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# INDEX-BASED DISCOVERY SERVICES

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CURRENT MARKET POSITIONS AND TRENDS

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Marshall Breeding

**Library Technology Reports**

Expert Guides to Library Systems and Services

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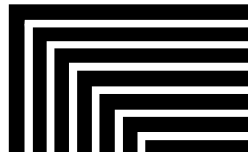
# Library Technology

R E P O R T S

Expert Guides to Library Systems and Services

## **Index-Based Discovery Services: Current Market Positions and Trends**

*Marshall Breeding*



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American Library Association

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### Index-Based Discovery Services: Current Market Positions and Trends

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## About the Editor

**Marshall Breeding** is an independent consultant, speaker, and author. He is the creator and editor of *Library Technology Guides* (<https://librarytechnology.org>) and the *Libraries.org* online directory of libraries. He is the editor for *Smart Libraries Newsletter*, published by ALA TechSource, and has authored the annual *Library Systems Report*, published in *American Libraries* since 2014. He has also edited and authored several books, articles, and book chapters; was formerly the director for innovative technology and research for the Vanderbilt University Library; and regularly teaches workshops and gives presentations both throughout the United States and internationally at library conferences.

## Abstract

*Library Technology Reports* (vol. 54, no. 8), "Index-Based Discovery Services: Current Market Positions and Trends," provides an updated look at the realm of discovery products implemented in libraries, focusing especially on how these products have been implemented in academic libraries. The scope of this issue focuses primarily on index-based discovery services. This genre of products was established in 2009 and has since become a mainstay of academic libraries. Despite broad interest, the number of players in this product category has remained limited and constant. Throughout the report, Marshall Breeding shares data he has gathered describing the use of the following discovery services among colleges and universities in the United States: WorldCat Discovery Service and its predecessor WorldCat Local from OCLC, Summon and Primo from Ex Libris, and EBSCO Discovery Service from EBSCO Information Services. Almost a decade has transpired since the introduction of these products. Libraries have made a substantial economic investment during that period, which warrants a look at some of the patterns in which discovery services have been implemented in libraries and what trends we may anticipate in the future.

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# Introduction

Libraries strive to implement the best technologies to provide access to the collections they build on behalf of their sponsoring institutions or communities. These tools must be convenient for users yet deliver sophisticated features and return relevant and objective results. The realm of library discovery products has become increasingly multifaceted as it evolves to meet the expectations of librarians and library users. The information environment these discovery tools address has become increasingly complex and reshaped by multiple models of open access publishing and competitive dynamics among the major companies involved in publishing, scholarly workflows, and analytics.

This issue of *Library Technology Reports* gives an updated look at the realm of discovery products implemented in libraries, focusing especially on how these products have been implemented in academic libraries. It is the third issue of *Library Technology Reports* produced by this author addressing topics related to library catalogs or discovery services.

“Next-Generation Library Catalogs” (July/August 2007) detailed the transition from traditional online catalogs provided with integrated library systems (ILSs) to a new genre of discovery interfaces designed to accommodate the expectations of users acclimated to the more elegant and powerful interfaces of popular internet services.<sup>1</sup> This work is now dated but remains as a historical overview of the emergence and development of the first generation of discovery interfaces apart from library catalogs.

“Library Resource Discovery Products: Context, Library Perspectives, and Vendor Positions” (January 2014) provided an overview of the many types of discovery products available at that time and included survey results from libraries evaluating their

perceptions of the effectiveness and objectivity of these products.<sup>2</sup>

This issue focuses primarily on index-based discovery services. This genre of products was established in 2009 and has since become a mainstay of academic libraries. Despite broad interest, the number of players in this product category has remained limited and constant. Four products were launched in 2009: Summon from Serials Solutions/ProQuest, WorldCat Local from OCLC, Primo from Ex Libris, and EBSCO Discovery Service from EBSCO Information Services. No new products have entered the field. The merger of Ex Libris into ProQuest has brought about a consolidated process for producing their respective indexes, but Summon and Primo Central continue to be offered as ongoing products.

Almost a decade has transpired since the introduction of these products. Libraries have made a substantial economic investment during that period. These products have gained general acceptance in academic libraries as one of the components expected among their service offerings, often the launchpad offered to their users to gain access to their full array of content and service options.

The immense investment in these products warrants a look at some of the patterns in which they have been implemented in libraries, which may in turn inform trends to expect looking forward. In the absence of comprehensive and reliable data regarding the deployments of these products globally, the author gathered data describing the use of these products among colleges and universities in the United States. This group of libraries forms an important constituency for these products. Although patterns may vary within each global region and among other types of libraries, these US academic libraries can be taken as generally

representative of the broader market.

This issue of *Library Technology Reports* gives a high-level view of the general characteristics of the index-based discovery services and the overall marketplace trends. It does not aim to provide a detailed evaluative look at the features provided by each product. The marketplace study included in chapter 4 can help libraries understand which products have been most successful among a library's peer institutions.

## Terminology and Definitions

Before we turn to the discussion of the products and technologies, the following definitions will clarify some terminology that is often used inconsistently in vendor discussions and in the professional literature. These definitions apply specifically to the library context and may be used differently in other disciplines or types of organizations.

**Discovery**, in the library context, describes the general activity of locating library resources, primarily by its users or members. In current times, discovery tends to be accomplished primarily through search technologies, but it can also include browsing or other serendipitous means of presenting resources to users based on their interests. Searching can take place through an interface or tool offered by the library as well as through services provided by other entities.

**Discoverability** involves techniques that enable library resources to be more optimally found in the search or discovery environments of organizations outside the library. A library resource management system, for example, can publish instances of an item or its metadata encoded in a linked data schema optimized for harvesting by general or scholarly search engines. Discoverability is an example of search engine optimization applied to library resources.

**Delivery**, or **access**, describes the mechanisms or processes to enable items found through an act of discovery to be made available to the user. The appropriate method for delivery to a user depends on the format of the item and any applicable copyright or license arrangements that may limit access. Access to electronic resources may be mediated through a link resolver that directs the user to a version of the item available within the library's subscriptions or through alternate services. Materials restricted to subscribers may require that the user be validated through a personal or institutional authentication service. Libraries strive to make the delivery of materials to which their users are entitled optimally transparent, with any needed authentication and linking taking place behind the scenes without intervention. Delivery mechanisms for physical materials involve established processes for lending or interlibrary loan.

**Discovery interface** describes applications created to enable users to discover and gain access to library resources. Typical features of a discovery interface include core search and retrieval features for accessing library resources, query recommendations through type-head or drop-down selections, relevancy ranking of results, presentation of facets to narrow search results, and other interface tools and conventions to facilitate the search process. Discovery interfaces do not come with prepopulated indexes of content but rather ingest content from external sources such as the organization's ILS, local institutional repositories, and digital collections, or from external services through APIs (application programming interfaces). Discovery interfaces usually operate with ILSs and other repositories provided by different vendors or developers. Discovery interfaces usually include internal indexing technologies, such as Apache Solr or Elasticsearch. Examples of discovery interfaces include

- Encore from Innovative Interfaces, which operates with a Millennium or Sierra ILS and local repositories. A version of the product branded as Encore Duet enables libraries subscribing to EBSCO Discovery Service to incorporate article-level results.
- Enterprise from SirsiDynix, which can be used with the company's Horizon or Symphony ILS product. SirsiDynix has a partnership with EBSCO Information Services to include article results for mutual customers.
- VuFind, an open source discovery interface originally developed at the Villanova University Falvey Memorial Library.
- Blacklight, an open source discovery interface originally created at the University of Virginia and Stanford University.

**Index-based discovery services**, sometimes called web-scale discovery services, are products that include a prepopulated central index along with a specialized discovery interface. These discovery services enable libraries to provide article-level results to their users. The major index-based discovery services include

- EBSCO Discovery Service from EBSCO Information Services
- Primo from Ex Libris
- Summon from Ex Libris
- WorldCat Discovery Service and its predecessor WorldCat Local from OCLC

These products depend on the major publishers, aggregators, producers of abstracting and indexing (A&I) services, and other providers to provide

resources that can be added to the central index. A key issue for these discovery services relates to the currency of the index. Publishers provide new resources to discovery services periodically, but not necessarily as the resources are added to their own servers. This workflow of content means that the central index of a discovery service may have delays in providing access to recent articles.

An index-based discovery service returns descriptive records with elements such as citation data, abstracts, and tables of contents. Once a record is selected, users click a link or button to access the full text of articles from the server of the publisher or aggregator. This workflow enables publishers to maintain control of their content as users discover resources through library-provided discovery services.

**Central index**, in the context of index-based discovery service, is a large-scale index, created and maintained by the discovery service vendor. Vendors of discovery services make arrangements to receive content from publishers and aggregators to build these indexes, which ideally represent the body of resources of interest to libraries that are made available through institutional subscriptions or open access licenses.

**Federated search**, synonymous with **meta-search**, describes a method for enabling users to search multiple content resources through a single search query. These products used protocols such as Z39.50 to transmit the user's query to multiple search targets and to present the results to the user. Results from the targets might be interleaved with each other, according to factors such as publication date or relevancy, or grouped by targets. These products were popular in the library arena from about 2000 until 2009. Metasearch products, though a pragmatic solution, were not especially well regarded due to slow performance, delivery of shallow result sets limited by the time and bandwidth required to transfer all the records returned by a query for each target, and non-intuitive interfaces. This genre of discovery product faded following the launch of index-based discovery services. Since federated search applications receive results directly from the servers of the information provider, even the most recently added resources are retrieved, unlike index-based discovery, which depends on periodically ingested materials.

A **link resolver** participates in the discovery service through facilitating access to resources returned in search results or from citations in documents. These products rely on the OpenURL standard for creating metadata-enriched links, a knowledge base of e-resource holdings, a profile of the library's subscriptions, and business logic to parse the link and, based on its metadata, connect the user to the version of the resource that the library subscribes to or that is available as open access. Link resolvers emerged to address the need to create reliable linking to articles that can

be managed at large scale rather than individually. Updates to the link syntax on a publisher site, changes in subscriptions, or other scenarios that might otherwise require massive manual intervention can be accomplished through configuration changes in the link resolver.

**Smart linking** is often implemented in discovery services to provide more reliable access to electronic resources than through the OpenURL process, making use of internal or proprietary data beyond what would be available through OpenURL.

**APIs**, or **application programming interfaces**, provide access to functionality and data from one computer system to another. APIs consist of a specific set of commands or directives, formulated according to specified syntax and structure, that enable a computer application to return a response for a request submitted through a program script or other application. While user interfaces enable humans to operate a software application, APIs work behind the scenes. Most discovery services offer APIs that enable a third-party discovery interface to initiate a search query and receive search results based on its central index and relevancy algorithms. In addition to search results, a discovery environment may also use APIs from an ILS or library services platform for features related to patron profiles, circulation, and personalization.

A **knowledge base**, in the context of library discovery, manages details related to packages of library resources. Content managed within a knowledge base generally includes the individual journal titles and coverage dates for each resource package offered to libraries and any additional relevant details, such as title or publisher changes. The commercial knowledge bases attempt to describe all of the content packages of interest to libraries, including subscription-based and open access. Knowledge bases can be filtered by a profile of a library's subscriptions and entitlements to determine the availability of an article. OpenURL link resolvers make use of a knowledge base as the key component in the process of linking to full text, which usually depends on whether the desired content item is covered within the library's body of subscriptions.

**Integrated library systems** (ILSs) provide operational support to libraries, including modules for cataloging library materials, managing acquisitions, circulating materials, and enabling users to search and make requests through an online catalog. The model of automation seen in ILSs was established in the late 1970s. The ILS emerged at a time when libraries were involved in print collections and has not been adapted to managing electronic resources. These products continue to be dominant in public and school libraries.

**Library services platforms** embrace a more comprehensive model for the management of library collections, designed to accommodate the workflows of electronic, digital, and print materials. These



products are deployed on web-based, multi-tenant platforms and provide internal knowledge bases and other shared content components. This genre of products, launched in about 2011, includes Alma from Ex Libris and WorldShare Management Services from OCLC. The FOLIO project is underway to produce an open source library services platform, with implementations expected by early 2019. Unsuccessful efforts to develop other library services platforms include the Kuali OLE open source project and Intota from ProQuest. The need for ProQuest to complete Intota was obviated when it acquired Ex Libris and its already well-established Alma product. Library services platforms have been adopted mostly by academic and research libraries, though the conceptual design could also be applied to other types of libraries.

## Special Challenges in Addressing Open Access Content

The default model of discovery provides access to resources within the library's body of subscriptions. Link resolvers are well positioned to be able to determine if an article should be available within subscribed resources. All persons are also entitled to the full text of any article published as open access, regardless of whether their library has purchased a subscription to the journal. Discovery services and link resolvers need some type of indicator that an article may be available as open access. Some of the techniques used to identify eligible open access content include the "Access and License Indicators" recommended practice from NISO (RP-22-2015), which defines metadata elements reflecting the status of an article.<sup>3</sup> These elements can be used in many ways, including submissions to discovery indexes and knowledge bases to better enable access to open access materials.

Another method for identifying open access materials involves the use of specialized citation databases that track these resources. The nonprofit organization Impactstory, for example, has created Unpaywall, a browser plug-in that helps researchers identify any available PDF full-text copies of resources they search for on the web.<sup>4</sup> Unpaywall captures the citation and checks it against the library's subscriptions as well as its database of open access resources available on institutional and disciplinary repositories. Link resolvers can also be configured to enable the Unpaywall service to provide links to open access copies of articles that may be outside the library's subscriptions.

Link resolvers from Ex Libris, including SFX, 360 Link, and Alma's resolver, support access to the Unpaywall service.<sup>5</sup> EBSCO offers an app that can be installed in a library's instance of EBSCOhost or EBSCO Discovery Service to check the availability of open access articles for items listed in search results.

*EBSCO Unpaywall API*

<https://cloud.ebsco.com/apps/unpaywall-api>

## Models of Discovery

Libraries today have many different options to enable their users to discover and gain access to their collections of information resources. Several different combinations of products can be assembled, depending on the ways in which the library wants to organize its website and discovery environment and the types of resource management systems it has in place. The following section describes some of the combinations currently seen on academic library websites in the United States.

### Online Catalog with No Index-Based Discovery

Libraries with an online catalog with no index-based discovery present a search box for the online catalog for access to locally owned items such as books, DVDs, and other materials managed by their ILS. Although most midsized and large academic libraries have implemented one of the commercial index-based discovery services, many smaller institutions direct users to specific aggregated databases or lists of e-journals. Public libraries predominantly present the online catalog of the ILS as their main search box.

### Index-Based Discovery Service with Separate Online Catalog

Another set of libraries have implemented an index-based discovery service but use it primarily for access to their electronic resources while maintaining the online catalog of their ILS for books and other local resources. Libraries often use a tabbed search box on their website to direct a query to the appropriate system. This approach makes it simple for a user to enter search terms, but once the initial search has been submitted, the user is then working with the native interface of the online catalog, discovery service, or other system.

### Bento Box

The bento box search model involves a discovery interface designed to offer a single box for users to enter a query, which is then simultaneously sent to multiple systems. Results are then organized into multiple panels, each representing the items returned from one service. The term *bento box* was coined by Tito Sierra, using the metaphor of a bento box keeping different types of food items separate to visualize the organization of different types of information separated into

cells of a webpage.<sup>6</sup> A typical bento box would present results from the library catalog, articles from the discovery service, content from the website, and resources from a digital collection within separate panels. The bento box discovery interface would interact with the APIs of each of the target services to populate each panel of the results page. Users can then select any panel to see a more complete list of resources according to the content type of interest.

### Online Catalog Integrated with Index-Based Discovery

Academic libraries operating an ILS may want to continue to use their online catalog as their discovery interface and be able to include articles in search results. This search model is accomplished through the use of the API of the discovery service called within the online catalog or discovery interface of the ILS. Almost all major ILS developers, for example, have created a mechanism for integrating with EBSCO Discovery Service (EDS). Encore Duet from Innovative Interfaces is based on Encore as the discovery interface, retrieving results from Sierra or Millennium for locally owned items and layering in articles through the EDS API. SirsiDynix follows a similar approach with its Enterprise discovery interface.

### Discovery Service with ILS Integration

The model of discovery service with ILS integration presents the interface of the discovery service to users, integrating results from its central index along with results from the library's ILS. The discovery interface can serve as a complete replacement for the online catalog of the ILS, including features related to the patron account such as placing requests for materials, viewing lists of items borrowed, and other related features.

### Bundled Discovery Service with Library Services Platform

Bundled discovery services with library services platforms provide a unified model for managing library resources across multiple formats. These products are used by library personnel to support the operations

of the library and for managing collection resources. They differ substantively from ILSs, which provide resource management through modules and workflows originally designed for print resources. The two major library services platforms, Ex Libris Alma and OCLC's WorldShare Management Services, do not directly include a patron-facing catalog or discovery service. Both organizations, however, bundle their discovery products with their library services platform. Although library services platforms can also be implemented with alternative discovery services, most installations to date pair components from the same vendor.

### Fully Integrated Discovery Service with Library Service Platform

Another model of discovery, a fully integrated discovery service with library service platform, brings the discovery service closer to its associated library services platform. Even when bundled together, Primo and Alma have been managed through separate configuration interfaces (or "back office" tools, to use Ex Libris terminology). Ex Libris recently launched a new option with a tighter coupling of Primo and Alma, both managed through the Alma back office.

### Notes

1. Marshall Breeding, "Next-Generation Library Catalogs," *Library Technology Reports* 43, no. 4 (July/August 2007).
2. Marshall Breeding, "Library Resource Discovery Products: Context, Library Perspectives, and Vendor Positions," *Library Technology Reports* 50, no. 1 (January 2014).
3. "NISO RP-22-2015 Access and License Indicators," Recommended Practice, NISO, January 5, 2015, <https://www.niso.org/publications/niso-rp-22-2015-access-and-license-indicators>.
4. Holly Else, "How Unpaywall Is Transforming Open Science," *Nature* 560 (August 2018): 290–91 <https://doi.org/10.1038/d41586-018-05968-3>.
5. See Heather, "oaDOI Integrated into the SFX Link Resolver," *Impactstory Blog*, February 2, 2017, <http://blog.impactstory.org/oaDOI-in-sfx>.
6. Cory Lown, Tito Sierra, and Josh Boyer, "How Users Search the Library from a Single Search Box," *College and Research Libraries* 74, no. 3 (2013): 227–41.

# Current State of Discovery in Academic Libraries

Academic libraries allocate substantial portions of their collection budgets to electronic resources and therefore are motivated to ensure that their default search option addresses this content. The methods for providing access to these resources have evolved according to available technology products and services. The early efforts of manually creating lists of electronic resources were soon automated by finding aids such as A–Z lists and other products based on knowledge bases of electronic-resource holdings. These products help libraries manage and direct users to specific journals of interest to their research. Users could search for content on publisher sites and on discipline-specific aggregated databases. Libraries were also interested in providing a simplified mechanism for searching across all the many electronic resources they license on behalf of their user communities. The initial phase of these search products was based on federated search technologies. These products eventually gave way to the index-based discovery products in widespread use today.

Federated search products have largely been abandoned. This technology continues to be used in scenarios where it is important to have current resources and where the number of potential information targets is relatively small.

Index-based discovery services have been adopted by most midsized and large academic libraries. Smaller academic libraries with more modest budgets may subscribe to discovery products directly or gain access to discovery services via consortial license arrangements. The market study provided in chapter 4 sheds light on the nuances of how these products have been implemented across the different levels of academic libraries in the United States.

**Table 2.1.** Installation statistics reported by vendors for their discovery products as of the end of 2017

Discovery Product	Installations
EBSCO Discovery Service	16,000
Primo	2,233
Summon	740
WorldCat Discovery Service	3,737
WorldCat Local	725

## Product Sales Statistics

Data regarding the sales of discovery services have been covered in the annual “Library Systems Report” published by *American Libraries*.<sup>1</sup> These sales statistics are provided by the vendors and are based on the numbers of contracts and licenses signed by libraries worldwide. The basis of these statistics varies among the vendors, and these variations make it difficult to understand the relative competitive position of each of the products.

Table 2.1 provides the installation statistics reported by each of the vendors for its discovery products as of the end of 2017. According to these statistics, EBSCO Discovery Service (EDS) has been licensed by more libraries than all of the other products combined. This product has been implemented not only by academic libraries, but also by public, school, and corporate libraries and in almost all geographical regions. Many of the libraries covered within consortial, statewide, or national licenses may not necessarily present EDS as their primary search tool. OCLC’s WorldCat Discovery Service or WorldCat Local can be covered by subscriptions to its FirstSearch reference product.

To gain an understanding of the technologies and products that libraries position as their primary search services, it is necessary to look beyond these sales statistics. Alternatively, data can be gathered based on whether the library offers a broad-based search box on its website and what indexes or discovery products are invoked.

## Note

1. Marshall Breeding, "Library Systems Report 2018: New Technologies Enable an Expanded Vision of Library Services," *American Libraries*, May 1, 2018, <https://americanlibrariesmagazine.org/2018/05/01/library-systems-report-2018/>.

# Index-Based Discovery Services

## *Current Players and Products*

The current library marketplace includes five index-based discovery services from three vendors. It is notable that the products in this category have remained constant since the initial slate of offerings emerged around 2009. The development and maintenance of the central indexes that power these products represent a massive investment of resources that is a very high barrier to entry for new products.

- EBSCO Information Services has developed EBSCO Discovery Service.
- Ex Libris, now owned by ProQuest, develops and supports Primo and Summon.
- OCLC offers WorldCat Discovery Service and its predecessor, WorldCat Local.

These discovery services have been very widely implemented among academic and research libraries as well as smaller proportions of other types of libraries. The market share distribution of these products will be analyzed in chapter 4.

For each of these organizations, its discovery services play a key role in its broader product strategies. The background of each product and how it fits within the company's product portfolio will be discussed below.

### **Ex Libris: Diverse Products for Academic Libraries**

Ex Libris has become established as the largest provider of technology products and services to academic and research libraries. The company was acquired by ProQuest in December 2015 and operates as a wholly

owned subsidiary. ProQuest also offers a wide range of content products, including aggregated databases, e-books, dissertations, and other resources of interest to libraries. ProQuest in turn is a subsidiary of Cambridge Information Group, owned by the family of Robert N. Snyder, with minority ownership by Goldman Sachs.

Ex Libris had assembled a diverse product portfolio prior to its acquisition by ProQuest:

- Its original product, the **Aleph** integrated library system, was developed in the early 1980s for the Hebrew University of Jerusalem.
- In 2000 Ex Libris acquired the **SFX** technology from Ghent University and subsequently launched it as a commercial product. In support of SFX, Ex Libris created a global knowledge base of e-resources.
- **MetaLib**, a federated search utility, was introduced in 2000.
- Ex Libris acquired the **Voyager** integrated library system from Elsevier in 2006.
- **Primo** was launched in 2006 as an enhanced discovery interface with relevancy-ranked results and faceted navigation.
- **Rosetta**, a digital asset management and preservation application, was released in 2009.
- Development of **Alma** began in about 2009, with its first implementations made in 2012.
- The **Leganto** resource list management application was announced in 2015.

Once under the umbrella of ProQuest, Ex Libris assumed responsibility for its library workflow and discovery products:

- **360 Link**, which was developed by Serials Solutions as an OpenURL link resolver that included a knowledge base of e-resource holdings.
- **360 Search** (previously Central Search) federated search application, launched by Serials Solutions in 2005.
- **WebFeat** federated search application, acquired by ProQuest in 2008. This product was eventually discontinued, though aspects of its design and technology were incorporated into 360 Search.
- **AquaBrowser**, originally developed by MediaLab as a graphical discovery interface for public libraries, acquired by ProQuest subsidiary Bowker in 2007, and shifted to Serials Solutions in 2008. Many academic libraries, including Harvard University, implemented AquaBrowser during its ownership by Serials Solutions. This product is no longer actively developed and currently is used only by some library services in the Netherlands.
- **Summon**, launched as the original index-based discovery service in 2009.
- **Intota Analytics**, developed as an early component of a library services platform that ProQuest had planned to create.
- **RefWorks**, a citation manager acquired through COS (Community of Science).
- **Pivot**, a resource to help research universities discover grant funding opportunities.

Since its acquisition, Ex Libris has announced **Esploro**, a new research services product intended to help universities optimize their research activities, including providing increased exposure to research outputs, creating faculty profiles, and incorporating discovery of funding opportunities.

Ex Libris has recently acquired Research Research Ltd., or \*Research, a UK-based company that has developed content and discovery resources for research funding opportunities from the UK, European, and other international regions. \*Research also publishes newsletters, including policy perspectives and other content of interest to the academic research community.

### Ex Libris Evolving Discovery Strategy

Ex Libris has continually evolved its discovery products throughout its business history. The company has been active in an expanding set of product categories in recent decades. These categories include resource management, resource discovery and delivery, and more recently, products oriented to the broader academic enterprise. On the discovery front, Ex Libris's Primo currently stands as the company's flagship product, though the company develops and supports other related technologies.

Over the course of the company's business history,

Ex Libris has offered discovery products consistent with the expectations of each given era.

Ex Libris's discovery products have advanced in step with the trends in the library technology arena. The online catalogs of its Aleph and later Voyager integrated library systems (ILSs) were typical for the era. They offer a combination of search and browsing capabilities to enable access to the materials managed by the ILS, primarily monographs and journal titles. Both Aleph and Voyager continue to be widely deployed in academic and national libraries globally, though installation numbers are gradually declining as these libraries migrate to Alma and competing products.

For much of the history of library automation, online catalogs of ILSs were the primary library search tool. These online catalogs have generally implemented interface conventions specifically developed for accessing library collections using browse lists and keyword searching. The complex interfaces of online catalogs fell out of favor among some libraries once internet search engines came on the scene with their simplified interfaces and sophisticated search and retrieval technologies.

As libraries became widely invested in electronic resources, new discovery and management tools emerged to complement the ILSs, whose inherent design was focused on print resources.

Ex Libris launched SFX in 2000 as a linking utility to assist users in gaining access to the full text of articles from citations, search results, or other contexts. SFX proved itself as a successful product, initiating a new competition among this new category of context sensitive link resolvers. SFX and 360 Link continue to be used in many libraries alongside various discovery interfaces. The most current of these components have been redeveloped with Alma, with new knowledge bases resident within its Community Zone.

Shortly after the launch of SFX, the company developed its MetaLib federated search tool. Federated search enabled a library user to enter a search that was then distributed to multiple content sources, usually organized by academic discipline, and received consolidated results. While libraries were interested in better ways to provide access to their expanding collections of electronic resources, federated search is an inherently limited technology, plagued with inconsistent search results, slow performance, time-outs of targets, and poor relevancy based on shallow result sets.

Ex Libris has a longstanding strategy of developing products that operate independently from its core resource management products. This strategy can first be seen with SFX. This product was launched in about 2000 and was adopted by academic libraries using a variety of ILSs. Once these libraries became customers of Ex Libris's lower-cost product, many of these

libraries eventually purchased larger scale products such as Primo or Alma.

Primo was launched in about 2006 during a time of peak interest in replacing traditional online catalogs with more modern interfaces. The initial versions of Primo included a relevancy-based search, faceted navigation, and a simplified and customizable interface. Primo uses indexes populated with records from the library's local ILS, local repositories, or other resources. Ex Libris offered a package marketed as MetaLib+, which used the Primo discovery interface with the MetaLib federated search engine.

Primo was launched prior to the development of Alma and was designed to operate with any ILS. Many of its installations were in libraries that used its Aleph or Voyager ILS, but it was also integrated with products from competing vendors, including SirsiDynix Symphony or Horizon, or Sierra or Millennium from Innovative Interfaces.

Ex Libris enhanced its Primo discovery interface with Primo Central, a new full-text article-level index introduced in 2009, shortly after the introduction of Summon from ProQuest. Ex Libris has continually expanded the Primo Central index since its introduction. Primo Central is based on an index that represents broad coverage of the resources of interest to academic libraries. Some gaps remain, mostly due to specific publishers opting not to expose their content within relevancy-based discovery services. Ex Libris was positioned to leverage publisher relationships initially established for SFX to form partnerships with content creators to contribute to the Primo Central index.

The acquisition of Ex Libris by ProQuest brought two of the index-based discovery services into a single organization. The former technology products of ProQuest and its Serials Solutions subsidiary are now part of the Ex Libris product suite. Ex Libris has also been given responsibility for Pivot, RefWorks, Intota Analytics, and the 360 Suite of electronic resource management applications.

Under Ex Libris, Primo and Summon continued to be developed, supported, and marketed (see tables 3.1 and 3.2). The indexes of these products, however, are now populated from a unified process. Prior to the merger, the Primo and Summon indexes were similar, though each had some content not available in the other. The consolidation of the back-end processes results in a more comprehensive index while giving the company some efficiencies in maintaining the products. The Summon and Primo Central indexes continue to be deployed on separate technology platforms. The interfaces for the two products have always been quite distinct. Primo offers a highly customizable discovery interface with indexes that can be created to represent diverse content resources in addition to the library's catalog and Primo Central.

Summon's interface is more streamlined with less emphasis on customizability.

Ex Libris initially introduced Primo as a stand-alone discovery product designed to be integrated with any ILS, including its own Aleph and Voyager products as well as those from competitors. This strategy built on a strategy seen with SFX where Ex Libris was able to sell products and build relationships with libraries outside its Aleph customer base. Through these relationships, Ex Libris was better positioned to market higher-profile products, such as Primo. Primo likewise was an entrée into Alma. Libraries that had previously implemented Primo with a traditional ILS were natural candidates to implement Alma once it became available.

In the current marketplace, Alma has seen wide adoption among larger academic libraries, and with that success, Primo has likewise gained ground. The market study incorporated in this report reflects a strong trend toward bundling Alma and Primo, though other options remain possible. In recent years, most Primo sales have been to libraries implementing Alma.

Ex Libris also supports Summon as a discovery and user interface for Alma. This option has been exercised by only a small number of libraries. Many libraries implementing Alma that were previously Summon sites have shifted to Primo, including Carnegie Mellon University, Fairfield University, Texas Health Science Libraries Consortium, and Oakland University.

Summon sales have remained relatively strong during the initial period of the consolidation of Ex Libris and ProQuest. Ex Libris reported 126 new contracts for Summon, primarily to libraries using non-Ex Libris ILS products. The NC LIVE program offering resources to all North Carolina residents selected ProQuest content resources delivered via Summon.

Ex Libris continues to develop new types of products beyond the resource management and discovery arena. Leganto belongs to a new category of reading list and copyright management, which spans resource management and discovery. Based on the Alma platform, Leganto provides discovery and delivery of library-provided resources for courses. Instructors use Leganto to produce lists of resources required or recommended for each class, tapping into resources owned by the library and managed through Alma or from other sources. Leganto also includes features to ensure copyright compliance and to minimize duplicative purchase or licensing of resources. The company has also launched Exploro, a new application based on the Alma platform to help universities enhance their research efforts, highlighting the accomplishments of faculty members and helping to discover funding opportunities, manage research data, and other related activities.

One of the threads running through the company's

**Table 3.1.** Primo sales statistics from 2006 to 2017

Year	Contracts	Libraries	Installed
2017	126	244	2,233
2016	138	223	1,989
2015	117	237	1,766
2014	88	122	1,529
2013	98	256	1,407
2012	101	237	1,151
2011	111	158	914
2010		506	756
2009	53	120	250
2008	37	53	130
2007	12	38	77
2006	8	59	8

discovery strategy has been an emphasis on unifying previously separate resources and services into consolidated services. The company has designed its products centered on the concept of unified resource discovery and delivery and unified resource management. The scope of its product suites continues to expand. Leganto and Esploro reach beyond the traditional bounds of the library into the broader campus for support for teaching and research.

## EBSCO Information Services: Content, Discovery, and Technology

EBSCO Information Services, the largest subsidiary of EBSCO Industries, provides a diverse portfolio of products and services for libraries. The company traces its history to 1944 to a company established by Elton B. Stephens to sell magazines to military bases; EBSCO Industries was established in 1958. The company has steadily added new products and services, including a variety of business acquisitions. Today EBSCO Information Services ranks as one of the largest companies offering products and services to libraries. Revenues across all EBSCO Industries companies are estimated to exceed \$2.8 billion annually. The portion derived from EBSCO Information Services is not publicly disclosed. EBSCO Industries is privately owned by the Stephens family. Tim Collins currently leads EBSCO Information Services as its president and chief executive officer.

As one of the largest global companies oriented to libraries, EBSCO Information Services has products that include the following:

- Content packages
  - A variety of research databases via its **EBSCOhost Research Platform** in many academic disciplines.
  - **EBSCO eBooks and Audiobooks.** EBSCO began a new initiative in 2018 to offer e-books

**Table 3.2.** Summon sales statistics from 2009 to 2017

Year	Contracts	Libraries	Installed
2017	67	164	740
2016	73	73	602
2015	158		718
2014	195	192	697
2013	169		673
2012	158		504
2011	214		407
2010	164		170
2009	50		50

without cumbersome digital rights management restrictions and now offers 70,000 e-books without DRM.

- **Flipster** digital magazines, launched in 2014.
- Content acquisition services
  - Print and electronic journal subscriptions via **EBSCONET.**
  - **GOBI** for acquiring books and other library materials.
- Discovery, access, and resource management technologies
  - **EBSCO Discovery Service (EDS)**, the company's flagship product for broad-based discovery and access to library resources.
  - **Explora**, a simplified discovery interface designed for school and public libraries, addressing selected collections of articles, topic overviews, and video content.
  - **OpenAthens** single sign-on technology, via a partnership with Eduserv established in 2007.
  - **Full Text Finder**, an application for libraries to organize their electronic resources and to provide public interfaces for searching, browsing a library's electronic resources, and linking to full text. The product operates on top of the EBSCO Integrated Knowledge Base.
  - EBSCO, via a partnership with Hybrid Ventures, offers **Stacks**, a comprehensive library website environment fully integrated with EDS for access to library resources.
  - A growing list of utilities and applications are available from EBSCO's **Apps and Cloud Services** offerings.

The *EBSCOhost* platform hosts the content products that EBSCO produces directly or licenses from other content providers. The content portfolio of *EBSCOhost* spans almost all academic disciplines and includes products oriented to academic libraries, the health-care industry, corporate information centers, government agencies, public libraries, and schools. Many *EBSCOhost* databases include access to the full text of the articles indexed.

*EBSCOhost* Integrated Search extends *EBSCOhost* with dynamic connections to selected external



targets. The product incorporated federated search technology to provide access to databases and other resources not directly indexed on EBSCOhost. EBSCOhost Integrated Search continues to be supported, though EDS is now promoted as the company's strategic offering for search and discovery.

EDS, launched in 2009, builds on the EBSCOhost platform to address the broadest representation of content of interest to libraries. EDS natively includes all resources delivered on EBSCOhost as well as metadata and full text from most publishers and aggregators. EDS also ingests metadata from and enables real-time interfaces to the libraries' ILSs. EDS falls within the company's software-as-a-service (SaaS) portfolio, which in recent years has become an area of growing strategic focus.

The indexing and relevancy ordering of results through EDS prioritizes subject indexing, consistent with the company's core expertise in producing content resources such as its A&I (abstracting and indexing) databases. EBSCO promotes this characteristic as an advantage of its discovery technologies relative to competing products based on keyword algorithms. This approach also resonates with other producers of A&I products, some of which contribute content to EDS but not to other discovery services.

The EDS API (application programming interface) was released in June 2012. This API enables third-party discovery interfaces to incorporate search results from EDS and has been an important factor in enabling interoperability with ILSs and fostering partnerships of mutual interest.

### Recent Enhancements

EBSCO has recently made a variety of enhancements to EDS. In addition to links to the full text of articles, EDS now also provides links to specialized databases covered by the library's subscriptions to facilitate further exploration of the topic via their native interfaces.

The EDS Interface now follows a responsive design, enabling easier use across all types of devices, including those with smaller screens, such as smartphones.

EBSCO, beginning in fall 2018, is launching Knowledge Services, a new suite of products based on the EBSCO Integrated Knowledge Base. These products are each powered by the EBSCO Knowledge Base API, spanning both electronic resource management and end-user interfaces.

### Content Exchange with Discovery Services

Index-based discovery services depend on content creators to provide access to metadata or full text. The discovery service provider builds its indexes based on this content, in most cases linking users back to the content provider for access to the full text of the items

selected from search results.

Almost all the primary publishers of scholarly and professional journals have contributed their content to the major index-based discovery services. These publishers gain an additional layer of exposure for their resources through participation, which benefits their business through possible increases in use, which in turn stands to bolster new subscriptions and renewals.

The role of A&I products within discovery services is more complicated. These products include proprietary content in the form of subject terms, abstracts, and other value-added elements applied to selected journals, book chapters, and other publications within a defined discipline. How the citation metadata, value-added elements, and full text fit within a discovery service is not necessarily straightforward and has been a controversial dimension of the index-based discovery arena.

Most A&I providers do not directly provide their content to discovery services or opt to cooperate only with ones able to control access to their proprietary content and that give special consideration to their subject indexing and abstracts. Discovery services can potentially pose a threat to their business model, based on the concern that libraries would no longer subscribe to their products if indexing based on the articles were perceived as a sufficient and less costly approach. To date, interest in A&I products remains strong despite the near saturation of index-based discovery services among academic libraries.

### EBSCO Discovery Service Market Position

EBSCO Information Services reports current installations of EBSCO Discovery Service (EDS) at around 16,000 sites. Table 3.3 provides the numbers of new contracts and total installations EBSCO reported for EDS for the *American Libraries* "Library Systems Report" in recent years.<sup>1</sup>

These installation counts far exceed those of the competing products. The marketplace study of academic libraries in the United States presented in the following chapter shows a more even distribution among the competing products. It should be noted that EDS has been licensed by many nonacademic libraries, including some public library systems and those associated with schools, corporations, and other types of organizations. The product has been implemented in almost all global regions and is used in conjunction with almost all ILSs.

EBSCO Information Services has a multipronged strategy for positioning its discovery service in libraries. In addition to direct sales to libraries in response to procurement processes focused on discovery, EBSCO has also formed many partnerships with the vendors of ILSs and open source projects for the integration of its discovery service.

**Table 3.3.** EBSCO Discovery Service sales statistics from 2013 to 2017

Year	Contracts	Libraries	Installed
2017			12,416
2015	2,634		10,003
2014	2,634		8,246
2013	1,774		5,612

The global sales force of EBSCO naturally promotes the product to libraries based on its merits as the only discovery service that prioritizes subject indexing in its relevancy algorithm, its interface features, and its ability to integrate with other interfaces and services.

EBSCO has worked with almost all the organizations developing ILSs to help enable integration between their products and EDS. The EDS API, released in 2012 and continually enhanced, enables the online catalogs or discovery interfaces to offer article-level results in addition to the local holdings managed within the library's ILS. The EDS API can also enable a library to use EDS as a complete replacement for the online catalog for its ILS. The market study presented in the following chapter shows that EDS has been implemented in conjunction with all the major ILSs within the study group.

Partnerships with EBSCO have proven to be beneficial to the ILS vendors that have not created their own index-based discovery services, e-resource knowledge bases, or other components for electronic resource management and access. Given that academic library collections are now dominated by electronic content, these components are essential to retain existing customers and to attract new ones. Currently EBSCO Information Services is the primary company that actively partners with the ILS companies to provide an index-based discovery service. Many academic libraries, for example, have implemented Primo with their non-Ex Libris ILS, but this arrangement is primarily supported by Ex Libris and is not an option actively promoted by the ILS vendor. In this market sector, these companies compete directly with Ex Libris, which not only has a specialized resource management system, but also has two of the major index-based discovery services in its product portfolio.

SirsiDynix and Innovative, both companies with substantial numbers of academic library customers, do not offer their own index-based discovery services and have developed business and technology partnerships with EBSCO. Innovative launched Encore Duet in April 2014, combining its Encore discovery interface with article-level search results from EDS. This product is available to libraries that subscribe to both Encore and EDS; many libraries have initiated subscriptions to EDS through the procurement of Encore Duet. SirsiDynix has a similar arrangement with

EBSCO for its BLUEcloud Campus product, which combines its Enterprise discovery layer with the EDS API. This strategy has helped SirsiDynix fend off many defections from libraries using its Symphony and Horizon ILS products that otherwise might have moved to Ex Libris Alma or OCLC WorldShare Management Services.

Given the must-have status of the index-based discovery services for most academic libraries, those using ILSs often seek an integrated solution with a third-party provider. Many ILS providers have worked out partnerships with EBSCO.

### Implications of FOLIO for Discovery Services

The FOLIO project to develop a new open source library services platform continues to advance. We can expect production implementations of this product beginning in 2019. Given the sponsorship of this project by EBSCO, we can also anticipate that most of these implementations will be integrated with EDS. Because it is an open source project, libraries can opt to create integrations with other discovery services, but most, if not all, of the currently named development partners and early adopters are likely to use the EDS index for article-level discovery.

In addition to its in-kind and financial support of FOLIO, EBSCO has announced that it plans to offer hosting and support services. ByWater Solutions will also provide support services, with EBSCO providing hosting. We can reasonably assume that EBSCO-hosted installations of FOLIO would be integrated with EDS and other apps available from the company's SaaS offerings, although that is not explicitly stated as required.

The top tier of academic libraries represents the most lucrative segment of the library technology and services industry. Product pricing is scaled according to the size and complexity of the institution, meaning that large institutions carry considerably more economic impact. Given that some of the early FOLIO partners are in the category of large academic libraries, the project has the potential to strengthen EBSCO's position within this market segment.

Ex Libris currently holds a dominant position in the top tier of academic libraries for placement of its discovery products, though EDS has a higher percentage of libraries among Doctoral/Research Universities—Intensive than either Primo or Summon individually, though not combined.

If the momentum of Alma continues at about the same pace it has in recent years, Ex Libris will also strengthen its market share in the discovery sector. Possible disruptions to that trend would include a wave of FOLIO implementations once the product has been completed and additional libraries opting to use EDS alongside Alma. A more cooperative relationship

between EBSCO and ProQuest to enable interoperability between EDS and Alma cannot be ruled out, but thus far has not been announced.

Neither OCLC nor Ex Libris has yet announced any plans to develop integrations between FOLIO and its discovery service.

### EBSCO Discovery Service Prospective

EBSCO Discovery Service (EDS) is currently the most widely deployed index-based discovery service globally. The success of EDS can be attributed to its merits on content coverage and interface design, as well as its interoperability with strategic systems implemented in libraries.

The almost unbridled success of Alma, with its tendency to capture current or potential EDS implementations, has had an impact on the higher tiers of the more lucrative academic library market. EBSCO has a very strong position among libraries that continue to rely on ILSs as the core of their automation environment. These libraries appreciate the integration options available for EDS. The trend for academic libraries to move away from ILSs to library services platforms has become increasingly pronounced in recent years. This trend works against EDS since most libraries opt to implement the bundled discovery service. EBSCO's involvement with FOLIO addresses this market trend, tapping into multiple threads of interest, including an additional option in the narrow slate of library services platforms, open source software as a hedge against the control associated with proprietary systems, and a modular architecture promoted as offering more flexibility for functional components.

### OCLC: A Suite of Discovery Tools Based on WorldCat

OCLC, a nonprofit cooperative based in Dublin, Ohio, is owned by its members, governed by a board of trustees, with a set of global and regional councils providing advice and oversight. An executive team, led by President and Chief Executive Officer Skip Prichard, provides strategic and operational leadership of the organization. OCLC operates as a nonprofit in the United States but is involved in commercial competition for library products and services and is active in almost all global regions.

The nonprofit offers a wide range of products and services, addressing almost all aspects of library operations. While too numerous to comprehensively describe, some of the offerings relevant to this report include the following:

- Resource management products
  - **WorldShare Management Services** was

launched in 2011 as a library services platform based on the bibliographic ecosystem of WorldCat. Its data model relies on attaching inventory records to WorldCat records and aims to deliver highly streamlined workflows by avoiding the need for local bibliographic databases.

- **WorldShare License Manager** provides functionality for managing licenses associated with library content subscriptions. Though tightly integrated with WorldShare Management Services, it is an optional, separately priced service.
- **CONTENTdm** is an application for the management of image and other digital collections. The product is deployed on its own codebase separate from the WorldShare platform.
- **EZproxy** provides authorization and authentication services to enable users to access restricted content resources.
- Metadata services
  - **WorldShare Metadata Services** supports OCLC member libraries in describing their collections, including using WorldCat records for copy cataloging, creating new original records, and attaching their holdings to bibliographic records for resource sharing. OCLC's metadata services span all formats, including print, electronic, and digital materials.
  - **WorldShare Collection Manager** provides bulk records for collections of e-books or other packaged content.
- Resource sharing
  - **WorldShare Interlibrary Loan** provides a brokering service to enable libraries to borrow and lend print and electronic materials.
  - **Tipasa** is a new interlibrary loan management utility based on the WorldShare platform intended to eventually replace the ILLiad application widely used for managing lending and borrowing operations in library interlibrary loan departments.
- Discovery services
  - **WorldCat.org** is a public-facing interface for the OCLC bibliographic database intended for use by the general public as well as member libraries and their patrons. The service enables users to find what libraries near them hold items of interest.
  - **WorldCat Discovery Service** is a subscription-based service for comprehensive patron search of the WorldCat.org database (prioritizing local library holdings) and article-level metadata associated with library subscriptions.
  - **FirstSearch** addresses the same content resources as WorldCat Discovery Service, but using an interface with advanced search capabilities oriented more toward library staff

members than patrons. FirstSearch subscriptions also enable exposure of the library's holdings to the open web through WorldCat.org.

OCLC's discovery products take advantage of the massive WorldCat.org database. This resource currently includes over 425 million bibliographic records and continues to grow at a rapid rate. It is populated through the cataloging performed by member libraries as well as by batch loading of records from national libraries, regional consortia, and other organizations. Publishers and other vendors also provide records for WorldCat, often with minimal descriptive data, which are often subsequently enhanced by catalogers from member institutions. WorldCat provides the foundation for OCLC's resource-sharing products and services, including WorldShare Interlibrary Loan, ILLiad, and Tipasa.

WorldCat Local was launched in April 2007 as an extended discovery tool integrated with a library's ILS. The product is based on the WorldCat database, prioritizing results for resources held by the library, with features such as real-time availability and requests enabled through live connections to the local ILS. WorldCat Local enables patrons to discover items in their library's collection and beyond, simplifying the process of having to search multiple systems to find and request items of interest. WorldCat Local depends on a library's collection being accurately represented in WorldCat, usually accomplished through a synchronization process OCLC describes as "reclamation."

In addition to the bibliographic records describing books and journal titles, WorldCat Local also provided access to an extended article-level index, populated with citation data received from publishers and aggregators and harvested from open access repositories. WorldCat Local has steadily grown in the article-level content indexed.

In April 2009 OCLC announced its intent to create a new resource management service based on WorldCat. Initially named Web-Scale Management Services, the product was branded as WorldShare Management Services in November 2011 prior to its initial production release.

OCLC launched WorldCat Discovery Service in January 2014 as an eventual replacement for WorldCat Local. WorldShare Management Services was deployed on a new technical platform and offered a redesigned interface and other improvements. Upon its production release, OCLC reported that the central index for WorldCat Discovery Service covered more than 1.5 billion articles, book chapters, and other electronic content.

WorldCat Discovery Service is offered as the default public interface for new libraries subscribing to WorldShare Management Services. WorldCat Local continues to be supported for libraries using

**Table 3.4.** WorldCat Local installations from 2009 to 2017

Year	Installed
2017	725
2016	725
2015	698
2014	1,796
2013	1,717
2012	1,683
2011	1,578
2010	1,419
2009	624

WorldShare Management Services and ILS products from other vendors.

OCLC released a beta version of the WorldCat Discovery API in October 2014. This API enables libraries to integrate results from WorldCat and the article-level central index into their own interfaces and other services. As of August 2018, this beta API has not yet been established as a commercial service.

Each of OCLC's discovery products addresses the needs of different categories of users, but all contribute to the organization's broader mission of supporting libraries through the efficiencies and impact gained through global cooperative services and supporting technology infrastructure.

WorldCat.org provides the general public access to library resources available in its member libraries. It is designed to help individuals find materials in nearby libraries and connects to local catalogs to display status and availability, enabling searchers to gain access to materials physically or electronically.

The number of active subscriptions to WorldCat Local peaked in 2014 and has declined since that time (see table 3.4). Many of these libraries have shifted to WorldCat Discovery Service. Table 3.5 shows the installations of WorldCat Discovery Service from 2014 to 2016.

The market positions of WorldShare Management Services and WorldCat Local are difficult to assess due to the complexity of implementation scenarios and license arrangements. The focus of interest in this report is on libraries that use an index-based discovery service as their primary search interface. Many libraries may have access to the OCLC discovery products but do not position them prominently on their websites as their main search tool for their patrons.

OCLC reported 521 libraries using WorldShare Management Services at the end of 2017, as shown in table 3.6. Almost all these libraries are using WorldCat Discovery Service or WorldCat Local as their patron interface and primary discovery tool. These libraries using WorldShare Management Services comprise about 12 percent of the combined subscriptions reported for WorldCat Local and WorldCat Management Services. A large portion of the subscriptions

**Table 3.5.** WorldCat Discovery Service installations from 2014 to 2016

Year	Installed
2016	3,737
2015	3,642
2014	2,085

for WorldCat Discovery Service are currently associated with FirstSearch subscriptions, including use intended for library personnel or advanced users as a specialized reference resource.

OCLC plans to phase out WorldCat Local in favor of WorldCat Discovery Service as its broad-based discovery tool. Contrary to initial announcements, OCLC now plans to continue FirstSearch as an advanced search interface for WorldCat. Although now combined, subscriptions for FirstSearch and WorldCat Discovery Services will eventually be discrete.

Not discounting the usefulness of OCLC's discovery products for library personnel and as reference tools, it is also important to understand the relative position of the product as a library's primary discovery service. The total subscription counts reported by OCLC reflect broad interest in these products, but do

**Table 3.6.** WorldShare Management Services sales statistics from 2010 to 2017

Year	Contracts	Libraries	Installed
2017	52	54	521
2016	83	97	440
2015	68	73	386
2014	79	90	303
2013	92	140	177
2012	163		73
2011	184		38
2010	130		5

not tell the whole story in terms of their use as a library's core discovery service. The implementation study presented in the following chapter will provide some insight into this question.

### Note

1. Marshall Breeding, "Library Systems Report 2018: New Technologies Enable an Expanded Vision of Library Services," *American Libraries Magazine*, May 1, 2018, <https://americanlibrariesmagazine.org/2018/05/01/library-systems-report-2018/>.

# Implementation Study

## *US Academic Libraries*

In support of this report, a systematic review was performed to gather data on the discovery services selected by academic libraries in the United States. This study focused on the libraries associated with colleges and universities in the US in selected classification categories assigned by the Carnegie Foundation for the Advancement of Teaching in 2000. The categories used are based on an older edition of the classification assessments now performed by the Center for Postsecondary Research at the Indiana University Bloomington.<sup>1</sup> The study is based on the Libraries.org directory of libraries maintained by the author as a component of Library Technology Guides. The entry for each academic library in the US has been populated with the 2000 Carnegie Classification designation.

*Libraries.org directory*  
<https://librarytechnology.org/libraries>

The Libraries.org directory includes fields for multiple categories of technology products. Current and previous integrated library systems (ILSs) are the core focus of Library Technology Guides and therefore were already comprehensively represented. The database previously had fields for current and previous index-based discovery services and discovery interfaces, but these were not thoroughly populated. The author visited the websites of all the libraries with missing data to determine the discovery services offered. This effort resulted in a snapshot of current implementations and may not reveal implementations or migrations that are planned or in process.

This review focuses on colleges and universities

and does not include two-year community colleges or associate's colleges. The specific classification levels include the following:

- 15: Doctoral/Research Universities—Extensive
- 16: Doctoral/Research Universities—Intensive
- 21: Master's Colleges and Universities I
- 22: Master's (Comprehensive) Colleges and Universities II
- 31: Baccalaureate Colleges—Liberal Arts
- 32: Baccalaureate Colleges—General

A report was adapted to present the data according to each of the Carnegie levels. The report organizes the libraries according to the discovery service used, providing links to the Libraries.org profile of each library and the total counts for each discovery service within that Carnegie Classification level. A pie chart illustrates the distribution of discovery services among the libraries of each Carnegie level. Summarized data are also presented in a table. The report also presents data from the 2012 data set collected and made available from the National Center for Educational Statistics showing total and technology expenditures in aggregate for each level and the average expenditures per library. These reports can be generated dynamically on Library Technology Guides (see URL in gray box). Tables 4.1–4.2 and figure 4.1 provide data from the report generated for the top Carnegie Classification level (15: Doctoral/Research Universities—Extensive).

*Library Technology Guides, ILS Report by Carnegie Classification*  
<https://librarytechnology.org/libraries/carnegie/>

**Table 4.1.** List of universities classified in level 15—Doctoral/Research Universities—Extensive—and the discovery service they’re currently implementing. For the complete table, view <https://librarytechnology.org/libraries/carnegie/>.

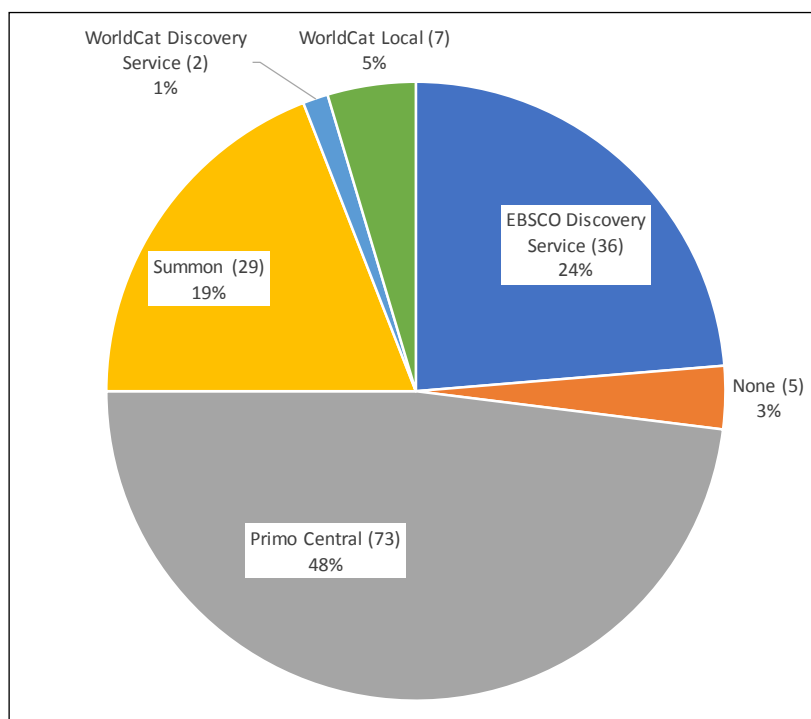
Discovery Product	Libraries	Count
EBSCO Discovery Service	Brigham Young University; California Institute of Technology; Florida International University; Florida State University; Fordham University; Georgia State University; Indiana University; Kent State University; Louisiana State University; Marquette University; and more. View the full list at <a href="https://librarytechnology.org/libraries/carnegie/">https://librarytechnology.org/libraries/carnegie/</a> .	36
None	Auburn University; Johns Hopkins University; Lehigh University; Northern Illinois University; University of Illinois - Urbana-Champaign	5
Primo Central	American University; Arizona State University; Binghamton University; Boston College; Boston University; Brandeis University; Carnegie Mellon University; Catholic University of America; Clemson University; Colorado State University; and more. View the full at <a href="https://librarytechnology.org/libraries/carnegie/">https://librarytechnology.org/libraries/carnegie/</a> .	73
Summon	Brown University; Case Western Reserve University; Columbia University; Cornell University; Duke University; Michigan State University; North Carolina State University; Pennsylvania State University; Princeton University; Syracuse University; and more. View the full list at <a href="https://librarytechnology.org/libraries/carnegie/">https://librarytechnology.org/libraries/carnegie/</a> .	29
WorldCat Discovery Service	Claremont Graduate University; University of New Mexico	2
WorldCat Local	Ohio State University; University of California - Los Angeles (UCLA); University of California - Riverside; University of California - San Diego; University of Delaware; University of Louisville; University of Maryland	7
Total		152

A total of 1,357 academic institutions are represented within these six categories (see table 4.3). These libraries represent the core market for index-based discovery services in the United States. Trends seen here may not necessarily be applicable to other geographic regions.

Limiting the review to these institutions does not represent the full installed base of any of the products involved since they are also implemented to a limited extent in two-year colleges in the US as well as in some nonacademic libraries. Each of the products has been implemented globally. This review does not cover regions outside the US, so it should be understood as a subset of global installations. That said, this systematic review of these libraries provides insight into the trends of discovery product implementations according to size and scope of academic libraries.

This review focuses on the index-based discovery product licensed, regardless of what discovery interface is used. A library, for example, that has developed an interface using VuFind that presents article content in its search results from EBSCO Discovery Service will be counted as EDS. Discovery interfaces are also tracked in Libraries.org, but not systematically.

A library is counted as using one of these products only if a search box on its website leads to results from



**Figure 4.1** Discovery products in Carnegie Classification 15 by percentage of current use

the service. Some may use another discovery interface but would be counted if their article search returns results from a given index-based discovery service. This approach does not count libraries that may have licensed the product, either directly or as part of a consortial or statewide arrangement, but do not present the search option dominantly on their website. Many libraries, for example, may have authorized access

**Table 4.2.** Aggregate expenditures per library classified in level 15

Category	Aggregate Expenditures	Libraries	Average per Library	Percentage
Total	\$3,387,652,935	152	\$22,287,190	
Technology	\$68,262,612	152	\$449,096	2.02%

**Table 4.3.** Discovery product installations by Carnegie Classification level

Carnegie Classification Level	EDS		Primo		Summon		WorldCat		None		Total
	# Using Service	% Using Service	# Using Service	% Using Service	# Using Service	% Using Service	# Using Service	% Using Service	# Using Service	% Using Service	
15: Doctoral/ Research Universities—Extensive	37	24%	73	48%	29	19%	9	6%	4	3%	152
16: Doctoral/ Research Universities—Intensive	40	38%	31	29%	17	16%	10	9%	8	8%	106
21: Master’s Colleges and Universities I	164	34%	151	31%	56	12%	65	13%	48	10%	482
22: Master’s (Comprehensive) Colleges and Universities II	28	27%	17	16%	11	11%	27	26%	21	20%	104
31: Baccalaureate Colleges—Liberal Arts	56	26%	36	17%	26	12%	58	27%	41	19%	216
32: Baccalaureate Colleges—General	96	32%	41	14%	15	5%	54	18%	91	31%	297
Totals	421	31%	349	26%	154	11%	223	16%	213	16%	1,357

to WorldCat Discovery Service through a FirstSearch subscription but opt not to use it as their primary discovery service. For this reason, the installation statistics given in this report may differ from the total number of sales or licenses reported by each vendor.

## Discovery Implementation Trends in US Academic Libraries

The implementation data for these libraries indicate a very high level of adoption of index-based discovery services. Only 16 percent of the libraries in the group under consideration have not yet implemented one of these products (213 out of 1,357). The adoption percentages vary according to advancement level: only 4 of the Doctoral/Research Universities—Extensive group and 31 percent of the Baccalaureate Colleges—General group have not implemented a discovery service. These statistics imply that the cost of these products may be out of reach to many of the smaller academic libraries. Libraries in the top tier of academic libraries that have not implemented an index-based discovery service seem more likely to have avoided

these products intentionally than from the lack of funding.

Of the three organizations offering index-based discovery services, ProQuest and EBSCO Information Services hold almost equal positions, with OCLC trailing these two substantially. Of the study group, 31 percent have implemented EBSCO Discovery Service (421 out of 1,357); ProQuest leads with 37 percent of the libraries (154 [11%] using Summon, 349 [26%] using Primo); OCLC follows with 16 percent (223 using either WorldCat Discovery Service or WorldCat Local). The proportion of libraries using Primo decreases with each academic level (level 15 = 48%; 16 = 29%; 21 = 31%; 22 = 16%; 31 = 17%; 32 = 14%). The same trend applies to Summon.

Statistics from the study group indicate that the higher-level academic libraries have implemented discovery products from Ex Libris in larger proportions than from its competitors. Among the Doctoral/Research Universities—Extensive institutions, 73 have implemented Primo (48%) and another 29 use Summon (19%) for a total market share of 67 percent. This top group of academic libraries has implemented resource management products from Ex Libris in similar



proportions: 68 use Alma, 20 use Voyager, and 13 use Aleph, totaling 101 out of the 152 installations or 66 percent.

Ex Libris discovery products hold a much smaller market share among the smaller academic institutions. Among the Baccalaureate Colleges—General group, only 5 percent have implemented Summon and 14 percent use Primo, well below the proportions using EBSCO Discovery Service or WorldCat.

EBSCO Discovery Service has been implemented in mostly consistent proportions among all the tiers of academic libraries. Percentages range from a high of 38 percent among Doctoral/Research Universities—Intensive institutions to 24 percent of Doctoral/Research Universities—Extensive. It is notable that EBSCO Discovery Service has been implemented in a higher proportion of the penultimate academic level than the other categories. These statistics suggest that this product has been well accepted by academic libraries ranging from the most complex to those with smaller collections.

EBSCO Discovery Service holds higher percentages than any of its competitors in several categories: Doctoral/Research Universities—Intensive (38%), Master's Colleges and Universities I (34%), and Baccalaureate Colleges—General (32%).

OCLC's WorldShare Management Services and WorldCat Local hold a smaller market share overall, though these two products are quite popular in the middle tier of academic libraries. In the category of Baccalaureate Colleges—Liberal Arts institutions, 27 percent use a discovery service from OCLC, more than any other discovery service, but slightly below the combined product totals from Ex Libris. Among the top two tiers of Doctoral/Research Universities, OCLC installations (5%) fall well below those from Ex Libris (58%) and EBSCO (30%).

The members of the Association of Research Libraries (ARL) provide another view of the discovery services implemented in large academic libraries.

Out of 116 academic members of the ARL, 114 have implemented one of the commercial index-based discovery services.<sup>2</sup> Below is a breakdown by discovery service:

- Primo/Primo Central: 53
- Summon: 27
- EBSCO Discovery Service: 25
- WorldCat Local or WorldCat Discovery Service: 9
- None: 2

## Discovery and Resource Management

Whether discovery services should be bundled or acquired à la carte has emerged as one critical issue in

the current phase of library systems. Both high-stakes business interests and the technology strategies of libraries come into play.

Perspectives differ regarding the benefits of pairing a discovery service with the resource management system from the same vendor. Two arguments prevail:

- From one point of view, discovery services should be selected independently from whatever resource management systems are used by library staff members. A library wants the most appropriate patron-facing service based on usability, content coverage, and other distinctive criteria. Libraries should be able evaluate and acquire their preferred products in each category and not be locked into a bundled package. A library's technical infrastructure should be modular so that the library can assemble the components best able to serve its needs. Each of the discovery services offers distinctive capabilities, warranting the additional effort needed for systems integration.
- It could also be argued that discovery services and resource management systems from the same provider can be better integrated in ways that can improve the patron's experience and produce search results with more reliable linking to full text. Patron profiles drive resource management functions such as circulation within the resource management system as well as request, fulfillment, and personalized features in the discovery service. Many libraries may be offered financial incentives to accept the discovery service bundled with a new library services platform compared to purchasing a discrete product from another vendor. The discovery services offer some differences in capabilities, but not to the level that justifies the additional effort involved in systems integration.

In the current phase of the library technology industry, academic libraries replacing existing ILSs tend to select a library services platform paired with the discovery service from the same vendor. Ex Libris dominates its competitors, with Alma and Primo as the top choice for academic libraries, both within the United States and internationally. Sales of OCLC's WorldShare Management Services fall well below those of Alma but are almost always paired with WorldCat Discovery Service.

Although most new Alma subscriptions are bundled with Primo, Ex Libris also supports some other discovery product combinations. The company also supports Summon as the patron interface and discovery service for Alma as well as open-source discovery interfaces such as VuFind and Blacklight. These open-source implementations will usually use the Primo Central index for article-level search results.

The pairing of Summon with Alma has so far been

**Table 4.4.** Ex Libris Alma installations from 2011 to 2017, including number of contracts, number of libraries, and number of installations

Year	Contracts	Libraries	Installed
2017	116	266	1,095
2016	132	203	829
2015	88	220	626
2014	43	77	406
2013	31	170	329
2012	17	71	126
2011	24	24	55

mostly seen with libraries that have previously implemented Summon. Although the indexes for Summon and Primo are populated with much the same content, they offer distinctive interfaces. Libraries acclimated to Summon may not necessarily appreciate the complexities of Primo. Eastern Michigan University, for example, has been an early adopter of Summon and chose to retain this discovery service as a condition of selecting Alma.

## Current Market Trend for Bundled Products

In the current phase of the academic library sector of the technology industry, Ex Libris has become established as the leading competitor for its Alma library services platform. Most new contracts for resource management systems have gone to Ex Libris (table 4.4), with OCLC's WorldShare Management Services attracting a smaller number of libraries (table 4.5). ILSs including Innovative's Sierra, SirsiDynix Symphony, and Koha also hold minority positions in new sales and continue to represent a large portion of incumbent installations.

Almost all the contracts for Alma and WorldShare Management Services also include a discovery service component. In this way, the trends for new library service platform selections favor three of the four discovery services: Primo and Summon from Ex Libris and WorldCat Discovery Service. This trend works against EBSCO Discovery Service, though it still holds a very strong position in the market and continues to see growth overall.

Several very large systems and consortia have selected Alma and Primo, which can mean displacement of multiple ILSs and discovery services. In the last few years, major contracts for Alma that displaced EBSCO Discovery Service installations included Partnership among South Carolina Academic Libraries, State University of New York Libraries Consortium, Rutgers University, and other individual academic libraries. Just as in the resource management arena, the trend toward contracts involving large numbers of libraries

**Table 4.5.** OCLC WorldShare Management Services installations from 2010 to 2017, including number of contracts, number of libraries, and number of installations

Year	Contracts	Libraries	Installed
2017	52	54	521
2016	83	97	440
2015	68	73	386
2014	79	90	303
2013	92	140	177
2012	163		73
2011	184		38
2010	130		5

through statewide systems or large consortia often results in a “winner-take-all” scenario that displaces many previously diverse implementations, which are consolidated into a unified system sharing a single resource management and discovery product suite.

Given the strong momentum of Alma and its tendency to displace EBSCO Discovery Service, the launch of FOLIO with strong backing by EBSCO can be seen as a proactive measure to introduce a new option into the marketplace that favors the concept of modular, unbundled application components. EBSCO will naturally promote EBSCO Discovery Service as the discovery component for the libraries that engage for FOLIO services.

The University of Pennsylvania libraries have implemented Alma, but with their locally developed discovery interface based on Blacklight that relies on the Summon index for article-level search results.

## Resource Management/Discovery Service Market Study

Table 4.6 describes the resource management and discovery products implemented among the libraries in the study group.

Several patterns can be seen in this group of US academic libraries relative to resource management systems and discovery services.

These implementation statistics confirm the trend that library services platforms are usually bundled with a discovery service from the same vendor. Of the 316 Alma sites in the study group, 293 have implemented Primo and 7 use Summon. In other words, 95 percent of libraries implementing Alma use a discovery service from Ex Libris. Out of the 206 libraries using WorldShare Management Services, 185 match it with WorldCat Discovery Service or WorldCat Local (90%).

It is notable that among the libraries using ILSs from Ex Libris, more are currently using EBSCO Discovery Service than Ex Libris's own Primo or Summon products. Of the 54 Aleph implementations in

**Table 4.6.** Number of implementations of resource management and discovery service products among university- and college-level libraries in the study

	<b>EBSCO Discovery Service</b>	<b>Primo</b>	<b>Summon</b>	<b>WorldCat Discovery Service</b>	<b>Total</b>
<b>Symphony</b>	85	2	22	4	113
<b>Horizon</b>	4	0	3	2	9
<b>Sierra</b>	139	2	67	2	210
<b>Millennium</b>	30	4	9	3	46
<b>Alma</b>	15	293	7	1	316
<b>Aleph</b>	30	17	4	3	54
<b>Voyager</b>	51	15	27	12	105
<b>WMS</b>	19	0	2	185	206
<b>Koha</b>	25	1	9	6	41

this group, 30 institutions use EBSCO Discovery Service, 17 use Primo, 4 use Summon, and 3 use OCLC's WorldCat Local or WorldCat Discovery Service. A similar pattern applies to Voyager (EBSCO Discovery Service = 51; Primo = 15; Summon = 27; WorldCat = 12).

Almost all libraries using OCLC's WorldShare Management Services have gone with WorldCat Local or WorldCat Discovery Service (185 out of 206 institutions); 19 use EBSCO Discovery Service for searching articles; 2 libraries use Summon; none use Primo.

One exception to the bundled options from Ex Libris can be seen in the University System of Georgia (USG) consortium of academic libraries. The consortium has licensed EBSCO Discovery Service for its members, most of which have implemented it as their primary article-level search service. The consortium selected Ex Libris in Alma. Most of the libraries in the consortium use Primo as their interface for books, e-journal titles, and other materials managed directly in Alma but continue to use EBSCO Discovery Service for searching articles. Within the USG system, Georgia Institute of Technology used both Primo and Primo Central instead of EBSCO Discovery Service. Since no direct integration is currently offered between the products, EBSCO Discovery Service cannot be used with Alma as a catalog replacement option as it can with most ILSs.

EBSCO Discovery Service has the most diversity in terms of integrations with resource management systems. Combinations include Symphony: 85 out of 113; Horizon: 4 out of 9; Sierra: 139 out of 210; Millennium: 30 out of 46; Alma: 15 out of 316; Aleph: 30 out of 54; Voyager: 51 out of 105; WorldShare Management Services: 19 out of 206; and Koha: 25 out of 41. This pattern is consistent with EBSCO's strategy of entering partnerships with the vendors of ILS products and open-source projects to develop technical integrations and business relationships in support of EBSCO Discovery Service.

Many libraries in the study group using Sierra and

Millennium have implemented EBSCO Discovery Service, either integrated with its Encore discovery service (marketed as Encore Duet), offered as a separate nonintegrated discovery service, or using EBSCO Discovery Service as the full patron interface. Out of the 210 libraries using Sierra, 139 also use EBSCO Discovery Service; 30 out of the 46 libraries using Millennium use EBSCO Discovery Service.

Out of the 41 academic libraries in the group using the open-source Koha ILS, 25 have also implemented EBSCO Discovery Service.

Other ILSs were also represented in this group, but with few installations. These include Virtua (4), Quali OLE (2), TIND ILS (1), Evergreen (1), Library Solution (14), Mandarin Oasis (2), Follett Destiny (3), EOS.Web (1), Polaris (9), LibraryWorld (1), Spydus (1), None (3), AGent VERSO (3), Alexandria (1), Insignia (1), and Mandarin M5 (1).

It is important to keep in mind that the academic library sector is very much in motion in terms of resource management systems and discovery services. Ex Libris continues to announce new Alma sales regularly, most of which also include Primo.

The statistics given in this issue are a snapshot of implementations as of August 2018. The reports developed for the issue can be accessed from Library Technology Guides. They are likely to have changed since the writing of this report because the entries in the Libraries.org database are continually updated to reflect new selections and implementations of resource management systems and discovery services.

Given the strong momentum toward adoption of library services platforms in academic libraries, those vendors offering only an ILS are vulnerable targets for Ex Libris and OCLC. Companies such as Innovative and SirsiDynix that have not created their own index-based discovery services and knowledge bases have formed partnerships with EBSCO as a defensive measure. In the long term, it will be interesting to see whether the libraries using SirsiDynix and Innovative ILS products paired with EBSCO discovery and

knowledge base components remain loyal or eventually gravitate toward bundled library services platforms and discovery services.

As a broad characterization based on available data, almost all large academic libraries and the majority of midsized and smaller libraries have implemented an index-based discovery service. Primo and Summon from Ex Libris have been implemented in higher proportions among large academic libraries; EBSCO Discovery Service is used by larger proportions of midsized and small academic libraries. OCLC's WorldShare Discovery Service and WorldCat Local are used as the primary discovery service in much smaller numbers.

Public libraries tend to prioritize the online catalog of their ILS. As these libraries acquire increasing proportions of e-books via packages from OverDrive, Bibliotheca, or Baker & Taylor, they often incorporate these titles into their ILS for discovery and access

through their online catalog. Public libraries focus more on enrichment and integration arrangements for the online catalog provided with their ILS than on third-party replacement products.

## Notes

1. Carnegie Foundation for the Advancement of Teaching (2001), *The Carnegie Classification of Institutions of Higher Education*, 2000 edition, Menlo Park, CA: Author. Referenced from <http://carnegieclassifications.iu.edu/>.
2. For a complete listing of which ARL libraries are using which discovery service, view the complete table at Marshall Breeding, "Academic Members of the Association of Research Libraries: Index-Based Discovery Services," *Library Technology Guides*, 2018, <https://librarytechnology.org/libraries/arl/discovery.pl>.

# Current Phase of Discovery

Following a period where discovery services represented more of a strategic area of competition in the library technology arena, libraries currently continue to value these products, but many are less likely to pursue them as an independent purchase. In recent years, there has been a growing trend to acquire a discovery service as part of a broader suite of products. In many cases this product suite will include a library services platform bundled with a discovery service, though some academic libraries have instead selected packages that include an integrated library system (ILS), an electronic resource management utility, and a discovery service.

The high implementation rates of discovery services reflect that most academic libraries with complex collections of print and electronic resources consider it important to offer a broad-based discovery service. Online catalogs focused on locally managed materials that do not encompass the full range of resources acquired by the library are no longer considered as the best search service to feature on the library's website.

Discovery represents one component in the technology infrastructure an academic library requires to support its broad range of operational activities and user services. Though important, the broad search service powered by an index-based discovery service may not be the primary way that most users gain access to library resources. Multiple research studies reveal that only a portion of research begins at the library's website. Even the most compelling search service delivered on the library's website is unlikely to move the needle significantly relative to the portions of researchers who prefer to rely on Google Scholar or discipline-specific search tools. While few large academic libraries opt out of providing a discovery

service on their website, the finite portion of research activity conducted through these products may mitigate the financial and technical resources some libraries devote to them.

Discovery services represent a relatively small portion of the investment in the core library automation environment. Resource management systems, in the form either of a library services platform or an ILS plus an electronic resource management application, can be expected to cost three to five times the cost of a discovery service. From a financial perspective, this differential in cost may mean that for some libraries, the choice of a resource management system may drive the selection of a discovery service. From a user perspective, some libraries may give higher priority to patron-facing products, such as discovery services, over staff-facing resource management platforms.

Academic and research libraries are increasingly looking for technologies to support new areas of activity, such as greater involvement in university research processes and in new ways to promote library resources in courses. Resource management and discovery products continue to represent key technology investments today, but new products supporting these other categories have been introduced, are gaining attention, and seem likely to gain further traction.

In this context of expanding library services and strategies, libraries may consider discovery services more as a commodity and give them a diminished level of attention.

Libraries today have moderate expectations of index-based discovery services. Although these products are a must-have component of their services, most libraries realize that they have limited attraction to researchers well served by Google Scholar and other search environments. Many libraries today

implement measures to improve the accessibility of their licensed resources when accessed through external search services. These efforts include registering their link resolvers with Google Scholar or promoting the use of browser plug-ins that facilitate access to the full text of research articles from citations given in search results or references. These browser plug-ins include Unpaywall from Impactstory; Kopernio, recently acquired by Clarivate Analytics; and Library Access from Lean Library.

*Link resolvers, Google Scholar Library Support*

<https://scholar.google.com/intl/en/scholar/libraries.html>

*Unpaywall*

<https://unpaywall.org/>

*Kopernio*

<https://kopernio.com/>

*Library Access, Lean Library*

<https://www.leanlibrary.com/>

The position of discovery services in the current marketplace can be seen as similar to that of link resolvers a decade ago. Before that time, libraries often acquired link resolvers through a discrete procurement process. These products worked reasonably well with most discovery products and resource management tools. Libraries would evaluate these products based on their functionality and the scope and accuracy of their knowledge bases. Over time, these products became less differentiated and could be acquired as part of a larger purchase, often packaged with a discovery service. As noted in a study conducted by the author for the National Library of Sweden:

Link resolvers and their associated knowledge bases entered the market just over a decade ago as stand-alone products that operated largely independently of existing library management systems, online catalogs, or discovery interfaces. Today, knowledge bases are increasingly positioned as an integral component of a broader set of interrelated products from each vendor, including not only link resolution, but also federated search, electronic resource management, discovery, and as a key asset in next-generation library automation platforms.<sup>1</sup>

Today, discovery services can be seen in a similar position. Although the products do encompass somewhat distinct features and differ to a limited extent in the content addressed, these differences may often be outweighed by an interest in acquiring a product suite

with integrated discovery. In the current phase, pre-integrated options include Alma with Primo, WorldShare Management Services with WorldCat Discovery, BLUEcloud Campus with EBSCO Discovery Service, Encore Duet (with EBSCO Discovery Service), and other ILS-plus-discovery bundles.

## Expectations for Open Discovery

Libraries evaluate discovery services based on their coverage of their body of subscriptions, including those licensed directly from publishers and those represented in Abstracting and Indexing (A&I) services. Since many A&I providers do not provide their content, discovery providers can provide coverage indirectly by indexing the citations and full text of the titles covered. If a library subscribes to a given A&I product, the discovery service vendor might be able to report that it provides indexing for a percentage of the articles covered, even if it does not receive content from that A&I product directly.

Libraries have expectations that each of the discovery services will provide even coverage of the body of academic and scholarly content, spanning all the major publishers. The NISO Open Discovery Initiative issued a Recommended Practice addressing issues and processes related to content providers, discovery service providers, and libraries to achieve transparency in the content coverage of index-based discovery services.<sup>2</sup>

Multiple creators of A&I products have formed exclusive arrangements with EBSCO based on alignment on the value of subject indexing and the design of EBSCO Discovery Service to handle their value-added content. Examples include *RILM (Répertoire International de Littérature Musicale)*, which announced that as of 2015 its content would be available only via EBSCOhost and EBSCO Discovery Service; more recently, Modern Language Association's *MLA International Bibliography* will be offered only through EBSCO effective in 2019. Data from some ProQuest databases likewise are not shared with other discovery services. ProQuest, for example, recently announced that it would be adding additional content from its news products, including ProQuest Historical Newspapers, Recent Newspapers, and Newsstream collections, into Primo. Contrary to ideal expectations, content coverage continues to be a competitive factor among the index-based discovery services.

In the current competitive arena, two of the three organizations offering index-based discovery services—ProQuest and EBSCO Information Services—are also involved in creating content products for libraries, primarily in the form of aggregated citation and full-text databases. In both cases, at least some content resources produced within the company are

not provided to competing discovery services. The ongoing competitive tensions between these two companies has made an impact in unevenness of content availability in their respective discovery services and in the lack of full interoperability between their respective library services platforms and discovery services.

## Notes

1. Marshall Breeding, *Knowledge Base and Link Resolver Study: General Findings* (Stockholm, Sweden: LIBRIS

2. nationella bibliotekssystem, 2012), 6, [http://www.kb.se/dokument/Knowledgebase\\_linkresolver\\_study.pdf](http://www.kb.se/dokument/Knowledgebase_linkresolver_study.pdf).
2. "NISO RP-19-2014 Open Discovery Initiative: Promoting Transparency in Discovery," Recommended Practice, June 25, 2014, <https://www.niso.org/standards-committees/odi>; Marshall Breeding, *The Future of Library Resource Discovery*, A NISO white paper (Baltimore, MD: NISO, February 2015), <https://www.niso.org/publications/future-library-resource-discovery>.

# Possible Future Trends

Looking to the future, we can anticipate some trends to develop in the academic library discovery arena based on some of the industry dynamics underway now. These trends might include the following:

- Continued movement of academic libraries away from integrated library systems and increased adoption of library services platforms. This movement will come with increased pairing of components from the same vendor.
  - The entry of FOLIO will introduce a third library services platform, which in most cases will be paired with EBSCO Discovery Service.
  - The current slate of discovery services will mostly remain intact. We can expect OCLC to fully consolidate WorldCat Local with WorldCat Discovery Service. Ex Libris may consolidate indexes and technical infrastructure for Summon and Primo but continue both interfaces indefinitely.
  - It is highly unlikely that an open access discovery index will be created with the same scope as the current commercial offerings. The financial investment and intense levels of operational support required will continue to exceed the practical thresholds of a community-supported project. As long as multiple commercial competitors remain, the benefits of an open access discovery index and corresponding interfaces will be limited. These dynamics could change should the existing products decline in quality or business strategies shift from the current relatively open environment to one that forces libraries into single-vendor content and technology ecosystems. These scenarios seem improbable given current market trends in both the content and technology sectors.
  - Discovery indexes will continue to expand, and gaps in coverage will diminish. Both through increased cooperation between content providers with discovery services and through more effective indexing of content covered in aggregated databases, index-based discovery services will eventually come quite close to comprehensive coverage of the professional and scholarly literature of interest to libraries.
  - Machine learning and other forms of artificial intelligence will increase their impact on discovery services. Currently products such as Yewno Discovery take advantage of concept extraction and machine learning to address the literature in specific scholarly disciplines. This product has been implemented by a growing number of libraries as a supplementary discovery tool for some categories of users.<sup>1</sup> This product demonstrates the applicability of these technologies to library discovery. Existing index-based discovery products may eventually adopt artificial intelligence technologies to replace or supplement the capabilities possible through traditional indexing.
- These trends point to continuity or at least incremental change in the academic library discovery services environment in the next five years or so. This product genre can be considered as reasonably mature in features and content coverage and is approaching saturation among large and midsized US academic libraries and other market sectors. Market opportunities remain, especially in other geographic regions, in smaller academic libraries, and among nonacademic libraries. Libraries can expect incremental innovation among these products, with any real breakthroughs more likely to take place in other areas of library



technology. Discovery services will continue as an essential component of a library's technical infrastructure, and current market dynamics point to an ongoing vigorous competition among a limited number of players. The competition may not center on these products directly, but they will continue to be an important component of broader product offerings.

## Note

1. Marshall Breeding, "Yewno Advances as a New Type of Discovery," *Smart Libraries Newsletter* 37, no. 4 (April 2017): 2-5.

# References and Resources

This section provides selected resources that address topics related to discovery services. These resources provide background information for this issue of *Library Technology Reports* and are recommended for additional in-depth information on specific topics.

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## Notes

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## Notes

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# Library Technology

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