

The Social Web: Research and Opportunities

Ed H. Chi, Palo Alto Research Center



Web 2.0-based technologies advance both collective and individual intelligence.

Imagine it's 2001, and you're a venture capitalist hosting an entrepreneur in your Silicon Valley office. He wants to build a collaborative hypertext system for the Web, in which anyone can edit anything they want without having to register for an account, on a site dedicated to building knowledge on any topic. He claims he can do this with a staff of only 15 people, relying primarily on volunteer contributions from users to administer what he says will become a top 10 Web destination. Would you have given him money to try this?

The following week, a pair of entrepreneurs visits with another crazy proposition: They want to build a website in which people can upload their personal photographs for all to see, and not only share these photos freely but also tag each one with keywords so that others can find them easily. They claim this photo-sharing site will boast billions of photos and become more popular than CNN.com. Would you have invested?

THE SOCIAL WEB

Of course these imaginary scenarios refer to Wikipedia and Flickr, which, as Figure 1 shows, have achieved impressive popularity in recent years. These and other successful Web 2.0 applications have defied the prediction of many pundits early in this decade who underestimated people's desire to use the Web to socially mediate their information environments and communications.

Wikipedia and Flickr applications are prime examples of the emerging Social Web, in which people use Web 2.0 technologies to facilitate social activities such as information foraging, sharing and tagging, and collaboration. As Figure 2 shows, these systems range from lightweight voting systems to heavyweight systems that let users collaboratively create complex content.

Information foraging

The Social Web lets people find information more efficiently than ever before. By using voting or other collective averaging methods, web-

sites can deliver information with better signal-to-noise ratios. Digg, for example, uses a voting scheme to identify the most popular and interesting news items submitted by users. Google's PageRank algorithm uses the Web's link structure to determine webpages' potential value. By linking other pages, websites essentially vouch for the content of those links, resulting in a collective averaging system.

Sharing and tagging

Users who upload and share various types of files on websites often tag them with keywords to make them easier for themselves or others to find. Data-mining algorithms use these tags to cluster photos, videos, and documents. The result is a collaboratively formed information structure that can be used to navigate, search, and browse through myriad types of content.

Collaborative Creation

Perhaps most surprising about the Social Web is users' willingness to participate in open-source-style creation of new and often complex contents. Wiki-based systems let users contribute their knowledge—whether it be on abortion rights, the invention of radio, or the cause of windburn—to encyclopedia projects like Wikipedia. More topic-specific sites, like the Lostpedia site dedicated to the popular *Lost* TV show, let users with common interests share their insights and opinions through forums, chatrooms, and blogs.

AUGMENTED SOCIAL COGNITION

It's clear that Web 2.0 isn't just a fad, but a fundamental transformation of the Web into a true collaborative and social platform. How are researchers studying the Social Web to better understand its opportunities and limits?

A core value in human-computer interaction (HCI) research is using technology to augment *human cognition*—that is, the ability to

remember, think, and reason. This value originated with computing pioneers like Vannevar Bush, J.C.R. Licklider, and Douglas Engelbart, who inspired PC and GUI developers such as Alan Kay. A natural extension of this idea in the realm of the Social Web is using technology to augment *social cognition*—that is, the ability of a group of people to remember, think, and reason.

There is a surge of new work on Web 2.0 technologies in a wide variety of disciplines and associated conferences. Beyond HCI researchers, scientists from diverse fields such as computer-supported cooperative work, WWW and hypertext research, and digital libraries are characterizing, modeling, prototyping, and evaluating various Social Web systems. Studies from behavioral microeconomics, organizational economics, sociology, ethnography, social network analysis, information flow analysis, political science, and conflict resolution also have applications in Social Web research.

At the light end of the Social Web collaboration spectrum, HCI researchers are exploring information-foraging and behavioral models in a new social context, while economists are studying voting systems, information-cascade processes, wisdom-of-the-crowd effects, peer production systems, and markets based on intrinsic motivations.

In the middle of the spectrum, mathematicians and social scientists are developing new theories and algorithms to model, mine, and understand socially constructed knowledge structures and social information networks. Information scientists are likewise devising and testing algorithms that identify expertise and information brokers.

At the heavy end of the spectrum, researchers are studying what hinders and fosters coordination on large group projects, which is especially important for understanding collaborative co-creation systems such as Wikipedia. For example, the discovery of “invisible colleges” in scientific

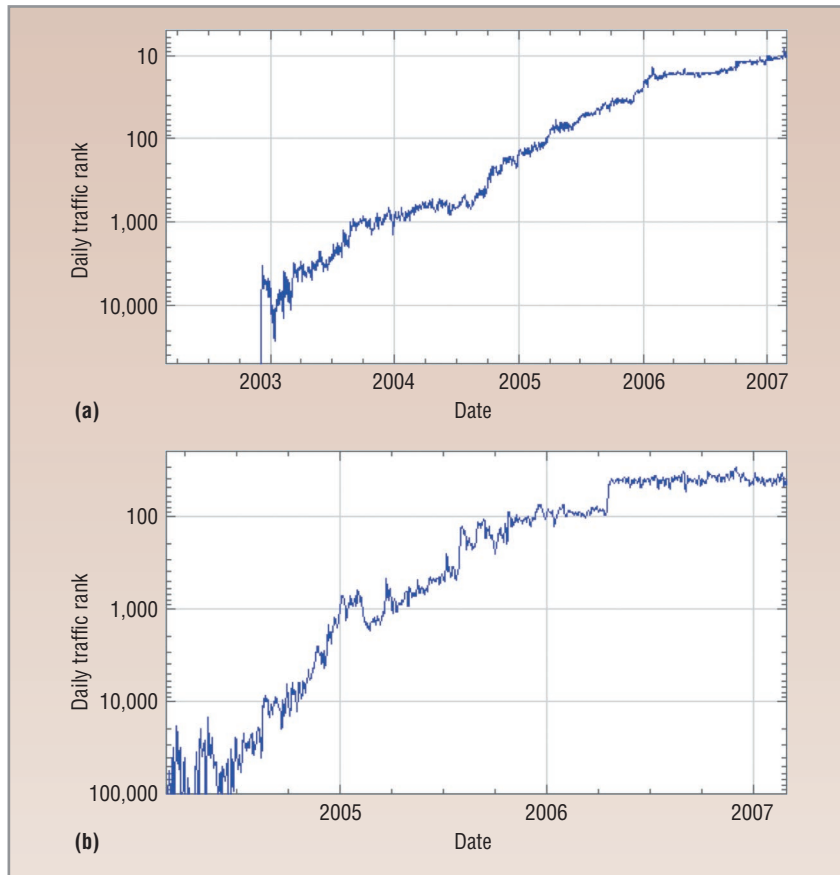


Figure 1. Growth in popularity, in terms of daily traffic rank, of (a) Wikipedia and (b) Flickr. Data chart from Alexa.net.

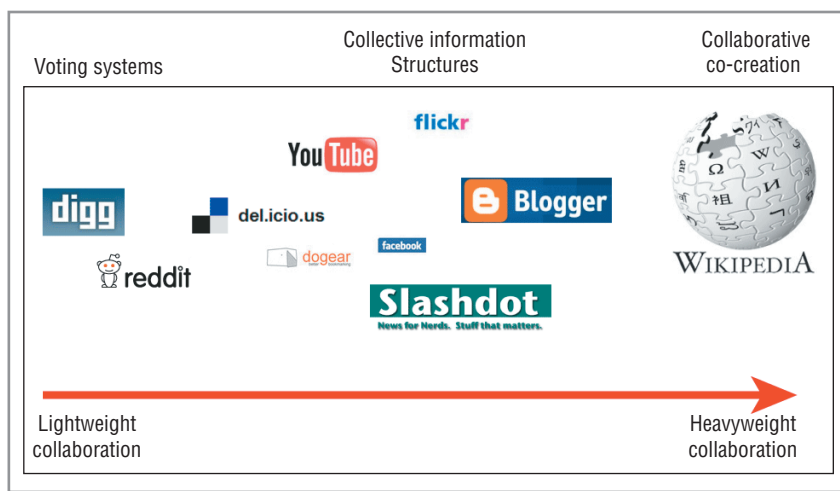


Figure 2. Social Web collaboration spectrum.

endeavors highlights the importance of implicit coordination.

(PARC) on augmented social cognition in the Social Web.

EXAMPLE RESEARCH PROJECTS

Two studies illustrate recent work at the Palo Alto Research Center

Social transparency for wiki editing patterns

Wikis are collaborative systems that let almost anyone edit anything, and

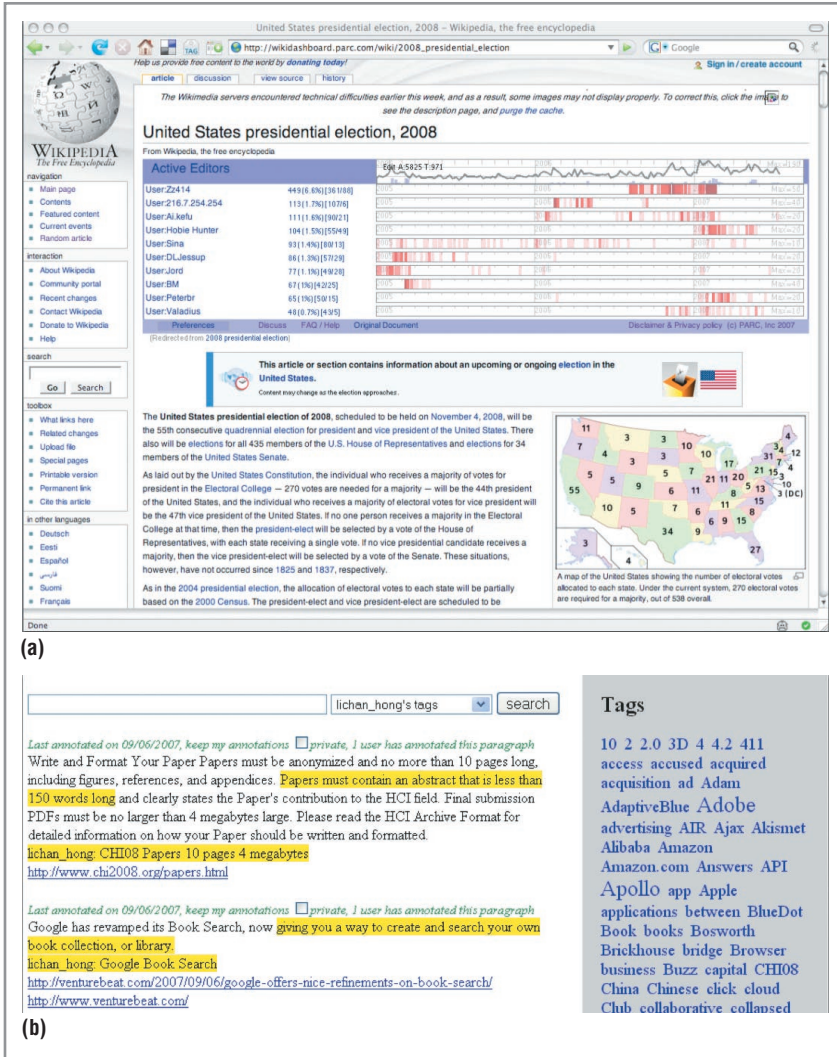


Figure 3. Example Social Web tools. (a) WikiDashboard visualization tool applied to the Wikipedia article "United States presidential election, 2008." (b) Screen capture from SparTag.us social reading and annotation environment.

they have become highly popular in many domains. However, a criticism of wikis is the lack of transparency in authoring activity. Readers can find it difficult to trust wiki content without knowing who created it, while writers might lack motivation to contribute if they receive no credit or cannot express individual points of view.

Successful tools for community-generated content such as wikis need to address this lack of "social transparency." WikiDashboard is one prototype tool that provides a useful visual digest of revisions on each Wikipedia page (B. Suh et al., "Lifting the Veil: Improving Accountability and Social Transparency in Wiki-

pedia with WikiDashboard," *Proc. 26th Ann. SIGCHI Conf. Human Factors in Computing Systems*, ACM Press, 2008, pp. 1037-1040).

As Figure 3a shows, WikiDashboard offers a bird's-eye view of the editing process, showing who has contributed content to a topic over time and revealing behind-the-scenes activities and patterns that are hard to detect. PARC researchers are currently exploring whether displaying edit attributions in tools like WikiDashboard will encourage user contributions to wikis.

Easy paragraph-based tagging
Social bookmarking sites like del.

icio.us let people share their Web-browsing experiences with others. However, the wide diversity on these sites can also interfere with quick, focused reading and recall of content.

SparTag.us is a social reading and annotation environment that lets users tag content within documents in simple one-click actions (L. Hong et al., "SparTag.us: A Low Cost Tagging System for Foraging of Web Content," *Proc. Working Conf. Advanced Visual Interfaces*, ACM Press, 2008, pp. 65-72). As Figure 3b shows, it can also automatically collect tagged or highlighted text into a notebook that users' friends can browse and search.

ENTERPRISE 2.0

Businesses, including many Fortune 500 companies, are adopting Web 2.0 tools—sometimes referred to as Enterprise 2.0—to stimulate innovation, improve productivity, and reduce costs (www.webguild.org/2008/07/next-generation-corporate-intranets.php).

Some companies have been experimenting with Web-based collaboration technologies for a while. In the late 1990s, for example, Xerox implemented an online knowledge-sharing system called Eureka to solve difficult repair problems that saved tens of millions of dollars each year in parts and labor (www.pcmag.com/article2/0,4149,28792,00.asp). The trend in using social computing tools has greatly accelerated in recent years.

Internally, both large and small companies are using Web 2.0 technologies to create intranets with wikis and blogs, as well as embracing free and open source online collaborative applications such as WordPress (http://wordpress.org), MediaWiki (www.mediawiki.org/wiki/MediaWiki), Google Docs (http://docs.google.com), and Scuttle (http://sourceforge.net/projects/scuttle).

Externally, software, consulting, and services-based compa-

nies are investing in Enterprise 2.0 with new customer-to-customer (C2C), business-to-customer (B2C), and employee-to-employee (E2E) offerings.

TAKE STEVE...

To understand how the Social Web interacts with the enterprise, consider the following scenario, which is based on an online slide presentation by Enterprise 2.0 evangelist Scott Gavin (www.slideshare.net/slgavin/meet-charlie-what-is-enterprise20).

Steve is a typical corporate employee today. He is mobile all the time: He works in the office but also works from home, and he is often on the road attending meetings. His project team is distributed geographically across several time zones.

In addition to using e-mail to deal with specific project matters, Steve subscribes to his boss's blog via an RSS feed, which updates everyone on the team on the latest project and company news. Steve also has a project blog, which he uses not only to communicate with the rest of the team and his boss, but also to record the project's history so that everyone can refer to it in the future as a source of knowledge.

Online project management software services such as Basecamp (www.basecamp.com) help Steve to manage tasks and deadlines. He uses Google Docs to collaborate with team members and customers on specific documents.

Steve often uses the company wiki, which is accessible and editable by everyone just like Wikipedia, and encourages his team members to document their own work experiences and tips. To better understand certain problems, he often reads the wiki contributions of experienced colleagues who have been at the company for more than a decade.

To ensure that he has access to his bookmarks no matter where he is, Steve stores and tags them on the company intranet. He highlights his interests and monitors specific topics that others have bookmarked

to discover experts interested in the same topics.

Steve has a colleague and mentor, Cathy, who hates typing but is one of the best salespeople in the company. He subscribes to Cathy's audio podcasts via an RSS feed, and listens to her advice on his iPod while exercising.

Steve has a LinkedIn profile (www.linkedin.com), which he uses to keep track of his former coworkers and to advertise new positions on his team. In fact, he got his current job by using the business-oriented online networking site to find new contacts and opportunities.

From his blog, intranet tags, wiki entries, and LinkedIn profile, people contact Steve from other divisions within the company as well as from outside the company, including professionals in his field in different countries. They ask him specific questions and see him as an expert, which empowers and engages him in his work.

Many of the Web 2.0 technologies Steve uses are already in place in many companies. They're all accessible from a Web browser, and thus

easier to deploy and less apt to suffer feature bloat than standard proprietary software packages.

The expansion of social computing research into the Social Web is a natural evolution of the endeavor to understand how to augment human cognition. The audacious challenge for researchers is to understand how to use Web 2.0 technologies to augment social cognition, particularly within the enterprise realm: to increase groups of users' capacity and speed to acquire, produce, communicate, and use knowledge. ■

Ed H. Chi is a senior research scientist and manager of the Augmented Social Cognition Area at the Palo Alto Research Center, Palo Alto, Calif. Contact him at echi@parc.com.

**Editor: Simon S.Y. Shim, CTO,
MarkAny Inc., Seoul, Korea;
sshim@markany.com**

**IEEE
Computer Society
members**

**SAVE
25%**

**on all
conferences
sponsored by the
IEEE
Computer Society**

www.computer.org/join