

Reworking the web, reworking the world: how web 2.0 is changing our society

Justin Reich

Harvard Graduate School of Education

December 2008

Abstract

Web 2.0 refers to a suite of technologies that have dramatically lowered the interaction costs of two-way communication over the World Wide Web, which has democratized the production of information and applications across the internet. To sum up the Web 2.0 phenomena in a sentence: lower communication costs have led to opportunities for more inclusive, collaborative, democratic online participation. As the costs of communicating online decreased, more people, in terms of million, decided that it was worth their while to participate in these communication networks. These people did not just communicate more, they started communicating in qualitatively different ways than before. As these millions found new media for expression and collaboration, they opened possibilities for a more inclusive, open, democratic society, possibilities which may or may not be realized.

There is no doubt that this democratization, these contributions from many millions of web participants, has produced a series of profound social, political and economic changes that this paper will seek to document. The changes inspired by the democratization of the web, however, will not of necessity lead to a more equitable distribution of power and resources in our society. The future of the web will depend upon the degree to which this blossoming of online participation will allow ordinary citizens and consumers to have greater voice and influence in shaping society and the degree to which powerful political and commercial interests can co-opt and constrain the surge of online enthusiasm in the support of the established hierarchy.

Keywords: internet, identity, politics, economics, education, democracy, society, community, citizenship, communication, networks

Web 2.0 is transforming our society. Online tools that support collaborative communities are redefining how firms do business, how retailers engage customers, how politicians energize voters, how journalists inform readers, how teachers educate students, how friends maintain relationships, and how individuals shape their own identity. Web 2.0 (O'Reilly, September 30, 2005) refers to a suite of technologies that have dramatically lowered the interaction costs of two-way communication over the World Wide Web, which has democratized the production of information and applications across the internet. There is no doubt that this democratization, these contributions from many millions of Web participants, has produced a series of profound social, political and economic changes that this paper will seek to document. The changes inspired by the democratization of the Web, however, will not of necessity lead to a more equitable distribution of power and resources in our society. The future of the Web will depend upon the degree to which this blossoming of online participation will allow ordinary citizens and consumers to have greater voice and influence in shaping society and the degree to which powerful political and commercial interests can co-opt and constrain the surge of online enthusiasm in the support of the established hierarchy.

Getting to know Web 2.0

The technological innovations that have enabled what we call Web 2.0, or the Read/Write Web, are perhaps best understood in the context of the costs of contribution to the earlier incarnations of the World Wide Web. In the early days of the web, which we can call Web 1.0, posting information online was expensive, time-consuming, and required specialized knowledge. One had to register a domain name, hire a hosting server, learn HTML, and use FTP tools to upload files to a Web server in order to put a page on the World Wide Web. These barriers were not overwhelming, hobbyists could learn the skills and commit the resources to participate, but as a result of these barriers, only a tiny portion of the community which used the web was responsible for providing the content. Most people just went to read, and then later, as bandwidth grew, to listen and watch.

Over time, web developers increasingly added functionality to websites that allowed people to more easily contribute content to the web. Some of the earliest of these sites were discussion boards, a feature of the internet from even the days before the web, which allowed multiple users to easily contribute information to the web without needing to learn how to program in HTML or register a domain. These simple discussion spaces embodied the crucial design principle that has driven the development of Web 2.0: make it as simple, as time-cheap, and inexpensive as possible for ordinary Web users to contribute. We'll soon turn to how this principle has found expression in a diverse variety of platforms - blogs, wikis, podcasts, social networks, virtual worlds - but first it's worth teasing out the significance of designing for simplified contributions.

Lowering the costs of communicating and barriers to participation

To sum up the Web 2.0 phenomena in a sentence: lower communication costs have led to opportunities for more inclusive, collaborative, democratic online participation. Economists would say that when developers made it easier to contribute to the web, they were lowering the interaction costs of communication. As the costs of communicating online decreased, more people, millions more, decided that it was worth their while to participate in these

communication networks. These people did not just communicate more, they started communicating in qualitatively different ways than before. As these millions found new media for expression and collaboration, they opened possibilities for a more inclusive, open, democratic society, possibilities which may or may not be realized. Understanding these social possibilities requires better understanding the technical design principle that has enabled them.

The dramatically lower costs of communicating information over the web can be illustrated with a simple thought experiment: how would you share a video with all of your friends in 1980 and today? In 1980, sharing a video message with your friends would involve the following steps: filming on a tape, transferring the tape to VHS, copying each individual VHS tape, packaging and addressing each tape, and mailing the tape to everyone you know. The time costs of such a venture were basically prohibitively high. People certainly had an interest in seeing each other's video clips - recall the remarkable run of Bob Saget and *America's Funniest Home Videos* - but they were simply too expensive to share within individual social networks.

Now consider the costs of adding video to YouTube. Click: I start my Web Cam, and I spout wisdom. Click: I save it. Click: I open YouTube. Click: I upload the file. Click: I label it with a "tag" so that others can find it (tagging is discussed further below). And for bonus points, Click: I change my Facebook status update to alert everyone in my social network that I've just added a video. There is some degree of learning curve to figure out how all of these applications and services work. But as people learn their way around one Web 2.0 service, they realize that Web 2.0 tools share many common features and it is increasingly easy to learn the next. Compared to the economic costs of these kinds of interactions in the past, global communication today is almost impossibly free.

Lowering communication costs doesn't just lead to more communication, it leads to qualitatively different behavior by web users. For instance, it turns out that if you make it extremely time-cheap to contribute an article to an online encyclopedia, that people will create a Wikipedia with 2.5 million of them. It also turns out that if you make the editorial process decentralized and consensual, that people will anonymously and collaboratively edit those same 2.5 million articles and come to editorial loggerheads over only a tiny percentage of them. It turns out that if you make it time-cheap to post short updates about your day and read at a glance all of the updates of your friends and colleagues, that millions will start following the daily and hourly turns of people's lives through tools like Facebook and Twitter (both to be discussed further). By itself, little updates like "Struggling with my statistics assignment," are rather dull and prosaic. But aggregated into thousands of little updates, friends are tracking each other's lives through Web 2.0 tools much more closely than has ever been possible by all but the closest social and working relationships. As a final example, the ease of producing and sharing online videos has allowed for the new social phenomena of viral videos, publically available online videos which are seen by hundreds of thousands or millions of people, which are typically created, published, and distributed outside of the traditional studio/publisher information networks. Because cheaper communication allows new communication media and practices, we have a whole new set of shared cultural texts created and distributed outside of the traditional, hierarchical publication networks.

Lowering the interaction costs of communication leads to perhaps the most important feature of Web 2.0: its inclusive, collaborative capacity. The new Read/Write web is allowing people to work together, share information, and reach new and potentially enormous audiences outside some of the traditional structures of power, authority, and communication in our society. The social developments that have resulted from the Web 2.0 phenomena

are best understood through a lens of democratization, but we must keep in mind the caveat that democracy means many different things in many different places (Haste and Hogan, 2006). Democratizing the web may mean one thing for the wealthy in the West with instant access to the web through wireless-connected laptop computers, and another thing for the poor in the West who access the web through public connections in schools and libraries (Jenkins, 2007). Democratizing the web may mean one thing for students in rural Africa with dial-up modem connections on cast off computers from Europe, and another thing for bloggers in China whose content is scrutinized by an army of government censors and language police. While democratization may mean different things in these diverse areas, certain commonalities hold as well. More people are getting involved in a series of increasingly global conversations, more people have the capacity to share their thoughts and insights to the world, and more people have the capacity to weigh in on the value and virtue of media and commentary. In older media forms the boundaries between authorship and readership, speaker and listener, producer and consumer remained quite clear. "The new Web", as professor Leon Watts notes "has broken down the authorship-readership roles into degrees of contact and reciprocation of infinitely variable granularity" (Personal Communication). In decentralizing the control over the flow of global information, Web 2.0 holds tremendous potential to shift the balance of power from the elite to the masses, with all of the chaos, creativity, exceptionality and mediocrity that have marked the expansion of political democracy.

Whether or not this potential is realized, whether or not the key Web 2.0 design principle of simplify contributing leads to gains in democratization depends on how developers, publishers, telecommunications companies and users negotiate the evolving spaces that allow for all this communication. Before considering possible scenarios for the future impact of Web 2.0 platforms on society, we should now examine what some of these platforms are and how they are evolving.

Instantiations of Web 2.0

Web 2.0 technologies may be animated by a single design principle, simplify contributing, but they take a wide array of forms. Some of the most visible Web 2.0 tools are categories of platforms. One of the first platforms of the Read/Write Web was Web logs, or blogs, which are websites that are like public journals. Blog authors, or bloggers, post chronologically-ordered journal entries to a site, and each entry has a feature that allows readers to comment, allowing for two-way interaction. Blog hosting services like Blogger, now owned by Google, developed around the turn of the century and allowed even people without any programming skills to create and publish blogs. Wikis, websites which are authored by a community of people, emerged as another platform that allowed for easy, collaborative publication of information. The most famous wiki, Wikipedia, is authored by millions of anonymous contributors, and indeed anyone can click on any page in Wikipedia at any time and add anything that they so desire. Podcasting tools allowed for the uploading and syndication of audio files, and podcasts are a kind of audio blog. YouTube pioneered online video sharing by creating a space where people could upload small video files and make them publically available. These diverse spaces have fostered new forms of global, multimedia, communication and publication.

Online social networks also fall within the domain of Web 2.0. In America, the two largest sites are MySpace and Facebook, where users create a web page profile, invite friends to connect to their profile, and use the page as a space to publish personal content and

connect with friends and co-workers. While broad scale online social networks are the most well known, niche social networks exist as well, and services like Ning allow users to create their own mini online social networks, such as Classroom 2.0, a social network for educators interested in Web 2.0. Virtual worlds, including online games, are, to some degree, other forms of online social networks, where users create avatars which inhabit three-dimensional virtual worlds. Second Life is the largest online virtual world community, and World of Warcraft, with over 10 million members worldwide, is the world's largest online game community. Both virtual worlds are also integrated with other forms of Web 2.0 tools like discussion boards, blogs, and wikis.

For those who have not closely followed the growth of Web 2.0, the scale of adoption is staggering. In America in 2006, over 50% of teenagers - across racial and socioeconomic lines - have created pages on online social networks like Facebook and MySpace, and in all likelihood this percentage has increased in the last two years (Lenhart, Madden, Macgill, and Smith, 2007). As of October 2008, Wikipedia had over 2.5 million pages, over 250 million page edits, over 8 million registered users, and over 150,000 people who had made an edit in the last 30 days. In February of 2008 Technorati was tracking over 112 million blogs, which doesn't include as many as 73 million Chinese blogs (Helmond 2008). Even in the US education sector, which was rated dead last out of 30 sectors in technology adoption by the Department of Commerce in 2003, Web 2.0 is growing exponentially. PBwiki reports hosting over 250,000 education related wikis; Wikispaces reports that they have given away over 100,000 free wikis to K12 educators and they plan on donating 250,000 more; and Edublogs hosts over 100,000 education related blogs. And while these are statistics from some of the largest Web 2.0 service providers, they represent only a fraction of online applications within the education sector.

Web 2.0 refers to these simple, often free tools for adding content to the Web, but it also refers to systems that allow users to evaluate content. Tagging refers to the process of allowing users to apply key word labels to discrete bits of content. The service del.icio.us, for instance, allows users to tag Web sites such that del.icio.us community can bypass search engines like Google and instead search the Web using user-generated key words. This form of content organization has been dubbed "folksonomy," a taxonomy generated organically by a community. Tagging is an essential feature of many Web 2.0 content sharing sites, like Flickr, a popular service for sharing photos.

Indeed this kind of convergence is one of the most common features in the evolution of Web 2.0 tools. User-generated videos from YouTube are embedded in wikis; podcasts are hosted by blogs, commerce sites like Amazon.com allow users to tag products and post reviews. Facebook attempts to serve as an individual's one-stop Web 2.0 hub, allowing users to chat, post updates, blog, share links, host photos, share videos, coordinate events, share music, and so forth. As Web 2.0 develops, many features of the various platforms are converging and overlapping.

The development of Web 2.0 is also characterized by new innovations. Right now in America, one of the fastest growing Web 2.0 services is Twitter, which allows for micro-blogging. Users post, either online or through mobile phones, status updates of 160 characters or less. Individually, most posts are trivial. Taken collectively, they allow users to track the daily ebb and flow of another person's life, creating a remarkable sense of intimacy and familiarity (Thompson, 2008). Twitter is now being integrated with Facebook and other tools, so that microblogging is just now entering the Web 2.0 milieu.

The ownership of these diverse spaces deserves careful consideration. Many of these platforms are created and managed by teams of volunteers who release their products

under licenses like GNU or creative commons that allow others to share and build upon their achievements. Wikipedia is run by a non-profit agency funded by user donations, Wordpress gives away their blogging platform, and MediaWiki gives away a wiki platform. Other platforms are proprietary and for profit: Google owns Blogger and YouTube, Rupert Murdoch owns MySpace, and so forth. The transmission of data that enables these communications is made possible by telecommunications companies that are regulated by governments around the world. In many dimensions, the newly enabled communications of millions of users depend upon the infrastructure provided by corporations and governments, and the boundaries and possibilities of new communications will be negotiated by users, corporate interests and governments. Corporations may seek to constrain communications in ways that maximize profits and governments may seek to constrain communications in ways that maximize state control. Whether or not the democratic possibilities of Web 2.0 are realized depends a great deal upon the degree to which users can negotiate for freedom and autonomy within the networks created and controlled by established political and corporate interests.

The broad future direction of Web 2.0

The driving force behind Web 2.0, the desire to lower the costs of communication, will continue to be a force shaping the web in the decades ahead, and innovations in time-cheap communications are going to present a future full of new surprises. Three other trends at various levels will continue to act on and shape this driving force. First, new platforms will continue to emerge. Second, the functionality in platforms will continue to converge. Third, we should expect to see greater integration between Web 2.0 tools and handheld devices. Finally, we should consider the efforts to those who seek not to extend the Web 2.0 regime, but to transcend it.

Platforms

It's hard to guess which web communication platforms are going to stick and which are going to fall to the wayside - the book has been pretty durable, the 8-track less so - but we can make some guesses. To step back and think broadly for a moment, platforms are essentially defined by their level of automation. Automation makes certain communication acts time-cheaper, but automation also acts as a constraint on communication forms. Blogs are highly automated. They take new posts and new comments, and they place them in chronological order. This means that making an online journal with collaborative comments is quite time-cheap, but it also means that it's difficult to make a blog anything other than an online journal. Wikis, by contrast, are the blank canvases of the online world. Almost nothing is automated in a wiki, and so they have a tremendously flexible format which is much more time-expensive to manually design.

Blogs and wikis are two of the formats which seem to have a great potential to prove quite durable. The free, flexible nature of the wiki means that it will likely continue to be suitable for innovative new structural arrangements. The enduring nature of the journal across time and cultures suggests that blogs will long have a place. Likely developers will find new ways to make communication within these platforms cheaper and easier, but these durable platforms seem well-poised to endure.

Some of the more proprietary platforms are perhaps more vulnerable to replacement. Online social networks are probably going to persist in the decades ahead, but five years ago one might have predicted that MySpace would dominate in America, whereas Facebook has begun to very successfully compete broadly with MySpace, especially amongst the demographic of Americans with higher levels of education. As more adults join Facebook, it may be that youth look to escape to a new network (Friending your parents is very uncomfortable... not friending your parents even more so), and perhaps a new space will be born.

Undoubtedly new platforms will also emerge as people develop new ways to make certain forms of communication time-cheap. Some of these may be rather obvious in retrospect, like Goodreads, which allows readers to share lists of what they are reading, lists of their favourite books, and lists of the books on their to-read list. Others applications, like Twitter, may appear quite strange as they appear because they represent new forms of social communication.

Convergence

Virtually all wiki platforms have built-in discussion boards. The Wordpress blog editor has a built-in static web page creator and publisher. Facebook integrates seamlessly with Twitter and a 1,000 other applications. Podcasts can be distributed through blogs. Platforms which began as serving one particular function are increasingly being combined and woven into other platforms. Teens used to send instant messages through systems like AOL Instant Messenger, but increasingly chat online through integrated chat in Gmail or Facebook. In America, Facebook seems well posed to be the primary launching point to the Web 2.0 world for many Americans, and other services like the start page for Google Apps is competing for the same title of home base. Some of the clear distinctions which now exist among platforms may cease to exist as tools increasingly adopt the functionality of other tools.

Handheld devices

Gcast is a service that allows any phone user to dial a phone number, record a message, and have that message published as a podcast within minutes. Jott is a service that transcribes and emails or publishes phone messages. Twitter updates can be made and read by text message, email, or on the web.

As handheld devices develop more sophisticated interfaces, increased functionality, and the ability to transmit more information more quickly, it's likely that handhelds are going to make Web 2.0 platforms increasingly portable. Right now the clunkiness of thumb pads, the small sizes of screens, and the low bandwidth of mobile phones are limiting their integration into Web 2.0 platforms. It's not time-cheap to add an article to Wikipedia through your mobile if you have to type out a whole article with your thumb and can only read 20 words of it at a time on your screen. However, as developers overcome these hurdles, mobile phones and other handheld devices will increasingly become integrated into the Read/Write web. At some level, this will simply mean more communication, but we should also expect qualitatively different forms of communication to emerge as well.

Web 3.0 and beyond...

Predicting the “knight’s move,” the radical changes that will reshape social phenomena is always a difficult task, though in the realm of science and technology we at least have the advantage that researchers and developers who are working on new breakthroughs are toiling in plain sight. Tim Berners-Lee, for instance, one of the founders of the World Wide Web, has been working for some time on developing tools to allow a “Semantic Web,” or a version of the web where computers would be able recognize the meaning of data at some level (Berners-Lee, Hendler and Lassila 2001). For instance, search engines can currently find every web page where the word “cat” appears. Clever programmers can even get computers to recognize that the word “cat” appears so frequently with the word “pet” that those words probably have some relationship. Computers cannot however, know what cat means or figure out that cats are a subset of pets. In the Semantic Web, computers would be able to identify these types of relationships, and thus one could do a web search for the phrase “all the types of pets” and the computer would not merely search for websites with those exact words, but would search throughout the data of the web to find all of the data considered a subset of pet, and then return that data to the user. Such a web would dramatically increase the meaning-making capacity of computers, allowing humans to focus even more of their time and energy on higher order thinking tasks, just as search engines on the web have allowed humans to find massive amounts of information in much less time.

Web 2.0 across the sectors

No facet of modern life will remain untransformed by the innovations of the Web 2.0. That’s a strong claim, but in the face of the scope and scale of the social transformations wrought by Web 2.0, it increasingly appears to be a defensible one. Across nearly every sector of the world, Web 2.0 is changing the way people interact and relate.

Business

Web 2.0 tools are sparking two major changes in business practices: how employees collaborate, and how businesses interact with customers. At the MathWorks near Boston, MA, software engineers are designing their entire products on wikis. Programmers no longer email snippets of code back and forth as they attempt to create and debug new features. Instead, programmers post their work to a wiki, which allows the entire MathWorks engineering community ready access to the entire database of code for their products. At BestBuy, the sales force of “Blue Shirts” participates in an online social network called Blue Shirt Nation, where employees can share strategies, give feedback to management, react to new products and campaigns, and help to shape the overall direction of the company (Li and Bernoff, 2008).

These practices represent both new efficiencies and new relationships within firms, and as of this moment it’s not yet clear which of these innovations will prove transformative. New efficiencies produced by collaborative work environments may be merely useful or they may be essential. Can a consumer durable retailer which has not harnessed the collective intelligence of its sales force compete with one who has? We may find that in certain economic sectors harnessing collective intelligence is more important than in other places, or we may find that firms who can use new Web 2.0 tools to empower their employees consistently out-compete those who do not.

Online networks may also upset hierarchical corporate structures. Will online communities within firms represent a new avenue for employee advancement? Will the Best Buy sales rep with the highest numbers be passed over for manager in favour of another employee who made several critical contributions to Blue Shirt Nation? Will the MathWorks wiki allow the most creative, productive programmers to be identified and recognized for their work, rather than the project manager who compiles and presents the final project to executives? These new platforms may allow different kinds of talents - talents related to online networking, communication and collaboration - to be more highly valued in the work place. They also may allow for employees at the bottom of the corporate hierarchy to more easily bend the ear of those at the top, and the examples of both Linux development and the Toyota production system lend support to this hypothesis (Evans and Wolf, 2005). These flatter, more democratic, more meritocratic social organizations may allow firms to draw out the strengths of their employees with less regard towards their position in the organization.

Lowering communication costs is also likely to accelerate the pace of globalization and outsourcing. As it becomes increasingly easier to collaborate online, both asynchronously and in real time, firms can employ people around the world and have those teams work together. For developing countries, this represents an incredible new opportunity for nations that can build the infrastructure for people to participate in this phenomena. For developed countries, it means greater competition in the global labour market.

Web 2.0 tools are also changing the ways that firms interact with consumers. For one rather silly example, take the case of the American film "Snakes on a Plane." When New Line Cinema published that title amongst their list of films in development in 2005, it captured the attention of a segment of film buffs on the internet. Perhaps it was the way the title succinctly captures the central conflict of the film; perhaps it unlocked some deep psychological tensions around flying in post 9/11 America. In any event, blogs about the film sprouted, fans started generating and sharing content about a film that had not even been created yet. Fans knew that Samuel L. Jackson was to play a lead role, and one fan produced a sound clip where he imitated Jackson saying "I want these motherfucking snakes off the motherfucking plane!" The clip went viral - it spread rapidly through social networks and outside traditional publication channels - amongst fans of this yet-to-be movie, and the fans demanded that the line be added to the movie. So the studio went back into production in order to add the line, which became the signature moment of the film.

That moment represents a powerful symbolic change in the relationship between producers and consumers. The fans were not the simple recipients of the movie; instead, they helped to design the film. They were co-constructors of the product, and through that co-construction not only did they improve the product (in a marketing sense, if not an artistic one), but they also felt a greater sense of investment in the product. These fans, with their blogs, fan sites, and media clips, became a free marketing arm for New Line, and produced a buzz around the movie that few campy B-movies can hope to achieve.

Web 2.0 tools allow many variations on these kinds of two-way communication amongst firms and consumers. At Snorg T's, about 1/3 of their ideas for new t-shirts, sold over the internet, come from consumers. At threadless.com, consumers not only submit t-shirt designs but vote on the ones that they want the company to produce, market and sell. Companies as diverse as Dell and Stonyfield Farms use blogs to talk and listen to consumers (Scoble and Israel, 2006). Proctor and Gamble launched Beinggirl.com as a space for girls to talk with each other and with health care professionals about issues of relationships and sexuality, sponsored throughout by advertisements for beauty and feminine care products (Li and Bernoff, 2008). As I write this, JetBlue airways has just announced its first flight from its new terminal at JFK via Twitter, sending the message

directly to its 6,000 followers on Twitter. In these conversations, firms not only have the chance to learn from their consumers, but also to communicate directly with them, unfiltered through the media. In the best of circumstances, firms can help consumers feel like partners in the life of corporate products; consumers become part of the team.

Looking towards the future, if all that corporations do with these tools is find new ways to sell their products, then that won't constitute a significant change in the economic sphere. If companies, however, go further in terms of listening to consumers, towards building partnerships with them, towards responding to their concerns and ideas, then we may see new ways for the marketplace to better serve consumers. If firms discover that they can draw strength from the ideas of consumers, that they can grow by building partnerships from consumers, and that they are vulnerable to widespread, online criticism of consumers, then that may shift the balance of power in capitalist society from the producers towards the consumers.

An alternative future where producers simply use Web 2.0 as a new medium to share advertising and propaganda with consumers is equally imaginable. BeingGirl.com may develop as an open forum where girls have a chance to speak with each other and with professionals about the challenging issues of adolescence, and Proctor and Gamble may get some incidental benefits from fostering this open space. On the other hand, Proctor and Gamble can exert powerful editorial controls over the content on BeingGirl in order to manipulate conversations towards the celebration of P&G products and the positioning of young girls as deficient beings without those products. We have to expect that Proctor and Gamble only cares about the interests of young girls to the extent that those interests coincide with their fiduciary responsibility to maximize shareholder profit. In these corporate sponsored spaces, which include Blogger, Facebook, MySpace, and many others, users and corporations will negotiate the norms of each space, and in the best possible future these negotiations will result in consumers working with producers to create a better marketplace. In the worst possible future, producers will use online spaces as a forum for cynical advertising to penetrate ever more deeply into the lives of consumers.

Politics and the civic sphere

Those who research the emerging Web trends in society are going to spend a considerable amount of time unpacking the role of the internet and other communication technologies in the Barack Obama presidential campaign. The Obama campaign reached out to voters through a wide variety of existing web platforms. The campaign has pages and groups on a variety of social network sites, posts regular updates on Twitter (where Obama has 100,000 followers), posts videos on YouTube, uploads pictures from the campaign trail to Flickr, and participates in other niche platforms like Faithbase and BlackPlanet. After Obama's victory, we have good reason to believe that Web 2.0 tools will be an established feature of political campaigns.

The Obama campaign built a proprietary online community of over 1,000,000 members called my.barackobama.com (myBO). Users at myBO could join groups based on states, neighbourhood or interests (like Tango dancers or air traffic controllers). They signed up to contact local undecided voters in their neighborhood and received "Walk lists" in seconds. Users could create a fundraising page which tracked their efforts at getting friends and family to donate to the campaign, and they could create their own blogs with which to share their thoughts with others. While myBO posed a number of strong constraints within the network in order to maintain their message and brand, they allowed remarkable freedom to users in creating their own blogs and fundraising messages. These messages were

screened, and objectionable language was removed and led to users being banned, but on the whole the campaign allowed users to craft their own personal message of support in the service of a shared goal.

All of these messages were also shared outside the bounds of the official Obama network. In some cases, users shared the Obama message by posting Obama updates to their own social network profile, or sharing YouTube videos from the campaign by email. At the same time, Obama supporters also took ownership of his message and created their own groups and communication platforms. Many people individually created their own blogs or groups, like the Obama-Mama blog or the Facebook group "I have more foreign policy experience than Sarah Palin."

These tools allowed the Obama campaign to achieve two objectives. First, they used communication tools to speak directly to millions of voters and potential voters without being filtered through the media. The decision to announce Obama pick for V.P. via text message at an early morning hour allowed the Obama campaign to send their message directly to the voters, rather than mediated through some kind of press release or press conference. Consider the costs of sending all of the words, images and videos distributed by the Obama campaign through a combination of media ads and direct mailing: it would be a staggering sum. The costs of transmitting these materials become entirely manageable using the web, and in fact, Obama volunteers and supporters absorbed much of the cost of those interactions.

The role of volunteers in sharing the message speaks to the second online objective achieved through Web 2.0 tools: getting a small army of grass-roots supporters involved in the campaign. The online tools dramatically reduced the cost of mobilizing huge numbers of volunteers and supporters. Those volunteers worked both through official channels, like those who volunteered to print out Obama walk lists, and through unofficial channels, like those who posted an Obama video to their social network profile or blog outside of myBO. The Obama campaign's online efforts gave supporters an online stake in the campaign and even gave them some control over personally shaping their version of the Obama message. By sharing this stake, the campaign unlocked entirely new bases of small donors, of volunteers, and of new voters.

While the Obama campaign is certainly the most prominent example of online civic mobilization, many other examples exist as well. On February 12, 2003, the largest coordinated protest in human history occurred across the world in opposition to the Iraq war, where somewhere between 12 and 20 million people took to the streets (Bennett, 2007). The protest was organized in a matter of months, and online communication played a critical role. At www.350.org, activists are mobilizing people to demand action on greenhouse gas emissions and reduce atmospheric carbon down to 350 ppm. At 350.org people can join the movement, find out about upcoming actions, organize their own actions and spread the word. Facebook has an application where individuals can create profiles dedicated to causes, where people can invite their friends to donate to or join in an action or effort. These tools will play an increasingly important role in grass-roots action over the decades ahead.

Just as we could imagine two alternative futures for Web 2.0 tools in the economic sphere - one which enhanced consumer power and one which co-opted consumer energy in the service of corporate power, so can we imagine two futures for these new political media. Whether you believe that Barack Obama is The One, That One, or just the next one, one has to assume that he'll be under constant pressure to use his online network as a tool for generating support for his agenda rather than as a medium for developing his agenda. If

myBO becomes another media for the Obama administration to spread a centrally constructed message, then it becomes another instrument of elite political power. If, however, myBO morphs into my.americangovernment.gov, a space where citizens have the opportunity to contribute and collaborate on solving problems and speaking truth to power, then the democratizing power of Web 2.0 tools may indeed lead to a more democratic republic. Given the pressure on politicians to consolidate their power, one has to assume that the better future will only come about if the citizenry organizes to demand that it happen.

Journalism and the media are also being profoundly affected by the emergence of Web 2.0 tools. In some cases, new media are simply being integrated into old media. Many New York Times columns are also published as blogs, and readers can comment back on the blogs, and columnists can respond to those responses in future columns. Certainly this kind of dialogue happened with letters in the past, but the communication is now faster and at a greater scale. More importantly, anyone can now read almost all of the comments left behind by others, so nearly the entire communication stream is publically available. The editorial control over the "letters to the editor" is greatly loosened, so hundreds of comments are published rather than just a few letters. Anyone who is willing to avoid vitriolic personal attacks and foul or hateful language can have their say on the pages of NYTimes.com and dozens of other newspapers.

Web 2.0 tools also allow new journalism platforms to emerge outside of the traditional media. The Drudge Report and the Daily Kos are two examples of partisan blog networks providing political news and opinion outside of the traditional corporate journalism structure. Blogs that provide coverage of niches, like particular celebrities, trends, or market sectors, have proven to be particularly successful in finding readerships in the media marketplace. In some cases, this citizen journalism has proven to be a powerful check on the mainstream media, such as when bloggers discovered and then demonstrated that documents that Dan Rather used to criticize George W. Bush's Texas Air Guard record were fabricated. In other cases, Web 2.0 tools have been the source of media stories, such as when Senator George Allen called a young Indian man a Macaca at a campaign event, a racial slur which was captured on video and published on YouTube for the media to pick up on. Web 2.0 tools have both allowed new voices into journalism, and they have created a new bank of user-generated media to inform journalism. Established media conglomerates will undoubtedly attempt to harness, control and profit from these new domains, but the ease of creating and publishing widely available media suggests that media consumers will have a far wider array of media choices in the future, and they will have more opportunities to interact with others in national and international conversations about news events.

Relationships and identity

Friend is now a verb. To "friend" someone is to solicit or accept an invitation from another person on an online social network that denotes that person as one of your friends. In this context, friends are not necessarily friends as in other contexts. Friends may be acquaintances from school or work rather than people who you choose to have a social, affectionate relationship with. Yet the power of these online friendships is that Web 2.0 tools can allow them to have a degree of intimacy that offline friendships may not necessarily have.

For instance, this past summer I took a group of students to India. While in India, I left new status updates from the road, and when I returned I posted a series of photo albums to my Facebook site. I have several very dear, close, offline friends who know nothing about this trip; we have not been in touch since then. I also have several acquaintances in my Facebook network who I have not spoken to in years, who I don't feel particularly emotionally close to, who followed this expedition quite closely. If I run into them, they can ask about what it was like to cross the high pass at 16,000 feet in the India Himalaya or about my relationship with Lado, the Indian mechanic who helped us with our service project. In several important respects, my Facebook friends know the shifting landscape of my moods, activities, and journey through life better than some of my offline friends with whom I have close emotional bonds but only a weak sense of the contours of their current life. For those outside the world online social networks, it's easy to imagine that Facebook friends aren't real friends. But when I look at who understands my life right now, the question "who are my real friends?" becomes much more complicated. In a sense, I have a whole new category of friends with whom I share a whole new category of intimacy. Social capital theory gives us a robust framework to understand how these relationships work as weak ties (Putnam, 2000), but social capital theory in its present form does not necessarily account for the significance of the new levels of intimacy that I have development with my acquaintances. As online social networks transform our social landscape, fundamental and remarkably durable notions of relationships and identity may evolve.

For many young people especially, the online world now is a parallel social space to the offline world. Just as teenagers carefully cultivate an image in school, through dress, activities, friendships, and conversations, so do teens carefully cultivate a second image offline. In shaping their MySpace or Facebook page, teenagers carefully choose which photos of themselves to display, what books and movies to list as their favorites, who to accept and reject as friends, and what other information and images should adorn their "profile." Just as students may express one identity in the classroom, another in church, and another on the basketball court, so students can experiment with new identities online. In many cases, the lack of instant social feedback from acts of identity-shaping may allow people to be bolder in experimenting with self-expression; you might be taunted immediately for wearing an Arsenal jersey in the halls of a Manchester high school, but you have some insulation from insults if you post a picture of Adebayor on your profile, at least until your online friends find you. Certain online spaces are specifically designed for this identity experimentation and role-play. James Gee, writing about video games, describes the capacity to create "projective identities" in virtual worlds like World of Warcraft or Second Life, where people can experiment with designing new identities for virtual representations, or avatars, of themselves (Gee, 2007). These games, which require communication not only in game, but through other mechanisms like guild sites, forums, wikis, and blogs, allow people to experiment with new identities in new domains.

Exploration of how these online networks are reforming notions of identity has only just begun, but as one example of the changing social landscape consider the notion of persistence. The mobility of modern life in the West has allowed many people the opportunity to "start over" with a new identity. High school kids go off to college, people change jobs, switch schools, move to a different town. Someone who tires of being the class clown in middle school can try to shape a new identity in a new high school; someone who was a chess nerd in high school can join a party fraternity in college. Part of what enables these new experiments is the chance to abandon an old identity. But what happens to the nature of these changes if people travel from one offline social world to another while maintaining a consistent online social identity? What does it mean to have a single Facebook page from middle school through one's working life? Is one's Facebook profile sufficiently malleable to allow significant changes in identity, or does the durable nature of one's

public, online identity constrain people's efforts to experiment as someone new? Some initial research suggests that the complexity of privacy setting tools in Facebook restricts people's ability to maintain old ties while entering new communities with different expectations, but we have much more to learn (DiMicco and Millen 2007). Answering these questions will be critical to psychologists and other social scientists, to educators and parents, and to young people in the years ahead.

Over time, the English language has developed such that "virtual" is the antonym of "real," and if social scientists accept this opposition, they will miss some of the most important phenomena developing in modern social relationships. Relationships developed in virtual or online worlds are not pale reflections of "real" world phenomena. They are a new class of meaningful and profound interactions which researchers will have to consider seriously as they try to understand the evolving nature of society in a Web 2.0 world.

Education

On the slow pace of adoption

There is a subversive joke told amongst education technology advocates that if Rip van Winkle awoke today, he wouldn't recognize or understand the work in an architect's office where the drawings are done by AutoCAD, in a mechanic's garage where computers run diagnostic tests, or at a retail counter where sales are made and tracked by computer. All of these places and interactions would be radically different from the world the Rip fell asleep in, but if Mr. van Winkle walked into a classroom where students were sitting in rows listening to teachers lecture by the blackboard, then Rip would finally feel right at home. As Web 2.0 technologies reshape nearly every aspect of modern life, their adoption has been relatively slow within the classroom. "Relatively" needs to be put into perspective: three providers alone, PBWiki, Wikispaces, and Edublogs claim to host nearly half a million education-related blogs and wikis. In all likelihood, millions more are hosted on other large public services, on course-management systems like Moodle or Blackboard, on proprietary systems for particular schools, and through other means, though there is no certain way to count. So on the one hand, in terms of raw numbers we are seeing an exponential growth in the adoption of Web 2.0 tools in the classroom, and on the other hand we are seeing very little evidence that this adoption is penetrating normal classroom routines. Reconciling this tension will help us understand the present and future of these tools in the classroom.

Hypothesised benefits

Very little academic research has centered on Web 2.0 tools in education. From the literature that does exist though, one can unearth hypothesized benefits for using Web 2.0 tools in the classroom with students, which can be organized into four major categories. The first category involves *increasing engagement*. On the one hand, we have some evidence that by allowing students to publish in a public space over which they have some control and ownership, students are motivated by the chance to work in Web 2.0 environments. Several small studies and experiments suggest that students who write using these technologies write longer pieces, write more frequently, claim to take greater pride in their work, and claim to enjoy the process more (Cole, 2004; Dunleavy, Dexter, and Heinecke, 2007; Grant, 2006; Olander, 2007). Students enjoy the chance to use tools in schools that

they use socially in the rest of their lives, and they enjoy the opportunities to connect and collaborate (Reich, 2008) . They are also pressured, usually in a positive way, to perform better when their work is public. They appreciate opportunities to connect with the world outside their classroom. At the same time educators also have observed that Web 2.0 tools allow increased participation in class discussions, since those who struggle to communicate orally have another avenue to contribute (Ellis, Goodyear, Prosser, and O'Hara, 2006; Reich, 2008).

Building on this increased engagement, Web 2.0 tools provide *new avenues to teach fundamental skills*, like writing, communication, collaboration, and new media literacy. One small recent study showed that students who blogged improved their writing skills more than students who completed assignments by hand or through word-processing (Roth, 2007). The author argued that these gains were largely connected to motivation, and while the sample of the study may be small, the results are suggestive if not conclusive. Another recent study showed that students may learn reasoning skills in online communication with their peers more than they learn such skills when modeled by adult instructors (Ellis et al 2006). The capacity of these tools to nurture collaboration skills has been noted by several authors (Reich and Daccord, 2008; Richardson, 2008) who argue that the communally-constructed nature of Web 2.0 spaces forces students to figure out how to work together to create final products. Several researchers have investigated the promises and challenges to use Web 2.0 tools to develop these kinds of collaboration skills (Armetta, 2007; Coyle, 2007). In addition to these established skills, other researchers, like Henry Jenkins at MIT, have noted that the proliferation of new media has necessitated learning a whole new set of literacies, like understanding distributed cognition and transmedia navigation, and of course it makes sense to study new media literacies in the context of new media platforms (Jenkins, 2007).

In addition to developing both old and new fundamental skills, students also need to *rehearse for 21st century situations*. As noted above, businesses are adopting Web 2.0 tools at an astounding rate, and students in schools need to have access to the communication media that are at least similar to the types of environments that they will be expected to use in the future (Laurinen and Marttunen, 2007). In one specific example, several researchers have noted that most classroom writing instruction looks absolutely nothing like the kinds of writing that employees are expected to do in the work force. Collaborative writing where iterations are workshopped by multiple people using online media are the norm in many workplaces, whereas these practices are the rare exception in education (Garza and Hern, 2005). Researchers have also recognized that collaborative digital media is an increasingly important part of the civic sphere, both nationally and globally, and *Civic Life Online* (2008) provides numerous examples both of how people are organizing in the 21st century to meet civic goals and some early efforts to ready students to participate in these new efforts (Bennett, 2007).

Underlying all of these proposed benefits is the notion that the normal routine of school life is insufficient for preparing students for the new labour force and civic sphere. As Levy and Murnane (2004) argue, computers are increasingly replacing many of the repetitive tasks that used to be performed by significant parts of the human labour force. As a result, schools need to prepare students with new skills where humans have a comparative advantage over computers, especially in terms of complex communication and critical thinking. Since Web 2.0 tools offer new mechanisms for teaching these critical skills which schools so often fail to teach, emerging Web tools can *enlighten the critique of the contemporary state of education*. The best Web 2.0 projects, which we will turn to in a moment, demonstrate the extraordinary capacity for communication tools to enrich our learning, especially in contrast to an educational system grounded in print technology and

an industrial infrastructure. While technology may play a role in highlighting the needs for change, technology alone will not provide reform. As Prof. Barry Fishman has argued, "Technology needs school reform more than school reform needs technology" (Personal Communication).

The potential and reality of Web 2.0 tools

The best instantiations of Web 2.0 tools are extraordinary, and the bulk are, unfortunately, quite ordinary and quite well suited for fairly standard instructional models.

There are hundreds of exemplary examples of Web 2.0 projects (many of which can be found at edublogawards.com), and I'll highlight just one here. The Flat Classroom Project of 2007, hosted at flatclassroomproject.wikispaces.com, was a collaboration amongst eight classrooms in America, Shanghai, Austria, Qatar, and India. Students in the classroom were divided into 10 teams of students from around the world in order to study the 10 world flatteners from Thomas Friedman's book *The World is Flat* (Friedman, 2007). Each team took one of the world flatteners and explored its impact by creating a wiki page which included video, images, and collaboratively composed text. The videos were shot in one country and then "outsourced" to another for editing, so a student might film something in Qatar to be edited in America. The essays that followed the videos were written collaboratively, and the discussion pages "behind" the main project pages show the various project management, communication and teamwork skills that students needed to practice in order to successfully complete the project. In the process of designing the wiki page, students undertook a critical examination of an important phenomena and then worked together to create a multimedia performance of their understanding.

While no studies have looked widely across Web 2.0 tools, there is anecdotal evidence that this kind of project is a very rare exception to two normal states. The first normal state with Web 2.0 is failure. Of the hundreds of thousands of blogs and wikis created, most die on the vine. This isn't necessarily a bad thing, as one of the advantages of Web 2.0 is that they are both inexpensive and time-cheap to create, and so one can fail repeatedly before finding a model that works. That said, these failed instantiations are not realizing any of the aforementioned hypothesized benefits. The second normal state for Web 2.0 tools are applications that fit neatly into standard, industrial models of education. In these states, a wiki might be used as an easy way for a teacher to create a website as a one-way delivery device for content, rather than a collaborative medium. Or perhaps a student creates a blog as a kind of online portfolio, but her writings are never published widely, never shared with others, or never commented upon by classmates. In a sense the blog has allowed the student to pass in her homework online, but none of the potentially benefits of publishing within a larger critical, collaborative community are realized. If these two states are indeed the norm, then right now Web 2.0 tools may offer tremendous potential for education, but this potential is not much realized.

There is also anecdotal evidence that the distribution of the use of these tools, sophisticated or not, is skewed towards wealthy, suburban communities rather than poorer rural or urban communities. In theory, free and simple Web 2.0 tools that can build learning communities within and beyond schools should be able to benefit a wide variety of students equitably. Indeed, under-resourced schools might plausibly even benefit disproportionately, since networked computing technologies can be used to bring a wide variety of intellectual resources into low-income communities, where higher-income communities can afford to bring more of those intellectual resources directly into the classroom. Unfortunately, this does not appear to be the scenario currently unfolding.

I hypothesize that the distribution of Web 2.0 tools is indeed uneven, and that schools that are more wealthy, more white, more selective, and more suburban are more likely to employ Web 2.0 teaching tools than schools where students are poorer, non-white, and from urban or rural communities. Though no empirical research has been done on this topic, my hypothesis has been shaped by anecdotal evidence from conversations with educators, online discussions amongst academic technology integrationists, and evaluations of renowned education-related wikis, blogs and social networks. At a first glance, it appears that new opportunities afforded by Web 2.0 tools are primarily available to those students with access to many other types of opportunities. Henry Jenkins (2007) has raised similar concerns around this "participation gap" between wealthy and middle class students with access to participatory online communities and working class students who are being left behind.

Moreover, I expect that there is not only a difference in the distribution of these tools, but qualitative inequities in their application. Researchers have found that instruction in poor, non-white, urban schools is dominated by didactic, teacher-centered forms of instruction, where white, suburban students enjoy more interactive, student-centered teaching (Diamond 2007). I believe that these inequities will extend into the digital domain, and that urban schools in low-income communities will use Web 2.0 tools in more teacher-centered, less collaborative ways than suburban schools in higher-income communities. Furthermore, it seems likely that this didactic instruction in under-resourced schools will be focused on training students on basic skills, and the more interactive instruction in wealthier school will involve nurturing students in the critical thinking and complex communication skills that are essential to the 21st century (Levy and Murnane 2004). Thus in the absence of policy interventions, it may be that low-income students will have less access to educational experiences with Web 2.0 tools, and the experiences that they do have will be less collaborative, less empowering, and less relevant to the future needs of society.

Future scenarios for Web 2.0 in education

The picture painted above is a fairly gloomy picture of Web 2.0 in education: these tools have tremendous potential to nurture the skills that students will need for the 21st century civic and economic spheres, and yet these tools remained largely under-utilized, especially in under-resourced environments. And without fairly dramatic intervention, there is no reason to believe that this will change in the future.

Educational institutions are conservative ones. In many systems, teachers are not fully professionalized, and very few systems have incentives that reward teachers for innovative instruction. A teacher who lectures at the front of the class gets paid the same as one who pours his heart into developing multimedia, cross-cultural collaborative projects. So classrooms prove remarkably resistant to change.

Changing the orientation of schools towards 21st century skills and teaching methods would be hard enough, and it's made even harder in America by standards-based instruction which directs schools to focus more on 19th and 20th century basic skills. The No Child Left Behind (NCLB) law forces schools, especially schools serving low-performing students, to focus on preparing students to take standardized tests in basic skills almost to the exclusion of every other goal. Within schools who feel threatened by the NCLB regime, there is a strong disincentive to focus on 21st century skills that will not be measured by standardized tests. The principle at work in America and applicable across all contexts is that education regimes which measure success through standardized tests that demand performances of rote

memory are unlikely to produce teachers who prepare their students for performances of 21st century skill demonstration.

As a result of these disincentives, teachers who want to wisely incorporate technology into their instruction are something of a rarity, and they tend to appear in wealthy, suburban schools where the teachers and administrators face little threat of having any significant number of their students fail to pass state tests. As a result, students who already attend schools with a variety of resource advantages, enjoy the additional instructional advantages of using Web 2.0 tools to develop fundamental skills and rehearse for 21st century environments, while their less well-off peers enjoy fewer opportunities in schools with fewer resources. Even extraordinary efforts to put more computers and bigger network connections in urban schools will provide little amelioration to the inequity because the appearance of machines is not going to change the incentive structure which rewards teachers who use computers for drilling students on basic math problems but not for involving them in collaborative, public performances of their understanding. In the most likely scenario unfolding in the United States, and perhaps in other Western countries, free Web 2.0 tools are likely to exacerbate the opportunity/achievement gap, since only schools with the luxury to largely ignore testing requirements will be able to afford the time to experiment with these new tools.

Changing this future scenario would require making some significant changes in the entire educational system. The most likely alternative scenario is one where business leaders demand that the educational system shifts its focus to 21st century skills, as groups like the Partnership for 21st Century Skills are trying to do in America. The growing gap between the applications of Web 2.0 tools in the world and in schools may be a critical part of the argument for more 21st century instruction. Based on that call, national standards and laws would change to reward schools for trying to go beyond the basic skills to teach critical thinking and complex communication, or perhaps teach the basics in the context of these new, critical skills. From there, schools and teachers would have to conduct a campaign of education technology professional development for teachers that used a proportion of resources similar to those invested in getting computers in schools in the first place. Schools of education would need to do more to prepare pre-service teachers for using technology, which would of course require many of the professors in schools of education to learn something about how to go about doing so. These technology reform efforts, however, would need to be driven by a desire to reshape the goals of education, rather than the desire to simply integrate technology. Technology can abet school reform, but it cannot replace it.

There are several other factors which may nudge the future towards or away from greater educational adoption of Web 2.0 tools. As more young teachers, digital natives, enter the teaching service with their technological experience, they may find it easier to adopt new technologies. That said, it is unclear that there is a strong relationship between technological know-how and the use of technology in the classroom. Most teachers learn to teach from their own experience and from mentors, neither of which usually provide an exemplary model for technology use in the classroom.

Certain technological advances could give a nudge towards using more technologies. If the cost of computers drops dramatically, such that 1-1 computing models in schools become broadly feasible, that may allow for greater adoption of a wide variety of computing technologies. It would also help if school adopted software that gave teachers better control over computers, such that teachers could restrict and allow access to certain applications, websites etc. in real time during a class period. Those kinds of structures would make it easier for students to stay on task and easier for teachers to structure and scaffold learning.

Internet filters are currently a serious obstacle towards using websites in the classroom. Most filters are knee-high fences around the internet which tech-savvy children jump over easily and which older teachers trip over. In many schools, filters serve to keep teachers off of the internet and away from employing novel teaching strategies while students happily employ proxy servers and other tricks to evade filters. Depending on these technological advances and policy decisions, we may see greater or lesser adoption of Web 2.0 tools in classrooms.

From the perspective of the university, the last thing that might be done to encourage a future where 21st century skills are taught through practices involving Web 2.0 would be to provide research to the education policy community that can show the benefits of learning 21st century skills in collaborative online environments and the inequitable distribution of these opportunities.

Gauging the future of the web

The collected works of Shakespeare include three categories of plays. In the comedies, things get better, and in the tragedies things get worse. It is in the histories that we find stories where some people are winners and others are not, and these histories probably provide the best models for predicting the future.

The driving technical principle behind the evolution of Web 2.0 tools is the reduction of the interaction costs of communication, and these costs will continue to be driven down. As these costs are driven down, we will continue to see the emergence of qualitatively new behaviors and the products of these behaviors will be as or more bizarre to future peoples as Wikipedia and Twitter are to us now. These new behaviors will be at some level democratizing, as they will involve harnessing collaborative energy and collective intelligence to meet cooperative goals. Many of these innovations will level hierarchies and include and involve more people in social systems. They will accelerate globalization by making cross-cultural, cross-content, cross-time-zone conversations even cheaper and take less time to achieve.

In some cases, business will use these tools to manipulate people into buying all manner of worthless products, and in other cases business will use these tools to allow consumers to participate in the design of new products that more effectively satisfy human needs. Global warming activists will use the tools to rally massive numbers of people to work to attend to this major crisis, and hate groups will use the tools to rally people together to oppress others. Some schools may use these tools to nurture new skill sets in their students, which may be essential and beneficial to national competitiveness, but create greater inequities between those who have, and those who lack, these 21st century skills. Other schools will use new media to continue herding students through an outdated, industrialized mode of education. Individuals may develop wider networks of online friends and fewer close ties, and those without reliable internet access may be locked out of the social networks of prestige and power. Web 2.0 tools will erase some of the challenges of collaborating and communicating across time and geography, and they will enact a series of new challenges in the stead of the old.

This document has been commissioned as part of the UK Department for Children, Schools and Families' Beyond Current Horizons project, led by Futurelab. The views expressed do not represent the policy of any Government or organisation.

References

- Armetta, J. (2007). An epistemological study: Wiki in the composition class. M.A., University of Wyoming.
- Bennett, W.L. ed. (2007) *Civic life online: Learning how digital media can engage youth*. Cambridge, MA, MIT Press.
- Berners-Lee, T., Hendler, J. and Lassila, O. (2001) The semantic web. *Scientific American*, 284 (5), pp34.
- Cole, K.L. (2004) Providing the soapbox, developing their voice: An analysis of weblogs as a tool for response to literature in the middle school language arts classroom. Ph.D., The University of Alabama.
- Coyle, J.E., Jr. (2007) Wikis in the college classroom: A comparative study of online and face-to-face group collaboration at a private liberal arts university. Ph.D., Kent State University.
- Diamond, J.B. (October 2007) Where the rubber meets the road: Rethinking the connection between high-stakes testing policy and classroom instruction. *Sociology of Education*, 80 (29), pp285-313.
- DiMicco, J.M. and Millen, D.R. (2007) Identity management: Multiple presentations of self in Facebook. *GROUP '07: Proceedings of the 2007 International ACM Conference on Supporting Group Work*, Sanibel Island, Florida, USA. pp383-386.
- Dunleavy, M., Dexter, S. and Heinecke, W.F. (2007) What added value does a 1:1 student to laptop ratio bring to technology-supported teaching and learning? *Journal of Computer Assisted Learning*, 23 (5), pp440-452.
- Ellis, R. A., Goodyear, P., Prosser, M. and O'Hara, A. (2006) How and what university students learn through online and face-to-face discussion: Conceptions, intentions and approaches. *Journal of Computer Assisted Learning*, 22 (4), pp244-256.
- Evans, P., and Wolf, B. (2005) Collaboration rules. *Harvard Business Review*, 83 (11), pp162-162.
- Friedman, T.L. (2007) *The world is flat : A brief history of the twenty-first century* New York, Picador/Farrar, Straus and Giroux. Distributed by Holtzbrinck Publishers.
- Garza, S.L. and Hern, T. (2005) Collaborative writing tools: Something wiki this way comes -or not! *Kairos*, 10 (1)
- Gee, J.P. (2007) *What video games have to teach us about learning and literacy* Revised and updated edition. New York, Palgrave Macmillan.
- Grant, A.C. (2006) The development of global awareness in elementary students through participation in an online cross-cultural project. Ph.D., Louisiana State University and Agricultural and Mechanical College.
- Haste, H. and Hogan, A. (2006) Beyond conventional civic participation, beyond the moral-political divide: Young people and contemporary debates about citizenship. *Journal of Moral Education*, 35 (4), pp473-493.
- Helmond, A. (2008) How many blogs are there? is someone still counting? *The Blog Herald*. Available from <http://www.blogherald.com/2008/02/11/how-many-blogs-are-there-is-someone-still-counting/> Accessed February 11 2008
- Jenkins, H. (2007) In: Clinton K., Purushotma R., Robison A. and Weigel M. eds. *Confronting the challenges of participatory culture: Media education for the 21st century*. Chicago, MacArthur Foundation. Available from www.digitalllearning.macfound.org
- Laurinen, L.I. and Marttunen, M. J. (2007) Written arguments and collaborative speech acts in practising the argumentative power of language through chat debates. *Computers and Composition*, 24 (3), pp230-246.

- Lenhart, A., Madden, M., Macgill, A.R. and Smith, A. (2007) *Teens and social media*. Washington, D.C, Pew Internet and American Life Project.
- Levy, F. and Murnane, R.J. (2004) *The new division of labor : How computers are creating the next job market*. Princeton, N.J., New York: Princeton University Press; Russell Sage Foundation.
- Li, C. and Bernoff, J. (2008) *Groundswell: Winning in a world transformed by social technologies*. Boston, MA., Harvard Business Press.
- Olander, M.V. (2007) *Painting the voice: Weblogs and writing instruction in the high school classroom*. Ph.D., Nova Southeastern University.
- O'Reilly, T. (September 30, 2005) *What is web 2.0: Design patterns and business models for the next generation of software*. Available from <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>
Accessed April 20, 2008,
- Putnam, R.D. (2000) *Bowling alone : The collapse and revival of American community*. New York, Simon and Schuster.
- Reich, J. (2008, May 13) Turn teen texting towards better writing. *Christian Science Monitor*, Retrieved from <http://www.csmonitor.com/2008/0513/p09s02-coop.html>
- Reich, J. and Daccord, T. (2008) *Best ideas for teaching with technology : A practical guide for teachers, by teachers*. Armonk, N.Y, M.E. Sharpe.
- Richardson, W. (2008) *Blogs, wikis, podcasts, and other powerful web tools for classrooms* (2nd ed.). Thousand Oaks, CA., Corwin Press.
- Roth, N.L. (2007) *To blog or not to blog? A comparative study of the effects of blogging in the teaching of writing in the high school classroom*. Ed.D., Duquesne University.
- Scoble, R. and Israel, S. (2006) *Naked conversations : How blogs are changing the way businesses talk with customers*. Hoboken, N.J., Wiley and Sons.
- Thompson, C. (2008, September 5, 2008) Brave new world of digital intimacy. *New York Times Magazine*, pp.42.

This document has been commissioned as part of the UK Department for Children, Schools and Families' Beyond Current Horizons project, led by Futurelab. The views expressed do not represent the policy of any Government or organisation.