

# NMC Horizon Project

## 2010 Edition Short List

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## Time-to-Adoption: One Year or Less

# Mobile Computing

Appeared in *Horizon Report, 2006-2009*; in *ANZ Edition in 2008-2009*; in *2009 K-12 Edition*; and in *2009 Economic Development Edition*.

The mobile market today has nearly 4 billion subscribers, three-fourths of whom live in developing countries. Over a billion new phones are produced each year, and the fastest-growing sales segment belongs to smart phones — which means that a massive and increasing number of people all over the world now own and use a computer that fits in their hand. Third-party applications for all kinds of tasks can now be developed once and ported to a variety of mobile platforms, increasing their availability.

It is these applications that are making mobiles such an indispensable part of our lives. Tools for study, productivity, task management, and more have become integrated into a single device that we grab along with car keys and wallet. More and more, online applications have a mobile counterpart; Blackboard's mobile app, for instance, gives students access to their course materials, discussions, assignments, and grades. Other mobile and handheld devices, such as netbooks, smartbooks, ebook readers, and email readers are also commonly carried. It is easier than ever before to remain connected anytime and anywhere.

### Relevance for Teaching, Learning & Creative Expression

- Tablet PCs—small, portable computers that fall in size and function between smart phones and laptops—are used to record and analyze field research during Bluegrass Community & Technical College's off-campus chemistry labs.
- In addition to the free lectures offered on iTunes, many universities are making courses available for mobile delivery.
- Medical students at the University of Louisville School of Medicine use their smart phones to check H1N1 updates from the Center for Disease Control.

### Examples

- Following the lead of Japan's Fukuoka-based Cyber University, several colleges in the United States are now offering full, media-rich courses delivered via smart phone: <http://www.universitybusiness.com/viewarticle.aspx?articleid=1233>
- Researchers at the University of Utah have created a mobile application that features a cadaver in various stages of dissection, allowing undergraduate students (who would not otherwise have access) to study real-life anatomy: <https://chronicle.com/blogPost/Want-to-Learn-Anatomy-Theres/8386>
- CourseSmart, a new mobile application, offers over 7000 e-textbooks; each is fully searchable and available via mobile or online: <http://www.coursesmart.com/iphone>

### For Further Reading

#### Teaching with Technology Face-Off: iPhones vs. PC's

<https://chronicle.com/blogPost/Teaching-With-Technology/4547>

(Jeffrey R. Young, *The Chronicle of Higher Education*, 25 February 2009.) One professor found that students with access to an iPhone studied more than those who used only a PC.

#### World's largest open university goes mobile

<http://www.pr-inside.com/world-s-largest-open-university-goes-r1553595.htm>

(Press release, *PR-inside.com*, 29 October 2009.) The Indira Gandhi National Open University, in partnership with Ericsson, will now offer courses on mobile phones. The classes will reach over 2.5 million students and allow learners in rural India to seek a higher education.

## Time-to-Adoption: One Year or Less

# Open Content

Appeared in the 2009 ANZ Edition.

Open content is a growing movement that focuses on sharing and reusability and thrives on the ready availability of a wide range of educational content. Offering an potential alternative to traditionally published materials such as textbooks that is highly customizable and cost-effective, the open content movement depends on a community of contributors and users who are willing to create and release high-quality educational content in a variety of media at little to no cost.

One effect of open content has been to dramatically increase the availability of information to students and independent learners. As a result, the role of the teacher is undergoing a slow but definite change, from the guardian and dispenser of knowledge to the guide and coach for learners faced with an overabundance of resources. Students have unparalleled access to learning materials; what they need from teachers now is help cultivating the skills of finding, assessing, interpreting, and synthesizing information.

### Relevance for Teaching, Learning & Creative Expression

- Open content allows teachers to customize their courses quickly and inexpensively and keep up with emerging information and ideas.
- Open educational resources are available to anyone with an Internet connection, thereby increasing access to education, especially in developing nations.
- Communities of practice and learner groups that form around open content provide a source of support for independent or life-long learners.

### Examples

- Folksemantic's OpenCourseWare Finder helps students find free online courses, known as OpenCourseWares, or OCWs: <http://ocwfinder.com>
- OpenLearn, a UK-based open learning site, offers students the opportunity to join a study group, or learn independently; use prepared materials, or join the lab and create their own: <http://openlearn.open.ac.uk>
- MIT's OpenCourseWare—which provides free, online access to all of MIT's courses—serves as a model for other universities: <http://ocw.mit.edu/OcwWeb/web/home/home/index.htm>

### For Further Reading

#### Countries Offer Different Takes to Open Online Learning

<http://chronicle.com/article/Countries-Offer-Different/48775>

(Simmi Aujla and Ben Terris, *The Chronicle of Higher Education*, 11 October 2009.) Many countries are using open educational resources to reach students who would otherwise be unable to attend university.

#### Students Find Free Online Lectures Better Than What They're Paying For

<http://chronicle.com/article/Students-Find-Free-Online/48776>

(Jeffery R. Young, *The Chronicle of Higher Education*, 11 October 2009.) Not only traditional students, but learners whose primary language is not native, advanced high-school students, and working professionals all take advantage of free educational resources.

#### Study Finds That Online Education Beats the Classroom

<http://bits.blogs.nytimes.com/2009/08/19/study-finds-that-online-education-beats-the-classroom/?scp=3&sq=higher%20education&st=Search>

(Steve Lohr, *The New York Times*, 19 August 2009.) A study conducted for the Department of Education found that students benefited from the multi-media experience of online learning, most markedly in higher education.

## Time-to-Adoption: One Year or Less

# Aggregators

*New topic in 2010.*

Aggregation is the process of transparently gathering together distributed pieces of online content based on an interest in the topic(s), the author(s), or other shared characteristic(s). RSS readers are one way to aggregate data, but with the increase in personal publishing, new tools for aggregation are emerging. Using these tools, readers can easily track a distributed conversation that takes place across blogs, Twitter, and other publishing platforms, as well as pull in relevant resources from news feeds and other sources.

Some educators and students are seeking alternatives to course management systems, preferring to open their discussions and make use of a variety of tools instead. Aggregation can reunite course discussions that once took place within CMS forums, even if they are scattered among different platforms and tools. Aggregation can allow a class to visualize its conversations in new ways. Information is available when and where the reader wishes, in almost any desired format.

### Relevance for Teaching, Learning & Creative Expression

- Using sites like Wiggio (<http://wiggio.com>), students with different majors and class schedules easily manage group projects without meeting face-to-face.
- Students of journalism stay up-to-the-minute with an aggregation tool from the Associated Press that provides news from around the world directly to their mobile phones (<http://www.apnews.com>).
- Students and instructors find relevant research materials using a website that aggregates professional documents (<http://www.docstoc.com/documents/education>).

### Examples

- The Introduction to New Media Studies course at Baylor University uses a blog template to aggregate course content, including student work and resources from all over the web: [http://courseblogs.gardnercampbell.net/baylor\\_nms\\_f09](http://courseblogs.gardnercampbell.net/baylor_nms_f09)
- Tutors from the University of Westminster in London use RSS feeds to aggregate student and professor feedback blogs to provide the former with relevant instruction: <http://www.insidehighered.com/news/2009/07/17/blackboard2>
- The library at The Pacific Northwest College of Art uses an aggregated website, Dabble DB, to track books, requests, and monies spent: <http://www.dabledb.com/stories/pnca>

### For Further Reading

#### 6 Online Email Aggregators that Do More Than Just Aggregate

<http://mashable.com/2008/08/18/email-aggregators>

(Palin Ningthoujam, *Mashable.com*, 18 August 2008.) A number of email sites collect additional information and gather it together for easy viewing.

#### 12 Twitter Stream Aggregators to Make You Smarter

<http://www.toprankblog.com/2009/02/12-twitter-stream-aggregators>

(Lee Odden, *Online Marketing Blog*, 17 February 2009.) A variety of tools are available to locate resources or find relevant content on Twitter.

#### Finally, Zensify's iPhone app shows key word trends across your social network

<http://eu.techcrunch.com/2009/05/27/finally-zensifys-iphone-app-shows-key-word-trends-across-your-social-graph>

(Mike Butcher, *TechCrunch Europe*, 27 May 2009.) Zensify aggregates comments from Facebook, Twitter, Delicious, Flickr, YouTube, and more.

## Time-to-Adoption: One Year or Less

# Cloud Computing

Appeared in 2009 Horizon Report; in ANZ Edition, 2008-2009; in 2009 K-12 Edition; and in 2009 Economic Development Edition.

The practice of cloud computing has not changed substantially since its appearance in the 2009 Horizon Report, although it has continued to grow and remains an important and interesting technology. Cloud computing includes three broad areas of development: cloud-based applications, which are designed for many different tasks and which are hosted in the cloud; development platforms for creating cloud-based applications; and massive computing resources for storage and processing, such as the EC2 or the GoGrid.

Cloud-based applications that allow work and information to be distributed and shared have become particularly worthy of attention by campus planners. Collaboratively-authored documents can be developed by several writers simultaneously. In the classroom, shared documents between students and teachers can change the model of turning in assignments and waiting for feedback; teachers can look in on work in progress, offering assistance at the moment the student is thinking about the task rather than a day or two after it has been completed. For many, the issue is no longer whether to accept cloud-based tools, but how to develop and manage cloud-based work patterns.

### Relevance for Teaching, Learning & Creative Expression

- The Medical College of Wisconsin Biotechnology and Bioengineering Center in Milwaukee developed a cloud-based program that allows institutions and individuals inexpensive access to large-scale protein research.
- Carnegie Mellon University in Qatar offers one of the first cloud platforms in the Middle East, offering its students, researchers, and local businesses opportunities not previously available.
- Cornell University hopes to use cloud computing—and the ability to analyze large amounts of data from multiple sources—to study and promote wildlife conservation and biodiversity.

### Examples

- The Michigan Community College Association uses cloud computing to offer full-credit, online courses via the Michigan Community College Virtual Learning Collaborative (VLC) : <http://vcampus.mccvlc.org/index.asp?dir=%27welcome%27&content=%27%27>
- This cloud-based event organizer, which began as a student lab project at UC Berkeley, successfully continues beyond the close of the course: <http://www.wejoinin.com>
- Cloud computing allows researchers and students from Harvard Medical School to quickly analyze large amounts of data and communicate that data to many locations around Boston: [http://www.scientific-computing.com/news/news\\_story.php?news\\_id=772](http://www.scientific-computing.com/news/news_story.php?news_id=772)

### For Further Reading

#### 7 Things You Should Know About Cloud Computing

<http://net.educause.edu/ir/library/pdf/EST0902.pdf>

(Educause, August 2009.) The use of cloud computing as it relates to higher education is discussed in this issue of the *7 Things You Should Know...* series.

#### Cloud Computing: "Be Prepared"

<http://www.educause.edu/er/GoldenInterview>

(Bernard Golden, *Educause Review*, July/August 2009.) Cloud computing is more than a fad. This article examines practical, political, and policy issues of the cloud.

#### Ohio Takes to the Clouds

<http://campustechnology.com/Articles/2009/10/22/Ohio-Takes-to-the-Clouds.aspx?Page=2>

(Guest Viewpoint, *Campus Technology*, 22 October 2009.) Cloud computing lowers IT costs, promotes clean technology, and links the University System of Ohio together.

## Time-to-Adoption: Two to Three Years

# Location-Based Services

*The related topic "location-based media" appeared in ANZ 2009 Edition and 2009 Economic Development Edition.*

Location-based services provide content that is dynamically customized according to the user's location. These services are commonly delivered to mobile devices, but can also be accessed from other portable computers, handhelds, or any Internet-capable device. Current common applications for location-based services include advertising, news, social networking, and similar services.

An increasing number of mobile applications are taking advantage of the built-in geolocation capability that is increasingly a standard feature in mobile devices. Information about nearby buildings, landmarks, or other fixed features is commonplace; a growing use of location-based services is to locate people nearby—people known or unknown to the user—who share interests or experiences in common. Educational applications for location-based services are currently along the same lines, delivering relevant place-based information and allowing easy geotagging of captured data. Media such as photos and video, as well as the simplicity of geotagging, will be important aspects of location-based services as they continue to develop.

### Relevance for Teaching, Learning & Creative Expression

- American University offers a location-aware virtual police escort. Students record their location and where they are going; if they don't call back within a certain time period to announce a safe arrival, campus security is notified.
- Ecorio, an Android app, tracks users' movements and determines their carbon footprint; a sister app, Zimride, offers them carpooling choices.
- Using location-awareness, apps like Nru ("near you") and Wikitude provide students with educational and entertaining information about their surroundings; for example, the history of the oldest building at the university, or a walking tour of campus.

### Examples

- Terraphone provides mobile users with comprehensive information about the geology surrounding their location: <http://www.elbeaus.com>
- A new service from MIT, Locast, provides a virtual tour guide for visitors to Italy, tailoring video offerings based on location: <http://locast.mit.edu>

### For Further Reading

#### 7 Things You Should Know about Location-Aware Applications

<http://www.educause.edu/ELI/7ThingsYouShouldKnowAboutLocat/163839>

(Educause, March 2009.) Location-aware applications have many uses on campus, and enhance a variety of disciplines.

#### Location-Aware Computing

<http://net.educause.edu/ir/library/pdf/DEC0803.pdf>

(A. Michael Berman, Sue M. Lewis, and Anthony Conto, for Educause, November 2008.) The authors describe location-aware computing as it is relevant to higher education. Several examples of LBS in current use are provided in the article.

#### Researchers Design Rooms With Sensors That Help Dependent People

<http://www.sciencedaily.com/releases/2009/09/090910084305.htm>

(*Science Daily*, 13 September 2009.) Researchers have developed a room that includes sensors to monitor the movements and location of the occupants. Using location-awareness, the room performs functions for the impaired, like opening a door, for example.

## Time-to-Adoption: Two to Three Years

# Electronic Books

*New topic in 2010.*

Electronic books are now accessible via a wide variety of readers, from dedicated reader platforms like the Kindle to applications designed for mobile phones, and are enjoying wide consumer adoption. As screen technology has become more sophisticated, the experience of reading electronic materials has become more comfortable, and the popularity of e-books has increased. Electronic books can be a portable and cost-effective alternative to buying printed books, although most platforms lack features to support advanced reading and editing tasks such as annotation, collaboration, real-time updates, and content remixing.

Electronic books have entered the mainstream in the consumer world and are beginning to make inroads on campuses. The potential for education includes the obvious advantages of lowering costs and making it easier to carry the information contained in several heavy textbooks, but electronic books and readers are also raising questions about the textbook and publishing industries that may have deeper implications in academia.

### Relevance for Teaching, Learning & Creative Expression

- Seton Hall University's Teaching, Learning & Technology Center found that students appreciated the ability to store and review a semester's worth of material in e-book form.
- Amazon's Kindle accepts emails of PDFs and .doc files, which provides students and faculty a convenient method of transporting and reading academic journals.

### Examples

- A pilot program at Northwest Missouri State University has determined that students prefer interactive digital readers that allow them to post virtual sticky notes and mark chapters: <http://www.edtechmag.com/higher/march-april-2009/swapping-textbooks-for-e-books.html>
- The University of Virginia's Darden School of Business plans to participate in a program using the Kindle DX: [http://www.darden.virginia.edu/html/news\\_article.aspx?id=19238](http://www.darden.virginia.edu/html/news_article.aspx?id=19238)
- Bookglutton invites users to set up a free online account. Readers choose a book (many at no cost), select a reading group (if desired), and comment on the book as they read: <http://www.bookglutton.com>

### For Further Reading

#### E-Books in Higher Education

<http://ici9.oum.edu.my/pdf/paper06.pdf>

(Jim Sinopoli, for the International Conference on Information, August 2009.) This paper briefly discusses the environment necessary to optimize e-books in higher education.

#### Clive Thompson on the Future of Reading in a Digital World

[http://www.wired.com/techbiz/people/magazine/17-06/st\\_thompson](http://www.wired.com/techbiz/people/magazine/17-06/st_thompson)

(Clive Thompson, *Wired Magazine*, 22 May 2009.) Thompson makes a case for digitizing books: in addition to enhancing sales of the printed book, e-books enable ongoing reader dialogs.

#### Librarians desperate for e-books as demand outstrips supply

<http://www.timeshighereducation.co.uk/story.asp?storycode=408039>

(Rebecca Attwood, *Times Higher Education*, 10 September 2009.) Publishers needn't worry that e-books will replace paper textbooks: a UK study found that students and faculty prefer to use the e-books as a supplement.

## Time-to-Adoption: Two to Three Years

# Simple Augmented Reality

*The related topic "augmented reality" appeared in the 2009 Economic Development Edition.*

The term *augmented reality* (AR) was first coined in 1990 by former Boeing researcher Tom Caudell. The idea is to blend, or augment, primarily location-based data accessed on the web with what we see in the real world. Wireless mobile devices are increasingly driving this technology into the mobile space where the applications offer the most promise. Initially, AR required unwieldy headsets and kept users largely tethered to their desktop computers. With the rise of smartphones and other increasingly powerful mobile devices, many equipped with high-quality cameras and GPS capabilities, AR is showing its legs in a number of applications. The improvement in technology allows more streamlined approaches and wider user adoption. Currently, many AR efforts are primarily based around entertainment and marketing, but will spill into other areas such as education once the technology matures and becomes more simplified.

Augmented reality has strong potential to provide both powerful contextual, *in situ* learning experiences and serendipitous exploration and discovery of the connected nature of information in the real world. Of particular relevance is AR gaming. Creating games based in the real world augmented with various networked data can give gamers and educators powerful new ways to show relationships and connections in the real world.

### Relevance for Teaching, Learning & Creative Expression

- MIT's Scheller Teacher Education Program is using AR and exploring its potential in a number of disciplines. They have developed a game called Environmental Detectives using GPS enable devices to uncover the source of a toxic spill.
- The Four Eyes Lab at Univ. of California Santa Barbara is engaged in a number of innovative AR research and demonstration projects.
- AugmentThis! is a mobile service that accepts KML (Google Earth) files, which can then be viewed on an Android phone, overlaying the data through the camera on the phone.

### Examples

- ARSights is a website and tool that allows you to visualize your 3D models out of Google Earth, based on the company's AR-Media augmented reality platform: <http://www.arsights.com/>
- Total Immersion created 3D Topps baseball cards and other implementations: <http://www.totalimmersion.com/>
- The company Layar has been leading the way in mobile phone AR space with apps for the iPhone and Android phones: <http://layar.com/>

### For Further Reading

#### If You Are Not Seeing Data, You are Not Seeing

<http://www.wired.com/gadgetlab/2009/08/augmented-reality/>

(Brian Chen, *Wired Gadget Lab*, Aug.25, 2009) This *Wired* article gives a good overview of augmented reality, including where it currently is situated and what to expect in the future.

#### Map/Territory: Augmented Reality Without the Phone

<http://radar.oreilly.com/2009/08/mapterritory-augmented-reality.html>

(Brady Forrest, *O'Reilly Radar*, Aug. 17, 2009) This post covers what augmented reality might look like beyond just using devices like the iPhone.

#### Mobilizy Proposes Augmented Reality Mark-up Language to The AR Consortium

[http://bit.ly/ar\\_markup](http://bit.ly/ar_markup)

(Ori Inbar, *Games Alfresco.com*, Sept. 22, 2009) This article discusses markup languages for augmented reality browsers that could leverage existing technologies such as Google Earth.

## Time-to-Adoption: Two to Three Years

# The Semantic Web

Appeared in the 2009 Horizon Report and as "semantic-aware applications" in the 2009 Economic Development Edition.

An increasing number of semantic-aware applications continue to emerge, bringing the web closer to Tim Berners-Lee's vision of a medium that not only allows people to share information, but to make sense of it. Applications for searching and finding, social networking, and focused research are appearing, and a new category of "smart" productivity applications has begun to emerge. These applications use the context of information as well as the content to make determinations about relationships between bits of data; examples like Triplt, SemaPlover, and Xobni organize information about travel plans, places, or email contacts and display it in convenient formats based on semantic connections.

Semantic searching is being applied for scientific inquiries, allowing researchers to find relevant information without having to deal with apparently similar, but irrelevant, information. For instance, Noesis, a new semantic web search engine developed at the University of Alabama in Huntsville, is designed to filter out search hits that are off-topic. The search engine uses a discipline-specific semantic ontology to match search terms with relevant results, ensuring that a search on "tropical cyclones" will not turn up information on sports teams or roller coasters.

### Relevance for Teaching, Learning & Creative Expression

- A wiki focused on teaching undergraduate math using Wolfram|Alpha helps students with their homework (<http://walphawiki.wikidot.com>).
- Using semantic web technology, the University of Plymouth has gathered course resources that would formerly be available through the library or bookstore; the material are available online in one location, so students need not compete for the library's limited resources.
- TrueKnowledge answers questions about history, geography, unit calculations, and more.

### Examples

- Scientists from several schools, including the University of Florida and Cornell University, have been granted funding to create a Facebook-like, scholarly website with semantic search: <http://www.networkworld.com/news/2009/102009-facebook-scientists-funding.html>
- Stanford graduates created a free semantic application that allows users to find and add relevant multimedia to their blogs with ease: <http://www.apture.com>
- Hakia, created using Yahoo's new Build your Own Search Service (BOSS), is a semantic web service that provides results based on quality, not popularity. One criterion, for example, is that the results come from librarian-recommended sites: <http://company.hakia.com/about.html>

### For Further Reading

#### A contextual search experience for Wikipedia

<http://googlecustomsearch.blogspot.com/2009/10/contextual-search-experience-for.html>

(Paul Komarek, *Google Custom Search Blog*, 25 October, 2009.) Using this new technology will offer a contextual search experience during a Wikipedia search.

#### Tim Berners-Lee on the Next Web

[http://www.ted.com/talks/tim\\_berniers\\_lee\\_on\\_the\\_next\\_web.html](http://www.ted.com/talks/tim_berniers_lee_on_the_next_web.html)

(*TED Talks*, February 2009.) Sir Tim Berners-Lee discusses the history and future of the web.

#### Wolfram alpha: Not a Google killer, but not meant to be

<http://www.connected-science.com/?p=230>

(Darin L. Stewart PhD, *Connected Science*, 18 May 2009.) Wolfram alpha seeks to answer specific questions rather than return a list of search results.

## Time-to-Adoption: Four to Five Years

# Gesture-Based Computing

*New topic in 2010.*

Devices that can accept multiple simultaneous inputs (like using two fingers on the Apple iPhone or the Microsoft Surface to zoom in or out) and gesture-based inputs like those used on the Nintendo Wii have begun to change the way we interact with computers. We are seeing a gradual shift towards interfaces that adapt to—or are built for—humans and human gestures. The idea that natural, comfortable movements can be used to control computers is opening the way to a host of input devices that look and feel very different from the keyboard and mouse.

Gesture-based computing allows users to engage in virtual activities with motion and movement similar to what they would use in the real world. Content is manipulated intuitively, making it much easier to interact with, particularly for the very young or for those with poor motor control. The intuitive feel of gesture-based computing is leading to new kinds of teaching or training simulations, that look, feel, and operate almost exactly like their real-world counterparts. Larger multi-touch displays support collaborative work, allowing multiple users to interact with content simultaneously, unlike a single-user mouse.

### Relevance for Teaching, Learning & Creative Expression

- Researchers at Georgia Tech University have developed gesture-based games designed to help deaf children learn linguistics at the critical time of language development.
- Using off-the-shelf existing technologies, the Sixth Sense project from MIT provides a gesture interface that can be used to augment information into real world spaces.
- After discovering the significant improvement in dexterity that surgeons-in-training gained from playing with the Wii (48%), researchers are developing a set of Wii-based medical training materials.

### Examples

- A number of mobile applications use gestures. *Mover* lets users flick files from one phone to another; *Shut Up*, an app from Nokia, silences the phone when the user turns it upside down; *nAlertme*, an antitheft app, sounds an alarm if the phone isn't shaken in a specific, preset way: <http://www.technologyreview.com/computing/22393/page2>
- As an assignment, several graduate students at Carnegie Mellon University created a virtual snowball fight using PC software and components of Nintendo's Wii: <http://www.post-gazette.com/pg/09308/1010559-96.stm>
- Microsoft's new Project Natal, similar to Nintendo's Wii, engages full-body movement: <http://blog.newsweek.com/blogs/techtonicshifts/archive/2009/11/05/microsoft-s-finally-got-game.aspx>

### For Further Reading

#### University offers new technology to help students study

<http://www.unr.edu/nevadanews/templates/details.aspx?articleid=5194&zoneid=14>

(Skyler Dillon, *Nevada News*, 1 October 2009.) The Mathewson-IGT Knowledge Center at the University of Nevada in Reno purchased two Microsoft Surfaces. In addition to maps and games, the University added an anatomy study guide.

#### Why Desktop Touch Screens Don't Really Work Well For Humans

<http://www.washingtonpost.com/wp-dyn/content/article/2009/10/13/AR2009101300113.html>

(Michael Arrington, *The Washington Post*, 12 October 2009.) A desktop touch screen isn't comfortable: a more ergonomic design (like an architect's drafting board) would relieve arm fatigue.

## Time-to-Adoption: Four to Five Years

# Data Visualization & Analytics

*New topic in 2010.*

A variety of tools are emerging that make it possible to extract data from large datasets and display it in new ways. These tools do not require sophisticated math skills—as used to be the case to do work of this nature—and they present data in forms that make patterns obvious and intuitive to grasp. Online services such as Many Eyes, Wordle, Flowing Data, and Gapminder accept uploaded data and allow the user to configure the output to varying degrees. Some tools, like Roambi, have mobile counterparts, making it easy to carry interactive, visual representations of data wherever one goes.

The implications for education are that these tools, backed by powerful computers that can easily cope with large amounts of data, will help us understand not only the concepts embedded in large datasets, but also to gain a deeper understanding of learning itself. Capturing and visualizing student data may enable teachers to make better decisions about what and how to teach. The expectation is that tools for gathering, reporting, and visualizing educational data will make it easier to understand where schools are successful, as well as seeing where improvements can be made.

### Relevance for Teaching, Learning & Creative Expression

- New apps for mobiles place data visualization in the palm of one's hand: Roambi charts your data, while SimpleMind Xpress is a colorful and intuitive mind-mapper.
- Harvard scientists are using data visualization from the Chandra X-Ray Observatory to measure the expansion velocity of supernova remnants.
- With Wordle, students can analyze their papers and see in moments which points need further development, and whether or not certain language has been overused.

### Examples

- From simulating the velocity of waves against a ship to visualizing seasonal carbon dioxide accumulation, these videos demonstrate the diversity of data visualization: <http://www.wired.com/wiredscience/2009/08/visualizations/all/1>
- Affecter Interfaces uses analytics to recognize facial expressions; the software charts the mood of the subject: <http://www.techcrunch50.com/2009/affective-interfaces>
- Analytics and data visualization allowed researchers at the University of Pennsylvania to visually capture (in real time) the response of the body's immune system to a parasitic infection: <http://www.upenn.edu/pennnews/article.php?id=1531>

### For Further Reading

#### 7 Things You Should Know About Data Visualization II

<http://net.educause.edu/ir/library/pdf/ELI7052.pdf>

(*Educause*, August 2009.) This article discusses data visualization as it relates to higher education: who's using it, why they're using it, and what to expect in the future.

#### Data visualization tools for free or cheap

<http://www.innovativeinteractivity.com/2009/05/14/data-visualization-tools-for-free-or-cheap>

(Tracy Boyer, *Innovative Interactivity*, 14 May 2009.) This post offers a brief summary with applicable links to many data visualization sites.

#### FlowingData Graphs Your Life Via Twitter

<http://www.fastcompany.com/blog/clay-dillow/culture-buffet/flowingdata-graphs-your-life-twitter>

(Clay Dillow, *Fast Company*, 15 July 2009.) Track anything you like via a private Twitter address: every time you have a cup of coffee, blood sugar readings, chocolate cravings, workout time or distances. A graph builds over time of all the data sent in.

## Time-to-Adoption: Four to Five Years

# Wireless Power

*New topic in 2010.*

Anyone who attends a class or meeting where most of the participants have laptop computers is well aware that there are never enough power outlets—and when they are available, they are invariably located in inconvenient places. Wireless power, already being prototyped by several companies, promises to alleviate the problem by making power for charging batteries in devices readily available. Using near-field inductive coupling, power can be transmitted through special surfaces or even through open space to charge devices within a home, office, school, or other setting.

Consumer products are already entering the market; the Powermat, for instance, charges up to three devices placed onto its surface (each device must first be slipped into a compatible sleeve). Fulton Innovation's eCoupled technology is designed to be built into desk- and countertops, enabling not only power transfer but other wireless communications between devices placed on the surfaces. Witricity is developing transmitters that would be embedded in walls or other furniture, transferring power via inductive coupling to receivers attached to devices anywhere within the home or classroom. The impact of wireless power for education will primarily be felt in learning spaces; the devices we carry will become more useful and easier to maintain, with increased opportunity for longer use in a variety of settings.

### Relevance for Teaching, Learning & Creative Expression

- Lecture hall furniture fitted with wireless power options would ensure that students' laptops and mobiles are always available.
- A suite at the Venetian Hotel in Las Vegas uses wireless power to charge guests' laptops, mobiles, and the LCD TV hanging on the wall: dormitories and classrooms could be supplied with the same technology.

### Examples

- A self-charging flashlight using wireless power is targeted for automotive and police use: <http://www.policemag.com/Channel/Technology/News/2009/10/27/Gamber-Johnson-Commercializes-eCoupled-Technology.aspx>
- Powercast is developing wireless smoke detectors and other sensors: <http://www.keystoneedge.com/innovationnews/powercast0212.aspx>
- Place mobile devices onto Powermat's sleek black mats to wirelessly charge them: <http://www.powermat.com>

### For Further Reading

#### Consumers Rank Wireless Power Charging in Top 20% of Lifestyle Demands

[http://www.wirelesspowerconsortium.com/view\\_attachment/50/Final\\_English.pdf](http://www.wirelesspowerconsortium.com/view_attachment/50/Final_English.pdf)

(Press Release, 27 April 2009.) The Wireless Power Consortium has been formed to set a universal standard for this emerging technology.

#### Wireless charging to go mainstream in 2010, says maker

<http://www.pcmag.com/article2/0,2817,2353745,00.asp>

(Eric Lai, *Computerworld*, 30 September 2009.) Fulton's vision of ubiquitous wireless charging pads for laptops, cell phones, and more, is well underway.

#### Wireless power system shown off

<http://news.bbc.co.uk/2/hi/8165928.stm>

(Jonathan Fildes, *BBC News*, 23 July 2009.) This article describes the use of Witricity's wireless power via magnetic fields. Included are several videos that explain the technology.

## Time-to-Adoption: Four to Five Years

# 3D Video

*New topic in 2010.*

3D video is not an entirely new technology, having been around in the film industry for many decades. However, the technologies that deliver this immersive form of video viewing are improving. New cameras, better viewing glasses, projection systems, software and displays are starting to bring 3D video into its own at the consumer level, enabling new forms of creative expression and imaging. 3D video requires the capture of two images simultaneously, the same way our eyes do. Once captured, this dual imagery must be displayed or projected in a way our eyes and brain can resolve enough to be believable with the assistance of specialized eyewear. To date, the projection has proved tricky, but these limitations are starting to fall away. Applications like telepresence, which is similar to 3D video but implies a two-way communication stream, can facilitate interactions with people or environments in remote locations, saving time, money and travel while still allowing for an immersive experience.

Video is rapidly expanding its reach online and is valuable for many teaching situations. However, 3D video and telepresence takes this form of media to the next level, allowing unprecedented immersive experiences and communication that can give viewers a real sense of what an object, environment or group of people might be like. Such applications in the education arena include exploration of remote locations and visualization of complex objects such as molecules or engineering projects. 3D video could be a new platform for creative endeavors such as filmmaking as well.

### Relevance for Teaching, Learning & Creative Expression

- YouTube is experimenting with showing 3D videos which could pave the way for more adoption at the consumer level.
- The University of Southern California's Institute for Creative Technologies is developing a one-to-many 3D video teleconferencing system.
- Sound Video Systems now offers AVRover, a mobile 3D projector system for classroom use.

### Examples

- Zebra Imaging is one company working to develop new 3D video display technology: [http://www.zebraimaging.com/html/lighting\\_display.html](http://www.zebraimaging.com/html/lighting_display.html)
- Cisco offers a number of telepresence-based products for business and home use: [http://www.cisco.com/en/US/netsol/ns669/networking\\_solutions\\_solution\\_segment\\_home.html](http://www.cisco.com/en/US/netsol/ns669/networking_solutions_solution_segment_home.html)
- TYZX is currently making 3D imaging systems (DeepSea line) that can be used for a variety of applications: <http://www.tyzx.com/products/DeepSeaV2.html>

### For Further Reading

#### Crowded theaters build momentum for 3-D at home

[http://tech.yahoo.com/news/ap/20091025/ap\\_on\\_hi\\_te/us\\_tec3\\_d\\_in\\_the\\_home](http://tech.yahoo.com/news/ap/20091025/ap_on_hi_te/us_tec3_d_in_the_home)

(Ryan Nakashima, *Yahoo! Tech*, Oct.25, 2009.) This article discusses the emerging trend for 3D television and what this means for 3D technology.

#### Ready or not, the latest 3D technology is coming home

<http://www.engadget.com/2009/10/26/ready-or-not-the-latest-3d-technology-is-coming-home/>

(Ben Drawbaugh, *Engadget*, Oct. 26, 2009.) This article discusses the technological barriers as well as advancements that will eventually allow this technology to become commonplace.

#### How 3-D TV Works

<http://electronics.howstuffworks.com/3d-tv.htm>

(Jonathan Strickland, *How Stuff Works.com*, June 23, 2009) This article gives an overview of the history and current state of 3D TV and what we can expect in the future.

## Research Question Four

# Challenges

**Budgets are shrinking in the present economic climate, forcing institutions to focus more narrowly on key goals.** Across the board, institutions are looking for ways to control costs while still providing a high quality of service. Schools are challenged by the need to support a steady—or growing—number of students with fewer resources and staff than before. In this atmosphere, it is critical for information and media professionals to emphasize the importance of continuing research into emerging technologies as a means to achieve key institutional goals, such as adequately preparing students to be effective in their fields.

**Current metrics for evaluating scholarly authority do not support emerging forms of authoring, publishing, and researching.** Citation-based metrics are no longer indicative of the relative importance of a given piece of scholarly work; new forms of peer review and approval, such as reader ratings, inclusion in and mention by influential blogs, tagging, incoming links, and retweeting, are arising from the natural actions of the global community of educators. These forms of approval are not yet recognized as significant.

**The demand for personalized learning is not adequately supported by current technology.** The increasing demand for education that is customized to each student's unique needs is driving the development of new technologies that provide more learner choice and control and allow for differentiated instruction. It has become clear that one-size-fits-all teaching methods are neither effective nor acceptable for today's diverse students. Technology can and should support individual choices about access to materials and expertise, amount and type of educational content, and methods of teaching.

**Faculty and teachers do not receive training in digital media literacy, although this is a key skill.** Often not seen as a priority for faculty or teacher training, digital media literacy is nonetheless a critical skill not only for students but for those who work with them. Faculty and instructors are beginning to realize that they are limiting their students by not helping them to develop and use digital media literacy skills across the curriculum. This challenge is exacerbated by the fact that it is not clear exactly how to codify the skills or set standards for their measurement.

**The public perception of the value of copyright is diminishing.** The challenge of providing the broadest possible access to content, without depriving artists, authors, and other content creators of their intellectual property and income, continues to be one of the largest faced by education today. Creative Commons and other alternative forms of licensing are quickly becoming mainstream; new business models must be developed that take these forms of licensing into account.

**The role of the academy—and the way we prepare students for their future lives—is changing.** In a 2007 report, the American Association of Colleges and Universities recommended strongly that emerging technologies be employed by students in order for them to gain experience in "research, experimentation, problem-based learning, and other forms of creative work," particularly in their chosen fields of study. It is incumbent upon the academy to adapt teaching and learning practices to meet the needs of today's learners; to emphasize critical inquiry and mental flexibility, and provide students with necessary tools for those tasks; to connect learners to broad social issues through civic engagement, and to encourage them to apply their learning to solve large-scale complex problems.

## Research Question Five

### Trends

**The abundance of resources and relationships induced by open resources and social networks is increasingly challenging us to revisit our roles as educators in sense-making, coaching and credentialing.** Access to educational materials of all kinds has never been so easy or so open as it is today, and this trend is only increasing. The sage-on-the-stage model of teaching, where the instructor holds all the information and all the cards, is simply not applicable in this world of instant access. Educators must respond by changing their roles to reflect the new need to guide and coach students in finding, interpreting, and building an understanding from multiple sources of information.

**Engaged citizenship is increasingly enabled by technology, political awareness, engagement and just-in-time learning.** Mobile technologies and new media show strong promise to improve civic participation and social inclusion for youth. Further, the growing trend of embedding media and connectivity into the urban fabric is opening up new forms of social and civic engagement. Students are able to be more connected with the world than previously, leading to increased levels of participation in social and civic activities.

**Increasingly, we expect to be connected wherever we go.** Wireless network access, mobile networks, and personal portable networks have made it easy to remain connected almost anywhere. We are increasingly impatient of places where it is not possible, or where it is prohibitively expensive, to be connected, such as airplanes in flight and countries outside our own mobile networks. The places where we cannot connect are shrinking—some flights provide wireless access, for instance—and our expectations of immediate access to our personal information, multi-level communication, and interaction with the world are more frequently met.

**More and more, people expect to be able to work, learn, study, and connect with their social networks wherever and whenever they want to.** We are not tied to desks anymore when we wish to use computers. Workers increasingly expect to be able to work from home or from the road, and most everyone expects to be able to get information, addresses, directions, reviews, and answers whenever they want. Mobile access to information is changing the way we plan everything from outings to errands. A corollary of this trend is the expectation that people will be available and online, anywhere and anytime.

**Students are increasingly seen as collaborators, and there is more cross-campus collaboration.** Using collaborative technologies, students are working with faculty and peers in other classes and on other campuses to create online resources that both demonstrate learning and contribute to public knowledge. Research projects are conducted by larger, more distributed teams than previously, and they are often becoming more public much earlier in the research process.

**Technologies are becoming more decentralized.** The continuing acceptance and adoption of cloud-based applications and services is changing the way we configure and use software and file storage. We readily accept that our work is stored on someone else's servers; we appreciate that our information is accessible no matter which computer we may sit down to use; we are used to the model of browser-based software that does not need to be installed on our computers. Many institutions have found that valuable campus resources are freed up by outsourcing utilities like email and applications. Campuses are responding to this trend in different ways; some are adopting decentralized, hosted solutions, while others are building in-house solutions of their own.