

From Web 1.0 to Web 2.0

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1. What is Web 2.0

The concept of “Web 2.0” was born in the first [Web 2.0 Conference](#) organized by O’Reilly and MediaLive International in 2004. The concept was further elaborated in the article “[What is Web 2.0 Design Patterns and Business Models for the Next Generation of Software](#)” published by Tim O’Reilly in 2005. Generally, Web 2.0 denotes the paradigm of employing the Web as the platform to deliver and use software. Nevertheless, what user experiences, design patterns and technologies Web 2.0 actually encompasses are not concretely bound and they keep evolving. As [described in Wikipedia](#), “Given the lack of set standards as to what ‘Web 2.0’ actually means, implies, or requires, the term can mean radically different things to different people.”

In this paper, Web 2.0 is defined as the innovative use of the World Wide Web to expand social and business outreach to and exploit collective intelligence from the community. The features of Web 2.0 from the user behavior and software design perspectives are discussed. A high level technical architecture to support Web 2.0 features is also covered. Finally, the limitations of current technologies are discussed in order to analyze the new technology development in the Web 2.0 model.

1.1. Features of Web 2.0

Despite its fuzzy definition, Web 2.0 also has a number of features that have gained general acceptance. Here these features are classified into the following two aspects: (1) social / business aspect and (2) technology aspect. The new technology model supports the new social / business model in this new Internet age.

User behavior aspect	Architecture of participation
	Personalization of web resources
	Power of the <i>Long Tail</i>
Software design aspect	Deployment of rich applications
	Perpetual beta release
	Syndication of information and services

1.1.1 Architecture of Participation

Web 2.0 advocates the Web architecture that promotes users’ participation and collaboration. Web 2.0 becomes the platform for users to share, contribute, review and enhance information resources. [Flickr](#) and [YouTube](#) provide virtually unlimited media repositories for users to share photos and videos respectively. Collaboratively edited by any Web users, [Wikipedia](#) has become one of the most resourceful encyclopedias in the world. Amazon allows users to contribute reviews on books and goods. This architecture of participation mainly serves two purposes: (1) social networking and (2) collective intelligence exploitation.

Users meet with others on the Web and seek to expand their social networks. Blogging becomes a means for businesses and individuals to share ideas in an informal fashion and let others better understand themselves. [LinkedIn](#) is a typical social networking website which allows users to share and find business contacts.

Virtually anyone can speak anything on the Web so matters can be discussed and judged collectively by laymen and experts. While information becomes more transparent and information accuracy is monitored by the democracy of public reviews and revisions, the Web 2.0 model aims to acquire the collective intelligence in various subjects from web surfers all over the world.

1.1.2 Personalization of Web Resources

In the Web 1.0 model, web resources, i.e. information and services provided on the web, are delivered on websites in the format decided by the service providers. Users are given limited flexibility to select what web resources to consume and how they are well presented to meet the needs and preferences of specific users. In the Web 2.0 model, users play the active role to manage web resources that are only relevant to their needs. Feed readers, such as [Google Reader](#) and [Bloglines](#), allow users to subscribe the web feeds relevant to individuals' interests, and organize and navigate the feeds in users' preferred ways. [My Yahoo!](#) offers personalized homepages to users for placing regularly used web services (e.g. stock quotes, weather information) on a page. In Web 2.0, users need not follow the navigation structures pre-designed for all users by service providers.

1.1.3 The Power of Long Tail

[According to Wikipedia](#), the Long Tail concept proposes that “products that are in low demand or have low sales volume can collectively make up a market share that rivals or exceeds the relatively few current bestsellers and blockbusters... The Long Tail is a potential market and... the distribution and sales channel opportunities created by the Internet often enable businesses to tap into that market successfully.”

In Web 2.0, every Internet citizen can easily and freely produce their works (e.g. blog articles, music and videos) for personal and business interests. Plentiful of information and media resources are digitalized and become accessible anytime anywhere and at their minimum costs. Building a “cyber shop” to sell abundant digital items, perhaps largely non-mainstream products, is inexpensive and scalable compared to a “brick-and-mortar” shop. Started in 2000, [Apple iTunes Store](#) has grown to the biggest media store that catalogs millions of items, such as songs, podcasts, movies, audiobooks, movies, TV shows and iPod games, and a song is sold at less than US\$1 each. [Google AdSense](#) has tapped into the vast weblog market in which it shares profits with bloggers who sells advertisements on their weblogs.

1.1.4 Deployment of Rich Applications

Technology has evolved to support deployment of feature rich and interactive applications on web browsers. New web technologies such as Asynchronous JavaScript and XML (AJAX) and Adobe Flash break the limitation of the one-action-one-page-load interaction between browsers and servers. Now the browsers are more capable of executing complex logic to enrich the users' interactivity with the website without unnecessary and redundant data queries to the server. While the interactivity of web applications is extensively enhanced, complicated web applications can be deployed and sophisticated business services can be delivered. For example, [Yahoo! Mail](#) provides a web mail environment similar to the Microsoft Outlook capability and [Google Docs and Spreadsheets](#) provides word processing and spreadsheet applications on browsers. Recently some WebOS applications begin to emerge and provide common operating systems services, such as application execution, file management, on a thin client.

1.1.5 Perpetual Beta Release

When software is developed in the form of web applications, features are added and bugs are fixed in a continuous manner and the concept of releasing discrete software versions blurs. This new deployment model behaves like the application is in beta testing stage perpetually. This perpetual beta release model has further evolved to a process that new features are enabled to some pilot user groups so that the usability of such features can be tested out by the real world usage before they are released to all users. For example, a new feature is implemented in two different graphical user interface (GUI) methods; the usability of the different methods can be tested by releasing each implementation to a different group of pilot users. By capturing and analyzing the mouse clicks and keystrokes of usage from two different users groups, the implementation with the better usability can be confirmed through practical usage.

This model never implies that software does not require thorough testing before it is released to users just because it is claimed to be a beta release, and users are exploited in testing the work-in-process software. On the contrary, a new function in a web application must have gone through even more rigorous testing cycles because the web environment (e.g. behaviors of different web browser versions) is uncontrollable and unbound. Also, a single bug may affect thousands of users in an hour leading to destructive consequences. However, in some cases, it is not possible to conduct accurate usability testing unless the software (well tested functionally) is released for real-world usage.

Another implication of this model is that web applications require high usability because user training cannot be conducted while every new feature is released. Moreover, service providers must provide convenient channels to capture usage feedbacks and bug reports from users.

1.1.6 Syndication of Information and Services

Web 1.0 assumes that information is published and services are provided for consumption by human users only. Web 2.0 advocates reuse of web resources and a web application can be provided as a syndication (or called a mash up) of other applications offered by different providers. In other words, web developers should also target to produce information and services not only for use by both human users but also for reuse by other software applications. An important criterion of syndication is that the information and services must be accessible through some standardized web API so that third party applications can utilize these web resources.

For example, while the contents of a website are prepared, the developer should consider not only how they are formatted in a web design but also whether they are well categorized and laid out in web feeds for subscription by feed readers. To-date, many providers manage their web contents in database systems instead of maintaining static pages in file systems. The contents are retrieved from the database and formatted with microformats for display in different media readers. (Microformats are mark-up structures that annotate web contents with semantic meta-data in HTML style.) Common web feed standards are RSS and ATOM.

Web 2.0 style services should also be exposed with some kind of web application programming interface (web API). A simple web API is the use of *meaningful* and *computable* URLs so that applications can compose the URLs to retrieve the required web resources. For example, the URL <http://maps.google.com/maps?ll=22.283378,114.150009> which contains the latitude and longitude of Hong Kong points to the map of Hong Kong in [Google Maps](#). A website called [Google Sightseeing](#) is an innovative yet simple mash-up of Google Maps, Google Earth and blogging, where interesting sightings discovered in the satellite photos of Google Maps are posted and discussed.

Other more advanced web APIs may be in form of the Web Services standards such as SOAP (Simple Object Access Protocol) and WSDL (Web Service Definition Language). [Amazon](#) provides a Web Services

interface for accessing product data, such as descriptions, pricing, etc.

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