

Developments in Cataloging and Metadata

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By Shirley Hyatt

Abstract:

This chapter examines some of the transformations occurring in the metadata environment that are impacting libraries, collection managers, and online information providers. After a brief synopsis of some legacy issues, I discuss a few of the trends that are near-future givens. These include growth in the shared networked space and proliferation and movement of communities using that space; an emphasis on simplification; a renewed interest in and ability for collocation; and an increase in modularity and recombination of metadata. I close with a high level overview of research that OCLC is presently exploring related to these trends.

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Developments in Cataloging and Metadata

By Shirley Hyatt

People not involved with cataloging have never really understood or sympathized with the difficulties involved in creating and maintaining a library catalog. In 1674 in his Preface to the *Catalogue for the Bodleian Library*, Sir Thomas Hyde wrote:

“What can be more easy (those lacking in understanding say), having looked at the title-pages than to write down the titles?” But these inexperienced people, who think making an index of their own few private books a pleasant task of a week or two, have no conception of the difficulties that rise or realize how carefully each book must be examined when library numbers myriads of volumes. In the colossal labor, which exhausts both body and soul, of making into an alphabetical catalogue, a multitude of books gathered from every corner of the earth there are many intricate and difficult problems that torture the mind. [Svenonius 2000]

Three centuries later, this hasn't changed. The labor is colossal and the empathy scant. This chapter examines a few issues that continue to bedevil us. It examines some of the transformations occurring in the metadata environment that are impacting libraries, collection managers, and online information providers. After a brief synopsis of some legacy issues, I discuss a few of the trends that are near-future givens. These include growth in the shared networked space and proliferation and movement of communities using that space; an emphasis on simplification; a renewed interest in and ability for collocation; and an increase in modularity and recombination of metadata. I close with a high level overview of research that OCLC is presently exploring related to these trends.

Where we've been: a matter of principles

In 1841, Antonio Panizzi, assistant librarian with the British Museum's Department of Printed Books, published his descriptive cataloging scheme entitled *Ninety-One Rules*. These rules caused an uproar among staff and users of the Reading Room. At the heart of the debate was the British Museum's practice of publishing the catalog as an alphabetized inventory list, ordered by author, and Panizzi's Rules of collecting all manifestations of a particular work through a single main-entry.

“The former cataloging practice viewed books in a library's collection as discrete entities, unrelated to any other book, and so represented in the catalog as unrelated to other catalog entries. Panizzi's view was that a book is a particular edition of a work, a part of a complex web of editions and translations, and that catalog users should be able to see these relationships even as they search for a particular book. [Wilson 2001]

Between 1852 and 1876, Charles C. Jewett, Charles Ammi Cutter, and Melvil Dewey all published their own seminal works in the United States--Jewett the first cataloging code in the United States, *On the Construction of Catalogues of Libraries and of the General Catalogue, and Their Publication by Means of Separate Stereotype Titles: With Rules*

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and Examples; Cutter, *Rules for a Dictionary Catalog*, and Dewey, *DDCI*. All were strongly influenced by Panizzi. Panizzi and his *Rules* prevailed at the time at the British Museum, but the classic dispute has returned several times since.

In the mid-19th century, the industrial revolution ushered in a manufacturing revolution in printing, binding, and book production. “Before 1800, book printing still closely resembled the processes that Gutenberg had used 300 years earlier. By the end of the 19th century, practically all book and newspaper printing had become mechanized, and it was possible to print thousands of pages per hour.” [Wilson 2001] Librarians were unable to catalog the huge amount of new material being produced, much of which they viewed as ephemeral and of questionable quality. Faster, simpler, and less expensive methods of cataloging were preferred. In this context, Panizzi’s *Rules* were viewed as time-consuming and costly. Over the rest of the 19th century, cataloging and its rules moved away from collocation toward something closer to the older concept of describing the item in hand, unrelated to other items. The catalog became, and to a large extent remains, a tool for managing a physical collection rather than a way of presenting knowledge about the collections and the relationships among the items.

In 1908, the American Library Association and the Library Association in Great Britain published *Catalog(u)e Rules: Author and Title Entries*-- in two editions, one for each country, because they could not come to agreement. Marking the beginning of “codification by committee”, it was primarily concerned with the construction of author/title catalogs, case-law style. The principles on which it was based were in fact the everyday practices in American and British cataloging. As a work of practicing libraries, rather than librarian-scholars, it lacked a set of unifying principles. As a result, the rules were complex and difficult to apply—problems that are still with us today.

Seymour Lubetzky, in his critique of the 1949 *ALA Cataloging Rules for Author and Title Entries* made famous the question, “Is this rule necessary?” He contended that the proliferation of rules, with their complexity and specificity, were obscuring the principles and reasons for cataloging.

Lubetzky advocated two main objectives for the catalog: to allow the user to determine if the library has the desired item; and to reveal to the user what other works the library has by a given author, including other editions, manifestations and translations. It is this second principle which links Lubetzky to Panizzi and Cutter. He distinguished between “books”, which are specific manifestations and “works”, which are abstractions of the manifestations. In Lubetzky’s catalog, a user entering the title *Harry Potter and the Sorcerer’s Stone* would retrieve a record that had in it information about all the versions/manifestations of that title—the paperback, the second edition, the spoken word version. The focus is on the content and its description, rather than on a specific physical item. [Wilson 2001]

Lubetzky had sufficient influence to induce dialog and change, but not to overturn the gravitation toward complex, practice-based cataloging aimed at describing specific

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physical items. The ensuing 1967 *Anglo-American Cataloging Rules* did not yield collocation of manifestations under works, especially in its United States version, and subsequent editions have, by and large, followed suit.

Metadata has always been driven by the technologies available. Technologies supporting cataloging were slow to come about in the 19th and 20th centuries. The typewriter notwithstanding, three innovations are key: in 1901, the Library of Congress introduced its program of distributing printed catalog cards to purchasing libraries. No longer did libraries have to bear the total burden and costs of producing their cataloging. This distribution method introduced the concept of cataloging as a commodity for commonly held quality books (“copy cataloging”), and freed librarians to work on more complex tasks of creating handcrafted cataloging unique to the local library, for those items not cataloged by Library of Congress. Nevertheless, it was not without its detractors: some fretted that it would spell the demise of high-quality, handcrafted, handwritten catalog cards.

Secondly, the MARC format was released in 1968 under the tutelage of Henriette Avram at the Library of Congress. It was intended to facilitate the electronic distribution of Library of Congress’s cataloging data for use in computer installations. This standard, which enabled communication of bibliographic data between machines, was pivotal. That it is still in active use 35 years after it became a standard is testament to its robustness and flexibility.

Thirdly, in 1967, Frederick G. Kilgour and Ralph H. Parker were inspired to propose a computerized, shared cataloging system, and an online catalog, and Kilgour was commissioned to do so by the Ohio College Association.

For those of us for whom WorldCat has been a fixture of our working lives, it is hard to grasp the enormous audacity of this recommendation. In 1965, Parker and Kilgour did not have such a system. In fact, no hardware or software existed that could do what was proposed. ...There weren’t even agreed-upon means of communicating bibliographic data between computers because the [MARC] standard had yet to be developed. [Wilson 2001]

Overcoming these challenges, the OCLC service went live in 1971, and has since been leveraged for interlibrary loan, resource discovery by end-users, full-text access, registry services, and many other activities.

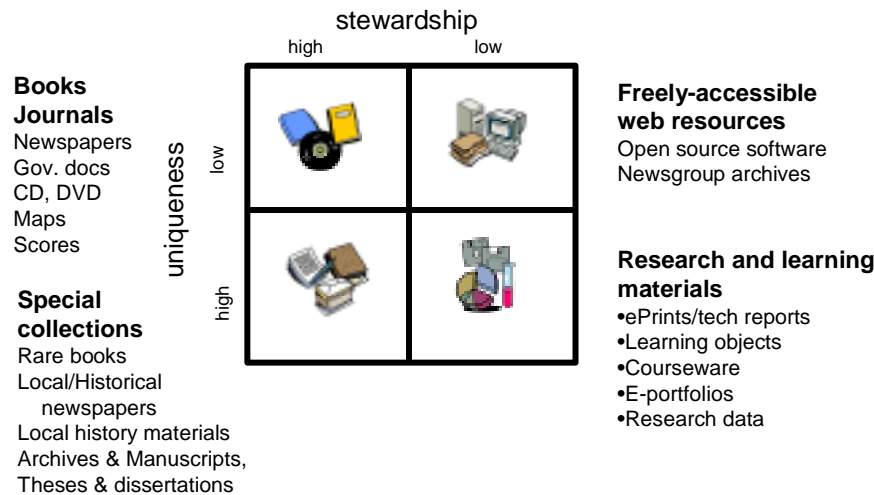
Today, WorldCat has more than 52 million bibliographic records representing nearly 888 million library locations. It is an amazing feat of social engineering: the OCLC system serves as a switching center around which librarians coalesce for distributed input and shared output and is in that sense uncannily “napster-like”. That 43,000 libraries in 86 countries would collectively share costs, labor, intellectual equity, and resources to build and maintain this service reflects a degree of cooperation, collaboration, and community that may be unparalleled among professions and industries.

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Nevertheless, cataloging (including its embodiment as WorldCat), has continued to be chiefly a description of the physical item in hand, and cataloging rules remain complex. Most cataloging processes, too, have remained basically unchanged since the 19th century. It has taken innovations outside of the library-world—introduction of the Internet and hypertext-based Web—to change those processes. With the Web comes the opportunity to transform the catalog record from a surrogate of something, to an essential part of the thing itself. With the Web also comes the opportunity for sharing a network space with many other libraries, many other communities, and many other approaches to metadata creation and structure.

Where we are: a shared network space

Lorcan Dempsey, Vice President of OCLC Research, has developed a schematic to illustrate some changes taking place in the information landscape today. (See **Grid 1.**) [Dempsey 2003]



In this schematic, the *horizontal axis* represents the degree of custodial care that is given by libraries to informational things. Commodity goods and special collections alike are cataloged and indexed, provided climate controlled storage conditions, repaired as needed, and made publicly accessible though a variety of costly methods and systems. Both are found on the left side of the grid. The right side of the grid, in contrast, represents items that are not conventionally given that special “librarian’s touch”: freely accessible Web pages, eprints and preprints, learning objects, and so forth.

The *vertical axis* represents the degree of uniqueness or “published-ness” that informational things have. In this schematic, the upper half contains books—the quintessential published item held by libraries—and other information commodities, and

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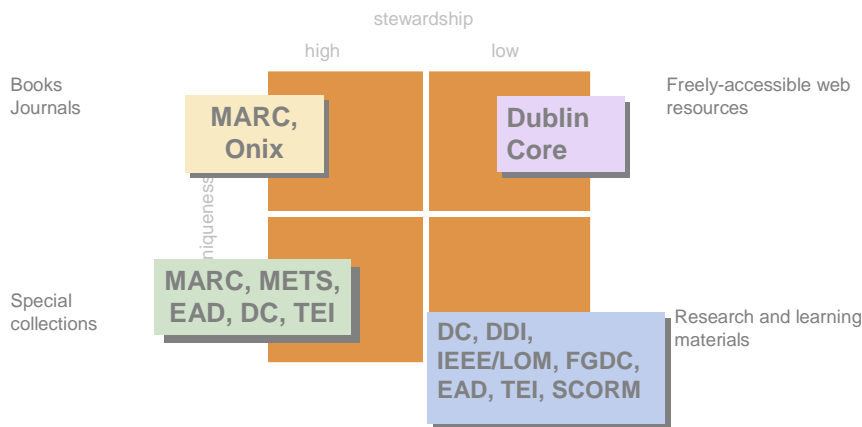
also all that openly-accessible information distributed world-wide via the Web. The lower half of the grid represents those items that are unique and not generally publicly available.

The upper left quadrant—published and highly curated goods--includes such items as books, published CDs, DVDs, albums, scores, videos, journals and magazines, and maps. The lower left quadrant—unique and highly curated items-- includes rare books, archives and manuscripts, local newspapers, local theses and dissertations. The upper right quadrant—widely published but uncurated items—contains freely accessible Web pages, open source software, newsgroup archives. The lower right quadrant—unpublished and undercurated items—contains items such as researchers’ data and lab notebooks, teachers’ curricular materials, eprints and technical reports, courseware, eportfolios and so forth.

It is informative to map the sea changes in the information and metadata landscape, against this grid.

Above the line. The upper left quadrant is a mature quadrant. Library technical processes—cataloging, authority control, material handling—have been oriented toward these sorts of commodity materials. Here libraries are in their element; traditional library metadata technologies like MARC and AACR2 are well-honed. Because these are commodities (identical items owned by many libraries), shared copy cataloging systems offer efficiencies and bibliographic utilities such as OCLC and RLG reign supreme. Google, on the other hand, with its automatic extraction of metadata from the text itself, rules the upper right square at present. Search engines have many problems, but nevertheless provide access that, for some queries, is superior to the traditional library approach. Google may be viewed as trying to push the gridlines down and leftward as they “push the envelope” of their text-search technologies to provide more and better access to today’s hidden web information. This –and costs, and public perception--puts pressure on the upper left quadrant structures.

Below the line. The lower sector is less mature, and is also where the vast majority of digital library activity is occurring. There are a plethora of metadata standards and a diversity of metadata creation practices and approaches. (See **Grid 2.**)



There is growing appreciation among libraries that unique or rare materials are valuable research and learning resources which are underutilized. When resources are not digitally accessible, the chances of their use rapidly decline. Interest in digitizing cultural heritage materials is growing, therefore; doing so offers opportunities for releasing their value in new ways, and promotes, for posterity's sake, a community's identity. At the same time, research and teaching communities (whose output is on the right side) are increasingly entering the network space. Institutions and faculty have an interest in surfacing research, scholarship, and learning materials as part of their enterprise. There are the beginnings of recognition that these communities have reciprocal interests with libraries: library resources need to be available at the appropriate stage within the learning and research environments; web-accessible research and learning items present major management and curatorial issues.

There are many movements to and fro on this grid. Growth within the upper left quadrant, mature though the quadrant may be, continues apace. Endless streams of new formats are entering this quadrant everyday, and for those items that are digital, new material is being added seamlessly as if they were loose-leaf services or serial publications. There is pressure on material in all sectors to become recombinant. Libraries have finite resources. Increasingly attentive to special collections, they are shifting resources and staff from the upper left quadrant to the "below the line" activities. Resources for training, attention to new standards activities, and equipment, are being reallocated from the upper left quadrant to the lower quadrants. Universities and other publicly-funded organizations, eager to leverage their investment in scholarship and education, are investing in "institutional repositories" which gather resources from across the organization into a single "knowledge bank". Digital and hybrid library projects are likewise bringing together discipline-related resources from all quadrants.

Some convergence among quadrants will take place, but these are, after all, different kinds of stuff representing an assortment of human and domain-specific purposes. Convergence is hampered by special needs of the various types of information, different intellectual property constraints, contrasting needs of communities, differing community cultures, and so forth.

In paper-based systems the need for summaries of a library’s collection was obvious—there were few other ways to make physical material available, and the only way to make physical resources available to remote users. [Jordan and Hickey 2001] It is sometimes presumed that with the Web and its marvelous Google-style free-text searching, structured, formal metadata created by metadata experts based on rules and principles is outmoded. Who can afford it? Who needs it? Can’t we just get everything digitized and let Google take care of our retrieval? (“*What could be more easy...?*”)

As Amazon has proven, and proven to both publishers and libraries: in a shared networked environment, we actually have to know a good deal of “metastuff” to retrieve information. We need metadata about what sort of stuff it is, what format it is in, what it looks like, its technical properties, rules for using it, e-commerce information, marketing data, etc. We cannot *not* have metadata. People need and want metadata. Furthermore, users want to *supply* metadata. Here, Amazon has again proven the value of pictures and excerpts, of peer reviews, user supplied content, and commerce ratings. In the online environment, a data representation of the object *is* the object, and the community of users who supply metadata are your *best* customers, your heaviest users.

Metadata is most useful when:

- There is nothing explicit in the document that can give the information
- When you actually need additional information e.g. type of document, structural information
- When people have to manage their collection inventories
- And of course, when the information is itself physical. Physical things must have metadata to serve as a bridge to, a surrogate on behalf of, the information seeker.

There has been a traditional tension between quality of metadata and the cost of producing it. As the quantity of information to be analyzed and described goes up, so does the overall cost of metadata creation and maintenance. Efficiencies have to be found to contain costs, which means compromises have to be made about quality. While information stewards tend to insist that bibliographic descriptions must be accurate or they are no good, clearly metadata has to be cheap and good *enough*.

Where we’re going: making data work

In the midst of this change, several trends are emerging, and OCLC is conducting research in these areas in conjunction with other information science organizations. This is a brief synopsis of selected trends and research.

Simplicity. Traditional library cataloging has always been relatively expensive to create and to maintain. It involves providing a detailed description of the item in hand, determining the people and organizations involved and checking these against authority files, and identifying the relationships that the item has with other items. As "below the line" information joins the shared network space, it requires new forms of metadata. This fuels the need to reduce costs while concurrently providing opportunities for cost reduction.

When the materials described in a library's catalog are directly accessible to a user from his/her computer terminal, the need for elaborate description is obviously less than that needed for physical materials which may take hours, days, or even weeks to obtain. In other words, as the cost to view items declines, less descriptive information is needed for users to make an informed decision before attempting to view it. For much material in digital form the cost is often simply that of clicking on a URL and waiting a few seconds for a display. When this level of access is obtained, even bibliographic information such as the item's relationship with other items (e.g. what series or larger work it is part of) becomes less important because the item itself can often answer such questions. [Jordan and Hickey 2001]

In this environment Dublin Core is significant. Dublin Core is the outcome of a workshop held in 1995 by OCLC and the National Center for Supercomputing Applications (NCSA) at which the participants explored simpler ways of describing the wide variety of resources held by various organizations including libraries, museums, archives, governments, and publishers. Participants proposed a core set of metadata elements for describing web-based resources for easier search and retrieval. The resulting Dublin Core is a 15-element set intended to emphasize retrieval, as described above, rather than description. It facilitates discovery of electronic resources and enables interoperability between metadata repositories. To this day, OCLC is a key supporter of the Dublin Core Metadata Initiative and remains the host of the DCMI directorate. [DCMI, 2003]

Another response to the need for simplification is OCLC's Faceted Application of Subject Terminology (FAST) project, based on the Library of Congress Subject Headings schema (LCSH). LCSH is by far the most commonly used and widely accepted subject vocabulary for general application. It is the *de facto* universal controlled vocabulary and has been a model for developing subject heading systems by many countries. However, LCSH's complex syntax and rules for constructing headings restrict its application by requiring highly skilled personnel and limit the effectiveness of automated authority control. To make bibliographic control systems easier to use, understand, and apply, OCLC has modified the LCSH with a simpler syntax. FAST retains the very rich vocabulary of LCSH while making the schema easier to understand, control, apply, and use. The schema maintains upward compatibility with LCSH, and any valid set of LC subject headings can be converted to FAST headings. [OCLC 2003]

Both Dublin Core and FAST are presumably usable by non-metadata professionals (non-catalogers) and even by authors as opposed to 3rd party information professionals.

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A return to emphasis on collocation. In 1998, the International Federation of Library Associations and Institutions (IFLA) studied information-seeking needs of users to develop a new framework for bibliographic catalogs. The outcome of this study is the Functional Requirements of Bibliographic Records (FRBR) model, a set of recommendations to restructure catalogs to reflect the conceptual structure of information resources.

The FRBR model specifies that intellectual or artistic products include the following types of entities:

- **the work**, a distinct intellectual or artistic creation
- **the expression**, the intellectual or artistic realization of a work
- **the manifestation**, the physical embodiment of an expression of a work
- **the item**, a single exemplar of a manifestation.

A **work** is realized through one or more **expressions**, each of which is embodied in one or more **manifestations**, each of which is exemplified by one or more **items**. In traditional cataloging, bibliographic units are described out of context. With the FRBR model, the items must be described in context sufficient to relate the item to the other items comprising the work. [IFLA Study Group 1998]

Having resources brought together under the "works" umbrella will help users sift through the myriad information resources available digitally. It will help them acquire the *work*, or content, that they are looking for, irrespective of the specific “container” the content is carried in.

Widespread adoption of FRBR will require major changes to bibliographic databases, including WorldCat. OCLC’s research group has been investigating the feasibility and cost of automatically converting large databases to the FRBR model. The techniques and approaches developed by OCLC researchers should facilitate conversion of WorldCat, and possibly other bibliographic databases, to FRBR standards. OCLC has undertaken a series of experiments with algorithms to group existing bibliographic records into works and expressions. Working with both subsets of records and the whole WorldCat database, the algorithm OCLC developed achieved reasonable success identifying all manifestations of a work. Experience from the projects has resulted in recommendations about how FRBR should be evaluated and implemented in large databases.

If successful—and we believe it will be—this allows the library community to implement Panizzi’s original principles, at least to the manifestation level.

Growth in the shared networked space. As described above, there is much proliferation and movement among communities using the Web.

As a result, there has been a call to fuse metadata from one repository with that other repositories. The Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH, aka OAI) is a standard to allow locally created metadata in a variety of formats to be

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shared. It is low-barrier interoperability specification for recurrent exchange of metadata between systems. Institutions that want to share metadata make their metadata available for harvesting by placing it in an OAI server which can respond to requests to send all or part of the file. The metadata can either be sent in its native format or in Dublin Core. (The Dublin Core version makes it easier for harvesters of the metadata to consolidate it into federated databases.) The data provider may register its availability on OpenArchives.org so that OAI harvesters know it's there. The important point here, though, is that OAI-PMH “includes a mechanism to indicate that the metadata on this server has changed, allowing harvester programs to keep the federated site up-to-date. This gives the creator of the metadata a great deal of control over the metadata.” [Jordan and Hickey 2001]

OAI is being used by preprint and e-print archives, digital libraries, institutional repositories, and intranets. Anyone requiring integration of information stored in diverse locations can use OAI to collocate the metadata. There is growing interest by search engines in using OAI to make hidden web resources available.

OCLC Office of Research has developed three OAI components, which are available as open source software:

- an OAI harvester (software that anyone can use, by installing it in front of their service, to harvest data from other organizations' OAI repositories)
- an OAI server (software that anyone can use, by installing it in front of their legacy repository, to make their data available to harvesters). OCLC's server software is called OAICat. MIT and Hewlett-Packard Lab's D-Space product incorporates OCLC's OAICat package as its OAI server.
- databases. Using OAI, OCLC has built the world's largest collection of metadata for theses and dissertations. This repository contains over 4.3 million records and is one of the largest OAI repository in existence. It is itself available for harvest by other organizations. The database is called XTCat (Experimental Thesis Catalog). Several other OAI databases are also available.

OCLC has also been exploring the application of standardized vocabularies—authority control and Dewey Decimal Classification numbers—to harvested records in the ePrints UK project; and has been actively engaged in digital learning and teaching initiatives.

Machine to machine web services. As more participants enter the metadata arena, libraries are creating more metadata for more types of material. They are using different formats, and often different systems. There is also an interest in harvesting metadata and in fusing it with metadata from other repositories into a “union catalog”. Such metadata may not have been created within a framework of consistent practice. Metadata will be required to “work harder”, serve multiple masters, serve multiple purposes.

OCLC is exploring the use of “Web services” to provide functionality in support of these metadata needs. Web services are modular Web-based machine-to-machine applications that use the HTTP protocol and return XML and that can be combined in various ways.

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"These services can be woven into people's workflow and diverse systems. ...They are deliberately discrete and the intention is that they may work together in various ways."
[Dempsey 2002]

Some of the functionality OCLC is exploring include building services that take a record from one format (Dublin Core, perhaps) and return it in another format (MARC); that take a document and return a classification number or authority record; that take a name and return candidate matching authorized headings; that enrich a record with data from other records for the same item, and so forth.

Key elements to this approach are the notions that these services are intended for machine-to-machine interfacing; that they are modular (OCLC is learning to decompose services that users can build back up within their own environments and workflows); and that they are small but versatile (a function may be equally useful in two quite different environments).

In the juggernaut advance of automation, the issues of the burgeoning growth in and sharing of the network space, collocation, simplification, and metadata reuse, will doubtless be appeased, but not eradicated. Though problems remain intricate and difficult, hopefully every iteration of these issues lessens the burdens of cataloging and reduces their "colossal labor". And, while cataloging may never be fully understood, perhaps it will be more fully appreciated by those who consult the emerging knowledge maps that are being created by the cartographers and techniques of the digital age.

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About the contributor

Shirley Hyatt is currently Communications and Business Transitions Director of the Office of Research, OCLC Online Computer Library Center, Inc., USA. Her responsibilities include recognizing the potential of technologies and innovations, and ushering them into OCLC's development and marketing environments. Prior to joining OCLC's Office of Research, Ms. Hyatt served as Director of Distributed Systems, and Manager of OCLC's Access Services product line. Shirley has over 20 years' experience in library access services. She holds an MA in Philosophy from Notre Dame University, an MLS from Case Western Reserve University School of Library Science, and a BA from John Carroll University.