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EDUCAUSE
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When New Technologies GET NEWER

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By Bonnie Neas and the EDUCAUSE
Evolving Technologies Committee

Tomorrow—that elusive day that never comes, but often a day of dreams about what may come. With the 2005 EDUCAUSE Annual Conference being held close to Walt Disney World, a place where “dreams are made of” in Tomorrowland, the EDUCAUSE Evolving Technologies Committee this year decided to focus on tomorrow and on dreams—by looking at new technologies and dreaming about what may come as they evolve into even newer technologies.

Each year, the members of the EDUCAUSE Evolving Technologies Committee identify and research the evolving technologies that are having the most direct impact on higher education institutions. The committee members choose the relevant topics, write white papers, and present their findings at the EDUCAUSE annual conference. This year, under the leadership of Committee Chair Bonnie Neas, the committee selected five evolving technologies, presenting a brief overview at EDUCAUSE 2005. Published below are excerpts from the white papers on each topic, written by individual members of the committee: “Wireless,” by Art St. George, Saiid Ganjalizadeh, and Saleh Elgiadi; “Portals,” by Leslie Maltz; “Outsourcing,” by John S. Bojonny; “Gaming in Higher Ed,” by Leslie P. Hitch and James M. Duncan; and “Student Collaboration Tools,” by Pablo G. Molina. The full white papers, with contributions by additional committee members, can be found on the committee Web site (<http://www.educause.edu/EvolvingTechnologiesReports/869>). These full papers address many other strategic areas for each evolving technology: key questions to ask; the implementation challenges; the major vendors and how to judge among them; how to proceed and the issues to be addressed; and the likely impacts in the next three to five years.

Wireless

Wireless is to the twenty-first century what the automobile was to the twentieth century: a new form of freedom, an innovative approach to conquering time and space, a powerful industry force, and one of the most important technologies of the century, influencing the nature of business, commerce, education, and society.

Of course, the term *wireless* is very broad, covering everything from satellite to Bluetooth. This section focuses on wireless LANs, the evolving wireless WANs, and the convergence of the two on handheld devices, or handsets. As these aspects of wireless continue to pervade our lives, two principal trends are influencing higher education. First, students of the Net Generation (also known as the M Generation or the Millennials) are arriving on campus with increasingly higher levels of technological literacy and, correspondingly, greater expectations of what the campus will provide them. This is usually focused on anytime-anywhere high-speed access to the Internet. Second, campuses have thought of wireless access as something to be brought to a building or exterior contiguous space. But as wireless becomes less building-centered and more user-centered, and as bandwidth to the individual user increases with the convergence of services to handsets, new organizational, business, and technology models must evolve.

Why Is Wireless Important to Higher Education?

Wireless is a force not to be denied. Colleges and universities are already utilizing wireless across their campuses—from student outreach and recruitment to spontaneous collaboration. Many campuses have already established successful wireless networking. Online course management systems are becoming more popular; therefore, there is a need for more ubiquitous computing access. Students are savvier with technology. In addition to e-mailing, chatting online, and surfing the Web, they use sophisticated graphical software and make movies. The current trends in technology, globalization, e-learning, and the need for flexible hours in the learning environment are driving forces for institutional decision-

The distinction between wireless handsets, what some of the older generation might call cell phones, and the new “lifestyle devices” is rapidly blurring.



makers and other stakeholders to be advocates for wireless campuses.

How Is Wireless Evolving?

The story of the evolution of wireless will be told around the campfire as one in which dominant business drivers, led by

consumers' apparently endless appetite for more powerful, robust, and convergent handsets, dictated the landscape of next-generation wireless. One of the principal shifts in the wireless industry, fueled by new technologies and standards, is the rapidly growing demand for wireless as an alternative to fiber. This shift is being driven primarily by the fixed-line carriers, who now see themselves as legitimate competitors to the mobile operators. More specifically, these carriers view broadband wireless as a viable alternative when cost, time, and geography mitigate against laying fiber.

Developments in wireless seem to be occurring in nanotime. Anyone attending the 2005 International Consumer Electronic Show in Las Vegas could hardly miss the daunting presence of wireless: the show exhibitors hawked multifunction handsets and converged services. The distinction between wireless handsets, what some of the older generation might call cell phones, and the new “lifestyle devices” is rapidly blurring. From a campus organizational perspective, the lines between telephone, computing, video, networking, and media arts are blurring as well, thanks in large part to these devices. Is the wireless podcast a harbinger of the future?

The 802.11 family of standards, often called WiFi, is more prevalent in the private sector, including hotspots, than it is on campus. About one-fifth of campuses report 802.11a/b/g campuswide wireless networks. These particular standards, though not frozen in place, will likely not see any radical developments as the industry focuses on newer standards that promise greater bandwidth (802.11n), better security (802.11i), and improved roaming (802.11r). With a firmware upgrade, campus networks will be able to implement MIMO, multiple-input, multiple-output antennas that will boost throughput. But since MIMO is not yet a ratified standard, caution is called for: MIMO systems from different vendors may not be interoperable.

Perhaps the most exciting development is the 802.11s standard, or mesh networks. Basically, mesh networks are self-configuring and self-healing. Most implementations do not require that access points, except for one, be connected to an

Ethernet outlet. The standardization process is expected to produce a firm proposal toward the end of 2006 or the beginning of 2007, with ratification following a year later.

The near-term future will also see the availability of broadband wireless in the form of WiMax, 3G, and EV-DO. WiMax will be implemented in both laptops, with chipsets from vendors such as Intel, and handsets. 3G and EV-DO are currently available, but their penetration is much higher outside the United States. WiMax is evolving to the standard 802.16e, which—along with a competing standard, 802.20—will provide mobility. The major drawback currently is that under the best of conditions, none of these provide more than several Mbps. Look for these to become more common in the 2006–7 timeframe.

Other emerging wireless technologies include ultrawideband (UWB), free space optics (FSO), and virtual fiber. As the name implies, ultrawideband uses a very wide spectrum of frequencies to push

large amounts of data at high speeds, 100 Mbps to 1 Gbps, over short distances, less than 100 meters. Free space optics is line-of-sight laser-based optical networking that uses light beams instead of radio waves. Although broadband wireless has eroded some of the market potential for free space optics, proponents of the technology argue that it requires no license, sets up quickly, and offers speeds of up to 2.4 Gbps. Distance claims vary: 2–3 miles at most. Environmental conditions can seriously degrade the performance. Lastly, the newest emerging technology is virtual fiber. In contrast to free space optics, virtual fiber uses high-frequency (71–76 GHz, 81–86 GHz, and 92–95 GHz, newly approved by the FCC) radio waves to transmit data point-to-point at a speed of up to 2.48 Gbps, with planned enhancements to 10 Gbps. Distance claims range from 1 to 3 km with “five nines.”

Conclusion

Wireless continues to be a rapidly evolving technology, one that will dramatically

affect lives on and off campus. Colleges and universities must plan now to take advantage of the emerging standards as wireless converges to handsets. Will wireless replace wire? As “road warriors” become “life warriors,” stay tuned.

Portals

Webopedia.com defines a portal as “a Web site or service that offers a broad array of resources and services, such as e-mail, forums, search engines, and on-line shopping malls. The first Web portals were on-line services, such as AOL, that provided access to the Web, but by now most of the traditional search engines have transformed themselves into Web portals to attract and keep a larger audience.”

Simply put, portals provide a flexible, customizable, and personalized access point to and view of information based on the interests and roles of the individual. The information is often presented in the form of links and “channels” that relate to applications, events, calendars, discussions, searching, content management,

and more, in formats tailored to the aesthetic and topical interests of the individual. Since portals require authentication in order to establish the identity of each user, the look and contents specific to

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each user will be the same every time the portal is accessed and from any location it is accessed. Web sites lack this portability, in that bookmarks are stored on a single machine and lack automatic portability. In addition, Web pages are customizable by the creator of the pages, but not by the user. They look much the same to all users, regardless of the browser or the user's identity or role. Pages may be publicly viewable or private, requiring authentication to gain access. By contrast, portals are customizable; depending on the user and the functions chosen or authorized, the look and functionality may differ widely from that available to another user.

In general, portals provide a unified interface with the ability to access multiple types of information, varying from general-interest topics such as the news and the weather to topics relevant to groups with common interests chosen by the user (or chosen for the user) based on identity or role, such as specific applications or materials pertaining to a course or the status of an account. Some portals provide resources for people who are members of a community or work in a specific industry. Portals provide opportunities to customize the look and functionality and to tailor the links, content, and applications based on the roles the user plays within the organization or group.

Why Are Portals Important to Higher Education?

Finding and deploying effective means of providing communication and access to information is an ongoing challenge for all organizations. In higher education, there are many types and sizes of communities (e.g., applicants, students, faculty, staff, alumni, vendors, donors, governmental agencies, and more), each with diverse interests and varying needs for information. Developing and maintaining Web sites for each unique community is both cost-prohibitive and confusing when an individual fits more than one category. But with customization as an integral feature of portals, individuals may be assigned rights that facilitate access to features, channels, and information targeted to their roles and needs, thus simplifying communication with target groups or audiences. Previously,

such communication was done via intranets or list e-mails (now viewed as spam).

Portals provide the best means yet for facilitating communication, authenticating who the user really is, and having a single place for community members to find timely and commonly needed information or access to applications. As such, the portal becomes a user's personal door to the information enterprise. Some of the most common features of portals in higher education are news, announcements, course catalogs, directories, calendars, library information, course management systems, alumni systems, registration, human resources information, menus, weather, financial applications, student information systems, employment opportunities, room reservations, campus stores, and webcams.

How Are Portals Evolving?

Like all other software, portals have evolved through generations of design and development, with each generation adding new or improved functionality and focus for local and mobile users.

First-generation portals provided a single, customizable place from which users could access commonly used information and applications. The emphasis was on content. Typical applications were searching, announcements, and content management within a common framework, with navigation features similar to those of the Web.

Second-generation portals added and integrated functionality, particularly to facilitate collaboration, and expanded the usefulness to the mobile user. They focused on services. The transition from generation one to generation two also strengthened the basic framework while placing a stronger focus on security.

Third-generation portals addressed a wider audience. Enterprise applications and data warehouses began to be accessible via portals. This generation represented the merger of multiple portals and the dawning of an enterprise portal. Third-generation portals focused on integration and enterprise solutions.

Fourth-generation portals extended the functionality for collaboration and communication. Chats and discussions became a way to facilitate communication

and make the experience interactive. This was the first portal generation to provide a desktop environment from which users could manage much of their daily tasks, regardless of their roles. Fourth-generation portals focused on federation of information from within the enterprise and from external sources, as well as the merger of multiple portals that may have been created in response to the absence of an enterprise portal. Fourth-generation enterprise portal solutions more frequently incorporated evolving architectural components, such as application platform suites (APSs) and smart enterprise suites (SESSs).¹

Fifth-generation portals are now beginning to emerge, with an orientation toward application delivery, the simplification of the application integration effort, and the incorporation of a myriad of standards. Although the effort toward the standardization of browsers has been less than successful, the effort will continue to establish standards for portals.

Conclusion

There will be a further reduction in the number of viable portal vendors in the future. Vendors are consolidating around ERP suites. Advertising-based portals will no longer be in the mix of choices. Open source portals are becoming more mainstream as the size of the development community continues to grow. Yet regardless of the source of the portal software, the future will include enhanced communication and collaboration tools, flexible customization features, an even broader set of channels and applications, and integration with mobility devices, all with a strong emphasis on security and privacy.

Just as institutions have recognized the necessity of having Web sites as their official, branded presence on the Internet, portals will become the official, branded gateway for accessing campus resources.

IT Outsourcing

Outsourcing is a topic that makes campus IT people quiver. They view any discussion about IT outsourcing as an at-

tack on their ability to provide services to their clients. But dealing with IT outsourcing in higher education is more critical today than it ever was. And many campuses may already be doing some of this without even realizing it.

Outsourcing some campus IT services may well make sense, but only if a long, thoughtful examination shows that the monetary and other benefits for the institution far outweigh the costs. If saving money is the only reason that outsourcing is being considered, then the institution will create resentment and probably will not in fact cut any costs.

Why Is IT Outsourcing Important to Higher Education?

The changing playing field of higher education is the reason that IT outsourcing is important. With students now having more options to gain a higher education, they are demanding distance courses and distance services. More access to information via the Web is being demanded by students, faculty, and staff. Technologies

are advancing too fast for the IT department to keep pace. Every facet of teaching is becoming dependent on technology. Institutions can no longer provide the computing capacity needed to perform the complex and high-computing-demand functions that research faculty are requiring. CIOs are being pressured to reduce their budgets. Finding highly skilled IT staff is becoming harder and harder. And vendors are aggressively marketing these services and filling the gap. These are the pressures that are challenging campus IT departments.

At each higher education institution, outsourcing of some functions is already taking place, including food services, bookstores, payroll, and other non-IT functions. The same argument for outsourcing those functions can be made for outsourcing IT functions. Vendors are pushing the idea that institutions should concentrate on their core competency, which is teaching. With IT budgets growing and becoming more easily targeted for reductions, outsourcing

will most certainly come up in budget discussions.

Because CIOs are being asked to find ways to reduce their budgets, the question will be not *whether* an institution should consider outsourcing IT functions but rather *when* will all or some of the IT functions be outsourced.

How Is IT Outsourcing Evolving?

The real evolution of IT outsourcing is in the options that are available. For example, offshore outsourcing of applications development and help desks is already happening in the corporate world. Higher education needs to consider this option as well. Newer options—such as Net-sourcing, co-sourcing, and cooperative outsourcing—all need to be considered in providing services to college and university students, faculty, and staff. In addition, course management systems vendors are sometimes demanding that course development be outsourced to them. And finally, with internal IT departments now being run like a business,

another option is for IT departments to provide the same outsourced services to other entities of the institution.

Conclusion

Although IT outsourcing has been around for a long time, the outsourcing options are increasing in complexity. CIOs and IT managers—who are already involved in outsourcing or will be in the near future—need to be aware of these new options. There is no silver bullet that will solve all of the issues. Finding only one solution may not be possible. A combination of IT outsourcing solutions may be needed. The necessary first step, however, is for CIOs and IT managers to be prepared to deal with the topic of IT outsourcing.

Gaming in Higher Ed

In 2003, the Pew Internet and American Life Project published *Let the Games Begin: Gaming Technology and Entertainment among College Students*, revealing weighty statistics about college and university students' preference for video games:

- All students surveyed had played video/computer or online games.
- One out of five said that gaming helped them with friendships.
- Most said gaming was part of their leisure activities.²

In this section, we use the terms *computer games*, *video games* and *online gaming* interchangeably and aggregate these terms into a definition of *gaming*—a genre signifying students' use of, preferences for, and expectations surrounding multiplatform, technology-mediated, visually enhanced interactive media.

Why Is Gaming Important to Higher Education?

Gaming stands to have a significant pedagogical and technological impact on higher education. Ironically, the challenge facing higher education from the expansion of video gaming involves factors not much different from those facing higher education in general: cost, attitudes, and gender gap.

Cost: The primary factor is cost. The cost to develop the games. The cost to buy the games. The cost to learn how to teach the games. But the effect of these costs is no different from the reeling caused on campus by the impact of the costs of technology.

Attitudes: Much has been written about the vast amount of time that gamers spend gaming and how that cuts into the time that was once spent (allegedly) on homework and how that is producing a generation of hermits. Yet as others have pointed out, the most popular video games are multiplayer and highly social. Games like the *Civilization* series show a surprising depth of analysis, problem-solving, collaboration, and fervor.

Gender gap: An interesting phenomenon of the growth in gaming curriculum is that the field does not seem to appeal to women. Nor, according to Pew, are women heavy gamers. On the other hand, the introduction of video gaming as an academic major or as a teaching tool may begin to woo male students to campuses. Estimates are that 56 percent of all college students today are women. Tom Mortenson, of the Pell Institute for the Study of Opportunity in Higher Education, worries that this gender gulf could

lead to work force and other societal implications.³ One way to engage males may be through video games.

How Is Gaming Evolving?

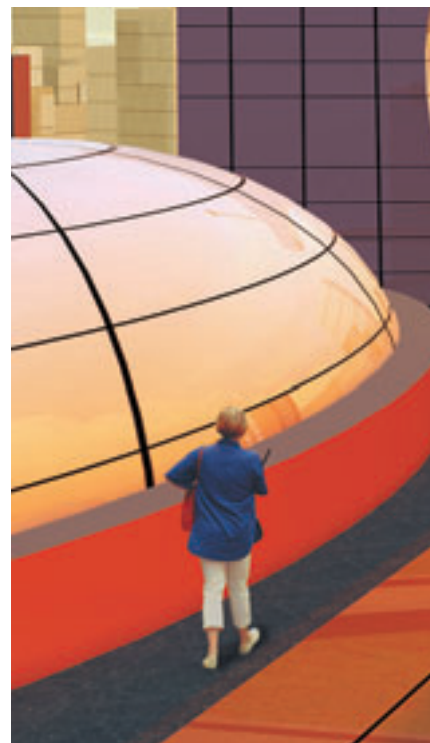
The evolution of gaming will be felt in the areas of curriculum, research, faculty instruction, academic libraries, and technology requirements and cost.

Curriculum: Gaming degrees and/or certificates are proliferating. An Internet search revealed initiatives at institutions as diverse as Cornell, Parsons, Southern Methodist University, Rensselaer Polytechnic Institute, Carnegie Mellon, University of Southern California, and MIT. The trend is global, with offerings at the Art Institute of Vancouver, City University of Hong Kong, and the University of Bradford (UK). Ohio University is taking this concept further with its Games Research and Immersive Technology (GRID) Lab, a research venue, community outreach program, and economic development incubator that includes a video game arcade (yes, arcade!) open to students and the public.

Research: Gaming is an emerging, rich area for research. The peer-reviewed international journal *Game Studies* (<http://www.gamestudies.org>) focuses on computer game research. Like the undergraduate and graduate programs mentioned above, video game research can be found in a wide variety of disciplines, from anthropology to artificial intelligence.

Faculty instruction: The potential for games to enhance, enliven, and embolden teaching is considerable. The Digital Media Collaboratory (University of Texas–Austin), the University of Southern California, and MIT, through corporate partnerships, are heavily involved in developing games for use by schools, businesses, and governments in an effort to bring the underlying concepts of video game technologies into the learning environment. Leading advocates for video-games-as-educative are James Paul Gee, professor at the University of Wisconsin–Madison and author of *What Video Games Have to Teach Us about Learning and Literacy* (2003), and Marc Prensky, author of *Digital Game Based Learning* (2001). In the September/October 2004 issue of *EDUCAUSE Review*, Joel Foreman interviewed a panel of

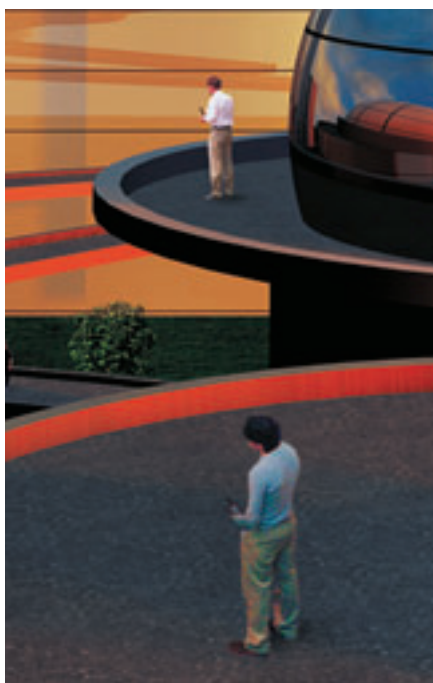
At each higher education institution, outsourcing of some functions is already taking place, including food services, bookstores, payroll, and other non-IT functions.



such experts (including Gee and Prensky) to discuss several pedagogical issues, including simulations and learning communities. The August/September 2005 special issue of *Innovate* focused on the role that video-game technologies play in educational settings.

Academic libraries: Although gaming is not on the radar for most academic libraries, it may soon be a blip at the edge of the screen. Advocates for gaming in higher education and researchers in the

Advocates for gaming in higher education and researchers in the field point to its potential for extending the instructional service mission of the academic library.



field point to its potential for extending the instructional service mission of the academic library. Librarians regularly collaborate with faculty to develop educational offerings or resources designed to supplement and enhance the learning taking place either in the physical or in the online classroom. Games may be an immersive and experiential method of reinforcing learning in an information-intensive world.

Technology requirements and costs: The costs and demand for technology are rising higher, while budget reductions are cutting deeper, particularly in public institutions. And more cost exposure is coming for increasing bandwidth, for producing games, and for meeting students' demands for additional connectivity for Xboxes and other devices. For students, the computer is a communication and entertainment device that (by the way) is also used for learning.

Conclusion

Will gaming change higher education? Skeptics may ask: "Did television? Did radio?" The obvious answer to the skeptics is, "No, television and radio did not change higher education." But we assert that gaming is different. Video games are interactive and, yes, social. The better questions to ask are whether gaming *can* change higher education and whether the increasing use of video games by this and forthcoming generations will actually force those changes.

Student Collaboration Tools

Learning is a social activity. Whether in class, remotely, or in ad hoc sessions, students form study groups to collaborate. Various new technologies facilitate and promote this collaboration: communication systems, conferencing methods, messaging, courseware platforms, Web services, portals, blogs, and wikis. However, the sheer diversity of existing methods and rules can make collaboration more difficult and time-consuming than it ought to be. Providing a common, simple, easy-to-use toolset is thus an important step toward fostering a collaborative environment. Ideally, every student should have access to the widest range of communication platforms and Web publishing and

sharing systems, integrated with calendaring and scheduling systems.

What do students expect in the way of institutional service and support for collaboration, and what should institutions provide? Institutions and their IT departments must strive to provide communication mechanisms, virtual collaboration spaces, and support systems for physical gatherings—for example, room and resource reservation systems. To some degree, all colleges and universities support these efforts. However, the wider the gap between the institutional offerings and the needs of students, the greater will be the barriers to student collaboration. In some instances, institutions must also find ways to ensure intercollegiate collaboration. Obstacles such as software licensing restrictions and authentication policies can make this particularly difficult.

Why Are Student Collaboration Tools Important to Higher Education?

Institutions must assess how much and how well they use technology to promote student collaboration. The following student collaboration tools are of growing importance to higher education: blogs, wikis, courseware sites, electronic facebooks, online social services (e.g., Evite, Yahoo! Groups), calendaring, e-mail with self-managed e-mail lists, SMS (short message service), instant messaging, chats, bulletin boards, Web conferencing, portals (e.g., uPortal or SharePoint), digital repositories (e.g., DSpace), e-portfolios, peer networking (e.g., Kazaa or Grokster), ad hoc collaboration systems, and room scheduling systems.

How Are Student Collaboration Tools Evolving?

The use of wikis in higher education is evolving, especially the social dimensions of using this technology. On May 12, 2005, the *Guardian Unlimited* published a story on the use of wikis for collaboration: "Les Blogs & Social Software . . . recently attracted 300 bloggers, social software gurus and the curious to the first European event of its kind. Loic Le Meur, vice president of blogging specialists Six Apart, had floated the idea of a conference only six weeks earlier. He posted a provisional programme on the

web, and mentioned it to a few bloggers. Word spread, and the conference pretty much organized itself, thanks to some Wiki-based collaboration software from Socialtext Inc.”⁴

Another evolving collaboration tool is courseware sites. Student organizations, institutes, centers, think tanks, research teams, and study groups regularly create courseware sites or derivatives to make content available to all members and, in some cases, to give certain members immediate access to the ability to disseminate information. Institutions must open their courseware systems—be those homegrown, Blackboard, WebCT, Sakai, or other—to non-traditional users to foment and support student collaboration. When I asked Jason Wileman, a University of Maryland senior, what technology, other than e-mail, he would use to collaborate with other students, he emphatically answered: “We all go to Blackboard, post messages, use the chat services, etc.”

Web conferencing services are also evolving. Purdue University is a well-known adopter of Web conferencing services. In a customer testimonial published in June 2005 on the Macromedia Web site, Bart Collins, director of digital content for Purdue University’s Instructional Development Center, stated that Web conferencing allows the center to achieve many goals, including “setting up environments where virtual teams of students can work on projects.” On the sample video segment, Assistant Professor Sheryl Kline, in the Department of Hospitality and Tourism Management, explained that virtual conferencing allows students to be able to see presentations and also to give presentations to people who would not have been able to see them.⁵

In March 2005, *The Economist* published an article, “United We Stand,” on collaborative filtering: “To find things you might like, but are not already familiar with, requires a different technology, known as ‘collaborative filtering.’” When this technology is applied to peer-to-peer services, it may yield rich academic content to groups of students everywhere. For example, according to its Web site, Spain-based MusicStrands “develops social recommendation tech-

Perhaps we are missing out on using other evolving technologies that could be harnessed for collaborative purposes.



nologies to help people discover and enjoy new music. MusicStrands uses statistical machine learning, collaborative filtering, complex network-based analysis, among others, to provide music recommendations based exclusively on the listening behavior of indi-

viduals and social networks.” These technologies could be used to share links to reference sites, foundation papers, sources, and research tools.

Finally, perhaps we are missing out on using other evolving technologies that could be harnessed for collaborative purposes. Games, particularly role-playing games, may be useful to foster cooperation among students. For example, during an undergraduate management class at Saint Louis University, Management Professor Michael Shaner used a strategic computer game in which teams of students played other teams in a simulated market competition exercise dealing with athletic footwear. And on May 27, 2005, CNN reported on an international student collaboration project to create a game: “The game, ‘Descent to the Underworld,’ re-imagines the Orpheus myth in settings designed by the students, who live in Philadelphia, Beijing, Brazil, and Prague.”

Conclusion

Institutions must monitor developments in student collaboration tools and actively craft a strategy to manage students’ expectations and to facilitate their collaboration needs. After all, most professions that require a college degree require collaboration among team members, and those are skills that many of us develop during our college years. *e*

Notes

1. Leslie Maltz, Peter B. DeBlois, and the EDUCAUSE Current Issues Committee, “Top-Ten IT Issues, 2005,” *EDUCAUSE Review*, vol. 40, no. 3 (May/June 2005): 26–27, <<http://www.educause.edu/er/erm05/erm0530.asp>>.
2. Steve Jones et al., *Let the Games Begin: Gaming Technology and Entertainment among College Students* (Washington, D.C.: Pew Internet and American Life Project, 2003), <http://www.pewinternet.org/pdfs/PIP_College_Gaming_Reporta.pdf>. Surveys were sent to both undergraduate and graduate students at twenty-seven institutions in the United States, with 1,162 responses received in the spring and fall of 2002.
3. See Tom Mortenson, “Fact Sheet: What’s Wrong with the Guys?” <<http://www.postsecondary.org/archives/previous/GuysFacts.pdf>>.
4. David Tebbutt, “Social Engagement,” *Guardian Unlimited*, May 12, 2005, <<http://www.guardian.co.uk/online/story/0,3605,1481266,00.html>>.
5. See “Macromedia Unveils Flash Platform,” press release, June 6, 2005, <http://www.macromedia.com/macromedia/proom/pr/2005/unveiling_flash_platform.html>.