THE HORIZON REPORT

2008 EDITION

a collaboration between
The NEW MEDIA CONSORTIUM
and the
EDUCAUSE Learning Initiative
An EDUCAUSE Program

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EXECUTIVE SUMMARY

The annual *Horizon Report* describes the continuing work of the New Media Consortium (NMC)'s Horizon Project, a five-year qualitative research effort that seeks to identify and describe emerging technologies likely to have a large impact on teaching, learning, or creative expression within learning-focused organizations. The *2008 Horizon Report,* the fifth in this annual series, is produced as a collaboration between the NMC and the EDUCAUSE Learning Initiative (ELI), an EDUCAUSE program.

The main sections of the report describe six emerging technologies or practices that will likely enter mainstream use in learning-focused organizations within three adoption horizons over the next one to five years. Also highlighted are a set of challenges and trends that will influence our choices in the same time frames. The project draws on an ongoing primary research effort that has distilled the viewpoints of more than 175 Advisory Board members in the fields of business, industry, and education into the six topics presented here; drawn on an extensive array of published resources, current research, and practice; and made extensive use of the expertise of the NMC and ELI communities. (The precise research methodology is detailed in the final section.) Many of the examples under each area feature the innovative work of NMC and ELI member institutions.

The format of the *Horizon Report* reflects the focus of the Horizon Project, which centers on the applications of emerging technologies to teaching, learning, and creative expression. Each topic opens with an overview to introduce the concept or technology involved and follows with a discussion of the particular relevance of the topic to education or creativity. Examples of how the technology is being—or could be—applied to those activities are given. Each description is followed by an annotated list of additional examples and readings which expand on the discussion in the *Report,* as well as a link to the list of tagged resources collected by the Advisory Board and other interested parties during the process of researching the topic areas.

Key Emerging Technologies

The technologies featured in the *2008 Horizon Report* are placed along three adoption horizons that represent what the Advisory Board considers likely timeframes for their entrance into mainstream use for teaching, learning, or creative applications. The first adoption horizon assumes the likelihood of entry within the next year; the second, within two to three years; and the third, within four to five years.

The two technologies placed on the first adoption horizon in this edition, *grassroots video* and *collaboration webs,* are already in use on many campuses. Examples of these are not difficult to find. Applications of *mobile broadband* and *data mashups,* both on the mid-term horizon, are evident in organizations at the leading edge of technology adoption, and are beginning to appear at many institutions. Educational uses of the two topics on the far-term horizon, *collective intelligence* and *social operating systems,* are understandably rarer; however, there are examples in the worlds of commerce, industry and entertainment that hint at coming use in academia within four to five years.

Each profiled technology is described in detail in the body of the report, including a discussion of what it is and why it is relevant to teaching, learning, and creative expression. Specific examples are listed there for each of the six topics, consistent with the level of adoption at the time the report was written (December 2007). Taken as a set, our research indicates that all six of these technologies will significantly impact the choices of learning-focused organizations within the next five years.

■ **Grassroots Video.** Virtually anyone can capture, edit, and share short video clips, using inexpensive equipment (such as a cell phone) and free or nearly free software. Video sharing sites continue to grow at some of the most prodigious rates on the Internet; it is very common now to find news clips, tutorials, and informative videos listed alongside the music videos and the

raft of personal content that dominated these sites when they first appeared. What used to be difficult and expensive, and often required special servers and content distribution networks, now has become something anyone can do easily for almost nothing. Hosting services handle encoding, infrastructure, searching, and more, leaving only the content for the producer to worry about. Custom branding has allowed institutions to even have their own special presence within these networks, and will fuel rapid growth among learning-focused organizations who want their content to be where the viewers are.

- **Collaboration Webs.** Collaboration no longer calls for expensive equipment and specialized expertise. The newest tools for collaborative work are small, flexible, and free, and require no installation. Colleagues simply open their web browsers and they are able to edit group documents, hold online meetings, swap information and data, and collaborate in any number of ways without ever leaving their desks. Open programming interfaces allow users to author tools that they need and easily tailor them to their requirements, then share them with others.

- **Mobile Broadband.** Each year, more than a billion new mobile devices are manufactured[1]— or a new phone for every six people on the planet. In this market, innovation is unfolding at an unprecedented pace. Capabilities are increasing rapidly, and prices are becoming ever more affordable. Indeed, mobiles are quickly becoming the most affordable portable platform for staying networked on the go. New displays and interfaces make it possible to use mobiles to access almost any Internet content—content that can be delivered over either a broadband cellular network or a local wireless network.

- **Data Mashups.** Mashups—custom applications where combinations of data from different

sources are "mashed up" into a single tool— offer new ways to look at and interact with datasets. The availability of large amounts of data (from search patterns, say, or real estate sales or *Flickr* photo tags) is converging with the development of open programming interfaces for social networking, mapping, and other tools. This in turn is opening the doors to hundreds of data mashups that will transform the way we understand and represent information.

- **Collective Intelligence.** The kind of knowledge and understanding that emerges from large groups of people is collective intelligence. In the coming years, we will see educational applications for both explicit collective intelligence—evidenced in projects like the Wikipedia and in community tagging—and implicit collective intelligence, or data gathered from the repeated activities of numbers of people, including search patterns, cell phone locations over time, geocoded digital photographs, and other data that are passively obtained. Data mashups will tap into information generated by collective intelligence to expand our understanding of ourselves and the technologically-mediated world we inhabit.

- **Social Operating Systems.** The essential ingredient of next generation social networking, social operating systems, is that they will base the organization of the network around people, rather than around content. This simple conceptual shift promises profound implications for the academy, and for the ways in which we think about knowledge and learning. Social operating systems will support whole new categories of applications that weave through the implicit connections and clues we leave everywhere as we go about our lives, and use them to organize our work and our thinking around the people we know.

As might be expected when studying emerging phenomena over time, some of these topics are related to, or outgrowths of, ones featured in previous editions of the *Horizon Report.*

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1 Jaques, Robert. (2007). One Billion Mobile Phones Shipped in 2006. *Computing, January 26, 2007.* Retrieved December 2007, from www.computing.co.uk/2173516.

Grassroots video (2008), for example, reflects the evolution of *user-created content (2007);* it has been singled out this year because it has emerged as a distinct set of technologies in common use that has broad application to teaching, learning, and creative expression.

Similarly, we have followed *mobile devices* with interest for the past several years. In 2006, multimedia capture was the key factor; mobiles became prolific recording devices for video, audio, and still imagery. Personal content storehouses were the focus of mobile in 2007; calendars, contact databases, photo and music collections, and more began to be increasingly and commonly stored on mobile devices over the past year. Now for 2008, we are seeing the effect of new displays and increased access to web content taking these devices by storm. Nonetheless, while there are abundant examples of personal and professional uses for mobiles, educational content delivery via mobile devices is still in the early stages. The expectation is that advances in technology over the next twelve to eighteen months will remove the last barriers to access and bring mobiles truly into the mainstream for education.

Critical Challenges

The Horizon Project Advisory Board annually identifies critical challenges facing learning organizations over the five-year time period covered by this report, drawing them from a careful analysis of current events, papers, articles, and similar sources. The challenges ranked as most likely to have a significant impact on teaching, learning, and creativity in the coming years appear below, in the order of importance assigned them by the Advisory Board.

- *Significant shifts in scholarship, research, creative expression, and learning have created a need for innovation and leadership at all levels of the academy.* This challenge has evolved over the past year and is a crucial one for teaching and learning. As the gap grows between new scholarship and old, leadership and innovation are needed at all levels of the academy—from students to faculty to staff and administrative leadership. It is critical that the

academic community as a whole embraces the potential of technologies and practices like those described in this report. Experimentation must be encouraged and supported by policy; in order for that to happen, scholars, researchers, and teachers must demonstrate its value by taking advantage of opportunities for collaboration and interdisciplinary work.

- *Higher education is facing a growing expectation to deliver services, content and media to mobile and personal devices.* This challenge is even more true today than it was a year ago. As new devices like the Apple *iPhone* and the LG Electronics *Voyager* are released that make content almost as easy to access and view on a mobile as on a computer, the demand for mobile content will continue to grow. Recent infrastructure changes have resulted in increased access areas for mobile devices, and there are clear applications of mobile technology for public safety, education, and entertainment. This is more than merely an expectation to provide content: this is an opportunity for higher education to reach its constituents wherever they may be.

- *The renewed emphasis on collaborative learning is pushing the educational community to develop new forms of interaction and assessment.* Collaborative experiences in virtual worlds are easy to find today compared to a year ago, when this challenge was first described. The results are encouraging, but more work is needed on the assessment side before the full potential of these kinds of activities can be realized. Issues like ownership of collaborative work and certification of authorship present difficulties for evaluation. Further development of social networking and other collaborative tools will continue to facilitate this kind of work, and opportunities for interaction will only increase; the challenge faced by the educational community is to seize those opportunities and develop effective ways to measure academic progress as it happens.

- *The academy is faced with a need to provide formal instruction in information, visual, and technological literacy as well as in how to create meaningful content with today's tools.* Web-based tools are rapidly becoming the standard, both in education and in the workplace. Technologically mediated communication is the norm. Fluency in information, visual, and technological literacy is of vital importance, yet these literacies are not formally taught to most students. We need new and expanded definitions of these literacies that are based on mastering underlying concepts rather than on specialized skill sets, and we need to develop and establish methods for teaching and evaluating these critical literacies at all levels of education. The challenge is to develop curricula and assessment rubrics that address not only traditional capabilities like developing an argument over the course of a long paper, but also how to apply those competencies to other forms of communication such as short digital videos, blogs, or photo essays.

These challenges are a reflection of the impact of new practices and technologies on our lives. They are indicative of the changing nature of the way we communicate, access information, and connect with peers and colleagues. Taken together, they provide a framing perspective with which to consider the potential impacts of the six technologies and practices described in this edition of the *Horizon Report.*

Significant Trends

Each year the Horizon Advisory Board also researches, identifies and ranks key trends affecting the areas of teaching, learning, and creative expression. The Board reviews current articles, interviews, papers, and published research to discover emerging or continuing trends. The trends are ranked according to how significant an impact they are likely to have on education in the next five years. The top trends are presented below in priority order, as ranked by the Advisory Board.

- *The growing use of Web 2.0 and social networking—combined with collective intelligence and mass amateurization—is gradually but inexorably changing the practice of scholarship.* The proliferation of tools that enable co-creation, mashups, remixes, and instant self-publication is remaking the traditional model of academic publication and has growing implications for tenure and merit systems. Web 2.0 and social networking tools are increasingly being adopted for educational use. In the sciences especially, amateur scholars are juxtaposing data into "data mashups" and creating sophisticated visual representations that add to the body of knowledge in compelling ways. Taken together, the increased use of these technologies indicates a steady change in the way scholarship is undertaken and perceived.

- *The way we work, collaborate, and communicate is evolving as boundaries become more fluid and globalization increases.* This trend, noted in last year's *Horizon Report* as well, still is having enduring impact, and continues to expand learning and creative possibilities. With the increasing availability of tools to connect learners and scholars all over the world—online collaborative workspaces, social networking tools, mobiles, *Skype,* and more—it is increasingly common to see courses that include international students who meet online or incorporate connections between classrooms in different areas of the world.

- *Access to—and portability of—content is increasing as smaller, more powerful devices are introduced.* Electronic book readers like the Amazon *Kindle* and small but powerful web-enabled devices like the Apple *iPhone* and the LG Electronics *Voyager* make it possible to carry vast amounts of information in a small package. Movies, books, email, and more are available on these lightweight, portable platforms and given the pace of innovation in this market, ever increasing capabilities and happily decreasing prices, their use will only grow in influence.

- *The gap between students' perception of technology and that of faculty continues to widen.* Students and faculty continue to view and experience technology very differently. Students have embraced social technologies like *Facebook* and many similar platforms in unprecedented numbers, yet these technologies remain a mystery to many on campuses. Webware tools with clear potential for education are meeting the same reception: faculty are often either unaware of tools like *Google Docs* and *Swivel,* or have difficulty integrating them into educational processes. Serving to expand this gap is the withering pace of emerging technology, and even old technology hands often tire at the thought of learning yet another new way of working. At the same time, student expectations are important, and successful learning-focused organizations have long known they ignore these expectations at their peril.

After Five Years: The Metatrends

This is the fifth edition of the *Horizon Report,* and it seems appropriate after five years to reflect on the sorts of patterns in the recent evolution of emerging technology that can only be seen over time. After five years, it is clear that the 175 people who have served on the Horizon Project Advisory Boards over that time have been remarkably prescient—without exception, the topics in the past five *Horizon Reports* have proved to be worthy of our attention. At the same time, we have seen many of the technologies and practices highlighted in this series converge, morph, and shift over the years, evolving in ways that continue to keep them in our sights as they move to nearer and nearer adoption horizons. Some of them have already become quite commonplace and are integrated into our everyday activities; others are clearly still with us, their current form influenced by parallel developments that are pushing them in one direction or another. While the currents and eddies of emerging technology are complex, it is clear that the *Report* has been following at least seven metatrends with some regularity.

These seven metatrends include the evolving approaches to communication between humans and machines; the collective sharing and generation of knowledge; computing in three dimensions; connecting people via the network; games as pedagogical platforms; the shifting of content production to users; and the evolution of a ubiquitous platform. What is remarkable is that each year the Advisory Board is reconstituted; more than half are new every year, with Advisors chosen from many industries, countries, and backgrounds.

Nonetheless, after five years, it is quite easy to see clear conceptual threads that this diverse and changing group has returned to time and time again. We believe it indicates a sustained interest and continued belief that these pathways of innovation and technological evolution will affect the long-term practice of teaching, learning and creative expression. Some of them already have.

While there is not room here to discuss them all, three metatrends are discussed in the paragraphs that follow. One that seems especially notable is the collective sharing and generation of knowledge, which was discussed in the very first *Horizon Report,* and has appeared in one form or another in every report since. Learning objects were an early attempt at this, but advances in intelligent searching eclipsed the need for complex metadata schema in the eyes of many, and laid the foundations for what we called knowledge webs, a topic that also first appeared back in 2004. In the larger picture, it is clear that this metatrend is mapped over nine years (2004-2012), and the current *Report* reaches into the future to describe technologies that we will not see entering mainstream use for learning for some time yet, such as mashups, new scholarship, and collective intelligence. By considering the pattern over these several years, it is easy to see that tools to aid and enhance collective sharing and generation of knowledge have been present for many years and continue to develop.

Connecting people through the network is a second metatrend that should be highlighted here. Ubiquitous wireless enabled a host of technologies like extended

learning, social computing, and social networking—all of which have been fueled by the emergence of anytime, anywhere access provided by wireless networks. In turn, the practice of extended learning contributed to the development of global learning communities. Extended learning approaches, so commonplace today, were the first steps at the time toward the application of social computing and social networking to teaching, learning, and creative expression. Social networking has steadily continued to be a major influence, retaining ties to knowledge webs and social computing while remaining distinct from both. The next phase for connecting people through the network has been identified as the emergence of social operating systems—tools that not only recognize our social connections, but will expose information in entirely new ways that will make these networks richer and more fluid.

Moving the computer into three dimensions has been an equally interesting and recurring theme that is now clearly a metatrend, with a mapping currently spanning the years between 2004 and 2010. In this case, development has been extensive, with the emergence of vector-based animation tools allowing simple 3D representations in 2004, and the growth of physical 3D outputs in the form of rapid prototyping over 2005 and 2006. Virtual and augmented reality began to find traction around that time as well, and today nearly every learning organization is exploring some form of virtual reality, either in direct learning applications taking place in platforms like *Open Croquet* or *Second Life,* or in research settings, where enhanced visualization tools are probing the depths of rich data sets for new learning and knowledge.

Each edition of the *Horizon Report* to date has targeted technologies or practices that fall somewhere along the path of one of these metatrends. With the benefit of time, it is easy to see that often one technology's adoption paves the way for others down the road. Technologies that feel natural today now have roots in those that appeared on the mid or far horizons in earlier editions of the Report. It is likely that those that appear on the far horizon today will similarly influence the development of technologies that will be the focus of future *Horizon Reports.*

The seven metatrends are described in more detail on the Horizon Project wiki (horizon.nmc.org/wiki), where you are invited to participate in an ongoing discussion taking place about them.

About the Horizon Project

Since the launch of the Horizon Project in March 2002, the NMC has held an ongoing series of conversations and dialogs with hundreds of technology professionals, campus technologists, faculty leaders from colleges and universities, and representatives of leading corporations. Each year, an Advisory Board considers the results of these dialogs and also looks at a wide range of articles, published and unpublished research, papers, scholarly blogs, and websites to generate a list of technologies and practices, trends, challenges, and issues that knowledgeable people in technology industries, higher education, and museums are thinking about.

The project uses qualitative research methods to identify the technologies selected for inclusion in each annual report, beginning with a survey of the work of other organizations and a review of the literature with an eye to spotting interesting emerging technologies. When the cycle starts, little is known, or even can be known, about the appropriateness or efficacy of many of the emerging technologies for these purposes, as the Horizon Project expressly focuses on technologies not currently in widespread use in academe. In a typical year, 75 or more of these technologies may be identified for further investigation; for the *2008 Report,* more than 80 were considered.

By engaging a wide community of interested parties, and diligently searching the Internet and other sources, enough information is gathered early in the process to allow the members of the Advisory Board to form an understanding of how each of the discovered technologies might be in use in settings outside of academe, to develop a sense of the potential the technology may have for higher education settings, and to envision applications of the technology for teaching, learning, and creative expression. The findings are discussed in a variety of settings—with

faculty, industry experts, campus technologists, and of course, the Horizon Advisory Board. Of particular interest to the Advisory Board every year is finding educational applications for these technologies that may not be intuitive or obvious.

To create the *2008 Horizon Report,* the 36 members of this year's Advisory Board engaged in a comprehensive review and analysis of research, articles, papers, blogs, and interviews; discussed existing applications, and brainstormed new ones; and ultimately ranked the items on the list of candidate technologies for their potential relevance to teaching, learning, and creative expression. Most of this work took place online over the fall of 2007. From the more than 80 technologies originally considered, the twelve that emerged at the top of the initial ranking process—four per adoption horizon— were extensively researched and cast in the format

of the *Horizon Report.* Once these semifinalists were identified, a significant amount of time was spent researching applications or potential applications for each of the areas that would be of interest to practitioners.

With the benefit of the full picture of how the topic would look in the report, the list of semifinalists was then ranked yet again. The six technologies and applications that emerged at the top of the final rankings—two per adoption horizon—are detailed in the sections that follow. Those descriptions are the heart of the *2008 Horizon Report,* and will fuel the work of the Horizon Project throughout 2008-09. The research aspects of the project, many of which are ongoing and build on the work in the *Report,* are detailed in the section on methodology which follows the descriptions of the six emerging technologies that are profiled in this year's report.

GRASSROOTS VIDEO

Time-to-Adoption Horizon: One Year or Less

Video is everywhere—and almost any device that can access the Internet can play (and probably capture) it. From user-created clips and machinima to creative mashups to excerpts from news or television shows, video has become a popular medium for personal communication. Editing and distribution can be done easily with affordable tools, lowering the barriers for production. Ubiquitous video capture capabilities have literally put the ability to record events in the hands of almost everyone. Once the exclusive province of highly trained professionals, video content production has gone grassroots.

Overview

Over the past few years, the ways we produce, use and even think about video have undergone a profound transformation. Literally millions of videos are just a click away for any Internet-connected user. As the numbers and quality of user-produced clips have increased, our notions of what constitutes useful or engaging video have been redefined—and more and more, it is a two to three minute piece designed for viewing in a three-inch browser window or on a mobile phone. That same phone is often the video capture device, with surprisingly high quality when viewed on a small screen.

Tools for assembling and editing clips are free or extremely low cost and make it easy for amateurs to get good results without investing in expensive equipment, software, or training. A new class of online toolsets do much of the work for you. *FixMyMovie* (www.fixmymovie.com), for example, enhances the quality of digital video and optimizes it for online distribution. Literally dozens of web communities offer easy-to-access outlets for distribution and richly featured search and tagging functions.

With video capture and editing tools in the hands of more and more people all the time, we are at the point where virtually any event may be caught on video, by virtually anyone. The proliferation of video is due in large part to how easy it has become to share clips. In January 2007 alone, 7.2 billion videos were viewed online by nearly 123 million Americans, or 70 percent of the total Internet audience in the U.S.[2] Video content is as easy to post to the Internet as is text,

2 Lipsman, Andrew. (2007). 'Primetime' U.S. Video Streaming Activity Occurs on Weekdays Between 5-8 P.M. *Comscore Press Release, March 21, 2007.* Retrieved December 2007, from www.comscore. com/press/release.asp?press=1264.

and in some cases, even easier. Sharing sites like *YouTube, Google Video, Viddler,* or *Blip.tv* accept a variety of common formats, and transparently handle the intricacies of conversion and distribution.

Some sharing sites are designed to handle live streams, allowing users to create their own broadcast shows with a webcam; *UStream* (www.ustream. tv) is one example. *Mogulus* (www.mogulus.com) is a service currently in beta that enables users to produce their own shows by collaborating online with other producers, mixing live and prerecorded content from around the web, and broadcasting live in real time. *Stickam* (www.stickam.com) is a similar service that lets users build social networks around their broadcasts—viewers can chat with the producer and with each other while they are watching. Many of these services provide embedding code that lets users place their streams on their blogs or other websites. The effect of all these developments is that the capacity for video production has been distributed to the grassroots level, to the point that even major news outlets routinely feature audience-captured cell phone videos of breaking news stories.

Relevance for Teaching, Learning, and Creative Expression

As the costs of production and distribution for video have dropped to nearly zero, many of the barriers to using in learning and creative situations have fallen away. Rather than investing in expensive infrastructure, universities are beginning to turn to services like *YouTube* and *iTunes U* to host their video content for them. As a result, students—whether on campus or across the globe—have access to an unprecedented

and growing range of educational video content from small segments on specific topics to full lectures, all available online. Hosting services like *YouTube* and *iTunes U* even provide institutional "channels" where content can be collected and branded.

With video easily produced on all manner of inexpensive devices from phones to pocket cameras, faculty have more options than ever before to incorporate video into their curricula. Video capture, in the hands of an entire class, can be a very efficient data collection strategy for field work, or as a way to document service learning projects. Video papers and projects are increasingly common assignments. Student-produced clips on current topics are an avenue for students to research and develop an idea, design and execute the visual form, and broadcast their opinion beyond the walls of their classroom.

Institutions are offering courses in new media production and new media literacy that take advantage of the inexpensive tools, distribution and editing services, and social networking communities that have evolved around video. New media courses are examining the phenomenon of video creation and sharing itself; one example, offered at Pitzer College, required student commentary to be created in video form and published on *YouTube.* Faculty at Elon University use digital storytelling approaches to reinforce research topics; student teams collaborate to develop and produce a digital story that extends the traditional research paper. The technique is used in a variety of disciplines at Elon, including computing sciences, philosophy, mathematics, Spanish, and French.

The popularity of video is providing new outlets for creativity and enabling literally millions of individual voices to be heard. In education, politics, and other arenas, people are using video rhetorically to persuade others and articulate points of view. Amateur cinematographers and musicians use hosting sites to reach a broader audience for their work and to build a network of fans. Increasingly, learning organizations, faculty, scholars, and students are using these tools as well, and in the coming year, it is very likely that such practice will enter the mainstream of use in these institutions.

A sampling of grassroots video applications across disciplines includes the following:

- **Information Technology.** Secondary school students from five schools in five different countries researched and envisioned the future of education and society through the framework of the *2007 Horizon Report,* capturing their work in a wiki. They then produced nearly twenty short videos about the topics in the Report and shared them via *YouTube.* See the results at www.youtube.com/results?search_query=horizonproject07.

- **Mathematics.** Two professors at the University of Minnesota used a 3-D animation to illustrate Möbius transformations. The simple video illustrates the mathematical concept in a way that seems to have sparked the imaginations of a wide range of viewers. The video has been watched more than 1.2 million times since it was put on *YouTube.* See the clip at ca.youtube.com/watch?v=JX3VmDgiFnY.

- **Studio Art.** At the University of Mary Washington, students in the course "Approaches to Video Art" study video as an art form and then create short video pieces as final projects. To see the students' work and read about how the course progressed over the course of the term, visit the course blog at cgar.umwblogs.org/.

Examples of Grassroots Video

The following links provide further examples of video applications being developed at the grassroots level.

MERLOT ELIXR
elixr.merlot.org
> The MERLOT ELIXR project uses digital case stories to encourage the adoption of exemplary classroom practices in higher education.

MIT Tech TV
techtv.mit.edu
> MIT *Tech TV* makes it easy for the MIT community to find and share video related to science, technology, or the community.

Learning From YouTube: MS135 at Pitzer College
www.youtube.com/mediapraxisme

In a new media studies class at Pitzer College, students investigate what can be learned from *YouTube.* Throughout the process, the professor writes frankly about the experience on her blog: wordpress.com/tag/learning-from-youtube/.

Custom YouTube Channels: University of California, Berkeley; UMBCtube; University of New South Wales
www.youtube.com/ucberkeley;
www.youtube.com/umbc;
au.youtube.com/user/unsw

Courses from UC Berkeley are available on its own specially branded *YouTube* channel, an approach also used by the University of New South Wales. *UMBCtube,* a custom *YouTube* channel for the University of Maryland Baltimore County, allows the campus to blend community-generated content with institutional video offerings. *UMBCtube* is designed to complement UMBC's main course media portal on *iTunes U.*

VideoANT
ant.umn.edu

VideoANT is an online environment developed at the University of Minnesota that synchronizes web-based video with an author's timeline-based text annotations. VideoANT is designed to engage learners by supporting interactions between students, instructors, and their video content.

For Further Reading
The following articles and resources are recommended for those who wish to learn more about grassroots video.

I Ustreaming Your Ustream: Tha's a Twitter of an Idea!
travelinedman.blogspot.com/2007/12/
i-ustreaming-your-ustream-thas-twitter.html

(Curt Bonk, TravelinEdMan, December 17, 2007.) A professor describes the serendipitous connections made during a talk he gave that happened to be Ustreamed by a member of the audience.

On YouTube, No Enrollment Caps
insidehighered.com/news/2007/10/04/youtube

(Andy Guess, Inside Higher Ed, October 4, 2007.) This article describes the University of California, Berkeley's course offerings on *YouTube* and compares them to content available on *iTunes U* and on Berkeley's internal video portal.

Video Toolbox: 150+ Online Video Tools and Resources
mashable.com/2007/06/27/video-toolbox/

(Mashable Team, Mashable, June 27, 2007.) This is a comprehensive, annotated list of online video creation, editing, and sharing tools.

Virginia Tech Launches First Major University YouTube Contest
www.vtnews.vt.edu/story.php?relyear=2007&itemno=109

(Mark Owczarski, Virginia Tech News, February 28, 2007.) This news announcement describes a competition for *YouTube* videos about the Virginia Tech campus.

del.icio.us: Grassroots Video
del.icio.us/tag/hz08+video

(Horizon Advisory Board and Friends, 2007.) Follow this link to find resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz08" and "video" when you save them to *del.icio.us.*

COLLABORATION WEBS

Time-to-Adoption Horizon: One Year or Less

In today's workplace, be it in education or industry, it is not unusual for a typical work week to include a virtual meeting or conference. Tools to support collaborative online work are easy to find and uncomplicated to use. Any networked computer can serve as a multi-function videoconference room, a gateway to a gathering in a virtual world, or a joint workstation where several people can author the same documents together. Virtual collaboration has been made increasingly seamless by a host of complimentary developments in networking infrastructure, social networking tools, web applications, and collaborative workspaces.

Overview

As the typical educator's network of contacts has grown to include colleagues who might live and work across the country, or indeed anywhere on the globe, it has become common for people who are not physically located near each other to collaborate on projects. In classrooms as well, joint projects with students at other campuses or in other countries is more and more commonplace as a strategy to expose learners to a variety of perspectives. Fueling these sorts of contacts, of course, is the Internet, the very existence of which has done much to dissipate the constraints once imposed by distance.

Indeed, web-based tools and collaborative work-spaces that support a range of activities from productivity-type tasks to fully fledged virtual conferences have been available for some time, but these platforms have often been expensive. Developments in two key areas, however, have resulted in tools that are now quite inexpensive and often free. These tools require no special installation or setup, are designed to be used within a web browser, produce materials that can be easily shared, and offer a convenience and flexibility that can make virtual collaborations both simple and highly productive.

The first area of development has been an explosion of straightforward tools that allow people to break work into small easy-to-accomplish pieces that a team of people can work on together or in parallel. Examples are tasks like writing a document, building a budget, assembling a presentation, or creating a digital story. Webware suites like *Zoho Office* (www.zoho.com) and *Google Docs* (docs.google.com) offer the most common features that off-the-shelf packages provide, including word processing, spreadsheets, presentation tools, and more, without the need to buy or install any software. Significantly, the ability to share documents and collaborate on content creation is built into the core functionalities of these toolsets.

A wide variety of webware applications exist to manage the creation and workflow of rich media projects as well (see www.splashup.com for photos and www.jumpcut.com for videos, to name just two examples); capture a sketch with audio narration (www.sketchcast.com); or publish presentations and slideshows (www.slideshare.net; www.slide.com).

The second area of development has been in online collaborative workspaces that serve as a hub where a group of people can easily work, share resources, capture ideas, and even socialize. In contrast to productivity applications, which enable users to perform a specific task or create a particular product, collaborative workspaces are "places" where groups of people gather resources or information related to their personal or professional lives. The most popular of these tools are highly flexible and can be adapted to almost any project. At the same time, these spaces conveniently lend themselves to almost seamless integration of content from other online resources, often quite transparently. Examples include do-it-yourself social networks like *Ning* (www.ning.com); sharable personalized start pages that are "pagecast"—shared, in other words—from services like *Netvibes* (www.netvibes.com) or *Pageflakes* (www.pageflakes.com); and social networks like *Facebook* (www.facebook.com).

Taken together, these tools are fostering collaboration webs that span almost every discipline. It is increasingly common to see custom workplaces for projects and collaborations. They are easy to create, and they allow people to jointly collaborate on complex projects using low-cost, simple tools.

Relevance for Teaching, Learning, and Creative Expression

The essential attribute of the technologies in this set is that they make it easy for people to share interests and ideas, work on joint projects, and easily monitor collective progress. All of these are needs common to student work, research, collaborative teaching, writing and authoring, development of grant proposals, and more. Using them, groups can collaborate on projects online, anywhere there is Internet access; interim results of research can be shared among a team, supporting illustrations and tables created, and all changes and iterations tracked, documented, and archived. In class situations, faculty can evaluate student work as it progresses, leaving detailed comments right in the documents if desired in almost real time. Students can work with other students in distant locations, or with faculty as they engage in fieldwork.

The bar for widespread participation is very low, since the software to support virtual collaboration is low cost or free, and available via a web browser. Students can access the same materials from any computer, whether it is theirs or one in a computer lab. Support needs are greatly reduced as nothing needs to be installed or upgraded.

A virtual collaborative workspace for a course or study group can be assembled quickly using tools, or widgets, that can pull information from a variety of sources, including *Flickr, Twitter, MySpace* or *Facebook,* news and weather feeds, *Del.icio.us,* blog feeds and more. For example, a custom course workspace could include a calendar widget populated with data from the school's online calendaring system, an RSS feed that displays students' and professors' recent blog posts or *Twitter* updates, a course-created tag cloud on *Del.icio.us,* a *Flickr* badge featuring related photos, and a whiteboard widget where course members can leave messages

for one another. All the information the group needs can be accessed and contributed to by any of them in a virtual space accessible from any computer.

The same tools can be used to set up a personal portfolio where a student can display his or her work in any form—photos, blog posts, shared videos, and more can be pulled to the page by widgets that grab the student's contributions on other sites. Complementary webware tools make it possible for students to easily incorporate multimedia into their work. Videos, audio clips, and images can all be edited online using free tools like those mentioned above, then easily published and shared using any of a number of online services.

As new work is blogged, podcast, or posted, a portfolio page created with these tools will automatically update with the most current content. Using similar approaches, online conferences and symposia can offer session archives that persist over time; simply request that participants use a particular tag when they post related content, and the widgets will continue to update the conference page as new content appears.

A sampling of applications of collaboration webs across disciplines includes the following:

- **Art.** Two art appreciation courses at Arkansas State University pull in current events, student work, topical blog posts by art scholars and researchers, and more. Instead of the campus LMS, the courses use *Facebook* as their primary interaction and information tool.

- **Business.** A course in Digital Entrepreneurship at Rochester Institute of Technology created a *Ning* network on the topic, bringing undergrads enrolled in the course into contact with over a hundred graduate students, venture capitalists, faculty, practitioners, and business owners around the world.

- **Educational Technology.** An educational technology course at George Mason University uses *Pageflakes* as the hub of a learning community. Content is dynamically assembled from a variety of timely sources, integrating it with student work from *Flickr* and other sources, all via RSS.

- **Multi-Disciplinary Studies.** The Flat Classroom Project (flatclassroomproject.ning.com) uses a *Ning* workspace to create a sense of space that is shared by students located in the U.S. and in Qatar. Students use the site to share information about each other, collect resources and information, showcase multimedia clips and other class projects, provide access to course materials, and participate in forums used to support group discussions and interactions.

Examples of Collaboration Webs

The following links provide examples of collaboration webs and the tools that support them.

Digital Entrepreneurship Community
digent.rit.edu

> This community, created by business faculty at the Rochester Institute of Technology, is comprised of students, faculty, professionals, venture capitalists, and other interested parties from around the world. To visit the community page, use the login "digentguest@gmail.com" and the password "ritdigent" (or your own *Ning* identity).

DIVA
diva.sfsu.edu

> San Francisco State University's Digital Information Virtual Archive (DIVA) blends repository services, content development tools, personal file management and sharing capabilities, and private workspaces to allow faculty to collaborate on course materials and leverage one another's work.

Google Apps at Arizona State University
www.asu.edu/emailsignup/

> Arizona State University offers *Google* applications, including mail, calendaring, and chat to its 65,000 students.

Melbourne 2051 at Victoria University
www.melbourne2051.com

> Victoria University's *Melbourne 2051* project combines traditional writing with digital storytelling in the form of a virtual world setting built by students.

National Forum on Canadian History
www.pageflakes.com/cnhs/14568889

> The National Forum on Canadian History is a one-day event with its own pagecast, including documents, photos and videos.

Skoolaborate
www.skoolaborate.com

> *Skoolaborate* is a global project that uses a mix of technologies (blogs, LMS, wikis and virtual worlds) for collaborative learning.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about collaboration webs.

Educational Uses of Google Docs & Spreadsheets
www.tltgroup.org/FridayLive/20070309Google DocsEdUsesResources.htm

> *(Steve Gilbert, Cynthia Russell, TLT-SWG, March 8, 2007.)* This resource page by The Teaching, Learning and Technology Group features materials about the educational use of Google Docs & Spreadsheets.

MPK20: Sun's Virtual Workplace
research.sun.com/projects/mc/mpk20.html

> *(Sun Microsystems Website, retrieved November, 2007.)* This page describes Sun's virtual workplace (MPK20), how it came about, and how it is used within the company.

Nine Ways to Build Your Own Social Network
www.techcrunch.com/2007/07/24/9-ways-to-build-your-own-social-network

> *(Mark Hendrickson, TechCrunch, July 24, 2007.)* This blog post describes nine tools that can be used to build collaborative workspaces.

Pageflakes, Netvibes Take on Social Networks: What Chance Do They Have?
www.readwriteweb.com/archives/pageflakes_ netvibes_take_on_social_networks.php

> *(Richard MacManus, Read/Write Web, July 22, 2007.)* This blog post discusses the emergence of services like *Pageflakes* and *Netvibes* and compares them to large social networking sites like *Facebook.*

Using Pageflakes as a Student Portal

weblogg-ed.com/2006/using-pageflakes-as-student-portal/

> *(Will Richardson, weblogg-ed, November 21, 2007.)* This blog post describes how to set up a *Pageflakes* portal for educational purposes.

What's Driving Adoption of Rich Internet Applications?

blogs.zdnet.com/Stewart/?p=634

> *(Ryan Stewart, The Universal Desktop, November 19, 2007.)* This blog post examines possible reasons why webware apps are growing in popularity and use.

del.icio.us: **Collaboration Webs**

del.icio.us/tag/hz08+virtualcollab

> *(Horizon Advisory Board and Friends, 2007.)* Follow this link to find additional resources tagged for this topic and this edition of the *Horizon Report.* To add to this list, simply tag resources with "hz08" and "virtualcollab" when you save them to *del.icio.us.*

MOBILE BROADBAND

Time-to-Adoption Horizon: Two to Three Years

Mobile devices have come a long way in the past few years. From portable (if bulky) telephones they became slim little cameras, audio recorders, digital video recorders, pocket datebooks, photo albums, and music players. Now they are video players, web browsers, document editors, news readers, and more. The technology and infrastructure have developed to the point where mobile devices are becoming essential tools, bringing the whole of the Internet and all your social connections to the palm of your hand.

Overview

We have followed mobile devices with interest for the past several years. In 2006, the *Horizon Report* described how multimedia capture had come to mobile phones, bringing the capability to record and play video, audio, and still imagery to small, portable devices that people carry routinely. A year later, mobiles were established as the storehouse of our digital lives, holding our calendars, to-do lists, photo and music collections, contact databases, and more. Driven by the innovation only possible in a market where more than a billion devices are built each year,[3] the feature sets of mobile phones continue to expand enormously.

Today, mobiles are increasingly about networking on the go. Better displays and new interfaces make it easier to interact with an ever-expanding variety of content—not just content formatted specially for mobiles, but nearly any content available on the Internet. Mobiles now keep us in touch in almost all the ways that laptops used to: with email, web browsing, photos and videos, documents, searching and shopping—all available anywhere without the need to find a hotspot or a power outlet.

Newer, longer-lasting batteries keep our mobiles alive for longer trips between charges. Today's mobiles are smaller, slimmer, and more powerful than ever before. Storage capacity has significantly increased, and some mobiles can even store and play back multiple feature-length films—perfect for long airplane rides.

3 Jaques, Robert. (2007). One Billion Mobile Phones Shipped in 2006. *Computing, January 26, 2007.* Retrieved December 2007, from www.computing.co.uk/2173516.

Even the days of having to buy a new phone to take advantage of the latest features are coming to an end. As more features are embedded in the software, the physical device will become more flexible simply by receiving the latest software updates. Open APIs (application programming interfaces) are already encouraging the creation of special add-on software that will offer even more services; those "widgets," combined with the growing array of webware applications will make mobiles as capable as computers for doing many everyday tasks. Smaller and less expensive than a laptop, yet increasingly useful, the mobile is fast becoming the ultimate portable computer.

Relevance for Teaching, Learning, and Creative Expression

The fact that many students already own and carry mobiles remains a key factor in their potential for education. Added to that is the tremendous pace of innovation in this sector, where intense competition is driving continual advancements. The feature sets of the most recent high-end phones have moved these devices into an entirely new class. Just as we have seen with cell phone cameras, as innovation continues, prices for established features will drop considerably. Over the time frame of this adoption horizon, it is expected that mobile broadband, full-featured Internet, touch-screen interfaces, remotely upgradeable software, and high-quality displays will become as common as cameras are today.

Mobiles, of course, were always designed to enable people to keep in touch, and in addition to voice, today's mobiles offer a multitude of ways to connect with peers and colleagues. Users now use their phones to post to their blogs, send updates to

services like *Twitter* and *Utterz,* add appointments to online calendars, find friends in their immediate area, signal the campus police to keep an eye on their whereabouts as they move across campus, and more. Students doing fieldwork are using mobiles to take notes and photographs and send them directly to a course blog, where they receive instructor feedback; colleagues using virtual collaboration tools have access to materials while traveling or otherwise away from their computers. The combination of social networking and mobility lets students and colleagues collaborate from anywhere they happen to be. Add to that connectivity the multimedia capacities of phones, and the storage they offer for podcasts, videos, photos, PDF files and even documents and spreadsheets, and it is not hard to see why phones are increasingly the portable tool of choice.

A sampling of learning-related mobile broadband applications includes the following:

- **Engineering.** Broadband-enabled cell phones can be used to remotely monitor structures, equipment, and processes in real time, and via web control interfaces can even be used as remote control platforms.

- **Museum Education.** Mobile phones are being used in museums as a delivery platform for supplemental content, with podcasts, multimedia, and video learning being delivered directly into the gallery. The promise of handhelds as an alternative to wands and audio tours is being fulfilled by phones that have geolocation capabilities.

- **Service Learning.** A planning, public policy and management course at the University of Oregon uses GIS-enabled mobile devices to collaborate on projects with the community in Eugene, Oregon. Students work with community members to develop resources such as safe walking route maps, reports of local area conditions, and sidewalk walkability surveys.

- **Social Sciences.** Students and researchers can use their mobile phones as data collection devices for fieldwork in the social sciences and

related disciplines. Interviews, sites, and artifacts can easily be captured in short video or audio segments; similarly, photographs can record events or evidentiary information. Broadband-enabled phones allow rich media to be shared in close to real time. With field access to the Internet, field workers can enter data directly into databases as it is collected, or access experts and knowledge banks as needed.

Examples of Mobile Broadband

The following links provide examples of mobile broadband applications.

Montclair State University

www.montclair.edu/Publications/News/NewsRelease0807technology.html

Initially, Montclair State University started requiring students to own mobile phones as a campus security measure. Now, mobile technology has become an integral component of project-based learning activities in several disciplines that involve blogging, polling, and video podcasts. Course groups are created that allow students to discuss study-related questions; the Office of Information Technology reports that since many of MSU's students commute, mobiles are very effective tools for creating a feeling of connectedness with the university.

Pocket Virtual Worlds

www.pocketvirtualworlds.com

Faculty and students at Bowling Green State University and Case Western Reserve University have developed a program that creates a 3D virtual space which they can explore via a screen on their mobile phone; the representation of the virtual surroundings changes as the user moves. The goal is to enable classroom-bound students to take "virtual field trips" of locations like the Amazon rainforest, with classroom projects and discussion launched from what they "see" around them. Since the program can use digitally-created images as well as photographs, students could also theoretically explore outer space or locations in history.

Wiki City Rome
senseable.mit.edu/wikicity/rome/

> MIT's Wiki City Rome project maps events and movement through the city in a 24-hour festival period using cell phone and other data. The Notte Bianca implementation allows people to access the real time data on dynamics that occur in the very place they find themselves in, in that moment, creating the intriguing situation that the map is drawn on the basis of dynamic elements of which the map itself is an active part.

ZoneTag
zonetag.research.yahoo.com

> *ZoneTag* is an application for mobile phones that enables photos taken on the phone to be instantly tagged with location information and uploaded to *Flickr,* right from the phone.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about mobile broadband.

iPhone vs Mobile Web
www.readwriteweb.com/archives/iphone_vs_mobile_web.php

> *(Richard MacManus, Read/Write Web, August 7, 2007.)* This blog post summarizes and comments on a Forrester report comparing the *iPhone,* which can browse normal web content, and content designed specially for mobiles.

Invention of the Year: The iPhone
w w w . t i m e . c o m / t i m e / s p e c i a l s / 2 0 0 7 / article/0,28804,1677329_1678542_1677891,00. html

> *(Lev Grossman, TIME, 2007.)* This article cites five reasons why the *iPhone* is "still the invention of the year" for 2007.

Mobile Productivity Toolbox: 45+ Mobile Productivity Tools
mashable.com/2007/08/21/mobile-productivity-toolbox/

> *(Johsua Ho, Mashable, August 21, 2007.)* This is an annotated list of mobile tools for phones and WAP enabled web sites, grouped by what the tool is designed to do.

So Much More than Phone Calls
betch.edublogs.org/2007/10/10/so-much-more-than-phone-calls/

> *(Chris Betcha, Betchablog, October 10, 2007.)* An Australian educator shares the tools he uses on a broadband-enabled cell phone.

del.icio.us: Mobile Broadband
del.icio.us/tag/hz08+mobile

> *(Horizon Advisory Board and Friends, 2007.)* Follow this link to find resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz08" and "mobile" when you save them to *del.icio.us.*

DATA MASHUPS

Time-to-Adoption Horizon: Two to Three Years

Overlay the location of every Flickr photo tagged with "bluejay" on a map of the United States and see where people are finding blue jays (www.flickr.com/map). See Twitter updates from your geographical area (www.twittermap.com) or follow the global progress of the public stream (www.twittervision.com). Each of these applications is a mashup: a combination of data from multiple sources in a single tool. Mashups have been around for several years, but in recent months they have captured greater interest, due in part to a broader exposure from their integration with social networking systems like Facebook. While most current examples are focused on the integration of maps with a variety of data, it is not difficult to picture broad educational and scholarly applications for mashups.

Overview

A *mashup* is a web application that combines data from more than one source via a single, unified tool.[4] Mashups are often about data visualization, but they can also be creative products of other kinds—indeed, the term "mashup" originates from the music industry—such as assorted film and music clips assembled into parodies of well-known productions, for instance. Data mashups are powerful tools for navigating and visualizing datasets; understanding connections between different dimensions such as time, distance, and location; juxtaposing data from different sources to reveal new relationships; and other purposes.

Tools like Google's *Mashup Editor* (code.google.com/gme/) make it relatively easy to create applications that grab online data, organize it, and display it the way the author wants. For example, the U.S. Environmental Protection Agency (EPA) has created a *Google Earth* mashup that generates maps of the U.S. displaying air quality based on the amount and kind of pollutants emitted by businesses (www.epa.gov/air/emissions/where.htm). This mashup requires viewers to download and install *Google Earth,* a free application; but most mashups are web-based and require no download. One such mashup, created by László Kozma, combines data from *Wikipedia* and *Google Maps* to identify the location of authors posting updates to *Wikipedia* almost in real-time (www.lkozma.net/wpv/).

4 *Wikipedia,* "mashup (web application hybrid)," retrieved December 2007.

Yahoo! Pipes (pipes.yahoo.com) is another mashup authoring tool. *Pipes* allows users to combine, filter, and display RSS content from all over the web. Finished "pipes" can then be published, shared, and embedded in other web pages. A pipe could pull updates from a handful of educational blogs, for instance, filtering the posts so that only those about technology, say, or physics, are received. Developers can also create and add additional modules to expand the functionality of the authoring tool. A specially formatted version is available for the *iPhone* (iphone.pipes.yahoo.com) that includes a "map" button to plot the results of any geographic pipe onto the *iPhone's* Google map with a single tap.

Geotagging, the practice of adding geographical metadata like latitude, longitude, altitude, and/or placenames to images, websites, or other media, has already ushered in compelling forms of data mashups that illustrate the potential of this practice for education. Mashups that make use of geotagged data let us plot information against the landscape of the real world to visualize phenomena and datasets in ways that make spatial and temporal relationships transparent and obvious. More and more, geo-information is becoming a characteristic embedded in everything around us, and mashups are the tools that enable us to reach in and put that information to use.

Relevance for Teaching, Learning, and Creative Expression

Mashups are very common on the Internet today, and new authoring tools are being developed that will

enable non-technical users to create sophisticated products without programming. As tools like these become more robust, we will see increasing use of data mashups in teaching and learning. Faculty will create custom mashups to illustrate concepts as they teach; students will include them in reports and assignments. Already new forms of visualizing data and relationships are changing the way we think about the world.

The power of mashups for education lies in the way they help us reach new conclusions or discern new relationships by uniting large amounts of data in a manageable way. Web-based tools for manipulating data are easy to use, usually free, and widely available. Research can be displayed on interactive graphs, charts, or maps that make the concepts clear.

Mashups of geotagged data have obvious applications for education; researchers can use public, tagged media to create mashup maps with embedded annotations. These "hyperlocal" annotations—minute details about a specific location in the form of everyday photographs, blog entries, and video clips—offer opportunities for research that were previously only available by actually living in the location in question. Digital photographs taken with GPS-enabled cameras automatically capture precise geographic/locative information; when uploaded to services like *Flickr,* the photos "know" where they were taken, making them readily available for geo-based mashups.

Creative mashups have educational applications as well, in teaching and learning as well as in creative expression. Mashups made from pop culture sources can demonstrate mastery of subject matter, understanding of cinematic and literary themes, social awareness, and more. At the University of Pennsylvania, a contest called for students to produce mashup video parodies of popular movies (see the presentation at wic.library.upenn.edu/mashup/cni2007.html for details). Creative mashups and remixes are themselves an art form—but they can also be an effective presentation tool.

A sampling of applications of data mashups across disciplines includes the following:

- **Criminal Justice.** At the Rochester Institute of Technology, a criminal justice course integrates local criminal statistics, population data and census data using GIS mapping software, graphing data and statistical analysis tools to study and attempt to better understand the problem of violence and homicide in the city of Rochester, New York.

- **Education.** A research project at the University of Oregon has created a tool that allows users to collect data about objects in the virtual world of *Second Life* and export it to a website. The tool is designed to be used to catalog educational objects that can be found in the virtual world (see blip.tv/file/571587 for a video overview).

- **Library Services.** Libraries—including those at the University of Calgary, Baylor College, McMaster University, and public systems in Topeka and Chicago, among others—have begun integrating a *MeeboMe* mashup that lets patrons send instant messages to a live librarian while using the library's online services (catalog search, reservations, etc).

- **Public Policy.** At the University of Oregon, a freshman seminar on investigating natural disasters and the response of governments, nonprofits and individuals to them uses the Havaria Information Services Alerts Map mashup (see below) to monitor current natural events as they develop.

Examples of Data Mashups

The following links provide examples of educational applications of data mashups.

Havaria Information Services Alert Map
hisz.rsoe.hu/alertmap/index.php?lang=eng
> This interactive map displays data relating to severe weather conditions, epidemic alerts, and seismic incidents around the world. Created by the National Association of Radio-Distress Signalling and Infocommunications (RSOE) in Budapest, Hungary, the map draws from over 200 news sources for the information it displays.

Interactive Learning Resources at Michigan State University

clear.msu.edu/teaching/online/ria/

Michigan State University offers a set of webware apps that allow faculty to mashup interactive language learning resources on the fly.

Interactive Map Tool

www.cer.jhu.edu/index.cfm?pageID=351

This web-based authoring tool, developed at Johns Hopkins University, supports digital field assignments and allows students and instructors to create custom mashups using a wide variety of digital media, text, and data.

Minnesota Interactive Internet Mapping Project

maps.umn.edu/

The Minnesota Interactive Internet Mapping (MIIM) Project is developing an internet mapping application that provides digital maps and imagery similar to *Google Maps* or *MapQuest;* the project involves educators in designing the tool to identify features necessary for instruction, including a broad range of data, interactivity, security, ease of use, customization, analytical capabilities, low resource demands, and sustainability.

Research at Pompeu Fabra University

www.girardin.org/fabien/tracing/

Researchers at the Pompeu Fabra University in Barcelona are mining the spatial-temporal data provided by geotagged *Flickr* photos of urban locations.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about data mashups.

ABS to Open up Data for Online Mapping

www.zdnet.com.au/news/software/soa/ABS-to-open-up-data-for-online-mapping/0,130061733,339282984,00.htm

(Angus Kidman, ZDNet Australia, October 16, 2007.) The Australian Bureau of Statistics plans to release its data for use in online mashups in 2008.

The Mash-up Future of the Web

news.bbc.co.uk/2/hi/technology/6375525.stm

(Bill Thompson, BBC News, February 19, 2007.) This article discusses the effect mashups may have on the Internet in coming years.

Mashing on the Library, Part I

theshiftedlibrarian.com/archives/2007/12/04/mashing-on-the-library-part-i.html

(Jenny Levine, The Shifted Librarian, December 4, 2007.) This blog post describes the *MeeboMe* mashup being used by libraries to allow patrons to send instant messages to librarians while searching the library's catalog.

Mishmash of Mashups

waynehodgins.typepad.com/ontarget/2007/07/mishmash-of-mas.html

(Wayne Hodgins, Off Course—On Target, July 25, 2007.) This blog post explains what mashups are (and aren't) and suggests why they are useful for education.

del.icio.us: Data Mashups

del.icio.us/tag/hz08+mashup

(Horizon Advisory Board and Friends, 2007.) Follow this link to find resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz08" and "mashup" when you save them to *del.icio.us.*

COLLECTIVE INTELLIGENCE

Time-to-Adoption Horizon: Four to Five Years

Two new forms of information stores are being created in real time by thousands of people in the course of their daily activities, some explicitly collaborating to create collective knowledge stores like the Wikipedia and Freebase, some contributing implicitly through the patterns of their choices and actions. The data in these new information stores has come to be called "collective intelligence" and both forms have already proven to be compelling applications of the network. Explicit knowledge stores refine knowledge through the contributions of thousands of authors; implicit stores allow the discovery of entirely new knowledge by capturing trillions of key clicks and decisions as people use the network in the course of their everyday lives.

Overview

Collective intelligence is a term for the knowledge embedded within societies or large groups of individuals. It can be explicit, in the form of knowledge gathered and recorded by many people (for example, the *Wikipedia*—www.wikipedia.org—is the result of collective intelligence); but perhaps more interesting, and more powerful, is the tacit intelligence that results from the data generated by the activities of many people over time. Discovering and harnessing the intelligence in such data—revealed through analyses of patterns, correlations, and flows—is enabling ever more accurate predictions about people's preferences and behaviors, and helping researchers and everyday users understand and map relationships, and gauge the relative significance of ideas and events.

Examples of uses for this type of intelligence already exist in industry. Google's *PageRank* system, which assigns value to a web page based on the number of other pages that link to it, uses patterns discovered in hundreds of millions of links to determine which web pages are most likely to be relevant in a list of search results. *Amazon.com* examines patterns in hundreds of buyer variables to recommend purchases that you might like based on your previous purchases, those of your friends, and other people who may have similar tastes or preferences.

Collective intelligence applications are an outgrowth of "open data," the practice and philosophy that certain data should, or even must be freely available to everyone (*Wikipedia*, "open data," retrieved December 2007). Collective intelligence refers to knowledge that can be uncovered by combing these open data

stores, and already businesses and governments are using tools to mine these storehouses; there are obvious applications to medicine, manufacturing, and economics, just to name a few disciplines.

While the approaches that enable collective intelligence have their roots in the open source movement, there are clear distinctions between the data stores that constitute collective intelligence and other approaches to open information such as the Open Educational Resources (OER) movement. Specifically, collective intelligence is by definition highly distributed, both in its implicit and explicit forms. The data are not organized in the traditional sense, and indeed it is in part the unstructured nature of collective intelligence which allows it to be created and mined in ways that often lead to multiple levels of new insights.

Relevance for Teaching, Learning, and Creative Expression

Sources of explicit collective intelligence provide opportunities for research and self-study and give students a chance to practice the construction of knowledge—they can contribute as well as consume. Social encyclopedias like the *Wikipedia* and others like the *Cellphedia* (www.cellphedia.com), are self-correcting; they tend to be more up-to-date, especially in areas such as emerging technology or pop culture, than printed sources simply because thousands of contributors are continuously and actively engaged in adding, modifying, reviewing, and updating them.

Implicit collective intelligence is already revealing a great deal about everyday patterns of activity based

on programs that mine datasets of information from huge numbers of human actions—purchases, hyperlink trails, search patterns—and the kinds of activities that can be recorded while respecting individual privacy are expansive and growing. Research projects in fields like business, economics, and cultural studies already make use of data from popular search engines, media sharing sites, e-commerce sites, and even game play. Geo-based mashups of health, commercial, and other data are easy to find, and as geotagging becomes more common, geographical data will be embedded in more and more of these data, making it possible to plot almost anything on a map or track its movement over time.

In fields like astronomy and meteorology, collective intelligence has already led to new discoveries and broadened our understanding of the world. Amateur scientists both contribute to and have access to data gathered by professionals; hundreds of millions of observations exist, and discoveries are quickly disseminated. Especially in these two fields, but also in other fields that grow by sifting through mountains of observations, amateur scientists have come to be considered valuable collaborators, adding to the body of understanding and contributing new discoveries to the field.

A sampling of applications for collective intelligence across disciplines includes the following:

- **Archival Science.** Tagging is an accessible form of collective intelligence that offers insight to language use and conceptual associations. The Steve Museum project is researching the effect of community tagging on access to and appreciation of museum collections (www.steve.museum).

- **Environmental Studies.** Researchers at the University of California, San Diego have developed a prototype personal device, *Squirrel,* that samples air pollutants and transmits the data to a cell phone. A program on the cell phone then

sends the data to a database, providing detailed information about local air quality and conditions anywhere. One possible use of such technology is to involve the community in capturing detailed climate data related to CO_2 emissions, smog, ozone and other pollutants to use in earth system science and environmental studies.

- **Dynamic Systems.** Currently, cell phones in major cities are transparently used to monitor traffic flow on major highways; by tracking the location of a mobile device as a caller moves from cell to cell, an accurate picture of how fast the traffic is moving can be projected and displayed on a map. When viewed over time, these data show how traffic flow is akin to other dynamic systems such as the movement of sound through air, or currents in the ocean.

- **History.** Created through a partnership among George Mason University, the University of New Orleans, the National Museum of American History, and others, the Hurricane Digital Memory Bank (hurricanearchive.org) is a community-created archive of stories, photographs, and other digital media that preserves and presents personal experiences of Hurricanes Katrina and Rita.

- **Meteorology.** Small personal weather stations installed in homes and schools augment those in public safety facilities, television stations, and official weather stations at airports and other facilites to continuously monitor local weather and atmospheric data. These data are transmitted automatically at intervals to the National Weather Service, where they are used to refine micro forecasts, especially in severe weather situations. Anyone can access the information to do research based on up-to-the-minute, real world data. Companies like WeatherBug provide easy access to this information and help connect the community around it.

Examples of Collective Intelligence

The following links provide examples of collective intelligence.

Freebase
www.freebase.com
> Freebase is an open, shared online database; not only is the data in it entered by the community, but the structure of the database itself (data types, categories, and so forth) is also community-created.

Google Image Labeler
images.google.com/imagelabeler/
> Google Image Labeler uses a game format to gather tags for images that are then used to improve image search.

Google Zeitgeist
www.google.com/intl/en/press/zeitgeist.html
> Google Zeitgeist, a year-end report of sorts, uses implicit collective intelligence to graph search terms used throughout the year to demonstrate what topics mattered most to people.

History Commons
www.cooperativeresearch.org
> The History Commons is an open-content civic journalism site. Contributors add articles about events or entities, creating detailed timelines about them (e.g. the events leading up to, during, and following Hurricane Katrina). Content is submitted, reviewed, and copyedited by volunteers.

Human Brain Cloud
www.humanbraincloud.com
> The Human Brain Cloud is a game that collects word associations from thousands of "players" and creates a visual map of common associations for a given word.

For Further Reading

The following articles and resources are recommended for those who wish to learn more about collective intelligence.

10 Semantic Apps to Watch
www.readwriteweb.com/archives/10_semantic_apps_to_watch.php
> *(Richard MacManus, Read/Write Web, November 29, 2007.)* This blog post describes ten "semantic apps," or applications that take advantage of the kinds of data provided by collective intelligence, that are currently in development.

Panel on Collective Intelligence
mitworld.mit.edu/video/494/
> *(Moderated by David Thorburn, MIT World, October 7, 2007.)* This panel discussion, featuring Thomas W. Malone, Alex Pentland, and Karim R. Lakhani, discusses the question of whether a group of people working with smart machines can achieve a greater degree of intelligence than humans or machines alone. Presented as a two-hour video.

Video, Education, and Open Content: Notes Toward a New Research and Action Agenda
www.firstmonday.org/issues/issue12_4/kaufman/index.html
> *(Peter B. Kaufman, First Monday, March 16, 2007.)* This paper discusses the intersection of moving images, education, and open content, and suggests areas for research.

del.icio.us: Collective Intelligence
del.icio.us/tag/hz08+collectiveintelligence
> *(Horizon Advisory Board and Friends, 2007.)* Follow this link to find resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz08" and "collectiveintelligence" when you save them to *del.icio.us.*

SOCIAL OPERATING SYSTEMS

Time-to-Adoption Horizon: Four to Five Years

Social networking systems have led us to a new understanding of how people connect. Relationships are the currency of these systems, but we are only beginning to realize how valuable a currency they truly are. The next generation of social networking systems—social operating systems—will change the way we search for, work with, and understand information by placing people at the center of the network. The first social operating system tools, only just emerging now, understand who we know, how we know them, and how deep our relationships actually are. They can lead us to connections we would otherwise have missed. As they develop further, these tools will transform the academy in significant ways we can only begin to imagine.

Overview

Our concept of the purpose and nature of the network is evolving. We are seeing a shift in focus; where the primary purpose of the web has been seen as sharing files and applications, there is a growing sense that the real value of the network lies in the way it helps us create, identify, and sustain relationships. This seemingly subtle change—from an emphasis on file sharing to one on relationships—will have a profound impact on the way we will work, play, create, and interact online.

Early social networking systems already recognize the value of connections and relationships. As opportunities for virtual collaboration increase and we rely more on trust-based networks, there is a growing need for context through which we can interpret and evaluate the depth of a person's social connections. How do we evaluate the depth of a relationship? Does it reflect years of working collaboratively in a particular discipline, or is it equivalent to the business card exchanged at a conference or an email introduction?

Current social networking systems like *Facebook* and *MySpace* are attempts to help people define themselves in ways that provide some of that context, but the information available to us about friends of friends is still superficial and often related more to personal interests than professional work. It is difficult for any given system to present an accurate picture of our relationships: social networking systems are unaware of connections that we have not explicitly told them about, and there is often little distinction between a deep connection and a shallow one.

The issue, and what social operating systems will resolve, is that today's tools do not recognize the "social graph"—the network of relationships a person has, independent of any given networking system or address book; the people one actually knows, is related to, or works with. At the same time, credible information about your social graph is embedded all over the web: in the carbon-copy fields of your emails; in attendee lists from conferences you attend; in tagged *Flickr* photos of you with people you know; in your comments on their blog posts; and in jointly authored papers and presentations published online. These data and other information you use every day, analyzed with a people-centric view, can be and are being used to transparently connect the dots among files, contacts, and much more.

Early applications like *Xobni* (www.xobni.com) and a proof-of-concept project from Yahoo known as *Yahoo Life!* demonstrate this shift in the organization of information. *Xobni* is a tool that extends the email program Microsoft *Outlook;* with *Xobni* installed, each time you select an email in your inbox, a pane shows you everything about that person that is implicit in your email system, including how often you email each other; what times of day you typically receive emails from that contact; any attachments you have sent to or received from that person; and previous email conversations you have had. *Xobni* places the person—the contact who sent you the email—at the center of all this data, and gathers information for you that helps you manage your interactions.

The proof-of-concept project from Yahoo, still very much in the conceptual stage, is also an effort to illustrate the kinds of activities that will be possible with applications that bring together information and services based on a contact. In a concept demonstration, a *Yahoo Life!* user opened an email sent to several colleagues meeting at a conference with an invitation to dinner. Possible locations were plotted on a map based on nearness to the convention center and previously stated preferences by the people involved, gleaned from earlier emails. These two examples illustrate how social operating system tools will access the user's social network and provide services based on information embedded there. While this category of applications is in its infancy, the emergence of tools like these heralds the beginning of the next generation of social software.

Flexible application programming interfaces (APIs) and an open, people-centered approach to developing widgets and applications is fueling progress in this area; for instance, Google has created a set of APIs called *OpenSocial* (code.google.com/apis/opensocial/) that is designed to facilitate development of independent social tools that can interoperate easily. Developers can use *OpenSocial* to create web applications, using standard HTML and Javascript, that can tap into any system that supports the *OpenSocial* API. Currently, over a dozen social networking sites support *OpenSocial,* including *Friendster, LinkedIn, MySpace, Ning,* and *Plaxo,* among others; widgets developed using *OpenSocial* can access connections and data in all of those spaces.

Relevance for Teaching, Learning, and Creative Expression

Placing people and relationships at the center of informational space will have a profound influence at all levels of academia. It will change the way we relate to knowledge and information; the way we do research and evaluate credibility; the way educators and students interact with each other; and the way students learn to be professionals in their chosen disciplines.

Students working on research papers often do not fully realize what it means to be a scholar. Of the network of activities that scholars are involved in—writing, researching, interacting with peers and colleagues, presenting at conferences and symposia, and so on—only a small part is apparent to a student doing research. Every idea, paper, experiment, and artifact is, in reality, attached to a person or group of people who helped bring it about. Imagine the impact of tools that place those people and relationships at the center of any research inquiry: concepts clearly linked to people; connections between those people and others clearly indicated; a much more complete picture of the topic would emerge, more quickly than is possible with current tools. Simply changing the organizing principle—from products or concepts to people and their connections—will change the kinds of results that are revealed.

Linking students to researchers and scientists will deepen their understanding of how professional research is done. Using the professional network as a point of departure for study will lead students to connections that are not otherwise apparent. Scholars collaborate on papers; students reading about Doug Engelbart, for example, would see who he has worked with on different projects, giving them a clearer picture of the community of scientists to which he belongs, and the contributions of Engelbart and his peers. Following those trails with social tools, students would discover other connections and insights that might not have come to light before.

Social operating systems will also address the issue of trust in virtual collaborations. It is not difficult to envision applications that will help fill in the spaces of our knowledge about a person we encounter in an online collaborative space or virtual world, displaying at a glance the contacts we have in common (including how deep those connections actually are), recent writing or other work the person has done, and other online locations where the person is active. Because the tools that make up the social operating system will access information stored all over the Internet, they will tap into the social graph, displaying analyses, documents, email and IM conversations, and much more, in real time. Credibility, too, will be

easier to assess: if an unfamiliar writer is part of a clear network of collaborators and cited authors—and your tools will be able to tell you if he or she is—chances are the writer is a credible source.

Each of us produces a significant amount of "stuff" that contributes to our professional identity and that we want to carry around wherever we go. Social operating systems will enable us to maintain our own work products and easily discover those belonging to others. This idea is not a new one; the concept of lifestreams, or electronic portfolios that are contributed to from our earliest youth through school, work, and on into late adulthood, has been around for years. Social operating systems will allow us to easily access lifestream-like materials without having to explicitly search for them.

The picture of someone's digital identity is a rich mosaic that communicates who we are. Social operating systems will tap that mosaic and encourage relationships between people based on connections and common interests between them. Self-organizing communities will develop around these interests as the network reveals them. Instead of having to find each online space where colleagues in your field collect resources and hold discussions, your tools will bring those discussions and colleagues to you. When you know someone who knows someone who shares your interests, your tools will realize it and will direct you to each other. The next "third place"—the space where people gather that is neither home nor work—will be spontaneous communities of interest created by social operating systems.

While there are early examples of tools with some of the capabilities described here, social operating systems are still very much in the conceptual stage. Nonetheless, it is possible to envision ways that social operating systems might be applied in education. Scenarios describing potential applications of social operating systems and related tools across disciplines include the following:

- **Graduate Studies.** Graduate students meeting for the first time in an online chemistry course click on the names of the students present in the collaborative workspace. With each click,

information about that person is displayed, including other fields of study the person is involved in. The students discover that the group includes people with experience in biology, physics, and nutrition, and their subsequent conversations about chemistry are enriched as they draw on one another's understanding of those topics.

- **Collaborative Research.** Colleagues working on the same research project share files, both by email and online using collaborative writing tools. In both cases, whenever one of them touches a document, the names and profiles of everyone else who has worked on that document are displayed in a sidebar. The application also suggests names from the scholar's network of other contacts who have not worked on the project, but whose background indicates that they might be useful contributors.

- **Professional Portfolios.** Information about presentations, papers, and research is already embedded in the web; social tools will be able to find and assemble it, giving the creator full control over what to include and what to display in his or her professional profile. Review committees looking for evidence of professional accomplishment or interview candidates wishing to demonstrate their experience would simply search for the person to find the body of work; researchers seeking new colleagues would do the same to evaluate potential partners discovered in their community of interest.

Examples of Social Operating Systems

The following links provide examples of applications for social operating systems.

Concept Demo of Yahoo Life!
blogs.zdnet.com/BTL/?p=7503

This blog post describes a presentation by Yahoo co-founder and CEO Jerry Yang in which he demonstrates a project concept, currently known as *Yahoo Life!,* that includes characteristics of social operating systems (also see the video at news.zdnet.com/2422-13934_22-182567.html).

Hosted Lifebits
blog.jonudell.net/2007/05/22/hosted-lifebits/

>*(John Udell, May 22, 2007.)* This blog post describes a scenario for a hosted space to hold all the digital media and information a person might create, throughout his or her life and even beyond.

The Social Catalog
pvlddirectorsblog.typepad.com/kathy/2007/11/the-social-cata.html

>*(Katharine Gould, PVLD Director's Blog, November 20, 2007.)* This blog post describes an idea for a "social catalog," a system for cataloging books that takes into account *why* the book is sought as well as what it is about.

Team ORCA Project Site
www.hcii.cmu.edu/M-HCI/2007/PittDental/

>This team project by students in the Masters of Human Computer Interaction program at Carnegie Mellon University is a prototype of a system that facilitates the kinds of connections social operating systems will enable. The project's goal was to develop a system to make it easier for scientists to find collaborators.

For Further Reading
The following articles and resources are recommended for those who wish to learn more about social operating systems.

Giant Global Graph
dig.csail.mit.edu/breadcrumbs/node/215

>*(Tim Berners-Lee, Dig (timbl's blog), November 21, 2007.)* This blog post discusses the social graph (or the giant global graph) in terms of its relationship to the Internet as a whole.

The Rise of the Social Operating System
novaspivack.typepad.com/nova_spivacks_weblog/2007/07/the-rise-of-the.html

>*(Nova Spivak, Minding the Planet, July 19, 2007.)* This blog post defines and suggests some key characteristics of a social operating system.

The Social Network Operating System
radar.oreilly.com/archives/2007/10/social_network_operating_system.html

>*(Tim O'Reilly, O'Reilly Radar, October 12, 2007.)* This blog post describes the benefits of the social graph.

Social Operating System: Connecting Domains and Social Media
www.circleid.com/posts/social_operating_system_domain_names/

>*(Isabel Wang, CircleID, August 2, 2007.)* This blog post speculates about possible forms of a social operating system.

Thoughts on the Social Graph
bradfitz.com/social-graph-problem/

>*(Brad Fitzpatrick and David Recordon, August 17, 2007.)* This article discusses the need for a social graph that exists outside of systems like *Facebook,* so that applications can take advantage of the fact that you already know who your contacts are.

Xobni and the Future of Social Networking Data
www.charleshudson.net/?p=385

>*(Charles Hudson, Charles Hudson's Weblog, October 19, 2007.)* This blog post describes three phases of social networking, from simply making connections to adding context to those connections and finally to having the network describe the strength of a connection.

del.icio.us: Social Operating Systems
del.icio.us/tag/hz08+socialos

>*(Horizon Advisory Board and Friends, 2007.)* Follow this link to find resources tagged for this topic and this edition of the *Horizon Report,* including the ones listed here. To add to this list, simply tag resources with "hz08" and "socialos" when you save them to *del.icio.us.*

METHODOLOGY

The *Horizon Report* is produced each fall using a carefully constructed process that is informed by both primary and secondary research. As many as a hundred technologies are examined for possible inclusion in the report each year, as well as dozens of meaningful trends and challenges; an internationally renowned Advisory Board examines each topic in progressively more detail, reducing the set until the final listing of technologies, trends, and challenges is selected. The entire process takes place online and is fully documented at *horizon.nmc.org/wiki.*

The process of selection, a modified Delphi process now refined over several years of producing *Horizon Reports,* begins each summer as the Advisory Board is selected. About half of the thirty to forty members are newly chosen each year, and the board as a whole is intended to represent a wide range of backgrounds, nationalities, and interests. To date, more than 175 internationally recognized practitioners and experts have participated. Once the Advisory Board is constituted, their work begins with a systematic review of the literature—press clippings, reports, essays, and other materials—that pertain to emerging technology. Advisory Board members are provided with an extensive set of background materials when the project begins, and then are asked to comment on them, identify those which seem especially worthwhile, and also add to the set. A carefully selected set of RSS feeds from a dozen leading publications ensures that these resources stay current as the project progresses, and they are used to inform the thinking of the participants through the process.

Following the review of the literature, the Advisory Board engages in the process of addressing the five research questions that are at the core of the Horizon Project. These questions are the same each year, and are designed to elicit a comprehensive listing of interesting technologies, challenges, and trends from the Advisory Board:

1 *What would you list among the established technologies that learning-focused institutions should all be using broadly today to support or enhance teaching, learning, or creative expression?*

2 *What technologies that have a solid user base in consumer, entertainment, or other industries should learning-focused institutions be actively looking for ways to apply?*

3 *What are the key emerging technologies you see developing to the point that learning-focused institutions should begin to take notice during the next 3 to 5 years? What organizations or companies are the leaders in these technologies?*

4 *What do you see as the key challenges related to teaching, learning, or creative expression that learning-focused institutions will face during the next 5 years?*

5 *What trends do you expect to have a significant impact on the ways in which learning-focused institutions approach our core missions of teaching, research, and service?*

One of the Advisory Board's most important tasks is to answer these five questions as systematically and broadly as possible, so as to generate a large number of potential topics to consider. As the last step in this process, past *Horizon Reports* are revisited and the Advisory Board is asked to comment on the current state of technologies, challenges, and trends identified in previous years, and to look for metatrends that may be evident only across the results of multiple years.

To create the *2008 Horizon Report,* the 36 members of this year's Advisory Board engaged in a comprehensive review and analysis of research, articles, papers, blogs, and interviews; discussed existing applications; and brainstormed new ones. A key criterion was the potential relevance of the topics to teaching, learning, and creative expression.

Once this foundational work was completed, the Advisory Board moved to a unique consensus-

building process based on an iterative Delphi-based methodology. In the first step, the responses to the research questions were systematically ranked and placed into adoption horizons by each Advisory Board member in a multi-vote system that allowed members to weight their selections. These rankings were compiled into a collective set of responses. From the more than 80 technologies originally considered in 2008, the twelve that emerged at the top of the initial ranking process—four per adoption horizon—were further researched. Once this "short list" was identified, the potential applications of these important technologies were further explored by higher education practitioners who were either knowledgeable about them, or interested in thinking about how they might be used. A significant amount of time was spent researching applications or potential applications for each of the areas that would be of interest to practitioners.

Each of these twelve was written up in the format of the *Horizon Report.* With the benefit of the full picture of how the topic would look in the report, the "short list" was then ranked yet again, this time with a reverse ranking approach. The six technologies and applications that emerged at the top of the rankings—two per adoption horizon—are detailed in the preceding sections, and those descriptions are the final results of this process.

As in previous years, the *Horizon Report* is intended to be the first step in building a research agenda rather than the final result of one; the NMC membership uses the *Horizon Report* each spring to generate an annual *Call to Scholarship* (see www.nmc.org/news/nmc/2007-08-horizon-project-call-scholarship-

released for details) based on the input of hundreds of faculty and staff working in campus-based groups. The *Call* details recommendations for research, demonstration projects, policy formulation, tools, and technology support systems related to each topic. These recommendations are a starting place for continued dialog and reflection around the six topics in the *Horizon Report,* and are acknowledgements that while these technologies offer considerable promise and potential, much work remains to be done before many of them are really ready for mainstream use.

The *Call to Scholarship* is also a call to action, and it is our hope that it will generate a cascade of activities across the academy. The NMC is deeply interested in such activities and hopes to see new demonstration projects, papers, and presentations at conferences around the ideas in each new edition of the *Horizon Report.* Simultaneous with the release of the 2008 edition of the *Horizon Report,* the NMC will launch the process to create its related *Call to Scholarship,* which will be released in the fall of 2008.

Another ongoing component of the project involves a special set of *del.icio.us* links that have been established to help extend the findings of the project and allow new information to be shared within the community. These *del.icio.us* tags are listed under the "Further Reading" section of each of the six topic areas, and readers are invited to view not only the resources that were listed in the report, but many others that were used in our research as well. Readers are further encouraged to add their own examples and readings to these dynamic lists by tagging them for inclusion in each category.