

# The Future of OpenURL Linking

## *Adaptation and Expansion*

### **Abstract**

*Previous chapters in this report have addressed the continuing importance of OpenURL linking in libraries and presented interface-based and data-based ways to improve local OpenURL link resolver systems. This chapter explores issues pertinent to the continued and expanded adoption of OpenURL and other linking technologies, with an eye toward incorporating the shift in library collections from ownership to access and our users' growing desire for instant access to online full text.*

OpenURL link resolvers are a staple service of academic and other libraries. In 2009, approximately 100,000 SFX menus were presented to EKU users. Of these, approximately 62,000 (62 percent) included full text targets, about 50,000 (80 percent) of which were clicked. These statistics reflect the fact that EKU relies heavily on native full text on the EBSCOhost platform to satisfy the majority of user needs. In 2009 at CUC, approximately 283,000 of about 422,000 Serials Solutions-based searches (67 percent) came through its 360 Link resolver (up from 61 percent in 2006). The remaining requests came from the A-Z list (26 percent) and the OPAC (7 percent). These figures prove that OpenURL is the main means of library-based access to journal content at CUC. Furthermore, they represent overwhelming evidence that CUC users have shifted to dependence on the linking functionality provided by the OpenURL resolver in a relatively short period of time.

Despite this growing dependence on OpenURL, investment in its ongoing development and optimization by both vendors and libraries seems to have waned in the past few years. It is our hope that as next-generation discovery tools increase the importance of OpenURL

effectiveness, libraries and vendors will approach OpenURL with renewed interest and vigor.

In this chapter, we present an overview of the emerging trends and technologies that may guide the ongoing development of OpenURL resolvers as they adapt to changes in the research environment and expand to serve the wider Web.

### **Adapting to Changes in the Research Environment**

#### **Access versus Ownership**

Online accessibility of metadata and full text content has resulted in a fundamental change in user expectations and a concomitant adjustment in library collection-building principles.<sup>1</sup> As users discover globally distributed content and grow to expect instantaneous access, libraries are transitioning from limited “just-in-case” local collections to “just-in-time” access to a wider range of content. This shift toward access over ownership has profound implications for OpenURL linking functionality.

OpenURL resolvers were originally designed to ask this question: Does my library own this item, and, if so, how do I obtain it? The shift toward an expectation of instantaneous access and away from ownership changes the question to these: How do I get this item? And how long will it take for me to do so? Resolver menus have already adapted to this change to some degree by linking to Google and interlibrary loan or document delivery, but further change is needed to meet user expectations more effectively.

Ideally, instead of listing services through which an item can be acquired, resolver menus should indicate

the delivery time for each available format. For example, instead of advising users, “Request this article via Interlibrary Loan,” they should read, “Deliver this article in three days or less,” as appropriate. Also, in keeping with an instantaneous, access-based approach, resolvers should be configured to support unmediated pay-per-view access to appropriate journal article collections whenever this service can be offered.<sup>2</sup> The ideal resolver menu for books would search locally available catalogs and present holdings, availability, and delivery information as well as interlibrary loan request links, where appropriate. Libraries participating in patron-driven print book acquisitions or with print-on-demand book machines could bring these options to the resolver as well.<sup>3</sup>

### Alternate Content Types

An increasing amount of research and scholarly work depends on communication in alternate formats. These range from conference proceedings and datasets, to audio and visual files, even to administrative and other non-scholarly content. The structure of the OpenURL standard is inherently flexible enough to accommodate these formats, but the resolver knowledge base is not. This suggests a general principle that should guide the future of OpenURL: use only when necessary.<sup>4</sup> In other words, OpenURL should be applied only to situations and content types that experience the appropriate copy problem.<sup>5</sup> When a static link or even a specific Web search will do, it is often preferable. The appropriate copy problem does not exist for content that is available in only one place (e.g., datasets) or content that is freely available to all and therefore appropriate for all. Practical reasons, however, tend to drive the use of OpenURL for freely available and other less apposite content: it is currently the only hook into proprietary source databases that libraries can control.

Libraries face a growing appropriate copy problem due to the wide variety of platforms that host electronic books. One simple improvement is to ensure that our e-book provider platforms are made to be OpenURL-compliant sources. Source OpenURL functionality is arguably more important for e-book platforms than for e-journal platforms because, unlike for journal content, e-book restrictions and usability issues often drive users to want to borrow or buy a print copy. Furthermore, OpenURL is necessary to enable easy navigation from a digital-rights-restricted copy of a book (e.g., partial access, no download, or limited printing) to a version with no DRM restrictions (i.e., on the publisher’s site). As of this writing, the only one of the “Big Five” e-book platforms used in libraries that supports OpenURL is Google Books, via its “Find in a library” link to OCLC’s Worldcat.org.<sup>6</sup>

E-books present some unique challenges for OpenURL resolver knowledge bases and vendors. Because most books are not serial publications, they

have to be represented at the individual book level. Thus there are roughly two orders of magnitude more potential book records than serial records (approximately 20 million books versus 200,000 journal titles).<sup>7</sup> Although books have standard numbers assigned to them as journals do, books often have several ISBNs assigned to different physical and electronic manifestations of the same work, where journals only have one commonly used, comprehensive identifier (print ISSN). OCLC’s xISBN has the potential to be a major help here, but the challenge of deciding the appropriate level of distinction between intellectual works is not easy to solve. This next phase of knowledge base building is necessary though, and differs from the first phase in that it is taking place after library link integration into Google Books and Google Scholar.

### Interoperability/Data Exchange

The library’s webpage is a fractionated portal to hundreds of disparate resources that we try to get our users to take advantage of.<sup>8</sup> Users have had to go to different search tools to access books, e-books, journal articles, patents, and so on. We present long lists for our users to navigate: lists of citation databases, individual e-journal titles, e-journal collections, primary resources, library catalogs, digital libraries, institutional repositories, and more. Google’s broad and deep reach has made the “library way” an increasingly harder sell. Proxy access, OpenURL, and now unified discovery tools have made some headway in addressing these issues, but we still have a long way to go.

In essence, libraries are struggling to overcome the difficulties inherent in this world of disparate online information silos. In a print-dominated world, local silos were necessary; the collections a library had on hand largely determined the universe of items available to its users. As online content and access become the norm, physical limitations on collections begin to fall away, but information silos proliferate. Because such is the case, we still have to repeat the mantra “You need to go to the library (webpage) to search for this . . . or access that.”

Web services and application programming interfaces (APIs) allow data to be pulled into catalogs and resolvers from external sources. The use of these tools reduces the need to search multiple locations as well as limiting dead ends. These tools are still constrained to the exchange of small amounts of data per transaction, and there is increasing demand for “best in class” services to provide localized, up-to-date access to the entire scope of a library’s holdings. There are Ex Libris customers who want to implement Serials Solutions’ Summon, Serials Solutions customers who want to integrate ExLibris’ bX; and Innovative Interfaces customers who want to present a different vendor’s catalog discovery layer. These scenarios are difficult to impossible at this time, as libraries

cannot successfully maintain multiple versions of their knowledge base or catalog, and vendors are slow to make their customers' data fully available and interoperable to each other. Labor-intensive workarounds to these challenges abound, but are ultimately unsustainable.

One bright spot in this landscape is the general recognition that more effective sharing of holdings data would be to everyone's advantage. Scholarly Information Strategies explored the concept of a "centralised" approach to knowledge base production in a report commissioned by UKSG in 2006.<sup>9</sup> This model would "revolve around a single repository of content definitions and packages . . . that would be publicly accessible to all who desired to use it." Although such a solution would not address local customization, it would free up significant resources currently being devoted by each vendor to create the underlying knowledge base for their own products. Personal conversations with management personnel from Serials Solutions and Ex Libris have confirmed that they would welcome the opportunity to redirect these resources into other means of improving their resolvers' functionality. It is our hope that the increasing demand for seamless exchange of library holdings will lead to a greater willingness to support regular exchange of knowledge base data in an interoperable format.<sup>10</sup>

### Disaggregation of Content

Knowledge bases were designed to describe journal holdings. Journals are naturally aggregated at three levels: articles within issues within volumes within titles. Web access is enabling disaggregation of this content: individual articles are regularly available and discoverable outside of their traditional contexts. Author webpages, institutional repositories (e.g., Harvard's DASH), open archives (e.g. PubMed Central or arXiv), and author-choice open access (where authors can pay a fee to make their articles freely available within a for-fee journal) are making millions of individual articles available in a way that cannot be described at the issue level or above.

Knowledge bases, as they are currently constructed, are incapable of representing "holdings" at the article level. This limitation to knowledge base granularity has necessarily resulted in resolvers relinquishing linking of disaggregated content to Web search tools like Google. As noted above, this is not necessarily a drawback, as this content does not suffer from the appropriate copy problem: its universal accessibility makes it appropriate for all. However, successful integration of search-engine access to this content into resolver menus is an ongoing challenge (see chapter 3).

### Complementary Systems

When referring to OpenURL's direct "competition" in

library instruction sessions, one of the authors of this report often refers to the ever-growing number of static links as "fast and dumb" and OpenURL links as "slow and smart." PubMed and Google Scholar, for example, have links that go directly to publisher content, whether it is licensed or not. These static links are preferable when the content is available, but are a dead end when the content is not. These links are necessary for independent users and users whose library does not have an effective resolver.

Since static links inherently point to a single location, OpenURL links are necessary to provide users access to non-publisher-direct content from aggregators or on the open Web. As such, libraries should seek to complement these static links with resolver functionality whenever possible. In the same vein, resolvers should be altered to include static links whenever they are the most appropriate (or only) way to access the content. This perspective, then, reflects a common theme of this report: resolvers must provide access to as broad a range of content as possible as accurately as possible, lest our users lose faith in their utility.

DOI, the Digital Object Identifier, was developed about the same time as the OpenURL. DOI linking depends on a linking service called CrossRef, which is a registration agency of the International DOI Foundation. DOIs are a way to assign persistent unique identifiers to online objects and can be one piece of metadata transported in an OpenURL. In a sense, a DOI is a hybrid between a static link and a knowledge base-driven OpenURL link. They improve on static links because they are stable persistent identifiers. They are similar to OpenURLs in that they depend on a directory of content. The DOI directory contains the DOI, citation metadata, and item URL. Publishers can update the item URL at any time when the address of the object changes. It is important to note, however, that CrossRef does not maintain library knowledge base data.<sup>11</sup>

Libraries use the DOI/CrossRef system in two main ways: to retrieve DOIs that are integrated into their resolver menus, thus providing a direct link to publisher's full text, and to retrieve the bibliographic metadata for a known DOI.<sup>12</sup> Unfortunately, the implementation of the first case, as tested by the authors, leaves much to be desired. CrossRef links to publisher full text failed 25 percent of the time and were redundant in nearly every other case (see chapter 3). However, an extension of the second case is of crucial importance in a way not previously recognized by the authors. CrossRef has provided a means whereby DOIs on the Web can serve as source URLs, enabling OpenURL linking from the content cited in papers hosted by hundreds of publishers. We describe this functionality in detail below. It is important to emphasize that CrossRef/DOI functionality is a complement rather than an alternative to OpenURL. It cannot address the appropriate copy problem without referring to the library

knowledge base by means of an OpenURL resolver.<sup>13</sup>

### Seamless Connectivity

One vision of the ideal future of OpenURL link resolution involves its continued progression from foreground service to background functionality. It should, perhaps, be our goal to render as *few* resolver menus as possible, replacing them with one-click direct linking to the best full text version available. As discussed in chapter 3, this functionality is currently available from both major resolver vendors, although its breadth and reliability need improvement.

Another ideal complement to one-click delivery of full text would be indication of full text availability via the resolver button in the source database. There are two levels of possible functionality here. First, as the button is being rendered, the source database could query the resolver knowledge base for full text availability and insert a “get full text” version of the button whenever it finds a match, instead of the standard resolver button. Similar functionality is built in to the Ex Libris MetaLib results set; this highly desirable feature should be implemented for other sources wherever possible. The authors hope that a future iteration of link resolver software or its successor will confirm full text access before providing links to the user.

This vision and functionality have been realized in Pubget, the first implementation of an OpenURL-based “pull” technology in a search tool. Back in the early days of OpenURL, it was magical just to be able to follow the path from result or citation to full text (in any number of steps) without having to manually translate citation metadata. The next generation of OpenURL integration may obviate the need to follow a path at all, inserting full text into the search process, rather than requiring users to leave the search interface to hunt for full text (which may or may not be available to them).

*Pubget*

<http://pubget.com>

Rather than pushing the user out to the full text via a bewildering (or at least distracting) plethora of paths, Pubget pulls in PDFs and colocates them with the search result list. At first blush, Pubget’s website seems to provide a magical service, free to not-for-profit organizations,<sup>14</sup> complete with all the secrets that make magic what it is. Behind the scenes, it is a knowledge base- and resolver-driven service that reduces the number of steps from discovery to delivery to zero (when the PDF is available).

Of course, Pubget has its limitations. The universe of 25 million citations it searches consists only

of PubMed, ArXiv, and JSTOR records. Like any link resolver, Pubget’s accuracy is limited by the quality of the knowledge base on which it’s based. Some Pubget libraries’ knowledge bases were found to have accuracy levels as low as 70 percent (Madeline Abrams, personal communication, July 14<sup>th</sup>, 2010). The company is actively developing strategies to increase library-level knowledge base accuracy by augmenting its version with library-specific, direct-from-publisher access lists. As of March 2010, Pubget chose to stop accepting new customers, instead focusing on the accuracy of PDF retrieval for its current 220 libraries. The impact of Pubget for libraries is still uncertain, but it does provide us a glimpse of a future where link resolvers function completely behind the scenes.

### Expanding the Reach of Reference Linking: OpenURL on the Web

An increasing amount of research starts with Web search engines.<sup>15</sup> Even research that starts at a library website or citation database quickly gets funneled away because such a high percentage of content is hosted beyond the libraries’ domain. As users conduct more research on the open Web, it has become crucial for libraries to ensure that users have access to high-quality, library-funded content from the place where they spend the majority of their research time.

OpenURL resolver functionality has yet to establish a significant presence outside of proprietary library indexes. Google Scholar, PubMed, Google Books, and Open WorldCat are the major exceptions to this blanket statement, yet compared to the Web as a whole, even these behemoths are quite small. The most significant challenge in the future of OpenURL is expansion onto the Web. The range of this expansion must include both the bibliographies of full text items contained in library-funded collections *and* citations and bibliographies available on the open Web.

The technological infrastructure necessary to support an expanded reach of OpenURL already exists; its greatest challenge is adoption and implementation. Two requirements must be met to enable OpenURL linking from citations on the Web. The citations must be coded with OpenURL-compliant tags or DOIs, and Web browsers must be extended to identify these codes and insert an affiliation-aware resolver button. The following three sections describe existing technology that supports these requirements and offer specific suggestions for meeting them.

#### Enabling OpenURL Linking from DOIs on the Web

CrossRef has registered more than 40 million metadata

records for scholarly items.<sup>16</sup> Many of these items are cited in multiple places on the Web. Libraries can facilitate access to this content from any or bibliography or webpage that includes DOIs.

The default behavior of DOI links on the Web is to direct users to the publisher's full text. In many cases, users will not be authenticated for this access, either because they are working outside of their library's network or because their library does not license access to the publisher version of the item. Libraries have the option to configure the CrossRef server to send DOI requests through their library's link resolver rather than directly to the publisher full text.<sup>17</sup> To accomplish this, a library registers its resolver base URL with CrossRef. Once it does so, a persistent cookie is downloaded that contains the URL for the local resolver server. This cookie enables OpenURL for DOIs within the browser, which will lead the CrossRef system to redirect DOI requests to the local resolver. The local link resolver then receives the metadata needed for link resolution, either from the source of the link or from the CrossRef DOI directory. Unfortunately, neither of the authors can vouch for the effectiveness of this service, as we have yet to implement it at either of our institutions, although we can test it through LibX-enabled right-click context menus (see the section "Leveraging COinS Coding," below). Since this configuration replaces direct linking with resolver-based linking, it will be important for libraries to confirm that activating it will increase full text access for users. Ultimately, the extensive reach of this service into the bibliographies of millions of articles on the Web will justify its implementation.

### ***COinS to Enable the Web Where DOIs Aren't Present or Available***

COinS is an acronym meaning "Context Object in SPAN" and is a way for Web content creators to embed citation information into any webpage using an HTML <SPAN> element. Users must install software such as LibX or OpenURL Referrer to make a browser COinS-aware. When the browser is operating from within an IP range or proxy server IP that is registered with OCLC's WorldCat Registry, it will automatically be directed to the library's local link resolver. When a COinS-aware browser encounters a COinS <SPAN> element, it places a resolver button in place of the code. Thus, COinS is a way to create OpenURLs that are tied on the fly to a specific resolver each time an HTML page containing COinS code is served. With COinS, a resolver button can appear anywhere there is coded citation data. COinS is currently utilized by reference managers (including RefWorks, Zotero, and Mendeley) and by a few publishers, and is embedded in PubMed,<sup>18</sup> WorldCat records, and many Wikipedia pages.

COinS code looks like this:

```
<span class="Z3988" title="ctx_ver=Z39.88-2004&rft_val_fmt=info%3Aofi%2Ffmt%3Akev%3Amtx%3Ajournal&rft_id=info%3Aid%2Focoinfo%3Agenerator&rft.genre=article&rft.atitle=Linking+and+the+OpenURL&rft.title=Library+Technology+Reports&rft.stitle=LTR&rft.issn=0024-2586&rft.date=2006&rft.volume=24&rft.issue=1&rft.spage=1&rft.aulast=Grogg&rft.aufirst=Jill&rft.au=Jill+Grogg&rft_id=info:doi/10.1108%2F00330330910978581">
```

(descriptive text, or remove so that only the resolver button displays)

```
</span>
```

It is easily generated and embedded into any library webpage.<sup>19</sup> This is useful for institutional repositories, faculty profile pages, and learning management systems, as well as for library blogs, wikis, and new book lists. COinS support is also being built into open source systems used in various libraries such as Drupal modules, the open source next-generation catalog software Scriblio, and the popular blogging platform WordPress. We strongly encourage libraries to invest effort in providing services to their faculty by embedding COinS code in strategic places. COinS coding of publications listed on faculty profile pages will make it easier for researchers and prospective students to find a copy of the item that is available to them. COinS coding of items deposited in institutional repositories facilitates access to an authoritative copy of manuscripts and preprints.

### ***Leveraging COinS Coding: Key Browser Extensions***

The COinS extension with the most impact on library researchers is a browser extension called LibX. Developed at Virginia Tech by Annette Bailey and Godmar Beck, LibX comprises several parts that together make for a powerful research experience. In addition to COinS support, LibX facilitates searching the library catalog, electronic journal list, and other resources from a toolbar or from the right-click context menu; ISSNs and ISBNs found on any webpage are linked to a library catalog search; any webpage can be reloaded through the library's proxy server; there is support for drag-and-drop Google Scholar searching; and visual cues linked to the library catalog

are embedded in Amazon.com and other websites. LibX is currently available for Firefox, Internet Explorer, and Chrome and requires local installation.

OpenURL Referrer is a much simpler extension that is available for Firefox and Internet Explorer, but it is not compatible with the latest version of Firefox (3.6.8) at the time of this writing. Furthermore, its resolver functionality is less favorable than LibX in that the resolver buttons are not locally branded and require more clicks to get to full text.

COinS is also utilized by reference management software—EndNote, RefWorks, Mendeley, and Zotero, to name a few—making it easy for a researcher to return to the full text of any item as provided to him or her by the library from its collection of references.

These programs support download of tagged citations via an icon in the address field or toolbar or via bookmarklets. Bookmarklets can extract citation metadata from COinS- or DOI-coded pages and will even create a less structured webpage citation for pages with scant metadata. Pubget has extended bookmarklet functionality to direct PDF retrieval, allowing users who don't use reference management software to retrieve PDFs from abstracts in PubMed.<sup>20</sup>

## Other Linking Initiatives

As has always been the case with the Web, OpenURL is not the only linking technology, but it does solve a particular problem, that of connecting and uncovering sometimes-hidden library holdings. Other linking initiatives that may influence the future of article and other item linking in the library landscape include the Semantic Web and microformats.

### The Semantic Web

The Web as we know it today consists of links that work and break instantaneously and that carry no indication of the relationship between one object and another. Information on the Web today is still largely text-based rather than based in machine-readable data. Simply put, humans can derive meaning from the words on a webpage, but computers cannot. The phrase *Semantic Web* encompasses efforts to create a framework for bringing machine-readable meaning (semantics) to the Web.

Efforts to bring bibliographic data into the Semantic Web are described succinctly and accessibly by Karen Coyle in her two *LTR* issues, “Understanding the Semantic Web: Bibliographic Data and Metadata” (January 2010) and “RDA Vocabularies for a Twenty-First-Century Data Environment” (February/March 2010). While it is easy to envision the application of the Resource Description and Access cataloging rules

in physical libraries as they exist in the early twenty-first century, it is less clear how RDA might extend to apply to and help retrieve items not necessarily collected individually in a library, yet available and desired by our online users: articles, book chapters, dissertations, proceedings, datasets, audio, and video. Regardless of this lack of clear path, putting our bibliographic data in a machine readable framework that is more “data-like” than the current, text-heavy MARC format is a step toward making that data available for use by nonlibrary entities on the Web.<sup>21</sup>

### Microformats

Microformats constitute one effort to add structure and machine-readable context to information contained in webpages. At this time, software must be added to the Web browser so that microformats can be seen. The Operator plugin for Firefox creates a toolbar that pulls out Contact, License, Event, and other microformat data and can export or send it as a search to other websites. There are also extensions for Chrome, Safari, and Internet Explorer, though the Chrome extension detects and displays only the hCard microformat at the time of this writing.

A draft specification of the Citation microformat exists. It is similar to COinS in that a microformat can easily be embedded in any HTML page for others to use. Karen Coombs writes that COinS and the Citation microformat differ in that the latter will “break the data down into component parts to make it more flexible” rather than building on the OpenURL Context Object.<sup>22</sup> As the Microformats.org Citation Formats page shows, there are myriad ways to display citation metadata; the discussion to create a single hCitation microformat is likely to be long and complicated.

*Microformats.org Citation Formats*  
<http://microformats.org/wiki/citation-formats>

## Conclusion

It has been interesting to watch the migration of library content to the Web and the evolution of the tools that libraries devise and purchase to connect their users with that content. Users, meanwhile, have turned in droves to Google and other free Web tools for their research needs. Rather than making libraries irrelevant, users' attraction to tools like Google has challenged us to make quality information available conveniently, quickly, and simply. We hope that the recommendations made in this report will enable others to accomplish this via improvements to their local OpenURL resolver implementations.

## Notes

1. Dan C. Hazen, "Rethinking Research Library Collections A Policy Framework for Straited Times, and Beyond," *Library Resources and Technical Services* 54, no. 2 (April 2010): 115-121.
2. ALCTS Electronic Resources Interest Group, "Slides and Audio from 'Pay-per-View Options: Is Transactional Access Right for My Institution?'" (panel discussion, July 11, 2009), ALAConnect website, <http://connect.ala.org/node/79063> (accessed Aug. 2, 2010).
3. For example, see Michael Levine-Clark, Michael Stephen Bosch, Kim Anderson, and Matt Naumann, "Rethinking Monographic Acquisition: Developing a Demand-Driven Purchase Model," *Charleston Conference Proceedings 2009*, ed. Beth Bernhardt and Leah Hinds (Santa Barbara, CA: Libraries Unlimited, in press); and Michael Levine-Clark, "Developing a Multiformat Demand-Driven Acquisition Model," *Collection Management* 35, no. 3 & 4 (2010): 201-207.
4. Thanks to Mike Buschman for a discussion of the future of OpenURL, where he shared this personal principle.
5. See chapter 1 and Andy Powell, "OpenResolver: A Simple OpenURL Resolver," *Ariadne*, no. 28 (June 2001), [www.ariadne.ac.uk/issue28/resolver/intro.html](http://www.ariadne.ac.uk/issue28/resolver/intro.html) (accessed July 28, 2010).
6. The Big Five e-book aggregators are EBook Library (EBL), Ebrary, Google Books, MyILibrary, and NetLibrary.
7. Based loosely on Serials Solutions, "KnowledgeWorks Statistics," [www.serialssolutions.com/knowledgeworks-statistics](http://www.serialssolutions.com/knowledgeworks-statistics) (accessed on July 30, 2010).
8. John Law, "Observing Students Researchers in their Native Habitat," *Information World Review Horizons*, 2008, [www.serialssolutions.com/assets/publications/IWR-Horizons-2008-Article-John-Law.pdf](http://www.serialssolutions.com/assets/publications/IWR-Horizons-2008-Article-John-Law.pdf) (accessed July 31, 2010).
9. James Culling, *Link Resolvers and the Serials Supply Chain*, Final Project Report for UKSG (Oxford, UK: Scholarly Information Strategies, 2007), 43, [www.uksg.org/sites/uksg.org/files/uksg\\_link\\_resolvers\\_final\\_report.pdf](http://www.uksg.org/sites/uksg.org/files/uksg_link_resolvers_final_report.pdf) (accessed July 31, 2010).
10. Both major vendors make up-to-date knowledge base data available to Google in a Google-defined format, and KBART is defining a format that could also be used (see chapter 1). The next step is for the vendors to make this data directly available to each other.
11. For an excellent overview of CrossRef functionality for libraries, see CrossRef.org, "CrossRef Linking and Library Users" (PowerPoint presentation, 2003), [www.crossref.org/08downloads/CrossRef\\_for\\_Libraries.ppt](http://www.crossref.org/08downloads/CrossRef_for_Libraries.ppt) (accessed Aug. 5, 2010).
12. CrossRef.org, "Fast Facts: How Libraries Use CrossRef," [www.CrossRef.org/03libraries/16lib\\_how\\_to.html](http://www.CrossRef.org/03libraries/16lib_how_to.html) (accessed Aug 1, 2010).
13. It is worth noting here that another limitation to CrossRef's ability to solve the appropriate copy problem was removed as of May 2008 (see CrossRef.org, "Multiple Resolution Intro," [www.crossref.org/help/Content/07\\_advanced%20concepts/Multiple%20Resolution/Multiple%20Resolution%20Intro.htm](http://www.crossref.org/help/Content/07_advanced%20concepts/Multiple%20Resolution/Multiple%20Resolution%20Intro.htm) [accessed Aug. 5, 2010]). At that time, CrossRef reconfigured its system to allow multiple resolution. In essence, publishers can choose to allow a third-party host to upload an additional URL for an existing DOI. The system is then configured to present the user with a choice as to which target he or she wants to go to.
14. This for-profit company monetizes its services in three ways: ad revenue, setup for for-profit medical customers, and premium services. One premium service is PaperStats, a usage data aggregating service (across ALL publisher usage statistics) that promises to give 360Counter (Serials Solutions) and ScholarlyStats (Swets) a run for their money.
15. Cathy De Rosa, Joanne Cantrell, Diane Cellentani, Janet Hawk, Lillie Jenkins, and Alane Wilson, *Perceptions of Libraries and Information Resources: A Report to the OCLC Membership* (Dublin, OH: Online Computer Library Center, 2005); Law, "Observing Student Researchers."
16. CrossRef.org, "40 Million CrossRef DOIs Preserve the Record of Scholarship" (news release), Feb, 5, 2010, [www.CrossRef.org/01company/pr/news020210.html](http://www.CrossRef.org/01company/pr/news020210.html) (accessed Aug. 1, 2010).
17. See CrossRef.org, "Using a Local Link Resolver," [www.CrossRef.org/help/Content/07\\_advanced%20concepts/Using\\_a\\_local\\_link\\_resolver.htm](http://www.CrossRef.org/help/Content/07_advanced%20concepts/Using_a_local_link_resolver.htm) (accessed Aug. 5, 2010).
18. "HubMed: pubmed rewired" is an alternative interface to the PubMed medical literature database: [www.hubmed.org](http://www.hubmed.org).
19. COinS code can be generated at the online COinS Generator, <http://generator.ocoins.info>.
20. For more information, see Pubget, "PaperPlane," [http://pubget.com/help/paper\\_plane](http://pubget.com/help/paper_plane) (accessed Aug. 5, 2010).
21. Karen Coyle, "Changing the Nature of Library Data," chap. 2 in "Understanding the Semantic Web: Bibliographic Data and Metadata," *Library Technology Reports* 46, no. 1 (Jan. 2010): 14-29.
22. Karen Coombs, "Microformats: Context Inline," *Library Journal*, no. 7 (April 15, 2009): 64.