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# WWW (R)evolution - web 2.0 as a milestone in world wide web development

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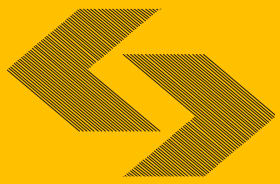

# WWW (R)EVOLUTION – WEB 2.0 AS A MILESTONE IN WORLD WIDE WEB DEVELOPMENT

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*The World Wide Web has changed dramatically over the past few years. The times when the Web was a read-only medium, where only the professionals created the content, ended and the new era in the history of the Web began. Just as it was planned by its creators, the Web became a virtual global space of collaboration where, finally, a common user could also contribute to the online content. In order to mark the changes that occurred the term "Web 2.0" was coined. The article is to clarify what the term exactly covers and describes and what the new features that revolutionized the Web are. Web 2.0 will be shown in the context of another step in the development of the Web, but an extremely important one.*

## Introduction

Web 2.0 has always been an unclear term, often overused in media for various purposes. The problem lies in the broad spectrum of aspects covered by "the umbrella" called Web 2.0 and the multitude of points of view and approaches towards the subject. Multiple sources provide information on what Web 2.0 is and what it is not in a rather descriptive manner basing on examples of websites and web applications or services and comparisons to the ones that certainly have nothing in common with Web 2.0 (for the differentiation called Web 1.0). All the attempts to define it seemed to lack details of some other approaches making the proposed definitions incomplete. Coming across a number of incoherent definitions while researching this subject can result in confusion and common incomprehension of Web 2.0 phenomena.

For that reason, after a comprehensive research of the subject carried in 2008 due to lack of a compact definition that would cover all the aspects and approaches to Web 2.0, the author established the following definition of the term:

***Web 2.0*** *is a result of an ongoing evolution of the Web. It is an attitude of openness, both, technological (adaptation of open sourcing of software and data*

*reusability to the context of the Web for collective benefit) and social (user contribution to Web content creation and improvement of services), enabled and supported by available technologies, co-operating in effective manner, in order to use the Web as a platform for collaboration, communication and collective knowledge.*

*The key characteristics include:*

- *Making good use of all available technologies and of the Web as a platform in order to provide web services/ web applications of functionality previously known only from desktop applications*
- *Providing software as a constantly improving web service where the real value lies in data (owned, licensed or user-created) and the ability to efficiently manage it, merge with other Internet-based data streams and make the best use/ reuse of it*
- *Encouraging user participation in the processes of service development (based on monitoring of user behaviour to improve the service according to users' expectations; or based on user-created content resulting in raising the value of a system and its growth) and recreation of the Internet (by allowing all users for unlimited adding and sharing of content).*

This attitude towards the use of the World Wide Web allows it to be closer to what the creator of the Web, Sir Tim Berners-Lee, has always wanted it to be.

## 1. From vision to realization

"A single, global, collaborative information space" where everything is linked together and the users are able to add and edit content – this has been Sir Tim Berners-Lee's vision of the Internet since the moment when, in 1980, he worked at CERN on a development called Enquire, the first of it's kind project management tool that was to let scientists link and edit pages with notes. (Anderson, 2007 [1])

In 1989, basing on the Enquire project concept, he came up with an idea to combine *hypertext* with *Transfer Control Protocol* and domain name system. As a result of it, on 25 December 1990, together with a student working at CERN, Robert Cailliau, for the first time in history they managed to establish an Internet-based communication between HTTP client and HTTP server. (Cailliau, 2000) The World Wide Web came to life then.

In order to provide means of interconnectivity and collaboration of the users Sir Burners-Lee created a web client/browser (called *WorldWideWeb*), which supported viewing of the web pages and editing of information using HTML. The relative simplicity of it (as the first versions of HTML were text-only) allowed the users willing to contribute to the Web to create and edit their Home Pages without the need for any specific tools or advanced knowledge. But in time, together with the ongoing technical development, users' expectations towards the presentation of the content increased. The complexity of the emerging technologies together with the incompatibility in browsers' functioning (a result of the competition war between Netscape and Microsoft) left the growing number of people with Web access unwilling to learn the technologies to create content. The Web became commonly perceived as a read-only medium with only a relatively small group of people creating and moderating the content, just like in any other, conventional media. Therefore, it started to become unattractive for a regular used and went far from being what it was originally intended to be - the collaborative workspace. [3]

Instead, the Web was dominated by the business sector with the *dot-coms* – Internet-based companies that dismissed the traditional, standard business models, all with web pages based on the same model (so called *"dot-com model"* ). The phenomenon of the rapid growth of their amount in the years 1995-2001 was called *"the dot-com bubble"*. [4]

In the shadow of *the dot-coms* new sites and revolutionary commercial and non-commercial web applications were constantly appearing. They are the ones that survived the burst of "the bubble" in 2001, when most of the companies went out of business. Studying "the survivors" (for example, Amazon, eBay, Google, iTunes, Wikipedia, BitTorrent, Blogs, etc). revealed that these websites had original features, used various new technologies and functioned using the Web in an innovative, improved, more efficient way. In order to mark out the changes that occurred and their significance to the Web, in 2004, Dave Dougherty (O'Reilly's vice-president) came up with the term *"Web 2.0"* and officially used it for the first time. But, as noted by Paul Anderson in his report *"What is Web2.0? Ideas, technologies and implications for Education"* [1], "the term was not coined in an attempt to capture the essence of an identified group of technologies, but an attempt to capture something far more amorphous".

## 2. Visible changes of the World Wide Web

O'Reilly in his report [5] evokes the comparison of example websites that "formulated the sense of Web 2.0":

| Web 1.0 | → | Web 2.0 |
|---|---|---|
| DoubleClick | → | Google AdSense |
| Ofot | → | Flickr |
| Akamai | → | BitTorrent |
| Britannica Online | → | Wikipedia |
| personal websites | → | blogging |
| evite | → | upcoming.org and EVDB |
| domain name speculation | → | search engine optimization |
| page views | → | cost per click |
| screen scraping | → | web services |
| publishing | → | participation |
| content management systems | → | wikis |
| directories (taxonomy) | → | directories (taxonomy) |
| mp3.com | → | Napster |
| stickiness | → | syndication |

**Table 1**. Differences between Web 1.0 and Web 2.0 shown on the example of existing websites and their features (*Source: O'Reilly, 2005.* [5])

O'Reilly underlined the fact that Web 2.0 cannot be described as a structure with hard boundaries. It is rather "a gravitational core", "a set of principles and practices" compared to the centre of "a variable solar system of websites". Various principles can be applied to a website and on various levels, which condition their distance from the mentioned centre. The conclusion coming from this statement is that a website can be "Web 2.0", not necessarily applying

all the principals/features of it. The character of features implemented and their usability in context of a website condition if the website is an accurate example of Web 2.0.

In order to picture Web 2.0 being the core, "the sun of the solar system" with various observations radiating from it and example websites that contain features later identified as the essentials of the concept, O'Reilly used the following graphic representation:

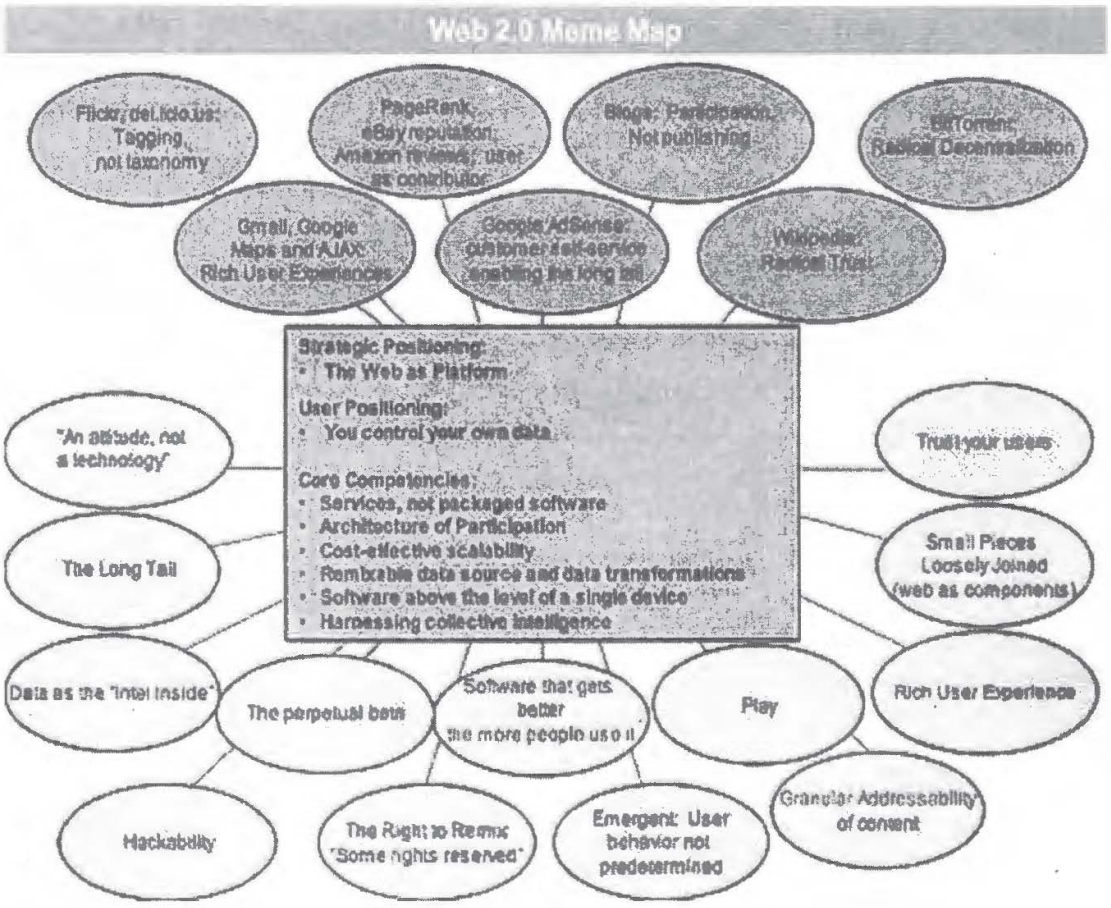


**Figure 1.** Web 2.0 Meme Map (Source: O'Reilly, T. 2005. [5])

According to Benkler [6] the most visible feature of Web 2.0 is "peer production of information, knowledge, and culture". The Web has been recreated by effective large scale, user-interaction-based, "cooperative efforts" replacing previous static-content websites moderated only by their administrators. The idea of open-source, free software has been adapted to the Web and resulted in various "peer production" web applications and websites of various functions, for example, encyclopaedias (such as www.Wikipedia.org), news and

commentary sites or entertainment sites (in the form of blogs). Benkler called it an actually functioning model and noticed its expansion into "every domain of information and cultural production" [6]

## 3. The technology behind Web 2.0

In order to achieve the goals of openness, flexibility, universality and collaborative nature the emerging technologies were engaged. These technologies were not completely new. To the contrary, they were simply very effective combinations of the technologies previously used, like HTML, CSS, XML, JAVAScript or asynchronous data retrieval, allowing lightweight programming. [7]

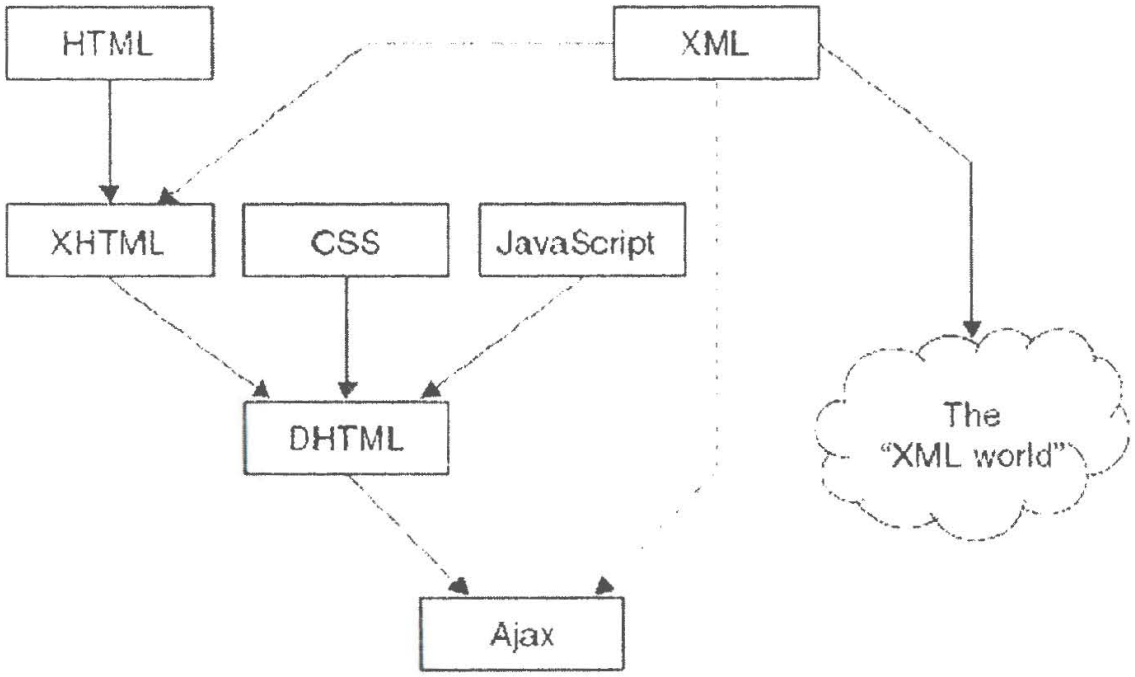


**Figure 2.** Evolution of Web (language) standards
(*Source: Vossen, G. and Hagemann, S.* (2007). [15])

The use of ***AJAX*** allows to break out of the start-and-stop nature of interaction on the Web as, using *XMLHttpRequest (...)* JavaScript API, it inserts a layer between the UI and web server. This one resides on the client, interacting

with the web server to get requested information, and interfacing with the presentation layer to update only the components necessary [8]

***DHTML*** provides flexibility in HTML presentation – it can redraw the whole page according to the user's expectations or, using Ajax technology it can display requested new information without the need to reload the page. Basing on HTML standards it brings a very important advantage- the pages are possible to be viewed on any browser, regardless of the company that released it or the platform it works on. [7, 8]

Apart from the ones mentioned above other ***dynamic scripting languages,*** such as Perl, PHP, Python or Ruby play a great role as they help building systems characterised by a constant change. [7]

The attitude of openness and cross-compatibility of solutions resulted in the creation of ***Rich Internet Applications (RIA)*** – online based applications that provide functionality known from PC software (example features: menus, drag and drop and toolbars). RIA can support a large variety of functions and the data (of any sort) that they provide in most cases can be edited or modified for further reuse. The access to them is flexible as they can be reached from any place and any online computer. They revolutionized the way a user interacts with the Web and greatly reduced the load on the bandwidth as they use resources from both, the Web and the local machine. By generating and manipulating the view and content of a webpage / web application within a client's browser using the local resources, the client-server connection is used only when data exchange is needed. This provides more desktop-like experience when using the apps and limits the occupation of the bandwidth reducing the dependency from the Internet connection quality and its speed. Outlook Web Exchange, Gmail, Google Maps , Flickr are just a few of them. [9]

The above is one more feature that changed the Web and took it to the next level – ***the co-operation of multiple devices.*** And, what follows, ***multiple data sources (data syndication).*** The website's/web application's content can be a result of a co-operation of a large number of devices, each serving different pieces of information (e.g. via RSS feeds) or providing different service (e.g. GoogleMaps applet, web video/music/radio player applet). This approach automates the distribution of content and is especially important when fast-changing content is involved, as it ensures the information reaches all the recipients interested in it on time. Combining that the massive daily amounts of user-created content, the idea of ***open data*** and ***data reusability*** (which are another features of Web 2.0 attitude), solutions like this one changed the Web dramatically, into **dynamic-content Web**.

## 4. New approach to software development

When software (RIAs and other web applications) comes not as a from-the-shelf product but as a service a provider's expertise in daily operations becomes "a core competency". The maintenance has to be performed on daily basis in order to provide the best efficiency, responsiveness, functionality and error-free operability of a service in order to maintain and improve the performance of software working the environment of constantly changing conditions.

The release cycle has changed, as well, due to constant change of the Web and open-source orientation characteristic for Web 2.0. In order to provide a service that matches the expectations of users the best way possible the software has to be constantly developed. The rule is "release early and release often". In such case, including users as co-developers becomes an important aspect of the development as thanks to them new features introduced into a service can be quickly evaluated and exchanged for others if not successful. It is accomplished by constant monitoring of users' behaviour to see if they use a particular feature and how they use it and gathering feedback from them. This can be associated with another, rather social feature of Web 2.0, ***harnessing collective intelligence***. [5]

## 5. The social web revolution – fulfilling the vision of WWW

The concept of Web 2.0 and the technical development of the World Wide Web finally took it to the point, where enabling common users without highly technical skills to interact, collaborate and contribute to the growth of the Web was easier than ever before. The Web became a read/write medium again. To make it happen web developers started providing appropriately intuitive, user-friendly online tools to enable user participation.

The tools of Web 2.0 characteristics support [5]:

- contribution by a group of people of various backgrounds from various locations for all kinds of purposes in an asynchronous way;
- means to share opinions and knowledge and discuss matters;
- effective communication and improved productivity compared to previously used solutions (email correspondence);
- means to harness knowledge of individuals for the purpose of collaboration

- centralized, shared repositories of exchanged information and documents with provided support for the content to expand and improve over time.

The web-based tools that provide that kind of functionalities are:

- ***blogs*** – online journals;
- ***wikis*** - content-oriented (content-management) and collaborative-authoring software system;
- ***social networks*** – virtual communities based on personal profiles;
- ***content networks*** – social networks oriented on sharing a particular type of data;

Moreover, not only can the users generate content, but also are able to organize it by evaluating, labelling and categorising the online data. Categorisations is enabled in all the tools stated above in the form of:

- ***tags*** - keywords added to a particular content objects, that best describe the content according to the user-creator of it;
- ***social bookmarking*** - a variation of tagging, the process of bookmarking pages interesting to a user by assigning tags in order to share them with others
- ***folksonomies*** - collectively created by Web users as they categorize the content found online by using open-ended tags (no restrictions on the vocabulary, in contrast with used in Web 1.0 professionally developed taxonomies, where categorization was strict due controlled vocabulary)

Introduction of these widely accessible and highly usable tools realized the vision of a "single, global, collaborative information space". It certainly is not the end of the World Wide Web development, but just a milestone, as it gave base for introduction of further changes.

## Conclusion

Web 2.0 solutions, in a short period of time, revolutionized the way people use the Web, communicate, create or cooperate, by engaging them via interpersonal online-based networks. It was a revolution but only in a sense that we had to wait for the Web to become what it is right now for longer than it was initially expected by its creators. The vision of the Web was clear from the very beginning, but technologically it was hard to achieve until now. The evolution of the computer and programming technologies led to the evolution of the Web,

as well. The term Web 2.0 sets another datum point in the history of the Web reminding how its development took the right path on the way to meet the expectations of its creators.

Constant development, which is one of the ideas of the concept, leads now to another step for online interaction. The next milestone, ***Web 3.0***, is to be mainly about semantic web (again envisioned by Sir Berners-Lee), recognizing the meaning of data provided by the user and recognizing it within the right context. Based on user behaviour analysis it is planned to act more intelligently, automatically providing the data that will be interesting to the assisted person.

After achieving the goal of engaging the users by grouping them in networks, the works carried now focus on the individuals and their personal interaction with the Web as an assistant in everyday tasks. The evolution of the Web continues...

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