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Executive Summary

Change always comes bearing gifts.
—Price Pritchett

Like the clothes in their suitcases, the technologies students bring to campus change every year. Occasionally, the change can be dramatic. It's hard to believe, but when the college seniors we surveyed for this year's study began their education four years ago, netbooks, iPhones, and the Nintendo Wii had yet to hit the market. When they went home for the holidays during their freshman year, some returned with a brand new game called *Guitar Hero* for the PlayStation 2, and some may have been lucky enough to score a $250 4-GB iPod nano or an ultrathin digital camera. Today's freshmen have mobile phones that hold more songs than that 4-GB nano, and they can use them to take digital photos and videos of the same quality as the $400 camera today's seniors got for their high school graduation.

The same forces of change apply to what college students are doing with their technology. Their written language has adapted to the technology of text messages and 140-character "tweets," and Andy Warhol's famous prediction about everyone eventually having 15 minutes of fame is being proved by the proliferation of social networking and YouTube. In fact, the pervasive uploading of content to blogs, video sites, wikis, and personal Facebook and MySpace pages suggests that "15 megabytes of fame" may be a more appropriate prophecy.

Since 2004, the *ECAR Study of Undergraduate Students and Information Technology* has sought to shed light on how technology affects the college experience. We ask students about the technology they own and how they use it in and out of their academic world. We also ask students about how skilled they believe they are with technologies; how they feel technology is affecting their learning experience; and their preferences for information technology (IT) in courses. Our ultimate goal is to provide college and university administrators, particularly those charged with implementing the technology environments in which these students will learn and grow, with reliable information on undergraduates' behaviors, preferences, and overall satisfaction with technology.

Our survey continuously evolves as technologies that are impacting higher education move through the cycle of user adoption from innovators and early adopters to mainstream and later adopters. However, some findings—particularly about students' beliefs, views, and opinions—resonate year after year regardless of specific technologies under investigation. Some sets of student beliefs and adoption patterns regarding technology are remarkably persistent, even as the technologies themselves change at what seems like breakneck speed. This kind of change, where students adopt technology at varying paces,

can be an opportunity, because even though institutions must prepare to leverage or support new technology, those technologies might be able to be implemented incrementally. Another benefit that comes with this type of change is that students who are technology leaders can provide a glimpse into what higher education can expect, and potentially they can enable institutions to make cost-effective decisions. And in this economic climate, institutions can use all the help they can get.

Methodology

The ECAR Study of Undergraduate Students and Information Technology, 2009 builds on and extends previous studies and consists of the following data collection and analytical initiatives:

- a literature review extending the 2008 literature review, along with a review of other relevant surveys;
- a web-based quantitative survey of college and university freshmen and seniors at 103 four-year institutions and students at 12 two-year institutions;
- student focus groups, providing qualitative data from 62 students from 4 institutions;
- student comments from written responses to the open-ended survey question, used to illustrate discussions of findings; and
- a comparison of longitudinal data from the 2006, 2007, 2008, and 2009 surveys where available.[1]

As in past studies, student respondents were weighted toward what we typically view as traditional students. Of the 30,616 respondents, 91.7% came from four-year institutions (34.2% freshmen, 44.5% seniors, and 13.0% saying "other" when asked about class standing), and the majority of respondents were under 25 years old (81.7%) and attended school full time (87.4%). Responses were also somewhat biased toward doctoral institutions (55.6%), larger institutions (67.3% enroll more than 8,000 students), and public institutions (74.3%).

Key Findings

The responses to our annual student survey continue to reveal themes about undergraduates' IT experience, including student technology ownership, use of and skill with IT, experience with IT in courses, and perceptions about how IT contributes to their academic experience. Our focus topic this year was Internet-capable handheld devices, and survey responses told us a great deal about how students use these devices, both in and out of class. The following sections highlight findings that stand out as especially interesting or relevant for higher education administrators as they develop plans to support the IT requirements and desires of their students.

Student Ownership and Use of Computers

The type of computer students bring to school has evolved along with their other personal technology. Although respondent ownership of computers has remained steady at around 98% the last four years, the ratio of ownership between laptops and desktops has changed notably. For the 39 institutions that participated in each of the last four years' studies, desktop ownership decreased 27 percentage points, while laptop ownership increased almost 23 points (see Figure 1-1). We also found that despite the current economic downturn, students are entering school with newer equipment, since nearly 8 of 10 (79.0%) freshmen owned a laptop that was one year old or less, and more than half of all respondents (52.3%) said their newest computer, whether laptop or desktop, was one year old or less. Two-thirds (67.9%) reported owning a machine two years old or less. This relatively up-to-date profile of computer ownership should reassure IT departments concerned about supporting students with older equipment; however, many respondents did still own older computers, including 17.9% who said their newest computer was four years old or older.

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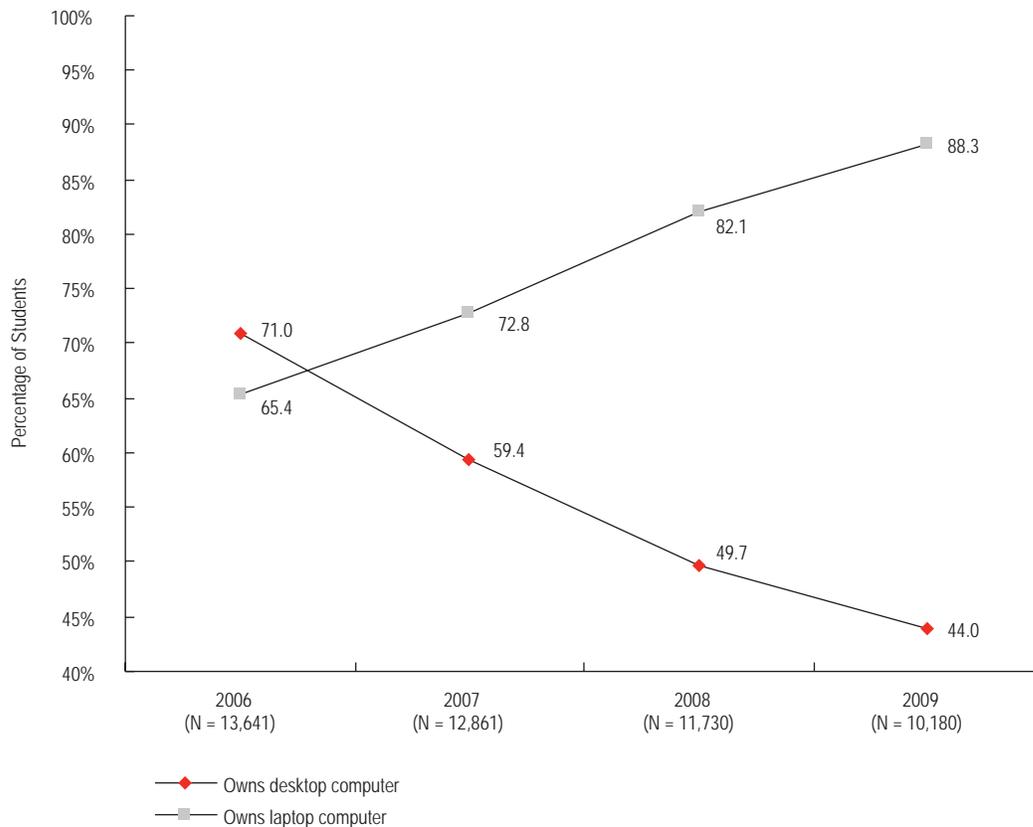
Figure 1-1. Change in Computer Ownership from 2006 to 2009 (39 Institutions*)

Data are based on student responses from the 39 institutions that participated in each of the 2006, 2007, 2008, and 2009 studies. Although institutions remained the same, the actual students responding were different each year.

When we asked students about their IT activities for school, work, or recreation, we found that basic technologies common in coursework continue to be very widely used. The vast majority of respondents, 9 out of 10, use the college and university library website (94.6%), with a median frequency of use of weekly, and about 9 in 10 use presentation software (93.8%) and spreadsheets (86.8%), with a median frequency of monthly. Downloading music or videos is also popular; 84.2% said they do it, with a median frequency of weekly. This activity has grown in popularity since 2006—the percentage of students who reported they download music or video has increased from 71.4% to 83.5% in the 39-institution longitudinal data set, and those who download daily increased from 7.2% to 11.0%.

Participation in content creation and sharing is also revealed in students' responses to questions about contributing content to Web 2.0 user-driven sites. Close to the same numbers of respondents said they contributed content to video websites (44.8%) and wikis (41.9%), and a little over a third of respondents said they contribute to blogs (37.3%) and use podcasts (35.0%). This year, we asked students for the first time if they use their computer for phone calls—voice over Internet Protocol, or VoIP (Skype, etc.) and found that more than one-third (37.7%) of the respondents reported using it, and the median frequency of use is monthly.

Interactive Communication Tools

Interactive communication tools such as instant messaging, text messaging, and social networking websites (SNSs) are shaping

how college students connect to the world and each other. The use of SNSs and text messaging is so widespread in some age groups that it has begun to reach a ceiling. This surge in use has been accompanied by a decline in a technology once seen as the definitive mode of teenage online communication: instant messaging. This year, SNSs and text messaging were used by about 9 in 10 respondents (90.3% for SNSs and 89.8% for texting), with a median frequency of use of daily for both, whereas 74.0% said they used instant messaging, with a median of several times per week. Among the 39 institutions in our longitudinal data set, a 23.2% relative decrease appears in the percentage of respondents who reported using instant messaging weekly or more often since 2006, versus a 32.6% relative increase in SNS use during the same time frame (see Figure 1-2).

Although the younger, so-called Net Generation students have more actively integrated social networking into their lives than older students, the gap between older and younger students is shrinking. Respondents ages 18 and 19 had the highest percentage of use (95.4%), with more than three-quarters (76.0%) reporting daily use. Respondents ages 20 to 24 were similarly active, with 94.7% reporting they use SNSs and 62.9% using them daily. Many articles and studies have reported the high rate of SNS use by this age group as well as the substantial growth in older users of SNSs, and the ECAR data corroborate this finding (see Figure 1-3). Whereas 18- and 19-year-old respondents from the 39 institutions that participated in each of the last four years' studies reported a consistently high use of SNSs, use by those ages 30 to 39 more than

Figure 1-2. Change in Communication Technology Use from 2006 to 2009 (39 Institutions*)
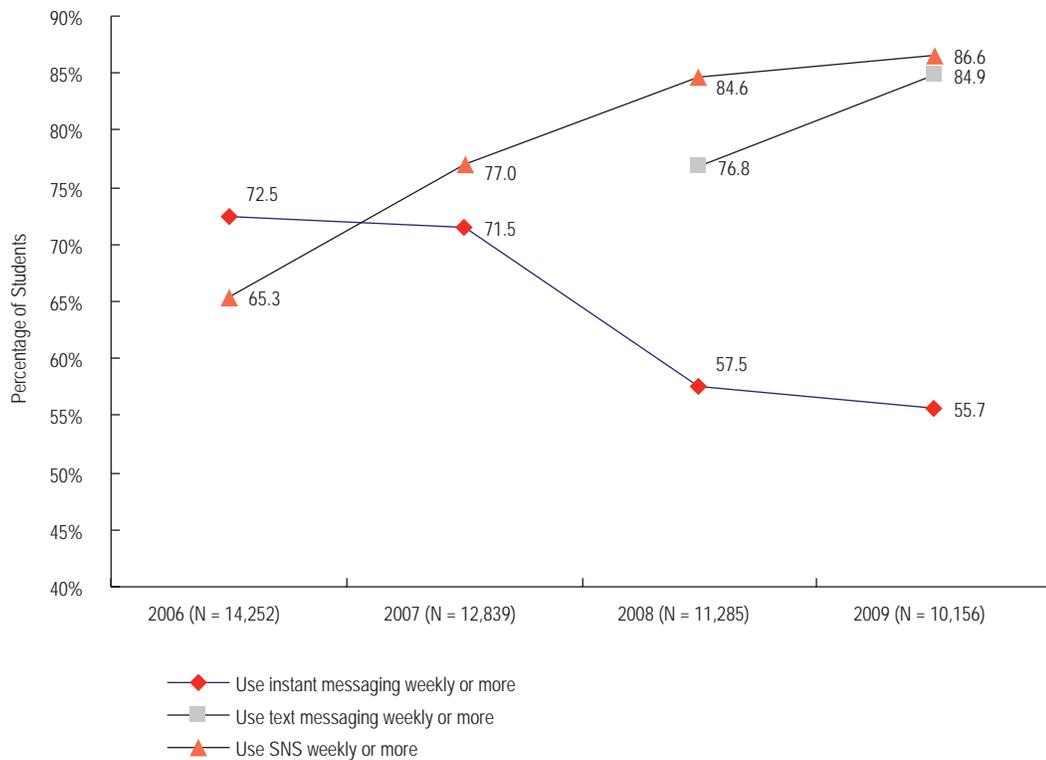
Data for four-year comparisons are based on student responses from the 39 institutions that participated in each of the 2006, 2007, 2008, and 2009 studies. Although institutions remained the same, the actual students responding each year were different. Use of text messaging was first surveyed in 2008.

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tripled (a 236% increase), and among the respondents 40 and older, SNS use more than quadrupled (a 326% increase).

Technology Being Used the Quarter/Semester of the Survey

After asking about the technologies students use for work, school, or recreation, the 2009 ECAR survey asked respondents which technologies they were actively using as a part of their courses at the time of the survey (February 23 through April 13, 2009). Majorities of respondents said they use the college or university library website (73.1%), a course or learning management system (70.4%), and presentation software such as PowerPoint (66.5%), and almost half (46.3%) said they use spreadsheets such as Excel.

Despite the very high percentages of personal use of SNSs, only 27.8% reported

using them in a course during the quarter or semester of the survey. About a quarter (25.3%) of respondents said they use wikis, and fewer than 2 in 10 use instant messaging (18.3%), graphics software (15.5%), blogs (11.5%), and programming languages such as C++ and Java (11.1%).

In addition to the marked difference between overall use of SNSs and their use in a course during the quarter/semester of the survey, we found a similar difference between personal and academic use of podcasts and video- and audio-creation software. Although more than a third of respondents reported using these software tools at least once per year overall, only 5.8% were using podcasts, 6.0% were using video-creation software, and 5.0% were using audio-creation software in courses during the quarter/semester of the survey. These findings, similar to previous years' survey
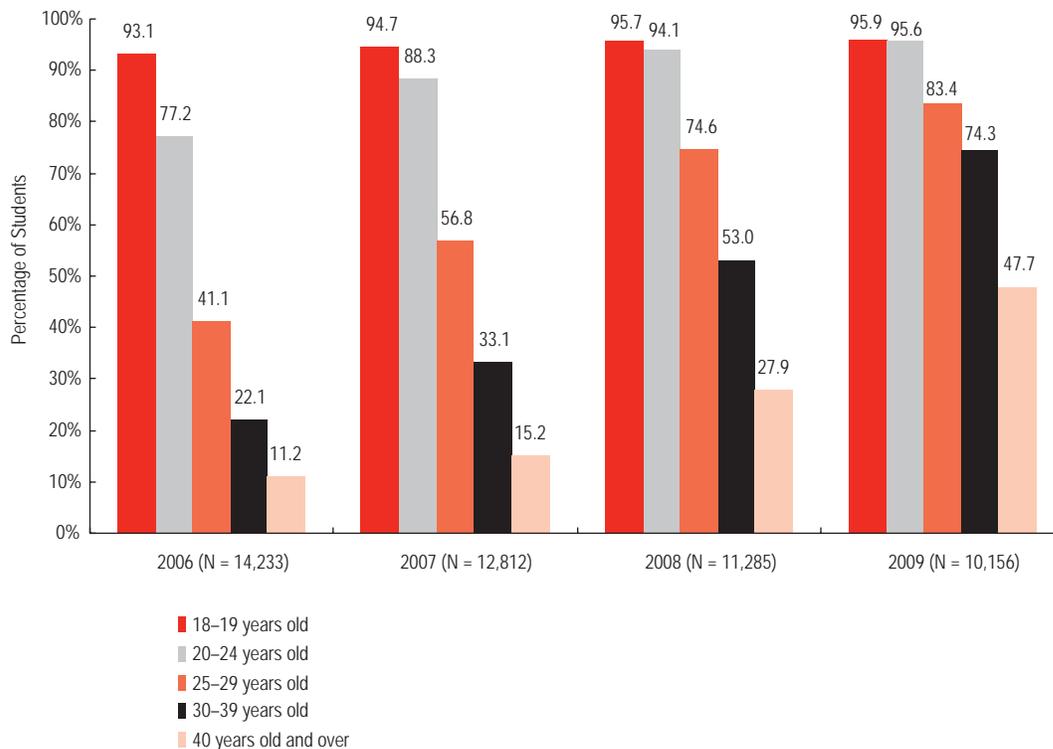
Figure 1-3. Percentage of Students Who Have Used Social Networking Websites (SNSs), by Age, from 2006 to 2009 (39 Institutions*)

*Data for four-year comparisons are based on student responses from the 39 institutions that participated in each of the 2006, 2007, 2008, and 2009 studies. Although institutions remained the same, the actual students responding each year were different.

results, suggest that students are learning and using these technologies, but not necessarily for formal academic reasons.

How Students View Their Own Technology Adoption and IT Skills

Since 2006, ECAR has asked students about their "technology adoption" tendencies and explored the issue using a scale on the basis of innovativeness and timing of adoption. Respondents are given a set of statements about technology adoption and asked to choose the one that best describes them. ECAR then maps their responses into five categories: innovators, early adopters, mainstream adopters, late adopters, and laggards. Student responses about technology adoption are often strongly associated with their use and experience with IT both generally and in the academic context. Student responses have been quite consistent over the years of the ECAR student studies, and this year's respondents' answers continue the traditional distribution into a rough bell curve, with about half (51.0%) of all respondents identifying themselves as mainstream adopters. However, there is a gender gap, since more than half of males (53.8%) claimed they are early adopters or innovators, whereas only one-fourth of females (25.4%) did so.
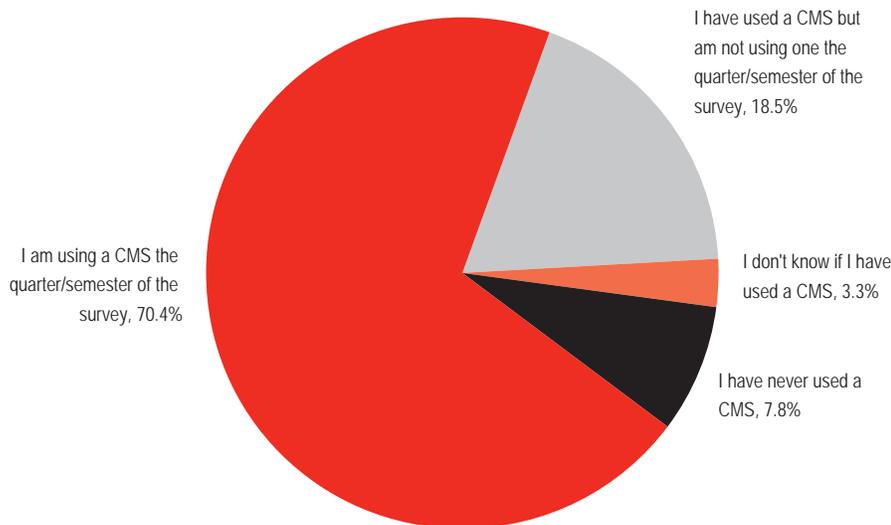
Since 2004, ECAR has explored student skills (based on respondent self-assessment) for a set of computer technologies and information literacy practices that have been deemed important to the undergraduate experience and beyond. This year's respondents indicated they have confidence in their skills with presentation software, spreadsheets, course and learning management systems, and college and university library websites, generally rating themselves between fairly skilled and very skilled. Respondents assessed themselves lower on their use of graphics software and on computer maintenance activities such as software updates and security.

ECAR also asked three survey questions about how students view their own information literacy skills and found that respondents considered themselves quite Internet-savvy users. Eight out of 10 (80.0%) said they are very confident in their ability to search the Internet effectively and efficiently. Almost half (45.1%) rated themselves as very skilled, and another third (34.9%) rated themselves as experts. Although students' assessments of their ability to evaluate the reliability and credibility of online sources of information and of their understanding the ethical and legal issues surrounding the access to and use of digital information were lower, overall ratings are still high. Students whose technology adoption responses categorize them as innovators and early adopters ranked their technology and information literacy skills higher than other students.

Course or Learning Management Systems

Many respondents indicated that they have used course or learning management systems (CMSs). From 2006 to 2009, CMS use increased from 79.7% to 91.0% of respondents from the 39 institutions that participated in the last four years of the ECAR student studies. This year, 88.9% of our respondents reported that they have taken a course that used a course or learning management system (see Figure 1-4). Of these students, almost 8 in 10 (79.7%) were using a CMS during the quarter or semester of the survey. This translates to 70.4% of all respondents using a CMS during the current quarter/semester.

Institutions' investments in CMSs seem to be paying off in generally positive student perceptions of their use. In this year's study, most respondents who had used a CMS said their overall experience with them was either positive (52.0%) or very positive (11.2%). We also found that, like last year, respondents who used a CMS more frequently reported

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I have used a CMS but am not using one the quarter/semester of the survey, 18.5%

I am using a CMS the quarter/semester of the survey, 70.4%

I don't know if I have used a CMS, 3.3%

I have never used a CMS, 7.8%

Figure 1-4. Student Use of Course or Learning Management Systems (N = 30,616)

more positive experiences. Instructors who have implemented CMS technology can take heart from our finding that nearly two-thirds (64.7%) said that they disagree or strongly disagree with the statement "I skip classes when materials from course lectures are available online." In fact, ECAR found other research studies that support the idea that posting course materials online can improve student attendance.[2]

Student Perceptions of IT in Courses

In general, respondents were lukewarm about their instructors' use of IT. Fewer than half (45.0%) of the respondents reported that most or almost all of their instructors use IT effectively in their courses. Just under one-half (45.9%) said most or almost all instructors have adequate IT skills for carrying out course instruction, and barely a third of the students (33.8%) said that most or almost all of their instructors provide them with adequate training for the IT in their courses. Like last year, the distributions of responses for these questions are surprisingly consistent across student demographics and types of institutions.

Because IT is integrated with many of the student engagement activities that influence college success, ECAR created four positive

"outcome statements" about the impact of IT in courses and asked students whether they agreed or disagreed with them:

- ◆ "I get more actively involved in courses that use IT."
- ◆ "IT makes doing my course activities more convenient."
- ◆ "The use of IT in my courses improves my learning."
- ◆ "By the time I graduate, the IT I have used in my courses will have adequately prepared me for the workplace."

As in last year's study, this year's respondents were most positive about IT's impact on convenience. Those who agreed (70.4%) far outnumbered the combined disagree and neutral responses (29.7%). This is not surprising, since we have found in both the quantitative and the qualitative data of past studies—and again this year—that students say convenience is the most valuable benefit to IT in courses. When asked if the use of IT in courses improves their learning, about half (49.4%) of respondents agreed or strongly agreed. Another 39.0% of respondents were neutral about whether the use of IT in classes improves their learning, and 1 in 10 (11.5%) disagreed or strongly disagreed with the statement. About half of respondents (46.8%) agreed

that upon graduation the IT used in their courses will have adequately prepared them for the workplace.

Since ECAR began the student survey in 2004, we have asked students how much IT they prefer in their courses, using a 5-point scale from "no IT" to "exclusive IT." Our respondents have been remarkably consistent in their preference for only a moderate amount of technology in courses (between 55% and 60% for the last four years). Despite the large proportion of our respondents who belong to the Net Generation and have grown up digital, respondents indicate they still appreciate the face-to-face learning experience. Our 2009 survey shows the same trend, with 59.6% of respondents saying they prefer moderate IT in their courses and fewer than 6% of respondents preferring the extremes—either no IT (2.0%) or exclusive IT (3.5%) in their courses.

Because respondents in previous surveys expressed concerns about accessing IT services due to occasional interruptions of the network, unavailability of the CMS, difficulty uploading/downloading files, etc., we asked whether they agree or disagree with the statement "My institution's IT services are always available when I need them for my coursework." In results similar to last year's, only half (52.6%) of the students agreed or strongly agreed with the statement, about a third said they were neutral (32.5%), and 15.0% disagreed or strongly disagreed that their institution's IT services are always available when needed for coursework.

Undergraduates and the Mobile Revolution

This year, ECAR chose student ownership and use of Internet-capable handheld devices for the survey focus area because we felt the appearance and adoption of a new generation of devices could have a significant impact on students and higher education institutions. About half of the respondents (51.2%) indi-

cated they own an Internet-capable handheld device, and another 11.8% said they plan to purchase one in the next 12 months (see Figure 1-5). This figure should be understood in the context of near-ubiquitous cell phone ownership among students; the ECAR 2007 student study reported simple cell phone ownership at 86.1% of respondents (and smartphone ownership at 12.0%). Though this ubiquity led us to drop the simple cell phone ownership question in 2008, very high ownership of at least a basic cell phone is implied in our current study finding that 9 out of 10 student respondents (89.8%) were engaged in text messaging, with a median use of daily. Note that ownership of an Internet-capable handheld device does not ensure that the Internet function will be used, since more than a third (35.4%) of respondents who own them said they never use that feature.

ECAR identified four emerging types of student adopters of mobile Internet use:

- ◆ *Power users.* More than a quarter of respondents owned handheld devices and used them to access the Internet weekly or more often.
- ◆ *Occasional users.* Fewer than 1 in 10 respondents owned handheld devices but used them to access the Internet monthly or less frequently.
- ◆ *Potential users.* About 30% of respondents either currently owned an Internet-capable handheld device but never used it to access the Internet or didn't own an Internet-capable handheld device but said they planned to purchase one in the next 12 months.
- ◆ *Non-users.* One-third of this year's respondents didn't own an Internet-capable handheld device and didn't plan to own one in the next 12 months.

To better understand the issues that delineate these users, ECAR asked respondents, regardless of whether they owned an Internet-capable handheld device, to select up to three reasons that kept them from using

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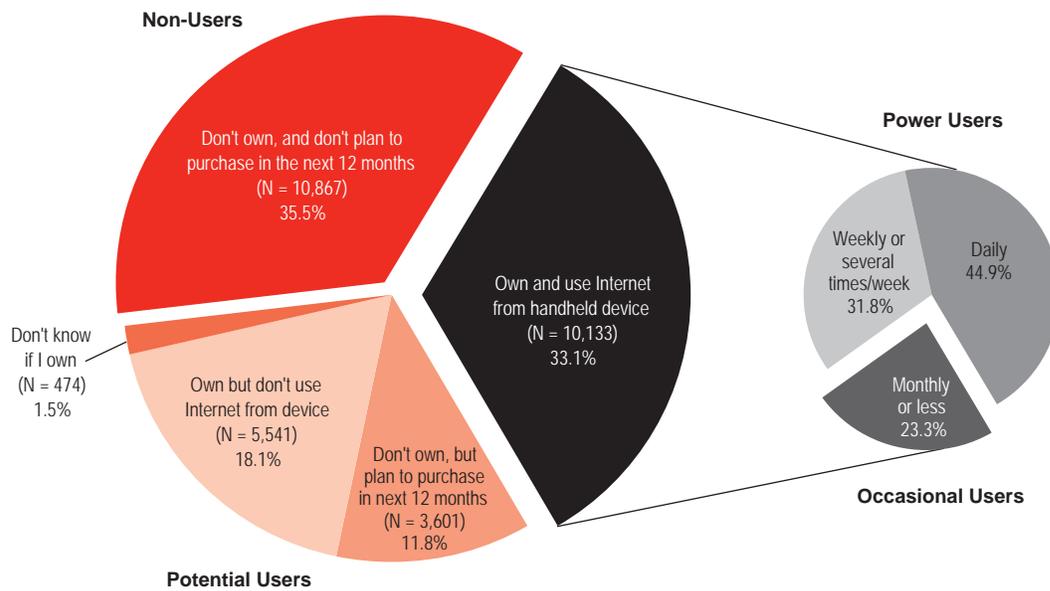
Figure 1-5. Ownership and Use of Internet-Capable Handheld Devices (N = 30,616)

the Internet, or using it more often, from a handheld device.

The reason selected most was that plenty of other ways are available to access the Internet (49.9%). Expense was also a factor: Cost of the data service was selected by 46.2% of the respondents, and cost of the device was chosen by 36.4%. Those who didn't own devices cited such cost factors much more often than those who did. Another 15.4% of student respondents indicated that a reason they don't access the Internet, or use it more often, from a handheld device is that they find no compelling reason to access the Internet.

When ECAR asked respondents who said they use the Internet from a handheld device what Internet activities they do from their devices (selecting all that apply from a list of 13 activities), the most popular activity, chosen by 76.7% of the respondents, was checking for information such as news, weather, sports, specific facts, etc. We also found that more than half of the respondents (58.7%) said they connect to the Internet from their handheld devices to use maps, find places, get directions, or plan routes. Other activities identified by respondents were using e-mail (75.1%) and SNSs (62.5%) from their handheld device.

Those who used the Internet from their handheld device on a daily basis were more likely to be technology early adopters or innovators than were those reporting less frequent use. A majority of those who reported using the Internet monthly or less often were mainstream adopters, and those who said they never use the Internet capability had the highest proportion of laggards and late adopters of all the use frequency categories. Some of these students may eventually become mobile Internet users, since more than 4 in 10 respondents overall (44.5%) agreed or strongly agreed that in the next three years they expect to do many things on a cell phone or handheld Internet device that they currently do on a laptop or desktop computer. Current users also anticipated that their use of mobile services will grow, since almost three-quarters (73.7%) of respondents who currently own an Internet-capable handheld device and access the Internet from their handheld device said they expect their use of the Internet from a handheld device to increase or greatly increase in the next three years.

Mobile Devices in the Academic Environment

ECAR also asked questions regarding respondents' current and expected use of handheld devices in an academic context. The

first thing we wanted to know was whether students were using mobile devices, Internet-capable or not, in the classroom. Instructors will probably not be surprised to learn that almost a third of respondents (32.2%) agreed or strongly agreed with the statement "While in class, I regularly use my cell phone or hand-held Internet device for *non-course* activities." When asked if they use their handheld devices for *course*-related activities, only 11.3% agreed or strongly agreed.

Quite a few respondents commented on the distraction that mobile phones were causing in the classroom, and when we asked students if instructors should have the authority to forbid the use of cell phones and handheld Internet devices during class time, half (50.5%) agreed or strongly agreed that they should. Agreement was much higher among older than among younger students.

Asked to select the three institutional IT services they are most likely to use, if available, from an Internet-capable handheld device, respondents who currently own a handheld device and use the Internet from it selected as their top three e-mail system (63.4%), student administrative services (official grades, regis-tration, etc.) (46.8%), and course or learning management system (45.7%).

Emergency Notification

For the first time, the ECAR 2009 student survey asked, "How should your institution <u>first</u> notify you of a campus emergency?" Results indicated a clear preference for using text messaging, with just over half the respondents (55.3%) choosing that option and far fewer choosing e-mail, voice tele-phone call, public-address systems, and other options. Respondents to the 2009 ECAR study *Spreading the Word: Messaging and Communications in Higher Education* gave SMS text messaging a relatively high mean confidence rating as an emergency notifica-tion channel, although it came in lower than e-mail, outdoor public-address systems, and dedicated emergency websites.[3] This evidence of institutional confidence and popularity with students, however, doesn't tell the whole story. As a recent *EDUCAUSE Review* article pointed out, using text messaging as an emergency notification system has several disadvantages, including inherent design problems, the opt-in process, character limits, and vulnerability to abuse.[4]

Conclusion

Most of the respondents to ECAR student studies fall into what is frequently described as the Digital Generation or Net Generation. They are comfortable with many of the tech-nologies we asked about, including some, such as e-mail, that we no longer query about because the technology has moved through the adoption cycle and has become all but ubiquitous. Despite their general comfort with technology, our respondents have been surprisingly consistent over the years in both technology adoption and desire for technology in the classroom. They are more likely to describe themselves in terms of mainstream adoption of technology, and they consistently report that they prefer only a moderate amount of IT when it comes to their courses.

Although a majority of respondents to the ECAR student survey don't identify themselves as what we call early adopters or innovators, it appears that a revolution in undergraduates' use of the mobile Internet has already begun. A quarter of the respondents to this year's study told us they are using handheld devices weekly or more often to access the Internet. This level of use may not be taxing the support capacity of higher education IT departments at the moment, but if the numbers of users increase, as they likely will if the cost of mobile Internet access drops, institutions could be quickly overwhelmed with demands for technical support and development of new mobile services.

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Will student adoption outpace institutional support capability, or will institutional support rise to the challenge of student demand? Perhaps institutional implementations of mobile services will encourage even more student use of the Internet from handheld devices. In the *EDUCAUSE Quarterly* article "The Revolution No One Noticed: Mobile Phones and Multimobile Services in Higher Education," Alan Livingston describes college students' use of mobile technology as "a revolution no one noticed," one that is laden with opportunity to improve the educational environment for college students."[5]

No matter how extensively the mobile revolution—or any other technology-based disruption for that matter—impacts higher education, respondents to our survey consistently tell us that they want to see the use of IT balanced with the human touch in their academic environment. In their responses to the final open-ended question of our survey, students wrote explicitly about a preference for "real books and people" and said that "shiny new tech is still no substitute for well-trained, passionate instructors." Of the many comments expressing this sentiment, perhaps this one summed it up best: "There is still a big disparity among academic staff when it comes to use of IT in class. Some professors are obsessed with their technology and some don't like to use it at all. There needs to be a balance between human interaction and IT-based learning."

Endnotes

1. For comparison of 2006, 2007, 2008, and 2009 data, we used data from the 39 institutions that participated in the student study each of these years. Although the institutions remained the same, they surveyed different students each year. [See Gail Salaway, Richard N. Katz, and Judith B. Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2006* (Boulder, CO: EDUCAUSE Center for Applied Research, 2006), Gail Salaway and Judith Borreson Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2007* (Boulder, CO: EDUCAUSE, 2007), and Gail Salaway and Judith Borreson Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2008* (Boulder, CO: EDUCAUSE Center for Applied Research, 2008), all available from http://www.educause/edu/ecar.]

2. M. Christina Hove and Kevin J. Corcoran, "If You Post It, Will They Come? Lecture Availability in Introductory Psychology," *Teaching of Psychology* 35 (2008): 91–95; and Kimberley A. Babb and Craig Ross, "The Timing of Online Lecture Slide Availability and Its Effect on Attendance, Participation, and Exam Performance," *Computers & Education* 52, no. 4 (May 2009): 868–881.

3. Mark C. Sheehan, *Spreading the Word: Messaging and Communications in Higher Education* (Research Study, Vol. 2) (Boulder, CO: EDUCAUSE Center for Applied Research, 2009), available from http://www.educause.edu/ecar.

4. Dewitt Latimer, "Text Messaging as Emergency Communication Superstar? Nt so gr8," *EDUCAUSE Review* 43, no. 3 (May/June 2008): 84–85, http://www.educause.edu/EDUCAUSE+Review/EDUCAUSEReviewMagazineVolume43/TextMessagingasEmergencyCommun/162894.

5. Alan Livingston, "The Revolution No One Noticed: Mobile Phones and Multimobile Services in Higher Education," *EDUCAUSE Quarterly* 32, no. 1 (2009).