
Library 2.0 : Innovative Technologies for Building Libraries of Tomorrow*

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Abstract

The concept of Library 2.0 is borrowed from that of Web 2.0 and Business 2.0 and follows some of the same underlying philosophies. Library 2.0 encompasses a range of new and contemporary technological tools and techniques that are used for evolving collaborative environment required for Library 2.0. These tools and techniques can broadly be grouped into five categories, i.e. i) Synchronous Communication: Instant messaging; ii) Content Delivery: RSS Feed, HTML Feed, Streaming Media, Podcasting, Vodcasting and SMS Enquiry Services; iii) Collaborative Publishing Tools: Blogs and Wikis; iv) Collaborative Service Platforms: Social Networks, Tagging, Social Bookmarking Services; and v) Hybrid Applications, Programs and Programming Tools: Mashups, AJAX, API and Toolbar. These tools and techniques are useful for libraries in providing new services and making existing services available in new and interesting ways. Implementation of some of these tools and techniques are likely to improve reputation and standing of libraries in the community. Some of them may successfully attract new patrons to the library, others may help to retain existing members or make libraries even more important as centres of the culture and history of their cities and academic institutions. Some of the new services may remain unused, however, since feedback and public opinion is a vital component of Library 2.0, such services may be abandoned in favour of other services that are better accepted by the users. Some of those changes may be viewed as disruptive, while others may not be feasible or applicable to all libraries. These new services and ongoing changes are likely to make libraries more interesting, more relevant, and better acceptable place.

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Library 2.0 proposes to bring revolutionary changes in libraries that are bound to bring about conceptual, cultural and physical changes in libraries to keep pace with the changes in communities and their information seeking behaviour. Applications of Web 2.0 technologies in libraries will result in a meaningful and substantive change in libraries, its collection, services and methods of delivery of services. The library's collection will change, becoming more interactive and fully accessible. The library's services will change, focusing more on the facilitation of information transfer and information literacy rather than providing controlled access to it. The implications of these revolutionary technologies are enormous and are discussed in the paper.

1. Introduction

The Internet and web technology has changed the way people communicate, interact, acquire, share knowledge, search, investigate and participate in the creation and re-use of content. However, when the Web was created originally, it did not have features and facilities for users to interact. In other words, Web 1.0 began as a platform for businesses and organizations to broadcast information to the people. With evolution in Internet and communication technology, Web 2.0 evolved into a dynamic, interactive and collaborative platform that facilitates exchange of information and knowledge amongst users. These features facilitate integration of people and the Web, and thus is the backbone of the Web 2.0. In Web 1.0 environment, users read what others wrote. However, now Web 2.0 facilitates users to express their views and publish them online through services like blogs and wikis. In other words, migration from Web 1.0 to Web 2.0 is essentially characterized by movement from "read-only" web to "read-and-write" web.

The phrase "Web 2.0" has become very popular. It has found its applications in several spheres of activities, which, in turn, led to evolution of concepts like Business 2.0, Travel 2.0, Library 2.0, Librarian 2.0, etc. As such, the concept of Library 2.0 is borrowed from that of Web 2.0 and follows some of the same underlying philosophies.

2. Web 2.0: Definition

Web 2.0 is the label attached to new capabilities and services offered by the second generation World Wide Web (WWW) that facilitate online collaboration and sharing among users. These capabilities include social networking, wikis, instant messaging and social tagging.

Tim O'Reilly and Dale Dougherty O'Reilly (2005), responsible for coining the term Web 2.0 define it as "applications that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better as more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an "architecture of participation", and going beyond the page metaphor of Web 1.0 to deliver rich user experiences".

3. Library 2.0: Definition

Although one concise definition will never fit Library 2.0, it can loosely be defined "as a model for a modernized form of library service that reflects a transition within the library world in the way services are delivered to users". Library services, in Library 2.0, are constantly updated and re-evaluated to best serve library users. Library 2.0 also attempts to harness the library user in the design and implementation of library services by encouraging feedback and participation. Proponents of this concept expect that ultimately the Library 2.0 model for service will replace traditional, one-directional service offerings that have characterized libraries for centuries (Wikipedia, 2008).

The term Library 2.0, first coined by Michael Casey in 2006 on his blog LibraryCrunch, refers to a number of social and technological changes that are having increasing impact upon libraries, its staff and their clientele, and how they could interact. The application of concepts and technologies of Web 2.0 applied to the library services and collections is named as "Library 2.0". It is a concept that defies new genera of library services geared towards the needs and expectations of today's library users.

4. Tools and Techniques

Conceptually speaking, Library 2.0 is independent of technology given the fact that every library activity designed or built with active participation and feedback of its user community qualifies to the concept of Library 2.0. However, Web 2.0 technologies can help libraries to create collaborative and participative environment that is necessary to deliver user-centric library services and to create new resources and build-upon existing ones using collective intelligence of users. Availability of technologies gives libraries the

ability to offer improved, customer-driven services to their users. Tools and techniques used for evolving Library 2.0 environment can broadly be grouped into five categories as described below:

4.1. Synchronous Communication

4.1.1. Instant Messaging (IM)

Instant messaging or IM, is a form of real-time, virtually instantaneous communication between two or more people using textual format. Libraries are already deploying IM for providing "real-time reference" services, where patrons can synchronously communicate with librarians much as they would in a face-to-face reference context. Software used in libraries for "live reference services" are usually much more robust than the simplistic IM applications. These software often allow co-browsing, file-sharing, screen-capturing, and data sharing and mining of previous transcripts. Libraries are already offering live reference service using IMs 24x7x365 in a collaborative fashion. Libraries can benefit greatly by adopting this technology as it evolves since it facilitates reference services in an online mode quite similar to traditional reference services of the physical library.

The INFLIBNET Centre is using Google Talk for supporting users of SOUL Software. The users of SOUL Software can log on to Google chat at "soulhelp0007@gmail.com" and enter into a chat session with dedicated and qualified team of professionals trained in SOUL Software for resolving their problems in a real-time mode.

4.2. Content Delivery

4.2.1. RSS Feeds

RSS stands for Real Simple Syndication or Rich Site Summary. The technology, on one hand allows a web site (or e-publisher) to list the newest published updates (like table of contents of journals, new articles) through a technology called XML, on the other hand, it facilitates a web user to keep track new updates on chosen website (s). Like a personal search assistant, RSS feed readers visit pre-defined web sites, look for updated information and fetch it automatically on to the user's desktop. It provides users a way to syndicate and republish content on the Web. Users republish content from other sites

or blogs on their sites or blogs, aggregate content on other sites in a single place, and ostensibly distil the Web for their personal use. Such syndication of content is another Web 2.0 application that is already having an impact on libraries, and could continue to do so in remarkable ways.

Libraries are already creating RSS feeds for users to subscribe to, including updates on new items in a collection, new services, and new content in subscription databases. They are also republishing content on their sites.

The INFLIBNET Centre has developed RSS Aggregation Service (<http://www.inflibnet.ac.in/feed/>) on its website targeted to users of UGC-INFONET Digital Library Consortium. The RSS Aggregation Service facilitate RSS feeds to open on the website of the Centre for all electronic journals that are covered in the Consortium and have option for RSS feeds. Resultantly, the users, instead of copying RSS feeds into their RSS Feed Readers, can visit the INFLIBNET website and read the current contents of all the journals subscribed under the UGC-Infonet Digital Library Consortium. These RSS feeds are arranged according to subject categories as well as alphabetically. Moreover, journals covered under the RSS Feed Aggregator Services can also be searched according to the subject category as well as by words in journal titles.

4.2.2. HTML Feeds

HTML feeds are basically RSS feeds converted into HTML codes so as to facilitate peer-to-peer interaction amongst researchers and sharing of RSS search results. The HTML codes can be placed onto the web sites and the resulting HTML feed can be customised to compliment the page. HTML feeds allows quicker access information to visiting users. The Elsevier Science has implemented HTML feeds for Scopus, the citation database from Elsevier.

4.2.3. Streaming Media

Streaming multimedia is sequential delivery of multimedia content over a computer network that is displayed (or played back) to the end-user as it is being delivered by the provider. The streaming of video and audio media is an important application that existed before Web 1.0 and finds its application in Web 2.0 too.

With availability of computer and network infrastructure to support multimedia streaming, library instruction delivered online began incorporating more interactive, media-rich facets. The static, text-based tutorials are being transformed to multimedia-based interactive tutorials. Several tutorials use Flash programming, screen-cast software, or streaming audio or video, and couple the media presentation with interactive quizzing; users respond to questions and the system responds in kind. Tutorials were the first library applications to migrate into more socially rich Web 2.0.

Besides its applications in computer-generated instructions, streaming media would also be available increasingly in its collections. As media is created, libraries will be responsible for archiving and providing access to them. Libraries are already beginning to explore providing such through digital repository applications and digital asset management technologies.

The INFLIBNET Centre uses "YouTube" (<http://in.youtube.com/inflibnet>) to upload multimedia video files. All the events held at INFLIBNET Centre are recorded and the contents are uploaded on to the You Tube for the benefit of the users.

4.2.4. Podcasting

The word "podcasting" is derived from two words, namely "broadcasting" and "iPod" (popular MP3 player from Apple Computer). Podcasting is defined as "process of capturing audio digital-media files that can be distributed over the Internet using RSS feeds for playing-back on portable media players as well as computers. Users can subscribe to such feeds and automatically download these files directly into an audio management program on their PCs. When a user synchronizes their portable audio device with their personal computer the podcasts are automatically transferred to that device to be listened to at the time and location most convenient for the user (Wikipedia, 2008).

A podcast is distinguished from other digital media formats by its ability to be syndicated, subscribed to, and downloaded automatically when new content is added, using an aggregator or feed reader capable of reading feed formats such as RSS or Atom. Several libraries use podcasts to support library orientations programmes. Taking advantage of podcasting and other consumer technologies (e.g., PDAs, iPods and other

MP3 players) as a deliver media of Library's content and services is a great leap forward for library profession.

4.2.5. Vodcasting

The "VOD" in Vodcasting stands for "video-on-demand". It is identical to podcasting. While podcasting is used for delivering audio files, vodcasting is used for delivering video content. Like podcast content, vodcasts content can be played either on a laptop or on personal media assistant (PMA).

4.2.6. SMS Enquiry Service

Short Message Service (SMS) is a mechanism of delivery of short messages over the mobile networks. The SMS enquiry services in a library allow patrons to use their mobile phones to SMS their inquiries to the library. The reference staff deployed to attend to such queries can respond immediately with answers or with links to more in-depth answers.

4.3. Collaborative Publishing Tools

4.3.1. Blogs

A blog (an abridged form of term web log) is a website, usually maintained by an individual, with regular entries of commentary, descriptions of events, or other material such as graphics or video. Entries are commonly displayed in reverse chronological order (Wikipedia, 2008). Blogs are considered as lightweight publishing tools. Blogs provide control to an individual or group of individuals for publishing contents or making commentary on it. Technologically, blogs are easier to use, platform-independent, and accessible online over the Internet. Broadly, blogs can be said to be online dairies, however, thousands of blogs are maintained by experts in different subject areas who are willing to share their knowledge, understanding and opinions with other people. Michael Casey, who coined the term "Library 2.0", for example maintains a blog called LibraryCrunch on Library 2.0.

The most obvious application of blogs for libraries is to use it as a tool for promotion, publicity and for outreach services. Libraries can disseminate information to their users,

make announcements for its new resources and events through its blogs. Blogs can be used to initiate debates and interaction amongst users and staff. Moreover, library staff and user can be encouraged to use Library blogs to get to know each other and interact at personal level.

The INFLIBNET Centre has recently started its blog (<http://www.inflibnet.ac.in/blog>) to encourage interactions amongst users and the INFLIBNET staff. The blog is also being used for promoting activities and services of the Centre.

4.3.2. Wikis

A wiki is a collection of web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language. Wikis are often used to create collaborative websites and to power community websites (Wikipedia, 2008). For example, the collaborative encyclopaedia, Wikipedia is one of the best-known wikis, that has broken down one the golden rules of librarianship, i.e. content validation and authenticity of information. Wikis are also used in businesses to provide affordable and effective Intranets and for knowledge management. Ward Cunningham, developer of the first wiki software, WikiWikiWeb, originally described it as “the simplest online database that could possibly work” (Wikipedia, 2008). Wikis can essentially be equated to open web-pages, where anyone registered with it can publish on to it, add to it, amend it and change it. As in case of blogs, Wikis do not have reliability as traditional resources. In spite of this, their value as information resource cannot be undermined.

Libraries can use wiki as a communication tool to enable social interaction among librarians and patrons. Users can share information, ask and answer questions, and librarians can do the same within a wiki. Moreover, a record of these transactions can be archived for perpetuity. Transcripts of such question-answer sessions would serve as a resource for the library to provide as reference. Furthermore, wikis (as well as blogs) will ultimately evolve into a multi-media environment, where both synchronous and asynchronous audio and video collaborations will take place.

The INFLIBNET Wiki (<http://www.inflibnet.ac.in/wiki/>) provides detailed information on activities, functions and services of the INFLIBNET Centre. Moreover, the users of

the Centre are also encouraged to contribute to the Wiki with their contents and suggestions on our services and activities.

4.4. Collaborative Service Platforms

4.4.1. Social Networks

A social network service is web-based software that facilitates creation of a virtual social networks for communities of people who share interests and activities or who are interested in exploring the interests and activities of others (Wikipedia, 2008). Most social network services are web-based interfaces that facilitate community of users to interact with each other deploying tools such as chat, messaging, email, video, voice chat, file sharing, blogging, discussion groups, etc.

MySpace, FaceBook, Del.icio.us, Frappr, and Flickr are some of the social networking services that are very popular. While MySpace and FaceBook enable users to share themselves with one another (detailed profiles of users' lives and personalities), Del.icio.us enables users to share Web resources and Flickr enables sharing of pictures. Frappr is a blended network that facilitates use of maps, chat rooms, and pictures to connect individuals.

Social networking services could enable librarians and patrons not only to interact, but to share and exchange resources dynamically in electronic environment. Users can create accounts with the library network service, see what other users have in common to their information needs, recommend resources to one another. Besides, libraries can also recommend resources to users through their network, based on similar profiles, demographics, previously-accessed resources, and a host of data that users provide.

The INFLIBNET Centre have a Facebook Page, which includes links of relevant parts of Centre's website, link to RSS aggregation services and search applications.

4.4.2. Tagging

A tag is a keyword or term or subject heading assigned to a piece of information (a picture, a geographic map, a blog entry, a video clip etc.), thus describing the item and enabling keyword-based classification and search of information. Tags are usually chosen informally and personally by author / creator or by its consumer/viewers/community.

Tags are typically used for resources such as computer files, web pages, digital images, and Internet bookmarks (Wikipedia, 2008).

While cataloguing is a fundamental skill of librarians, but the art of tagging is essentially a prerogative of user which enables them to assign keywords to a piece of information or object. The user can define and categorize information based on his or her own perception of given piece of information. In Library 2.0, users could tag the library's collection and thereby participate in the cataloguing process. The best thing about tagging is that everyone is allowed to categorize the information the way they want.

The catalogues of Library 2.0 would enable users to follow both standardized and user-tagged subjects, whichever is more convenient or makes better sense to a user. In turn, they can add tags to resources. The user responds to the system, the system to the user. This tagged catalogue would be an open catalogue, a customized, user-centered catalogue. The University of Huddersfield, West Yorkshire, UK, for example, has introduced Web 2.0 features into their library catalogue and options for rating the books as well as dynamic floor plans showing locations of subject areas with an aim to make the catalogue more interactive tool.

4.4.3. Social Bookmarking Services

Social bookmarking is a method of storing, organizing, searching and managing bookmarks of web sites using descriptive metadata. In a social bookmarking system, users can save links to web pages that they want to remember and /or share with other users. These bookmarks can be made public, or saved privately or shared only with specified people or groups of people. The authorized people can usually view these bookmarks chronologically, by category or tags, or via a search engine (Wikipedia, 2008).

Most social bookmark services encourage users to organize their bookmarks with informal tags instead of traditional browser-based system of folders, although some services feature categories / folders or a combination of folders and tags. These services also enable viewing of bookmarks associated with a chosen tag, and include information about the number of users who have bookmarked them. Some social bookmarking

services also draw inferences from the relationship of tags to create clusters of tags or bookmarks.

itList, Blinklist, Clip2, ClickMarks, HotLinks, del.icio.us, Furl, Simpy, Citeulike and Connotea, Stumbleupon, Magnolia, Blue Dot, Diigo, etc. are some of the popular bookmarking services.

Libraries can make use of social bookmarking sites using RSS feeds for subject disciplines or in areas of specialization relevant to them.

4.5. Hybrid Applications, Programs and Programming Tools

Mashups, Ajax, API and Library toolbar are applications that can be deployed effectively to implement Library 2.0 features into a traditional library.

4.5.1. Mashups

A mashup is a web application that combines data from more than one source into a single integrated tool. Mashup originally referred to the practice in pop music (notably hip-hop) of producing a new song by mixing two or more existing pieces. Content used in mashups is typically sourced from a third party via a public interface or API (web services). Other methods of sourcing content for mashups include Web feeds (e.g. RSS or Atom), and screen scraping. Many people are experimenting with mashups using Amazon, eBay, Flickr, Google, Microsoft, Yahoo, YouTube and APIs, which has led to the creation of the mashup editor (Wikipedia, 2008).

Mashup is a hybrid of blogs, wikis, streaming media, content aggregators, instant messaging, and social networks. Mashups are applications, where two or more technologies or services are merged into a completely new, novel service. Retrivr, for example, merges the functioning of Flickr's image database and an experimental information architecture algorithm to enable users to search images not by metadata, but by the data itself. Users search for images by sketching images. Another example is WikiBios, a site where users create online biographies of one another, essentially blending blogs with social networks.

Mashup in Library 2.0 environment remembers a user when they log in. It allows the user to edit OPAC data and metadata, saves the user's tags, IM conversations with librarians, wiki entries with other users (and catalogues all of these for others to use), and the user is able to make all or part of their profile public; users can see what other users have similar items checked-out, borrow and lend tags, and a giant user-driven catalogue is created and mashed with the traditional catalogue.

There are a number of mashup platforms that can be used to create mashups, e.g. Intel Mash Maker, Google Mashup Editor, LiquidApps, Microsoft Popfly, Serena Mashup Editor, Yahoo pipes, etc.

4.5.2. Ajax (Asynchronous JavaScript and XML)

Ajax (Asynchronous JavaScript and XML), or AJAX, is a group of inter-related web development techniques used for creating interactive web applications. The technology facilitates web pages to interact with users by exchanging small amounts of data with the server "behind the scene" so that entire web pages do not have to be reloaded each time there is a need to fetch data from the server. This is intended to increase the web page's interactivity, speed, functionality and usability (Wikipedia, 2008).

Ajax is a cross-platform technique usable on many different operating systems, computer architectures, and web browsers as it is based on open standards such as JavaScript and the Document Object Model (DOM). There are free and open source implementations of suitable frameworks and libraries.

4.5.3. Application Programming Interface (API)

An application programming interface (API) is a source code interface provided by an operating system, library or service to support requests made by computer programs. Language-dependent APIs are available only in a particular programming language. They utilize the syntax and elements of the programming language to make the API convenient to use in this particular context. Language-independent APIs are written in a way that they can be called from several programming languages. This is a desired feature for a service style API which is not bound to a particular process or system and is available as a remote procedure call. Examples of API are Windows API, Scopus API that enables a user to select Scopus data elements to your own mashups.

A new Application Programming Interface (API) has recently been developed as a front-end to interact with INFLIBNET's union databases for books, serials and theses stored in MS SQL as back-end database using Java, JSP, Servlet, Ajax technologies. The interface also facilitates universities to restrict their searches to their own collections.

4.5.4. Library Tool Bars

A toolbar is a graphical user interface consisting of a panel of buttons, icons, menus or commands that are used more often in an application. Toolbars are used in common applications such as Microsoft Word, and as add-ons for web browsers such as Internet Explorer and Mozilla Firefox. The INFLIBNET Centre has recently developed its tool bar to show-off its e-resources, databases, products and services.

5. Transformation from Library 1.0 to Library 2.0

Traditional libraries maintain their resources, authorities, information on the shelves or behind a login that are known and managed by librarians. Collection (print or electronic) in libraries is catalogued and classified and made accessible through Library OPAC to users to explore. Users are given open access to these resources within libraries, they are also allowed to borrow these resources to be returned for someone else to use. In Library 2.0, however, the content and information can come from the patrons also. Although, traditional libraries maintain manuscripts and unpublished works by local authors and researchers, but it did not have a way to provide a platform to their users to publish their own ideas, thoughts, and experiences. With availability of technological solutions, libraries are now adopting tools and techniques to collaborate with its community with an aim to preserve its collective knowledge and experience.

The librarians, being the earliest inhabitants on the web, following their professional instincts and immediately began to create subject gateways for all sorts of subjects. However, most of what libraries adopted during the early days of Web was static. The Library web sites consisted of a number of static web pages with provision of e-mail-based "feedback". Although, the online public access catalogues (OPACs) facilitate users to search for information, they do not have more dynamic features like Amazon.com offers. Similarly, the first generation of online library instruction was provided via text-based tutorials that are static and do not respond to users' needs nor allow users to

interact with one another. These tutorials are now evolving into more interactive, media-rich tutorials, using animation programming and more sophisticated database quizzes. The librarians and libraries should recognize the fact that Internet and search engines are now the main source of information for users. Instead of trying to change the behaviour of users, the libraries should change its approach and deliver their services through Internet using tools users enjoy the most. Besides, Library 2.0 also recognizes that human beings do not seek and utilize information as individuals, but as communities.

The best conception of Library 2.0 would be a social network interface that a user designs him / her-self. It is a personalized OPAC that includes access to IM, RSS feeds, blogs, wikis, tags, public and private profiles within the library's network. It is virtual reality of the library, a place where one can not only search for books and journals, but interact with a community, a librarian, and share knowledge and understanding with them. Library 1.0 moved collections and services into the online environment, and Library 2.0 will move the full suite of library services into this electronic medium. The library has had a web-presence for many years, and with Library 2.0, its patrons will be joining it.

Some examples of the move from Library 1.0 to Library 2.0 include:

Library 1.0 Services and Applications	Library 2.0 Services and Applications
Digital reference service (email-based)	Real-time reference service using Instant messaging
Selective Dissemination of Information (SDI)	Personalization (RSS Feeds, HTML Feeds, Atom)
Text-based tutorials	Multimedia tutorials (Streaming media)
Mailing Lists, Listservs Catalogue of reliable subscribed print or electronic collections	Blogs and Wikis Catalogue of reliable subscribed print or electronic collections as well as web pages, blogs, wikis, etc.

OPAC	Personalized social network infrastructure
Taxonomies (classification)	Folksonomy (Tagging)
Controlled classification schemes	Tagging
Encyclopaedia	Wikipedia
Content Management System	Wikis, Wikipedia
Information as commodity	Information as conversations
Integrated Library System as core operation	User service as core operation
Address books, Contact lists	Online social networks
Authenticated and validated print and e-resources	Resources created by people through their collective intelligence on blogs and wikis
Delivery mechanism: Library (physical) + Internet	Delivery through Internet using wikis, blogs, podcasting, etc.

6. Conclusion

The concept of Library 2.0 is borrowed from that of Web 2.0 and Business 2.0 and follows some of the same underlying philosophies. Library 2.0 encompasses a range of new and not-so-new technologies tools and techniques used for evolving Library 2.0 environment. These tools and techniques are useful for many libraries in providing new services and making existing services available in new and interesting ways. Library 2.0 also encompasses a set of concepts about library services, several of them are not exactly new. Implementation of some of these tools and techniques are likely to improve reputation and standing of libraries in the community. Some of them may successfully attract new patrons to the library, others may help to retain existing members or make libraries even more important as centres of the culture and history of their cities and academic institutions. These new services and ongoing changes are likely to make libraries more interesting, more relevant, and better acceptable place. However, methodologies, applications and concepts will continue to change within libraries.

Library 2.0 proposes to bring revolutionary changes in libraries that are bound to bring about conceptual, cultural and physical changes in libraries to keep pace with the changes in communities and their information seeking behaviour. Applications of Web 2.0

technologies in libraries will result in a meaningful and substantive change in libraries, its collection, services and methods of delivery of services. The library's collection will change, becoming more interactive and fully accessible. The library's services will change, focusing more on the facilitation of information transfer and information literacy rather than providing controlled access to it. The implications of these revolutionary technologies are enormous. Librarians are only beginning to acknowledge and adopt some of these technologies into their libraries.

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