Georg Gartner*

Applying Web Mapping 2.0 to Cartographic Heritage

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Summary
The term Web 2.0 was first popularized by O'Reilly Associates in 2004 to reflect changes in the ways in which the World Wide Web was being deployed, and has subsequently come to stand for what is a potentially revolutionary change in the nature of the Internet. Web 2.0 extends the traditional Web by employing an architecture of participation that goes way beyond following hyperlinks. In this next generation of networked services a web site is used as a platform for others to extend or edit content or services, instead of simply disseminating information created by a web master. Examples of Web 2.0 applications include social-networking sites, video sharing and podcast sites, wikis, blogs, and folksonomies. Such websites are designed to work in a social, collective and participatory manner, as is the opensource software that underpins their development. Such software is increasingly being used in the development of cartography and mapping services, and a number of Web 2.0 mapping applications are active across the Internet.
In this contribution the main issues of Web Mapping 2.0 are discussed as well as the consequences for cartographers and users. Questions over the quality, integrity, design and aesthetics, privacy and potential influences of governments or commercial companies are key for the success of the mapping in Web 2.0. It is argued that WebMapping 2.0 enables the integration of social and technical aspects into models of cartographic communication and that the process of technological change is itself leading to an important rethinking of mapping. With these new technologies an infrastructure is available which can have an impact on the way cartographic heritage is distributed and used. Knowledge concerning cartographic heritage can be collected and shared in a different way.

Web 2.0

The concept of Web 2.0 began with a conference brainstorming session between O'Reilly and MediaLive International in 2004. Although the term suggests a new version of the World Wide Web, it does not refer to an update to any technical specifications, but instead was coined to reflect changes in the ways software developers and end-users deploy the Web. The core competencies of the concept of Web 2.0, as coined by O'Reilly (2005) were as follows:

1) The web as a platform with cost-effective scalability instead of packed software
2) Harnessing collective intelligence: using the "wisdom of the crowds" (e.g. as a filter for incorrect or inaccurate information)
3) Control over unique, hard-to-create data sources that get richer as more people use them (serving as a provider of data and tools instead of maps; an architecture of participation)
4) Trusting users as co-developers: including rich user experiences which would otherwise not be accessible
5) Leveraging the long tail through the consumer himself: reaching out to the entire web, to the edges and not just the centre, via user networks

* Institute of Geoinformation and Cartography, Vienna University of Technology [georg.gartner@tuwien.ac.at]

6) Lightweight programming models: simplicity and organic web-based, open source software, with no or little intellectual property protection, designed for "hackability" and remixability
7) Software above the level of a single device: seamless connection of new devices (e.g. mobile devices) to the platform.

Web 2.0 websites allow users to do more than just retrieve information, encouraging them to add value to the application as they use it. According to Best (2006), the characteristics of Web 2.0 are: a rich user experience, user participation, dynamic content, metadata, web standards and scalability. Three further important characteristics are openness, freedom (Greenmeier & Gaudin 2008) and collective intelligence (O'Reilly 2005) by way of user participation. This user participation depends upon the gradual development of what has been termed the semantic web.

In summary, there is no single, simple definition for Web 2.0 and there is no single, new technology that is driving its development. Rather a plethora of new ideas and applications are generating a shift in the meaning and use of the Web. The significance of Web 2.0 can be seen in the textual associations of the term mapped out in Figure 1, and in particular in the changed designs, economy, convergence, participation, usability, standardization and remixability that are facilitated by these changes. Rather than understanding this development as a change of paradigms (Kuhn 1962), it can be seen as an evolving technology. The main changes associated with these shifts are in the variability of content, enhanced interactivity and collaborative nature of Web 2.0.

Figure 1: Textual associations to Web 2.0 (Source: http://www.aperto.de, Markus Angermeier, nerdwideweb.com, Lizenz:cc-by-sa)

Web Mapping 2.0

The term Web Mapping 2.0 is used here to refer to Web 2.0 applications that have a spatial frame of reference. Possible applications include: search engines considering spatial distance to find results; GeoTagging (virtually referring to objects in real space or on maps); GeoBlogging (enhancing blogs or photos with spatial references); and Web Mashups (combining map data in a collaborative way). Mashups in particular characterise the technological changes associated with Web 2.0 and are the most popular new form of mapping associated with Web 2.0.

A mashup is a web application that combines data from more than one source into a single integrated tool, but is much more than a simple embedding of data from another site to form a compound document. Content used in mashups is typically sourced from a third party via a public interface or API web service, with the data processed in some way so as to increase its value to users. Mashup APIs are used to connect different information (feeds) to the Geospatial Web. These data are encoded in data formats such as GeoRSS or KML. Mashups currently come in three general types: consumer mashups (combining data elements from multiple sources, hidden behind a simple unified graphical interface); data mashups (mixed data of similar types from different sources); and business mashups (combinations of all the above, focusing on data aggregation and presentation, and additionally adding collaborative functionality, making the end result suitable for use as a business application).

One of the reasons of the dominant position of mapping as the most popular mashup applications can be found in the popularity of Google Maps as top application programming interface (API). Table 1 shows that nearly half of all the mashups sourced in the programmableweb.com web site deploy the Google Maps API.

API	Popularity
Google Maps	47%
Flickr	11%
YouTube	9%
Amazon	7%
VirtualEarth	4%
Ebay	4%
411Sync	3%
YahooMaps	3%
Del.icio.us	3%
Yahoo	3%

Table 1: Top APIs for Mashups as of 8.8.2008 (Source: ProgrammableWeb.com)

To summarize: Web 2.0 and WebMapping 2.0 applications depend upon many different technologies but mashups using APIs are the most popular and are easy to design and use. These mashups enable the integration and visualization of different geographic information on base map (such as Google Maps, Virtual Earth, or Yahoo Map). Consequently, technology is no longer a restricting factor when developing WebMapping 2.0 applications.

The significance of Web Mapping 2.0

The potential consequences of applying Web 2.0 principles to cartographic practice pertain to several overlapping topics. Information may be accessed in different ways in Web 2.0 Mapping. Web cartography now offers wide possibilities to anybody who uses the Internet. Retrieval of geographic information ranges from classical forms of static maps, through to more interactive, dynamic, and animated maps.

As users naturally bring in different levels of skills in producing maps and geographic information, so issues of reliability and data quality must become more important. Displaying the reliability of both data sources and producer would be highly beneficial for consumer confidence. Existing metadata may be inappropriate in this context. New models for maintaining trust and "rating" shared information already exist in the world of social networking and Web 2.0. Sellers on ebay rate other sellers; Facebook allows users to report inappropriate behaviour; wikipedia edits inappropriate content, etc. Mechanisms for maintaining geographic trust need to be established in the world of Web Mapping 2.0, and including rules for resolving 'crowd conflict' (see http://wiki.openstreetmap.org/index.php/ Disputes for recent procedures established by Open StreetMap.)

Concerns around privacy and users' rights to their own data are a serious challenge in the world of Web 2.0, especially as companies have begun to realise one of their chief sources of competitive advantage is controlling private data. Open data projects must therefore allow users to take control of their data, and there are potential conflicts between the shared nature of many sites, in which data are created according to the terms of Creative Commons licensing, and the much more private and controlled needs of the commercial sector. These developments are strangely paradoxical. Web users seem to be prepared to share and publish large amounts of personal and private information over the web, as evidenced in the proliferation of Blogs, personal websites, travel diaries of globetrotters (http://www.wherethehellismatt.com), and popular social networks like MySpace (http://www.myspace.com/) or Facebook (http://www.facebook.com), but are strongly concerned about keeping information about themselves private or secret. This paradoxical willingness to share and reveal, whilst protesting the need to maintain privacy, seems to be an important characteristic of the new media.

Semiotics of Web Mapping 2.0 and benefit for the domain of cartographic heritage

During the twentieth century academic cartographers developed a number of conceptual schemas for understanding this process. The most well known of these is the map communication model, which uses a signal communication metaphor in which cartographic information is encoded via various filters (scale, projection, selection, etc.) into the map itself (the signal), and then decoded via further user-based filters (viewing time, map expertise, prior knowledge of the subject, etc.) (see for example Kolacny 1970). Subsequent research on contemporary cartography has often focussed on developing this model in cognitive, semantic or theoretical approaches (see for example Ogrissek 1987). Significant impacts on the understanding of cartography as a form of communication have been given by Bertin (1974), Robinson and Petchenik (1975), Gould and White (1974), and MacEachren (1995).

However Freitag (2008) argued that all these models lacked an appreciation of the social context of communication. In order to cover all aspects of cartographic communication he proposed that a

model needed to integrate dialogue-oriented processes with monologic and collaborative communication. He also argued that the function of maps for defined user groups has to be made explicit, so that the communication model could be relevant to the concrete actions of users (cp. Dransch 2004). Such a model would define cartography in a more holistic way and encompass social aspects often neglected in research previously dominated by technical arguments.
The syntactical dimension can be explored to explain how graphical codes should be defined and whether they can be clearly perceived. The semantic dimension can be used to explain the methods being used to design maps as a whole, so they are efficient, useful and practical. The pragmatic dimension relating signs to users and their actions, has however, until recently, been rather neglected in cartographic research. As this deals primarily with psychological and sociological aspects it is difficult to incorporate into formal communication models. However, actions of human beings in the real world have to be an essential part of all theoretical models of cartographic communication processes, and the technological changes associated with Web 2.0 make it much more pressing to focus upon pragmatics.
However the collaborative and participative nature of Web Mapping 2.0 will lead to a change in research priorities. Pragmatics is likely to receive much more attention. Cartography in the age of participative mapping will be challenged to define and offer rules, methods and techniques, which can be applied to the collaborative data input. Topics like collaborative access, shared discussions, pragmatic experiences can be applied to artefacts of cartographic heritage as well. Cartographers are needed to engineer frameworks to design syntactical and semantic dimensions of systems and for the first time in cartographic history the pragmatic dimensions of cartographic communication can be properly addressed in scientific research. All of this can be a benefit to the domain of cartographic heritage.

Conclusion

In this chapter the technologies underpinning Web 2.0 have been outlined, and the nature of Web Mapping 2.0 has been described. The implications of these shifts for cartographic practice and the impacts on rethinking cartographic research have also been evaluated. Key issues that must be resolved in order to release the full potential of WebMapping 2.0 include: how users can contribute in participatory systems; the availability of standardized programming tools and languages in open-source software communities; the design of new web mapping applications; and (especially) research agendas investigating syntactically correct and semantically useful maps in pragmatic contexts that are collaborative and participative.
Web 2.0 offers great possibilities in the field of cartography, promising to open up new vistas of acquiring, assembling, and publishing geographic information and forcing academics to change the ways they think of the map and mapping. Professionals in the domain of cartogaphy can benefit from these developments.

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