White Paper on Interoperability between Acquisitions Modules of Integrated Library Systems and Electronic Resource Management Systems

Prepared by a Subcommittee of the Digital Library Federation's
Electronic Resource Management Initiative, Phase II

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EXECUTIVE SUMMARY

The following white paper investigates interoperability between the acquisitions modules of integrated library systems (ILS) and electronic resource management systems (ERMS). The first section of the paper features four case studies: UCLA, Cornell University, the Tri-College Consortium of Bryn Mawr, Haverford, & Swarthmore Colleges, and the Library of Congress. Each case highlights the library's institutional environment, consortium considerations, systems architecture (ILS, ERMS, and link resolver), and electronic resource workflows. A review of these components reveals (1) complex systems environments; (2) transitioning of staff and workflows to more effectively manage electronic resources; and (3) license negotiation and documentation as relatively new and time-consuming tasks. The case studies yielded a set of seven acquisitions elements deemed critical for exchange between the ILS and ERMS. This set includes purchase order number, price, start and end dates for the subscription period, vendor name, vendor ID, fund code, and invoice number. Each library identified the prospect of automated generation of cost-per-use statistics as a catalyst for desiring ILS/ERMS interoperability. Yet the authors recognize that there are inherent challenges to generating meaningful cost-per-use metrics, given the way electronic resources are acquired and packaged.

The second part of the paper reports on conversations held with product managers and other relevant staff of the leading ERMS. Those interviewed agreed that interoperability between the ILS and ERMS was strategically important, but difficult to achieve given the lack of an open identifier standard for e-resource packages and package constituents. Those interviewed disagreed about the future role of ERMS. Opinions ranged from the ERMS as a module of the ILS to the ERMS supplanting most of the features of the ILS.

The paper concludes with a recap of the general value of ILS/ERMS interoperability and some of the more significant barriers to achieving it. Finally, it is proposed that further discussions among stakeholders take place, and that these discussions focus on establishing agreement on a small set of elements for exchange and on the development of standard identifiers. A detailed look at identifiers is included as an appendix.

I. INTRODUCTION

Electronic resource management systems (ERMS) are becoming an important tool in many libraries. Commercial ERMS development has been driven in part by the lack of accommodation within integrated library systems for elements specific to electronic resources. Financial aspects of acquiring e-resources, in particular, necessitate recording an array of data not suited to ILS acquisitions modules. Unlike other data recorded in an ERMS such as licensing and administrative terms, a moderate percentage of acquisitions data is redundant, being populated in one's ILS during the acquisitions process, while also being accommodated within ERMS in accordance with the data structure detailed in *Electronic Resource Management: Report of the DLF Electronic Resource Management Initiative*.[1] Some ERMS implementers are eager to automate the process by which acquisitions data move from their ILS into their ERMS. This interest has intensified over the past few months as prospects for connecting financial data to usage statistics have been improved through the Standardized Usage Statistics Harvesting Initiative (SUSHI), a NISO standard, Z39.93.

The following white paper investigates interoperability between the acquisitions modules of integrated library systems (ILS) and electronic resource management systems (ERMS)[*]. The paper describes the workflows at four libraries that share the challenge of trying to integrate ERMS and ILS services; identifies a core set of acquisitions elements deemed vital to ILS/ERMS interoperability; reports on conversations held with product managers and other relevant staff of the leading ERMS; summarizes common themes; and concludes with discussion and recommendations for next steps.[**]

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[*] Time and resources did not permit investigation of another possible interoperability strategy for moving library-specific order data into an ERMS: reliance on subscription agents.

[**] Recent changes in the library system marketplace, along with vendor-specific solutions to data exchange, will have bearing on future approaches to ILS/ERMS interoperability. These influences, and their potential effects, are not addressed in this paper.

II. CASE STUDIES

The following section provides case studies from four libraries: UCLA, Cornell University, the Tri-College Consortium of Bryn Mawr, Haverford, and Swarthmore Colleges, and the Library of Congress. These libraries are described, their systems environments and workflows detailed and summarized, and data elements useful to each for exchange are listed, then brought together and discussed.

The Libraries & Consortium Considerations

UCLA: The UCLA library system serves a user population of nearly 40,000 students and faculty (see Table 1 below) and has been actively developing its electronic resource collections for a number of years. Between 80-90% of UCLA's e-resource fund allocation is devoted to consortial acquisitions, and the California Digital Library (CDL) is responsible for the bulk of electronic resource acquisition across the University of California (UC) system. The CDL manages the funding of both "Tier 1" and "Tier 2" licensed e-products, with "Tier 1" licenses representing products available to all ten campuses, while "Tier 2" products are desired by two or more of the ten campuses. UCLA also actively acquires electronic products outside of the consortium, maintaining at present over 125 such UCLA-specific licenses for electronic products and aggregations.

Cornell University: The Cornell University Library is similar in size to UCLA's, but serves a smaller user population (see Table 1). Cornell is a complex institution that includes both private and public sides, and encompasses the main campus in Ithaca, the Weill Medical Center in New York City, and another medical school in Qatar. While each campus has its own Innovative Interfaces ILS, the focus of this case study will be the Cornell Ithaca campus, which uses Ex Libris' Voyager as the main ILS, alongside the Innovative Interfaces, Inc. standalone ERM. Although the University belongs to the NYLINK network, to date consortium issues have been secondary to the Library's workflow considerations.

Tri-College Consortium: The libraries of Bryn Mawr, Haverford, and Swarthmore Colleges serve a much smaller user community than either UCLA or Cornell (see Table 1). They purchase the majority of their e-resources collectively; therefore consortium considerations loom large in most transactions. Given the means by which member librarians perform tasks on behalf of the consortium, it is important that information about the Tri-College collection be readily available to all authorized staff.

Library Patrons	UCLA	Cornell University	Tri-College Consortium
Undergraduate	24,811	13,562	4,480
Graduate/professional	10,814	6,077	273
Faculty	3,326	1,627	406
TOTAL	38,951	21,266	5,159

Table 1. Participating Academic Library FTE's, 2006-2007

Library of Congress: As is widely known, the Library of Congress is one of the largest library systems in the world, and as shown in Table 2 has an estimated user population of nearly a quarter of a million. Roughly 80% of this number consists of registered readers, United States citizens permitted to use the collections on-site On-site usage is also granted to foreign visitors with proper identification such as a passport. Patrons with actual borrowing privileges are a fairly small population consisting primarily of members of the U.S. Congress, Congressional staff, members of the federal courts, and the Library staff. The Library has no consortium considerations at this time.

Library Patrons	2006-2007
Registered readers	200,000
Patrons with circulation privileges	41,556
TOTAL	241,556

Table 2. Library of Congress Patrons, 2006-2007

Systems Environments

For purposes of this study, the systems environments at the four participating libraries consist of their integrated library systems, electronic resource management systems, and link resolvers. These components will be discussed in turn, and are summarized in Table 3 on page 9.

Integrated Library Systems

UCLA: The Library uses the Ex Libris *Voyager* integrated library system for all cataloging, acquisitions, circulation, and public discovery functions. However, a very different future for the online catalog (OPAC) of the University of California Library consortium is being explored. The UC has recently announced their participation in a "Next Generation Melvyl Pilot" with OCLC. The experiment is being supported by the WorldCat Local Service, and will investigate future possibilities for the University of California Libraries Catalog. The pilot is targeted for release in April, 2008. If such a change is permanently implemented, it would have a significant impact on public discovery at UCLA as well as on each UC campus.

Cornell: The Library uses Ex Libris' *Voyager* integrated library system for cataloging, acquisitions, circulation, and the online catalog. At present, there are no plans to migrate to a different system on the staff side. However, there is considerable dissatisfaction among staff regarding the quality of the online catalog. There is interest among staff and library decision-makers in moving to a different platform for the public presentation of the Library's cataloged collection. For that reason, the Cornell Ithaca campus will be implementing WorldCat Local in 2008

Tri-College Consortium: The Libraries share an Innovative Interfaces' *Millennium* integrated library system.   The Tri-Colleges are deeply invested in this system, having used it since 1990 for acquisitions, cataloging, circulation, interlibrary loan, public discovery, and serials processing. Like Cornell, there is interest among administrators and staff in considering a different platform for the public presentation of the Library's cataloged collection.

Library of Congress: Ex Libris' *Voyager* integrated library system (Unicode version in production) is stable, has been in production at the Library since 1999, and the Library has no plans to migrate to a different system. The Library monitors developments related to federated search products in the broader marketplace, and has a pilot project underway to better integrate the Library's collections, both analog and digital. It is too early to determine whether such a federated search tool will be purchased or the pilot will be developed internally.

Electronic Resource Management Systems

UCLA: The UCLA Library currently employs a "homegrown" electronic resource management system, the *Electronic Resources Database* (*ERDb*), which was put into production in 2001. This local ERMS is used by library patrons for e-resource discovery, and the public interface occupies a prominent place on the UCLA Library home page. The ERMS is integrated into staff e-resource management workflows, storing unique acquisitions and access information, as well as key licensing data. The CDL embarked on a search for an ERMS in 2004; however to date, no commercial product has been implemented.

Cornell University: The Library is using the Innovative Interfaces standalone *ERM* electronic resource management module. It has been in production at Cornell for over two years. In addition to being a repository for license information for staff, *ERM* is also the public interface to the Library's "Find eJournals" A-Z list (for searching and browsing) and the Library's "Get it ! Cornell" link resolver service. *ERM* is fully integrated into the Library's workflow. There are no plans to change to another product in the foreseeable future.

Tri-College Consortium: In spring 2007 the Libraries implemented the *Verde* ERMS from the Ex Libris Group. The Libraries maintain four instances: one for each library and one for the consortium as a central agency. From 2005 through autumn 2006 the Libraries were development partners for the VTLS *Verify* electronic resource management system. From 2002 through 2004, the Libraries used a locally-developed ERMS named *ERTS*.

Library of Congress: The Library was involved with the beta phase of *ERM*, the e-resource application offered by Innovative Interfaces (III). The system has been in production for over three years. The Library maintains production and test versions of *ERM* on local servers. The Library recently acquired the III WebOPAC front-end to *ERM*, which is being configured for display on the LC web page. It serves as a management system for licensed and "free" e-journals that have been selected by on-site users. The WebOPAC will serve as an advanced A-Z listing for the Library's electronic serials, both licensed and freely-accessible. The Library has no plans to switch ERMS in the foreseeable future.

Link Resolvers

UCLA: The Library has not purchased a link resolver, but uses and maintains an instance of the Ex Libris *SFX* product, which is contracted for and hosted by CDL. Currently, Library staff is activating journal titles in the *SFX* server and is exploring the use of the SFX A-Z List for public discovery.

Cornell University: The Library uses the *WebBridge* link resolver product from III. Given that the Library was already populating its *ERM* system with e-journal holdings and already had the hardware in place, it made sense to purchase the III link resolver product.

Tri-College Consortium: The Libraries maintain three instances of *SFX*, the link resolver provided by the Ex Libris Group. Success with *SFX* was a factor in the Libraries' decision to purchase *Verde*, which leverages the *SFX* knowledge base.

Library of Congress: The Library uses the *SFX* link resolver from the Ex Libris Group. The Library has no plans to migrate to a different system. The Library is interested in sharing a knowledge base of e-resource subscription information between *SFX* and *ERM*. Test versions of both applications share a server in the Library's test laboratory.

	UCLA	**Cornell University**	**Tri-College Consortium**	**Library of Congress**
ILS	Ex Libris *Voyager*	Ex Libris *Voyager*	Innovative *Millennium*	Ex Libris *Voyager*
ERMS	Local	Innovative *ERM*	Ex Libris *Verde*	Innovative *ERM*
Link Resolver	Ex Libris *SFX*	Innovative *WebBridge*	Ex Libris *SFX*	Ex Libris *SFX*

Table 3. Participating Library System Environments

Workflows and Discussion

Workflow Descriptions

As Marilyn Geller notes, "Library initiatives to bring electronic resources into the collection require a systematic way to communicate among groups, track progress, and store data."[2] The number and distribution of staff performing tasks related to managing e-resources offer new challenges to libraries. The following section describes workflows developed by the featured libraries and illustrates the roles of the ILS and ERMS within these workflows.

UCLA: The electronic resources workflow at UCLA experienced a major restructuring earlier this year. Because of the complex nature of the electronic format coupled with consortium involvement, the Library made the decision to split acquisitions into two units based on format. Digital Collections Services (DCS), a new unit, contains three electronic acquisitions specialists, who process the ordering and payment for all electronic products licensed by the UCLA Library. DCS also negotiates and oversees the licensing workflow for all digital acquisitions. The acquisitions specialists process recharges for electronic purchases made on UCLA's behalf by the CDL. To the fullest extent possible, anything "electronic" is funneled through this new unit.

DCS has modeled its workflows on "Appendix B: Electronic Resource Management Workflow Flowchart" of the ERMI *Report*,[3] working in concert with the Library's Cataloging & Metadata Center, the Research, Instruction and Collection Services, and the Collections, Research and Instructional Services units to distinguish responsibilities for tasks and the order in which they should be completed. DCS is also responsible for activating titles in *SFX*, and for investigating new tools for improved access and maintenance for electronic products. DCS is also responsible for ongoing maintenance of metadata contained in the *ERDb*. Currently, selected descriptive metadata fields from new e-resource catalog records in the *Voyager* system are migrated weekly into the *ERDb*.

An abbreviated workflow for UCLA licensed electronic products is as follows:

1. Selector or selection unit notifies DCS of a potential license agreement.

2. DCS works with the selector on the license, and pending successful negotiation of the license arranges for the acquisition of the product, using the *Voyager* acquisitions module.

3. A bibliographic record with order status is loaded into the *Voyager* cataloging module, and a record is created in the *ERDb* for the package, individual title, or database as appropriate.

4. Selected license terms are recorded in the *ERDb*.

5. When access to the electronic resource is enabled, registered with the local proxy server, and activated in *SFX*, DCS notifies the Cataloging & Metadata Center via email from the *ERDb*.

6. The request is routed to the appropriate cataloger through the Microsoft Outlook "Tasks" manager.

7. Once the resource is cataloged, notification is sent to the selector responsible for the license.

8. DCS is responsible for the future lifecycle of the e-product, including renewals, negotiation, troubleshooting, and other maintenance activities.

Cornell University: The Library's workflow for managing electronic resources is complicated and dependent on significant staff skill to keep the various systems in sync. In general terms, the process works as follows:

1. Librarian selector makes decision to purchase a new title or package.

2. Acquisitions staff sends payment to the vendor and adds a resource/license record to the *ERM* system.

3. Acquisitions staff add the title or package to the Library's active holdings within the Serials Solutions admin module.

4. In the next monthly delivery of MARC records from Serials Solutions, the new titles are included as new records.

5. Acquisitions staff run a custom script that draws license information out of the *ERM* module and uses it to modify the incoming MARC records from Serials Solutions. The program adds a prefix to the URL in the 856 field setting the proper access rights and routing the original URL through a CGI script that routes off-campus patrons through the proxy server.

6. All of the e-journals in the catalog are then extracted from *Voyager* -- this includes those managed in Serials Solutions and those managed outside

Serials Solutions. Two files are created: one file for the MARC records, and another "coverage file" (that is, holdings data, title, package, start date, end date, embargo period, ISSN, eISSN). These files are then imported into the *ERM* system, thus updating the *Find eJournals* and link resolver knowledge base. Unmodified titles are marked for deletion.

Tri-College Consortium: Most e-resource management tasks are performed by technical services staff. A typical workflow for a consortium purchase involves the following steps:

1. A bibliographer notifies the Tri-College Electronic Resources Group (ERG) about a resource of interest.

2. ERG places the request in the trials queue.

3. The Tri-College Trials Coordinator arranges the trial. This includes sending the vendor an electronic copy of the Tri-College's model license.

4. Upon trial completion, ERG reviews comments about the resource and forwards its recommendation to each institution's Collection Officer (CO).

5. If the COs decide to purchase the resource, the Tri-College Licensing Librarian contacts the vendor to begin the price and terms negotiation, the latter activity also including Bryn Mawr College counsel.

6. Upon receipt of invoice, the Serials Specialists (SS) make payment and prepare for resource activation.

7. The Tri-College E-Resource Cataloging Coordinator reviews the process by which MARC records will be added to the catalog.

8. Upon notification of activation, the SS test URLs and activate the resource within *SFX*, the Tri-College's homegrown "A-Z list," and the proxy servers.

9. The Technical Services Administrators receive and review the executed license.

10. Access problems are handled by the SS.

11. The ERG facilitates the renewal/termination review.

Library of Congress: The Library is piloting a team in technical services that will concentrate on merging workflow processes for analog and digital collections. Pilot participants, all of whom are knowledgeable about *Voyager* cataloging and acquisitions systems, received training on *ERM* and *SFX* systems. Licensing specialists have trained the group on the Library's newly adopted model license agreement and other aspects of the license negotiation process. This pilot study is expected to greatly inform a projected reorganization of the acquisitions and cataloging operations.

Currently:

1. Selection officers make purchase recommendations as well as recommendations to acquire access to licensed content.

2. These are forwarded to acquisitions specialists.

3. Acquisitions staff track purchase orders, invoicing, and all subsequent order-related matters through *Voyager*, but send payments to vendors through the *Momentum* system, a commercial application that tracks funds and produces vouchers. Updates from *Voyager* acquisitions to *Momentum* are run daily.

4. A resource record is then added to *ERM*. Holdings/coverage information, URLs, and other specifics about titles acquired, chiefly through aggregator packages, are imported through data supplied by two publication access management services (PAMS), Serials Solutions and TDNet. The Library also incorporates information provided through the Elektronische Zeitschriftenbibliothek (EZB), a German consortium that maintains e-serial holdings for its membership.

5. As new titles are identified through PAMS update files and the EZB, bibliographic records are identified and loaded into *ERM*. Records are identified from *Voyager*, OCLC, the ISSN Portal, and other sources and imported into *ERM*. Uncataloged titles receive a minimal level of cataloging sufficient to provide access points to benefit searching in the Library's III Web OPAC. These bibliographic records are linked to *ERM*'s resource records and display with their holdings in the Library's III WebOPAC.

6. License data are input manually and represent an unacceptable bottleneck. The Library is looking forward to the production of machine-readable licenses that will facilitate automated ingestion of terms of use data. An ONIX group is currently working on a standard to define an XML message

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with license content. The Library will encourage its vendors to implement this standard at the earliest opportunity.

Workflow Discussion

Similarities
The complex and distributed nature of e-resource activities is apparent in each case study. The featured libraries are in the process of transitioning staffs and workflows to effectively manage electronic resources, but the number of systems into which data are entered is already disconcerting. For example, in each case, the library's ILS, ERMS, and link resolver were sources and/or targets of data, dependent on either scripts or manual intervention. In addition, each library also maintains at least one additional database: UCLA's *ERDb*, Cornell University's *Find eJournals*, the Tri-College's *A-Z list*, and the Library of Congress's *Momentum*. Moreover, Cornell University and the Library of Congress contract with PAMS for various services.

Other workflow commonalities include the complex systems matrices summarized in Table 3 and the pressure resulting from license negotiation and documentation. Licensing activity represents a new area of focus for libraries and can consume anywhere from a moderate to very substantial amount of staff time. Although the case studies include little mention of how staff is notified of impending work, it was clear to the authors that this is a significant challenge exacerbated by the distribution of e-resource tasks across multiple units. Our impression is that a combination of human- and machine-generated email "ticklers" is used, but we did not study their nature or extent.

Differences
While the activities of ordering, licensing, paying for, activating, and cataloging e-resources are similar, the means of doing so differ across the libraries. Cataloging offers the most divergent example: some of the featured libraries perform this work in-house, while other libraries contract for records from a third party.

Although narrative descriptions of the workflows don't lend themselves to quantitative analysis, one can discern the relative complexity and effort spent on certain workflow components provided by these descriptions. UCLA's electronic-only workflow concentrates much effort on cataloging e-resources; Cornell University's workflow utilizes scripts to manipulate data for various systems; the Tri-College Consortium's workflow places emphasis on decision-making and license negotiation; and the Library of Congress's workflow seeks to minimize manual input and avoid redundant data entry between systems.

Data Elements Critical to Exchange

The tasks associated with acquiring information resources vary from library to library. In spite of these differences, the types of information recorded and deemed important to libraries form a relatively small element group. The following section reports on the acquisitions elements managed at the four featured libraries. A core set of elements drawn from these case studies appears in Table 4 below.

UCLA: Over 10 data fields are replicated in the *Voyager* acquisitions client and in the local ERMS. In the spirit of the ERMI *Report*,[4] an ERMS system should work with the appropriate components of an ILS to minimize data repetition. Although there is a substantial number of data fields in the UCLA *Voyager* acquisitions client that would successfully map to an ERMS system, certain other critical acquisitions data do not necessarily include a one-to-one match between data sets. Currently, detailed information such as renewal/cancellation dates, cancellation restrictions, discounts on price, as well as various notes are concatenated into a single note field in *Voyager* acquisitions records. However, the technological feasibility of a meaningful transfer of acquisitions data into *an* ERMS (or vice versa) would no doubt provoke a change in the way information is entered into the acquisitions client. Internal discussions with electronic acquisitions specialists led to the identification of first and second priority lists of elements for exchange.

Critical elements to exchange:
- Purchase order number
- Price
- Start date
- End date
- Vendor subscription ID
- Vendor
- Budgets (i.e. fund codes)

Additional elements useful to exchange:
- Acquisition status
- Acquisition status date
- Renewal/cancellation date
- Renewal/cancellation decision note
- Renewal/cancellation note for vendor
- Print cancellation restriction
- Print cancellation note
- Subscription type
- Discount on price

Cornell University: The primary driver for ILS/ERMS integration at Cornell is an interest among collection management staff to better understand the value of e-journal subscriptions by combining COUNTER download data with title level payment data. Among the requirements are that it must be possible to generate

suitable reports for each selector or "fund," while minimizing the amount of workflow modification or custom programming needed to do so. The following data elements support such an application and are to be found in the ILS; they would be matched to appropriate title in the III ERMS where COUNTER data are stored upon being pulled into it via the SUSHI protocol from ScholarlyStats, or directly from a publisher site or vendor.

- Line item id
- Price
- Subscription start date
- Subscription end date
- Vendor code
- Fund code

- Invoice number
- Invoice date
- Selector
- Purchase order note
- Line item note
- Invoice note

Tri-College Consortium: As the Tri-Colleges move towards ERMS-centric workflows, maintaining the following data alongside other acquisitions, bibliographic, and licensing data would provide a single point of interaction for staff. These data would also support cost-per-use comparisons and additional reports otherwise not available to the Libraries.

- Price
- Vendor
- Vendor title number
- Purchase order number
- Invoice date

- Invoice number
- Term start/end dates
- Fund code
- Selector

Library of Congress: At present, the Library uses a Microsoft (MS) Access database to provide "API-like" capability between its *Voyager* ILS and III ERM systems. First, the following data elements are extracted from *Voyager* and imported into the MS Access database via Open DataBase Connectivity (ODBC). A file is then created in an MS Access database that will be used to transfer the select *Voyager* acquisitions data to the III ERMS. This data transfer process is currently under development with Innovative Interfaces. The ability to load acquisitions data into the III ERMS from another ILS is estimated to be in operation in spring, 2008. Once available within the ERMS, the data is "married" to usage and performance data to produce reports for collection development and acquisitions staff.

- Purchase order number
- Invoice number (latest)
- Invoice date

- Vendor name
- Vendor address
- Vendor telephone number

● Price (based on invoice amount)   ● Vendor email address
● Start and end date of contract   ● Vendor ID number

Data Elements Summary

The shaded cells in the chart below indicate the acquisitions elements that the featured libraries identified as critical for exchange between the ILS and the ERMS.

Element Name	UCLA	Cornell University	Tri-College Consortium	Library of Congress
purchase order number	X	X	X	X
price	X	X	X	X
start/end dates	X	X	X	X
vendor	X	X	X	X
vendor ID	X	X	X	X
invoice number	X	X	X	X
fund code	X	X	X	
invoice date		X	X	X
selector		X	X	
vendor contact information				X
purchase order note		X		
line item note		X		
invoice note		X		

Table 4. Critical Acquisitions Elements

Although acquisitions activities are highly variable across libraries,[5] it is likely that the elements identified most often in the case studies would be considered important to the majority of libraries interested in such interoperability. Eight of the 13 elements noted above were deemed critical by at least three libraries. These elements, which facilitate activation, troubleshooting, and report-generation, include:

● Purchase order number (a unique identifier, often the order record number)
● Price
● Start and end dates for the subscription period
● Vendor name
● Vendor ID (vendor-supplied identifier associating a resource with a library)
● Fund (or budget) code
● Invoice number
● Invoice date

Desired Outcomes, Future Scenarios

Interoperability between the ILS and ERMS is a goal identified by each of the featured libraries. The generation of cost-per-use data is a common theme in this regard, but additional reasons for increased interoperability are noted by the libraries below.

UCLA: With the ongoing development of the ERDb and other electronic resource management tools, it is hoped that a level of interoperability with the Voyager Acquisitions system can be achieved in a reasonable amount of time. This will aid greatly in the exploration of better cost analysis measures, which to date have not been made available routinely to support local decision-making. Once they can be derived more easily, UCLA hopes to use this information and the up-to-date acquisitions and holdings information that will also result from interoperability to support more active participation in the California Digital Library consortium.

Cornell University: In the shorter term, the Library's goal is to build closer interoperability between the *Voyager* acquisitions module and the *ERM* system, and especially to improve its ability to quickly create reports that help assess the value of its electronic resources. Other goals include:

- improving the accuracy of journal holdings (e.g., 1999 - present)
- improving the quality of incoming OpenURL data from content providers
- providing title level terms of use information for large aggregators.

Tri-College Consortium: Placing acquisitions data in an ERMS with other ERMI-specific elements such as pricing model and price cap would provide a comprehensive view of e-resource purchases. Moreover, the prospect of importing usage statistics via the NISO Standardized Usage Statistics Harvesting Initiative (SUSHI) protocol and combining these statistics with price information would help the ERMS become a powerful collection assessment tool.

Library of Congress: The Library hopes to automatically update its *ERM* database with acquisitions information drawn from *Voyager*. Thereafter, the Library will develop a way to take advantage of usage information available in *ERM* so as to provide selection officers with cost-per-usage information. Load programs for data kept in *Voyager* are under development. Much of this work is in the early, experimental stage.

Challenges to Generating Meaningful Cost-per-Use Data

The case studies presented in this report are in agreement that generation of cost-per-use data is one compelling reason for effecting interoperability between the ERMS and ILS. As Franklin[6] has noted however, although cost per use data (and unit costs more generally) can be especially helpful when making journal subscription and cancellation decisions, they carry with them some challenges and difficulties.

One such challenge that emerged during the work for this report pertains to publisher collections commonly referred to as "big deals," in which a library pays for access to a list of "subscribed" journals, but also receives access to a substantial number of additional journals at no stated or identifiable cost. Occasionally these unsubscribed journals garner significant use. In such a scenario, it may be simple enough to determine an overall cost-per-use at the package level, but difficult to know how or whether to assign costs to the unsubscribed journals.

Additional challenges include:

● Assigning pricing to constituents of a package that is invoiced as a single line item. That is, if and when e-journal packages are established and marketed as "databases" (rather than as collections of individually subscribed titles), it may become increasingly difficult to determine what the price for any one might be – especially if the content provider does not provide that information.

● Developing a means of assessing percentages of the total cost across multiple budgets or fund lines based on the subject areas served by the package.

Despite the promise of SUSHI and the capability of ERMS to combine usage and cost data in many or even most cases, the challenges noted above will need to be overcome before meaningful reports can be generated for situations like those described.

III. VENDOR SURVEY AND RESPONSES

In November 2006, as the case studies described above were under way, the authors held conference calls with product managers and other appropriate staff of the leading ERMS.[7]   The conversations were used both as a means of explaining the benefits of such interoperability from the library perspective, as well as learning the challenges of building such interoperability into commercial ERMS and ILS products. A summary of responses follows.

Is your company currently involved with any projects that explore loading data from a third party ILS to your own ERM product?
One example of such interoperability occurs between Serials Solutions' *ERMS* and SirsiDynix integrated library systems. According to Mike Showalter, formerly of Serials Solutions, the unique relationship between Serials Solutions and SirsiDynix leverages links between *ERMS* and acquisition modules to reduce or eliminate redundant data entry.   Web services were being employed by at least one ERMS vendor to provide such interoperability. Other product managers indicated that such data loading was occurring either via loaders that support standard file types such as MARC, CSV, and ONIX Serials Online Holdings (SOH), or through contracted one-time loads.

Is your ILS product supplying data to another vendor's ERMS? If so, what data are being exchanged?
None of the product managers were aware of such an exchange, but most indicated that they were not necessarily in a position to know.

Do you have any plans to engage in such a data interchange between your products and those of another company?
Responses to this question varied quite a bit. Some product managers indicated that they were eager to effect data exchanges, regardless of the ILS. One product manager indicated that customers demand a "best of breed" ERMS, which makes interoperability across vendor platforms an important business consideration. Working with competitors to effect such interoperability was seen by some as necessary. On the other hand, one product manager indicated no immediate plans for such exchange.

Are you exchanging data between your own ILS and your ERMS?
The product managers indicated that their ILS and ERMS were exchanging data. The means, however, varied. In one case web services were effecting the data exchange. In another the ERMS was a module of the ILS, and therefore tightly woven into the underlying system.

Is such interoperability a strategic component of your system's future?
This question evoked a wide range of responses. All product managers indicated that such interoperability was strategically important since customer needs vary. One product manager, however, indicated that the resource discovery aspect of ERMS, particularly as it relates to one's link resolver and knowledge base, was of greater strategic importance. Lack of standard identifiers at the product level was a common lament across the group. Serials Solutions' proprietary IDs, when available, facilitate data exchange with SirsiDynix systems.

What competitive advantage would such interoperability bring your system?
Two distinct viewpoints emerged from the responses to this question. On the one hand, interoperability was considered a strong customer desire, and therefore competitively important. Such interoperability helps to open up alliances and markets that otherwise could not be reached. One product manager emphasized that ERMS will ultimately become the inventory control/payment/management system, replacing the traditional ILS, especially as discovery tools move to alternative solutions. In contrast to this view, other managers offered more tempered remarks about the competitive advantage of interoperability, and questioned whether a "best of breed" modularized environment is feasible for most libraries, given the technical skill typically required of libraries to glue different systems together.

IV. CONCLUSION AND RECOMMENDATIONS

While the exchange of data elements between a library's ILS acquisitions module and its ERMS is valuable, especially to support cost-per-use and similar analyses that depend on combining pricing or payment information with usage data, it is neither feasible nor desirable for libraries to manually rekey data. Since it is unlikely ERMS will assume the role of library acquisitions system anytime soon, there exists a desire to move acquisitions data across systems, even in cases where the source and destination systems are offered by different companies.

Based on the interviews conducted for this report, most vendors see market value in providing such interoperability if it will serve the needs of existing ILS customers while providing a competitive advantage for their ERMS product. Given the high stakes, and general unease with which competitors join forces, it may be that interoperability between an unrelated ILS and ERMS will tend to occur only when a contractual agreement exists between the two parties, as is the case currently with the SirsiDynix and Serials Solutions arrangement. In the absence of such an agreement, interoperability between products of different vendors may only occur when a library is willing and has the capacity to contribute technology staff to the effort. A more useful approach would be for vendors and libraries to collaborate in order to address a market need, minimize duplication of effort, and assure ongoing systems compatibility.

In order to effect such interoperability across the industry, the authors of this report advocate two separate but potentially mutually-supportive strategies for libraries, vendors and publishers to pursue in common as appropriate.

First, as is obvious from the attention given in the report to identifying key data elements for exchange between the ILS and ERMS, we believe that it should be possible to establish consensus on a set of "core" acquisition data elements. To be practical, this set could and should remain relatively small – no more than ten-to-twelve elements. We suggest that the seven elements identified as critical to the four libraries participating in this study serve as a starting point for identifying this core set.

Second, while the idea was only mentioned in passing within the report, it is clear from discussions among ourselves and with the vendors who participated in our informal survey that the lack of unique and persistent resource- or collection-level identifiers presents a serious problem whose resolution would go a long way toward facilitating data exchange. In order to help initiate further discussion, a brief appendix on the topic has been provided.

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APPENDIX A: The Problem of Resource Identifiers

During the research and discussions that led to the writing of this white paper, two identifier-related problems were noted. The first problem occurs when descriptive metadata or coverage updates provided by a third party lack an ISSN or ISBN. These international standard numbers can be missing for a variety of reasons, including that no ISSN or ISBN was ever assigned to the e-resource, or inaccurate ISSN/ISBN data accompanied the e-resource coverage update.

While the problem illustrated above is significant, the lack of a standard identifier for product-level resources (i.e. unique identifiers that distinguish resources offered through multiple licensors or vendors) poses what may be an even larger challenge to ILS/ERMS interoperability. Such identifiers could play a critical role in a variety of contexts and help solve some serious e-resource management problems that libraries are experiencing. The absence of such identifiers — or inaccurately rendered ones -- makes the process of transferring acquisitions data between the ILS acquisitions modules and the ERMS more difficult.

For example, the lack of these identifiers adds to the difficulty of adding, deleting and updating coverage and holdings records related to works maintained in the ERMS and requires a finer level of holdings information coordination than would be necessary if such identifiers were available. The manual process of searching unlinked updates to improve and refresh URLs and/or holdings descriptions can also be very costly to libraries, while availability of such identifiers would facilitate the process of loading data automatically into ERMS. Such product-level identifiers could also serve as critical match points for providing a useful means of comparing data about orders in the acquisitions systems with records managed in the ERMS. While proprietary numbering schemes may seem a viable alternative, experience shows that reliance on them results in frequent load failures.

In order to provide useful evaluations of licensed electronic resources for collection development purposes, it is critical to unite in one system cost data with usage and other performance-related data, the latter often maintained exclusively in the ERMS. The inability to automatically match acquisitions data to e-resources maintained in the ERMS has a negative effect on the amount of staff support required to maintain the data separately.

With these considerations in mind, we believe that future discussions of collection- or resource-level identifiers should focus on applications such as the following:

1. Generally, to provide sufficient match points within ERMS and ILS Acquisitions systems to allow for exchange of acquisitions data between them.

2. To match individual coverage updates to existing holdings records in ERMS to provide more current information.

3. To identify additions to e-collections packages and establish holdings records associated with them.

4. To identify works associated with existing e-collections whose coverage has been dropped.

To elaborate further, the role of the persistent identifier is explored in the following section by showing how a variety of use cases rely on or employ persistent identifiers to link data about e-subscriptions that may start with the content provider and make their way through the knowledgebase supply chain to the local library's ERMS.

1. A holdings update is sent by the Library's Publication Access Management Service (PAMS).
   a) The Library receives a coverage update from the PAMS.
   b) Attempts to load the update assist staff in identifying titles not yet established in the ERMS, new e-collections that need to be established or problems in linking coverage updates to established titles.
   c) Attempts are made to identify standard identifiers (ISSNs or ISBNs) for coverage update entries.
   d) ERMS holdings are manually updated when load attempts are unsuccessful.

2. A new e-subscription is ordered using the Library's acquisition system.
   a) ERMS staff is notified that a new subscription must be established in the ERMS.
   b) It is determined if metadata to describe the new acquisition already exists in the ERMS. A new descriptive record is created if no record already exists.

c) A new holdings record is established in the ERMS system that links the work to its affiliated package or collection record in cases where this linkage is appropriate.

d) Appropriate data about the order and the licensed terms of usage are established in the ERMS based on copies of the license agreement and order.

3. An e-subscription is cancelled in the Library's acquisitions system.

a) An alert is generated by the Library's acquisitions system that the e-subscription has been canceled.

b) In cases where no perpetual access or archival provisions provide for continuing access to the work, the title is either suppressed or deleted from the public catalog, and suppressed or deleted from the ERMS system, depending on the Library's policy.

4. An aggregator drops an e-resource from an e-collection.

a) The Library receives a coverage update from the PAMS.

b) Load software identifies titles associated with the collection that have not been updated

c) An investigation is conducted to determine whether the work is no longer provided by the aggregator

d) If the work is confirmed as no longer available in the e-collection and no continuing access or archived copies persist to provide local access, the title is suppressed from the OPAC and/or deleted from the ERMS.

5. An update to acquisitions data is processed to bring acquisitions data from the Library's integrated library system (ILS) into the ERM.

a) The library pulls a file with acquisitions data such as invoice numbers and payment amounts drawn from the acquisitions system of their ILS.

b) Acquisitions data can match on ILS order numbers established in the ERM or can match on ISSNs or title ID numbers drawn from ordered line items that link ERM bib records to their related order history. When an appropriate match is found, the acquisitions data is added to the order history record in the ERM.

c) Error reports from the update run are generated to identify cases where incoming order-related data failed to match up to an ERM record.

d) Failed updates due to lack of identifiers or inaccurate identifiers are processed by staff to add necessary match points to support future acquisitions updates.

e) Re-runs of the acquisitions update load completes the addition of order-related data to the matching ERM records.

<u>Toward the development of standard, product-level identifiers.</u>

As noted above, in the absence of a true standard for these identifiers, some PAMS have developed and maintain proprietary numbering schemes that consistently associate "member" title numbers for works associated with aggregator packages. While this has proven helpful, the practice is not universal, nor has application been comprehensive. Serials Solutions, for example, provides a proprietary number for all works for which it can provide cataloging, but does not maintain a consistent number for uncataloged works that are part of such collections. Since many freely accessible works are not contained in the knowledge bases of existing vendors, works that lack ISSNs and fall into this category are particularly difficult to maintain.

As pointed out at the beginning of this appendix, many individual subscriptions to licensed digital works as well as packages of electronic resources lack standard identifiers, either ISSNs or ISBNs, as appropriate. To the extent that aggregator "packages" and other sorts of e-collections have a consistent population of titles on offer, it may be possible to have ISSNs associated with them. However, libraries' subscriptions to some e-journal packages aren't always identical, since some may actually be subsets of the package; Elsevier's ScienceDirect product, for example, can either be subscribed to in its entirety or selectively by journal. Thus, a "package" identifier could and should point to the correct package without being deemed to have completely identified its contents. Some combination of package- and title-level identifiers seems to be required.

To overcome such limitations, a true standard for collection- or resource-level identifiers is needed, and the best hope for one may lie with the ISSN revision process currently underway – which also may result in expanding ISSN to cover other kinds of continuing resources besides traditional serials. A formal proposal that outlines the desirability of this type of ISSN assignment would be an important step in furthering the clear and accurate identification of such types of continuing resources.