Electronic Resources and Web Sites: Replacing a Back-end Database with Innovative's Electronic Resource Management

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In the fall of 2002, Ohio State University along with the University of Washington, the University of Western Australia, Washington State University, and Glasgow University entered into a development partnership with Innovative Interfaces. The goal was to develop a module to manage electronic resources, integrated into Innovative's Millennium library system. The product, Electronic Resource Management (ERM), became available in 2004 and is based on the work of the Digital Library Federation Electronic Resources Management Initiative. This article focuses on one aspect of ERM, the integration of the module with the Web OPAC, and describes how the Ohio State University Libraries replaced a back-end database with ERM to support lists of electronic resources on their Web site.

The number of electronic resources available on the Web has grown dramatically since the mid-1990s. Most libraries have some electronic journals and books, as well as electronic indexes and abstracts, many of which connect to full-text articles. Management of these licensed resources has become somewhat difficult. The number of resources has grown, and existing integrated library systems were not originally developed to handle these types of purchases. In the fall of 2002, Ohio State University along with the University of Washington, the University of Western Australia, Washington State University, and Glasgow University entered into a development partnership with Innovative Interfaces. The goal was to develop a module to manage electronic resources, integrated into Innovative's Millennium library system. The product, Electronic Resource Management (ERM), became available in 2004 and is based on the work of the Digital Library Federation Electronic Resources Management Initiative (DLF ERMI).[1] Grover and Fons describe the development partnership in their 2004 article.[2] Tull, Crum, Davis, and Strader describe the functionality of ERM in their forthcoming article.[3] The product can also be used stand-alone and has been purchased by institutions such as the Library of Congress, Cornell University, and Utah State University.

The purpose of this article is to focus on one aspect of ERM, the integration of the module with the Web OPAC, and to describe how the Ohio State University Libraries (OSUL) replaced a back-end database with ERM to support lists of electronic resources on their Web site.

Literature review

Timothy Jewell, head of collection management services at the University of Washington Libraries, surveyed the practices of several large research libraries to discover how they were managing their commercial electronic resources.[4] He reported that most libraries were using a variety of locally developed computer-based systems as well as their existing library system to manage everything from the selection of electronic resources to providing Web access to the resources for users. He also noted that libraries were tracking common pieces of information to manage their electronic resources. Interest in this area spurred DLF to work with the National Information Standards Organization (NISO) to examine the need for standards in this area. Jewell and Adam Chandler, CTS information technology librarian at Cornell University Library, maintain a Web hub that highlights developments in this area.[5] The work of DLF ERMI is essentially complete and the report is available on the DLF Web site.[6]

Locally developed systems usually involve the development of a database using software such as MySQL, FileMaker Pro, or Microsoft Access. Such scripting languages as PHP and Cold Fusion provide a method to dynamically display information from the database on a Web site. MIT libraries and Johns Hopkins University libraries have published detailed accounts of their locally developed databases in the library literature.

MIT libraries developed a local system called Vera, using FileMaker Pro database software, to manage their electronic resources and journals after usability studies showed that users placed a high value on the lists of electronic resources and e-journals on their Web site.[7] The database was developed to improve the public Web site as well as to help track licenses, manage URLs and interactions with the proxy server, and produce reports. The interface allows users to browse electronic resources by broad subject category, title, or provider (e.g., JSTOR), and search by keyword.

Johns Hopkins University libraries developed HERMES, a university-wide electronic resource management system, with similar goals.[8] These goals included dynamic generation of information about e-resources for public display on the Web; support for such staff functions as selecting, ordering, and implementing e-resources; managing links; and generating reports. They developed a sophisticated system that was interoperable

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with their integrated library system, the campus proxy server, and various library Web sites. The software was recently released as open source and is based on the PostgreSQL relational database and Cold Fusion.[9]

Ohio State's locally-developed database

OSUL, like the other large research institutions in Jewell's report, had developed similar techniques for dealing with the growth of electronic resources. Managing the entire workflow for electronic resources required that the information be kept in a variety of places (e.g., static Web pages, the library system, and file cabinets). To help manage these resources, especially in relation to the Web site, staff in the information technology (IT) division developed a local database using MySQL, an open source relational database management system. The main purpose of the database was to provide a listing of these electronic resources on OSUL's Web site with such information as description, coverage dates, and a link to the electronic resource. The work of managing electronic resources is divided between two divisions at OSUL. The electronic resources librarian in the IT division oversees electronic resource trials and acts as a central point for troubleshooting problems with electronic resources provided through the consortium, OhioLINK. The serials/electronic resources (S/ER) unit in technical services manages the acquisition of electronic resources as well as troubleshooting problems with access to locally purchased electronic resources. The electronic resources librarian entered information about these resources into the MySQL database. S/ER kept paper copies of license agreements and entered information that they needed for the acquisition and management of the resources into the library system using fields within bibliographic, order, and holdings records. Because these records were not developed with managing electronic resources in mind, staff often entered information in note fields. Some information was duplicated in both the MySQL database and in library system records. When the University of Washington formed a development partnership with Innovative, OSUL was eager to participate and streamline this convoluted workflow.

Innovative translated the data elements defined by DLF ERMI into fields in three new types of records in their Millennium library system: a resource record, a license record, and a contact record. The resource record provides fields to describe the resource in great detail. For example, there are fields for resource name, resource URL, coverage dates, description, usage statistics, an incident log to record problems with the resource, and so forth. A license record is attached to a resource record and contains fields specific to the individual license agreement that a library has with a vendor for the resource. Fields exist for such vital information as the number of concurrent users allowed, who is authorized to use the resource, which locations can use the resource, authentication method, and so forth. The contact record contains the name and contact information for the vendor's staff responsible for technical support, billing issues, and other duties.

From the beginning of the development partnership, some information from the resource and license records was intended to display in the Web OPAC. Resource records contain a field for the resource name, which has its own index. Early in the development project, it became clear to OSUL that adding a field in the resource record for a local subject along with a subject index may provide a way to replicate the functionality of the MySQL database. Once Innovative put this in place, an informal working group, consisting of the system librarian, the electronic resources librarian, and several key personnel from S/ER, began to explore the idea of using ERM to replace the MySQL database. This became imperative with a bleak budget situation on campus. OSUL could no longer automatically fill vacant positions and lost several key positions in the IT division, including the Web librarian. Examining ERM as a replacement for the MySQL database was an opportunity to streamline processes while still providing good service to our users.

OSUL's Web site had several pages devoted to listing the more than three hundred electronic resources to help users find journal articles and other information. These resources consisted mainly of journal article indexes and abstracts, some with full text. The lists also included such online reference works as dictionaries, directories, and encyclopedias, as well as some online special collections. The entry page, titled "Find Articles: Research Databases" (figure 1), had A–Z links to an alphabetical browse-by-title page (figure 2), an alphabetical browse of titles limited to electronic resources containing full-text articles, and lists by broad, locally assigned subjects. The entry page also had a keyword search to find electronic resources using words in either the title or description of the resource. From the browse lists, users could click on a link that would connect them directly to the electronic resource or click on "more information" to get a description of the resource (figure 3). The efficiency of generating these lists from a back-end database was a great improvement over static Web pages because a simple-to-use Web interface allows staff, who may lack Web authoring skills, to enter information into the database, providing immediate display of new electronic resources on the Web site. This particular back-end database was multifunctional. Besides the lists of electronic resources, it also provided two lists for staff. One noted librarians who could provide expertise in using a particular resource. The second, restricted to S/ER and IT staff, contained information helpful for

Figure 1. Entry Web page to OSUL's electronic resources

Figure 2. Browse list of electronic resources generated from the MySQL database

troubleshooting problems with resources. The MySQL database also interacted with the proxy server, sending new URLs to the proxy server's configuration file, providing remote authentication services for off-campus users.

Functionality issues

In order to demonstrate the feasibility of replacing the MySQL database with ERM, the working group had to compare the functionality of the two systems. The working group listed every function provided through the MySQL database, consulting with public services staff when necessary, and categorized the functions in the following ways:

- ERM can provide the same function.
- ERM cannot provide the same function, and the function is essential. Develop an alternate method for providing the same function.
- ERM cannot provide the same function, and the function is not essential.

Public Web pages

Resource-name and resource-subject browse screens in the Web OPAC replicated the title and subject browse lists on the Web site fairly well. The entry page to electronic resources on the Web site could remain essentially the same (figure 4), but the URLs behind the A–Z and subject links perform a search of the new resource-name or resource-subject indexes in the Web OPAC and return a browse screen to the user (figure 5). Generating Web pages from a back-end database is a little more flexible than a Web OPAC in that links to helpful information for users can be placed on every browse or record screen. Subject browse lists on the Web site had links to the Web sites of related libraries. For example, the list of electronic resources for the subject "Astronomy," included a link to the Web site for the science and engineering library. The list for the subject, "Business and Economics," contained a link to the business library. Although it is possible to have links on the browse screens in the Web OPAC, it was not possible to dynamically display different links depending on the subject searched. However, there are fields in the resource record itself that can contain a URL. Something the working group is considering for the future is automatically adding a link to a related library in the resource record at the time it is created to supply the same functionality on the record screen in the Web OPAC.

Replicating the information provided to the public about a resource was an essential function. The records in the MySQL database had more than thirty fields of information. The working group had to map these fields to equivalent fields in the resource and license records in ERM and then make sure that the information could display in the Web OPAC. This was fairly easy because ERM is based on the DLF ERMI, which gathered much of its information from institutions using locally developed databases. Most fields easily mapped to an equivalent field in ERM. Innovative's library system provides a great deal of flexibility and local customization for displaying information in the Web OPAC, so all of the information that currently displayed to the public on the Web site could display on the resource record screen in the Web OPAC, plus the license information (figure 6).

A few functions could not be replicated in ERM. The full-text field in the MySQL database was used to generate

a list restricted to electronic resources that link to full-text articles. This separate list was not replicable in ERM. That piece of information was useful to both staff and users, so the working group devised a workaround to provide it. Staff add the words "[Full-text]" at the end of the name in the resource name field of the resource record. Although ERM could not provide a separate listing for full-text resources, users can immediately see on the browse screens which resources have full text.

Another useful function that could not be replicated in ERM was a procedure to alert users that an electronic resource is new. Whenever a resource was added to the MySQL database, it could be tagged as new so that a small yellow image of the word "New" displayed next to the name of the resource on the browse lists. To provide the same service, the entry page to electronic resources will link to a static Web page listing new resources.

Staff Web pages

Two staff Web pages relied upon the MySQL database. The first assisted a handful of staff with troubleshooting. The second listed librarians who were experts in using a particular resource. Records in the MySQL database included information designating whether an electronic resource was locally purchased or provided to OSUL by our consortium, OhioLINK. It also provided information about whether an OhioLINK resource was housed on OhioLINK's servers or at a vendor's site to help determine whether a problem could be reported to OhioLINK during the evenings or on weekends. Vendors typically only respond to problem calls during normal business hours, but OhioLINK will respond evenings and weekends. For problems with locally purchased resources, it also listed who was responsible for contacting the vendor.

The resource record in ERM has fields that could house this type of information, so during the day staff could refer to the resource record in ERM. However, IT staff can be paged at night and on the weekends for problems with OhioLINK electronic resources. For security reasons, OSUL has restricted the use of Millennium to IP addresses on campus and does not yet have a solution to allow staff to access ERM securely from home. In the meantime, the solution for this problem was to export the appropriate information from the resource records to a spreadsheet that staff could print out and take home with them and that could also be posted on the staff Web site if necessary.

An informal poll of the public services staff determined that no one used the second Web page so it was deemed inessential.

Proxy server

When off-campus users selected one of the licensed electronic resources on the Web site, the system determined

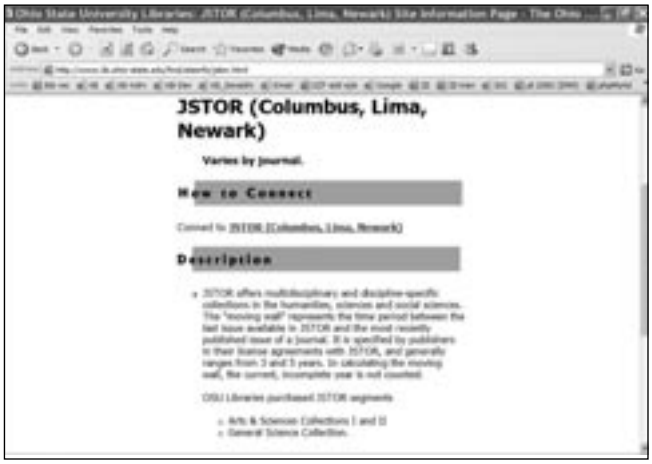

Figure 3. Sample record for an electronic resource generated from the MySQL database

Figure 4. ERM entry page remains essentially the same as before, but the links return results from within the Web OPAC

whether they were on or off campus and prompted off-campus users to sign in. After they entered their login ID and password, off-campus users were automatically directed to the electronic resource they had selected. The proxy server, EZproxy from Useful Utilities, authenticates users with some assistance from a few PHP scripts and a field in the MySQL database records. The electronic resources librarian selected the EZproxy field for a licensed resource when she created database records for new electronic resources. An automated process regularly wrote the URLs for new electronic resources from the database to the configuration file of the proxy server so that they would be available from off-campus within a day. The electronic

Figure 5. ERM browse list integrated into the Web OPAC

Figure 6. ERM record display in the Web OPAC displays license information

resources librarian had already started to review this process because not all URLs were getting into the EZproxy configuration file using current procedures. This provided an opportunity to develop a new procedure that totally disassociated the process from the MySQL database. The new procedure involved collecting all of the URLs from bibliographic records and resource records in the catalog and merging them into the EZproxy configuration file.

The other aspect of the proxy server process that could not be completely replicated using our current EZproxy configuration was the ability to determine whether a user was on or off campus and offer them the sign-in screen appropriately. The public note field in a resource record can contain hyperlinks. To partially replicate offering off-campus sign-in on the resource record, the electronic resources librarian added a public note containing the proxied URL to each resource record and titled the link "Off-campus sign-in." Currently, two links display in the record, one titled "Off-campus sign-in" that presents the sign-in screen to a user. The other is the regular link to the database for on-campus users. It is not as elegant a solution as the Web site offered, but it will allow off-campus users to sign in at the point that they display a record and then be immediately directed to the electronic resource. Another option is to offer a header template on every screen in the catalog with a link to "Off-campus sign-in", but this solution is not as efficient for the user, who has to sign in, return to the record, and then click on the link to the electronic resource.

Policy issues

Several policy issues were brought to the forefront when the working group discussed whether or not OSUL needed to continue to create bibliographic records for electronic resources as well as resource records. Doing so seemed like duplicate work. As a member of OhioLINK, OSUL contributes bibliographic records to a central catalog. OhioLINK uses Innovative's INN-Reach software, which provides a central catalog and circulation among member institutions. When a bibliographic record is created, it can be tagged to be automatically sent across the network to the central catalog. OhioLINK encourages members to contribute records to the central catalog for their locally purchased licensed electronic resources. This informs users across the state as to which institutions have access to particular electronic resources. Although users cannot access the electronic resource from their own campus if their institution does not have a license for it, the catalog record provides users with information to decide if they want to travel to a particular institution to use that resource. At this initial stage of development ERM is not integrated with Innovative's INN-Reach software, so resource records cannot be sent to the central catalog. This could change in the future as Innovative develops ERM, but for now OSUL will continue to create bibliographic records for electronic resources. Bibliographic records were also deemed necessary for internal purposes; because bibliographic records along with their accompanying order records are currently used to gather statistics.

Another policy issue involved the selection criteria that determined which electronic resources would be listed on the Web site. These have traditionally been restricted to purchased electronic resources with a few exceptions. Free Web sites were excluded as well as individual electronic journals. To abide by this policy, S/ER would have to suppress any resource record that did not meet the criteria so that it would not display in the Web

OPAC. This idea caused some concern because they could envision situations in which they might need to manage an electronic resource, such as an individual journal with its own license that did not meet the criteria. Yet they would want the license information to be available to the public. We are currently working with Innovative to test a workaround for our situation. The workaround is to create an extra field in the resource record titled "Other resource name" and index it in the title index. The records should not display in the resource name or subject indexes as long as these fields are left out of the records. These records would display to users from a title search providing the license information but they would not display on the browse screens from resource name or resource subject searches

Although not directly related to ERM, its implementation brought up one other policy issue that OSUL had not completely addressed. In ERM, it was easy to create a new subject just by adding it to a resource record. Staff members had complete control over the local subjects and could develop the list to meet users' needs. How new subjects would be added to the list and who would be responsible for maintenance is something that OSUL has yet to address.

Conclusion

The advantages for OSUL of replacing the back-end database that listed electronic resources on the Web site leaned heavily in favor of ERM. OSUL implemented ERM in December 2004. The major advantages for the public and staff are as follows:

- ERM eliminates duplication of effort between two units in the library.
- ERM centralizes all information about a resource into one record, increasing troubleshooting efficiency.
- IT staff do not have to support, troubleshoot, or develop the MySQL database. Support and development is shifted to Innovative. Troubleshooting problems in ERM is shifted to the systems librarian responsible for troubleshooting the Innovative system.
- A crucial service of the library is shifted to the Innovative server, which is more stable than the aging Web server.
- Integration into the Web OPAC provides users with a familiar searching and display interface.
- ERM has a special function titled "related holdings" that allows an association between a resource record and a holdings record attached to a bibliographic record. This useful feature can associate a resource record for a journal article index, for example, to all of the full-text e-journals provided through that index. If a library uses the related holdings feature of ERM, resource records in the Web OPAC will display links to all of the individual bibliographic records of those related e-journals.
- Both public and reference staff can view license information in the Web OPAC, including which campuses are authorized to use the resource, the terms of use, the maximum number of concurrent users, and authorized users. If a library uses the related holdings function explained previously, users can also display the license information from a link in the bibliographic records for the e-journals.
- Staff can add a resource advisory note telling users that the resource is temporarily unavailable. This note immediately displays on the resource record in the Web OPAC. If the library uses the related holdings function of ERM, this note will also display on all of the related bibliographic records.
- Adding local subjects is easy within ERM, so they can be managed by a librarian without assistance from the IT division.

There are some disadvantages to ERM, and libraries will have to consider the cost versus benefit of maintaining a back-end database along with ERM. Some of the major disadvantages are:

- Libraries lose control over the development of the software. This was not an issue at OSUL because the loss of staff restricted the development IT could provide for the MySQL database. Development of the software is shifted to a library system vendor, Innovative Interfaces. Adding new functionality or enhancements to the system, which are suggested and voted upon by customers, is a slow process. Individual libraries cannot always count on getting the functionality they desire.
- Generating Web pages from a back-end database is more flexible than a Web OPAC. Lists can be generated in a variety of ways using a back-end database. Besides the browse lists by title and subject, the Web site had a list that was restricted to electronic resources that contained full text. Although the major functions of the MySQL database could be replicated in ERM, some of these finer details could not. Adding links and images to the browse lists is easily done on the Web site but not on browse screens in the Web OPAC. Using the MySQL database, a search could search both the title and description fields for keywords. The default searches in ERM are a phrase search of the resource name and subject fields.
- On the Web site, the links to connect to an electronic resource could be more smoothly integrated into the proxy server process. When an off-campus user

clicked on a link, the system determined whether or not the user was on or off campus and offered them the appropriate sign-in screen. Once signed in, the user was automatically directed to the electronic resource.

OSUL had been interested in an electronic resources management system for some time before Innovative developed ERM. Although the local MySQL database addressed some staff functions, its main purpose was to provide information and access to electronic resources for faculty, staff, and students. When Innovative announced its development efforts, OSUL was eager to help in the development mainly for the staff management functions it would offer. As development progressed, the integration with the Web OPAC offered an opportunity to streamline services within the Web OPAC. A major factor in the decision-making process is the ability to communicate license and advisory information to staff and users. OSUL had not developed a method to deal with these through the MySQL database. Centralizing information about a resource is another major factor of interest. Other local factors, such as loss of staff in the IT division, also influenced the decision to abandon the MySQL database. Libraries will have to measure the cost versus benefit of this option by looking at their current staffing situation and users needs. Innovative libraries that currently have a back-end database for electronic resources will have to consider the pros and cons of relying solely on ERM. Libraries that have opted to buy the stand-alone version of ERM will not be able to take advantage of the tight integration with the Web OPAC and this option may not be as appealing to them. For OSUL, the advantages of replacing our back-end database with ERM clearly outweighed the disadvantages.

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