Web 2.0

A New Wave of Innovation for Teaching and Learning?

By Bryan Alexander

The term is audacious: Web 2.0. It assumes a certain interpretation of Web history, including enough progress in certain directions to trigger a succession. The label casts the reader back to Sir Tim Berners-Lee's unleashing of the World Wide Web concept a little more than a decade ago, then asks: What forms of the Web have developed and become accepted enough that we can conceive of a transition to new ones? ■ Many people—including, or perhaps especially, supporters—critique the "Web 2.0" moniker for definitional reasons. Few can agree on even the general outlines of Web 2.0. It is about no single new development. Moreover, the term is often applied to a heterogeneous mix of relatively familiar and also very emergent technologies. The former may appear as very much "Web 1.0," and the latter may be seen as too evanescent to be relied on for serious informatics work. Indeed, one leading exponent of this movement deems continuous improvement to be a hallmark of such projects, which makes pinning down their identities even more difficult.[1] Yet we *can* survey the ground traversed by Web 2.0 projects and discussions in order to reveal a diverse set of digital strategies with powerful implications for higher education.[2] Ultimately, the label "Web 2.0" is far less important than the concepts, projects, and practices included in its scope.

Concepts

Social software has emerged as a major component of the Web 2.0 movement. The idea dates as far back as the 1960s and JCR Licklider's thoughts on using networked computing to connect people in order to boost their knowledge and their ability to learn. The Internet technologies of the subsequent generation have been profoundly social, as listservs, Usenet groups, discussion software, groupware, and Web-based communities have linked people around the world. During the past few years, a group of Web projects and services became perceived as especially connective, receiving the rubric of "social software": blogs, wikis, trackback, podcasting, videoblogs, and enough social networking tools like MySpace and Facebook to give rise to an abbreviation mocking their very prevalence: YASN (Yet Another Social Network). Consider the differences between these and static or database-driven Web pages. Wikis are all about user modification; CNN's front page is decisively not. It is true that blogs are Web pages, but their reverse-chronological structure implies a different rhetorical purpose than a Web page, which has no inherent timeliness. That altered rhetoric helped shape a different audience, the blogging public, with its emergent social practices of blogrolling, extensive hyperlinking, and discussion threads attached not to pages but to content chunks within them. Reading and searching this world is significantly different from searching the entire Web world. Still, social software does not indicate a sharp break with the old but, rather, the gradual emergence of a new type of practice.

These sections of the Web break away from the page metaphor. Rather than following the notion of the Web as book, they are predicated on *microcontent*. Blogs are about posts, not pages. Wikis are streams of conversation, revision, amendment, and truncation. Podcasts are shuttled between Web sites, RSS feeds, and diverse players. These content blocks can be saved, summarized, addressed, copied, quoted, and built into new projects. Browsers respond to this boom in

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microcontent with bookmarklets in tool-bars, letting users fling something from one page into a Web service that yields up another page. AJAX-style pages feed content bits into pages without reloading them, like the frames of old but without such blatant seams. They combine the widely used, open XML standard with Java functions.[3] Google Maps is a popular example of this, smoothly drawing directional information and satellite imagery down into a browser.

Like social software, microcontent has been around for a while. Banner ads, for example, are often imported by one site from another directory. Collaboratively designed Web pages sometimes aggregate content created by different teams over a staggered timeline. And if we consider e-mail messages, discussion-board posts, Usenet-hosted images, and text messages to be microcontent, then users have generated this material for decades. But Web 2.0 builds on this original microcontent drive, with users developing Web content, often collaboratively and often open to the world. Moreover, technical innovations suggest still further refinements in microcontent. Arnaud Leene outlines a series of characteristics, including variable licenses, feeds, Web APIs, and single identity.[4]

This *openness* is crucial to current Web 2.0 discussions. The flow of microcontent between domains, servers, and machines depends on two-way access. Web 2.0 can break on silos but thrive in shared services. Still, silos and shared services are not mutually exclusive. Amazon.com, for instance, lets users harvest ISBN numbers from its listings but does not allow access to a customer's shopping cart. Some wiki platforms allow users to lock down pages from editing or restrict access to authorized users, as does the popular blog service LiveJournal. Yet openness remains a hallmark of this emergent movement, both ideologically and technologically.

Openness and microcontent combine into a larger conceptual strand of Web 2.0, one that sees users as playing more of a foundational role in information architecture. Drawing on the "wisdom of crowds" argument, Web 2.0 services respond more deeply to users than Web 1.0 services. A leading form of this is a controversial new form of metadata, the *folksonomy*. Whereas traditional metadata is usually hierarchical (topics nested within topics), structured (e.g., the fields within Dublin Core), and predetermined by content authorities, folksonomic metadata consists of words that users generate and attach to content. A historian photographs the Waterloo battlefield, uploads the result to Flickr or 23, and adds keywords meaningful to her: Napoleon, Wellington, Blucher, 1815. A literature scholar creates similar images but tags them according to his interests: Thackeray, Hugo, Clarke.

Why does this matter, and why do such projects not degenerate into multi-subjective chaos? First, users actually use tags. Folksonomic services fill up with tags rapidly enough to make information professionals take notice. Second, Web 2.0 services tend to provide tools for helping users with their folksonomies. Tags can be arranged into concept maps called "tag clouds," which allow revisualization of the way one considers one's work.[5] The social bookmarking innovator del. icio.us automatically reminds users of previously deployed tags, suggests some tags, and notes tags used by others. Third, people tend to tag socially. That is, they learn from other taggers and respond to other, published groups of tags, or "tagsets."[6] There are of course limitations to folksonomies, including the difficulty in scaling up tags from several to many users and the problem of quickly grasping contextual shifts between tagsets. But the rapid adoption and growth of folksonomies is noteworthy. Popularly created metadata is a rarity.

Taken together, this set of concepts informs a way of making, sharing, and consuming digital documents—a way that differs from what we have grown accustomed to. Implementations of these concepts are not uniform. Not all projects deemed "Web 2.0-ish" share all of these underpinnings. There are many different ways to understand microcontent, for example. Yet an awareness of the aggregate approaches of such projects can shed some light on emergent practices and lead us to generate rough categories for them.

Projects and Practices

Social bookmarking is one of the signature Web 2.0 categories, one that did not exist a few years ago and that is now represented by dozens of projects. The very strangeness of the term (what's social about bookmarks?) summons up much of the Web 2.0 ethos. It was launched by the advent of Joshua Schacter's del.icio.us (a cleverly spelled URL, using the rarely seen U.S. suffix)—an elegant, focused, and unassuming service for storing, describing, and sharing bookmarks. Users register and then personalize their bit of del.icio.us (http://del. icio.us/) with a minimally designed page, including nothing beyond annotated

Tag Cloud of a NITLE Blog Generated by ‹http://tagcloud.com/›, October 2005

URLs to Web pages. Each URL is accompanied by a line of text describing it, followed by one or more words for tags. A user does not have to be a single person: groups can create del.icio.us accounts. In addition to a person's or group's own bookmarks, any user can create an in-box for what someone else is bookmarking, by subscribing to the other person's del.icio.us pages. Users can also subscribe to tags and receive a list of URLs tagged with a certain word on their del.icio.us page. Each annotated tag is dated, editable, and organized in reverse chronological order, blog-style. For example, a splendid Web site on French cooking appears thusly:

French cuisine resource
to <u>food</u> ... <u>and 123 other people</u> ... on 2005-11-27 ... <u>edit</u> / <u>delete</u>

Del.icio.us was one of the first popular folksonomic sites, based on the proliferation of these tags. Users were apparently delighted to tag the sites they found interesting, as a casual browse through the site reveals. Schacter's site became influential in a short period of time. There is something immediately gratifying about adding a description to a site one is interested in, being able to do so beyond prose sentences, and not having to look to an authority for ontological assistance. Visitors to the del.icio.us site can examine which tags are the most prominent at a given time throughout the entire set of all del.icio.us pages, can search for sites by tags (what is tagged "Napoleon"?), or can look to see what tags users have attached to the same site. Having found another del.icio.us user, one can check what else the other user has chosen to bookmark and share, thereby learning from a potentially kindred spirit.[7] This is classic social software—and a rare case of people connecting through shared metadata.

Following the success of del.icio.us, similar social bookmarking projects have appeared. By October 2005, the Wikipedia entry listed nearly forty. These are now too many to enumerate here, and it is likely that some will disappear in the common fate of competitive software.[8] But we can note several for their innovative features. Shadows (http://www.shadows.com/) supports "Shadow pages" for bookmarked pages. There users can discuss, rather than simply tag, a site. RawSugar (http://www.rawsugar.com/) and several others expand user personalization. They can present a user's picture, some background about the person, a feed of their interests, and so on, creating a broader base for bookmark publishing and sharing. This may extend the appeal of the practice to those who find the focus of del.icio.us too narrow. In this way too, a Web 2.0 project learns from others—here, blogs and social networking tools.

How can social bookmarking play a role in higher education? Pedagogical applications stem from their affordance of collaborative information discovery. For instance, researchers at all levels (students, faculty, staff) can quickly set up a social bookmarking page for their personal and/or professional inquiries. The Penntags project at the University of Pennsylvania (http://tags.library.upenn.edu/) and Harvard's H2O (http://h2obeta.law.harvard.edu/home.do) are examples. First, they act as an "outboard memory," a location to store links that might be lost to time, scattered across different browser bookmark settings, or distributed in e-mails, printouts, and Web links. Second, finding people with related interests can magnify one's work by learning from others or by leading to new collaborations. Third, the practice of user-created tagging can offer new perspectives on one's research, as clusters of tags reveal patterns (or absences) not immediately visible by examining one of several URLs. Fourth, the ability to create multi-authored bookmark pages can be useful for team projects, as each member can upload resources discovered, no matter their location or timing. Tagging can then surface individual perspectives within the collective. Fifth, following a bookmark site gives insights into the owner's (or owners') research, which could play well in a classroom setting as an instructor tracks students' progress. Students, in turn, can learn from their professor's discoveries.

This desire to discover, publish, and share appears far back in Internet history. The first e-mail listservs (SF-LOVERS, from Rutgers) and the discussion forum of Usenet (started in 1979 and now partially archived by Google[9]) served such a function, but in prose. Similarly, as Web services have evolved, projects have emerged that act as *social writing platforms*. After e-mail lists, discussion forums, groupware, documents edited and exchanged between individuals, and blogs, perhaps the writing application most thoroughly grounded in social interaction is the wiki. Wiki pages allow users to quickly edit their content from within the browser window.[10] They originally hit the Web in the late 1990s (another sign that Web 2.0 is emergent and historical, not a brand-new thing). Wikis have recently become popular in many venues, including business. The most visible wiki project is Wikipedia (http://en.wikipedia.org/wiki/Main_Page), which allows users to edit each encyclopedia entry, thereby creating an open editing and review structure. There are many wiki applications that users can install and run from their own machines. Hosting services have recently grown: Socialtext (http://www.socialtext.com/) is one of the standouts. Users can set up accounts, then write and revise their collaborative work. Socialtext, along with some earlier wiki implementations, like TWiki (http://www.twiki.org/), supports blocking access to selected pages except by passwords, narrowing the pool of potential collaborators.

At a smaller level, other Web 2.0 services are aimed at somewhat more constrained yet still easily collaborative writing. They are very wiki-like but do not use that name. Writeboard, Writely, and

JotSpotLive each let users rapidly create a Web page focused on an item of writing content, prominently visible in the browser. Writeboard (http://writeboard.com/) restricts editors to those invited, via e-mail, by the creator of a page. Writely (http://www.writely.com/) also closes access to those not allowed by the creator of a page but lets the creator export the resulting content in several formats, including HTML for a Web page and Word.[11] JotSpot Live (http://www.jotlive.com/) differs in aiming at groups that are editing multiple documents. It can display what documents other users within a team are working on and are responsible for, hearkening back to the earlier days of groupware. Taken together, these services are similar to wikis but offer several differences. Their appearance is very slick and professional. Their editing interfaces are smooth WYSIWYGs, cleaner and more recognizable than many wiki implementations. Furthermore, these services usually identify individual contributors, a feature that is generally not available in wikis (as recently seen in the Wikipedia Siegenthaler debacle). Some of the newer features—team displays, easy exporting—are valuable for various social requirements.

How do social writing platforms intersect with the world of higher education? They appear to be logistically useful tools for a variety of campus needs, from student group learning to faculty department work to staff collaborations. Pedagogically, one can imagine writing exercises based on these tools, building on the established body of collaborative composition practice. These services offer an alternative platform for peer editing, supporting the now-traditional elements of computer-mediated writing—asynchronous writing, groupwork for distributed members, and so on—but

with a different, wiki-like spin.

If social writing platforms support people creating and editing each other's content, a different group of Web 2.0 services explores that content from the outside, as it were. *Blogging* has become, in many ways, the signature item of social software, being a form of digital writing that has grown rapidly into an influential force in many venues, both on- and offline. One reason for the popularity of blogs is the rise in Google searches of blog posts, based in part on the tendency of bloggers to link extensively and Google's use of links to rank results. But how does one search within the blogosphere? How can one query that slice of the Web in order to draw on its features—timeliness, microcontent, interactivity, personal commentary?

To answer this qustion, an array of blog and RSS search services have appeared, with individual tweaks and spins aimed at differentiating the experience based on user needs and information architecture. Feedster (http://feedster.com/) and Daypop (http://www.daypop.com/) let users search for content within blogs alone. They also let a query lump blogs together with selected news services. This enables a search for timely commentary, rather than popularly linked content, à la Google. Daypop offers a tag-like feature by identifying and ranking the most commonly used words in the blog or RSS world, generating an almost impressionistic keyword survey of blogospheric interest. Waypath (http://www.waypath.com/) searches blogs but returns fewer results, with those results more likely to be relevant. Waypath also generates "topic streams"—categories of posts, based on analysis of blog posts within a given time period. PubSub (http://www.pubsub.com/) searches blogs, but not immediately. Instead, PubSub saves a query,

then applies it to posts as they occur after the query is created, reporting the results to the user by Web, RSS feed, or e-mail. BlogPulse (http://blogpulse.com/) adds still another twist, creating graphic visualizations of results in order to help users identify trends within blogospheric results. Recently, Google and Yahoo have thrown their much larger resources into this field. Yahoo! integrated blogs within its news search (http://news.search.yahoo.com/), and Google launched a standalone blog search (http://blogsearch.google.com/). Yahoo has also included a tagging aspect, called My Web, and has purchased several Web 2.0 projects, most notably Flickr and del.icio.us.

Technorati (http://technorati.com/) and IceRocket (http://icerocket.com/) head in the opposite direction of these sites, searching for who (usually a blogger) has recently linked to a specific item or site. Technorati is perhaps the most famous blog-search tool. Among other functions, it has emphasized tagging as part of search and discovery, recommending (and rewarding) users who add tags to their blog posts. Bloggers can register their site for free with Technorati; their posts will then be searchable by content and supplemental tags.

Many of these services allow users to save their searches as RSS feeds to be returned to and examined in an RSS reader, such as Bloglines (http://www.bloglines.com/) or NetNewsWire (http://ranchero.com/netnewswire/). This subtle ability is neatly recursive in Web 2.0 terms, since it lets users create microcontent (RSS search terms) about microcontent (blog posts). Being merely text strings, such search feeds are shareable in all sorts of ways, so one can imagine collaborative research projects based on growing swarms of these feeds—social bookmarking plus social search.

However, when one speaks of each of these services searching blogs, the reality is somewhat more complex. Some, like Technorati, have created large databases of blogs, partly by spidering the Web, partly by relying on user submissions and for-pay subscriptions. Some, like

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Google's blog search, query RSS feeds, which are produced by many blogs (but not all) and other sites that aren't blogs. In other words, the boundaries around what is being searched are somewhat fuzzier than those in the already fuzzy world of Web search.[12] One Web service is in fact based on tackling this problem from a different direction. Rollyo (http://rollyo.com/) lets a searcher choose up to ten Web sites to be searched, much like a whitelist restricts connections to a selected few. (A whitelist blocks all sites or users *not* on a list.) Users can publish and share their "searchrolls."

Amid this flurry of Web services, what are the pedagogical possibilities? Like many computer-mediated techniques for teaching and learning, some of these possibilities start from pre-Web practices. For example, we have long taught and learned from news articles. Indeed, a popular metaphor for describing RSS reading is the clipping service of old. Since blogs, most social bookmarking tools, and other services are organized in reverse chronological order, their very architecture orients them, or at least their front pages, toward the present moment. Web 2.0 therefore supports queries for information and reflections on current events of all sorts. Given bloggers' propensity for linking, not to mention some services' ability to search links, blogs and other platforms readily lead the searcher to further sources. Students can search the blogosphere for political commentary, current cultural items, public developments in science, business news, and so on.

The ability to save and share a search, and in the case of PubSub, to literally search the future, lets students and faculty follow a search over time, perhaps across a span of weeks in a semester. As the live content changes, tools like Waypath's topic stream, BlogPulse's trend visualizations, or DayPop's word generator let a student analyze how a story, topic, idea, or discussion changes over time. Furthermore, the social nature of these tools means that collaboration between classes, departments, campuses, or regions is easily supported. One could imagine faculty and students across the United States following, for example, the career of an Islamic feminist or the outcome of a genomic patent and discussing the issue through these and other Web 2.0 tools. Such a collaboration could, in turn, be discovered, followed, and perhaps joined by students and faculty around the world. Extending the image, one can imagine such a social research object becoming a learning object or an alternative to courseware.

Given the Web 2.0 ethos of sharing content across services, and the importance of social software, it is only logical that crossbreeds of news and social software have emerged. Blogdex (http://blogdex.net/), for example, charts the most popular Web pages as linked by a group of bloggers. These pages can be blogs, of course, as well as news stories, Web sites, images, PDF files, or different URLs for the same item. A glance at Blogdex offers a rough snapshot of what the blogosphere is tending to pay attention to. In that feature, it resembles Google's Zeitgeist (http://www.google.com/press/zeitgeist.html), an annual compendium of leading searches, broken down into various topics (technology, news, sports). A closer look at an individual Blogdex result reveals the blogs that link to a story. As we saw with del.icio.us, this publication of interest allows the user to follow up on commentary, to see why those links are there, and to learn about those doing the linking. Once again, this is a service that connects people through shared interest in information.

A related Web service is Memeorandum (http://www.memeorandum.com/), the punningly named project that integrates news stories and blog responses. Memeorandum displays a series of topics and adds to each one both journalistic accounts and blogospheric opinion. It resembles the classic newspaper style of including news and op-ed pages within the same section, but it draws on *thousands* of sources, rather than a handful, and from far more diverse stances. Like Blogdex and Zeitgeist, Memeorandum—through the topics presented—offers a glimpse into the collective mind of many, many people at a given moment.

Whereas Memeorandum, Google News (http://news.google.com), and Blogdex automate their ranking of topics and stories, Digg (http://www.digg.com) opens the process to more active human intervention. Digg, devoted primarily to technology topics, accepts submissions of stories that users consider worthy of public attention. Users can then vote for, or "digg," stories they like, and the site promotes the results accordingly. Digg draws on the recent experience of Wikinews (http://en.wikinews.org/wiki/Main_Page), which also lets users drive topical choice. Unlike Digg, Wikinews and its great forebear, the South Korean OhmyNews (http://english.ohmynews.com/), consist largely of user-created news content.[13] Such projects, taken together with Wikipedia, represent the acme of social software as information production and aggregation. Remember that these are exercises in microcontent: the bar to entry is lower for the average user. A user doesn't have to author an entire site—just proffer a chunk of content.

The rich search possibilities opened up by these tools can further enhance the pedagogy of current events. A political science class could explore different views of a news story through traditional media using Google News, then from the world of blogs via Memeorandum. A history class could use Blogdex in an exercise in thinking about worldviews. There are also possibilities for a campus information environment. What would a student newspaper look like, for

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example, with a section based on the Digg approach or the OhmyNews structure? Thematizing these tools as objects for academic scrutiny, the operation and success of such projects is worthy of study in numerous disciplines, from communication to media studies, sociology to computer science.

The extensive growth of Web 2.0 projects has even more recently given rise to tools that make use of multiple services simultaneously. These meta-services and meta-projects are perhaps too nascent to describe in any narrower way and bear watching for emergent trends. SuprGlu (http://www.suprglu.com/) builds Web pages in which users' RSS feeds from multiple services are aggregated. For example, a professor might include the del.icio.us feeds from a research group and senior seminar alongside a series of blogs from colleagues around the world. At a meta-meta level, SuprGlu plans on letting users form RSS feeds from their many incoming streams. Gnosh (http://webtools. allegheny. edu/gnosh/), a related project, was created within higher education by tech leads at Allegheny and Vassar Colleges, stemming from a NITLE social software users group meeting. Gnosh searches multiple Web 2.0 and similar services while letting users store and share their queries. As with Rollyo, a student could build a group-of-search area. Unlike Rollyo, Gnosh queries a much broader content field. Users can visualize their results or the searches of others by tags or keywords. Finally, another meta-Web 2.0 project breaks the Web browser mold by redesigning the browser itself. Flock (http://flock.com) is still in early developmental stages (pre-beta as of this writing), but it offers a Web 2.0 way of browsing. Users can import their Flickr content into the browser frame as a sort of image-based toolbar, then post to del.icio.us or their blog from within the browser window.

Rising Services or Churning Wave?

Clearly, such projects are in their early days, suggesting a certain amount of risk. The concepts, projects, and practices of Web 2.0 as a whole, insofar as we have surveyed them, are fluid and emergent. They are also so accessible as to be launched and interconnected at a pace rapid even by Web standards. At the same time, many services are hosted externally to academia. They are the creations of enthusiasts or business enterprises and do not necessarily embrace the culture of higher education. Local, campus hosting is attractive for many Web 2.0 projects, raising the classic problem of IT support. A related support issue involves microcontent. When will enough readers peruse Web sites through RSS and other microcontent readers to warrant resigning campus public electronic presentations? How will colleges and universities consider preserving such small pieces of intellectual work, especially as the works migrate across multiple, shifting, changing platforms?

A separate threat to this movement is the familiar one of copyright. Since these new Web services allow users to own, modify, and exchange data, it is probably inevitable that intellectual property holders will initiate lawsuits investigating perceived misappropriations.[14] The amount of content in the Web 2.0 matrix is relatively small, so far, and largely user-generated. But in a time when headlines are being contested in some courts,[15] microcontent may not be immune.[16] Lawrence Lessig, J. D. Lasica, and others remind us that as tools get easier to use and practices become more widespread, it also becomes easier for average citizens to commit copyright violations.[17]

And these practices will continue to evolve. As we have seen through the rapid rise of podcasting, new forms of communication surface as technologies change. As with the growth of other electronic technologies (radio, television), new forms of storytelling through these new Web practices are likely to emerge. Storytelling by blog, for example, has already appeared, as has publishing novels through podcast. A subgenre of computer gaming, alternate reality games (ARGs), certainly contains much that we think of as Web 2.0: microcontent, social collaboration, sharing content across domains. What other narrative shapes will appear in the near future, for both fiction and nonfiction?

Web 2.0's lowered barrier to entry may influence a variety of cultural forms with powerful implications for education, from storytelling to classroom teaching to individual learning. It is much simpler to set up a del.icio.us tag for a topic one wants to pursue or to spin off a blog or blog departmental topic than it is to physically meet co-learners and experts in a classroom or even to track down a professor. Starting a wiki-level text entry is far easier than beginning an article or book. What new, natively digital textual forms are impending as small-scale production scales up? "Web 1.0" has already demonstrated immense powers for connecting learners, teachers, and materials. How much more broadly will this connective matrix grow under the impact of the openness, ease of entry, and social nature of Web 2.0?[18] How can higher education respond, when it offers a complex, contradictory mix of openness and restriction, public engagement and cloistering? How do we respond to the possibilities of what some call "E-learning 2.0," based on environments, microcontent, and networking?[19]

The story of this wave of innovation, whether we call it Web 2.0 or something else, is itself emergent and uncertain. While business models appear around it and venture capital swarms in, the second annual Web 2.0 conference was held in October 2005 (http://www.web2con.com/). Most of these projects are bottom-up entities. A quick check of Emily Chang's eHub list (http://www. emilychang.com/go/eHub/) shows an explosion of hundreds of Web 2.0 projects. Yet far larger players have entered the field, most notably Yahoo, which has been

buying up many projects, including Flickr and del.icio.us. Microsoft is considering a massive extension of RSS. And Google has been producing its own projects, such as the Lens RSS reader and Google Maps. Meanwhile, academic implementations are bubbling up, like the social bookmarking and search projects noted earlier. This Web 2.0 movement (or movements) may not supplant "Web 1.0," but it has clearly transformed a significant swath of our networked information ecology. *e*

Notes

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