Key Findings

The ECAR Study of Undergraduate Students and Information Technology, 2010

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I love IT. IT is my life. My laptop is my life. Without IT I would be a very unhappy person. IT allows us to do so many things, and those of us who are natural at it wouldn't be the same without it. So far my experience with IT at college has been a positive one. It's an exciting experience.

I don't like all this digital stuff. I don't like all the problems that come along with computers. I don't really understand most of it, and there's always something new to learn right after you get used to one thing.

—Undergraduate students' comments submitted with this year's survey

Google announced the launch of Gmail in a press release issued on April Fool's Day in 2004. According to the release, Gmail was created after a Google user complained about existing e-mail services, although its title, "Search Is Number Two Online Activity—Email Is Number One; 'Heck, Yeah,' Say Google Founders," is a pretty clear indication that this was a strategic decision. Hotmail, Yahoo, and several sites now long gone had been around for years and, according to the market research firm comScore, both Hotmail (Windows Live Hotmail today) and Yahoo have more users today. But Gmail, with its promise to let users keep all their e-mail available and searchable for years in a generously sized web-based mailbox, changed the game. By the time Gmail officially exited beta status in July 2009, Google had released a dazzling array of eponymously named add-ons and integrated applications that enabled users to manage calendars, contacts, and tasks as well as documents, spreadsheets, presentations, and forms, all on the web.[1]

The idea of using the Internet as a giant storage drive in the sky has not taken long to catch on among computer users. College freshmen have been coming to campus for years with personal web-based e-mail addresses, but today many of them also arrive with accounts on YouTube, iTunes, Facebook, and countless other popular websites where they access and store gigabytes of data who-knows-where. USB may one day go the way of the eight-track tape as laptops, netbooks, smartphones, and other portable devices enable students to access their content from anywhere. They may or may not be aware of it, but many of today's undergraduates are already cloud-savvy information consumers, and higher education is slowly but surely following their lead. Some students use these tools on their own to support their learning experience, but innovative instructors are experimenting with ways to bring the familiar into the classroom using YouTube videos, iTunes U podcasts, Facebook, and other well-known websites. Our students may not have learned how to use most of these popular cloud-based tools from us, but these tools appear to be poised to become an integral part of the college experience.

A few weeks after Google announced Gmail in April 2004, ECAR finished the survey that was used in our first-ever ECAR study of undergraduate students and information technology. This 2010 edition marks our seventh report on technology and the college experience. Our survey continuously evolves along with the technologies being used in higher education, and this year we take a closer look at cloud-based (specifically, web-based) applications and resources. While the tools students are using may vary, some of our findings, particularly about students' assessments of their own technical skills and their opinions on the use and effectiveness of IT, resonate year after year regardless of specific technologies under investigation. As we explore the changing landscape of students' ownership and use of technology, our 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.

Methodology and Study Participants

The ECAR Study of Undergraduate Students and Information Technology, 2010 builds on and extends previous studies and consists of the following data collection and analytical initiatives:

- a literature and survey review extending previous years' reviews;

- a web-based quantitative survey of college and university freshmen and seniors at 100 U.S. four-year institutions and general students at 27 U.S. and Canadian two-year institutions;

- student focus groups, providing qualitative data from 84 students from 4 institutions;

- student comments from written responses to the open-ended survey questions used to illustrate discussions of findings; and

- a comparison of longitudinal data from the 2007, 2008, 2009, and 2010 surveys where available.[2]

As in past studies, student respondents are weighted toward what we typically view as traditional students. Of the 36,950 respondents, more than three-quarters come from U.S. four-year institutions (34% freshmen and 42% seniors), and the majority of respondents are under 25 years old (78%) and go to school full time (86%). Responses are also somewhat biased toward doctoral institutions (56%), larger institutions (72% in institutions that enroll more than 8,000 students), and public institutions (75%). We have seen a steady increase in AA institutions participating in the study over the last few years. This year, 26 AA institutions participated in the study, contributing about 12% of student responses, up from 12 AA institutions accounting for 8% of student respondents in 2009, and 8 AA institutions making up 12% of the respondent base in 2008.

Key Findings

The responses to our annual student survey 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. Survey responses told us a great

deal about how students use certain types of technology, including handheld devices, both in and out of the classroom. 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.

How Students View Their Own Technology Adoption and Information Literacy

ECAR maps student responses to a set of statements about technology adoption into five categories: innovators, early adopters, mainstream adopters, late adopters, and laggards. Students' technology adoption category is 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 retain the traditional distribution of a rough bell curve with about half (49%) of all respondents identifying themselves as mainstream adopters. However, there is a persistent gender gap: about half of the male respondents see themselves as innovators or early adopters versus just a quarter of females choosing these categories.

ECAR also asked three survey questions about how students view their own information literacy skills. Eight out of 10 (81%) students considered themselves expert or very skilled in searching the Internet effectively and efficiently. While lower than their Internet searching skills, students' overall ratings for the other two skills we asked about were generally high: more than half (57%) of respondents rated their ability to evaluate the reliability and credibility of online information as expert or very skilled, and slightly fewer than half (48%) rated their understanding of related ethical and legal issues at the same level.

Student Ownership and Use of Technology

While respondent ownership of computers has remained steady at around 98% for the last four years, the ratio of ownership between laptops and desktops has changed notably. Desktop ownership declined by more than 25 percentage points from 2006 to 2009, while laptop ownership increased by nearly as many points (see Figure 1),[3] but desktop ownership seems to be stabilizing. About 45% of respondents owned desktops this year and last year. For the first time, in 2010 we distinguished between "full-sized" laptops and "small, lightweight" netbooks and found that 89% own either a laptop or a netbook.

Figure 1. Overview of Technology Ownership
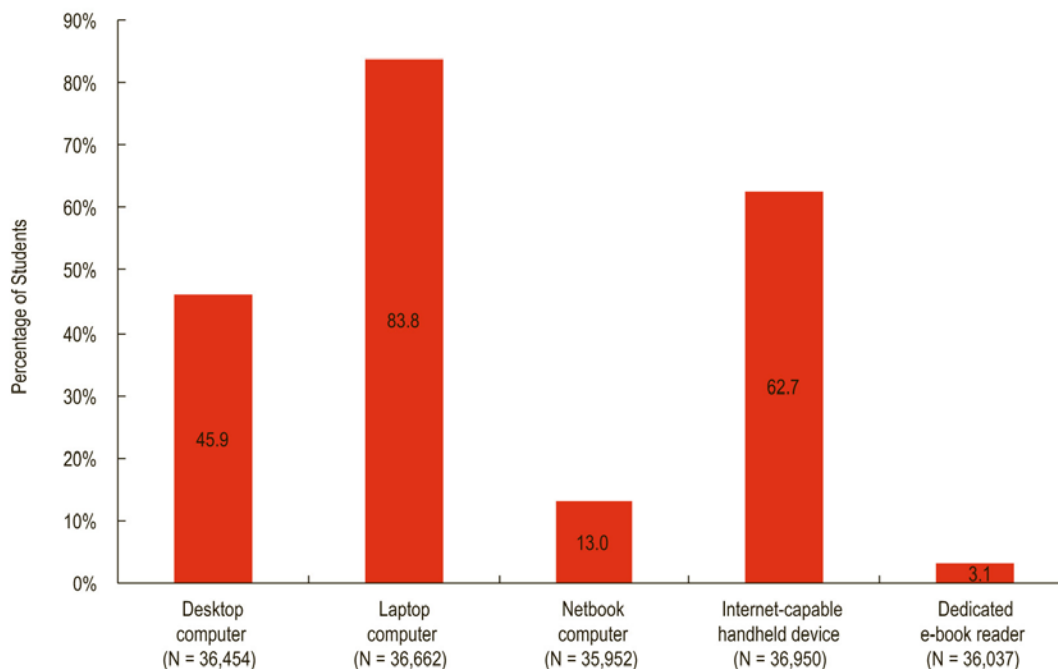
As in previous years, IT administrators concerned about supporting obsolete student equipment can take comfort in the relatively up-to-date profile of computer ownership. More than half said their newest computer, whether laptop, netbook, or desktop, is one year old or less, and 7 out of 10 reported owning a machine two years old or less. However, many respondents own older computers, including 17% whose newest computer is four years old or older and nearly half who said they own a desktop that is four or more years old.

When we asked students about their IT activities undertaken for school, work, or recreation, we found that basic technologies commonly used in coursework continue to be very widely used. This year more than 94% reported using their institution's library website for school, work, or recreation, and more than a third of respondents use it several times a week or more often. In addition, more than 9 out of 10 respondents reported using presentation software and course or learning management systems, and more than 85% were using spreadsheets.

Students are also creating and sharing content, as revealed in responses to our questions about Web 2.0 user-driven sites. Close to the same numbers of respondents said they contributed video to video websites (42%) and updated wikis (40%), while slightly more than a third of respondents said they contribute to blogs (36%). About a quarter of respondents said they played online multiuser computer games and used social bookmarking/tagging websites.

Interactive Communication Tools

Communications technology continues to dominate students' use of IT, as more than 9 out of 10 respondents said they use text messaging and access social networking websites, and the median frequency of use is daily for both. Four of 10 use voice over computer-based Internet protocol (VoIP)

services such as Skype, with a median use of monthly. Internet-capable handheld devices are growing in popularity; two-thirds own one of these devices (refer to Figure 1), and about half of this year's respondents said they use the Internet from their device daily, up from about a third of last year's respondents (see Figure 2).

Figure 2. Internet-Capable Handheld Device Users, 2009 and 2010
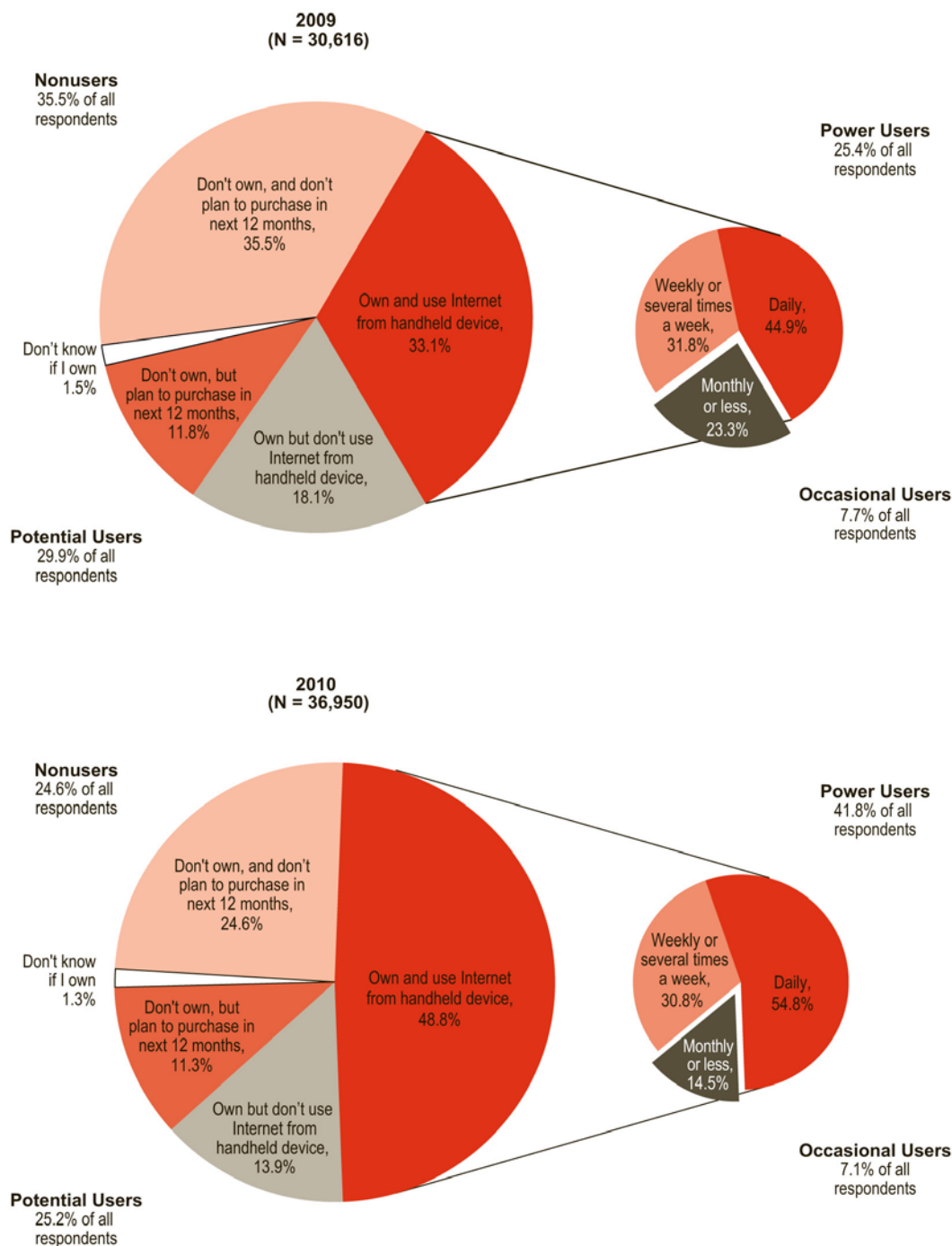
Last year we observed that students were moving into the mobile Internet in complex, nuanced ways and identified four emerging types of student adopters of the mobile Internet, as shown in Figure 2:

- power users who own and use their devices to access the Internet weekly or more often;

- occasional users who own devices but use them to access the Internet monthly or less frequently;

- potential users who own but don't use their device or do not own a device but plan to purchase one in the next 12 months; and

- nonusers who did not own a device or plan to purchase one in the next 12 months.

The mix of user types among this year's respondents shows students are adopting the mobile Internet in ways that we would expect for a maturing technology, with an increase in power users and a decrease in nonusers from 2009 to 2010.

Of the roughly one-half of respondents who own an Internet-capable handheld device and access the Internet with it, more than 8 in 10 said they use it to check for information such as news, weather, sports, specific facts, etc., and about the same percentage also said they use their handheld device to send and receive e-mail. We also found social networking to be a rapidly growing application for mobile access, as more than three-quarters of our respondents said they use social networking sites (SNSs) from their handheld device, up from two-thirds among last year's respondents.

Social Networking

While the younger, so-called Net Generation students have integrated social networking more actively into their lives than older students, the gap between older and younger students is shrinking. Respondents ages 18 and 19 have reported using SNSs at a nearly consistent 95% for the last four years, while students 25 and older have seen very steady increases over the same period (see Figure 3).

Figure 3. Percentage of Students Who Have Used Social Networking Websites, by Age, 2007 to 2010
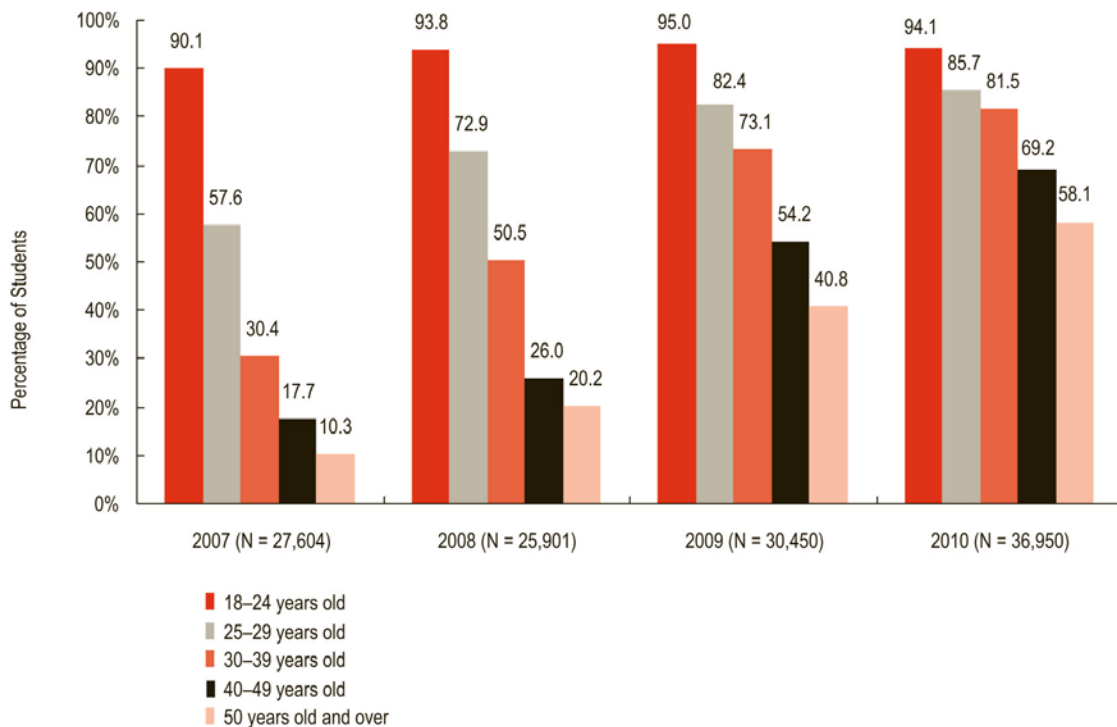
When we asked respondents to identify the social networking sites they use, some of which have other primary functions, Facebook, at over 96%, far surpassed the next closest, MySpace, with just 23%. We also asked students how they used SNSs, and from a list of 14 activities, the top two selections made by respondents were "Stay in touch with friends" (96%) and "Share photos, music, videos, or other work" (72%). Because so much attention has been drawn to privacy and security concerns when using SNSs, we were curious about whether students limited or restricted who has access to their profiles. Slightly fewer than 7% had applied no restrictions at all, and fewer than 2% said they did not know if they had. Four in 10 said they applied some restrictions, and about half said they put a lot of restrictions on access to their SNS profiles. Not surprisingly, in light of well-publicized incidents of cyberstalking and cyberbullying, we found that female respondents were more likely to put a lot of restrictions on their profiles than were males (59% versus 40%).

Technology in Courses

In addition to asking about the technologies students use for work, school, or recreation, each year the ECAR student survey asks respondents about technologies they were actively using as a part of their courses at the time of the survey (in 2010, from February 22 through April 9). This year, we divided the technologies into two groups: a core set of mostly older online and PC-based technologies, and newer web-based (or "cloud") resources with collaborative potential.

Of the core technologies, we found majorities of respondents were using the college or university library website, presentation software, and the institution's course or learning management system. About a quarter of respondents said they were using e-books or e-textbooks in a course during the

time of the survey. This was the first year we asked about e-books/e-textbooks, so we don't know if this represents a rapid penetration into courses, but given that fewer than 4% of respondents reported owning a dedicated e-book reader (refer to Figure 1), it is likely that students are using laptop/desktop computers, or possibly smartphones or other handheld devices, to access them.

Fewer than one in five respondents said they were using course lecture podcasts or videos, and about the same percentage told us they were using clickers or student response systems as well as instant messaging and graphics software.

Web-Based Technologies and Student Collaboration in Courses

We wanted to know to what extent the members of today's college generation, who have grown up with high-speed Internet and cloud-based tools, are using such services and how they might be integrating them into their college experience. To find out, we asked if respondents were using several types of web-based tools (with examples to further describe the type of tools or services) for any of their courses during the quarter/semester of the survey. We followed up with a slightly different list and asked if the respondent was collaborating or working with other students using the tools for any of their courses during the semester/quarter of the survey (see Table 1).[4]

Table 1. Students Using Web-Based Technologies in Courses the Quarter/Semester of the Survey and Those Using the Technologies Collaboratively in Courses

Web-Based Technology	Percentage Using the Technology (N = 36,950)	Number of Users	Percentage of Users Using the Technology to Collaborate in Courses
Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)	36.2%	13,368	53.0%
Wikis (Wikipedia, course wiki, etc.)	33.1%	12,228	30.7%
Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	29.4%	10,855	49.4%
College-related review/opinion sites (RateMyProfessors, College Prowler, Unigo, College Confidential, etc.)	27.1%	N/A	
Textbook publisher resource websites (Pearson, PrenticeHall, McGraw-Hill, etc.)	26.1%	9,654	23.2%
Video-sharing websites (YouTube, etc.)	24.3%	8,962	33.4%
Web-based calendars (Google Calendar, etc.)	17.4%	N/A	
Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)	17.2%	6,345	16.9%
Blogs	11.6%	4,279	37.6%
College study support (Cramster, Turnitin, Essay Checker, ShareNotes, etc.)	10.9%	N/A	
Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)	5.4%	1,996	32.9%
Micro-blogs (Twitter, etc.)	4.3%	1,605	40.2%
Web-based to-do lists/task-managers (Remember the Milk, Ta-da, etc.)	4.3%	N/A	
Social bookmarking/tagging (Delicious, Digg, Newsvine, Twine, etc.)	2.8%	1,053	30.5%
Online virtual worlds (Second Life, Forterra, etc.)	1.4%	527	29.4%

None of the tools we named were being used in courses by a majority of respondents. But reported use was high enough to suggest that cloud-based resources are making substantial inroads into students' academic lives, particularly considering that our question referred only to the current quarter/semester. Six of the 15 tools we asked about were being used in courses by one-fourth or more of respondents, and among tool users, collaborative use with other students was common. We're unable to say whether students are assigned to use these tools by instructors or are choosing them on their own; we presume that both factors are at work.
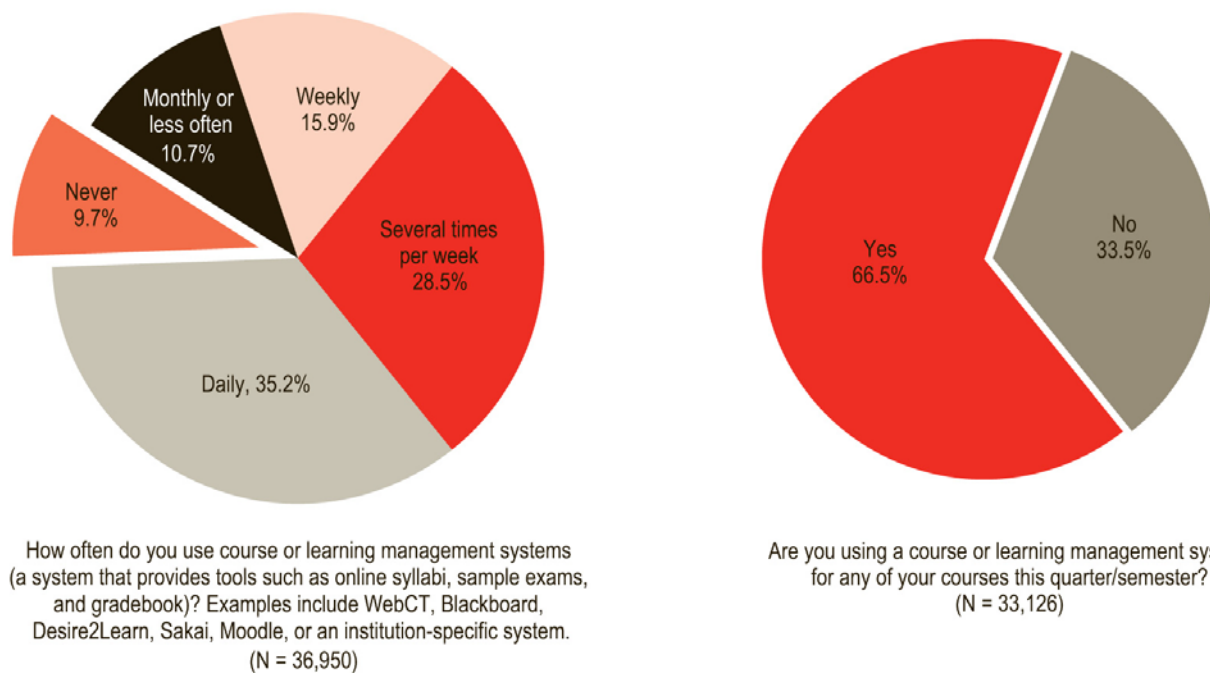
Social Networking and Coursework

Despite the very high percentages of personal SNS use (refer to Figure 3), only about 3 in 10 respondents told us they were using social networking websites in their courses the quarter/semester of the survey, although half of those students were using them to collaborate with other students in a course during the semester/quarter of the survey. More than half of SNS-using respondents said they use SNSs to communicate with classmates about course-related topics, but fewer than 1 in 10 (8%) said they use them to communicate with instructors about course-related topics. Only about 3 in 10 of the respondents who used SNSs said they had accepted current or previous college or university instructors as friends or contacts on social networking sites, with seniors reporting it at the highest percentage (40%) versus freshmen (23%) and students from two-year institutions (26%). When we asked students if they would like to see greater use of social networking websites in their courses, we found that slightly more than a quarter said they would, with respondents using an SNS in a course during the quarter/semester of the survey being more likely to say so.

Our findings suggest to us that students are gradually integrating SNSs and other web-based tools into their academic experience. Because today's high school and college-age students have been adopting social networking and content sharing at such high rates, higher education has an opportunity to leverage these technologies. There will be challenges, and experts point out that we need to truly understand which tools students are already embracing in their personal lives, how they actually use them, and their importance. By identifying ways to adopt these tools in order to remove potential technical barriers and introduce a sense of familiarity, institutions can better prepare students to make a connection with their campus and courses and let students know they understand their needs.[5]

Course or Learning Management Systems and IT Availability

Research from the 2009 EDUCAUSE Core Data Service report confirms a prevalence of course management system (CMS) and learning management system (LMS) availability, as more than 90% of responding institutions confirmed they have at least one commercial, homegrown, or open source course management system. This is also reflected in our student study, as more than 9 in 10 respondents told us they have used a CMS (see Figure 4). Students appear to be relying on CMSs; more than a third of all respondents use a CMS daily, and more than a quarter said they use them several times a week. Both the overall use and daily use rates reflect increases since 2008. However, just two-thirds of those students who did use CMSs told us they were using one during the quarter/semester of the survey, which seems to indicate that not all faculty are putting courses on CMSs. A majority of Core Data Service institutions indicated that their CMSs were used selectively by faculty, but the percentage that said their CMS(s) were ubiquitous and employed for all or nearly all courses increased from 38% in 2008 to 43% in 2009.[6]

Figure 4. Student Use of Course or Learning Management Systems

How often do you use course or learning management systems
(a system that provides tools such as online syllabi, sample exams,
and gradebook)? Examples include WebCT, Blackboard,
Desire2Learn, Sakai, Moodle, or an institution-specific system.
(N = 36,950)

Are you using a course or learning management system
for any of your courses this quarter/semester?
(N = 33,126)

Of this year's respondents who have used a CMS, slightly more than half said that their overall experience with them is positive or very positive, but we have found over the last few studies that the percentage of respondents who feel positive or very positive about the CMS experience has dropped from 77% in 2007 to 51% in 2010.

We continue to find that respondents who use a CMS more frequently report more positive experiences using a CMS. We have also found over the last three years that when asked whether they agreed with the statement "My institution's IT services are always available when I need them for my coursework," about half of respondents agreed or strongly agreed (52% this year), about a third were neutral (33% this year), and the remainder disagreed or strongly disagreed (15% this year). Over the same time frame we have consistently found that respondents' perception about institutional IT service regarding coursework availability is related to their CMS experience. Students reporting a positive or very positive experience using a CMS were much more likely to agree about IT availability than those reporting a negative or very negative experience.

Instructors' Use of IT in Courses

Other research has found that higher education instructors are a bit behind the curve when it comes to implementing IT in the classroom. The Faculty Survey of Student Engagement (FSSE) surveyed approximately 4,600 faculty members at 50 U.S. colleges and universities in the spring of 2009 and found that overwhelming majorities of faculty were not using IT tools such as collaborative editing software, blogs, plagiarism detection tools, student response systems, or video games/simulations/virtual worlds. The only technology FSSE reported faculty using extensively was course management systems.[7] Despite numerous experiments with leading-edge teaching technologies on campuses around the country, the FSSE findings suggest that many instructors continue to teach using old-school, lecture-based instruction.

In general, we have found in our study that respondents are lukewarm about their instructors' use of IT. ECAR began asking questions about students' views on instructors' use of IT in courses in 2007, and the responses to these questions have been consistent from year to year, as have the distributions of responses across student demographics and types of institutions. Fewer than half of respondents told us that "most" or "almost all" of their instructors meet the criteria stated in each question every year we have asked. Questions include whether respondents' instructors use IT effectively in their courses (47% this year), whether they have adequate IT skills for carrying out course instruction (49% this year), and whether they provide students with adequate training for IT in their courses (38% this year).

When asked to respond to the statement "I skip classes when materials from course lectures are available online" on a scale of strongly disagree, disagree, neutral, agree, and strongly agree, nearly two-thirds (64%) told us that they disagree or strongly disagree with the statement.

Student Perceptions, Preparedness, and Preferences for IT in Courses

Because IT is integrated with many student activities that influence college success, ECAR created four positive "outcome statements" about the impact of IT in courses and since 2008 has asked students whether they agree or disagree with them. Since we began this study we have found in both the quantitative and the qualitative data that students say convenience is the most valuable benefit of IT in courses, and this year 7 of 10 agreed with the statement "IT makes doing my course activities more convenient." About half of this year's respondents agreed or strongly agreed with the statement "The use of IT in courses improves my learning," and only about a third felt the same way about the statement "I get more actively involved in courses that use IT." Between 8% and 20% disagreed or strongly disagreed with these three statements.

To get a sense of how students felt about their technical skills when they started college, we asked respondents if they agreed with the statement "When I entered college, I was adequately prepared to use IT as needed in my courses." We found that half agreed or strongly agreed. We then asked them to think about the end of their undergraduate experience to find out how they felt about IT's role in the ultimate goal of a college education: getting and keeping a job. Slightly fewer than half agreed or strongly agreed with the statement "By the time I graduate, the IT I have used in my courses will have adequately prepared me for the workplace."

Surprisingly, we found no meaningful relationship between class standing and the level of agreement with either of these IT preparedness statements, nor were there any demographic factors that influenced the responses to these or any of the other statements about IT in courses. The only consistent factor associated with how a student responded to these questions was our technology adoption scale, discussed earlier in this chapter. Innovators and early adopters agreed or strongly agreed with all of these statements at higher levels than did mainstream/late adopters and laggards.

Technology adoption is also closely associated with what may be the ultimate question regarding IT in a student's undergraduate experience: how much IT do they prefer in their courses? Using a 5-point scale from "no IT" to "exclusive IT," we have found since we began asking seven years ago that the responses have been remarkably consistent. Majorities of students (between 55% and 60%) have told us every year that they prefer only a "moderate" amount of technology, while fewer than 5% of respondents prefer the extremes—either no IT or exclusive IT in their courses.

It is surprising that the desire for moderate IT in courses has been this consistent over the years when students' use of technology in their personal lives, such as text messaging, social networking, and using mobile devices, has increased. One possible explanation is that what respondents in 2004 considered a "moderate amount of IT" may be quite different from what today's respondents consider moderate. Would a mainstream adopter in 2004 think that watching videos on the Internet and discussing them via Facebook chat with a classmate was a moderate or an extensive use of IT in a course? The hybrid courses that have emerged utilizing CMSs, video websites, and other tools as supplements to face-to-face courses might have been viewed as extensive use by mainstream adopters of a few years ago, whereas today's mainstream adopters might consider them to be just the right, or moderate, amount of IT in their courses. As users encounter and employ IT without even thinking about it, the oft-mentioned "commoditization of IT" could be shaping just what a student considers to be innovator-level or laggard-level technology adoption as well as just what "moderate" might mean when asked how much IT they prefer in courses.

Conclusion

Google is well known for playing April Fool's Day pranks, and when Gmail was announced on April 1, 2004, many people thought the campy press release that had Google founders saying "Heck, Yeah" to the then-unheard-of offer of one gigabyte of free e-mail storage for life to be a joke. A Google representative denied that Gmail was a hoax but did not comment on the job posting on the company's website on the same day seeking staff for a space mission with a project dubbed the "Google Copernicus Hosting Environment and Experiment in Search Engineering," or GCHEESE. Six years later, Google doesn't have a lunar hosting environment, but they do have a patent on an ocean-powered data center. They may need both in order to accommodate the worldwide growth in cloud-based consumer applications and the changing economics of personal data.

What will undergraduates who have come to adulthood during an era in which data location is incidental, if not invisible, expect of their institutions and how will student adoption of cloud-based applications play out on campus? Our study suggests that mobile computing is on the rise, and cloud-based applications and resources are catching on among undergraduates. But it also reveals that many student technology adoption patterns are surprisingly stable, even as the technologies themselves change dramatically; and students continue to express a desire for a moderate level of technology in their courses, even if we can't be sure exactly what moderate or extensive technology means to them. Perhaps the most important take-away from our study, this year and every year, is that there is no stereotypical student when it comes to technology.

Endnotes

1. "Google Gets the Message, Launches Gmail," Google Press Center, April 1, 2004, http://www.google.com/press/pressrel/gmail.html; Experian Hitwise Data Center, "Top 20 Sites & Engines," September 4, 2010, http://www.hitwise.com/us/datacenter/main/dashboard-10133.html; and Matthew Glotzbach, "Google Apps Is Out of Beta (Yes, Really)," The Official Google Blog, July 7, 2009, http://googleblog.blogspot.com/2009/07/google-apps-is-out-of-beta-yes-really.html.

2. We began comparing longitudinal data in the student study in 2005, the study's second year. That year, most of the differences were found to be minor and statistically insignificant, but a few were identified as noteworthy. Where questions were consistent, more robust longitudinal analysis of repeated questions was performed in 2006 through 2010.

3. From 2006 to 2009, desktop ownership declined from 71.0% to 44.0% while laptop ownership increased from 65.4% to 88.3%. This was among only those institutions that participated every year from 2006 to 2009 (see Chapter 4 in the 2009 study).

4. Table 1 reports collaborative use only among those respondents who said they were using the technology in a course during the quarter or semester of the survey. Substantial numbers of those saying they did not use the technologies during the quarter or semester of the survey also reported collaborative use, perhaps because they were using it incidentally or their instructor had not initiated the use.

5. David F. Ullman and Blake Haggerty, "Embracing the Cloud: Six Ways to Look at the Shift to Cloud Computing," *EDUCAUSE Quarterly* 33, no. 2 (2010), http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/EmbracingtheCloudSixWaystoLook/206528.

6. EDUCAUSE, "2009 EDUCAUSE Core Data Survey," (EDUCAUSE, 2009), http://www.educause.edu/coredata/. Finding was generated directly from the Core Data.

7. "Professors' Use of Technology in Teaching," *The Chronicle of Higher Education* (July 25, 2010), http://chronicle.com/article/Professors-Use-of/123682/?sid=wc&utm_source=wc&utm_medium=en; Faculty Survey of Student Engagement, http://fsse.iub.edu/.

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