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Improving the discoverability of scholarly content in the Twenty-First Century: Collaboration opportunities for librarians, publishers, and vendors, A SAGE White Paper

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Improving the Discoverability of Scholarly Content in the Twenty-First Century

Collaboration Opportunities for Librarians, Publishers, and Vendors

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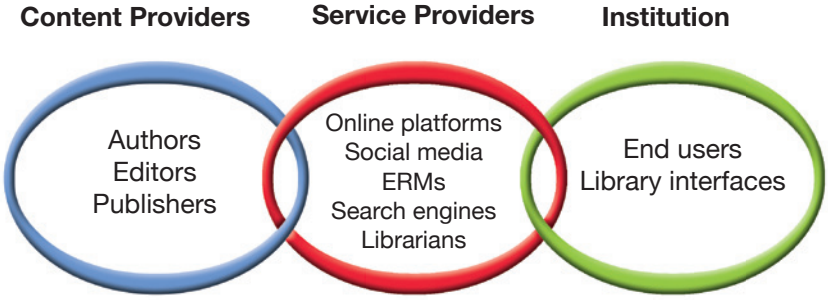
Abstract

Discoverability is a popular buzzword—ultimately meaning the degree to which scholars can locate the content needed to advance their research and other creative activity. Improved user discovery experiences require heightened collaboration among (1) scholarly publishers and their published authors; (2) search engine developers, database providers, abstracting and indexing services, and academic publishers; (3) electronic resource management and integrated library system vendors; and (4) librarians who advance institutional discoverability. Drawing from interviews with value chain experts, results of research studies, and insights from scholarly literature, this white paper assesses the currently fragmented discovery environment and proposes cross-sector conversations to further visibility and, ultimately, usage of the scholarly corpus, not only on the open web, but within library services.

Discoverability: Concept Introduction

Researchers should have the best of all worlds: discovery acceleration tools in familiar web environments, the power of detailed indexing to produce highly relevant and precise search results, and seamless identification and fulfillment experiences. Achieving such ambitions requires purposeful conversations among contributors to the value chain for scholarship production and dissemination. Four main parties are involved in creating and/or consuming scholarly content: scholars, who produce the work and are its ultimate consumers; editors (often faculty), who act as the bridge between scholars and publishers by shaping the vision of academic works, managing peer review, and ensuring content acquisition; publishers, who curate, refine, disseminate, and promote scholarly works; and subscribers, largely institutions, who purchase, lease, or access the corpus. Traditional scholarly values fortify and sustain these long-standing relationships despite transformative forces that have irrevocably altered the established knowledge generation landscape. Discoverability has been particularly transformed, as end users employ a growing range of navigation strategies—demonstrated by web log analytics that calculate the sites from which users of scholarly resources were referred and studies that report where users started their research before arriving at content websites, among other points of evidence. To optimize this complex discovery value chain, libraries' vendors (bibliographic data services, content aggregators, and technology providers), publishers' vendors (printers, platform hosts, content architects, and technology providers), and search engine providers must initiate forward-thinking conversations.



Therefore, this white paper, sponsored by SAGE, aims to deepen collective dialogue about and reflection on the optimum discovery of scholarly publications and authoritative information today. Such conversations must necessarily consider a wider range of topics—library discovery tools, web discovery services, publisher tutorial services, and library research pages. The increasing presence of social media, including "the Googlization of everything," predicts that researcher behaviors will continue to evolve. As such, suggestions for best practices and shared solutions aspire to further involve (1) publishers with the authors whose interests they represent, (2) search engine developers with the publishers who provide them with scholarly content to index, (3) electronic resource management (ERM) service providers with the publishers and librarians who advance institutional discoverability, and (4) librarians with the researchers and scholars who contribute to and harvest from scholarly materials. These sustained relationships could generate actionable outcomes that harness the full potential of contemporary technology and human capabilities.

This proposal is timely. In recent years—amid accelerating, unrelenting changes that promise to fundamentally transform scholarly knowledge creation, dissemination, and research—the concept of discoverability has emerged as a shared concern for publishers, vendors, and librarians who are committed to enhancing the ease with which researchers can locate and use relevant academic material to further studies. Although the fourteen supply chain representatives interviewed for this paper had markedly different points of view, all agreed that improved discoverability depends on heightened cross-sector collaboration. Interviewees

across the industry—from OCLC to EBSCOhost, ITHAKA, HighWire Press, and Serials Solutions—expressed this imperative in terms of "shaking hands," "having conversations," and "thinking together" to enable robust knowledge exchange and generation activities and enduring research and publication practices.

Discovery Concept Revisited

In response to value chain representatives' consensus, this paper challenges the simplistic definition of discoverability as solely comprising technical search engine optimization methods for ensuring that content, whether licensed, owned, or free, is readily findable in the open web. Rather, as study participants agreed, even if you "build it" and index it, "they may not come."[1] Therefore, the location, placement, and context of published material are vital to nuanced definitions of discoverability. As one value chain contributor observed, "resources, information, and data must be visible without having to look . . . outside your normal path, in your usual space."[2] In other words, there are increasingly more ways of finding that do not necessarily start with searching, such as press releases from researchers' home institution, alerting services from journal websites, widgets to announce content on related sites, and discussion forums and blogs for disciplinary colleagues—all of which serve to enhance visibility and promote discovery and, ultimately, usage. Review of core published literature, including commissioned research studies supplemented by proprietary vendor studies, corroborated this observation and provided evidence that users are discovering scholarly content through an ever-growing range of pathways, thereby intensifying the need for cross-sector best practices and increased collaboration.

At present, however, discoverability—including finding information serendipitously (i.e., information that you didn't even know you needed[3])—is an imperfect process among already uncertain experiences that depend largely on invisible interdependencies among value chain contributors and users. In response, this white paper aims to explicate evolving interrelationships among traditional contributors to scholarship as well as newer participants providing integrated library systems, ERM systems, e-journal platforms, and web scale discovery services.

The latter perspectives are not well represented in the professional literature, which precipitated interviews of industry experts from July through October 2011. Interview questions probed industry best practices and challenges, provoking one interviewee to quip, "I think the simple question to ask each of us who are a piece of the value chain is 'What practices would you recommend for the OTHER guys in the value chain?' . . . since, of course, we already implement best practices in our own part of the chain, don't we?"[4] This suggestion guided our analysis of interview content, which explores statements of best practices and collaboration opportunities across the industry, and it informed our mission to encourage cross-sector dialogue on improving discoverability and visibility of scholarly content, "whenever, wherever, and however,"[5] with a primary focus on discovery of online publications and surrounding services.

Discoverability: History and Context

Some historical background is helpful in considering how we arrived where we are and for the purpose of determining where we need to aim because, despite increasingly challenging organizational contexts exacerbated by economic uncertainty and disruptive technologies, "the driving missions of academic publishing and librarianship have not changed."[6] The shared goal remains furthering discovery, access, and usage of scholarly publications and creative work. Similarly, the age-old process of furthering knowledge creation through formal and informal information exchange remains constant though uncertain, whereas conducting information-seeking and retrieval activities has intensified amid the proliferation of new and different search tools, sources, and channels,[7] which confuse traditional signifiers of quality and authority.

The importance of a sustainable integrated system for production and dissemination was anticipated as early as 1945 by Dr. Vannevar Bush, director of the Office of Research and Scientific Development, who, in his classic Atlantic Monthly article,[8] celebrated the record of ideas, which catalyze knowledge generation. Bush recognized the importance of first selecting credible sources for "the record" and then the most relevant sources to advance disciplinary understanding. He characterized human thinking as associative, concluding that interrogation depends on robust indexing schemas that animate an intricate "web of trails carried by the cells of the brain." In establishing a sense of urgency, Bush noted, "Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the

few who were capable of grasping and extending it; and this sort of catastrophe is undoubtedly being repeated all about us, as truly significant attainments become lost in the mass of the inconsequential."[9] This concept was eloquently rephrased decades later: "We have billions of pages indexed in Google, we need a few million good ones."[10]

In this early call to action, Bush urges collaborative efforts to address "the massive task of making more accessible our bewildering store of knowledge," noting that professional "methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose."[11] Nearly a half century later, the World Wide Web was invented (in 1990) and Google launched (in 1998), thereby accelerating the knowledge potential and complexity challenges driving today's need for better articulated, more collaborative discoverability and visibility solutions.

Discovery Improvement Prerequisites

In the wake of technology-driven consequences that disrupted scholarly publication traditions (including search and retrieval), significant progress in the past twenty years has advanced the possibility of achieving what Bush termed "the record" of human accomplishment. The URL (uniform resource locator) format evolved to become a persistent identifier for a digital object. Termed digital object identifier (DOI), it may include such properties as an ISSN for a journal-level link. Furthermore, the CrossRef[12] initiative—founded and directed by publishers—contains DOIs and metadata, including the online locations of objects. This initiative enables web scale discovery search engines to link authenticated institutional users to local library holdings. For our interviewees, it made the DOI "come alive" and helped "get me the article"[13] and "find it in the library."

The OpenURL standard, advanced by the National Information Standards Organization (NISO), builds on this technology. Established as ANSI standard Z39.88-2004, this protocol effectively contains two parts: first, a base URL (Z39.88), which refers to the location of OpenURL resolver software deployed by, for instance, an academic library; second, a context object (2004), which describes the item of interest using an agreed syntax, thereby permitting identification of additional items of interest. In a complementary fashion, a United Kingdom Serials Group/NISO initiative known as KBART (Knowledge Bases and Related Tools) guides standardizing data and practices for ERM knowledge bases that populate library website A-Z lists and link resolvers. These initiatives not only illustrate the wide-ranging interests and activities across the scholarly information community—libraries, publishers, ERM vendors, data standards, standards organizations, platform vendors, among others—but also suggest the complexity of coordinated efforts required to attain current levels of reliability and quality across multiple information flows, which, if exploited fully, "offer a nicely oiled chain—technology working with and for the community."[14]

Additional international initiatives are concurrently advancing the development of other facets of scholarly communications. For instance, the author DOI—like the content DOI, which permanently tracks an object (be it a book, an article, a chapter, a graph, etc.)—would trace a scholar across all of his or her work, whether as a primary author of a text, a peer reviewer, or an authoritative commenter. In another initiative, an overlay kitemark would track versions of record in a world where digital preprint, postprint, revised, copied, and republished versions abound. Named for the British Standards Institution certification schemes indicating quality and adherence to standards, the kitemark could contain metadata ranging from the type of peer review an article underwent to the retraction or revision of any citations. A complementary initiative advanced by representatives from all areas of the community is ORCID (Open Researcher and Contributor ID),[15] which aims to provide researchers and other entities with unique identifiers to associate with their research outputs. Version of record is also being addressed[16] to ensure that researchers have visibility into the various incarnations of a journal article through its life cycle of publication and can locate the authoritative and most recent version of a given work. NISO has recommended standard version terms, and CrossRef has released a new feature for version validation, called CrossMark.

Meanwhile, webmasters are increasingly adopting schemas such as HTML to construct (i.e., mark up) web pages in ways recognized by major search engines, such as Bing and Google. When these search providers directly access databases structured by standardized schema, they can improve discovery of relevant web pages. Within the scholarship realm, ScholarlyArticle offers a structured data schema to enable improved discovery

of appropriate creative content through consideration of a variety of unique properties, including publisher, editor, reviewer, genre, reviews, ratings, institution, location, creation date, and modification date, as well as author, title, and source[17]—all value-added signifiers of provenance and authority. Since journal publishers began providing online access to full-text scholarly articles in the late 1990s—thus triggering a revolution in the scholarly communications process—these cross-sector advancements have assumed growing importance.

Library Discovery Evolution

For centuries, card catalogs facilitated access to the monographic literature. As information and computer sciences evolved in the 1970s and early 1980s, automated library systems were introduced to replace them. Earliest OPACs (online public access catalogs) enhanced the search functionalities of traditional card catalogs by offering Boolean search functionalities. In the late 1990s and early twenty-first century, library vendors developed federated search solutions; these simultaneously searched, retrieved, and displayed content from various remote information hosts—such as abstracting and indexing (A&I) services and full-text databases—but with limited success. In addition, they were typically difficult or time-consuming to configure and maintain. Later in the decade, library catalogs evolved into their next generation, offering increased intuitive functionality, integration with open web services, and user interfaces mimicking popular websites, such as Amazon.com. This generation of catalogs also provided the capacity to harvest records from locally hosted library silos of information. In short, these systems offered new discovery layer options, uncoupled from any specific underlying integrated library system, nowadays comprising a variety of highly coordinated library management system modules.

More recently, Google Scholar's release in 2004 led to the competitive development of web scale discovery services for the library environment. In 2009, Serials Solutions announced the development of such a resource when it unveiled its web scale discovery tool, Summon. Other vendors soon followed with similar products, such as EBSCO's Discovery Service and Ex Libris's Primo Central. These products more easily connect researchers with the library's vast information repository, including locally held and hosted content, as in physical holdings, digital collections, and local institutional repositories. Perhaps more significant, web scale discovery enables access to a widespread array of remotely hosted content, often purchased or licensed by the library, such as publisher and aggregator content for tens of thousands of full-text journals, additional content from A&I resources, and content from open-access repositories. This is made possible by preharvesting and centrally indexing content sourced across multiple silos, thereby streamlining discovery and delivery of content. In other words, "web scale discovery can be considered as deep discovery within a vast ocean of content . . . normalized into an underlying schema developed by the discovery service vendor that facilitates indexing, relevancy ranking, and even level of presentation for different content types with potentially varying levels of metadata,"[18] searching a broader collection than what the local library may own or license.

Scholarly Ecosystem Shifts

Web scale discovery and visibility tools depend on value-added, largely invisible contributions of authors, publishers, librarians, and vendors who compose the scholarly value chain. In this symbiotic ecosystem,

- librarians manage systems for institutional collection, dissemination, and retrieval of the scholarly corpus;
- publishers produce and promote authors' work through formats findable on the open web and in library catalogs;
- publishers' technology vendors supply e-publication platforms and strategic discoverability solutions; and
- libraries' technology vendors connect publishers' digital content to OPACs through ERM systems and web scale discovery services.

Traditionally, these content and service providers satisfied complementary roles: publishers provided gatekeeper services, ensuring peer-reviewed content adjudicated by peer-reviewed editorial boards; in turn, librarians served as access gatekeepers for the published authoritative resources. However, the Internet has disturbed those comfortable and conventional relationships, thereby necessitating reinvention of centuries-old partnerships

mindful of the mandate to make scholarly content widely "discovered or discoverable." This now involves search engine optimization (SEO) and search engine interoperability to promote effective crawling, indexing, and ranking by search engines—"thinking, in other words, about the robot users of our systems as well as the human users."[19]

The purpose for optimizing online products for search engines is essentially to improve their visibility to readers and researchers of all kinds. This challenges publishers to invest in technically sound SEO strategies as a standard element of editorial and operational divisions, which can disturb standard business practices. Publishing house staff must grow and maintain actionable knowledge of SEO techniques, which regularly fluctuates as online technologies and the businesses that offer them advance. Publishers must also continually monitor the successful discovery of their products through sites like Google and Bing, and make rapid modifications to content platforms and online products to keep pace with the changeable landscape of online searching.

Publishers are equally concerned with effectively mapping their products for use within the diverse arena of library products and services. Unique library website designs and OPACs come in wide varieties. In addition, to ensure quality discoverability of their products within the library ecosystem, publishers must now produce quality secondary data for ERM vendors. Traditionally, generation of this metadata was the purview of A&I services. Today, however, publishers must fulfill the expectation to deliver free bibliographic data at purchase, without any assurance that libraries will use these data in uniform ways—if at all. Publishers must meet the resource demands for library indexing and cataloging requirements in staff knowledge and time as well as systems and equipment. To scale these functions, publishers must overcome manual maintenance routines and establish automated content management systems that allow metadata deliveries to vendors that are both cost effective and time efficient. Investment in XML-based technologies has also become a standard infrastructural addition to most publishing houses.[20]

In contrast, discovery of and access to content remains important for libraries, in librarians' opinion[21]—despite growing faculty perceptions that libraries' value resides in their "buyer" function, which increasingly "disintermediates" libraries from scholarly research processes.[22] Traditionally, this role was expressed through a combination of effective cataloging and classification, open and browsable stacks, A&I tools, reference/research support, instructional programs, and other services that improve the range and quality of information available in and through libraries. In a discovery environment increasingly dominated by web search services, such as Google and Bing, libraries are struggling to perform their discovery role amid increasingly complex changing workflows, licensure restrictions, statistics analysis, and return-on-investment expectations. Despite these obstacles—further exacerbated by uncertain and declining budgets[23]—libraries are in increasing numbers implementing web scale discovery platforms that manage local access through a single index that provides relevancy ranking, facets for drilling deeply into search results, user ability to write or read summaries and read or add editorial comments, and agnostic access to content in all forms. Furthermore, all this can occur in mobile mode because companies such as Ex Libris, EBSCO, OCLC, and Serials Solutions partner with growing numbers of publishers of primary and secondary content (scholarly corpus and A&I services, respectively) to produce simplified, centrally indexed content, amid growing recognition in all scholarly value chain sectors of the importance of web scale discovery services.

As a consequence, libraries can now replicate the centralized search model of Google's search interface and speed, content breadth, and quality results, thereby finally addressing the vexing question, if Google can do it, why can't libraries? Although the implications for libraries are not fully understood in terms of implementing web scale discovery services, at least one published study reports a dramatic decrease in the use of traditional A&I databases and an equally dramatic increase in the use of resources from full-text database and online journal collections.[24] In anticipating this phenomenon, an A&I vendor responded in an industry survey, "These services may expose our content to users who would never think to choose our database for their search, and my fear is that if we are not 'in,' then we are well and truly 'out.' On the other hand, we may lose brand recognition and if their usage reporting isn't sophisticated enough, how will the library know that it was our database that navigated the user to the full text? So we risk losing out that way too."[25] Similarly, within a library context, when a link resolver enables Google Scholar, it eliminates the need for a user

to understand the distinctions among databases[26]—reflective of the dilemma that "while authors and readers want us to be invisible, libraries, publishers, and vendors want constituencies to recognize our value."[27] Contributors throughout the value chain experience such uncertainties in the wake of a former library monopoly on access to peer-reviewed scholarship.

Shared Aspirations and Accomplishments

As a consequence, publishers, libraries, and vendors must necessarily explore the following: "In these days where users are searching across huge amounts of information with free web tools, how can we support discovery of the quality vetted and peer reviewed content that libraries invest in and scholars require at appropriate points in their workflow?"[28] In echoing that publisher's sentiments, two discovery service leaders phrased the quandary thusly: "How can you make searching the library as easy as searching the Web?"[29] and "The users are comfortable with the open web and the Googles of the world. We need to make our services just as natural and easy to use."[30] This shared cross-sector aspiration requires expanded partnerships to promote discoverability and visibility—that is, "Can I find it?" and "Can it find me?"[31]

Discoverability requires content to be well indexed and well represented. Ideally, metadata would be continually enriched through the supply chain as they pass from author to publisher to platform to ERM vendor to discoverability service to library and, finally, to the end user. In response, publishers have evolved best practices for metadata, "depositing it anywhere they will accept it,"[32] such as RSS feeds for library vendors. Routine iterative testing now generates new publisher website design practices that ensure optimum search engine optimization, measured by assessment tools with increasingly sophisticated success metrics. Many platform providers that partner with publishers further discovery through content enrichment and regular usability testing that ensures that online content is well presented—whether on a publisher's website or a university catalog, whether at home or work, whether through Google Scholar or PubMed.

Visibility involves placing information in locations where people will come across it in the work that they do. In response, publishers and others have initiated various Web 2.0 efforts to further engage online content—for instance, Facebook pages and blogs dedicated to individual publications (e.g., journals) or to cohorts of scholars and authors within particular fields of study. In addition, publishers are beginning to explore enhanced information environments for novice researchers—displaying encyclopedia entries alongside journal articles and developing search widgets to populate library sites[33]—as a supplement to other end user support services. Finally, in response to growing demand from mobile device owners, contributors across the value chain are developing mobile websites, apps, and related services.

As a consequence to the increased pressures for institutional libraries to demonstrate outcomes and impact and maximize resource usage, best practices have evolved in recent years through adoption of COUNTER (Counting Online Usage of Networked Electronic Resources) and SUSHI (Standardized Usage Harvesting Initiative)[34] for content access and web analytics for user behavior. Value chain interviewees concurred that additional discussion on enhanced metrics exploring, among other dimensions, the matter of completeness and currency would enhance the practical use of such data.[35] As expressed by one journal aggregator vendor, "how do you measure what isn't found?"[36] Such sentiments point to the heightened level of aspiration needed to take discoverability and visibility to the next phase.

Collaborative Conversations Leading to Better Practices and Next Steps

Despite considerable progress and impressive goodwill, much work remains. Libraries and commercial entities need to find new ways of working together. Again, this proposal is timely, given that web statistical services such as Google Analytics demonstrate that researchers are increasingly using many pathways to discover content. To improve user experiences, value chain contributors spanning the full range must share "what they want and need from one another,"[37] including specific functions, best practices, unmet goals, and collaborative recommendations. Drawing from expert cross-sector interview data, the following recommendations highlight optimism for future collaborations, with the promise to enhance discoverability through changed industry standards that will catalyze and crystallize new best practices.

For publishers and vendors:

- Initiate cross-platform, cross-publisher investigations to identify best industry practices, further share standards, and apply researcher behavior findings, then revise online product and publisher website designs based on these cooperative efforts.

- Become more conversant with how libraries operate so that they can more successfully advance local discoverability through improved records workflow, acquisitions functions, statistics management, and systems interoperability.[38]

- Implement more open, standardized approaches to online hosting that allows published content to be used as a platform upon which others can innovate, such as

    - CrossMark standard to signal to the user which version of a scholarly item—that is, of the many versions—is in fact the archival, published one; and

    - Machine-readable Creative Commons license tagging to guide usage privileges and attribution responsibilities.[39]

For publishers and librarians:

- Vigilantly monitor knowledge of researcher needs and habits (which will inevitably change as discovery and delivery functions evolve) to improve the connections between readers and knowledge.[40]

- Collaborate on metadata enrichment and successful ingestion into library systems, such as OPACs, and coordinate about routine testing to ensure that all holdings are visible and easily available.

- Productively collaborate on improved means of teaching novice and expert researchers to use existing systems,[41] with the aim of building systems that are better suited to the way that researchers want to behave.

For all members of the scholarly communication industry:

- Consider what new discoverability services, givien general-purpose search engines access to metadata records for indexing purposes, could be leveraged from search engine utilities. For example, widespread adoption of ScholarlyArticle tagging, found at schema.org, is an especially promising initiative, as is standardizing the metadata embedded in HTML and PDF versions of an article.[42]

- Revisit how business is done based on the following:

    - First, the difference between library patron and consumer is blurring. Most users do not recognize exactly where content is served or stored, and they may be willing to directly pay all or part of the cost to secure the needed information. For these reasons, more varied pricing structures need to evolve.

    - Second, content is fluid in an online ecosystem, where users may want only a sentence or a page out of a whole publication. The conversation in the value chain therefore needs to consider expanded copyright solutions. If such barriers were removed, libraries may save money; publishers may uncover new revenue streams; and end user access may improve.[43]

- Further cross-industry standards for content file formats, quality of metadata, and usage statistics to ensure interoperability among search engines, publisher platforms, and integrated library systems, especially as new models for scholarly communication develop.[44]

Conclusion

The development of more sophisticated discovery and visibility strategies very much depends on heightened cross-sector collaborations. The conversations proposed above suggest some especially promising topics for discussion, which surfaced during interviews with sector experts. Such exchanges on improvements in web scale discovery are timely, as the technical prerequisites, shared standards, and best practices for significantly enhanced search performance have either been developed or are in development. At the same time, new forms of scholarship are emerging, and user experience expectations are accelerating—intensifying the need for value chain contributors to initiate boundary-crossing inquiries that benefit scholarship. Librarians know the research and discovery needs of their patrons; publishers and editors understand the curation, production, and dissemination of scholarly content; and vendors provide necessary technological infrastructure through platform, discovery, and organizational tools – however, each does not sufficiently understand the perspective of the others. Collaboration across the academic value chain is critical if we are to realize our collective potential and catalyze knowledge generation for today's scholars.

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