

# Information Services and Web 2.0: New Challenges and Opportunities

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## Abstract

Facebook, MySpace, Flickr and YouTube are currently among the most frequently visited websites with Web 2.0 features. Features such as social networking and collaboration, personalization, user-supported content and metadata enrich the user experience and make those websites more attractive. Libraries and information centers are increasingly incorporating some of the Web 2.0 features in order to continue to offer a viable service to their users. This paper briefly reviews the impact of new technologies such as mobiles and cloud computing on teaching, learning, research, and creative expression within a short time span. More specifically, it discusses the impact of Web 2.0 technologies on library and information services, along with the new challenges and opportunities facing information professionals in the digital age.

*Keywords:* Web 2.0, information services, dynamic content, social networking, personalization

## Introduction

Internet and the Web made it possible to get access to information sources on a 24/7 basis by removing the temporal and spatial barriers. Users no longer have to travel to the library to make use of, say, journals. They can simply get access to their library's web site using a wide variety of computers (desktops, laptops, handheld computers, PDAs) or mobile telephones and download the articles they need from electronic journals. In other words, libraries nowadays are not just physical places but virtual digital environments embedded in users' workbenches and social networks. Library collections and services are no longer limited with what can be provided (both off-line and on-line) with scarce resources. They are extended beyond the library walls to encompass rich content and applications, usually free of charge. Moreover, synthesized, specialized and mobilized information services are offered to the users in points of need (e.g., Web, e-mail, office tools, and e-learning management systems) (Murray, 2006).

We owe most of these innovations to Web technologies and design, and, more specifically, to the development of Web 2.0 concepts. Tim O'Reilly visualizes "Web 2.0" as a set of principles and practices and sees "the Web as platform" that provides services and enables users to control their own data. He listed seven principal features of Web 2.0: the Web as platform, harnessing collective intelligence by way of user participation, dynamic and remixable data sources, services instead of packaged software, lightweight programming models, software above the level of a single device, and rich user experiences. He explored them in detail and provided a list of core competencies of Web 2.0 companies as follows:

- Services, not packaged software, with cost-effective scalability
- Control over unique, hard-to-recreate data sources that get richer as more people use them
- Trusting users as co-developers
- Harnessing collective intelligence
- Leveraging the long tail through customer self-service
- Software above the level of a single device
- Lightweight user interfaces, development models, AND business models (O'Reilly, 2005).

Needless to say, openness and freedom are an integral part of Web 2.0 principles, which have "led to the development and evolution of web-culture communities and hosted services, such as social-

networking sites, video sharing sites, wikis, blogs, and folksonomies” ([http://en.wikipedia.org/wiki/Web\\_2.0](http://en.wikipedia.org/wiki/Web_2.0)).<sup>1</sup>

The emergence of Web 2.0 applications and the availability of rich content supplied by for-profit companies, non-profit institutions and end-users have resulted in marked changes in the organization of information sources and services. Libraries are faced with the challenge of providing access to such content and applications with a wide variety of information models and user interfaces, and integrating them with what they can offer using their own resources. Reconciling the requirements of these two different environments and creating a “ubiquitous library” is an unenviable task facing library and information professionals. This paper briefly discusses the implications of some of the Web 2.0 and technologies for the library and information world.

## Digital Natives, Digital Immigrants

Some years ago, in a two-part series entitled “Digital Natives, Digital Immigrants”, Marc Prensky (2001a, 2001b) drew attention to the fact that current-day students surrounded with digital media (“digital natives”) learn in a different manner than their teachers who grew up being more used to the print world (“digital immigrants”). He pointed out that students today spend more time playing video games than reading, and the digital media such as computers, cell phones with audio and video capabilities, e-mail, and the Web became “integral parts of their lives”. “Digital natives” are

used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics *before* their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to ‘serious’ work. (Prensky, 2001a, italics in original)

In contrast, “digital immigrants”

learn – like all immigrants, some better than others – to adapt to their environment, they always retain, to some degree, their “accent,” that is, their foot in the past. The “digital immigrant accent” can be seen in such things as turning to the Internet for information second rather than first, or in reading the manual for a program rather than assuming that the program itself will teach us [how] to use it. (Prensky, 2001a)

Prensky argued that “as a result of this ubiquitous environment and the sheer volume of their interaction with it, today’s students *think and process information fundamentally differently* from their predecessors” and “their *thinking patterns* have changed (Prensky, 2001a, 2001b, italics in original). He refers to the findings of neuroplasticity research that show that “different kinds of experiences lead to different brain structures” and that “the brain changes and organizes itself differently based on the inputs it receives”:

Children raised with the computer ‘think differently from the rest of us. They develop hypertext minds. They leap around. It’s as though their cognitive structures were parallel, not sequential.’ . . . ‘Linear thought processes that dominate educational systems now can actually retard learning for brains developed through game and Web-surfing processes on the computer.’ (Prensky, 2001a, 2001b).

The implications of technological developments in the digital age on current educational systems notwithstanding, the ways by which digital natives seek, use and create information are markedly different from that of digital immigrants.<sup>2</sup> While digital immigrants continue to use libraries as a “place”

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<sup>1</sup> “Web 2.0” has been criticized by many as not being a new concept. See the “Criticism” section of the Wikipedia article entitled “Web 2.0” for further information ([http://en.wikipedia.org/wiki/Web\\_2.0](http://en.wikipedia.org/wiki/Web_2.0)).

<sup>2</sup> See VanSlyke (2003) for a counter argument on “the implications of Prensky’s analogy and whether it provides sufficient justification to radically change the way we view teaching and learning”. See also Bayne and Ross (2007) for a deconstruction of Prensky’s native/immigrant metaphor. Studies show, on the other hand, that information seeking behaviors and use patterns of older generations have also changed. “Everyone exhibits a bouncing/flicking behaviour, which sees them searching horizontally, rather than vertically. Power browsing and viewing are the norm for all; reading, appears to be undertaken only occasionally online, probably undertaken offline and possibly not done at all.” (Nicholas, Rowlands and Huntington, 2007, p. 21) See Carr (2008) for

where they can get information services, digital natives prefer their libraries to be where they happen to socialize, study, or work. Most digital natives have already abandoned libraries that are not networked. They flock to social networking sites such as Facebook or MySpace instead of library web sites. This is mainly due to the fact that such social networking systems “are rapidly becoming Webs within the Web – one-stop shops for a wide range of services” (Social, 2009). Social networking systems function as a virtual place to get socialized as well as to share information, run thousands of applications or create their own content and applications. As one of the best examples of social networking sites using Web 2.0 technologies, Facebook provides access to 52,000 applications created by 660,000 developers (Social, 2009). Let’s look at what Facebook has to offer to its users:

... through a combination of its own creation and that of third-party developers, Facebook has become a world unto itself. Now the Web’s largest social network as measured by active users [140 million at yearend 2008], Facebook offers bread-and-butter portal services like e-mail and instant messaging as well as photo posting and video sharing. But Facebook’s reality extends much further. A partnership with Amazon.com (AMZN) has produced a shopping application that lets users buy items at Amazon without leaving Facebook’s site, while tapping opt-in “news feeds” that broadcast activities on Amazon, such as product reviews and wish list updates, to Facebook friends. At the same time, a chat feature introduced last spring, which automatically populates itself with a user’s Facebook “friends,” may render older services like AOL’s AIM [where new users must build their own “buddy lists”] socially impoverished.

Facebook’s mobile alerts, long familiar to the site’s users, are just the tip of the iceberg in wireless apps, as the company delivers mobile services for plain-vanilla cell phones and more sophisticated smartphones. Applications for popular devices, such as Apple’s (AAPL) iPhone or Research In Motion’s (RIMM) BlackBerry, deliver even richer social experiences. Video has taken off, too, with 45 million clips uploaded on Facebook to date; last month, the site also introduced higher-resolution video formats. Facebook users can send video messages from the site and from mobiles. (Social, 2009)

In order to keep up with current developments and better serve the needs of not only digital natives but also digital immigrants, libraries strive to employ Web 2.0 technologies and provide a service comparable to those offered by social networking sites such as Facebook. RSS feeds, blogs, wikis are among the most heavily used Web 2.0 technologies. More and more libraries are offering customized content and personalized alerts through RSS feeds, blogs or wikis. Users can communicate with library personnel, comment upon or rate resources in an interactive environment. Information resources that are freely available through web sites and search engines (e.g., Amazon.com and Google) are integrated with library web sites. Services such as catalog search are being made “mobile-ready” so that mobile users can get access to library resources while “on the run”. Libraries create browser toolbars that can be embedded in the users’ workbenches so that users can run applications seamlessly without changing their settings.

Although the availability of such Web 2.0 applications has been a most welcome development in libraries (also referred to as “Library 2.0”), adopting Web 2.0 technologies and adapting to the information seeking habits of digital natives is both a challenge and an opportunity. What follows is a brief discussion of the impact of current technological developments and trends on education, research, social networking, and library and information services.

### **Web 2.0 Technologies in the Horizon: New Challenges and Opportunities for Libraries**

The 2009 edition of the *Horizon Report* outlines six technologies to watch that will make a tremendous impact within one to five years’ timescale on teaching, learning, research, and creative expression and, implicitly, on library and information services) (Johnson, Levine and Smith, 2009). Using a non-technical language, this 31-page report provides an overview of each technology along with several links to relevant articles, blog posts and applications. These technologies are (in the order of

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anecdotal evidence of the impact of too much information available through search engines such as Google on “the ability to read and absorb a longish article on the web or in print”.

timescale): mobiles, cloud computing, geo-everything, personal web, semantic-aware applications, and smart objects.

The report identifies the mobile technology as such that it will have an impact on education and research within a year and maintains that “*Higher education is facing a growing expectation to make use of and to deliver services, content, and media to mobile devices*”. (p. 6, italics in original) It underlines the “unprecedented evolution of mobiles” and states that

The idea of a single portable device that can make phone calls, take pictures, record audio and video, store data, music, and movies, and interact with the Internet — all of it — has become so interwoven into our lifestyles that it is now surprising to learn that someone does not carry one. As new devices continue to enter the market, new features and new capabilities are appearing at an accelerated pace. One recent feature — the ability to run third-party applications — represents a fundamental change in the way we regard mobiles and opens the door to myriad uses for education, entertainment, productivity, and social interaction. (p. 6, italics in original)

Some 1.2 billion phones are produced each year (p. 8). It is predicted that “by the year 2020, most people across the world will be using a mobile device as their primary means for connecting to the Internet ([http://www.pewinternet.org/PPF/r/270/report\\_display.asp](http://www.pewinternet.org/PPF/r/270/report_display.asp))”. Mobiles are “already well on the way to becoming a universal tool for communication of all kinds” and many business travelers “rely more on smartphones, rather than laptops, as travel computing devices” and leave behind their laptops”. (pp. 9-10)

Libraries are certainly not exempt from the impact of mobile technology. In a recent paper entitled “Always on: Libraries in a world of permanent connectivity”, Dempsey (2009) analyzes the impact of mobile communication on library and information services in detail. He thinks that mobile communication will bring about two subtle changes: “First, services may be made mobile-ready, as with special mobile interfaces for library services, alerting services, and so on. Second, mobilization continues the restructuring of services, organizations and attention that networking has brought about.” (Dempsey, 2009) He discusses the mobile communication’s impact on four elements of libraries; namely, place, collections, people and expertise, and systems and services. He also offers general observations on services, switching, sourcing, socializing and personalizing, and expectations, and provides examples of libraries initiating mobile services for their users ranging from alerting services to reference services to catalog search (e.g., North Carolina State University Libraries mobile site, <http://www.lib.ncsu.edu/m/>) (Dempsey, 2009).

Dempsey observed that the borders between one’s social, business, learning and educational lives are getting blurred. This forces libraries to diffuse services “through various manifestations (a physical place to meet, a toolbar, a set of services in the course management system, a FaceBook application, a set of RSS feeds, office hours in a school or department, and so on)” (Dempsey, 2009). Thus, libraries can be “present” wherever their users happen to be.

The *Horizon Report* identifies “cloud computing” as the second technology to be watched that has immediate applicability within one year or less. “The *cloud* is the term for networked computers that distribute processing power, applications, and large systems among many machines.” (Johnson, Levine and Smith, 2009, p. 11). Search engines such as Google and social networking systems such as Flickr and YouTube use the cloud computing to quickly serve the needs of their users. Google, for instance, announced in its official blog in 2008 that Google has processed one trillion unique URLs. This would not have been possible if the cloud computing based on distributed infrastructure was not available. Google acknowledges that this architecture “allows applications to efficiently traverse a link graph with many trillions of connections, or quickly sort petabytes of data, just to prepare to answer the . . . next Google search” (Alpert and Hajaj, 2008).

When describing the impact of mobile technology on libraries and the need for “restructuring of services, organizations and attention that networking has brought about”, Dempsey (2009) also mentioned the challenge for libraries in view of the availability of cloud computing. The challenge for libraries, in Dempsey’s words, is:

. . . how to socialize and personalize services; how to adapt to collection and service use which spans personal, institutional, and cloud environments; how to position and promote the library ‘brand’

as services become atomized and less 'visible' on the network; and more complex questions about what best to do locally and what to source with collaborative arrangements or third parties. (Dempsey, 2009)

Lynch (2001) drew attention to the challenge of personalization long before social networking sites have become fashionable. He pointed out that in a distributed information environment it is quite difficult to implement personalization as it "occurs separately within each system that one interacts with" and "[i]nvestment in personalizing one system (either through explicit action or just long use) are not transferable to another system." The issue gets more complicated if one thinks about the facts that comments and ratings of users are scattered all over the network, and that personalized electronic books have to keep users' annotations and hyperlinks attached to the existing text and retrieve them whenever users wish to get access to them (Ohene-Djan and Fernandes, 2003). This would mean that the number of objects that the library has to deal with would multiply several orders of magnitude as each copy of an e-book should be stored along with a number of personalized annotations and hyperlinks to the massive number of outside resources available through the Web (Tonta, 2003).

The third technology identified by the *Horizon Report* to watch is the geolocation technology, which will see widespread applicability within the next two to three years. Mobile phones are currently equipped with geolocation technology so that photos and videos taken can automatically be tagged with geolocation information and uploaded to social networking sites such as Flickr or YouTube.

Google Maps (<http://maps.google.com>), for example, offers a one-button way to overlay public, geotagged media onto the relevant section of a map as you view it; photos or videos tagged with the location in question simply fall into place on the map. A similar feature is available to place media onto Google Earth's 3D display. With Flickr Maps (<http://www.flickr.com/map>), viewers can see at a glance what tags are currently being applied in a given region, or find (for instance) locations in North America where photographs of monarch butterflies were taken. Other mashup authoring tools give the user even more control, allowing the use of uploaded datasets, custom maps, and more. (Johnson, Levine and Smith, 2009, p. 16)

Geolocation technology has also been used by libraries. The [programmableweb.com](http://programmableweb.com) site offers more than 3,600 mashups (programs that remix data from different sources) and applications programming interfaces (APIs) including several library-related ones. For instance, a mashup showing data for more than 20,000 public libraries in the US and Canada on Google Maps has been available for some time ([www.libraries411.com](http://www.libraries411.com)).

Existing collections of geolocate data are also becoming more accessible as the tools to search, organize, filter, and display such data become more sophisticated, easier to access, and simpler to use. (. . .) Mobile learners can receive context-aware information about nearby resources, points of interest, historical sites, and peers seamlessly, connecting all this with online information for just-in-time learning. Social networking tools for handheld and mobile devices or laptop computers can already suggest people or places that are nearby, or show media related to one's location. (Johnson, Levine and Smith, 2009, p. 16)

As more libraries invest in geolocation technology, there is no reason why mobile phones should not alert users to the clusters of information repositories and libraries nearby.

The *Horizon Report* draws attention to the sheer volume of material available through the Web and the need to sift through information resources using various tools, widgets and services so that users create their own "personal webs" with dynamic online content within the next two to three years' time span. The personal webs will proliferate as

it is easy to create customized, personal web-based environments — a personal web — that explicitly supports one's social, professional, learning and other activities via highly personalized windows to the networked world. Online material can be saved, tagged, categorized, and repurposed without difficulty and without any special knowledge of how web pages are put together. In fact, the underlying technology that supports the web has all but vanished for most users; all that is necessary is to know which tools to use, and any task — from creating and distributing content, to organizing

one's personal and professional time, to developing a library of resources that constantly refresh and update themselves — becomes point-and-click trivial. (Johnson, Levine and Smith, 2009, p. 19)

Web 2.0 tools used for blogging, tagging, aggregating, and updating are well known: WordPress, Delicious, Diigo, and Zotero are but a few to name (Johnson, Levine and Smith, 2009, p. 20). They are used to create and enrich a personal web and enable users to socialize and personalize their web spaces. Libraries are expected to facilitate data transfer between library web sites and users' personal webs and function seamlessly in an increasingly complex digital space.

The *Horizon Report* predicts that semantic-aware applications and smart objects will have a tremendous influence in four to five years' timescale on teaching, learning, research, and creative expression. "A smart object is simply any physical object that includes a unique identifier that can track information about the object" (Johnson, Levine and Smith, 2009, p. 27). In fact, as the *Report* acknowledges, libraries are already experimenting with the applications of smart objects. RFID (radio frequency identification) tags are already being used in libraries

as a means for collection tracking and checking materials in and out. A few libraries are experimenting with further uses for smart objects: a project called ThinkeringSpace from the Illinois Institute of Technology's Institute of Design (<http://www.id.iit.edu/ThinkeringSpaces/>) combines physical and virtual components to produce an environment where physical objects, like books, can be annotated with contextual information that is added manually or retrieved automatically. The information remains connected with the object and displays whenever the object is scanned. (Johnson, Levine and Smith, 2009, p. 28)

The *Report* envisions a much wider use of smart object technology in the future including "the Internet of things". I think it was Clifford Lynch who observed years ago that it is odd that books sitting in the library shelves are not "talking to each other" about their contents. The Internet of things and smart object technology will soon make this a reality:

The vision for the future of smart object technology is a world of interconnected items in which the line between physical object and digital information is blurred. Applications that tap into "the Internet of things," as this vision is called, would assist users in finding articles in the physical world in the same way that Internet search engines help locate content on the web. Reference materials, household goods, sports equipment: an actual instance of anything a person might need would be discoverable using search tools on computers or mobile devices. Further, while looking at an object, a prospective buyer could call up reviews, suggestions for alternate or related purchases, videos of the item being used, and more, as well as finding out whether something similar lay forgotten in the garage back home. (Johnson, Levine and Smith, 2009, pp. 27-28)

With trillions of digital objects, both smart and not-so-smart, floating around the digital space, it is not enough to simply have smart objects technology. Although "semantic-aware applications" are in their early development, such tools are "designed to use the meaning, or semantics, of information on the Internet to make connections and provide answers that would otherwise entail a great deal of time and effort" (Johnson, Levine and Smith, 2009, p. 23). The "Semantic Web" as envisioned by Tim Berners-Lee can be materialized with semantic-aware applications that infer the meaning from "content and context". There may be thousands of smart objects tagged with "turkey", naming the bird as well as the country. Tools and search engines such as TrueKnowledge (<http://trueknowledge.com>), Hakia (<http://www.hakia.com>), Powerset (<http://www.powerset.com>), and SemantiFind (<http://www.semantifind.com>) will identify the context and "provide more accurate search results, either by scanning metadata tags added to content (the bottom-up approach, taken by SemantiFind) or by using semantic algorithms or lexica (the top-down approach, taken by Hakia)" (Johnson, Levine and Smith, 2009, p. 23). Data gathered about each user through the Web 2.0 features such as personalization will also be of help in this respect.

As the *Report* suggests, "semantic-aware applications hold the potential to organize and display information embedded in our data in meaningful ways that make it easier to draw connections. Semantic-aware tools to help visualize relationships among concepts and ideas are just beginning to emerge, including mashups that not only plot data on graphs or maps, but also emphasize and illustrate conceptual links" (Johnson, Levine and Smith, 2009, p. 24).

## Conclusion

New technologies and Web 2.0 applications are shaping the library and information services in various ways. Users spend enormous amounts of time collectively in social networking sites such as Yahoo!, Google and Facebook (120 billion, 42 billion, and 34 billion minutes, respectively, in October 2008) (Social, 2009). Users' behaviors as such have even changed the performance metrics used. It was common to cite the number of visits that a web site receives in a given period. But it is more common now to use the "engagement" or "time spent" metrics as we just indicated.

The heavy use of social networking sites is even changing the traditional approach to information organization on the Web:

Google's oft-stated mission is "to organize the world's information." Organizing information is how earlier generations of Web companies have traditionally created value for users, with or without search. But the new game is radically different. Facebook, in particular, has set out to organize not the world's content, but the world's people. As this social meta-Web emerges, the players that own and harness social applications will radically reorganize and reshape the Web in ways we can only imagine today, and that will profoundly alter our experience of the online world. (Social, 2009)

I discussed elsewhere that libraries "must move their resources and services to the network as quickly as possible and restructure themselves accordingly" if they wish "to become virtual destinations in the vast digital information landscape" (Tonta, 2008, p. 8). It appears, however, that it is not enough to become "virtual destinations". More and more Web users "live" their lives online in social networking sites rather than visit library web sites as virtual destinations. Libraries, then, should be accessible from within social networking sites without users' leaving their familiar digital environments (just as Amazon.com is accessible from within Facebook, as we indicated earlier). Libraries, too, should "build constellations, not destinations" by combining "connectivity, communications, and content" (Social, 2009).

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