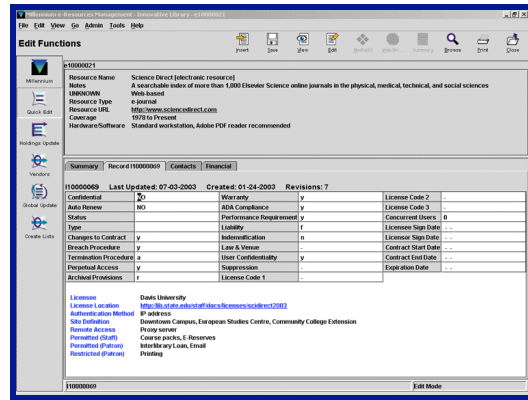# Electronic Resource management systems:

the impact of DLF ERMI standards

A review of recent literature

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Info 663 – tech processes in libraries

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Cover image credit: Innovative Interfaces, Inc. (2004*). Screen shot, Electronic Resource Management System*. Retrieved April 12, 2006 from http://www.iii.com/images/scr_erm.gif

ABSTRACT

Electronic resources management (ERM) is the area of library technical services responsible for the evaluation, selection, pricing, securing, maintenance and provision of electronic resources. As electronic resource collections continue to expand, associated workflows and processes have grown in complexity. This review of the literature provides an assessment of advances made in commercial ERM systems development since August, 2004, when the Digital Library Federation published the final report of their Electronic Resource Management Initiative. An accelerating trend from in-house application development to third-party solutions is identified, and several new commercial systems are individually reviewed. Current challenges and future enhancements of ERM solutions are explored, as well as electronic resource management issues not addressed by the DLF initiative. The review concludes with recommendations for future ERM system research.

AUTHOR KEYWORDS:

Electronic resource management; technical services; library technology; Digital Library Federation (DLF); Electronic Resource Management Initiative (ERMI).

INTRODUCTION

Problem Domain

Electronic resource management (hereafter, 'ERM') is an area of technical services responsible for the evaluation, selection, pricing, securing, maintenance and provision of electronic resources such as e-journals, e-books and databases. As electronic collections continue to grow exponentially in both size and use, ERM has emerged as a distinct activity within acquisitions units, and a dedicated specialization for librarians (Bergman, 2005).

Academic articles about ERM invariably begin with a nod to the complications of this relatively new area of acquisitions:

"Libraries have struggled to manage the burgeoning number of electronic resources…" (Tull, Crum, Davis, & Strader, 2005, p. 103).

"Several factors have rendered the job of librarians who deal with electronic resources extremely challenging…" (Sadeh & Ellingson, 2005, p. 208)

"Why are e-resources so difficult to manage?" (Farb & Riggio, 2004, p. 144)

The reasons for this complexity are manifold. Unlike their print counterparts, e-resources may be accessed via a diverse array of data formats, delivery systems and interfaces. They may be acquired individually or as part of packages, and can be sourced direct from providers or indirectly through aggregator services. Pricing models and licensing terms for e-resources are legally intricate and largely non-standardized. E-resources also entail administrative activities not applicable to print resources, including the management of user authentications, trial subscriptions, contractual restrictions, archival and preservation issues, and technical troubleshooting. In short, e-resources display significantly different characteristics and requirements than their print counterparts. Detailed discussions of the challenges associated with e-resource management can be found in Morris and Larson (2006), Sadeh and Ellingson (2005), Kennedy (2004), and Farb and Riggio (2004).

The unique demands of ERM have resulted in administrative processes and workflows that diverge considerably from those developed for the management of print resources. Traditional integrated library systems (hereafter, 'ILS') were not designed to address e-resource management

activities; as a result, librarians have faced increasing frustration in their efforts to maintain growing

e-collections. The clarion call grew for "a system that supports management of the information and

workflows necessary to efficiently select, evaluate, acquire, maintain, and provide informed access to

electronic resources in accordance with their business and license terms" (Anderson, Farb, Chandler,

Jewell, Parker, Riggio, & Robertson, 2004, p. 499).

DLF ERMI

Although the need for dedicated ERM systems was recognized as early as 1994, library

software providers were slow to heed the call. Their lack of responsiveness can be attributed in part

to poor communication channels between libraries and vendors, lack of consensus on required

system features, and inability of librarians to properly convey their technological needs (Kennedy,

2004, p. 452). As will be reviewed, many libraries therefore took up the challenge themselves,

embarking on a range of in-house and consortia ERM systems development projects. These

proprietary projects varied in success, demanded the continual attention of technical personnel, and

could not be shared with other institutions due to a lack of standardized vocabulary. Yet they also

pointed the way towards effective solutions by identifying the need for standards and clarifying

system requirements.

The Digital Library Federation, a consortium of research libraries and related organizations,

began exploring the mounting ERM issue in 2000. The study was spearheaded by Tim Jewell, Head

of Collection Development Services for the University of Washington, and initial findings were

published in a 2001 report. The study confirmed the importance of standards for guiding the long-

term progress of ERM systems, and a formal working group was soon formed to define those

standards. Both George and Seaman (2003) and Chang (2003) provide comprehensive overviews of

the Digital Library Federation and its ERM Initiative during the time the project was underway.

In August, 2004, the Digital Library Federation published its final report, entitled the "Electronic Resource Management: Report of the DLF ERM Initiative" (hereafter, "DLF ERMI"). After reviewing the features of existing ERM systems, the study identified seven key areas of ERMS functionality:

1. Descriptive bibliographic data
2. Licensing details
3. Financial information
4. Order status information
5. Administrative/technical activities
6. Support information
7. Usage statistics

These functions were defined in a series of deliverables attached to the DLF report, including:

1. A data dictionary identifying and standardizing terms and data fields.

2. An entity-relationship model mapping the relationships between data fields.

3. A specification of approximately 50 functional requirements for ERM systems.

4. A workflow diagram emphasizing the difference between print and e-resource work processes.

5. A formal recommendation for the development of a new metadata schema to support ERM data exchange, based upon the report's data dictionary.

Additional discussions of DLF ERMI goals and deliverables may be found in Grover and Fons (2004), Chang (2003), and Sadeh and Ellingson (2005), with perhaps the most detailed review made by ERMI's lead investigator, Tim Jewell (2005). The argument for dedicated metadata standards in e-resource management is set forth persuasively in Farb and Riggio (2004).

Purpose and Scope

The primary goal of the DLF initiative was to achieve "rapid progress in developing systems to manage electronic resources (Medeiros, 2006), and the consensus of the literature is that this aim was realized. Medeiros notes that the report "attracted the attention of leading library systems vendors, publishers and standards organizations" (p. 92), while Jewell (2005) reports that "librarians and vendors have invariably been very positive in their reactions to the initiative" (p. 156). Finally, Alan (2005) observes "the landscape is now changing due to the development of standards".

This review literature aims to survey that current ERM "landscape", in order to assess the progress of systems development since the publication of DLF ERMI and identify any remaining areas of concern. Accordingly, emphasis is placed almost exclusively on articles published from 2004 to present. The sole exceptions are two 2003 articles reviewing the DLF during the time the ERMI initiative was under development. 14 academic articles in all were reviewed, as well as the final DLF ERMI report.

Three major areas of discussion in the recent academic literature are identified and discussed herein: 1) the trend away from in-house solutions, towards third-party software solutions; 2) detailed reviews of vanguard ERM systems; and 3) remaining challenges.

ERM SYSTEM DEVELOPMENT

A survey of the literature reveals a clear shift in the authorship of ERM systems, away from in-house or consortia library-based development and towards integrated library system (ILS) modules and independent solutions offered by commercial vendors. While this trend was slowly emerging prior to the publication of ERMI, the standards and benchmarks established the DLF served to rapidly accelerate it. Each phase of the trend is examined below, both prior and

subsequent to the publication of DLF ERMI. It should be noted that these phases overlap in time to a great extent.

Phase 1: In-House Solutions

Kennedy (2004) notes that librarians recognized the need for tailored ERM systems by the early 1990's (p. 451). With no systems existing or in the works by third-party providers, however, several institutions embarked on efforts to develop their own solutions. Pioneering projects included Pennsylvania State University's Electronic Resources Licensing and Information Center (ERLIC) in 1998, MIT Libraries' Virtual Electronic Resource Access (VERA) system in 1999, and the more recent University of California, Los Angeles (UCLA)'s Electronic Resource Database (ERDb) in 2003. Developed independently, each of these products were built using different system architectures and terminology, but still reflect common ERM goals (Kennedy, 2004, p. 453).

The projects have achieved varying levels of success. In a detailed analysis of PSU's ERLIC system, Alan (2005) reports an ever-increasing workload for technical staff as the growing system required multiple upgrades and platform migrations. Update and query times lengthened as the database grew in size, and normal maintenance activities began to consume 20-30 hours of staff time weekly. Beginning in 2002, the library began to actively discuss options for migrating away from their in-house solution. Kennedy (2004) also remarks on the difficulties encountered with maintaining the ERLIC system.

The problem was not unique to PSU. Fong and Wicht (2005) cite field reports that many libraries were already developing third or fourth major versions of their systems, yet they were becoming increasingly unwieldy as features and data storage needs increased (pp. 147-148). Data maintenance was requiring more staff time, and in some cases, systems were not being fully utilized due to insufficient personnel (p. 147). As Fong and Wicht (2005) point out, "if a system requires

substantial staff resources for updating information, the costs in time and labor may outweigh the desired benefits of an online solution" (p. 148). More seriously, such systems can drain resources away from immediate patron needs (Kennedy, 2004, p. 456).

These early efforts also revealed broader problems inherent with in-house solutions. Because they are proprietary and not founded on any shared standards, cross-analysis studies to evaluate and improve ERM system quality are difficult / impossible to conduct (Kennedy, 2004, pp. 450-451). Kennedy (2004) further observes that each system reflects a "metaphoric redesign of the wheel", and an inefficient and unnecessary allocation of limited library resources; as a result, many libraries still find themselves mired in the early program-building stages of systems development (p. 452).

These early ventures were not without benefit. By experimenting with design solutions themselves, librarians developed a clearer understanding of ideal ERM system requirements (Alan, 2005, p. 24). In-house efforts also resulted in the ultimate realization, that "in-house programs will never do it all for us – we just don't have the time to build the dream programs on our own (Kennedy, 2004, p. 456).

Phase 2: Collaborative Ventures

Recognizing the drawbacks of individual efforts, libraries began to communicate with each other, discussing the challenges of ERM systems design, sharing their experiences, exchanging knowledge and providing general community support. In several cases, these conversations led to collaborative ERM systems development projects involving two or more library institutions. Kennedy (2004) discusses the Tri-College Consortium's Electronic Resource Tracking System (ERTS), a joint venture of Haverford, Swarthmore and Bryn Mawr Universities (p. 455). HERMES, an ambitious open source freeware project developed by Johns Hopkins University is explored by both Kennedy (2004) and Jewell (2005, pp. 142-143). Gold Rush, the product of a twelve library

consortium known as The Colorado Alliance of Research Libraries, is treated in detail by Fong and Wicht (2005).

Both HERMES and Gold Rush are notable in that they are made available to other interested libraries. Whereas HERMES is available at no cost, Gold Rush is offered for a reasonable annual licensing fee. All libraries subscribing to Gold Rush are encouraged to contribute to a pooled inventory of e-resource providers, packages and titles, further promoting inter-library cooperation (Fong & Wicht, 2005, p. 150). This data, however, is not comprehensive, and requires constant vigilance and time investment by participating libraries to keep up to date. Additionally, Gold Rush database updates are fairly manual and time-consuming (Fong & Wicht, 2005, p. 158).

Despite these continuing challenges, the trend toward collaborative ventures was a critical and positive development, improving communication among libraries about ERM system needs. A groundswell of interest led in 2001 to a "Web Hub" for facilitating information exchange (http://www.library.cornell.edu/cts/elicensestudy/webhubarchive.html). Web Hub discussions inspired more libraries to announce intentions to build independent ERM systems (Jewell, 2005, p. 140). This particular development can be viewed as counterproductive; Web Hub was positive, however, in that it transitioned directly into the DLF ERM Initiative and the development of universal standards.

Phase 3: Third-Party Solutions

Integrated library systems (ILS) have long possessed dedicated modules for acquisitions and serials management, and therefore seem an obvious means for managing the demands of e-resources. Vendors were slow to respond, however, and librarians soon found the print orientation of ILS modules insufficient for managing e-content. Alan (2005) notes that "integrated library management systems do not support the unique complexities of electronic resource management"

(p. 18), while Sadeh and Ellingson (2005) discuss specific inadequacies encountered by users of Ex Libris' ALEPH ILS system. As a result, libraries migrated away from ILS solutions, choosing to manage e-resources via a standalone system (whether purchased or developed in-house). Some institutions then export data from the independent system into their ILS; others do not (Morris, 2006, p. 103).

There is ample evidence this trend has now reversed, due to the publication of DLF ERMI. DLF ERMI's primary goal was to establish the standards necessary for furthering long-term advances in electronic resource management., with the specific aim of encouraging standards-based ERM system development (Sadeh & Ellingson, 2005, p. 210). The shared standards and architectural requirements outlined by DLF ERMI (and emerging competition from e-resource content providers) clearly provided the impetus needed to encourage ILS system providers to develop true ERM modules, as evidenced by the large number of third-party solutions that have debuted in the past two years.

The literature is consistent on this point. In 2004, Kennedy observed that "as procedures and workflows related to the acquisition of electronic resources become more standardized across libraries, vendors are beginning to respond to requests from libraries to build programs with these workflows in mind" (pp. 455-456), and that "vendor-created programs are beginning to emerge" (p. 452), modeled on the architecture proposed in DLF ERMI. The following year, Sadeh & Ellingson (2005) notes that "one can now find a list of commercial products – including those already available and those in various stages of development – on the DLF ERMI web hub site" (p. 210). Alan (2005) states that "library vendors are now answering the call for solutions that may better integrate the management of electronic resources within the framework of evolving standards and library management system development (p. 17).

Perhaps the greatest demonstration of how rapidly the ERM systems market flourished in the wake of DLF ERMI can be found in Collins' (2005) review and comparison of ERM system providers. Her article covers 10 systems in detail, including two fully integrated ILS modules (Dynix Horizon ERM; Sirsi ERM) and four ILS systems that can function as either standalone or ILS-integrated systems (Endeavor Meridian; Ex Libris Verde; Innovative Interfaces ERM; VTLS Verify). Of these six ILS systems, it is telling that five were released or scheduled for release in 2005; only Innovative Interfaces' product was available earlier.

In addition to the non-profit Gold Rush, Collins (2005) also reviews three standalone systems offered by public access management or subscription agents, including Serials Solutions ERMS, TDNet's TeRMS, and Harrossowitz's HERMIS.

Phase 4: Vendor Selection

The market has clearly shifted from a dearth to a wealth of options for ERM system applications. In just a short two years since the debut of DLF ERMI, the concern of technical processes units has transitioned from how to develop a solution to the "e-resource problem" to how to pick among the many systems now available. Collins (2005) provides useful advice on this issue, recommending the consideration of such factors as standalone vs. ILS-integrated systems, ILS vs. third-party vendor applications, interoperability and functionality issues (pp. 125-126).

The market still seems to be debating the relative merits of these choices. Sadeh & Ellingson (2005) observes that standalone ERM systems are proving more popular than ILS modules, and cites research that supports libraries' growing preference for independent vs. modular ERM systems (p. 209). In contrast, Collins (2005) cites research indicating a growing preference for integrated ILS modules over standalone systems. Further, while content providers currently hold the upper hand in

terms of subscription data support ("knowledge bases"), ILS vendors such as Ex Libris are beginning to provide better support in this area (Collins, 2005, p. 126). These issues can only be settled with time as the market matures, and as academic research begins to conduct much-needed critical analysis of available ERM systems.

ERM SYSTEM REVIEWS

As ERM systems began to emerge in the 2004-2006 time period, a number of researchers focused their attention on exploring the functionality and design process of specific third-party solutions. On the whole, these articles are of a descriptive and non-critical nature. This section highlights a number of such articles and the products they review.

Innovative Interface's ERM

As the first commercial ILS vendor to offer an ERM system, Innovative Interfaces, Inc.'s Electronic Resource Management (hereafter, "II ERM") module has received significant attention in the academic literature. Released in 2004, II ERM was developed over a 2-year period, in close coordination with the DLF ERMI steering committee and partnering customers. Grover and Fons (2005) explored this development process from both the library and vendor perspectives, and report largely positive feedback (pp. 113-115). As opposed to being beta testers or early product adopters, partnering libraries were able to influence the design of the underlying product architecture. The result of this user-driven design process is a system that has met with commercial success. By early 2005, fully 86 libraries subscribed to the system (Collins, 2005, p. 133).

II ERM can be run either as a standalone system or as an integrated ILS module. Libraries that already subscribe to II's Millennium ILS system will enjoy the greatest benefits, however, as maintenance of acquisition data is more fully supported in ILS mode (Collins, 2005, p. 133). System

aspects such as resource selection, acquisition, licensing, maintenance and reporting features, are explored in depth with extensive screen shots by both Fong and Wicht (2005) and Tull, et al. (2005). While largely descriptive papers, these articles present the II ERM product in an distinctly positive light.

Ex Libris Verde

Although development of Ex Libris' Verde system began around the same time as Innovative Interface's application, it was not released until August, 2005. Within two months, the company had signed up 14 customers, a reflection of Ex Libris' longstanding leadership in the area of electronic resource functionality (e.g., SFX; MetaLib). Like II ERM, Verde was developed in close partnership with the DLF ERMI steering committee and several library partners, including Harvard University and the Massachusetts Institution of Technology (MIT) (Collins, 2005, p. 132). And like II ERM, Verde can be run as either a standalone system or as an ILS module. A detailed discussion of Verde's functionality can be found in both Sadeh and Ellingson (2005) and Collins (2005).

Colorado Alliance Gold Rush

The Colorado Alliance's Gold Rush software is examined in detail by Fong and Wicht (2005), particularly with respect to license management features. The authors identify 10 key criteria for effective license oversight, including data tracking, user authorization according to use permissions, and linking to full text of resource licenses. Gold Rush is evaluated in terms of these 10 requirements, with positive conclusions. The authors note several areas in which Gold Rush's functionality excels that of Ex Libris' Verde system, including the ability to browse and compare e-resource collections with those held by other Gold Rush users (Font & Wicht, 2005, p. 157).

LOOKING FORWARD

Despite the many advances made in electronic resource management since the publication of DLF ERMI, ERM systems are not without their challenges. The academic literature covers 3 main issues: 1) Challenges with current solutions 2) desirable enhancements in future system releases, and 3) issues not resolved by DLF ERMI. Each of these areas is discussed herein.

Current System Issues

Libraries that designed early in-house systems are now facing the challenge of migrating data to newer commercial systems that adhere to DLF standards. Medeiros (2006) observes that these commercial systems may differ in their ability to map locally defined metadata elements to DLF standards. At the time Alan (2005) reviewed Pennsylvania State University's in-house ERLIC system, the library had made a strategic decision to "take advantage of vendor solutions for managing and delivering content" (p. 23). A follow-up article that tracks their vendor selection process and experience with migrating data to PSU's chosen platform would be a welcome addition to the literature.

Medeiros (2006) notes that despite the introduction of sophisticated ERM systems, "staffing for e-resource activities is being vastly outpaced by the growth of e-resource collections in libraries" (p. 94). Libraries are increasingly hiring dedicated electronic resource librarians (Bergman, 2005), yet tasks associated with e-resource administration continue to multiply. ERM system vendors need to work closely with libraries to understand the ongoing changes to acquisitions workflow brought on by the growth of e-resources, and accommodate their products to serve those needs more efficiently.

Sadeh (2005) also observes an ongoing challenge with providing true systems integration in an already highly-automated library environment (p. 209). Many libraries employ a variety of library

management software; an effective ERM system should complement these existing services, and not cause duplication of data or effort. Kennedy (2004) identifies double data-entry as a primary issue for standalone ERM systems, and calls for librarians to take the issue up with system providers (p. 456).

Future System Enhancements

Now that the recent crop of ERM systems has relieved many of the immediate needs identified by libraries, researchers are beginning to turn their attention to ways in which systems can be further refined. For example, the ability to customize ERM system interfaces to meet a library's particular needs is cited as one area for improvement (Kennedy, 2005, p. 456).

Software feature improvement is only a partial means for improving e-resource management, however. Changes must also be made to current provider business practices. As Farb and Riggio (2004) note, "A plethora of business models currently plagues the commercial publishing environment." Even with a standardized metadata schema to support consistent licensing terminology, agreements still need to be made more transparent, and the variety of models needs to be simplified. Kennedy (2004) calls for publishers and libraries to work together to simplify and standardize licensing agreements.

Issues Not Addressed by DLF ERMI

In the area of license management, the standard terminology promoted by DLF ERMI provides only a partial solution. A standard format for exchanging machine-readable licensing terms is also required to avoid unnecessary manual keying or optical scanning of license agreements. Chang (2003) identifies this facilitation of subscription data exchange between publisher and subscriber as one of the two most crucial issues facing e-resource management (p. 46). The issue is

currently being explored by the License Expression Working Group of the National Information Standards Organization (NISO).

The second critical issue identified by Chang (2003) as not resolved by DLF ERMI is the management of intellectual property rights (p. 46). DLF ERMI (2004) notes that "As e-resources have become pervasive, formal license agreements have come to supplement or supersede copyright law as the basis for defining and determining their appropriate use." A rights expression language is needed. While DLF ERMI investigated and reported on digital rights management issues in its final report, it did not make sufficient progress to take action on this issue.

Metadata standardization is still needed in the area of e-resource usage reports. Project COUNTER is a current international initiative to standardize the exchange of usage statistics data via an XML schema (Sadeh, 2005, p. 214). When complete, it is hoped that ERM systems will adopt the standard to facilitate statistics gathering from vendors. This is necessary, as only vendors can supply statistics for usage behavior by users once they access remote provider resources.

Jewell (2005) lists a number of additional outstanding issues not addressed by DLF ERMI (pp. 157-159). These include the specialized ERM needs of library consortia, effective archival tracking of e-resources across changes in ownership or delivery platforms, support for descriptive data exchange, and e-resource identification systems.

CONCLUSION

This survey of the literature on electronic resource management since the publication of DLF ERMI reveals a significant amount of progress, as well as a roadmap for continued progress. DLF ERMI's primary goal was to establish standards that would encourage the development of ERM products; in this regard, their efforts clearly met with success. In 2004, the majority of ERM

systems were developed by either individual libraries or small library consortiums, and libraries were struggling to maintain them. Just two years later, a library's greatest challenge now lies in proper selection from among a wide set of commercially available ERM system choice.

Given this, it is advisable that future research focus more critically on cross-product analysis and testing. In-depth studies of how ERM systems are impacting workflows and processes in technical processes units are also needed. Only such rigorous empirical examination will reveal areas for improvement in ERM systems, and drive continuing progress in the effective management of electronic resources.

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