Chapter 4

Electronic Resource Management Systems and Related Products

Abstract

ERMS software is available to help with electronic resource management, but each system and company provides a different option. Chapter 4 of Library Technology Reports *(vol. 50, no. 3) "Electronic Resource Management Systems: A Workflow Approach" covers some of the major available ERMS products, including vendor ILS add-ons and stand-alone systems, open source options, and home-grown development. The chapter also provides an overview of library service platforms and a brief discussion of how the ERMS impacts other library software such as discovery interfaces, ILS systems, link resolvers, and interlibrary loan software.*

This chapter is intended to highlight a few of the major ERM systems available to libraries at the time of this writing. It is by no means comprehensive and should not be taken as the final word on any of these systems or vendors. Described below are a few of the major products and vendors available for vendor ERMSs, open-source systems, and the newly available library service platforms. It is important to keep an open mind when evaluating products. All the products in this chapter have changed and improved significantly even during the writing of this report and will continue to do so. While I do not have direct experience with each product, I have tried to interview librarians and libraries that use each of these and to incorporate some of their (anonymous) comments, as well as literature reviews and case studies, into this chapter. Several of these vendors have both an individual stand-alone ERMS and a library service platform; both are discussed here, but in separate sections.

Vendor Systems

The following ERMSs are all available from commercial providers. Many of these systems are from well-known library software vendors. This is intended to be a brief overview of some of the available options for electronic resource management. It is not an exhaustive list or a complete review of any of these products.

EBSCO ERM Essentials

EBSCO is one of the major library vendors of both software and content. It provides journal aggregator services but also has subscription databases that can be independently licensed. EBSCO has been expanding its software for managing electronic resources into a complete software suite, including software management, content, and a single search discovery platform.

EBSCO is well known for its journal aggregation software, EBSCONET, which comes with its journal subscription management service. The software allows easily adding new titles to subscriptions, as well as traditional journal processes like managing claims and looking up information on journal subscriptions and history. An additional service can also incorporate usage statistics for journals into the system, allowing EBSCO to consolidate COUNTER statistics information for journal subscriptions. This allows EBSCO to generate cost-per-use information for each subscription within the tool, as well as to create larger aggregating reports.

EBSCO's stand-alone ERM tool, ERM Essentials, is a newer entry into the ERM arena, but the company is well positioned to offer such a service by building on its extensive content metadata and relationships and subscription management information and expertise. EBSCO ERM Essentials consists of a knowledge base, an

A–Z list, and a link resolver, as well as some reporting functionality. EBSCO can field a knowledge base with journal and publisher information for any of the journals it offers through its subscription service. In addition, since EBSCO is also a content database publisher, there are presumably certain synergies available in the data. EBSCO A-to-Z will generate a list of journals included in subscriptions, pulling holdings availability information and links from the knowledge base. The EBSCO link resolver product, LinkSource, is also new, but it is integrated into EBSCO ERM Essentials.

EBSCO ERM Essentials
http://www2.ebsco.com/en-us/ProductsServices/ERM/Pages/index.aspx

Ex Libris Verde

Ex Libris began as a traditional ILS vendor, offering two different ILS systems due to a company merger. It was one of the very first companies to open the web-scale search market and to supply a federated search product with an integrated link resolver (Primo), a federated search engine (MetaLib), a link resolver (SFX), and an ERMS (Verde). It continues to develop and market its products and is a significant player in the library software marketplace.

The two ILSs available from Ex Libris, Voyager and Aleph, both have their own acquisitions systems built in. Ex Libris also provides a stand-alone system, Verde, which is built to integrate either with an Ex Libris ILS, with an ILS from another company, or with other library management systems. Verde has been popular for its integration into the other Ex Libris electronic resource products like SFX, Primo, and MetaLib. Alma, a new product from Ex Libris, will be discussed later in this chapter as part of the examination of the new, all-in-one library services platforms.

Verde, as a stand-alone ERM product, offers ERM functionality, including a knowledge base of resources, a single point where staff can get information about electronic resources holdings and status at the library, and contact and administration information. Verde also has workflow functionality to support trials, acquisitions, licensing, usage information, and renewal procedures. Donna Ekart described her experience with Verde implementation and workflow in a 2008 article, where an initially unpromising start was turned around through focus on the library and the tool.[1] Eric Hartnett, Apryl Price, Jane Smith, and Michael Barrett described an experience with implementing Verde and the workflow tools available at the Texas A&M University Libraries.[2] Guoying Liu provided a case study of Verde implementation within a consortium, noting that the individual library's needs and situation are the most important factor in the decision to get or implement any ERMS.[3]

Verde also has full licensing functionality and the ability to define licensing workflows within the system. The statistics functionality available in Verde includes SUSHI compliance to download statistics automatically. If the library also uses the cost and acquisitions modules, then Verde makes finding cost-per-use information possible. This statistics-gathering functionality also includes an area to note problems with access or other vendor issues for further attention and review during renewals.

One historical issue with Verde has been a data silo problem, where the knowledge base for Verde contained the same information but was separate from the knowledge bases for the SFX link resolver and the Primo single search product. Ex Libris has addressed this issue in its new system, Alma.

Ex Libris Verde
www.exlibrisgroup.com/category/VerdeOverview

Innovative Interfaces Millennium

Millennium from Innovative Interfaces has a reputation as an ILS with considerable acquisitions fuctionality. Because the ERM product ties so closely to the acquisitions system, Innovative Interfaces's ERMS is designed primarily as a knowledge base management system with licensing and contact functionality, but with limited intrinsic acquisitions functionality of its own. Pricing model, subscription to print, cancel restrictions, multiyear price caps—all would be found stored in the Millennium acquisitions module within acquisitions records. Although the ERM module is sold as a stand-alone, it lacks most acquisitions functionality on the assumption that it would be used in conjunction with the acquisitions module. This acquisitions system is elaborate and sophisticated and can easily handle fund accounting, setting up invoices, and splitting costs between departments or universities.

In order to differentiate the acquisitions and ERM modules, the ERMS focuses on managing and synchronizing knowledge base information between the ILS and other systems, allowing imports of journal title lists by package from link resolvers like Serials Solutions's 360 Link and Ex Libris's SFX. Managing these imports is complicated, and it is helpful to have the functionality available in the ERMS for that. However, it is important to note that uploading all the holdings records from databases into the ILS implies making the catalog and the OPAC the systems of record for holdings. The upload process allows for creating basic MARC records. One particular concern with batch-loading records into the ILS is always having an easy way to batch-remove

those sets of records, although Innovative is particularly good in this respect and also features well-developed reporting functionality. The ERMS is tied to the Millennium reporting function, which is complicated but powerful and sophisticated. The reporting information from Millennium will depend more on what reports the librarian is able to run; it is flexible enough to provide almost any reports.

Because this functionality is so important to the Millennium ERMS, several of the case studies on implementing and using this system focus on the requirement for importing the journal lists, or coverage loads. Denise Pan described an implementation experience that focused on creating coverage loads but, because of insufficient communication, was confusing for the library staff and required revisiting the entire workflow a year later.[4] A 2011 survey of Millennium ERM users found that more than half of the libraries had difficulty with implementation, but that almost all reported positive impact on workflow. Most libraries also found a significant improvement in patron access to resources.[5] Another case study described a positive experience with implementing the ERMS and a commercial link resolver at the same time.[6]

One librarian interviewed about using the Millennium ILS and Millennium ERMS said that they work extremely well together. A specific selling point mentioned was the robust alerts and renewals information; the librarian recommended Millennium as a good way to store and share usernames and passwords in a centralized location. The system was considered extremely strong as a central repository for all electronic resources information, which could then be used as the basis for homegrown patron interface systems or other innovations. Innovative has recently released another product, Sierra (or, as Innovative refers to it, the Sierra Services Platform from Innovative Interfaces), which is an all-in-one library services platform.

Innovative Interfaces Millennium
http://www.iii.com/products/millennium

Serials Solutions 360 Resource Manager and 360 Counter

Serials Solutions's 360 Resource Manager was an early entry into the ERM field, and top people at the company were part of the very early ERM and digital management meetings that gave rise to the DLF ERMI report and standards work.[7]

360 Resource Manager is based around Serials Solutions's original link resolver product, so this is a product with extensive focus on a vendor-maintained, frequently updated, carefully curated knowledge base. One advantage of the Serials Solutions knowledge base is that its software is cloud-based, accessed through the Internet, and hosted by Serials Solutions. This means that individual libraries are not responsible for maintaining or updating software and that updates to the knowledge base by the company take effect for individual libraries in real time. Because the software is cloud-based, though, it may offer fewer customization options for libraries with extensive technical support. 360 Resource Manager brings administrative information and tracking, a license module with templates, budget tracking and fund accounting support, and contact information management to integrate with the link resolver product. It also includes several types of maintenance and management reports, as well as integrating with an add-on reporting product to manage and compile COUNTER statistics.

360 Counter includes administrative information and a SUSHI harvesting tool to automatically download and compile COUNTER statistics from any compliant vendors. The tool has an ability to pull statistics reports together into a dashboard. 360 Counter includes the ability to have reports pulled and the SUSHI capability to compile them automatically. The Serials Solutions link resolver also includes usage data for click-through statistics within the link resolver, but for download and COUNTER-compliant statistics, particularly for compiling statistics from many different providers, using a dedicated statistics aggregation product is faster and simpler.

Serials Solutions 360 Resource Manager
www.serialssolutions.com/en/services/360-resource-manager

Open-Source ERMSs

Open-source software poses its own challenges. If the institution has technical knowledge and support, access to IT resources and someone willing to learn the software, or if a vendor offers support for a fee, using open-source software may be extremely feasible. Open-source is particularly attractive to very small libraries where cost is a primary motivator and the collection is relatively small. At the other end of the scale, a library or consortium may be so large and complicated that it must look outside of traditional options to find software that can contain all the necessary functionality, as the University of Notre Dame did for ERM software or the public library system of Georgia did when developing the Evergreen ILS software package.

One advantage of open-source is that the software is free. Anyone can download and install the source code, and there are few restrictions on its use. The disadvantage to this kind of software is the difficulty of

supporting it. Installing and running open-source software may require more on-site expertise than commercially managed software. Generally, however, there are companies that can be hired to provide technical support and implementation, and open-source software may be the less expensive and more flexible option under many circumstances.

Some of the libraries and companies that have developed their own ERMSs in-house have gone on to offer those systems to other libraries. This is extremely beneficial for the library community, and these systems can be the perfect option for smaller libraries without the resources to develop their own in-house software. The systems discussed below do not constitute an exhaustive list, but, according to their own websites, all are used by more than twenty libraries, and all have active user communities for support.

CORAL

CORAL is a system developed by the University of Notre Dame and is available open-source. It is a lightweight software solution and has an active e-mail discussion list. CORAL is organized into four distinct modules based on functionality: manage resources, record licenses, track organizations, and report usage. These modules follow the main functionalities of the ERMS and can be downloaded separately or together.

In addition to its active discussion list, CORAL has free demos on the university website. The program is a small database and must be installed on a server, but does not require a dedicated server of its own. It also has a web interface for entering and reporting data, giving it an attractive and simple appearance. To use CORAL, the library needs to have access to a server and to have someone available to install and maintain the software.[8]

Kristen Blake and Maria Collins's article noted that a major benefit to using CORAL is the ability to synchronize journal holdings data with the SFX link resolver.[9] A 2011 case study by Sharon Whitfield pointed out that although her library had some small problems with authentication, the e-mail discussion list was extremely helpful as a technical support resource, and implementation was generally smooth. The functionality continues to be developed and allowed the software to be used on a desktop to start with, facilitating staged implementation and getting used to the resource.[10] Another case study of three libraries reported that CORAL was popular for its low cost, and the major difficulties reported were common to many ERMSs, such as problems with interoperability with other systems or the need to perform a full implementation process and integrate the system into workflow.[11] Texas A&M University actually began to use CORAL after two unsuccessful attempts to use other ERMSs, which resulted in a careful evaluation process and the selection of CORAL. All three libraries cited in the article note that CORAL's flexibility and adaptability are a major selling point for the software. The College of New Jersey also selected and implemented CORAL and reported a positive experience.[12]

CORAL
http://erm.library.nd.edu

CUFTS

CUFTS is an open-source system developed by the Simon Fraser University Library as part of a suite of open-source products, including a link resolver called GODOT and a knowledge base called Open Knowledgebase. The entire suite taken together is called reSearcher and was designed for academic libraries.

CUFTS provides license tracking support, renewal alerts, and contact information management. It is also set up to provide an A–Z list for patron discovery. The entire project is open-source. Resources in the knowledge base can be updated either through the web interface or by using an uploader tool.

One librarian interviewed about CUFTS said that implementation took several months but that completing the implementation and using CUFTS was extremely helpful. The library was able to implement CUFTS when other products were too expensive, allowing it to spend the money on additional content. The amount of control the library got as a result of using the reSearcher suite was a huge selling point. The interviewee mentioned that the open-source community for reSearcher was still small and the statistics tracking not yet robust, but overall the library was extremely satisfied with CUFTS and the reSearcher suite. CUFTS and reSearcher require a server and can be locally hosted by the library for no cost outside of hardware and maintenance or hosted and maintained by Simon Fraser University for a low fee. In a 2006 article Kevin Stranack described in detail the CUFTS ERMS and some of the options available, including the link resolver and knowledge base functionality.[13] A 2010 article described the process of workflow change and implementation at San Francisco University and further development of the software.[14]

CUFTS
http://researcher.sfu.ca/cufts

ERMes

ERMes was developed in-house by the University of Wisconsin-La Crosse. It is an extremely simple system built in Microsoft Access, and it is free to download

by any interested party. It has an active discussion list and a blog. It might be a very good choice for libraries that do not have much systems support or no servers or absolutely no additional money for software. At the time of this writing, there are seventy-one libraries advertised as using this system. There are also add-ons provided by other users to create an A–Z patron database list.

The ERMes system is designed to manage license, contact, and cost information for databases, as well as to compile COUNTER database statistics into a report. There are PDF training manuals and documentation explaining how to implement the system in order to gain the maximum benefit. Because of the setup of the database, it is important to implement it in the suggested order unless the library has a very thorough understanding of Access and is able to work with sophisticated table relationships and queries. One nice feature is a staff interface with menu and drop-down options to make entering data and pulling reports simple and convenient. William Doering and Galadriel Chilton, the developers of ERMes, have written two articles about the creation of ERMes and its further development.[15]

This system could be very beneficial to very small libraries since the only technical requirements are a license for the Microsoft Office suite and some sort of shared library network space where the database can live and everyone can access it. The simplicity of this approach allows anyone moderately comfortable with Access and database structure to create new reports to generate specific information, and libraries can customize and add on as long as they understand the underlying database well.

ERMes
http://murphylibrary.uwlax.edu/erm

Homegrown ERMSs

Many libraries have chosen to develop their own ERMSs instead of going with a commercial product. Just a few of the case studies are listed here, along with major points.

The Smithsonian Institution Libraries decided to develop their own ERM system largely for the internal purpose of e-journal management and the external purpose of creating the patron-facing A–Z list. The system allows license and vendor-tracking information and real-time updates but lacks link resolver functionality and requires manual knowledge base updates.[16] Concordia College has also written a case study on getting a custom database created by a company called Zoho after doing an extensive analysis of library needs and available commercial products.[17]

Other libraries have written about the experience of creating an ERMS from an assortment of free and Web 2.0 software. Adam Murray suggested this approach, using a combination of wikis, blogs, and Google Docs.[18] Lenore England and Li Fu wrote about their experience of using a combination of LibGuides and its website and wiki-like functionality and a homegrown database tool to manage their electronic resources.[19] Denise Pan has also written about using blogging as a component of electronic resources management as an addition to the library ERMS.[20] Another 2013 article points to Google Sites as an electronic resource management tool preferred to a vendor ERMS.[21]

Library Service Platforms

The above discussion attempts to summarize a few of the pros and cons of each approach and to give a basic outline of available software from each vendor. However, there are several vendor products that do not fit into the categories above.

All of these vendors discussed in this chapter are distinguished by a long history in the library software market with a more traditional product, such as an ILS or a link resolver, and have recently added a stand-alone ERMS. Now each of these vendors is pushing to develop and market a new product that goes beyond stand-alone additions to a software suite. Each one is trying to develop an all-encompassing set of products that attempts to completely solve the problems of managing electronic resources in the digital age. However, each company is taking a slightly different approach to the problem based on its particular expertise.

Marshall Breeding called the next generation of library automation software *library service platforms*.[22] These are new products, just starting to be available, that combine all the functionality of library software into one or two modules. This software generally promises to combine link resolver and ERM functionality with patron discovery and a single search module, as well as print item management traditionally done in the ILS. This new kind of software is available from most of the major vendors, although at the time of this writing, not all of the products are available for production use.

Regardless of the original specialty of the company, whether ILS, link resolver, or something different entirely, the functionality libraries need now is the ability to see and organize their workflow to include all resources at the same time. The ERMS is beginning the transition from a specialty piece of software to part of a unified and complete software management system that can also include print management and unified patron discovery services as well as life-cycle management for all library resources. Sharon Yang did an analysis of the library service platforms listed

here that may be a helpful resource when beginning an evaluation.[23]

OCLC WorldShare

OCLC has provided the MARC records for most libraries within the United States for many years. It was one of the first library technology companies and has nonprofit status as a member library cooperative. For many years, OCLC has offered a variety of software related to the library services it offers, such as software to support interlibrary loan and cataloging. In recent years, it began to expand its services to offer a free public catalog available on the Internet to show unified library holdings information to any member of the public looking for a book. This service was one of the first efforts to reach out directly to patrons and was incorporated into search results such as Google Books. This service is known as WorldCat Local, soon to be WorldCat Discovery Services.

Libraries can subscribe to a more sophisticated version, allowing them to update holdings more easily and to use that software as their ILS public interface instead of the OPAC.

OCLC then expanded its software suite repertoire with a link resolver product, which went through several iterations before settling into the current WorldShare License Manager software. It incorporates electronic resource management, a link resolver, the popular EZproxy proxy server—which allows libraries to manage off-campus access restrictions—licenses (using templates), and acquisitions. This acquisitions functionality includes generating orders, cataloging records, and generating fund and budget reports. This product is available as a stand-alone and incorporates all the ERMS functionality of other products previously mentioned. Marshall Breeding provided a description of this product when it was first released in 2009.[24] Hope International University published a case study of its migration in 2012, saying that one issue was lack of individualized control over settings, but that generally the new software was a positive for both library staff and patrons.[25]

The WorldShare License Manager product also integrates with WorldShare Management Services, the OCLC library services platform. WorldShare Management Services incorporates the ERM functionality with the additional single search platform functionality and the print management capability of the catalog. The stated goal is to allow for flexible resource management, integrated into and defining a library's workflow and incorporated into the entire library management software. This product is still new and was one of the first of its kind. The advantage to this approach is ease of unifying all the different functionalities and eliminating silos.

OCLC WorldShare Platform
http://oclc.org/worldshare-platform.en.html

Ex Libris Alma

Ex Libris is another company that spans many definitions. It started as a more traditional ILS vendor, although, unusually, it supported two different ILSs—Voyager and Aleph—due to a merger. From there, it developed the extremely popular link resolver SFX, the federated search engine MetaLib, and the single search interfaces Primo and Primo Central. These systems were paired with the ERMS, Verde.

All of the products mentioned above started as separate systems, with some connections built in. These connections were particularly successful in some cases, such as the integration of SFX, Voyager, and Aleph with Primo. However, a lingering issue for Ex Libris was the separate knowledge bases in SFX, Verde, and Aleph or Voyager. The Ex Libris response was a new product, Alma, which integrates these functionalities and workflows.

Alma is structured to have a unified knowledge base and a workflow that integrates all the functionality to keep this information all together in one place and facilitate easy tracking and sharing. Alma allows for acquisitions workflow, ERM information, notes fields, and a single search interface for patron discovery. More information is available on the Ex Libris website.

Ex Libris Alma
www.exlibrisgroup.com/category/AlmaOverview

Serials Solutions Intota

Intota from Serials Solutions is another library services platform that combines a unified knowledge base with a complete resources management suite and patron discovery. Serials Solutions is able to take advantage of the current resource management workflow because it began as a link resolver company, so its linking and electronic resources management are sophisticated. Taking advantage of its SaaS platform and link-resolving software puts Serials Solutions in a good place to offer a library services platform.

Serials Solutions also has some experience in the patron search interface business with its single search platform, Summon. Summon has the advantage of being powered by the same knowledge base as the link resolver, but it can integrate with other platforms as well.

The literature available from Serials Solutions suggests that it was designed with a variety of unified library workflows in mind, including management

and assessment of print materials. More information is available on the Serials Solutions website.

Serials Solutions Intota
www.serialssolutions.com/en/services/intota

Kuali OLE

Kuali OLE open library environment is a new project, only just released for general use. The Kuali OLE Foundation is a group with several foundation libraries working together to build an integrated library services platform. This project was originally started by a grant from the Andrew W. Mellon Foundation. Kuali OLE also allows institutions to become members for a moderate fee and encourages contributions of code and bug fixes.

Kuali OLE's software is separated into modules, and each handles some portion of managing resources, known in the documentation as *entities*. The software was designed to manage a variety of resources and to incorporate workflow management, as well as to integrate smoothly with other software systems. Because this system was developed by and for libraries, it is intended to be extremely functional and to address the core needs of libraries, particularly large academic institutions. However, the system is very new and still funded and developed by grants, so it is not entirely clear what the future will hold. A recent article by Michael Inkler and Robert McDonald provided extensive information about the project.[26] More information is available online.

Kuali OLE
https://www.kuali.org/ole

Innovative Interfaces Sierra

Sierra is a library services platform offered by Innovative Interfaces as a new product that complements its ILS, Millennium. Sierra has the functionality of the ILS, including circulation, cataloging, and acquisitions. It also has complete ERMS functionality, including the ability to manage licenses and track administration information and contacts for products.

One librarian interviewed about an experience with Sierra praised the license functionality. The librarian noted that the customizable license records made it very easy to store a great deal of complex information, keep it linked to the source records and resources, and also choose certain fields and pieces of information to be available to patrons. The interviewee mentioned that the library had notable success in importing MARC records for ebrary e-books and e-journals. The library also found the acquisitions tracking functionality extremely helpful. A case study was published in 2012 with a glowing account of Sierra's functionality and features.[27]

One other major point about the Sierra system is that it advertises itself as an interoperable tool based on standards. It offers application programming interfaces (APIs) that can be used in many different ways and the ability to have it hosted on local servers or in the cloud. This is a rare selling point, but an important and extremely helpful one, particularly for those libraries lucky enough to have significant in-house technical support.

Innovative Interfaces Sierra
http://sierra.iii.com

Related Software

ERMSs and library service platform software are responsible for most of the management of electronic resources. But electronic resources have become an extremely important part of the overall libraries resource picture, and so the connection between the ERMS and other major pieces of library software is important to consider when looking to implement an ERMS or change the electronic resources environment.

For good integration, it is important to consider the library discovery software. It is not necessary to have the same vendor for ERMS and discovery software, but it is a good idea to make sure the two systems can be integrated and to see if other libraries have implemented the same combination successfully. Likewise, more ERMSs are starting to incorporate link resolver functionality. It may not be necessary to use the link resolver in the ERMS, but it is a good idea to make sure the knowledge bases are similarly comprehensive and to investigate what maintaining two knowledge bases is going to involve. The ILS is a crucial piece to managing most libraries, and many different levels of integration and electronic resource management within the ILS are possible. The last important separate piece that relies on the ERMS but generally does not integrate is interlibrary loan software. Integration is starting to be possible within certain systems, but if the library has a smaller budget for software, these new options may be out of reach. It is worth investigating to see whether license information in the ERMS can be set up in a way that is easily accessible to interlibrary loan staff or, if licenses are stored in the interlibrary loan systems, whether this information can be easily pulled and aggregated into the ERMS.

Discovery—Federated and Indexed

One important piece of library software is the discovery service tool. A Google-like single search interface has increasingly become the goal for many librarians and library vendors over the last several years. While even a few years ago the technical and logistical challenges were daunting, many vendors have risen to the challenge and now provide products that work on either the federated or the preindexed single search model. This report is not intended as a comprehensive guide to single search interfaces, but I will briefly discuss the logistics and a few of the pros and cons of each model before discussing how discovery tools impact decision making about and implementing an ERMS. A study by Melissa Hoffman and Sharon Yang found that the use of discovery search tools doubled between 2009 and 2011.[28] Marshall Breeding provided an overview of the discovery services available, common problems, and areas for future development in a 2013 article.[29] A paper from 2012 (Ruddock and Hartley) investigated selection of single search systems, which are referred to as metasearch resources.[30] Other libraries chose to develop their own tools, as described in a case study from the Houston Academy of Medicine, Texas Medical Center Library.[31]

Much of the recent research on discovery tools focuses on their impact on information literacy, searching, and on patron discovery.[32] Continuing research presented at the 2013 Charleston Conference evaluated four of the available commercial discovery tools in an effort to measure the effect they have on usage statistics and found that discovery service tools generally do increase usage statistics although not uniformly across tools or publishers using a particular tool.[33]

A federated single search product can simultaneously search multiple databases, including the OPAC, subscription databases, abstracting and indexing databases, and local repositories. Implementing this type of search usually requires some preselection of databases into facets or subject areas. When the patron enters the search, he or she is given the option of choosing the subject. The search terms are then sent to the selected databases, the search is run on those databases, the results are returned, and the federated search product ranks the results from the selected databases by relevancy. One well-known federated search product is Primo from Ex Libris. As Primo is one of the best known of the discovery products, there are multiple case studies on its implementation and use.[34]

Preindexed search is also a single search product, but one based on a different concept. The preindexed search also provides a single search box to search across resources like the OPAC, subscribed article databases, abstracting and indexing databases, e-books, and local repositories. However, these products actually index the contents of each resource rather than running a search directly against each database. The single search vendor hosts the search index, and search queries are run against the premade index. The vendor updates this index at regular intervals. The updates can be run at different frequencies for different kinds of information. For example, MARC records from the ILS might be updated every day, but a subscription database might be updated each week.

This pre-created index has the advantage of providing a fast search. Options for preindexed and federated searches are available from multiple vendors as SaaS (software as a service). The most famous of these is probably Summon, although EBSCO Discovery Service (EDS) works on a similar model. Multiple case studies exist for Summon, offering experience and opinions on using it.[35] Additionally, several studies either compare Summon to EDS or survey multiple libraries on their experience with Summon.[36]

The distinctions between preindexed and federated searches are starting to disappear as the software and search technology gets faster. Most companies seem to be moving to a hybrid approach, where content is pulled into a local index, where possible, but searched through a federated style search when an agreement cannot be set up with the publisher. This results in the popular "suggested database" or "recommended resource" links that are presented alongside the main search results panel. Both kinds of single search products depend on the search company owning or licensing the right to index and full-text search that content and on search and licensing agreements between software and content companies. These agreements can be tricky to implement, and some publishers refuse to allow their content to be indexed in this way. However, the amount and depth of content in these agreements keep expanding, creating better and more complete data to draw from. Only a few years ago very few companies would allow more than basic metadata for books to be searched. Now, more and more are offering keyword-level searching of full-text books and articles, as the ranking search algorithms continue to improve.

There are currently four major single search products on the market from the major library vendors. Each product has a strategic advantage and is offered either alone or as part of one of the library service platform products that started to come on the market in 2012. Serials Solutions offers Summon, which is well integrated with its suite of ERM and link resolver products. EBSCO offers EBSCO Discovery Services, which has extremely good indexing of EBSCO's large content databases as well as other content and integration with its journal subscription management tools. OCLC's WorldCat Local has the advantage of being free and integrated with Google Books. Ex Libris offered one of the very first federated search products on the market with Primo, which integrates with its very popular SFX, Aleph, and Voyager systems. A case study is available from Tonia

Graves on selecting and implementing a search product based on Marshall Breeding's recommendations.[37] For a breakdown of each single search product with features and platforms, Marshall Breeding offered a guide, ranking, and survey of discovery products in 2010 and an update on discovery in general in 2012.[38]

None of the products listed above, or other single search products available on the market, require an ERM system. All of these can be purchased as standalone software and will work with whatever other software the library has. But it will be necessary to specify what electronic resources the library has for each of these products. The subscribed and print resources for the library will become the single search product's knowledge base, which can be specified in several different ways.

Usually, the single search product will pull from a library catalog to display print items and their status on the shelf. If the library has an institutional repository, those resources are also frequently pulled in. Another common knowledge base is the link resolver. This is generally a key resource for setting up a single search platform and one of the primary ways that electronic resources are tracked. When the link resolver knowledge base can be used for single search software, it simplifies maintenance of the holdings.

The single search product needs holdings information about journals as well as books and databases and information about vendor and purchase history. Having these products active through the link resolver allows them to be available through the single search product. If an ERM product is involved, this can also be an easy way to add information such as license terms and usage restrictions and to keep subscription information updated automatically. These are important to have available because if there are special or restrictive license terms on access, or even something simpler like an individual registration required to get credit for reading continuing education articles, this will need to appear in the patron interface, which means finding a way to present it in the single search interface.

Generally libraries have a system that becomes the system of record for library resources. For most libraries, the ILS is the system of record for print resources, and in some cases for electronic resources as well if the library has solved the problem of MARC records for a large, changing collection. One important factor when selecting a single search product is to be sure that if the single search product has its own knowledge base of resources, the search knowledge base is either the same as or integrates smoothly with the knowledge base the library uses for most resources. It's important to keep the library from duplicating effort, which happens when it maintains separate knowledge bases of the same information. Another important thing to check is that the search knowledge base has the title lists and publishers for the most important library resources. Two articles analyzing this relationship with the ERM and ILS knowledge base in relation to discovery services were published in 2010.[39]

Having an ERMS can help with implementing a single search platform, but it is not essential. One helpful piece is if the library can use its ERMS as the knowledge base for electronic resources for the single search platform to avoid having duplicate knowledge bases. Another advantage is that having an ERMS may mean that all the information necessary to implement a single search—lists of platforms, lists of journals and providers, cost information for all resources—is already compiled in an easy-to-use format, which will simplify getting the single search platform implemented. Libraries that are able to proactively manage their knowledge base, make sure important resources are available and show up in results, track and update knowledge base title lists, and make sure they are doing everything possible to report problems, are more likely to have a good patron experience.

Integrated Library System

One of the main elements of library software that has to be considered when examining electronic resources management is the integrated library system. In some senses, this is the most complicated piece to integrate precisely because it is so integral to the library. The ILS generally holds all the MARC records for the library, allowing all the records for books, journals, and other materials to be found in a variety of ways. The ILS contains all the circulation and item management records, as well as the patron database of people who are eligible to use the library. The ILS usually contains some reporting and acquisitions information as well.

Since an important aspect of managing electronic resources is reducing duplication of work across different systems, one major thing to investigate when evaluating ERM systems is how the ERMS will interact with the library's ILS. Because ILSs are generally designed around a MARC record format, if the ILS will be a central piece of electronic resource management then an ERMS that can manage MARC records exports and imports may be extremely important. Electronic resources require some information that is not standard across ILSs, such as platforms and constantly changing title lists, so it is important to ensure that the ILS and ERMS can integrate and also to understand the extent of the integration. The functionality the ILS has regarding electronic resource management will also help to determine what pieces the library should look for most with the ERMS. If the library has acquisitions and budget tracking fully implemented within its ILS, it may not need that in the ERMS and may want to focus on other elements, such as link-resolving management.

Every library situation is different, but generally the integrated library system is a very important piece

and evaluating electronic resource management workflow will require working with it carefully to make sure the library has arrived at the most useful solution with both existing software and additional products such as an ERMS.

Interlibrary Loan Software

Interlibrary loan software generally stands alone and uses the shared knowledge base of library collections and journal holdings. The biggest of these is the OCLC interlibrary loan knowledge base containing most of the holdings for libraries in the United States. Some smaller regional or subject-specific databases are also common, such as DOCLINE from the National Library of Medicine for medical libraries. Regardless of the system, it is the library's responsibility to get its print and electronic holdings correctly reflected in the knowledge base. It is to the library's advantage if it is able to have its knowledge base holdings match its resource record and have a somewhat automated process, as this will require less work. The more closely the OCLC holdings match the library's actual holdings, the more ILL requests it will receive. The process to automatically update holdings depends on the systems involved. If the library is able to get batches of MARC records from OCLC, it may be able to get holdings for those records set automatically, although updating them would still be a manual process.

The trickiest issue with electronic resources in interlibrary loan is the licensing terms. Even if the library is able to get all of its electronic holdings into OCLC, whether or not a journal article can be lent will depend on the publisher license agreement. Since each publisher may have different terms, libraries usually cannot just set up batch deflection of all electronic resources without restricting themselves from getting requests they would be able to fill.

At this time, most ILL software either does not have a licensing term knowledge base or is not able to integrate with other systems to pull this information smoothly. The best-known ILL software, ILLiad from OCLC, does have licensing add-ins that can pull standard information. OCLC's other product, WorldShare Manager, has license management integrated into the knowledge base and ILL functionality, and a case study on using ILL with WorldShare Manager reported a favorable experience.[40] Some libraries have found that a simpler option is to add a link or click-through to a page explaining licensing restrictions to the link resolver screen, where patrons and ILL staff can easily see the terms and familiarize themselves with the restrictions.[41]

Link Resolvers

Link-resolving software allows linking from citations to the library that subscribe to the full text of an article, wherever the citation is from. This allows linking from citations in abstracting and indexing databases, in Google, or in subscription databases, to subscribed full text. Link resolver software is based on the OpenURL standard. Generally, link resolver software involves a database or knowledge base of publishers, databases, journals, and journal holdings and requires library staff to select library subscriptions in the knowledge base. Vendors generally maintain link resolver knowledge bases, and the accuracy and timeliness of updates to the knowledge base are a major factor in evaluating link resolvers. The link resolver was recognized as an essential piece of the electronic resources management puzzle as early as 2004 and 2005.[42] Jill Grogg was an early author in explicating this complicated area and in explaining OpenURL, link resolvers, and link resolver alternatives.[43]

In order to implement a link resolver, it is necessary to go into the knowledge base and select the providers and databases licensed by the library, then to communicate with each provider to add library-specific link resolver information at the citation level within the database. Multiple articles are available on selecting and implementing a link resolver from the available options.[44] The most common problems described with link resolvers are broken links due to problems in the knowledge base, something that a set of standards initiatives—KBART, IOTA, and PIE-J—have been designed to address.[45] More discussion of link resolver standards is included in chapter 1.

In some ways, an ERMS and a link resolver are extremely similar, particularly in the need for a consistent, complete knowledge base of subscribed and purchased content of a library's holdings. The main difference between the ERMS and the link resolver is the amount of information contained in the knowledge base in addition to the list of holdings. The link resolver will likely have some notes fields available to store administrative information, but an ERMS frequently has an entire administrative management module, the ability to track payments, a licensing module, and more sophisticated reports. A library that is happy with its link resolver and has all the other functionality covered through other systems might not need an ERMS at all, depending on workflow and the other library system capabilities.

The interactions between the ERMS and the link resolver are important. Both products manage electronic resources. Both may impact the way patrons see and have access to electronic resources, and depending on the system, both may pull holdings information from the same databases. The subscription information in the knowledge base requires regular updating and may require more intensive maintenance if the knowledge base feeds multiple systems. Additionally, since the accuracy of the knowledge base depends on the software vendor pulling constantly changing information

from publishers, there will always be a certain amount of inaccuracy. Discovering how much, reporting the inaccuracies, and updating records and performing maintenance to keep the link resolver working smoothly all require a certain amount of staff time. Close integration between the ERMS and the link resolver, or having them pull from the same knowledge base, will reduce the total amount of staff time needed to manage resources by reducing duplicate knowledge base systems.

Ticket Management Software

One additional, optional piece of software used by some libraries is a ticket-tracking system for electronic resource problems. There are a variety of solutions available, including incorporating library troubleshooting into the help desk ticket queue or reference question management software. These systems do not have to be complex and can be as simple as a spreadsheet, but having some sort of tracking software to document reported issues with electronic resources can be extremely helpful for problem resolution and pattern recognition. Without some sort of system, it can be difficult to transfer problems among the different parties involved in troubleshooting, and it is harder to verify that each reported question or issue has been responded to and resolved. Library troubleshooting can be difficult in another way, because typically ticket troubleshooting software is designed for short-term issues. If a library is reporting on missing content to a publisher and waiting to get confirmation of content located and loaded, a ticket might stay open for weeks or even months. Library problems are also difficult because there are a variety of issues that may be reported: a patron who has lost his username and password for all institutional resources, a subscribed journal not reflecting library access, a misconfiguration in the proxy server for off-campus access, a patron needing help with access to additional content such as continuing education modules, or content not loaded onto publisher websites. These issues might come from or be referred to library IT support, reference, or a serials and electronic resource department. Of course, any of these issues can happen in combination, resulting in a problem that has to get passed through multiple hands in order to be resolved.

Basically, any software can work as the library's troubleshooting ticket tracker, but a few software options are extremely popular. A case study from the University of Colorado Denver Auraria Library identifies technology and teamwork as the "essential components of successful troubleshooting" and describes its process of troubleshooting using free blog software with a template.[46] Another case study recommends having frequently asked question pages and library distribution lists so that multiple people are aware of the problem and can take a team approach to troubleshooting issues.[47] A third study produced a survey showing that administrative troubleshooting is stored in e-mail for 53 percent of the libraries surveyed, leading to the library creating "troubleshooting records" to go along with administrative records for electronic resources.[48] Eric Hartnett and Carole Thompson have written a case study of using screencasting, or streaming video, as an effective tool to capture and troubleshoot e-resource problems.[49] Laura Tull, Janet Crum, Trisha Davis, and Rockelle Strader described using Innovative Interfaces's ERM incident log entry in the resource record for recording problems.[50] Jeffrey Perkins's 2008 article stressed the importance of clear workflow and good communication as essential to the troubleshooting process, with checklists of common problems available to help troubleshoot.[51]

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