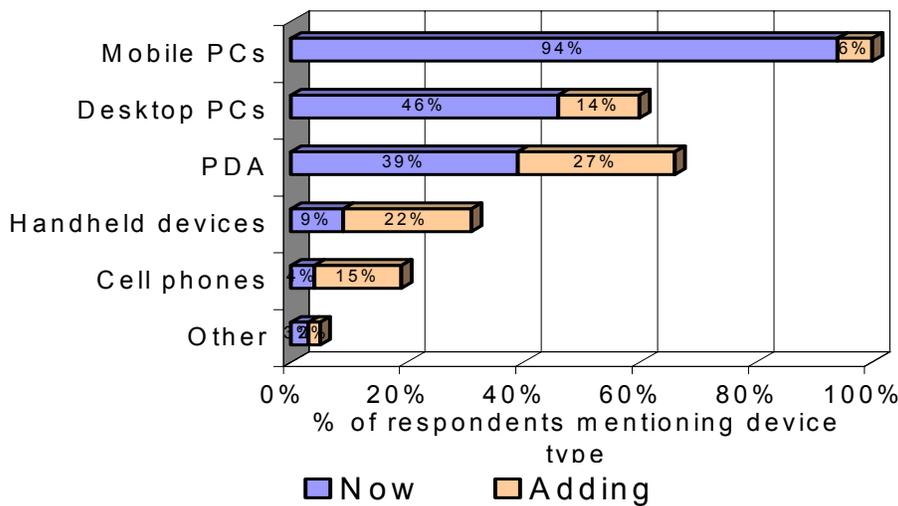


A Single Standard is Not Imperative

Wireless standards are still developing. Committing to a single approach too early can set the stage for premature obsolescence. The traditional approach of determining standards before moving to technology implementation has to be tempered in the case of wireless LANs to allow for almost continuing refinements. The largest share of wireless LAN institutions (90 percent) currently use 802.11b as their network standard; 53 percent of those with new networks are planning for 802.11a. In addition, 18 percent are looking to implement Bluetooth solutions.

Only 53 percent of wireless network institutions have established standards for wireless network interface cards. Of those planning to implement a wireless LAN, only 28 percent have established a standard. While some users receive very specific instructions on what products must be used on the network, most equipment recommendations are under continuous review. Supporting a range of equipment can represent a problem for some institutions, but it provides flexibility and allows continuing network development that may ultimately result in optimal performance.

Distributed Printing Services Augment

Communication Capabilities

While communication—specifically e-mail—is a critical wireless LAN application, traditional printing is also important. Just as wireless LANs provide anytime, anywhere network access, users have a

strong interest in decentralized printing. Three-quarters of institutions with wireless networks support wireless printing. Access to multiple printers is the most common approach. Proximity to the user is typically what motivates the choice of which printer to use, but this could change depending on an institution's support. For example, access to color printers or printers that provide for special finishing (stapling, special stock for covers) could be supported effectively through wireless LANs.

| Access to Printing from Wireless Networks | Percentage |
|---|---|
| Several distributed devices | 43 |
| Designated printer only | 16 |
| Central printer for all | 6 |
| No network printing | 26 |
| Other | 5 |
| Don't know/no answer | 4 |

## Lay Ground Rules for Appropriate Use

While cellular phone interruption in the classroom can, to some extent, be managed, the distraction of incoming e-mail may be a greater challenge. Students using laptops during class may be taking notes, but access to a wireless LAN makes it possible for them also to read and send e-mail. At a time when student multitasking is the norm outside of the classroom, wireless LANs seem poised to open the door to more distractions inside the classroom.

Thus far, distractions have not been a major problem. About 21 percent of institutions of all sizes and types noted that there is a problem during class/lecture time with students' accessing non-pertinent content. This figure may be conservative, since some faculty may not report problems and other faculty may not be aware of problems. That said, the freedom made possible through wireless LANs will naturally mean that the technology is not always used appropriately. With four of five networked institutions not reporting problems, inappropriate use of the wireless network does not seem a major concern in the classroom. However, the best advice is to lay ground rules for the appropriate use of wireless technology, in and out of class.

## Expect Increased Interest in Mobility and Communication

Colleges and universities have already learned much about network use and support; integrating a wireless LAN into existing network structures may be a less dramatic development than the introduction of previous technologies. In terms of impact on the teaching and learning environment, wireless access to the network by faculty and students has the potential to facilitate further communication inside and outside the classroom. For example, students who have wireless access report using it to read a professor's notes or reference materials in class as well as for collaboration. A wireless network can make Internet resources available to nomadic students and faculty. Many institutions believe this access will encourage greater collaboration, resulting in better learning, research, and creative scholarship. Just as students of today are interested in having their colleges

make broadband access to the Internet available, students of tomorrow may well have a similar view regarding "anytime, anywhere" wireless network connections. The enhanced mobility and communication provided by wireless technology fits well with both the mindset and habits of an increasing number of faculty and students.

# Key Questions to Ask

As institutions plan for a move to wireless, there are a number of questions they should ask:

- What is the rationale for moving to wireless?
- Are the right groups involved in planning for wireless?
- What type of devices do you plan to connect with the wireless network? PCs? PDAs? Other devices?
- Will the implementation be phased or all at once?
- If you have more than one wireless initiative on campus, are they interoperable?
- What are your plans for encryption and authentication?
- Do you plan to establish a standard for wireless cards?
- Will you make printing available from the wireless network? Will printing be centralized or distributed?
- Will the existing help desk also support questions about wireless?
- Do you have a plan to establish appropriate use of wireless during classes?

The move to wireless networks involves all types of institutions, regardless of size or mission. As implementations become more widespread and as experience grows, higher education will be able to determine what the impact of wireless technology is on the academic enterprise. Early indications suggest that it will be positive.

# Where to Learn More

- To access the EDUCAUSE archive on wireless technology, go to <http://www.educause.edu/asp/doclib/subject_docs.asp?Term_ID=304>.

- Moriarty, Laura, "The Wireless War Dance," *EDUCAUSE Quarterly*, 24 (1), 2001, 4-7. <http://www.educause.edu/ir/library/pdf/EQM0116.pdf>

- Olson, Florence, "The Wireless Revolution," *Chronicle of Higher Education* (October 13, 2000).

- Smolek, Jason, *The Political Economy of Regulation and Its Impact on Wireless LAN* (August 2001). IDC #25435. The abstract can be found at <http://www.idc.com/getdoc.jhtml?containerId=25435>.

- Weber, Stephen, and Raymond Boggs, *The State of Technology Usage in Higher Education* (March 2001). IDC #24015. The abstract can be found at <http://www.idc.com/getdoc.jhtml?containerId=24015>.

*A copy of the full study referenced above will be available via subscription or purchase through the EDUCAUSE Center for Applied Research (www.educause.edu/ecar/)*

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