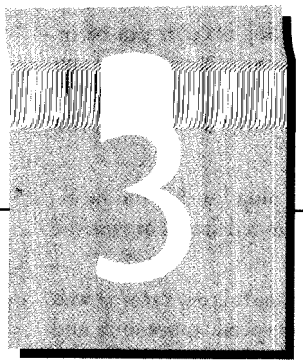

Dive Into® Web 2.0

Network effects from user contributions are the key to market dominance in the Web 2.0 era.
—Tim O'Reilly

Link by link, click by click, search is building possibly the most lasting, ponderous, and significant cultural artifact in the history of humankind: the Database of Intentions.
—John Battelle, *The Search*

Web 2.0 is a massive social experiment...this is an opportunity to build a new kind of international understanding...citizen to citizen, person to person.
—Lev Grossman, *TIME*

One of the powerful things about networking technology like the Internet or the Web or the Semantic Web...is that the things we've just done with them far surpass the imagination of the people who invented them.
—Tim Berners-Lee, interviewed by Peter Moon, *IDG Now*

OBJECTIVES

In this chapter you will learn:

- The defining characteristics of Web 2.0.
- Why search is fundamental to Web 2.0.
- How Web 2.0 empowers the individual.
- The importance of collective intelligence and network effects.
- The significance and growth of blogging.
- Social networking, social media and social bookmarking.
- How tagging leads to folksonomies.
- How web services enable new applications to be quickly and easily "mashed up" from existing applications.
- Web 2.0 technologies.
- Web 2.0 Internet business and monetization models.
- The emerging Semantic Web (the "web of meaning").

Outline

[Note: *Chapter 3, Dive Into® Web 2.0, is also available as a free, frequently updated HTML-based e-book at* `http://www.deitel.com/freeWeb20ebook/`. *It is also available as a downloadable, fully-formatted PDF for a small fee. Check this site for the latest hyperlink-rich version. Many of the topics in this chapter are supplemented by extensive Resource Centers at* `http://www.deitel.com/resourcecenters.html`. *The e-book and the PDF link to the Resource Centers and other web resources for further study.*]

3.1 Introduction

Chapter 1 presented basic computing concepts and the roles of several key technologies in developing distributed client/server applications for the Internet and the web. Chapter 2 discussed the capabilities of web browsers and how to use the latest versions of the two most popular browsers, Internet Explorer 7 and Firefox 2. Chapter 3 introduces the principles, applications, technologies, companies, business models and monetization strategies of Web 2.0.

When the Mosaic browser was introduced in 1993, the web exploded in popularity. It continued to experience tremendous growth throughout the 1990s—a period referred to as the "dot-com bubble"; that bubble burst in 2001. In 2003 there was a noticeable shift in how people and businesses were using the web and developing web-based applications.

The term Web 2.0—coined by Dale Dougherty of O'Reilly® Media[1] in 2003 to describe this trend—became a major media buzzword, but few people really know what it means. Generally, Web 2.0 companies use the web as a platform to create collaborative, community-based sites (e.g., social networking sites, blogs, wikis, etc.). Web 2.0 was popularized by the annual O'Reilly Media Web 2.0 Summit (launched in 2004), in Tim O'Reilly's defining article on Web 2.0 entitled, "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software,"[2] and in John Musser and Tim O'Reilly's for-sale report, "Web 2.0 Principles and Best Practices."[3]

The growth of Web 2.0 can be attributed to some key factors. First, hardware keeps getting cheaper and faster, with memory capacities and speeds increasing at a rapid rate. Moore's Law states that the power of hardware doubles every two years, while the price remains essentially the same.[4] This allows for development of applications with high demands that would have been previously unthinkable. Second, broadband Internet use has exploded—a Pew Internet study in March 2006 found 42% of American adults had high-speed Internet in their homes. Of the 35% of Internet users who had posted content online, 73% had broadband Internet.[5] The abundance of digital media online would never have been possible without high-speed Internet. Third, the availability of abundant open source software (see Section 3.11) has resulted in cheaper (and often free) customizable software options. This makes it easier to start new Web 2.0 companies and greatly decreases the cost of failure. Fourth, unlike in Web 1.0 (the state of the web through the 1990s and early 2000s), there are many easy-to-employ models available to monetize Web 2.0 businesses—immediately generating (modest amounts of) revenue allows for more stable growth of new companies.

Our information on the companies in this chapter comes from common knowledge, the company websites and the footnoted books and articles.

3.2 What Is Web 2.0?

In a sense, this entire chapter defines Web 2.0, but let's begin with a brief, one-section discussion. Web 1.0 was focused on a relatively small number of companies and advertisers producing content for users to access—some people called the web at the time the "brochure web." Web 2.0 *involves* the user—not only is the content often created by users, but users help organize it, share it, remix it, critique it, update it, etc. One way to look at Web 1.0 is as a *lecture*, a small number of professors informing a large audience of students. In comparison, Web 2.0 is a *conversation*, with everyone having the opportunity to speak and share views.

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1. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
2. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
3. Musser, J. and T. O'Reilly. *Web 2.0 Principles and Best Practices.* O'Reilly Media, Inc., 2006.
4. Moore, G. "Cramming More Components onto Integrated Circuits." *Electronics*, April 1965 <ftp://download.intel.com/museum/Moores_Law/Articles-Press_Releases/Gordon_Moore_1965_Article.pdf>.
5. Horrigan, J. B. "Home Broadband Adoption 2006." *Pew Internet & American Life Project*, May 2006 <http://www.pewinternet.org/pdfs/PIP_Broadband_trends2006.pdf>.

Web 2.0 embraces an architecture of participation—a design that encourages user interaction and community contributions.[6] You, the user, are the most important aspect of Web 2.0—so important, in fact, that in 2006, *TIME Magazine*'s "Person of the Year" was "you."[7] The article recognized the social phenomenon of Web 2.0—the shift away from a powerful few to an empowered many.

> *"We can't be device centric...we must be user centric."*
>
> —Bill Gates, MIX06 conference[8]

Many Web 2.0 companies are built almost entirely on user-generated content and harnessing collective intelligence. The significance is not just in having user-generated content, but in how it is used. Google—the leading search engine and Internet advertising company—sends its users to user-generated websites by considering what users collectively have valued in the past. For websites like MySpace®, Flickr™, YouTube and Wikipedia®, users create the content, while the sites provide the platforms. These companies *trust their users*—without such trust, users cannot make significant contributions to the sites.

> *"A platform beats an application every time."*
>
> —Tim O'Reilly[9]

The architecture of participation is seen in software development as well. Open source software is available for anyone to use and modify with few or no restrictions—this has played a major role in Web 2.0 development. Harnessing collective intelligence,[10] communities collaborate to develop software that many people believe is better than proprietary software.

You, the user, are not only contributing content and developing open source software, but you are also directing how media is delivered, and deciding which news and information outlets you trust. Many popular blogs now compete with traditional media powerhouses. Social bookmarking sites such as del.icio.us and Ma.gnolia allow users to recommend their favorite sites to others. Social media sites such as Digg™ or Reddit enable the community to decide which news articles are the most significant. You are also changing the way we find the information on these sites by tagging (i.e., labeling) web content by subject or keyword in a way that helps anyone locate information more effectively. This is just one of the ways Web 2.0 helps users identify new meaning in already existing content. RSS feeds (Chapter 14, XML and RSS) enable you to receive new information as it is updated—pushing the content right to your desktop.

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6. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
7. Grossman, L. "TIME's Person of the Year: You." *TIME*, December 2006 <http://www.time.com/time/magazine/article/0,9171,1569514,00.html>.
8. "Bill Gates: Microsoft MIX06 Conference." *Microsoft*, March 2006 <http://www.microsoft.com/presspass/exec/billg/speeches/2006/03-20MIX.mspx>.
9. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
10. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.

The rise of social networks has changed the way we interact and network. MySpace—the largest social network—has rapidly become the world's most popular website. Other popular social networking sites include Facebook, Bebo, LinkedIn, and Second Life—a 3D virtual world where you interact with others via your online persona called an avatar.

Many Web 2.0 businesses leverage the Long Tail.[11] Coined by Chris Anderson in an article in the October 2004 *WIRED* magazine, the Long Tail refers to the economic model in which the market for non-hits (typically large numbers of low-volume items) could be significant and sometimes even greater than the market for big hits (typically small numbers of high-volume items).[12] So an online company like Netflix—which has a catalog of over 80,000 movie titles for rent—typically rents a large volume of less popular movies in addition to the substantial business it does renting hits. A local movie store has limited shelf space and serves a small, local population; it cannot afford the space to carry the Long Tail movies in every store. However, Netflix serves millions of people and does not have the physical constraints of stores; it can keep a small inventory of many Long Tail movies to serve its entire customer base. The opportunity to leverage the Long Tail is made possible by the relative ease of running a Web 2.0 Internet business and is fueled by the social effects of Web 2.0 that increase exposure for lesser-known products.

In this chapter, we introduce some of the key technologies used to create Web 2.0 applications. Many of these technologies are discussed in detail in the programming chapters of *Internet & World Wide Web How to Program, 4/e*. You'll learn web development technologies, such as Ajax (Chapter 15); its component technologies, including XHTML (Chapter 4), Cascading Style Sheets (CSS, Chapter 5), JavaScript (Chapters 6–11), the Document Object Model (DOM, Chapter 12), XML (Chapter 14) and the `XMLHttpRequest` object (Chapter 15); and the popular Ajax toolkits—Dojo (Chapter 15) and Script.aculo.us (Chapter 24).

You'll learn how to build Rich Internet Applications (RIAs)—web applications that offer the responsiveness and rich GUI features of desktop applications. We discuss key tools for building RIAs, including Adobe's Flex (Chapter 18), Microsoft's Silverlight (Chapter 19), ASP.NET Ajax (Chapter 25) and Sun's JavaServer Faces (Chapters 26–27). We present web development tools such as Adobe's Dreamweaver and its Ajax-enabling capabilities (Chapter 20). We also discuss other popular development technologies including JSON (Chapter 15), the web servers IIS and Apache (Chapter 21), MySQL (Chapter 22), PHP (Chapter 23), and ASP.NET (Chapter 25).

We discuss the emergence of web services (Chapter 28), which allow you to incorporate functionality from existing applications into your own applications quickly and easily. For example, using Amazon Web Services™, you can create a specialty bookstore and earn revenues through the Amazon Associates program; or using Google™ Maps web services with eBay web services, you can build location-based mashup applications to find auction items in certain geographical areas. Web services, inexpensive computers, abundant high-speed Internet access, open source software and many other elements have inspired new, exciting lightweight business models that people can launch with only a small investment. Some websites with robust functionality that might have required hundreds of thousands

11. Anderson, C. *The Long Tail: Why the Future of Business Is Selling Less of More.* Hyperion, 2006.
12. Anderson, C. "The Long Tail." *WIRED*, October 2004 <http://www.wired.com/wired/archive/12.10/tail.html>.

or even millions of dollars to build in the 1990s can now be built for nominal amounts of money.

Section 3.17 overviews key Web 2.0 business models, many of which are also explained in greater depth throughout the chapter. Fig. 3.1 includes a list of Web 2.0-related conferences. Some have a technology focus, while others have a business focus.

Web 2.0 and related conferences	
AdTech	Microsoft MIX
Affiliate Marketing Summit	Microsoft Tech Ed
AjaxWorld Expo	MySQL Conference and Expo
All Things Digital	Open Source (OSCON)
Always On	RailsConf
Blog Business Summit	Search Engine Strategies
eBay Live	Tools of Change for Publishing
Emerging Technology	Ubuntu Live
Emerging Telephony	Web 2.0 Expo
Future of Online Advertising	Web 2.0 Summit
JavaOne	Where 2.0

Fig. 3.1 | Web 2.0 and related conferences.

3.3 Search

"Google's mission is to organize the world's information and make it universally accessible and useful."

—Google[13]

In Web 2.0, the saying "content is king" remains a prevailing theme. With seemingly endless content available online, the **findability** of content becomes key. **Search engines** are the primary tools people use to find information on the web. Today, you perform searches with keywords, but the future of web search will use natural language (see, for example, Powerset.com). Currently, when you enter a keyword or phrase, the search engine finds matching web pages and shows you a **search engine results** page (SERP) with recommended web pages listed and sorted by relevance. People-assisted search engines have also emerged, such as Mahalo, which pays people to develop search results.[14] The popularity of vertical search engines—ones that focus on a specific topic or industry—is on the rise, though traffic to these search engines is still far behind the major (more generalized) search engines.

Traffic to the major search engines is growing rapidly—according to a recent comScore (a web analytics company) report, Americans conducted 8 billion search queries in June 2007, up 26% from the previous year. In the same report, the comScore analysis of

13. "Company Overview." *Google* <http://www.google.com/intl/en/corporate/index.html>.
14. "Mahalo Greenhouse FAQ." *Mahalo* <http://greenhouse.mahalo.com/Mahalo_Greenhouse_FAQ>.

U.S. market share across the most popular search engines reported Google at the top with 49.5% of the U.S. search market, followed by Yahoo! with 23.1%, Microsoft with 13.2%, Ask with 5.0% and Time Warner Network with 4.2%.[15]

John Battelle's book *The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture* provides an extensive history of search engines and presents strong arguments for the importance of search in almost every aspect of our personal and business lives. John Battelle's *Searchblog* discusses search and technology issues (`http://battellemedia.com`).

Attention Economy

> *"Telecommunications bandwidth is not a problem, but human bandwidth is."*
>
> —Thomas Davenport and John Beck, *The Attention Economy*[16]

The abundant amounts of information being produced and people's limited free time has led to an attention economy. More content is available than users can sort through on their own, especially given the demands on their time, such as responsibilities to children, parents, friends, employers, etc. *The Attention Economy*, by Thomas Davenport and John Beck, begins with the familiar story of a man whose attention is constantly demanded by work and family. The authors explain that the constant flow of information in today's world causes attention to continually be diverted.

Though it used to be difficult to obtain diverse content, there are now seemingly endless options competing for an audience's attention. As a result, search engines have gained popularity by helping users quickly find and filter the information they want.[17]

Google Search

Google is the leading search and online advertising company, founded by Larry Page and Sergey Brin while they were Ph.D. students at Stanford University. Google is so popular that its name has been added to the Oxford English Dictionary—the verb "Google" means to find something on the Internet using the Google search engine. ("google" with a lowercase "g" is a cricket term, whereas "googol" or 10^{100} is the mathematical term Google was named after.)[18]

Google's success in search is largely based on its PageRank™ algorithm (patented by Stanford University and Larry Page) and its unique infrastructure of servers that uses linked PCs to achieve faster responses and increased scalability at lower costs.[19] Estimates on the number of Google servers range from hundreds of thousands to over one million.[20] The PageRank algorithm considers the number of links into a web page and the quality of

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15. "comScore Releases June U.S. Search Engine Rankings." *CNNMoney*, 16 July 2007 <`http://money.cnn.com/news/newsfeeds/articles/prnewswire/AQM17916072007-1.htm`>.
16. Davenport, T. and J. Beck. *The Attention Economy: Understanding the New Currency of Business.* Harvard Business School Press, 2002, p.2.
17. Thompson, C. "Media in the Age of the Swarm." *cbc.ca* <`http://www.cbc.ca/10th/columns/media_thompson.html`>.
18. Brin, S. and L. Page. "The Anatomy of a Large-Scale Hypertextual Web Search Engine." <`http://infolab.stanford.edu/~backrub/google.html`>.
19. "Technology Overview." *Google* <`http://www.google.com/corporate/tech.html`>.
20. "Google: One Million and Counting." *Pandia Search Engine News*, 2 July 2007 <`http://www.pandia.com/sew/481-gartner.html`>.

the linking sites (among other factors) to determine the importance of the page. Each inbound link is a vote saying that site is valuable to someone else; however, votes are given different weights depending on the "voter" site's own value. So, two pages could have the same PageRank even if one has numerous links in from other pages and the other has fewer links in but from pages with higher PageRank. Google search also considers all of the content on the page, its fonts, its headers and the content of neighboring pages.[21] Sites with the highest PageRank will appear at the top of the search results.

In addition to its regular search engine, Google offers specialty search engines for images, news, videos, blogs and more. Using Google web services, you can build Google Maps and other Google services into your applications (see Section 3.13, Web Services, Mashups, Widgets and Gadgets).

AdWords, Google's pay-per-click (PPC) contextual advertising program (launched in 2000), is the company's main source of revenue. AdWords ads appear next to search results on the Google site (and are related to the search query). Advertisers write their own ads, which are unobtrusive and uniform in appearance—each ad consists of a headline, limited text and a URL. Advertisers bid on search keywords related to their ads and pay based on the number of users who click on the ads.

AdSense is Google's advertising program for publishers (sites like `http://www.deitel.com` that offer content), inspired by Susan Wojcicki, the vice president of product management. (In 1998, Wojcicki rented a spare room in her house to Larry Page and Sergey Brin where they founded Google.)[22] AdSense is a fundamental and popular form of website monetization, particularly for Web 2.0 startup companies. Google text ads (as well as banner and rich-media ads) are placed on participating sites with related content. Click-through rates on contextual ads are often higher than on non-contextual ads because the ads reach people expressing interest in a related topic. As a result, contextual pay-per-click ads generally pay a higher eCPM (effective cost per thousand impressions).

Yahoo!

Yahoo! was started in 1994 by Jerry Yang and David Filo (also Stanford Ph.D. students) as a web directory rather than a search engine. The original site, "Jerry and David's Guide to the World Wide Web," consisted of their favorite websites manually added to a categorized directory.[23] As the web grew, maintaining the directory structure became increasingly difficult, and a search capability was created for better access to the data. Focusing more on search, Yahoo! also expanded into other areas, becoming a popular provider of e-mail, user groups and more. In 2003, Yahoo! acquired Overture (now Yahoo! Search Marketing), which was the first search engine to offer sponsored search results successfully.[24]

MSN

MSN search was created in 1998, a year after Google was launched.[25] Over the past few years, Microsoft has made search engine technology development a top priority.[26] Mi-

21. "Technology Overview." *Google* <http://www.google.com/corporate/tech.html>.
22. Graham, J. "The House that Helped Build Google." *USA TODAY*, 5 July 2007, 1B.
23. "Company History." *Yahoo!* <http://yhoo.client.shareholder.com/press/history.cfm>.
24. Mills, E. "Google Rises at Yahoo's Expense." *CNET*, 23 April 2007 <http://news.com.com/Google+rises+at+Yahoos+expense/2100-1038_3-6178164.html>.
25. Underwood, L. "A Brief History of Search Engines." *Web Ref* <http://www.webreference.com/authoring/search_history/>.

crosoft search query volume and its search market share grew rapidly in June 2007; analysis companies comScore and Compete attribute this boost largely to MSN's Live Search club, a program introduced in May 2007 to reward users of Live Search.[27, 28] MSN's Live Search includes a new search engine, index and crawler.[29] It allows you to search the web, performing specialized searches (news, images, or local listings) or MSN content searches.[30] Another approach that Microsoft is taking to increase its search market share is buying vertical search sites such as MedStory, a health search engine. [31] Microsoft is also looking to gain market share in the contextual advertising market through Microsoft adCenter (similar to Google AdWords and Yahoo! Search Marketing).

Ask

Ask (formally known as AskJeeves.com) is owned by InterActiveCorp (IAC), which also owns Ticketmaster®, Match.com®, LendingTree.com®, RealEstate.com® and many other Internet properties. In June 2007, Ask launched a new search site, which includes a new design with a simple homepage default, customizable backgrounds, new video search (powered by Blinkx) and the ability to view video previews and listen to music clips. The search results are based on the searcher's location—Ask will report relevant local businesses and events. Searching for movies, for example, will show local show times.

Vertical Search

Vertical search engines are specialists (focusing on specific topics) in comparison to generalists (e.g., Google and Yahoo!).[32] Vertical search engines enable you to search for resources in a specific area, with the goal of providing you with a smaller number of more relevant results. Popular vertical search engines include travel sites (such as Kayak or Expedia), real-estate sites (such as Zillow or Trulia), job search sites (such as Indeed or Monster) and shopping search engines (such as Shopzilla and MySimon).

Location-Based Search

Location-based search (offered by most major search engines as well as some smaller specialized ones) uses geographic information about the searcher to provide more relevant search results. For example, search engines can ask the user for a ZIP code or estimate the user's general location based on IP address. The engine can then use this information to give higher priority to search results physically located near the user. This is particularly useful when searching for businesses such as restaurants or car services. (See Section 3.14 for more information on location-based services.)

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26. Olson, S. "MSN Launches Revamped Search Engine." *CNET,* 30 June 2004 <http://news.com.com/MSN+launches+revamped+search+engine/2100-1032_3-5254083.html>.
27. "comScore Releases June U.S. Search Engine Rankings." *CNNMoney,* 16 July 2007 <http://money.cnn.com/news/newsfeeds/articles/prnewswire/AQM17916072007-1.htm>.
28. Sullivan, D. "Compete: Microsoft Gaining Searches; Live Search Club Giveaway Working?" *Search Engine Land,* 10 July 2007 <http://searchengineland.com/070710-105603.php>.
29. "MSN Live Search: About Us." *MSN* <http://search.msn.com/docs/default.aspx>.
30. "Web Search: How to use MSN Search." *MSN* <http://search.msn.com/docs/help.aspx?t=SEARCH_CONC_WhatsNewWithMSNSearch.htm>.
31. "Vertical Search-Engines: Know Your Subject." *Economist.com,* 12 July 2007 <http://www.economist.com/business/displaystory.cfm?story_id=9478224>.
32. "Vertical Search-Engines: Know Your Subject." *Economist.com,* 12 July 2007 <http://www.economist.com/business/displaystory.cfm?story_id=9478224>.

Creating Customized Search Engines

Rollyo—a build-your-own customized search engine website—allows you to explore, create and personalize search engines ("searchrolls") created by others. This helps you narrow your search to sites you already trust.[33] Other custom search sites include Gigablast and Google Custom Search Engine.

Search Engine Optimization (SEO)

Search Engine Optimization (SEO) is the process of designing and tuning your website to maximize your findability and improve your rankings in organic (non-paid) search engine results. To maximize traffic, you need to take into consideration how search engines work when you design your website. There are two ways of employing SEO. The first, **white hat SEO**, refers to methods that are approved by search engines, do not attempt to deceive the search engines, and produce quality, long-term results. Top white hat techniques for SEO include: offering quality content, using proper metadata and effective keywords, and having inbound links from relevant high-quality pages.[34] **Black hat** methods are used to deceive search engines. Although they may result in temporary improvement in search engine results, these tactics could get your site banned by the search engines. A "Googlebomb" (or link bomb) is an example of a black hat method—it attempts to trick the Google algorithm into promoting a certain page (generally for humorous reasons).[35]

Link Building

Link building is the process of increasing search engine rankings and traffic by generating inbound links to a particular website. Search engine algorithms regard each link as a vote for the destination website's content, so sites with the greatest **link popularity** (or number of high-quality inbound links) appear highest on search engine result pages (SERPs). The three most practiced methods of building links include reciprocal linking, link baiting and natural linking. **Reciprocal linking** is an exchange in which two related websites link to each other, increasing the link popularity of both sites and adding value for site users. **Link baiting** involves creating attention-grabbing web content specifically for viral (exponentially increasing) exposure through social media and social bookmarking websites. **Natural linking** is the process of building one-way inbound links by optimizing website content and user experience without the explicit solicitation of a backlink. Search algorithms are continuously updated to prevent black hat SEOs from deceiving search engines with automated linking software and links from directories or other low-quality websites. One-way links from websites with strong, related pages are given greater weight than reciprocal links, links from sites with unrelated content or links from sites with low PageRank.

Search Engine Marketing (SEM)

Search Engine Marketing (SEM) is the method of promoting your website to increase traffic and search results by raising the site's visibility on search engine results pages. Danny Sullivan (founder of Search Engine Watch and, more recently, Search Engine Land) introduced the term "Search Engine Marketing" in 2001 to include SEO, manag-

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33. "About Rollyo." *Rollyo* <http://www.rollyo.com/about.html>.
34. Wilding, R. "Top 5 Black Hat and White Hat Search Engines Optimisation Techniques."*PushON* <http://www.pushon.co.uk/articles/top5-black-hat-white-hat-seo.htm>.
35. Calore, M. "Remembering the First Google Bomb." *Compiler (WIRED blog)*, 26 January 2007 <http://blog.wired.com/monkeybites/2007/01/earlier_today_m.html>.

ing paid listings, developing online marketing strategies and submitting sites to directories.[36] SEO is the most popular form of search engine marketing, which continues to take away business from other marketing channels (especially offline sources). According to the Search Engine Marketing Professional Organization's annual State of Search Engine Marketing survey, North American advertisers spent $9.4 billion on search engine marketing in 2006, a 62% increase over 2005 spending.[37]

Search Engine Watch and Search Engine Land

Search Engine Watch is a search engine marketing resource site. It includes articles, tutorials, conferences and more. The site, launched in 1997 by Danny Sullivan, was inspired by his 1996 release of "A Webmaster's Guide To Search Engines." Search Engine Watch incorporates Web 2.0 features (blogging and forums in addition to expert columnist articles). Other Search Engine Watch departments include search engine submission tips, web searching tips, popular search engines and search engine resources (numerous topics related to search engines). Danny Sullivan served as Search Engine Watch's editor-in-chief until November 2006, when he left the site and became the editor-in-chief for Search Engine Land. The site provides news and information on the major search engines—Google, Yahoo!, and Microsoft—as well as search engine marketing and searching issues. The site also informs users of upcoming related conferences and webcasts.

Search Engine Strategies Conferences

Search Engine Strategies is a global conference series focused on search engine advertising (including current SEO and SEM issues). Search Engine Strategies (hosted by Search Engine Watch) offers event information given by the top experts in the field as well as representatives from search engine companies.[38] Because traffic and advertising are so important to most Web 2.0 businesses, understanding the search process and making sure your site is easily found is vital.

Discovery

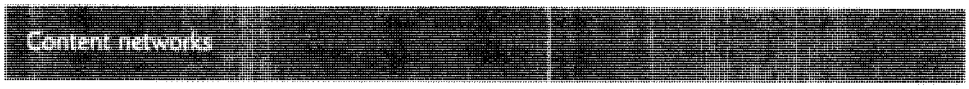
Rather than the traditional use of search engines (searching with a topic in mind), discovery refers to finding new content you would not have otherwise sought out. For example, Yahoo!'s original directory design allowed users to browse categories, and discover new interesting sites. StumbleUpon, a social bookmarking site, addresses discovery with its recommendation system that helps you discover and share websites based on your interests. Content networks also direct users to web content they would not necessarily have looked for otherwise.

3.4 Content Networks

Content networks are websites or collections of websites that provide information in various forms (such as articles, wikis, blogs, etc.). These provide another way of filtering the vast amounts of information on the Internet, by allowing users to go to a trusted site that

36. Sullivan, D. "Congratulations! You're a Search Engine Marketer!" *Search Engine Watch*, 5 November 2005 <http://searchenginewatch.com/showPage.html?page=2164351>.
37. Sherman, C. "The State of Search Engine Marketing 2006." *Search Engine Land*, 8 February 2007 <http://searchengineland.com/070208-095009.php>.
38. *Search Engine Strategies: Conference & Expos*, 2007 <http://www.searchenginestrategies.com>.

has already sorted through many sources to find the best content or has provided its own content. Figure 3.2 shows some examples of content networks.



About.com—Acquired by the *New York Times*, About is a collection of information on a wide variety of topics. About was founded in 1996 and provides over 500 guides written by topic experts. The guides include new content as well as links to other websites.

b5media—A blog network with over 200 blogs related to travel, entertainment, technology and more.

Corante—A blog network authored by leading commentators in technology, business, law, science, and culture.

Deitel—Deitel Resource Centers (currently about 80 sites and growing rapidly) include links to, and descriptions of, key tutorials, demos, free software tools, articles, e-books, whitepapers, videos, podcasts, blogs, RSS feeds and more. Resource Centers are grouped into major topic areas, including Web 2.0, Internet business, programming languages, software development and open source. See Fig. 2 in the Preface for a complete list of Resource Centers.

eHow—eHow claims over 35,000 articles explaining "how to do just about everything." The articles are written by members, and the site also features a section of "how to" videos.

Gawker Media—A blog network that includes 14 blogs, such as Gizmodo, Gawker, Valleywag and Lifehacker. The blogs cover a range of topics including technology, gossip and more.

HowStuffWorks—HowStuffWorks offers articles explaining "how the world actually works." Articles are written by freelance writers, and experts from *Consumer Guide* and *Mobil Travel Guide*.

LifeTips—LifeTips provides short articles on both work and general life issues from hundreds of writers. Tips are voted on by readers (who can also mark their favorites for easy access).

9rules—A blog network with a wide range of blog topics. The site also includes social networking aspects.

Suite101—Suite101 offers thousands of articles on a variety of topics written by freelance writers. In addition to the articles, the site also provides discussion areas and free courses.

Weblogs, Inc.—A blog network of 90 blogs, including Engadget, Autoblog and Joystiq. Users can apply to write for one of the blogs (and get paid) or suggest topics for potential new blogs.

Fig. 3.2 | Content networks.

3.5 User-Generated Content

User-generated content has been the key to success for many of today's leading Web 2.0 companies, such as Amazon, eBay and Monster. The community adds value to these sites, which, in many cases, are almost entirely built on user-generated content. For example, eBay (an online auction site) relies on the community to buy and sell auction items, and Monster (a job search engine) connects job seekers with employers and recruiters.

User-generated content includes explicitly generated content such as articles, home videos and photos. It can also include implicitly generated content—information that is gathered from the users' actions online. For example, every product you buy from Amazon and every video you watch on YouTube provides these sites with valuable information

about your interests. Companies like Amazon have developed massive databases of anonymous user data to understand how users interact with their site. For example, Amazon uses your purchase history and compares it to purchases made by other users with similar interests to make personalized recommendations (e.g., "customers who bought this item also bought..."). Implicitly generated content is often considered hidden content. For example, web links and tags are hidden content; every site you link to from your own site or bookmark on a social bookmarking site could be considered a vote for that site's importance. Search engines such as Google (which uses the PageRank algorithm) use the number and quality of these links to a site to determine the importance of a site in search results.

Collective Intelligence

Collective intelligence is the concept that collaboration can result in smart ideas. Working together, users combine their knowledge for everyone's benefit.

The first chapter of *Wikinomics*, by Don Tapscott and Anthony D. Williams, tells the Goldcorp story. Inspired by the community efforts in Linux, the CEO of Goldcorp released to the public proprietary geological information about the company's land. Goldcorp offered cash rewards to people who could use this information to help the company locate gold on the land. The community helped his company find 8 million ounces of gold, catapulting Goldcorp from $100 million in stock equity to $9 billion.[39] Goldcorp reaped amazing benefits by sharing information and encouraging community participation.

User-generated content is significant to Web 2.0 companies because of the innovative ways companies are harnessing collective intelligence. We've already discussed Google's PageRank (Section 3.3), which is a product of collective intelligence. Amazon's and Last.fm's personalized recommendations also result from collective intelligence, as algorithms evaluate user preferences to provide you with a better experience by helping you discover new products or music preferred by other people with similar interests. Wesabe is a web community where members share their decisions about money and savings—the site uses the collective financial experiences of the community to create recommendations.[40] Reputation systems (used by companies like eBay) also use collective intelligence to build trust between buyers and sellers by sharing user feedback with the community. Social bookmarking sites (Section 3.10), and social media sites (like Digg and Flickr) use collective intelligence to promote popular material, making it easier for others to find.

Wikis

Wikis, websites that allow users to edit existing content and add new information, are prime examples of user-generated content and collective intelligence. The most popular wiki is Wikipedia, a community-generated encyclopedia with articles available in over 200 languages. Wikipedia trusts its users to follow certain rules, such as not deleting accurate information and not adding biased information, while allowing community members to enforce the rules. The result has been a wealth of information growing much faster than could otherwise be produced. In 2005, an experiment comparing 42 entries from Wikipedia and *Britannica* (a popular printed traditional encyclopedia) showed only slightly

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39. Tapscott, D. and A.D. Williams. *Wikinomics: How Mass Collaboration Changes Everything.* Portfolio Hardcover, 2006.
40. "FAQ." *Wesabe* <http://www.wesabe.com/page/faq>.

more inaccuracies in the Wikipedia articles.[41] The Wikipedia entries were promptly corrected, though, whereas errors in *Britannica* entries cannot be corrected until the book's next printing and will remain in already printed copies.

Wikipedia, Wikia (a site for specialized wiki communities about popular television shows, games, literature, shopping and more) and many other wikis use MediaWiki open source software (originally developed for Wikipedia). The software can be downloaded from MediaWiki's website (`www.mediawiki.org`), where you can also find descriptions, tutorials, suggestions and more to help navigate the software. Wikis are also used by many companies to provide product information, support and community resources. SocialText, the first wiki company, provides corporate wiki services. Many companies have found that using wikis for project collaboration reduces e-mails and phone calls between employees, while allowing the ability to closely track a project's changes.[42]

Collaborative Filtering

Though collaboration can result in a wealth of knowledge, some users might submit false or faulty information. For example, Wikipedia has experienced instances of people deliberately adding false information to entries. While moderation (monitoring of content by staff) is sometimes necessary, it is time consuming and costly. Many Web 2.0 companies rely on the community to help police their sites. This collaborative filtering lets users promote valuable material and flag offensive or inappropriate material. Users have the power to choose for themselves what is important. Examples of sites using collaborative filtering include Digg, a news site where users rate the stories (see Section 3.8), and social bookmarking sites such as del.icio.us, where users can easily find popular sites (see Section 3.10). Customer reviews on Amazon products also employ collaborative filtering—readers vote on the usefulness of each review (helping other readers to find the best reviews).

Craigslist

Craigslist, founded by Craig Newmark, is a popular classified ads website that has radically changed the classified advertising market. Newspapers have experienced a decline in classified ad sales,[43] as revenues from help-wanted ads on Craigslist climbed to $50 million in 2006.[44] Most ad postings on Craigslist are free, and it's easy for anyone to post ads. The site has gained popularity because of its job and housing postings. In 2005, a documentary, "24 Hours on Craigslist," showed the diverse postings that occur on the site in a single day.[45] Craigslist is built on user content, leveraging the Long Tail by connecting the unique (often unusual) needs of its users. The site also uses collaborative filtering—users are encouraged to flag inappropriate postings.

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41. Cauchi, S. "Online Encyclopedias Put to the Test." *The Age*, 15 December 2005 <http://www.theage.com.au/news/national/online-encyclopedias-put-to-the-test/2005/12/14/1134500913345.html>.
42. "SocialText is the Enterprise Wiki Trusted Most by Global 2000 Corporations." *SocialText* <http://www.socialtext.com/products/overview>.
43. Steel, E. "Newspapers' Ad Sales Show Accelerating Drop." *The Wall Street Journal*, 18 July 2007, A4.
44. "Leading Indicators." *FORTUNE*, 13 November 2006, p.40.
45. "24 Hours on Craigslist."<http://24hoursoncraigslist.com/>.

Wisdom of Crowds

Wisdom of crowds (from the book of the same title written by James Surowiecki) is similar to collective intelligence—it suggests that a large diverse group of people (that does not necessarily include experts) can be smarter than a small group of specialists. The key difference between collective intelligence and the wisdom of crowds is that the latter is not meant to be a collaborative process—part of forming a reliable crowd is making sure people don't influence each other.[46] For example, Surowiecki describes how calculating the average of all submissions in a guessing contest (e.g., guessing the number of jelly beans in a jar) often results in nearly the correct answer, even though most individual estimates are incorrect and vary considerably. When the U.S. submarine *Scorpion* sank in 1968, the Navy asked various experts to work individually assessing what might have happened; their collective answers were then analyzed to determine the accurate location of the submarine.[47] Practical everyday applications of the wisdom of crowds can be seen in sites employing collaborative filtering.

3.6 Blogging

"The blog is the best relationship generator you've ever seen."
—Robert Scoble, blogger[48]

History of Blogging

Blogs are websites consisting of entries listed in reverse chronological order. They have existed since the mid-1990s; however, interest in blogging has grown exponentially in recent years because of easy-to-use blogging software and increasingly economical Internet access. The term "blog" evolved from **weblog**, a regularly updated list of interesting websites. These blogs consisted of short postings, in reverse chronological order, that contained links to other web pages and short commentaries or reactions. Blogging has since taken on a looser structure—some blogs still follow the traditional format of links and small amounts of text, while others consist of essays, sometimes not containing any links. Blogs can also now incorporate media, such as music or videos. Many people are familiar with personal journal blogs, like those on **Xanga** or **LiveJournal**. These sites include social networking features and are particularly popular with teenage bloggers, who often write about their day-to-day lives for friends.

Blogging has become a major social phenomenon, empowering users to participate in, rather than just view, the web. In July 2006 most **bloggers**, or blog authors, had not had a personal website before starting their blog.[49] The increased availability of user-friendly blogging software has allowed blogging to become accessible to more mainstream Internet users.

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46. Jenkins, H. "Collective Intelligence vs. The Wisdom of Crowds." *Confessions of an Aca-Fan*, 27 November 2006 <http://www.henryjenkins.org/2006/11/collective_intelligence_vs_the.html>.
47. Surowiecki, J. *The Wisdom of Crowds*. Anchor, 2005.
48. Kirkpatrick, D. "Why There's No Escaping the Blog." *FORTUNE*, 10 January 2005 <http://money.cnn.com/magazines/fortune/fortune_archive/2005/01/10/8230982/index.htm>.
49. Lenhart, A. and S. Fox. "Bloggers: A Portrait of the Internet's New Storytellers." *Pew Internet & American Life Project*, July 2006 <http://www.pewinternet.org/pdfs/PIP%20Bloggers%20Report%20July%2019%202006.pdf>.

Blog Components

Reader comments create an interactive experience, allowing readers to react to blog entries. According to a Pew Internet study, 87% of blogs allow reader comments.[50] Successful bloggers pay attention to their readers and respond, often sparking interesting discussions and debates. However, allowing comments increases the possibility of spam (including irrelevant comments, inappropriate language and link spam—where a user tries to increase an irrelevant site's number of inbound links). By some estimates, over 90% of blog comments are spam.[51]

Permalinks provide blog readers with a way of linking to specific blog entries. Each blog post has a unique URL referring to that single post. Links stay relevant even after the blog entry moves off the homepage and into the archive.

Trackbacks tell bloggers who is linking to their posts. This enhances Internet content by making linking two-way. The blogger provides a trackback link, and sites that use the link are added to a list on the blog entry. For an example of a trackbacks section, visit `http://www.techcrunch.com/2006/08/08/web-20-the-24-minute-documentary/`. This is a permalink to a post on **TechCrunch**, a popular Internet technology blog, that features a Web 2.0 video from 2006.

A **blogroll** is a list of the blogger's favorite blogs. Though not all blogs feature a blogroll, it is common for the main page of a blog to contain links to several other blogs. For example, LiveJournal automatically incorporates a blogroll (consisting of users the blogger has marked as friends) into a user's profile page.

Blogging and Journalism

> *"Freedom of the press is guaranteed only to those who own one."*
> —A.J. Liebling[52]

Blogging has encouraged **citizen journalism**, allowing anyone to be a journalist. Blogs have become a significant news resource, drawing traffic away from the mainstream media. Some argue that this form of "participatory journalism" holds less biases than mainstream media, or at least makes these biases clear and provides many different views. This **democratization of media** allows a larger group to take part in journalism.[53] Traditional journalists had previously been able to create a representative democracy (much like the political system of the United States) by speaking for the masses. However, blogging gives a voice to everyone with a computer and Internet access, creating a more direct democracy.

Many bloggers are recognized as members of the media. Just as television and radio increased the speed of news delivery over that of newspapers, blogs have become a fast and in-depth (and often "unwashed") news medium. The mass media is embracing blogging; many TV news anchors suggest that viewers read their blogs after the show, and many newspaper websites feature blogs by reporters.

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50. Lenhart, A. and S. Fox. "Bloggers: A Portrait of the Internet's New Storytellers." *Pew Internet & American Life Project*, July 2006 <http://www.pewinternet.org/pdfs/PIP%20Bloggers%20Report%20July%2019%202006.pdf>.
51. *Akismet*, 10 August 2007 <http://akismet.com/stats/>.
52. "A.J. Liebling Quotes." *ThinkExist.com Quotations* <http://thinkexist.com/quotation/freedom_of_the_press_is_guaranteed_only_to_those/220714.html>.
53. Bowman, S. and C. Willis. "We Media." July 2003 <http://www.hypergene.net/wemedia/download/we_media.pdf>.

Though journalism is a large part of the blogging phenomenon, according to a Pew Internet study only one-third of bloggers consider their blogs a form of journalism. Eighty-four percent of bloggers consider it a hobby, and only 10% spend more than ten hours a week blogging.[54] Posting new content and responding to reader comments requires a substantial time commitment.

Growth of Blogging

The number of blogs has been doubling about twice a year.[55] However, there is also a large number of abandoned blogs. A Caslon Analytics study found that "66.0% of surveyed blogs had not been updated in two months."[56]

Companies are reaching out to the blogosphere, or blogging community, to keep in touch with consumer opinions. Many CEOs and top executives from large companies such as Sun Microsystems, Marriott International and General Motors are now regular bloggers. This helps build consumer trust and loyalty. The NewPR Wiki lists over 250 CEOs and upper-management bloggers.[57]

Increased use of mobile devices has also lead to moblogging, or mobile blogging, as bloggers no longer need to be at their computer to update their blogs. Similarly, vlogging, or video blogging, has gained popularity. Rocketboom, for example, posts a three-minute video every day covering news and Internet stories.

Blogging and RSS Feeds

Many popular blogs provide RSS and Atom feeds to let readers know when new content is posted. Feeds, offered through blogging software or sites such as Feedburner (acquired by Google in 2007), help bloggers track and maintain a steady readership. The feeds (containing an entire post or just a selection with a link) can be automatically syndicated via the web and aggregated on a website or application designated by the user. Some sites (like Feedburner) provide an e-mail option, forwarding the day's posts to subscribers. While the use of feeds is certainly growing, a Pew Internet study in July 2006 reported that only 18% of bloggers provide RSS feeds.[58] (See "RSS and Atom" in Section 3.15.)

Blogging Software

Bloggers now have many options for building blogs. Online hosted blog software options include WordPress (which also offers server software), TypePad and Blogger. Blog server software programs include Movable Type and Textpattern. These require users to have their own web server; however, they also allow for more customization. Some word pro-

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54. Lenhart, A. and S. Fox. "Bloggers: A Portrait of the Internet's New Storytellers." *Pew Internet & American Life Project*, July 2006 <http://www.pewinternet.org/pdfs/PIP%20Bloggers%20Report%20July%2019%202006.pdf>.
55. Walsh, B. *Clear Blogging: How People Are Changing the World and How You Can Join Them.* Apress, 2007.
56. "Blog Statistics and Demographics." *Caslon Analytics.* March 2007 <http://www.caslon.com.au/weblogprofile1.htm>.
57. "CEO Blog List." *NewPR Wiki* <http://www.thenewpr.com/wiki/pmwiki.php/Resources/CEOBlogsList?pagename=Resources.CEOBlogsList>.
58. Lenhart, A. and S. Fox. "Bloggers: A Portrait of the Internet's New Storytellers." *Pew Internet & American Life Project*, July 2006 <http://www.pewinternet.org/pdfs/PIP%20Bloggers%20Report%20July%2019%202006.pdf>.

cessors (such as Microsoft Word 2007) also offer blog publishing features or are compatible with blog posting extensions.

Blog Networks

Blog networks are collections of blogs, often with several editors. Popular blog networks include Corante, Weblogs, Inc., 9rules, b5media and Gawker Media. Many of these networks, with multiple bloggers and daily postings, draw significant traffic and a broad audience. Blog networks help bloggers build reputations and loyal readers. Some social networking sites like MySpace and Facebook also enable blogging to a private network of friends.

Blog Search Engines

Blog search engines, such as Technorati and Google Blog Search, monitor the blogosphere's constant changes. When dealing with blogs, search results cannot be based strictly on traditional factors such as reputations built over time (since the blogosphere is so dynamic). Technorati, which tracked over 93 million blogs in July 2007, addresses the unique needs of what they call the "World Live Web." Google Blog Search adjusts Google's search algorithms to specifically address the blogosphere. Other blog search engines include Feedster, IceRocket and Blogdigger.

3.7 Social Networking

Social networking sites, which allow users to keep track of their existing interpersonal relationships and form new ones, are experiencing extraordinary growth in Web 2.0. According to the "Hitwise US Consumer Generated Media Report," in September 2006 "one in every 20 Internet visits went to one of the top 20 social networks." A large portion of the traffic on shopping sites (and other Web 2.0 sites) comes from social networking websites such as MySpace.[59]

Network Effects

> *"What distinguished 2.0 is the design of systems that harness network effects—a broader way of saying community—to get better the more people use them."*
>
> —Tim O'Reilly[60]

The term network effects refers to the increased value of a network as its number of users grows. Metcalfe's Law states that the value of the network is proportional to the square of the number of users.[61] Consider, for example, eBay—the more buyers and sellers that use the site, the more valuable the site becomes to its users. Google's AdSense advertising program also increases in value as the number of participating advertisers and publishers grows and ads can be better matched to site content (see Section 3.3). Social networking sites also rely heavily on network effects, often attracting users only if their friends are on the site.

A key part of building a successful network and creating an architecture of participation is setting the user preferences to default to share content so users will automatically

59. Prescott, L. "Hitwise US Consumer Generated Media Report." *Hitwise,* February 2007.
60. Heiss, J. "Open Possibilities at the First CommunityOne Conference." *JavaOne,* 7 May 2007 <http://java.sun.com/javaone/sf/2007/articles/comm1_post.jsp>.
61. "Metcalf's Law." <http://www-ec.njit.edu/~robertso/infosci/metcalf.html>.

contribute to the value of the network.[62] Most users do not think about sharing capabilities, let alone care to alter their preferences. If companies do not enable sharing automatically, few users will take the time to share their data. *Providing the option to disable sharing is an important privacy feature.*

Network effects also make it difficult (though not impossible) to break into markets already claimed by successful companies. User content often loses value when moved into a new network. For example, a photo's tags (created by the community) on Flickr are lost if the photo is taken to a different site. Competitors must then find a unique way of convincing users that it's worth the switch.

Friendster

Friendster was an early leader in social networking. Within a year of Friendster's founding in 2002, Google offered to buy the site (Friendster rejected the offer). Created as a dating site, Friendster experienced a boom in popularity that quickly overwhelmed its servers. Friendster's popularity declined as new sites like MySpace emerged.[63] Though Friendster has not been able to keep pace with competing social networking sites, it still claims over 45 million members worldwide. It was granted a patent in 2006 on a key part of social networking, specifically how networks of friends are developed (i.e., identifying mutual friends and degrees of separation).[64]

MySpace

MySpace is the most popular social networking site. Hitwise reported it as the top website in May 2007 based on market share (beating Google by 1.5%).[65] Self-defined as "an online community that lets you meet your friends' friends," MySpace allows you to build a network of friends and identify mutual friends. Each user's page can contain general info, pictures, blog entries, a message board and more. Customization options, such as changing the background or adding music, give users an easy way to create their own unique web page. The site also features a private messaging system and special sections for film, music, videos, classifieds, etc.

MySpace plays an important role in the music scene, and even companies and politicians are creating accounts. MySpace reaches a younger audience than most conventional media outlets. Some political candidates have used MySpace to reach out to young voters and find new volunteers. Though candidates risk embarrassing connections (to inappropriate accounts) on these sites, they have often found the benefits to be worth it.[66] Businesses can also create profiles, which then become a form of free advertising. News Corp, which acquired MySpace in 2005 for $580 million, recognizes its benefits for local busi-

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62. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
63. Rivlin, G. "Wallflower at the Web Party." *New York Times*, 15 October 2006 <http://www.nytimes.com/2006/10/15/business/yourmoney/15friend.html>.
64. Kirkpatrick, M. "Friendster Awarded Patent on Social Networking." *TechCrunch*, 7 July 2006 <http://www.techcrunch.com/2006/07/07/friendster-awarded-patent-on-social-networking/>.
65. "Top 20 Websites." *Hitwise*, May 2007. <http://hitwise.com/datacenter/rankings.php>.
66. Jesdanun, A. "Candidates Seek Youths at MySpace." *ABC News*, 17 August 2006 <http://abcnews.go.com/Technology/wireStory?id=2325325&page=1>.

nesses that want to gain exposure.[67] Though many consider social networking sites to be more popular with teenagers and young adults, the largest user group on MySpace (and other large social networking sites) consists of 35–54 year olds.[68]

Facebook

Hitwise named Facebook the "preferred network among college students. Because Facebook was closed to non-students, students felt safer than on MySpace, and Facebook became nearly a social necessity for students seeking to connect with peers."[69] In July 2007, Facebook held an 85% market share of four-year U.S. universities and had over 31 million users.[70] Though Facebook has since allowed users without an `.edu` e-mail address to join, this elitism and idea of increased privacy drew a large enough crowd to compete with MySpace. A user can set privacy levels for networks or even individuals, but Facebook users (as well as users of other social networking sites) are warned about possible repercussions from information they post.

> *"Remember, unless you're prepared to attach something in your profile to a resume or scholarship application, don't post it."*
>
> —Facebook[71]

The site has added many features over the past few years, including photo albums where you can tag your friends in pictures, recently updated profiles lists, events, groups, a marketplace for classified ads, and user status updates. In May 2007, the site introduced third-party applications that can be integrated directly into Facebook. Not all feature implementations have gone smoothly, though. In Fall 2006, Facebook experienced resistance from users concerned over privacy issues when it added a "News Feed" feature, which lists updates of friends' Facebook activities in real time.[72] Facebook increased privacy options in response, quieting most complaints.

LinkedIn

In June 2007, LinkedIn claimed a membership of "11 million experienced professionals." The business-oriented social networking site allows users to stay in touch with professional contacts, network with new contacts, check references, and find a job or a potential employee. Its low-key design and feature implementations keep the site unobtrusive.[73] Because of its older, more mature audience, privacy concerns are more prevalent—some users worry that their professional contacts will be abused by other users or even their employers

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67. "Businesses Find MySpace is a Place to Reach Youth." *Trend Watching*, 11 July 2006 <http://www.trendwatching.com/about/inmedia/articles/youniversal_branding/businesses_find_myspace_is_a_p.html>.
68. Arrington, M. "Bear Stearns: Yahoo Must Form A Social Networking Strategy." *TechCrunch*, 3 August 2007 <http://www.techcrunch.com/2007/08/03/bear-stearns-yahoo-must-form-a-social-networking-strategy>.
69. Prescott, L. "Hitwise US Consumer Generated Media Report." *Hitwise*, February 2007.
70. "Facebook Statistics." *Facebook*, 17 July 2007 <http://static.ak.facebook.com/press/facebook_statist ics.pdf?11:44617>.
71. "Customer Support." *Facebook* <http://www.facebook.com/help.php?tab=safety>.
72. Schmidt, T. S. "Inside the Backlash Against Facebook." *TIME*, 6 September 2006 <http://www.time.com/time/nation/article/0,8599,1532225,00.html>.
73. Copeland, M. "The Missing Link." *CNNMoney.com*, 28 February 2007 <http://money.cnn.com/magazines/business2/business2_archive/2006/12/01/8394967/index.htm>.

for marketing reasons.[74] However, the site has gained popularity as a convenient way of networking. Members can find other professionals through their mutual acquaintances and get introductions.

LinkedIn monetizes the site through advertising, premium accounts for power users (mostly recruiters), and groups for companies and organizations. Because of the growing size of its network, LinkedIn maintains a strong hold on the professional market.[75]

Xing

Xing is a professional networking site based out of Germany. Xing is most popular in Europe and offers its services across many countries, industries, and languages—an important factor, given today's globalization of organizations. With its discovery capability and management tools, Xing helps members find professionals, search for job opportunities and locate other business prospects. In April 2007, Xing reached 2 million users.[76] Xing has also been acquiring other social networks in an attempt to increase its global reach.

Second Life

Second Life, developed by Linden Labs, is a 3D virtual world with millions of inhabitants. Users create avatars, digital representations of themselves that they can use to meet other users with similar interests, conduct business, participate in group activities, take classes and more. Some users have created profitable businesses or continued their real-life professions in the virtual world. For example, lawyers have used Second Life to meet new clients (often software developers wanting to discuss patent laws).[77] Many large corporations, such as IBM and Hewlett-Packard, have created Second Life presences to connect with customers, hold meetings and even recruit and interview new hires.[78, 79]

Users can create objects and add scripts (to animate the objects) in the virtual world. Because Second Life allows users to maintain rights to whatever they create, a dynamic marketplace has emerged that does millions of dollars in transactions monthly—the site has its own exchange, the LindeX.[80] Not only does this create monetization opportunities for users (one woman claims to have earned over $1 million in Second Life assets[81]), but Second Life earns revenue from premium accounts, purchases of virtual land and more.

Gaia Online

Gaia Online is a popular teen virtual world. This online community allows teens to play games, make friends and express their creativity. Similar to Second Life, Gaia has its own marketplace where members can earn Gaia Gold for various actions they perform on the

74. "The CEO's Guide to Social Networks." *BusinessWeek*, 11 September 2006 <http://businessweek.com/mediacenter/qt/podcasts/guide_to_tech/guidetotech_09_11_06.mp3>.
75. Copeland, M. "The Missing Link." *CNNMoney.com*, 28 February 2007 <http://money.cnn.com/magazines/business2/business2_archive/2006/12/01/8394967/index.htm>.
76. "Xing Reaches 2 Million Users." Mashable, <http://mashable.com/2007/04/16/xing/>.
77. "Second Life Lawyer." *Business 2.0*, May 2007, p.86.
78. Athavely, A. "A Job Interview You Don't Have to Show Up For." *The Wall Street Journal Online*, 20 June 2007 <http://online.wsj.com/article/SB118229876637841321.html>.
79. Bulkeley, W. "Playing Well With Others." *The Wall Street Journal Online*, 18 June 2007 <http://online.wsj.com/article/SB118194536298737221.html>.
80. "What is Second Life." <http://secondlife.com/whatis>.
81. Lawson, S. "Second Life Creates a Millionaire." *IDG News*, 30 November 2006 <http://www.itworld.com/App/4201/061130secondlife/>.

site (e.g., playing games or posting), and use their earnings at the virtual stores or for creating their own shops. Nearly 300,000 members login daily and about 2 million unique visitors login to Gaia every month.[82]

Mobile Social Networking

Many social networking sites have found innovative ways of connecting people through the Internet and their mobile devices (such as cell phones and PDAs). Mobile users can send instant messages, check e-mail, and post content to the web from Internet-enabled mobile devices. The new Apple iPhone further realizes the dream of having the Internet in your pocket by allowing the full Internet (not a simplified mobile one) to be accessed wherever wireless Internet access is available.

Google's Dodgeball.com provides users with mobile access to a network of friends in many cities. GPS chips in mobile devices allow Dodgeball users to update their location and be notified of nearby friends or "crushes." Dodgeball also provides an easy way of sending messages to groups of friends to plan get-togethers. (See Section 3.14, Location-Based Services.)

Other sites such as Twitter provide similar services, accessible by text message, IM or a web client. Twitter users can message groups of friends at once and automatically receive their friends' updates on a cell phone or through a chat window. The site is considered to be a microblogging service (since users are limited to a small number of characters for each update). Twitter offers a web services API, which allows developers to integrate Twitter into other applications. (See Section 3.13, Web Services, Mashups, Widgets and Gadgets, for more information on web services APIs.)

3.8 Social Media

Social media refers to any media shared online (e.g., videos, music, photos, news, etc.). Hitwise reported that "increased broadband penetration, combined with the rise of consumer generated content and the proliferation of webcams and cell phone and home video cameras have firmly entrenched online video viewing into the habits of entertainment seekers in the United States."[83]

YouTube

YouTube, launched in late 2005, is the leading Internet video site. In true Web 2.0 fashion, the entire site is based on user-generated content. Users upload videos, and rate and comment on videos posted by other users. YouTube's Quick Capture Flash software makes it easy to upload content directly from a webcam. Users can browse videos by category, tag, or by following "related video" links. Highly rated videos are featured on YouTube's homepage. While many professionals and film students post content on the site, the most popular submissions are often simple spoofs or home videos. Because of the viral network effects of YouTube, these amateur videos can quickly gain worldwide attention.

Users can subscribe to other users' content, share videos with friends by e-mail, or embed videos directly into their blogs or other websites. YouTube addresses privacy and

82. "About Us." *Gaia Online*, <http://www.gaiaonline.com/info/about.php?>.
83. Prescott, L. "Hitwise US Consumer Generated Media Report." *Hitwise*, February 2007.

spam concerns by allowing users to set videos as "public" or "private" and flag inappropriate material for review by YouTube's staff.

Less than a year after its official launch, YouTube was acquired by Google (which had its own less popular Google Video site) for $1.65 billion. Less than six months after the acquisition, Viacom sued YouTube for $1 billion for copyright infringement.[84] The Digital Millennium Copyright Act of 1998 protects companies from prosecution due to user actions if they work in "good faith" to remove offending content.[85] However, interpretations of this act vary, and it has become a point of contention for many companies. YouTube is developing a mechanism that automatically detects copyrighted material. Currently, illegal content is removed from the site manually.

Internet TV

Many mass-media companies now offer full-length episodes of popular television shows on their websites to tap into the increasingly popular Internet television market. The average American watches 4.5 hours of television a day, not including Internet television.[86] Sites, such as Joost, Veoh and MobiTV, have emerged as a new way of watching television. Joost, for example, uses semantic technologies to help users find programs that interest them. (See Section 3.18, Future of the Web.)

Limited by copyright issues, Internet TV sites must make deals with mainstream networks to offer their content online. Viacom made a deal with Joost, allowing the site to include some shows from networks such as MTV, VH1 and Comedy Central.[87] As users take back the power to choose what they watch and when, networks may find themselves making more deals with Internet TV companies. As technologies continue to improve, Internet TV has the potential to radically change the television industry. Already, smaller content creators are able to gain access to worldwide audiences. In late June 2007, MySpace joined the market with its MySpaceTV. With MySpace's enormous membership, it could rapidly become a direct competitor to YouTube and Internet TV websites.

Internet TV allows advertisers to target their markets more precisely than with broadcast television. Advertisers can use demographic information, such as location, gender and age, to serve appropriate ads.

Digg

Digg features news, videos and podcasts, all posted and rated by users. It has gained popularity by allowing users to "digg" or "bury" posts and user comments. Valuable sites, marked by large numbers of diggs, are moved to the Digg front page where other users can easily find them. Formulas were adjusted to make sure the "wisdom of crowds" was not being hijacked by users trying to promote their own posts.[88] Sites that are "dugg" and fea-

84. Mills, E. "Copyright Quagmire for Google and YouTube." *ZDNet*, 14 March 2007 <http://news.zdnet.com/2100-9588_22-6167281.html>.
85. "Conference Report Filed in House." *Library of Congress*, 8 October 1998 <http://thomas.loc.gov/cgi-bin/bdquery/z?d105:HR02281:@@@D&summ2=m&>.
86. Colvin, G. "TV Is Dying? Long Live TV!" *FORTUNE*, 5 February 2007, p.43.
87. O'Hear, S. "Viacom to Partner with Joost." *ZDNet*, 20 February 2007 <http://blogs.zdnet.com/social/?p=96>.
88. Maney, K. "Techies Hot on Concept of 'Wisdom of Crowds,' But It Has Some Pitfalls." *USA Today*, 12 September 2006 <http://www.usatoday.com/tech/columnist/kevinmaney/2006-09-12-wisdom-of-crowds_x.htm>.

tured on the homepage typically experience a traffic surge. Bloggers can add Digg buttons to their sites, making it easy for readers to "digg" their posts.

Digg uses collaborative filtering to help reduce spam by "burying" it (users can vote against posts they don't like). Users can also set the threshold of diggs to automatically filter out content with low ratings. The site was criticized for removing popular posts of HD DVD security cracks (on the advice of lawyers); however, Kevin Rose (Digg's founder) decided to support the crowds and "deal with whatever the consequences might be."[89] Digg has additional social networking capabilities; users can view their friends' Digg activities and the Diggs of other users with similar interests. Some Digg-like sites include Netscape, Reddit and Newsvine.

Last.fm

Last.fm is an Internet radio website that uses Web 2.0 concepts to make music recommendations and build communities. The site provides open source desktop software that can be integrated into most popular music players. Its scrobbling feature tracks the music users listen to so that Last.fm can provide users with personalized recommendations. A streamable radio with "discovery mode" and a network of like-minded listeners help users find new music. Groups and an events section add social value. The site also offers tagging and wiki pages for artists and record labels.

Digital Rights Management (DRM)

Digital Rights Management (DRM) systems add software to media files to prevent them from being misused, but these systems restrict compatibility with many media players. Companies want to protect their digital products from illegal distribution; however, users want unrestricted access to media they've purchased.

iTunes, Apple's music store, has been criticized for restricting users' access to their own music by allowing only up to five computers to be authorized to play any given file. However, Apple's Steve Jobs advocated a DRM-free music world in February 2007, arguing the greater risk for piracy is in DRM-free CDs, which make up the majority of music sales.[90] CDs remain DRM-free because many CD players are not compatible with DRM systems. In June 2007, Amazon offered DRM-free downloads from more than 12,000 record labels, and both iTunes and Amazon sell DRM-free music from EMI (one of the four major record companies).[91]

Podcasting

Podcasting was popularized by Apple's iPod portable media player. A podcast is a digital audio file (e.g., an .mp3) that often takes on the characteristics of a radio talk show (though without live callers).[92] Much as blogging has made journalism accessible to everyone, pod-

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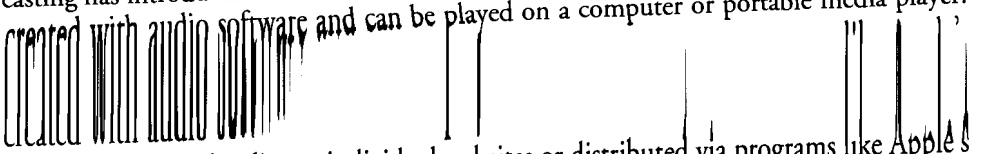
89. Hefflinger, M. "Digg Users Revolt Over Deleted Posts of HD DVD Security Hack." *digitalmediawire*, 2 May 2007 <http://www.dmwmedia.com/news/2007/05/02/digg-users-revolt-over-deleted-posts-of-hd-dvd-security-hack>.
90. Jobs, S. "Thoughts on Music." 6 February 2007 <http://www.apple.com/hotnews/thoughtsonmusic/>.
91. "Amazon.com to Launch DRM-Free MP3 Music Download Store with Songs and Albums from EMI Music and More Than 12,000 Other Labels." 16 May 2007 <http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=irol-newsArticle&ID=1003003>.
92. Torrone, P. "What Is Podcasting?" *O'Reilly Media*, 20 July 2005 <http://digitalmedia.oreilly.com/2005/07/20/WhatIsPodcasting.html>.

casting has introduced a more democratic form of radio broadcasting. Podcasts are easily created with audio software and can be played on a computer or portable media player.



The files are posted online at individual websites or distributed via programs like Apple's iTunes. Listeners can often subscribe to podcasts via RSS feeds. Forrester Research predicted 12 million households will be regularly subscribing to podcasts by 2010.[93]

3.9 Tagging

History of Tagging

Tagging, or labeling content, is part of the collaborative nature of Web 2.0. A tag is any user-generated word or phrase that helps organize web content and label it in a more human way. Though standard sets of labels allow users to mark content in a general way, tagging items with self-chosen labels creates a stronger identification of the content. In an interview by the Pew Internet & American Life Project, David Weinberger (author of *Everything is Miscellaneous*) said:

> *"Maybe the most interesting thing about tagging is that we now have millions and millions of people who are saying, in public, what they think pages and images are about."*
>
> —David Weinberger

As part of the same December 2006 report, 28% of Internet users had reportedly "tagged" content online.[94]

Tag Clouds

Tag Clouds are visual displays of tags weighted by popularity. Many Web 2.0 sites include a graphical representation of popular tags (the popularity of the tag marked by the size of its text). There are many ways of forming tag clouds—terms often appear in alphabetical order. However, tag clouds show only how the majority (or the crowd) thinks and disregard many individual unique points of view.[95] Figure 3.3 is an example of a "text cloud" that we created manually from the major terms in this chapter. (To build your own text cloud try ArtViper's TextTagCloud tool at `http://www.artviper.net/texttagcloud/`.)

Folksonomies

Folksonomies are classifications based on tags. The term is generally attributed to Thomas Vander Wal, who combined the words "taxonomy" and "folk" to create a new term for this Internet phenomenon.[96] Folksonomies are formed on sites such as Flickr, Technorati and del.icio.us. Users can search content by tags, which identify content in different (and sometimes more meaningful) ways than traditional keywords used by search engines.

An example of Web 2.0's reach outside of traditional technology fields can be seen in the steve.museum project, an experiment in tagging and folksonomies regarding museum

93. D'Agostino, D. "Security in the World of Web 2.0." *Innovations*, Winter 2006, p.15.
94. Rainie, L. "Tagging." *Pew Internet & American Life Project*, 31 January 2007. <http://www.pewinternet.org/pdfs/PIP_Tagging.pdf>.
95. Rainie, L. "Tagging." *Pew Internet & American Life Project*, 31 January 2007. <http://www.pewinternet.org/pdfs/PIP_Tagging.pdf>.
96. Vander Wal, T. "Folksonomy Coinage and Definition." *Vanderwal.net*, 2 February 2007 <http://www.vanderwal.net/folksonomy.html>.

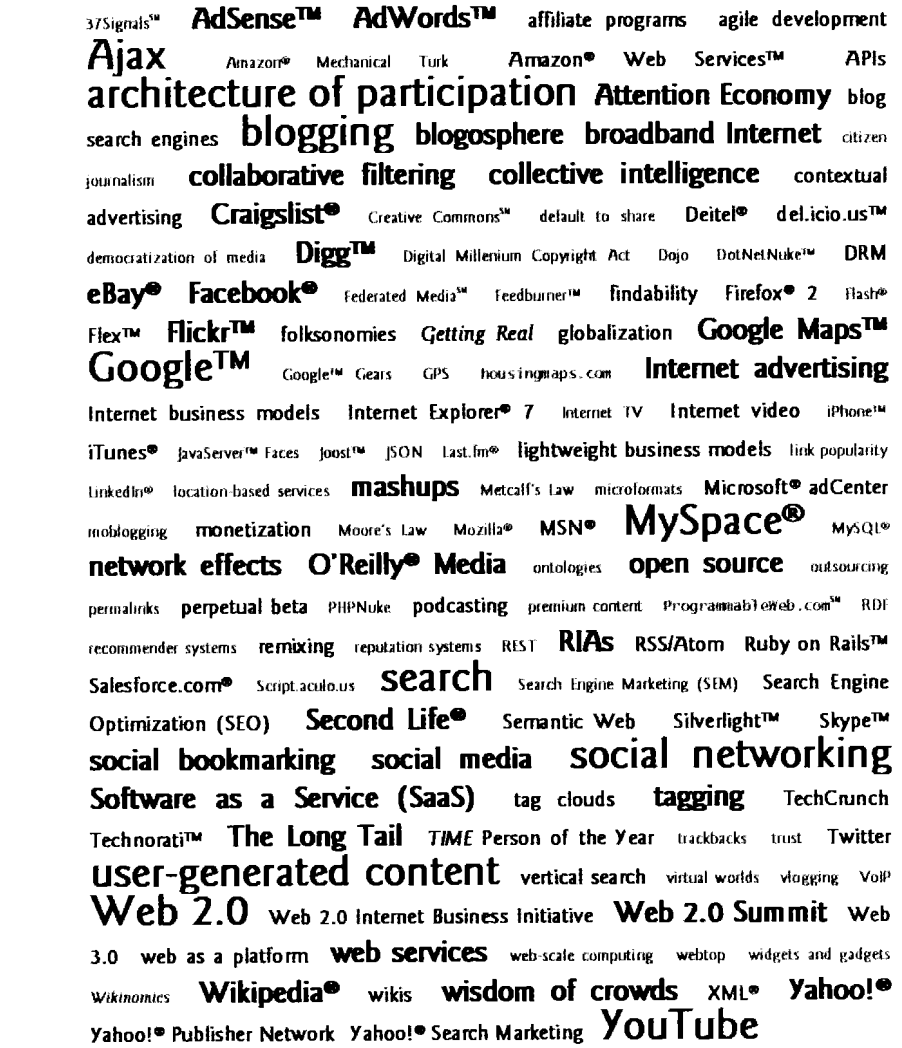


Fig. 3.3 | Text cloud of major Web 2.0 terms from this chapter.

collections. In 2005, The Metropolitan Museum of Art and the Guggenheim Museum organized a retreat to plan the project.[97] In 2007 they posted various collections of art online and asked the community for help tagging them.

Flickr

Flickr—a popular photo-sharing site—was launched in February 2004 and acquired by Yahoo! in 2005. The Flickr development team was originally working on "The Game

97. Chun, S., R. Cherry, D. Hiwiller, J. Trant and B. Wyman. "Steve.museum: An Ongoing Experiment in Social Tagging, Folksonomy, and Museums." *Archives & Museum Informatics*, 1 March 2006 <http://www.archimuse.com/mw2006/papers/wyman/wyman.html>.

Neverending"—a multiplayer Flash game based on IM (instant message) and chat interfaces.[98] However, the team listened to its users and developed real-time photo sharing (Flickr Live) and more traditional web pages where users could view uploaded pictures. The Game Neverending and Flickr Live were later retired as the popularity of photo sharing and commenting on the web pages grew.[99]

Flickr is a key content-tagging site. Intended as a way of organizing personal photo collections, tagging on the site gained popularity as the community became interested in "a global view of the tagscape" (how other people are tagging photos).[100] Users can search for photos by meaningful tags. The tags also encourage loyalty to the site, since the tags are lost if photos are moved to another site.

Technorati

Technorati, a social media search engine, uses tags to find relevant blogs and other forms of social media. To become searchable by Technorati, bloggers can add tags to their posts with a simple line of HTML or use the automated category system offered by some blogging software packages.[101] Technorati tag searches return results from the blogosphere, YouTube videos and Flickr photos. Technorati features a tag cloud on its homepage and a "where's the fire" section to promote the most popular tags and search results.

3.10 Social Bookmarking

Social bookmarking sites let you share your Internet bookmarks (e.g., your favorite websites, blogs, and articles) through a website. Users can access these bookmarks from any computer and discover new sites by searching popular bookmarks and tags. Some of the most popular social bookmarking sites are del.icio.us, Ma.gnolia, Blue Dot, StumbleUpon, Simpy and Furl.

del.icio.us

del.icio.us, a self-described "collection of favorites," reported its two-millionth user registration in March 2007.[102] Users can add a bookmark by going to the site or by using the del.icio.us downloadable browser buttons. Some sites post clickable badges—a button provided by del.icio.us to "save this page"—that make it easy for users to bookmark the site using del.icio.us.

del.icio.us is a great example of a Web 2.0 company that uses tagging, social networking and user-generated content. When bookmarking a website, users can add notes and tags to describe the site. These tags are searchable and help organize sites, making it easier for users to find the content they want based on what other users have recommended (by bookmarking). Users can also add descriptions to tags, which can help clear up what

98. Schonfeld, E. "The Flickrization of Yahoo!" *CNN Money.com*, 1 December 2005 <http://money.cnn.com/magazines/business2/business2_archive/2005/12/01/8364623/>.
99. Garrett, J.J. "An Interview with Flickr's Eric Costello." *Adaptive Path*, 4 August 2005 <http://www.adaptivepath.com/publications/essays/archives/000519.php>.
100. Garrett, J.J. "An Interview with Flickr's Eric Costello." *Adaptive Path*, 4 August 2005 <http://www.adaptivepath.com/publications/essays/archives/000519.php>.
101. "Using Technorati Tags." *Technorati* <http://support.technorati.com/support/siteguide/tags>.
102. "That was Fast." del.icio.us blog, 29 March 2007 <http://blog.del.icio.us/blog/2007/03/that_was_fast.html>.

a certain tag might mean to different people. Thus, searching for content on del.icio.us is based on collaborative filtering rather than search engine algorithms. The site also offers a fully searchable podcasting section.

Third parties can use the del.icio.us web services API to build tools and incorporate social bookmarking functionality into their applications (see Section 3.13, Web Services, Mashups, Widgets and Gadgets). For example, Adobe Illustrator uses the del.icio.us technology to organize bookmarks in the program's documentation.[103]

Ma.gnolia

> *"If searching was the first day of the web, people helping each other find what they want must be the second."*
>
> —Ma.gnolia[104]

Ma.gnolia is another social bookmarking site offering tagging and convenient bookmark accessibility through the site. Bookmarked pages are saved (when possible) so users need not worry about losing content if a page goes offline. The site also provides browser buttons (bookmarklets) for posting sites to Ma.gnolia, and a "roots" feature, which lets you see what other users have said about a site while surfing the Internet. Ma.gnolia encourages social networking through user groups and a private messaging feature. To deal with spam, Ma.gnolia trusts handpicked moderators, called "gardeners."[105]

3.11 Software Development

A key to Web 2.0 software development is to KIS (keep it simple; keep it small). At the 2006 Emerging Technology Conference, Rael Dornfest (now CEO of the company "values of n" and former O'Reilly CTO) explained, "great businesses will be built on giving you less."[106] This is particularly important given the "attention economy" (too much information, too little time)—the theme of the 2006 conference.

The Webtop

The web has now become an application, development, delivery, and execution platform. The **webtop**, or web desktop, allows you to run web applications in a desktop-like environment in a web browser. Using the web as a platform is part of a movement toward operating-system–independent applications. The removal of OS barriers allows the potential audience for any single product to become larger. An example of a popular webtop is the Laszlo Webtop (built on the OpenLaszlo framework), which runs applications written in OpenLaszlo as well as those written in other frameworks using XML requests.[107] Exam-

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103. "Know How Adobe and del.icio.us Work Together?" del.icio.us blog, 30 May 2007 <http://blog.del.icio.us/blog/2007/05/knowhow_adobe_a.html>.
104. "About Ma.gnolia." <http://ma.gnolia.com/about>.
105. "Gardeners." Ma.gnolia Community Wiki, 29 March 2007 <http://wiki.ma.gnolia.com/Gardeners>.
106. Farber, D. "ETech: Attenuation, Web 2.0 and spimes." *ZDNet*, 7 March 2006 <http://blogs.zdnet.com/BTL/?p=2667>.
107. "The RIA Desktop in a Browser." *LaszloSystems* <http://www.laszlosystems.com/software/webtop>.

ples of Laszlo Webtop applications can be seen at http://www.laszlosystems.com/showcase/samples. Other webtops include eyeOS and StartForce.

Software as a Service (SaaS)

Software as a Service (SaaS), application software that runs on a web server rather than being installed on the client computer, has gained popularity, particularly with businesses. It provides many benefits, including fewer demands on internal IT departments, increased accessibility for out-of-the-office use, and an easy way to maintain software on a large scale.[108] Instead of being installed on the local machine, software is installed on the provider's web server and accessed by customers "as a service" over the Internet. Updates applied on the server impact every computer. This change from local to server machine makes it easier for large corporations to keep software updates uniform throughout the organization. Most Google software is offered as SaaS. Microsoft now offers SaaS products, Windows Live and Office Live.

Collaborating on projects with co-workers across the world is easier, since information is stored on a web server instead of on a single desktop. 37Signals has developed several SaaS products, including Basecamp (a product management and collaboration tool), Campfire (a group chat tool), Backpack (a personal organization tool), Ta-da (a "to-do" list tool), Highrise (a customer relations tool), and Writeboard (a collaborative word-processing tool). Salesforce.com, which specializes in Customer Relationship Management (CRM) software, is a key SaaS company—they provide popular business applications for sales, marketing, customer support, analytics and more.

Perpetual Beta and Agile Development

Due to the increased use of web applications there has been a shift away from the traditional software release cycle. Historically, companies would spend months or even years developing major new software releases. Because releases came so infrequently, each one had to go through extensive testing and beta periods to create a "final" release each time. There is now a greater focus on agile software development, which refers to development of fewer features at a time with more frequent releases. This "perpetual beta" of frequent smaller releases is made possible by using the web as a platform.[109] A new CD cannot be distributed to all customers every day; however, updates to web servers delivering the application can be easily made.

37Signals' *Getting Real*, an e-book that discusses agile techniques for building web applications, warns against the temptation to overuse "betas." The Internet is a dynamic medium—there will always be flaws and possible upgrades. Companies must decide how long it's really necessary to remain in a beta period, before it becomes just an excuse for a weak application. *Getting Real*, comprised of 91 short essays and numerous quotes and anecdotes, is a must read, providing an informative, insightful and entertaining walk through the software development process. The e-book can be read for free on their site or downloaded as a PDF for a fee.[110]

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108. Peiris, M. "The Pros and Cons of Hosted Software." *SmartBiz*, March 2006 <http://www.smartbiz.com/article/articleview/1118/1/42>.
109. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
110. 37Signals. *Getting Real.* 2006 <http://gettingreal.37signals.com>.

Open Source

The open source movement continues to gain momentum. The idea behind it is not new (it was popularized in 1998 with O'Reilly's Freeware Open Source Summit, now known as OSCON).[111] Historically, programs had been distributed by sharing the source code, before selling compiled programs became the norm. Though open source software is not always free, the source code is available (under license) to developers, who can customize it to meet their unique needs.

> *"Business-technology managers know all too well the adage about open source: It's free, as in a free puppy. The work and expense start once you get it home."*
>
> —Larry Greenemeier, *InformationWeek*[112]

Using open source projects, such as the popular Linux operating systems Red Hat or Ubuntu, may require more work and technical knowledge than using the Microsoft Windows or Apple Macintosh operating systems. However, advanced users are able to customize the software to fit their needs. Benefits to using an open source program include the possibility of reduced cost (if you have the skills to work with it) and the worldwide support networks where users help each other. Because the source code is available to everyone, users can look to the community for bug fixes and plug-ins (program extensions that add functionality), instead of waiting for the software vendor to address each issue. The Ubuntu forums, for example, contain a wealth of information created by users helping other users. In addition to the free support that springs up around open source projects, businesses have been built from developing project extensions and consulting. IBM invested $1 billion in Linux in 2001.

> *"Linux can do for business applications what the Internet did for networking and communications."*
>
> —Louis Gerstner, former CEO of IBM[113]

At `http://www.SourceForge.net` over 150,000 open source projects are under development. Other sites with open source downloads include freshmeat.net and Tucows. The popular Firefox web browser from the Mozilla Foundation, the Apache web server from the Apache Software Foundation, and the MySQL database system are all open source. DotNetNuke and PHPNuke offer open source frameworks for developing rich Internet portals, making it easy and economical to develop sophisticated websites. (`http://www.deitel.com` is a DotNetNuke site.)

Licensing: GNU Licenses and Creative Commons

Open source project licenses vary—many projects use the GNU General Public License (GPL), which allows redistribution of the project provided the source code is included and the copyright information is left intact. The Free Software Foundation provides other versions as well, including the GNU Lesser General Public License and the GNU Free Doc-

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111. Van Rossum, G. "Open Source Summit Trip Report." *Linux Gazette*, 10 April 1998 <`http://linuxgazette.net/issue28/rossum.html`>.
112. Greenemeier, L. "Open-Source Exuberance." *InformationWeek*, 11 July 2005 <`http://www.informationweek.com/story/showArticle.jhtml?articleID=165700923`>.
113. Wilcox, J. "IBM to Spend $1 Billion on Linux in 2001." *CNET*, 12 December 2000 <`http://news.com.com/IBM+to+spend+1+billion+on+Linux+in+2001/2100-1001_3-249750.html`>.

umentation License. The Open Source Initiative also lists over 50 licenses available to open source software developers, including the BSD license and the MIT license.[114]

Creative Commons (`creativecommons.org`) deals with licensing issues for all types of digital media. The organization offers a variety of options to support **remixing** (extending existing content), commercial issues and attribution. By allowing users access to general licenses through Creative Commons or the Free Software Foundation, developers can worry less about the complicated issues of licensing and instead focus on developing.

3.12 Rich Internet Applications (RIAs)

Rich Internet Applications (RIAs) are web applications that offer the responsiveness, "rich" features and functionality approaching that of desktop applications. Early Internet applications supported only a basic HTML **graphical user interface (GUI)**. Though they could serve simple functions, these applications did not have the look or feel of a desktop application. The relatively slow Internet connections these applications relied on led to the term "World Wide Wait." RIAs are a result of today's more advanced technologies that allow greater responsiveness and advanced GUIs.

Ajax

The term **Ajax (Asynchronous JavaScript and XML)** was coined by Adaptive Path's Jesse James Garrett in February 2005. Ajax (see Chapter 15, Ajax-Enabled Rich Internet Applications) allows partial page updates—meaning updates of individual pieces of a web page without having to reload the entire page. This creates a more responsive GUI, allowing users to continue interacting with the page as the server processes requests.

The technologies that make up Ajax—XHTML, CSS, JavaScript, the DOM, XML, and the `XMLHttpRequest` object—are not new. In fact, in the 1990s, Netscape used asynchronous page updates in LiveScript, which evolved into JavaScript. However, the popularity of Ajax has dramatically increased since its naming. Ajax performs a vital role in Web 2.0, particularly in building webtop applications and enhancing the user's overall experience. The following toolkits and **frameworks** (environments with standard components that make development faster and easier) provide libraries and tools for convenient Ajax-enabled application development.

Dojo

Dojo is an open source JavaScript toolkit—it is a library, not a framework. Dojo development began in late 2004.[115] Dojo helps standardize JavaScript by providing a variety of packages for cross-browser compatibility, rich GUI controls, event handling and more. (See the Dojo section in Chapter 15.)

Flex

Adobe **Flex** (see Chapter 18) is an RIA framework that allows you to build scalable, cross-platform, multimedia-rich applications that can be delivered over the Internet. It uses the Flash Player 9 runtime environment, which is installed on over 97% of computers, allow-

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114. Tiemann, M. "Licenses by Name." *Open Source Initiative*, 18 September 2006 <`http://www.opensource.org/licenses/alphabetical`>.

115. "History." *The Dojo Toolkit*, 10 April 2007 <`http://dojotoolkit.org/book/dojo-book-0-9/introduction/history`>.

ing for almost universal compatibility.[116] Flash Player 9 is backed by ActionScript 3, Adobe's object-oriented scripting language—this uses an asynchronous programming model, which allows for partial page updates similar to Ajax. Flash CS3 (the development tool for creating Flash movies) is discussed in Chapters 16–17.

Silverlight

Microsoft's **Silverlight** (see Chapter 19), formerly known as Windows Presentation Foundation Everywhere (WPF/E) and released in May 2007, is Microsoft's new competitor to Flex and Flash. Silverlight 1.1 uses a compact version of the .NET framework. Silverlight applications have user interfaces built in Extensible Application Markup Language (XAML)—Microsoft's XML-based format for describing user interfaces. The new framework allows quick and easy development of RIAs and is designed to run on major browsers and operating systems.[117] **Moonlight**, an open source version of Silverlight for Linux operating systems, is being developed.

JavaFX

JavaFX is Sun Microsystems' counterpart to Flex and Silverlight, also designed for building Rich Internet Applications. It consists of the JavaFX Script and JavaFX Mobile (for mobile devices). The JavaFX Script, which takes advantage of the fact Java is installed on most computers, will be available under open source licences (see `https://openjfx.dev.java.net/`).[118]

Ruby on Rails

Ruby on Rails (see Chapter 24), developed by 37Signals' David Heinemeier Hansson, is an open source framework based on the Ruby scripting language that allows you to build database-intensive applications quickly, easily, and with less code. Ruby on Rails was designed to build 37Signals' Basecamp (a project management and collaboration tool) and other SaaS products.

Script.aculo.us

The **Script.aculo.us** library for creating "eye candy" effects is built on the Prototype JavaScript framework. Prototype encapsulates the DOM (Document Object Model, Chapter 12) and provides cross-browser processing capabilities.[119] Script.aculo.us uses this framework and adds capabilities for rich user interfaces. Its core effects include opacity, scale, morph, move, highlight and parallel (for combining multiple effects).[120] Script.aculo.us is used on many popular websites and is incorporated into other frameworks (such as Ruby on Rails). We discuss Script.aculo.us and present examples in Chapter 24, Ruby on Rails.

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116. "Adobe Flex 2." *Adobe* <http://www.adobe.com/products/flex/whitepapers/pdfs/flex2wp_technicaloverview.pdf>.
117. Cubrilovic, N. "Silverlight: The Web Just Got Richer." *TechCrunch*, 30 April 2007 <http://www.techcrunch.com/2007/04/30/silverlight-the-web-just-got-richer>.
118. "Sun Radically Simplifies Content Authoring—Previews JavaFX Script." *Sun Microsystems*, 8 May 2007 <http://www.sun.com/aboutsun/pr/2007-05/sunflash.20070508.2.xml>.
119. "Prototype Tips and Tutorials." *Prototype JavaScript* <http://prototypejs.org/learn>.
120. "Core Effects." *Script.aculo.us Wiki* <http://wiki.script.aculo.us/scriptaculous/show/CoreEffects>.

JavaServer Faces
JavaServer Faces (JSF) is a Java-based web application framework. JSF separates design elements from business logic and provides a set of user-interface components (JSF components) that make developing RIAs simple. One of the Java BluePrints projects provides additional resources and libraries for building Ajax-enabled applications. We build RIAs with JSF in Chapters 26–27.

ASP.NET Ajax
ASP.NET Ajax (Chapter 25) is an extension of the .NET framework for creating Ajax-enabled applications. It includes an open source Ajax Control Toolkit for implementing asynchronous functionality. ASP.NET Ajax is easily used in Microsoft Visual Web Developer or Microsoft Visual Studio to quickly create Rich Internet Applications.

Adobe Integrated Runtime and Google Gears
Though web application use has been increasing, many feel these programs cannot truly compete with desktop applications until the "Offline Problem" (not being able to access web applications and data when not connected to the Internet) has been solved.[121] Businesses can lose valuable time and money when Internet issues occur such as a slow or broken Internet connection.

Adobe released its Adobe Integrated Runtime (AIR; previously called Apollo) in beta form in June 2007. AIR allows users to run Flex web applications on their desktops even when they are *not* connected to the Internet, thus allowing users to remain efficient when they are unable to access the Internet or when an SaaS application server goes down. Users can continue their work and synchronize it with the servers again later.

Google Gears, also in beta, is a similar product, allowing use of web applications while offline. Google Gears was created out of a Google engineer's 20% project, inspired by wanting to use Google Reader on a bus with "flaky" Internet access.[122] (Google engineers devote 20% of their time to projects other than their usual work and 10% of their time to projects that are "truly new.")[123] Dojo Offline (using the Dojo library) is built on top of Google Gears, creating an easy-to-use interface for using web applications offline.[124]

3.13 Web Services, Mashups, Widgets and Gadgets

"Design for 'hackability' and remixability."
—Tim O'Reilly[125]

Instead of reinventing the wheel with every new project, developers can use existing companies' web services to create feature-rich applications. Incorporating web services into new programs allows people to develop new applications quickly.

121. Berlind, D. "Google Gears Vies to be De Facto Tech for Offline Web Apps." *ZDNet*, 31 May 2007 <http://blogs.zdnet.com/Berlind/?p=504>.
122. Mills, E. "Google Gears Churns Toward Microsoft." *CNET*, 31 May 2007 <http://news.com.com/2100-1012_3-6187942.html>.
123. "The 70 Percent Solution." *Business 2.0*, 28 November 2005 <http://money.cnn.com/2005/11/28/news/newsmakers/schmidt_biz20_1205/>.
124. "The Dojo Offline Toolkit." *The Dojo Toolkit* <http://dojotoolkit.org/offline>.
125. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.

APIs

APIs (Application Programming Interfaces) provide applications with access to external services and databases. For example, a traditional programming API, like the Sun's Java API, allows programmers to use already-written methods and functions in their programs. Web services APIs are now offered by some websites as ways of sharing some of their functionality and information across the Internet.

Unique databases are central to Web 2.0; "data is the next Intel Inside."[126] Whether data is obtained from a proprietary source or collected over time from users, much of a site's value is in its databases. Many major Web 2.0 companies (e.g., eBay, Amazon, Google, Yahoo! and Flickr) provide APIs to encourage use of their services and data in the development of mashups, widgets and gadgets.

Mashups

Mashups combine content or functionality from existing web services, websites and RSS feeds to serve a new purpose. For example, Housingmaps.com is a mashup of Google Maps and real-estate listings from Craigslist. Mashups with maps are particularly popular, as are mashups using RSS feeds (see "RSS and Atom" in Section 3.15) created by using services such as Yahoo! Pipes™—a tool that enables you to aggregate and manipulate many data sources.

Using APIs can save time and money (some great mashups have been built in an afternoon); however, the mashup is then reliant on one or more third parties. If the API provider experiences downtime, the mashup will be unavailable as well (unless the mashup is programmed to avoid sites that are down). Always check the "terms of service" for using each company's web services. Many API providers charge usage fees based on the mashup's number of calls made to the server. Some sites require you to ask permission before using their APIs for commercial purposes, and others (e.g., Google) require that mashups based on their web services be free. Also, while mashups add value to data, there is always the question of who owns the data, and thus who should profit from the mashup.

Figure 3.4 lists some popular mashups. The site Programmable Web catalogs APIs and mashups and offers a "Mashup Matrix" (`http://www.programmableweb.com/matrix`) detailing which APIs have been combined to form each mashup. As more companies offer APIs, the only limitation on mashups (and the businesses built on them) is the developer's creativity. More complex mashups, using programs like Google Earth and Second Life, could be coming soon.[127]

Mashup	Combines
`http://www.housingmaps.com`	Google Maps and Craigslist real-estate listings to create a map marked with available housing listings.

Fig. 3.4 | Mashup examples. (Part 1 of 2.)

126. O'Reilly, T. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." September 2005 <`http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html`>.
127. Roush, W. "Second Earth." *Technology Review*, July/August 2007, p.38.

Mashup	Combines
http://www.chicagocrime.org	Google Maps and crime data from Citizen ICAM to create a map of Chicago marked with crime locations.
http://www.feedmashr.com	RSS feeds from Digg, ClipMarks, the *New York Times*, del.icio.us, Reddit and Slashdot to create a listing of the most popular stories from all sources.
http://www.secretprices.com	Amazon, Epinions.com and Shopping.com to create a comparison shopping site.
http://paul.kedrosky.com/publicloos/	Google Maps and Bathroom Diaries to create a map of San Francisco marked with the locations of public restrooms.

Fig. 3.4 | Mashup examples. (Part 2 of 2.)

Widgets and Gadgets

Widgets, also referred to as **gadgets**, are mini applications designed to run either as stand-alone applications or as add-on features in web pages. *Newsweek* called 2007 the "Year of the Widget" because of the huge increase in popularity of these applications.[128] Widgets can be used to personalize your Internet experience by displaying real-time weather conditions, aggregating RSS feeds, viewing maps, receiving event reminders, providing easy access to search engines and more. The availability of web services, APIs and various tools makes it easy even for beginner programmers to develop widgets. There are many catalogs of widgets online—one of the most all-inclusive is **Widgipedia**, which provides an extensive catalog of widgets and gadgets for a variety of platforms.

Amazon Web Services

Amazon is a leading provider of web services. The site provides historical pricing data and E-Commerce Services (ECS), which enable companies to use Amazon's systems to sell their own products. Amazon also offers hardware and communications infrastructure web services that are particularly popular with companies, providing economical **web-scale computing**. Amazon's Elastic Compute Cloud (EC2), Simple Storage Service (S3) and Simple Queue Service (SQS) enable businesses to pay for only the processing or storage space needed during any given period. This makes it possible for companies to save money (by not having to buy and maintain new hardware, software and communications equipment) while still being able to scale their storage and computing power to handle traffic surges (or reduce loss when the site's popularity declines). This is extremely significant in the Internet world, where a site's traffic can explode or crash overnight.

128. Braiker, B. "Tech: Welcome, Year of the Widget." *Newsweek*, 30 December 2006 <http://www.msnbc.msn.com/id/16329739/site/newsweek/>.

Amazon also provides "artificial artificial intelligence" with its unique Mechanical Turk. This web service allows applications to call on people to perform tasks (such as identifying pictures) that are easier for humans to do than computers. People can sign up to become part of the Mechanical Turk web service and bid on jobs (called Human Intelligence Tasks or HITs). This creates a competitive market, driving down developer costs, creating opportunities for people worldwide and allowing more applications to become feasible.

REST (Representational State Transfer)-Based Web Services

Representational State Transfer (REST) (originally proposed in Roy Thomas Fielding's doctoral dissertation[129]) refers to an architectural style for implementing web services. Though REST is not a standard, RESTful web services are implemented using web standards. Each operation in a RESTful web service is easily identified by a unique URL. So, when the server receives a request, it immediately knows what operation to perform. Such web services can be used in a program or directly from a web browser. In some cases, the results of a particular operation may be cached locally by the browser. This can make subsequent requests for the same operation faster by loading the result directly from the browser's cache.[130] Amazon's S3 is RESTful, and many other Web 2.0 web services provide RESTful interfaces.[131]

RESTful web services are alternatives to those implemented with SOAP (Simple Object Access Protocol). (We discuss both REST-based and SOAP-based web services in Chapter 28, Web Services.) With SOAP-based web services, the request and response are hidden (in entities known as a SOAP "envelopes"). SOAP requests must be deciphered as they are received at the server to determine the operation to perform and the arguments required to perform that operation. Similarly, the responses are encoded and deciphered on the client to obtain the result of the operation. SOAP does not currently provide a mechanism for caching results.

3.14 Location-Based Services

Location-Based Services (LBS) are applications that take your geographic location (city, state, location of your mobile device, etc.) into consideration. While the term generally refers to services accessed on mobile devices using the Global Positioning System (GPS), it can also be used to describe web applications that take your location into account. Search engines including Yahoo! Local and Google Maps use **localization** to provide you with geographically relevant content. Local search is particularly useful when you want to find a nearby business (e.g., plumbers, taxis, etc.). Location-based services are becoming increasingly popular in Web 2.0 applications. Conferences related to LBS include O'Reilly's Where 2.0 and the Location Intelligence Conference.

Global Positioning System (GPS)

The Global Positioning System (GPS), developed by the United States Department of Defense, uses numerous satellites that send signals to a GPS receiver to determine its exact

129. Fielding, R. T. "Architectural Styles and the Design of Network-Based Software Architectures." <http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm>.
130. Costello, R. "REST Tutorial." *xFront*, 26 June 2002 <http://www.xfront.com/REST.html>.
131. Richardson, L. and S. Ruby. *RESTful Web Services*. O'Reilly, 2007.

location. (A Russian system called GLONASS also exists, and a new system named Galileo is under development in Europe.) In the 1980s, the US Department of Defense opened GPS for civilian use to encourage satellite technology development.[132] Numerous location-based services are now available using GPS technology, such as GPS mapping devices used in cars or on mobile devices. GPS is also being used for safety. The US Federal Communications Commission (FCC) now requires wireless carriers to provide the locations of wireless customers calling 911 so emergency services can find them faster. To meet this requirement, wireless carriers have developed GPS-enabled cell phones.[133] These phones also provide premium services, such as driving directions and local information. The Disney Family Locator service uses GPS-enabled phones to help parents keep track of their children (as long as the child is carrying the special cell phone).[134]

Mapping Services

Google Maps is one of the most popular mapping applications available online. You can use Google Maps to locate businesses in your area, get driving directions and live traffic information, create custom maps with images and more. You can even get the information by using your mobile device. Google's local search allows you to locate a business in a geographic area and get its address, phone number, driving directions and even user reviews. Google Earth provides satellite images of virtually any location on the planet. In some areas, you can even get a panoramic view of a neighborhood at street level. You can use the Google Maps API to add mapping capabilities to your websites and web applications.

MapQuest, owned by AOL, provides similar mapping services. Use it to get directions and maps on your desktop or mobile device. The MapQuest OpenAPI allows you to add location-based services to your web applications. Additional mapping services include Yahoo! Local Maps and MSN Live Search. Both services offer maps, driving directions, traffic information and local search.

Companies such as NAVTEQ and Tele Atlas provide digital map data for in-vehicle and portable navigation devices, websites, location-based services and more. Developers building commercial location-based services can license the robust mapping products from these companies to build richly functional web applications.

GeoRSS and Geotagging

GeoRSS, based on the RSS standards, is a set of standards for representing geographical information in a feed. Location and geographical information in a GeoRSS feed can be used in GPS devices, mapping applications and other location-based services. For example, a blog post about a vacation could map the locations mentioned.[135]

Geotagging can be used to add location information (longitude, latitude, etc.) to websites, images, RSS feeds, videos and more. Websites can often determine a user's location by their IP address. Geotagging a website provides the user with location information about the site.[136] Geographic information can be used to add value to search results. Geotagging

132. Schiller, J. and A. Voisard. *Location-Based Services.* Morgan Kaufmann, 2004.
133. Malykhina, E. "Nokia Wants Your Cell Phone To Tell You Where You Are." *InformationWeek*, 9 October 2006 <http://www.informationweek.com/showArticle.jhtml?articleID=193105219>.
134. Magid, L. "Global Positioning by Cellphone." *New York Times*, 19 July 2007, C7.
135. "GeoRSS: Geographically Encoded Objects for RSS Feeds." *GeoRSS* <http://georss.org/>.
136. Turner, A. "Geotagging Web Pages and RSS Feeds." *Linux Journal*, 11 January 2005 <http://interactive.linuxjournal.com/node/8025>.

could also be mashed up with existing visualization systems, such as Google Earth or MSN Virtual Earth, which provide advanced satellite images for anywhere on the planet.

3.15 XML, RSS, Atom, JSON and VoIP

For more information on any of the following technologies, visit the corresponding Resource Centers at `http://www.deitel.com/resourcecenters.html` (see Fig. 2 in the Preface for a complete list of Deitel Resource Centers).

XML

XML (Extensible Markup Language, Chapter 14), developed in 1996 by the World Wide Web Consortium (W3C), is a markup language that allows you to label data based on its meaning. XML describes data in a way that is meaningful to both humans and computers.

XML documents are text files with a `.xml` extension; they can be created in text editors. These documents can reference a Document Type Definition (DTD) or a schema, which defines the structure for the document. This allows the information in the document to be verified by validating parsers, meaning they will check to make sure that no elements are missing (e.g., a last-name element in a document listing full names) and that the elements occur in the proper order. This makes XML data more reliable than data prepared with some other data-describing options. XML also can be used to create customized markup languages (e.g., XHTML for web content, CML for chemistry, MathML for mathematical content and formulas, and XBRL for financial data)—these are referred to as XML vocabularies. XHTML is described in Chapter 4, Introduction to XHTML. Chapter 14, XML and RSS, presents several examples that use MathML to render mathematical expressions.

RSS and Atom

Sites that offer RSS (Chapter 14) and Atom feeds can maintain an "open connection" with their readers. Users no longer have to regularly visit sites for updates—by subscribing to a site's feed, users receive updates as new information is posted to the site. The difference between RSS and Atom is subtle and unimportant to most users—many tools support both formats. Versions of RSS (an XML-based web content syndication format) have existed since the late 1990s; Atom dates to 2003.

Most major web browsers support RSS and Atom feeds, and many aggregators (or feed readers) are available to help users organize their subscriptions. Feedburner (acquired by Google) is used by many blogs to provide their readers with new posts by e-mail. This service also helps bloggers get a better idea of the size of their audience (by allowing them to see the number of subscribers).

JSON

JavaScript Object Notation (JSON) was developed in 1999 as an alternative to XML. JSON (discussed in Chapter 15, Ajax-Enabled Rich Internet Applications) is a text-based data interchange format used to represent JavaScript objects as strings and transmit them over a network. It is commonly used in Ajax applications. JSON text is easy to produce and read—it is also faster to parse (or extract) than XML.

VoIP

Voice over Internet Protocol (VoIP) is the technology used to make free or inexpensive phone calls over the Internet. Some businesses and individuals have switched completely

to VoIP and eliminated traditional phone lines to cut costs. There are many VoIP services, such as Vonage, Packet8 or Lingo. Skype is the most popular. Acquired by eBay to integrate buyer and seller voice communication into auctions,[137] Skype offers free and fee-based services (such as calling non-Skype phones). VoIP is an enabling technology that can be layered into Web 2.0 companies and websites.

3.16 Web 2.0 Monetization Models

"The advertising model has come along; we underestimated how big that would be."
—Bill Gates, MIX06

Many Web 1.0 businesses discovered that popularity ("eyeballs") was not the same as financial success. Web 2.0 companies are paying more attention to monetizing their traffic. Starting an Internet business is cheaper than ever, and the cost of failure is lower. Anyone can start earning modest amounts of money almost immediately, using the monetization models described in Fig. 3.5.

Web 2.0 monetization is heavily reliant on advertising. Using Google's AdSense contextual advertising program is one of the fastest and most popular ways of monetizing a new Internet business. For more information see Deitel's Google AdSense and Website Monetization Resource Centers at `http://www.deitel.com/resourcecenters.html`.

Web 2.0 monetization models	
affiliate network—A business (such as Commission Junction and LinkShare) that connects web publishers with cost-per-action affiliate programs. See affiliate program.	**banner ad**—An ad that consists of an image, often placed at the top of a page.
affiliate program—A deal offered by a company to share a portion of the revenues earned from traffic coming from web publisher websites. Affiliates provide text and image ads to post on the publishers' sites. If a user clicks through to the affiliate site and takes a specified action (e.g., makes a purchase, fills out a registration form, etc.) the publisher is paid a portion of the revenue or a flat fee. Companies offering affiliate programs include Amazon (the Amazon Associates program), Indeed, ClickBank, eBay and thousands more.	**blog advertising**—Advertising specifically designed for display on blog sites. Companies include Federated Media and Blogads. **contextual advertising**—Advertising that is targeted to the content on a web page. Contextual ad programs include Google AdSense, Yahoo! Publisher Network, Vibrant Media, Kontera and Tribal Fusion. **cost-per-action (CPA)**—Advertising that is billed to the advertiser per user action (e.g., purchasing a product or filling out a mortgage application). Companies include Amazon and Indeed. See also performance-based advertising.

Fig. 3.5 | Web 2.0 monetization models. (Part 1 of 2.)

137. Broache, A. "eBay to Nab Skype for $2.6 Billion." *CNET*, 12 September 2005 <http://news.com.com/eBay+to+nab+Skype+for+2.6+billion/2100-1030_3-5860055.html>.

Web 2.0 monetization models

cost-per-click (CPC)—Advertising that is billed by user click. The web publisher receives revenue each time a user clicks an ad on the publisher's site, regardless of whether the user makes a subsequent purchase. Companies include Google AdSense and Yahoo! Publisher Network.

cost-per-thousand impressions (CPM)—Advertising (usually banner advertising) that is billed per thousand impressions, regardless of whether the user clicks on the ad. Companies include DoubleClick, ValueClick and many more.

e-commerce—Selling products and/or services directly through a website. Companies include Amazon, Dell, CafePress.com and thousands more.

interstitial ad—An ad that plays between page loads. Companies include Tribal Fusion, DoubleClick, and many more.

in-text contextual advertising—Advertising that is marked by double-underlined keywords or phrases in the content of a web page. When a reader hovers the mouse cursor over a double-underlined word or phrase, a text ad pops up. By clicking on an ad, readers are taken to the advertiser's page. Companies providing in-text contextual advertising include Vibrant Media, Text Link Ads, Kontera and Tribal Fusion.

lead generation—Leads are generated when a visitor fills out an inquiry form so that a salesperson can follow through and potentially convert the lead to a sale. Lead generation is a subset of cost-per-action advertising. See cost-per-action (CPA).

paid blog post—A blog post (often a product review) that an advertiser pays a blogger to write. Some argue the ethics of this practice, and bloggers are encouraged to disclose that they are being paid for the posts. Companies that match bloggers and advertisers include PayPerPost, SponsoredReviews and ReviewMe.

performance-based advertising—Advertising that pays based on user action, such as making a purchase, filling out a registration form, etc. These are also often part of affiliate programs such as Amazon and ClickBank. See cost-per-action (CPA).

premium content—Content on a website that is available for an extra fee (e.g., e-books, articles, etc.). Companies that offer premium content include *The Wall Street Journal Online* and Search Engine Watch.

RSS ad—An ad included in RSS feeds. Companies include Feedster, Feedburner and Yahoo! Search Marketing.

tagging for profit—A site that buys inbound links or tags from other sites to help increase traffic, and thus increase potential advertising revenue. High-traffic sites can sell tags or links to other websites for a profit. (Caution: Search engines may lower the ranking of sites with paid links.) An example is 1000tags.com.

virtual worlds monetization—Selling products, premium services, virtual land and more in an online virtual world website. Virtual worlds include Second Life, IMVU, Habbo, Gaia Online and There.

Fig. 3.5 | Web 2.0 monetization models. (Part 2 of 2.)

3.17 Web 2.0 Business Models

The technologies and collaborative nature of Web 2.0 have opened up new business models. Some of these would not have been feasible even ten years ago, but because of Moore's Law they are not only possible but thriving. At the moment, there is no foreseeable end to the advancements attributed to Moore's Law, so fantastic ideas that are impossible today may become possible within just a few years. Figure 3.6 outlines many popular Internet

business models and lists some companies that use each one. In just about every case, there are many more companies using that business model.

Web 2.0 business models

advertising exchange—An online marketplace where web publishers can sell their advertising inventory (ad space) to advertisers. Companies include DoubleClick Advertising Exchange and Right Media Exchange.

affiliate network—A business that connects web publishers with cost-per-action affiliate programs, which are a form of cost-per-action advertising. Companies include Commission Junction and LinkShare. (See Fig. 3.5 for more information on affiliate programs.)

blog—A website with a series of posts in reverse chronological order. Many blogs attract significant traffic and monetize with advertising and affiliate programs. Popular blogs include BoingBoing, Gizmodo, TechCrunch, John Battelle's Searchblog, Problogger and Scobleizer.

blog search engine—A search engine devoted to the blogosphere. Companies include Technorati, Feedster, IceRocket and Google Blog Search.

blog network—A collection of blogs with multiple editors. Popular blog networks include Corante, 9rules, Gawker Media and Weblogs, Inc.

buying and selling domain names—A company purchases domain names with the intent of selling them in the future as Internet real estate becomes more valuable. Companies include Afternic.com and GreatDomains.

competitive intelligence—A company that analyzes Internet usage for use by client websites. Companies include Hitwise and Compete, Inc.

content network—A site (or collection of sites) that provides content including articles, wikis, blogs and more. Companies include About.com, Deitel, LifeTips and Suite101.

discovery—A site that introduces users to valuable content they would not have looked for otherwise. Sites include StumbleUpon, Aggregate Knowledge, MOG and Deitel.

domain registrar—A site that sells domain names. Companies include Register.com, GoDaddy and Network Solutions.

encyclopedia and reference source—An online reference encyclopedia, dictionary, thesaurus, etc. Sites include Wikipedia, Reference.com and Citizendium.

feed aggregator—An application that combines RSS or Atom feeds so the user can view all subscriptions in a single location. Applications include NetNewsWire, Google Reader and Bloglines.

file sharing—An application where users can share files, music, software and more. Companies include BitTorrent, LimeWire, Kazaa, AllPeers and Shareaza.

infrastructure for distributing open source projects—A site that hosts collaborative open source software projects. Sites include SourceForge, freshmeat.net and Tucows.

Internet and web conference organizer—A company that organizes conferences on Internet and web topics. Companies include O'Reilly Media, CMP and Jupiter.

Internet radio—A site that distributes music and radio shows over the Internet. Companies include Last.fm and Pandora.

Internet TV—A site that distributes television shows (or allows you to distribute your own shows) over the Internet. Companies include Joost and Brightcove.

Internet video—A video sharing site where users upload and share content. Companies include YouTube and Yahoo! Video.

Fig. 3.6 | Web 2.0 business models. (Part 1 of 4.)

Web 2.0 business models

job boards and job search—A site that connects job seekers with employers and/or job search engines. Job boards include Monster, CareerBuilder and Dice. Job search engines include Indeed, Jobster and SimplyHired.

mashup—A combination of two or more existing web services and feeds to create a new application. For example, `http://www.housingmaps.com` combines real estate listings from Craigslist with Google Maps so you can view the listings on a map. For a list of popular mashups, see `http://www.programmableweb.com/popular`.

massively multiplayer online game—An online role playing or strategy game where Internet users interact with one another. Games include World of Warcraft, Guild Wars and Lineage.

mobile social networking—A social network oriented towards mobile devices (such as cell phones). Companies include Twitter, Dodgeball and MocoSpace.

music distribution site—An online music site where you can purchase electronic versions (e.g., `.mp3`) of single songs or entire albums. Companies include iTunes, Rhapsody and Amie Street.

online advertising—An online advertising company that offers contextual advertising, banner advertising, in-text contextual advertising and more. Companies include Google, Yahoo!, Microsoft, DoubleClick, Vibrant Media, Tribal Fusion, Kontera, Quigo, ValueClick, Federated Media and many more.

online auction—A marketplace where visitors bid for products (and services) over the Internet. Companies include eBay, Overstock.com and Amazon Auctions.

online classifieds—A classifieds "advertising" site where users can post jobs, real-estate listings, personal ads, etc. Companies include Craigslist, Yahoo! Classifieds and Google Base.

online survey site—A site that offers survey services to other companies. A popular example is Survey Monkey.

open source—Software that is available (under license) for anyone to use and modify with few or no restrictions. Many Web 2.0 companies use open source software to power their sites and offer open source products and content. Companies include the Free Software Foundation, Apache, Mozilla, Zend and many more.

outsourcing marketplaces—An online marketplace where contractors and freelancers can connect with potential clients for short-term work. Companies include Elance and Guru.com.

payments—A site that handles secure payments for e-commerce sites. Companies include PayPal and Google Checkout.

people-assisted search—A search engine or search-driven content site that is filtered and organized by people to provide users with more relevant search results. Companies include Mahalo and Deitel.

personalized start page—A site that allows you to customize a start page with weather, news, etc. Companies include Netvibes, iGoogle, Pageflakes and Protopage.

photo sharing site—A site where users can post and share their photos with other users. Companies include Flickr and Photobucket.

real estate—A site that offers online real estate listings and information. Companies include Redfin, Trulia and Zillow.

recommender system—A system that collects data using collaborative filtering systems to determine users' tastes and interests. Sites can gather information about your personal interests, compare you to other users with similar interests and make recommendations. Popular examples of sites using recommender systems include Pandora, Netflix, CleverSet, ChoiceStream, MyStrands, StumbleUpon, Last.fm, and MovieLens.

Fig. 3.6 | Web 2.0 business models. (Part 2 of 4.)

reputation system—A system used by businesses like eBay and Amazon to encourage trust. For example, after each eBay transaction, the buyer and the seller can each leave positive or negative comments about the other party.

search engine—The primary tool people use to find information on the web. Companies include Google, Yahoo!, MSN, Ask and many more.

selling digital content—An e-commerce site that sells digital media (e.g., e-books). Companies include ClickBank, Blish, Lulu and more.

social bookmarking site—A site that allows users to share their bookmarks with others. Users bookmark their favorites sites, articles, blogs and more, and tag them by keyword. Companies include del.icio.us, Ma.gnolia and Blue Dot.

social media site—A site that allows digital media (text, photos, videos, music, etc.) to be shared online. Companies include Digg, YouTube, Flickr, Reddit, Wikipedia and more.

social networking site—A site that helps users organize their existing relationships and establish new ones. Companies include MySpace, Facebook, Bebo, LinkedIn, Second Life, Gaia Online and more.

Software as a Service (SaaS)—Software that runs on a web server rather than being installed on a local client computer. By modifying the version of the software on the server, a company can simultaneously update all users to the latest version. SaaS applications include Salesforce.com, Microsoft Office Live, Microsoft Windows Live, Zoho Office Suite and many Google and 37Signals products.

subscription site—A site that offers member-only areas and premium content (additional content for a fee). Examples include Safari Books Online and the *Wall Street Journal*.

travel site—An online travel resource site that allows you to find and book hotels, air travel, rental cars and more. Companies include Expedia, Travelocity and Orbitz.

vertical search engine—A search engine that allows you to focus your search on a narrow topic. For example, travel search engines include Yahoo! Fare Finder, SideStep and Kayak; source-code search engines include Krugle and Koders.

virtual world—A social networking site (or program) where users create an avatar (their online image and persona) that they use to meet other users with similar interests, conduct business, participate in group activities, take classes and more. Companies include Second Life, Habbo, Gaia Online and There.

Voice over Internet Protocol (VoIP) site—A site that offers inexpensive or free telephone services over the Internet. Companies include Skype, Packet8, Lingo and Vonage.

Web 2.0 software—Software designed to build Web 2.0 sites and applications (e.g., blogging software). Companies include Six Apart, 37Signals, Adobe and Microsoft.

web analytics—Software (desktop and SaaS) and companies that analyze Internet traffic, demographics, navigation and more. Companies include Alexa, WebTrends, ClickTracks, Google Analytics and WebSideStory.

web and mobile messaging—A service that allows you to chat with your contacts from various Internet messaging services (AIM, Yahoo! Messenger, MSN Messenger, Google Talk). Companies include Meebo and eBuddy.

web conferencing—An application that enables users to collaborate remotely. This often includes chat, VoIP and desktop sharing. Companies include WebEx, GoToMeeting and DimDim (open source).

Fig. 3.6 | Web 2.0 business models. (Part 3 of 4.)

Web 2.0 business models	
webmail—A web-based e-mail system that allows you to send and receive e-mail using a standard browser. Popular webmail services include Google gmail, .Mac, Yahoo! Mail and MSN Hotmail.	**wiki**—A site that offers collaborative, editable documents online. Companies include Wikipedia, Wikia and SocialText.

Fig. 3.6 | Web 2.0 business models. (Part 4 of 4.)

3.18 Future of the Web

"Web 2.0 will make the cover of Time *magazine, and thus its moment in the sun will have passed. However, the story that drives Web 2.0 will only strengthen, and folks will cast about for the next best name for the phenomenon."*

—John Battelle[138]

"We're a long way from the full realization of the potential of intelligent systems, and there will no doubt be a tipping point where the systems get smart enough that we'll be ready to say, 'this is qualitatively different. Let's call it Web 3.0.'"

—Tim O'Reilly[139]

The XHTML coding on websites defines their structure and layout, specifying colors, fonts, sizes, use of bold and italic, paragraphs, tables and the like, but *not* specifying the *meaning* of the data on the page. Web 1.0 servers sent mostly static web pages coded in HTML or XHTML to browsers that rendered the pages on the screen. Web 2.0 applications are more dynamic, generally enabling significant interaction between the user (the client) and the computer (the server), and among communities of users.

Computers have a hard time deciphering meaning from XHTML content. The web today involves *users'* interpretations of what pages and images mean, but the future entails a shift from XHTML to a more sophisticated system based on XML, enabling *computers* to better understand meaning.

Web 2.0 companies use "data mining" to extract as much meaning as they can from XHTML-encoded pages. For example, Google's AdSense contextual advertising program does a remarkable job placing relevant ads next to content based on some interpretation of the meaning of that content. XHTML-encoded content does not explicitly convey meaning, but XML-encoded content does. So if we can encode in XML (and derivative technologies) much or all of the content on the web, we'll take a great leap forward towards realizing the Semantic Web.

It is unlikely that web developers and users will directly encode all web content in XML—it's simply too tedious and probably too complex for most web designers. Rather, the XML encoding will occur naturally as a by-product of using various content creation tools. For example, to submit a resume on a website, there may be a tool that enables the

138. Battelle, John. "2006 Predictions, How Did I Do?" *John Battelle Searchblog*, <http://battellemedia.com/archives/003216.php>.

139. O'Reilly, Tim. "Web 3.0 Maybe when we get there." *O'Reilly Radar*, 13 November 2006 <http://radar.oreilly.com/archives/2006/11/web_30_maybe_wh.html>.

user to fill out a form (with first name, last name, phone number, career goal, etc.). When the resume is submitted, the tool could create a computer readable microformat that could easily be found and read by applications that process resumes. Such tools might help a company find qualified potential employees, or help a job seeker who wants to write a resume find resumes of people with similar qualifications).

Tagging and Folksonomies

Tagging and folksonomies are early hints of a "web of meaning." Without tagging, searching for a picture on Flickr would be like searching for a needle in a giant haystack. Flickr's tagging system allows users to subjectively tag pictures with meaning, making photos findable by search engines. Tagging is a "loose" classification system, quite different, for example, from using the Dewey Decimal System for cataloging books, which follows a rigid taxonomy system, limiting your choices to a set of predetermined categories. Tagging is a more "democratic" labeling system that allows people, for example, to associate whatever meanings they choose with a picture (e.g. who is in the picture, where it was taken, what is going on, the colors, the mood, etc.).

Semantic Web

> *"People keep asking what Web 3.0 is. I think maybe when you've got an overlay of scalable vector graphics—everything rippling and folding and looking misty—on Web 2.0 and access to a semantic Web integrated across a huge space of data, you'll have access to an unbelievable data resource."*
>
> —Tim Berners-Lee[140]

> *"The Holy Grail for developers of the semantic Web is to build a system that can give a reasonable and complete response to a simple question like: I'm looking for a warm place to vacation and I have a budget of $3,000. Oh, and I have an 11-year-old child... Under Web 3.0, the same search would ideally call up a complete vacation package that was planned as meticulously as if it had been assembled by a human travel agent."*
>
> —John Markoff[141]

Many people consider the Semantic Web to be the next generation in web development, one that helps to realize the full potential of the web. This is Tim Berners-Lee's original vision of the web, also known as the "web of meaning."[142] Though Web 2.0 applications are finding meaning in content, the Semantic Web will attempt to make those meanings clear to computers as well as humans. It will be a web able to answer complex and subtle questions.

Realization of the Semantic Web depends heavily on XML and XML-based technologies (see Chapter 14), which help make web content more understandable to computers. Currently, computers "understand" data on basic levels, but are progressing to find mean-

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140. Shannon, V. "A 'More Revolutionary' Web." May 2006 <http://www.iht.com/articles/2006/05/23/business/web.php>.

141. Markoff, John. "Entrepreneurs See a Web Guided by Common Sense." The New York Times, November 2006 <http://www.nytimes.com/2006/11/12/business/12web.html?ex=1320987600&en=254d697964cedc62&ei=5088>.

142. Berners-Lee, T. *Weaving the Web.* Harper-Collins, 2000.

ingful connections and links between data points. The emerging Semantic Web technologies highlight new relationships among web data. Some experiments that emphasize this are Flickr and FOAF (Friend of a Friend), a research project that "is creating a Web of machine-readable pages describing people, the links between them and the things they create and do."[143] Programming in both instances involves links between databases—ultimately allowing users to share, transfer, and use each other's information (photos, blogs, etc.).[144]

Preparations for the Semantic Web have been going on for years. XML is already widely used in both online and offline applications, but still only a minute portion of the web is coded in XML or derivative technologies. Many companies, including Zepheira, an information management company, and Joost, an Internet TV provider, already use semantic technologies in working with data. Deterring Semantic Web development are concerns about the consequences of false information and the abuse of data. Since the Semantic Web will rely on computers having greater access to information and will yield a deeper understanding of its significance, some people worry about the potentially increased consequences of security breaches. The Policy Aware Web Project is an early attempt at developing standards to encourage data sharing by providing access policies that can sufficiently protect individuals' privacy concerns.[145]

Microformats

> *"We need microformats that people agree on."*
> — Bill Gates, MIX06 conference[146]

Some people look at the web and see lots of "loose" information. Others see logical aggregates, such as business cards, resumes, events and so forth. Microformats are standard formats for representing information aggregates that can be understood by computers, enabling better search results and new types of applications. The key is for developers to use standard microformats, rather than developing customized, non-standard data aggregations. Microformat standards encourage sites to similarly organize their information, thus increasing interoperability. For example, if you want to create an event or an events calendar, you could use the hCalendar microformat. Some other microformats are adr for address information, hresume for resumes, and xfolk for collections of bookmarks.[147]

Resource Description Framework (RDF)

The Resource Description Framework (RDF), developed by the World Wide Web Consortium (W3C), is based on XML and used to describe content in a way that is understood by computers. RDF helps connect isolated databases across the web with consistent semantics.[148] The structure of any expression in RDF is a collection of triples.[149] RDF triples consist of two pieces of information (subject and object) and a linking fact (predicate).

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143. Friend of a Friend Project homepage. <http://www.foaf-project.org/>.
144. Shannon, Victoria. "A 'More Revolutionary' Web." *International Herald Tribune.* May 24 2006 <http://www.iht.com/articles/2006/05/23/business/web.php>.
145. Weitzner, D., J. Hendler, T. Berners-Lee, and D. Connolly. "Creating a Policy-Aware Web: Discretionary, Rule-based Access for the World Wide Web." October 2004 <http://www.w3.org/2004/09/Policy-Aware-Web-acl.pdf>.
146. "Bill Gates: Microsoft MIX06 Conference." *Microsoft,* March 2006.
147. "Microformats Wiki." *microformats.org* <http://microformats.org/wiki/Main_Page>.

Let's create a simple RDF triple. "Chapter 3, Dive Into® Web 2.0" is the title of this document and one property (the document's subject) that we'll use in our RDF triple. Another property of this chapter is "Deitel" as the author. So the sentence "Chapter 3, Dive Into® Web 2.0 is written by Deitel" is an RDF triple, containing two properties and a linking fact ("is written by").

DBpedia.org is currently transferring content into RDF from Wikipedia, one of the largest and most popular resources of online information. Using **SPARQL** (SPARQL Protocol and RDF Query Language), DBpedia.org is converting data from Wikipedia entries into RDF triples. In June 2007, they claimed to have over 91 million triples—this will allow the information (from Wikipedia) to be accessed by more advanced search queries.[150]

Ontologies

Ontologies are ways of organizing and describing related items, and are used to represent semantics. This is another means of cataloging Internet content in a way that can be understood by computers.[151] RDF is designed for formatting ontologies. **OWL** (**Web Ontology Language**), also designed for formatting ontologies in XML, extends beyond the basic semantics of RDF ontologies to enable even deeper machine understanding of content.[152]

Closing Comment

This book will get you up to speed on Web 2.0 applications development. Building a "web of meaning" will ultimately open a floodgate of opportunities for web developers and entrepreneurs to write new applications, create new kinds of businesses, etc. We don't know exactly what the "web of meaning" will look like, but it's starting to take shape. If it helps accomplish what many leaders in the web community believe is possible, the future of the web will be exciting indeed.

3.19 Wrap-Up

In this chapter, you learned how Web 2.0 embraces an architecture of participation, encouraging user interaction and community contributions. User-generated content is the key to success for many leading Web 2.0 companies. Harnessing collective intelligence can result in smart ideas. Collaborative filtering lets users promote valuable content, and flag offensive or inappropriate material. The wisdom of crowds suggests that a large diverse group of people can be smarter than a small group of specialists.

We presented several popular Web 2.0 business models. You learned how you, the user, are deciding which news and information outlets you trust, enabling popular blogs and social media networks to compete with traditional media powerhouses. People are using social networks to interact and network, personally and professionally. We discussed

148. Miller, E. "An Introduction to the Resource Description Framework." *D-Lib Magazine*, May 1998 <http://dlib.org/dlib/may98/miller/05miller.html>.
149. "Resource Description Framework (RDF) Concepts and Abstract Sytax." *w3.org* <http://www.w3.org/TR/rdf-concepts/#section-Concepts>.
150. *DBPedia.org.* <http://dbpedia.org/docs/>.
151. Heflin, J. "OWL Web Ontology Language Use Cases and Requirements." *W3C*, 10 February 2004 <http://www.w3.org/TR/webont-req/>.
152. "Introduction to OWL." *W3Schools* <http://www.w3schools.com/rdf/rdf_owl.asp>.

popular social bookmarking sites that let you share your favorite websites, blogs, and articles with other users.

You learned about the Long Tail economic model and how Web 2.0 Internet businesses are increasing exposure for lesser-known products in a way that traditional businesses cannot. Web 2.0 companies are monetizing their content with advertising, affiliate programs and more.

We discussed how the explosion of content combined with people's increasing demands on time has led to an attention economy, increasing the importance of search engines used to find content online. SEO, link building and SEM can help you maximize your website's findability and improve search engine results. Many Web 2.0 sites enable discovery, pointing you to valuable new content that you might not have otherwise sought. Tagging and folksonomies help you locate content on the web more effectively, especially content that computers have a hard time identifying, such as photos and videos. Search engines are using localization to provide you with geographically relevant content.

You learned how Software as a Service (SaaS) applications offer companies (and users) many benefits, including fewer demands on internal IT departments, increased accessibility for out-of-the-office use, an easy way to maintain software across a diversity of platforms on a large scale and more. Rich Internet Applications offer responsiveness, "rich" features and functionality similar to desktop applications. Web services are used to create feature-rich mashup applications, combining content or functionality from existing web services, websites and RSS feeds. Many people believe that the Semantic Web—the "web of meaning"—will be the next generation of the web, enabling exciting new kinds of applications.

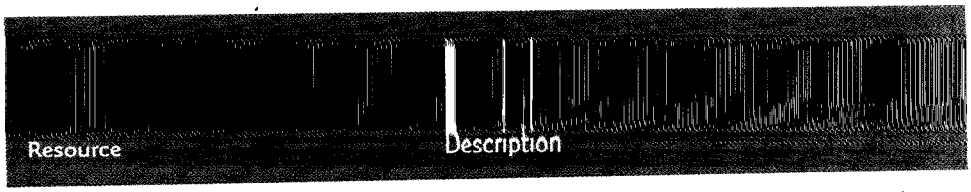
This chapter concludes our introduction to computers, the Internet, browsers and Web 2.0. The remainder of the book is devoted to building web applications—you'll learn how to program the client side and the server side, including interacting with databases. We'll focus on building Ajax-enabled Rich Internet Applications. We begin in Chapter 4 by discussing how to use XHTML (the Extensible HyperText Markup Language) to create web pages to be rendered by web browsers. You'll use XHTML to incorporate images into your web pages, add internal linking for page navigation, create forms for collecting information from a user, create tables and more.

3.20 Where to Go for More Web 2.0 Information

Figure 3.4 lists some popular resources for Web 2.0 news and analysis.

Resource	Description
TechCrunch `http://www.techcrunch.com/`	Edited by Michael Arrington, this blog is the leading Web 2.0 news resource that profiles innovative and important Internet companies and products.
Mashable `http://www.mashable.com/`	A social networking news blog, edited by Pete Cashmore. The site includes sections devoted to MySpace, YouTube, Bebo, Facebook and Xanga.

Fig. 3.7 | Web 2.0 news, analysis, technology and business resources. (Part 1 of 2.)



ReadWriteWeb `http://www.readwriteweb.com/`	Edited by Richard MacManus, this blog provides web technology news, reviews and analysis.
GigaOM `http://www.gigaom.com/`	Technology news and analysis blog, edited by Om Malik—founder of GigaOmniMedia and a former writer for Business 2.0, Red Herring and Forbes.com.
Dion Hinchcliffe's Web 2.0 Blog `http://web2.socialcomputingmagazine.com/`	Web 2.0 news and analysis blog by Dion Hinchcliffe, Editor-in-Chief of *Social Computing* Magazine.
Matt Cutts' Blog `http://www.mattcutts.com/blog/`	Matt Cutts, a software engineer at Google, blogs about gadgets, Google and SEO.
O'Reilly Radar `http://radar.oreilly.com/`	O'Reilly Media's blog about Web 2.0, open source, emerging technology and more.
SearchEngineLand `http://www.searchengineland.com/`	Search engine news blog, edited by Danny Sullivan—a leading search engine expert.
SearchEngineWatch `http://searchenginewatch.com/`	News and analysis of the search engine industry. Includes blogs, tutorials, forums and more.
Deitel Resource Centers `http://www.deitel.com/resourcecenters.html` (See Fig. 2 in the Preface for a list of Resource Centers.)	Numerous Web 2.0 technology and Internet business Resource Centers that include links to, and descriptions of tutorials, demos, free software tools, articles, e-books, whitepapers, videos, podcasts, blogs, RSS feeds and more.

Fig. 3.7 | Web 2.0 news, analysis, technology and business resources. (Part 2 of 2.)

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3.22 Web 2.0 Glossary

Adaptive Path—A strategy and design consulting company that helps companies build products that improve the users' experiences. Founder Jesse James Garrett coined the term Ajax and is a major proponent of the technology.

Adobe Integrated Runtime (AIR)—Allows offline access to web applications (i.e., when an Internet connection is not available).

AdSense—Google's search advertising program for web publishers. This is a fundamental and popular form of monetization, particularly for Web 2.0 startup companies.

AdWords—Google's search advertising program for advertisers.

affiliate network—A company (see Commission Junction and LinkShare) that connects web publishers with cost-per-action affiliate programs. (See affiliate program.)

affiliate program—A program that allows publishers to post text and image ads on their sites. If a user clicks through to the affiliate site and takes a specified action (e.g., makes a purchase, fills out a registration form, etc.) the publisher is paid a portion of the sale or a flat fee.

agile software development—A process that focuses on developing small pieces and upgrades to a program quickly and continuously throughout the life cycle of the product.

Amazon—An online retailer and web services provider. The Amazon Associates affiliate program allows web publishers to monetize their sites by recommending Amazon products.

Apache—An open source software foundation, responsible for the Apache Web Server and many other open source products.

API (Application Programming Interface)—An interface called by a program. Web services are often referred to as APIs and are accessible over the Internet.

Apple—A leading computer company, responsible for Macintosh computers, the iPod, iTunes and the iPhone.

architecture of participation—A design that encourages user interaction, where the community contributes content and/or participates in the design and development process. Creating websites that encourage participation is a key part of Web 2.0.

Ajax (Asynchronous JavaScript and XML)—Allows pieces of a web page to be refreshed separately, while the user continues to work on the page. Ajax improves the user's experience by making webtop applications approach the responsiveness of desktop applications.

Atom—Used for web feeds; similar to RSS.

attention economy—The result of the abundant amounts of information being produced and people's limited free time. More content is available than users can sort through on their own.

avatar—A person's digital representation in a 3D world such as Second Life.

Basecamp—An SaaS project management and collaboration tool from 37Signals.

Blinkx—A video search engine with over 12 million hours of video indexed (which makes the content searchable).

blog—A website consisting of posts in reverse chronological order. For common blog components see: blogroll, permalink, reader comment, and trackback.

blog search engine—A search engine devoted to the blogosphere. Some of the top blog search engines include Technorati, Feedster, IceRocket and Google Blog Search.

Blogger—A popular blogging platform now owned by Google.

blogger—The author of a blog.

blogging—The act of writing a blog.

blog network—A collection of blogs with multiple editors. Popular blog networks include Corante, 9rules, Gawker and Weblogs, Inc.

blogosphere—The blogging community. In mid 2007 there were over 90 million blogs.

blogroll—A list of links to a blogger's favorite blogs.

broadband Internet—High-speed Internet, often offered by cable companies and satellite companies.

collaborative filtering—The act of working together to promote valuable content and remove spam or offensive content.

collective intelligence—The idea that collaboration and competition among large groups results in grand and intelligent ideas.

Commission Junction—A popular affiliate network with member advertisers including eBay, Best Buy, Hewlett-Packard and hundreds more.

community-generated content—Content (writing, videos, etc.) that is created by Internet users.

contextual advertising—Advertising that is targeted to web page content. Because these ads are relevant to the nearby content, contextual ads often enhance the value of that content and generate higher clickthrough rates.

Corante—A blog network whose blogs are written by leading commentators in their field. Categories include law, policy, business, management, media, the Internet, technology and science.

cost-per-action (CPA)—Advertising that is billed by user action (e.g., purchasing a product or filling out a form).

cost-per-click (CPC)—Advertising that is billed by user click. The publisher receives revenue each time the user clicks an ad on the publisher's site, regardless of whether the user makes a subsequent purchase.

cost-per-thousand impressions (CPM)—Advertising that is billed per thousand impressions, regardless of whether the user clicks the ad or makes a subsequent purchase.

Craigslist—A popular classifieds and social networking website that fits the Web 2.0 lightweight business model. The company has few employees and all of the content is user generated. Craigslist was originally free; however, it is now transitioning to charging for certain services such as real-estate and job postings. A portion of the company is owned by eBay.

DBPedia.org—A website working on converting Wikipedia articles into RDF triples. This is a step toward the Semantic Web.

Deitel—A content-creation, corporate training and Web 2.0 business development organization. Deitel has a rapidly growing content network (currently about 80 Resource Centers) specializing in topic categories, including Web 2.0, Internet business, programming languages, software development and more.

del.icio.us—A social bookmarking site.

Digg—A social media site where users submit news stories and the community votes on the stories. The most popular stories are featured on the site's front page.

Digital Rights Management (DRM)—Technology used to prevent piracy and misuse of digital media. Several high-profile executives, including Apple CEO Steve Jobs, have recently started an anti-DRM movement.

discovery—The future of search; the idea of introducing users to valuable content they might not have looked for otherwise. For example, social bookmarking sites and Deitel Resource Centers suggest valuable resources.

Dodgeball.com—A social networking site designed for use on mobile devices, owned by Google. Allows users to locate friends and "crushes" who are nearby so they can meet up.

DotNetNuke—An open source web application framework based on Microsoft's .NET framework. DotNetNuke allows users to build dynamic websites quickly and easily. For more information, visit the DotNetNuke Resource Center (`http://www.deitel.com/ResourceCenters/Software/DotNetNukeDNN/tabid/1217/Default.aspx`).

DoubleClick—An Internet advertising company acquired by Google in 2007 for $3.1 billion. Their advertising exchange connects advertisers with online publishers.

Dougherty, Dale—Coined the term "Web 2.0."

eBay—The leading online auction site.

Extensible Markup Language (XML)—A widely supported open (i.e., nonproprietary) technology for electronic data exchange and storage, which is fundamental to Web 2.0 and the Semantic Web. It can be used to create other markup languages to describe data in a structured manner.

Facebook—A social networking site. Though it is now open to the public, Facebook was originally designed for and is especially popular with college students.

Federated Media—A company that connects bloggers with advertisers. Founded by John Battelle, the chair for the annual Web 2.0 Summit Conference, and the author of *The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture.*

Feedburner—Provides RSS feeds for blogs, feed monetization, podcast tracking and more. Acquired by Google.

Firefox—Open source web browser (based on the Netscape Navigator browser introduced in 1994) developed by the Mozilla Foundation. For more information, visit the Firefox Resource Center (`http://www.deitel.com/ResourceCenters/Software/Firefox/tabid/1213/Default .aspx`).

Flex—A Rich Internet Application (RIA) framework developed by Adobe. For more information, visit the Flex Resource Center (`http://www.deitel.com/ResourceCenters/Programming/AdobeFlex/tabid/1682/Default.aspx`).

Flickr—A photo-sharing website often credited as one of the best examples of tagging content.

folksonomy—A classification based on tagging content. Users tag the web content (web pages, photos, etc.), making it easier to find the content online. Folksonomies are formed on sites such as Flickr, Technorati and del.icio.us. Users can search tags for content that is identified in different (and sometimes more meaningful) ways than by traditional search engines.

Friendster—A social networking site; an early leader in the category of social networking. In 2006, Friendster was awarded a patent for a method and tool called the "Web of Friends," which gathers descriptive and relationship information for users in the network. The combined data is used to show all of the social relationships connecting two users in the social network. It also allows users to find people connected to their friends, their friends' friends, etc.

Garrett, Jesse James—Coined the term "Ajax" and founded Adaptive Path.

Gawker Media—A blog network that includes Gawker.com (New York City gossip), Gizmodo.com (technology and gadgets) and more.

Google—A Web 2.0 search and online advertising company founded by Larry Page and Sergey Brin when they were Ph.D. students at Stanford University. It is the most widely used search engine, commanding almost 50% market share. In addition to its regular search engine, Google offers specialty search engines for images, news, videos, blogs and more. Google provides web services that allow you to build Google Maps and other Google services into your applications.

Google Gears—An open source web browser extension that enables developers to provide offline usage of their web applications. The program can easily be resynchronized when an Internet connection becomes available.

Google Maps—Google's mapping web service, hugely popular in mashups.

Hitwise—An Internet competitive intelligence service provider. Hitwise collects and sells usage information from over one million websites in numerous industries. Clients use the information to find market share, keyword, web traffic flow and demographic data.

housingmaps.com—A mashup of Google Maps and Craigslist apartment and real-estate listings; often credited as being the first mashup.

IceRocket—A blog search engine.

Intel—The computer hardware company that creates the processors that power most of the world's computers.

interstitial ad—Ad that plays between page loads.

in-text contextual advertising—Advertising that is marked by double-underlined keywords in the content of a web page. When a reader hovers the mouse over a double-underlined word, a text

ad pops up. By clicking on the ad, the reader is taken to the advertiser's page. Companies providing in-text contextual advertising include Vibrant Media, Kontera, Text Link Ads and Tribal Fusion.

iPhone—Apple's mobile phone, released June 2007. The iPhone is designed to run a full version of the Internet.

iPod—Apple's portable media player.

iTunes—Apple's online music and video store; designed to sync with the iPod.

John Battelle's Searchblog—A blog in which John Battelle discusses search, media, technology, and more. (See Federated Media.)

JSON (JavaScript Object Notation)—A text-based data interchange format used to represent data structures and objects, and transmit them over a network. JSON is most often used with JavaScript in Ajax applications, but it can also be used with other programming languages.

Joost—An Internet TV company using semantic technologies to provide high-quality video with time shifting (recording for later viewing) and social networking capabilities. Joost allows advertisers to target their markets precisely. Advertisers can use demographic information such as location, gender, age, and more, to serve appropriate ads and to get a better return on investment from their advertising campaigns.

Last.fm—A popular social music website that uses the wisdom of crowds to recommend music to its users. The Last.fm Audioscrobbler music engine automatically sends the name of every song the user plays to the server. It then uses the information to recommend songs and artists, connect users with similar tastes and more.

Laszlo Webtop—A desktop-like environment for running web applications built on the OpenLaszlo framework.

lead generation—A monetization model for many sites that send traffic to another site and typically collect a fee when the visitor fills out an inquiry form so a salesperson can follow through and potentially convert the lead into a sale.

lightweight business model—A plan that allows a company to start quickly and with little capital investment. This is facilitated by powerful yet economical computers, the wide availability of inexpensive broadband Internet, robust open source software offerings, and well-developed, easy-to-employ monetization models—especially advertising and affiliate programs.

link baiting—Attracting other sites to link to your site, but without specifically asking for links. Providing quality content is considered the best form of link baiting.

link building—Using various methods to encourage other sites to link to your site. It is widely believed that increasing the number of inbound links to your site will encourage search engines to send you more traffic.

LinkedIn—A social networking site for business professionals. It can be used to stay in touch with professional contacts or make new contacts in your extended network.

LinkShare—A popular affiliate network with over 600 member companies (including American Express, Office Depot and Walmart).

Livejournal—A website where you can create your own blog.

Long Tail—Coined by Chris Anderson in an article in the October 2004 *WIRED* magazine (`http://www.wired.com/wired/archive/12.10/tail.html`). Refers to the continuous sales of numerous items with low sales volume that can add up to a significant part of a company's total sales. Amazon and Netflix are classic Long Tail companies.

mashup—A combination of two or more existing web services, RSS feeds or other sources of data to create a new application. For example, `http://www.housingmaps.com` combines real estate

listings from Craigslist with Google Maps so you can view the listings on a map. For a list of popular mashups, see `http://www.programmableweb.com/popular`.

Mechanical Turk—Amazon's "artificial artificial intelligence," which uses people in a web service to perform tasks that are difficult for computers to perform, such as identifying the subject of a picture and transcribing dictation recordings. Users can post a HIT (Human Intelligence Task). Anyone interested in completing the task can submit a response. If the response is approved by the person who posted the HIT, the responder is paid a predetermined fee for each task completed. The key is that the human task is interwoven with the execution of the web service, creating applications that mix computing power with human intelligence accessed worldwide.

MediaWiki—Open source software written originally for Wikipedia and now used by many popular wikis.

Metcalfe's Law—The value of a network is proportional to the square of the number of its users. Metcalfe's Law was authored by Robert Metcalfe, the creator of Ethernet. (See also network effects.)

microformat—A common standard for identifying information in a way that can be understood by computers. Some current microformats include adr (for address information), hresume (for resumes and CVs), and xfolk (for collections of bookmarks). See `http://microformats.org` for more information.

mobile technology—Devices such as cell phones and PDAs. An increasing number now offer web access, which has opened up new web application possibilities. (See also iPhone.)

moblogging—Blogging from mobile devices.

moderation—Monitoring and censoring inappropriate content and comments in blog or forum postings. The potential need for moderation is a drawback to allowing user-generated content.

monetization—Generating money through your website (e.g., using contextual advertising, affiliate programs, e-commerce and other revenue-generating models).

Moonlight—An open source version of Microsoft's Silverlight for Linux operating systems.

Movable Type—A blogging software package from the company Six Apart that is installed on the blogger's server.

Mozilla Foundation—Creates and maintains open source software including the Mozilla Firefox web browser and the Mozilla Thunderbird e-mail client.

MySpace—The most popular social networking site, and the most popular site on the Internet.

network effects—The increased value of a network as its number of users grows. For example, as the number of people with Internet connections grows worldwide, the value and benefit to all users of the Internet grows (individuals can communicate with more people, companies can reach more customers, etc.). (See Metcalfe's Law.)

9Rules—A blog network.

ontology—A way of organizing and relating things. Ontologies are a key technology in the Semantic Web.

open source software—Software that is available for anyone to use and modify with few or no restrictions. Users can modify source code to meet their unique needs, or collaborate with others to enhance the software. Many Web 2.0 companies use open source software to power their sites, and offer open source products and content.

O'Reilly Media—The company that introduced and promoted the term Web 2.0 (coined by company executive Dale Dougherty). O'Reilly Media publishes technology books and

websites, and hosts several conferences, including the Web 2.0 Summit, Web 2.0 Expo, OSCON™ (the Open Source Convention), Emerging Technology, Emerging Telephony, Where 2.0, RailsConf, MySQL, Ubuntu Live and more. See the O'Reilly Radar (`http://radar.oreilly.com/`) to keep up-to-date on emerging technology trends.

outsourcing—A company's hiring of independent contractors or other companies to perform various tasks. Outsourcing is often cheaper for the company.

performance-based advertising—Advertising that pays based on user actions, such as making a purchase, filling out a registration form, etc. (See also cost-per-action.)

permalink—A URL that links to a specific blog entry instead of the blog's homepage. Links stay relevant even after the blog entry moves off the home page and into the archive.

perpetual beta—The idea of continually releasing new features even if they aren't "final." This allows software companies to constantly fix bugs and improve the software by getting continuous feedback from real users.

Pew Internet & American Life Project—A non-profit Internet research company. The project is funded by the Pew Charitable Trusts, which has also initiated other research and cultural projects.

PHPNuke—An open source content-management system and web publishing tool based on PHP and MySQL.

podcast—A media file designed for syndicated distribution online. It can be played on a personal computer or mobile media player (such as an iPod or MP3 player).

Policy Aware Web Project—A site devoted to developing policies regarding Internet data. This is an attempt to deal with Semantic Web security concerns.

premium content—Website content that is available for a fee (e.g., e-books, articles, etc.). It is a way for publishers to monetize their sites. Sites offering premium content typically offer free content as well.

Problogger—A blog about blogging. It teaches bloggers how to monetize their sites with Google AdSense and other programs.

Programmable Web—A website with extensive directories of web services APIs and mashups.

publisher—See "web publisher."

RDF (Resource Description Framework)—An XML-based language used to describe content attributes such as the page title, author, etc.

RDF triples—Composed of two pieces of information and a linking fact. They are used to help computers understand data, a vital part of the Semantic Web.

reader comment—Feedback left by readers on a blog.

recommender systems—Systems that collect data using collaborative filtering to determine users' tastes and interests as they search the Internet. For example, Amazon's "customers who bought this item also bought..."

Red Hat—A popular version of the Linux operating system. The company is a leader in the open source movement.

remixing—Combining existing applications and/or content into something new; this is fundamental to Web 2.0.

reputation systems—Systems used by businesses like eBay and Amazon to encourage trust. For example, after each eBay transaction, the buyer and the seller can each leave positive or negative comments about the other party.

REST (Representational State Transfer)—A simple alternative to SOAP for implementing web services. Many developers prefer REST-based web services to SOAP-based web services for their simplicity, their ability to be cached and more. Amazon offers some REST-based web services. (See also SOAP.)

Rich Internet Applications (RIAs)—Web applications that have the responsiveness and the rich GUI normally associated with desktop applications. Related technologies for building RIAs include Ajax, Dojo, Silverlight, Flex and more.

RSS—An XML-based web-content syndication format. Syndicated RSS feeds are used to publish frequently updated content such as news, blog entries, podcasts, and more. Some RSS feeds include the full text, but most contain only a portion of the document, encouraging the reader to visit the content site.

Ruby on Rails—An open source, web application development scripting language and framework that increases the speed at which you can create typical database-driven web applications.

Salesforce.com—An SaaS company that specializes in Customer Relationship Management (CRM) software; a leader in the SaaS movement.

scrobbling—Last.fm's music tracking and analysis feature that provides you with recommendations based on the music you listen to through the site or on your iPod. (See also recommender systems.)

search engine marketing (SEM)—Promoting your website to increase traffic and search results. This includes paid search, online advertising and more.

search engine optimization (SEO)—Designing your website to maximize your findability and improve your rankings in organic search engine results.

search engine result page (SERP)—The page shown to a user by a search engine with a listing of web pages matching the search query sorted by relevance.

SearchEngineLand.com—Danny Sullivan's search engine news blog.

SearchEngineWatch.com—A search engine marketing resource site. Includes articles, tutorials, conferences and more.

Second Life—A 3D virtual world social networking program developed by Linden Labs. Users create an avatar (their online image and persona) that they use to meet other users with similar interests, conduct business, participate in group activities, take classes and more.

Semantic Web—The "web of meaning." What some believe will be the next evolution of the web in which web content can be read and understood by software applications.

Silverlight—A Rich Internet Application (RIA) framework developed by Microsoft; competes with Adobe Flash and Flex.

Six Apart—The company responsible for several blogging software applications and websites, including Movable Type, TypePad and Vox.

Skype—The most popular VoIP company. Users can place free calls to other Skype users around the world over their Internet connection. They also offer fee-based services that allow you to call non-Skype phone numbers. Skype was purchased by eBay in 2005 for $2.6 billion. Its founders recently launched Joost (an Internet TV site).

SOAP (Simple Object Access Protocol)—A protocol for exchanging XML-based information over a network. SOAP is used as a messaging framework in web services.

social bookmarking—The act of sharing your bookmarks with others through a website such as del.icio.us or Ma.gnolia. Users bookmark their favorites sites, articles, blogs and more, and tag them by keyword.

social media—Any media (e.g., photos, videos, music, etc.) shared online. Social media sites, such as Digg, YouTube and Flickr, often include features for user comments, collaborative filtering and tagging.

social networking—Sites designed to organize users' existing relationships and help users establish new ones. Popular social networking sites include MySpace, Facebook, LinkedIn, Second Life and more.

SocialText—The first wiki company; provides wiki services to corporations. (See also wiki.)

Software as a Service (SaaS)—Software that runs on a web server. It does not need to be installed on your local computer, and companies can instantly update all users to the latest version. Salesforce.com, Google, 37Signals and Microsoft all have extensive SaaS offerings.

spam—Junk e-mail messages, blog comments and forum postings.

SPARQL Protocol and RDF Query Language (SPARQL)—An RDF query language for the Semantic Web.

tag—An author- and/or user-submitted label for web content used to classify it by subject or keyword. For example, a picture of the Statue of Liberty posted on Flickr might be tagged with "newyorkcity," "statueofliberty," "usa," etc. Users can search for content on a site by tags. For examples of tag usage, see Technorati and Flickr.

tag cloud—A weighted list of content tags on a website. A tag cloud is usually in alphabetical order, with the most popular tags often appearing in a larger or bold font. Each tag links to a page where you'll find all of the content on that site that has been "tagged" (by publishers and/or users) with that term. Tag clouds are used by many Web 2.0 companies, including Technorati, Flickr, del.icio.us and more.

tagging—The act of adding tags to content.

tagscape—The tagging "landscape"; the patterns and trends that are seen in tagging and tag clouds.

TechCrunch—A popular Internet technology blog that focuses on the companies, products, people and events of Web 2.0.

Technorati—A popular blog search engine that uses tagging.

37Signals—The company that developed Ruby on Rails (`http://www.deitel.com/ResourceCenters/Programming/Ruby/tabid/715/Default.aspx`) and many SaaS applications, including Basecamp.

trackback—A method for web content authors to request notification when a website links to their content (articles, blog postings, etc.). It is a great way for authors to track links into their sites, measure the viral effects of their work, find related sites and more.

Twitter—A mobile web service that enables users to message groups of friends at once and automatically receive their friends' updates on a cell phone or through a chat window.

Ubuntu—A popular distribution of the Linux operating system.

user-generated content—Content that is created by users. User-generated content is central to Web 2.0.

ValueClick—An Internet advertising company.

vlogging—Video blogging.

VoIP (Voice over Internet Protocol)—Voice services over the Internet; used to build telephone services. The leading VoIP company is Skype, which offers free phone service among Skype users worldwide.

Vonage—A VoIP company. They provide broadband Internet telephone services that can be used with a standard phone (with adapter).

Web 1.0—The Internet experience previous to Web 2.0, focusing more on static content. Some people called it the "brochure web."

Web 2.0—A term coined by Dale Dougherty of O'Reilly Media in 2003. It refers to the current state of the web, which has a strong emphasis on user participation and community. Web 2.0 sites include social networking, wikis, blogging, social media, tagging, collaborative filtering, and more.

web as a platform—Instead of viewing the operating system as the application platform and building "Windows-based applications" or "Linux-based applications," developers now build "web-based applications."

web of meaning—Another name for the "Semantic Web."

Web Ontology Language (OWL)—A key Semantic Web technology, used for organizing data.

web publisher—A site that offers content. Advertisers place ads on web publisher sites.

web-scale computing—Refers to the ability to scale memory and processing power according to need, by using web-based processing power and memory, often provided by other companies. Amazon offers web-scale computing through web services such as Simple Storage Service (S3) and Elastic Compute Cloud (EC2).

web service—A service provided online that can be called by another program across the Internet.

Weblogsinc—A blog network.

webtop—A desktoplike environment (such as Laszlo Webtop) for running web applications in a web browser.

wiki—A collaborative, editable document online. The best known example of a wiki is Wikipedia, which has quickly become a leading web resource for virtually any topic.

Wikia—A site offering specialized wiki communities about popular television shows, games, literature, shopping and more.

Wikipedia—A community-generated encyclopedia using wiki technology.

wisdom of crowds—The concept that a large diverse group of individuals that does not necessarily include experts can provide more accurate answers than a small group of specialists working together.

WordPress—Popular blogging software.

World Wide Web Consortium (W3C)—An organization that develops web standards.

Xanga—A popular personal blogging site that includes community features.

XML (Extensible Markup Language)—A markup language developed in 1996 by the World Wide Web Consortium (W3C) that allows you to label data based on its meaning.

XML vocabularies—Customized XML-based markup languages, such as XHTML for web content, CML for chemistry, MathML for mathematical content and formulas, and XBRL for financial data.

Yahoo! Pipes—A mashup tool that enables you to aggregate and manipulate many data sources.

Yahoo! Publisher Network—Yahoo's contextual advertising program for publishers. This is a fundamental and popular form of monetization, particularly for Web 2.0 startup companies.

Yahoo! Search Marketing—Yahoo!'s advertising program for advertisers.

YouTube—An Internet video sharing site that has created a huge social phenomenon. Users upload and share videos. The company was bought by Google in 2006 for $1.65 billion.

Zepheira—A company that provides Semantic Web knowledge management and enterprise data integration products and services.

Self-Review Exercises

3.1 Fill in the blanks in each of the following statements:

a) _____ content refers to (legally) taking someone else's existing content and adding to it or changing it in some way.

b) The term Web 2.0 was coined by _____ of O'Reilly® Media in 2003.

c) _____ are user-generated labels used to categorize content.

d) The major Ajax technologies are _____, _____, _____, _____, _____ and _____.

e) _____ are webtop applications that have responsiveness and functionality approaching that of desktop applications.

f) Amazon's hardware and communications infrastructure web services are examples of _____. They enable businesses to pay for only the processing or storage space needed during any given period.

g) The increased value of a network as its number of users grows is referred to as _____.

h) Two popular RIA frameworks are Adobe's _____ and Microsoft's _____.

3.2 State whether each of the following is *true* or *false*. If *false*, explain why.

a) Tagging is for personal organization of content only.

b) The user is at the center of Web 2.0.

c) Location-based services always use GPS.

d) Open source software is often called "free" because it does not cost money.

e) Google's PageRank is determined by the number of page views a website receives.

Answers to Self-Review Exercises

3.1 a) Remixing.

b) Dale Dougherty

c) Tags.

d) XHTML, CSS, JavaScript, the DOM, XML, the `XMLHttpRequest` object.

e) Rich Internet Applications (RIAs).

f) web-scale computing.

g) network effects (an aspect of Metcalfe's Law).

h) Flex, Silverlight.

3.2 a) False. User-generated tags are used by many websites to categorize content so that it is easily searchable by other users.

b) True.

c) False. Location-based services often use GPS; however, they often use other information to determine your location, such as your IP address.

d) False. Open source software is free in terms of allowing access to the source code. It is not necessarily free of cost.

e) False. The PageRank algorithm considers the number of links into a web page and the quality of the linking sites (among other factors) to determine the importance of the page. Google search also considers all of the content on the page, its fonts, its headers and the content of neighboring pages.

Exercises

3.3 Fill in the blanks in each of the following statements:

a) _____ is an example of an agile development process.

b) The _____ is a design that encourages user interaction and community contributions.

c) Ruby on Rails was developed by _____.

d) _____ systems add software to digital media to prevent piracy.

e) _____ are attempts at consistent naming conventions.

f) Wikis rely on the _____.

3.4 State whether each of the following is *true* or *false*. If *false*, explain why.

a) Advertising is the most common Web 2.0 monetization model.

b) Collaborative filtering is used by search engines.

c) XML is an executable language.

d) Most bloggers provide RSS feeds.

e) Holding people's attention is difficult in today's society.

3.5 Define each of the following terms:

a) collective intelligence.

b) folksonomy.

c) permalink.

d) tag cloud.

e) web service.

f) monetization.

3.6 List some of the key factors that have attributed to the growth of Web 2.0.

3.7 Discuss some of the methods you can use to increase the findability of your website.

3.8 In Section 3.3 we discussed how many Web 2.0 sites are enabling discovery—helping you find new content you would not have otherwise sought out. Pick three Web 2.0 sites and describe how they are enabling you to discover new content through their sites.

3.9 Consider a picture of the Eiffel Tower. List 10 words you might use to tag this picture on a photosharing site such as Flickr so that others searching the site will find it.