

# Making the Connections: An E-Matrix for Managing Resources in the Dis-integrated Library System

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## Introduction

The past decade has seen explosive growth in both the investment in and importance of electronic resources. From 1992 to 2002, the average ARL member's investment in electronic resources grew by 800 percent. During that same time frame, the average e-resource expenditure as a percentage of the overall materials budget grew by 16 percent.<sup>1</sup> The growing investment in e-resources has created a hybrid environment where print versus electronic, copyrighted versus licensed, and owned versus leased materials exist in an increasingly challenging and constantly shifting balance. While librarians have generally met the challenge of delivering information in the hybrid environment, the tools for managing hybrid collections consistently fail to meet needs and expectations. At the same time, increases in the types of content available, the move from copyright to contracts to govern use, growth in the availability of use statistics, and increased variety of licensing models make administering electronic resources infinitely more complex. Combine those factors with the

growth of journal packages that tie electronic access to print subscription costs and the conclusion is clear: as vital as electronic resources and serials are to libraries, the profession has yet to develop adequate tools for managing and clearly presenting them our users. The integrated library system (ILS) has categorically failed to provide librarians with effective tools for managing serials and electronic resources. Evidence of that failure is found on every library Web site and in every library catalog.

Libraries have inserted a variety of tools—ejournal finders, subject guides, licensing databases, and statistics spreadsheets to name a few—into the breach between growing complexity and inadequate management systems. These patchwork collections of tools and data stores are labor intensive, partially effective silos of the current dis-integrated library system. As a result, academic libraries have increasingly turned to non-ILS related tools such as reference linking, metasearch, and now electronic resource management (ERM) systems for help. ERM is part of a growing effort by academic

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libraries to improve the management, stewardship, accessibility, and presentation of electronic resources while reintegrating to date disparate systems for managing print and electronic journals, databases, and other e-content. ERM is poised to move from development to production and has become a key strategic opportunity for research libraries and vendors.

This paper references dis-integrated library systems a number of times. The phrase summarizes the substantial investment academic libraries and consortia have made in developing data stores to aid in the description, presentation, management, accessibility, and evaluation of e-resources and related content. The central problem is that these data stores exist on separate software platforms, are not interoperable, involve frequent duplication, and are only partially successful in facilitating efficient stewardship and effective access. Figure 1 summarizes the pieces of the dis-integrated library system.

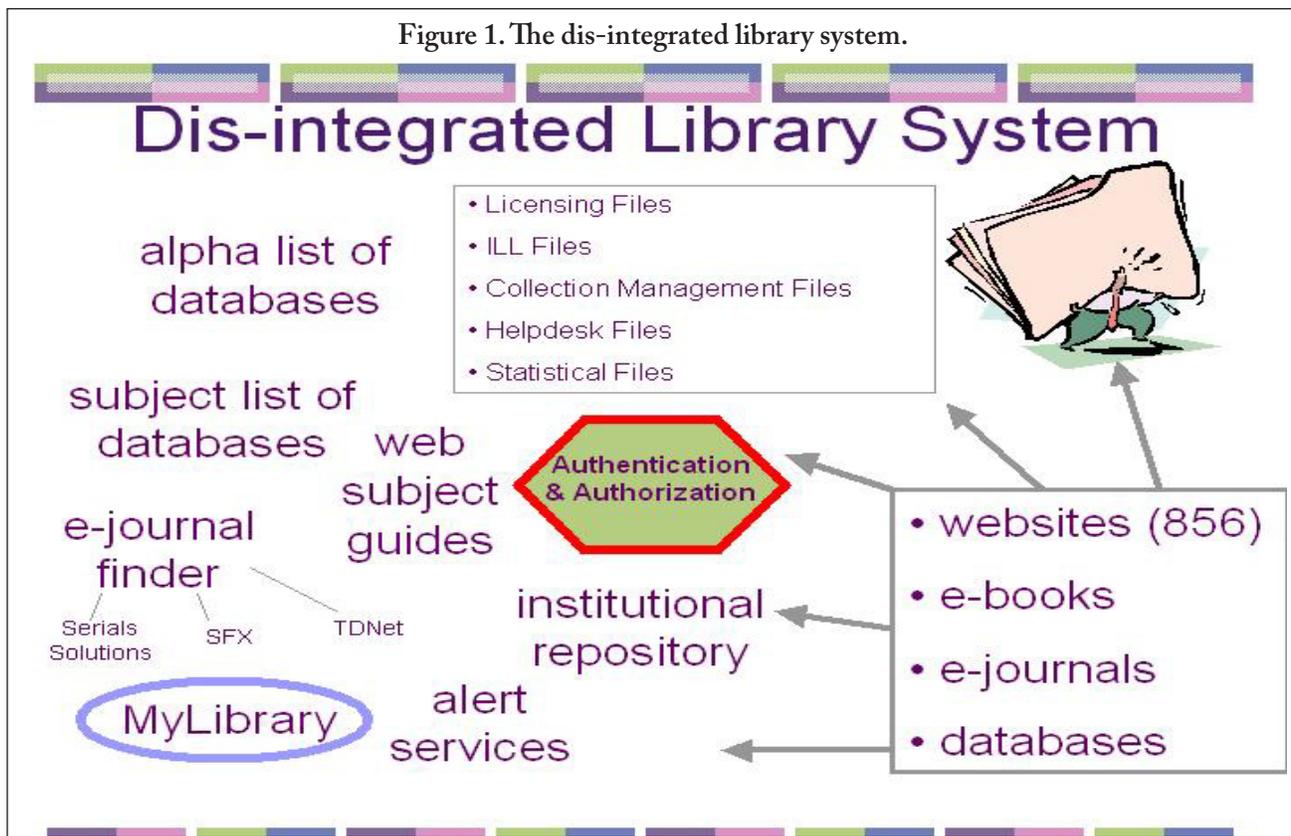
Potential ERM applications are full of broad and varied promise. ERM has the potential to impact 1) the management of licensing information; 2) the collection and application of usage statistics and other

evaluative data; 3) improved display and accessibility of e-resources; 4) the integration of different manifestations of a single work; and 5) the ability of libraries to consolidate separate data stores existing outside of the ILS into one system with integrated search, display, and reporting modules. ERM systems cannot be solely relied upon to solve such fundamental management problems, but if applied correctly, ERM has the potential to significantly improve efforts in all of those areas. This article will briefly cover the ERM marketplace, discuss the evolution of E-matrix, a locally developed ERM system at the NCSU Libraries, identify key features that separate E-matrix from the broader ERM marketplace, discuss the inherent value of ERM, and discuss possibilities for further development.

### Evolution of the Idea and Developments in the Marketplace

In the spring of 2003, the NCSU Libraries began outlining the development of a local ERM system called E-matrix. Born out of the aforementioned growth of and increasing complexity for managing e-resources, E-matrix was originally intended solely for databases,

Figure 1. The dis-integrated library system.



aggregated resources, and ejournal packages. However, faced with an ILS that could not effectively manage print or electronic subscriptions and the growth of journal packages that join electronic and print subscriptions (see Table 1), it became clear early in the project that including print journals would be an essential piece in the success of E-matrix. Additional concerns over duplicative data stores for managing subscription resources supported the inclusion of print journals and the addition of a major data analysis and collection evaluation module. Finally, concern among librarians and faculty over past serial review projects led to the inclusion of a web-based input module that allows faculty to review and rank subscribed journals by title, call number, and subject area. The final E-matrix project became an ambitious effort to develop an ERM system that, by including the essential link to print, enables the Libraries to address the array of problems associated with managing and describing electronic and subscription based print resources.

E-matrix has entered a rapidly growing marketplace, but one that remains in its nascent period. Once the sole arena of homegrown academic library and consortia development, ERM has become a priority initiative for most ILS vendors. A Digital Library Federation (DLF) effort to develop standard workflows, functional specifications, data elements, and a data dictionary released its final report in August 2004.<sup>2</sup> The DLF Electronic Resource Management Initiative (ERMI) deserves significant credit for advancing system development and serves as the de facto starting point for most ERM systems. The ERMI documentation provides hope that ERM systems, whether library or vendor developed, can become interoperable solutions in what is mainly an integrated ILS market. That said, early entries into the ERM market are largely vendor systems designed to integrate with their own ILS product. One notable exception is III's ERM offering that functions as an integrated or stand-alone system.

The lack of standard bearing products in the marketplace leaves open the question of whether vendors or libraries are best equipped to deliver comprehensive ERM systems. Vendors have an obvious advantage

**Table 1. Sample Subscription Models**

<b>Print Based</b>
Individual print subscriptions with a premium for electronic Print subscription bundles with a general electronic access payment
<b>Electronic Based</b>
Individual electronic subscriptions with a premium for print Electronic subscription bundles with an optional print archive payment
<b>Content Based</b>
Content subscriptions, both individual and bundled, with alternate premiums for print and/or electronic

in development resources over individual libraries. However, libraries and consortia have the potential for collective action and a greater long-term interest in producing interoperable solutions that can exist outside of a single ILS environment. After piecing together a variety of solutions to plug weaknesses inherent in the ILS, libraries are keenly aware of the need for a more effective solution that interoperates with the inventory control and circulation portions of the ILS while consolidating the data silos of the dis-integrated library system. A number of early academic library developers have chosen to partner with vendors to build the next generation of ERM systems.<sup>3</sup> Others continue with local developments in an effort to push innovation in a still moving market. E-matrix closely follows the ERMI documentation, but the NCSU Libraries has committed to local development because of the added data elements and reporting features for print journals, improved content evaluation, enhanced resource display, and tighter integration with the Libraries' web portal. See Table 2 for a sample of E-matrix data elements and Figure 2 for a graphical outline of E-matrix. While E-matrix may not settle the question of who should take the lead on ERM system development, it expands the capabilities of ERM systems with a more ambitious and comprehensive system than the ERMI documentation lays out or vendors have yet developed.

### Key E-Matrix Features

E-Matrix is built in Oracle and its table structure and relationships were designed to allow the real-time querying or batch loading of data from external sources and maximize links to existing data fields in the NCSU Libraries' current Sirsi Unicorn ILS. Im-

pacted workflows have been adjusted to define a single authoritative data store for each data element to insure that no re-keying of data occurs and to guarantee data integrity between the two systems. Added to this is a robust interface that allows staff to enter descriptive, licensing, access, administrative, and evaluative metadata for library resources. E-matrix includes most of the data elements from ERMI with the addition of several evaluative and descriptive data fields. E-matrix identifies the various manifestations of a title; print, complete electronic journal, aggregated database access and can determine their relationship to each other as well as the relationship between on version of a title to a sibling title in a combined package. Knowledge of the various relationships are critical to understanding the control the library has over a particular instance of a work for collection management and usage purposes. Title control and relationship identification is also essential in using E-matrix to control the presentation of journals and electronic resources on the library's Web portal.

Resources within E-matrix are assigned fund codes, localized subject headings, and descriptive attributes. The NCSU Libraries recent web redesign is being developed using these elements to produce context driven generated lists of resources. Resources are ranked within subject areas and this information is used to determine display order on the website and to determine relevancy in federated searching. The public interface will use the relationships within E-matrix to produce a single holdings display for works or titles. The outcome of this subject-based approach will lead to further enhanced resource discovery.

E-matrix specifically and ERM's in general can succeed in critical areas where the ILS fails. Rather than focusing on bibliographic description and identification of a physical item through linear catalog records, ERM's can serve as a bridge to collocate distinct manifestations of a work.<sup>4</sup> Work level identification in ERM's enables librarians to focus on establishing relationships between abstract entities, such as different expressions of a journal, and providing contextual links rather than simply describing an individual expression. The result is a system that allows for a single record to clearly display different expressions and manifestations of a work. Pulling together holdings from print subscriptions, electronic journal subscriptions, and aggregated packages and controlling the priority each is given when displayed while radically simplifying holdings statements removes barriers to users. The ILS as currently constructed does the opposite in providing barriers, such as obtuse title change records and confusing holdings statements, to users. ERM's are a step in the direction libraries must move, understanding that links between content and simplified connections from citation to full-text are more important than bibliographic description.

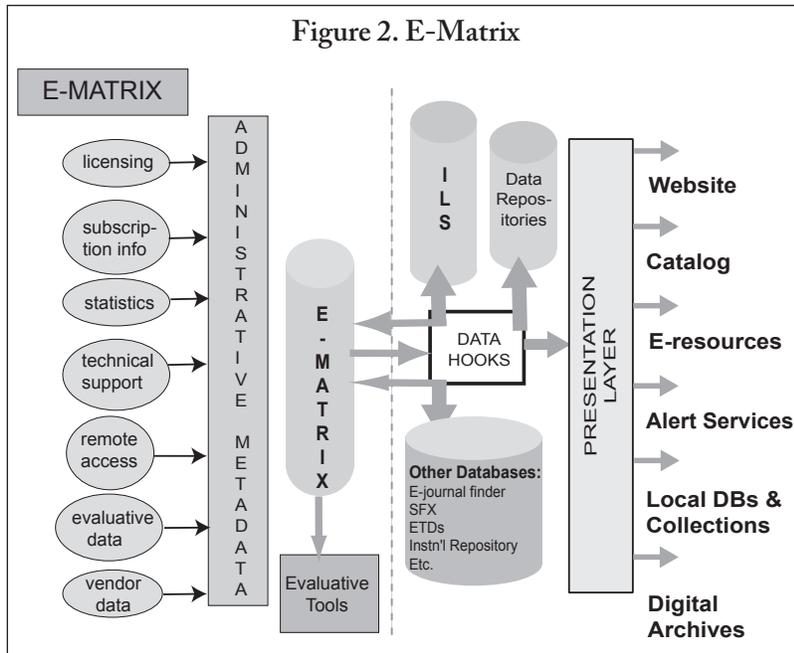
Two additional objectives of E-matrix are to integrate evaluative data and provide advanced reporting capabilities. Evaluative data kept for titles include faculty rankings, LJUR citation and publication data, full-text article downloads, and local weblog connection information. Title information can be combined with fund codes, subject descriptors, licensed rights, bundled restrictions, price, and inflation history in customized reports. This allows for interdisciplinary

review by faculty and librarians, which enables a more thorough analysis than looking at titles by single data points or in individual subject views. Packaging integrated data reports with a librarian's knowledge of the local user community creates an efficient tool for making better-informed choices in managing serials and e-resource expenditures.

Key to the whole process was the development of an effective interface that allowed collections and technical services staff to re-engineer their workflow processes

Table 2. E-matrix Data Elements

Basic ERM Data Elements	Including data points such as...
Descriptive	Title fields, holdings, publisher, and ISSN.
Licensing	Authorized users, archiving rights, and cancellation allowances.
Financial	Price and inflation rate.
Administrative & Support	Administrative password and vendor contact information.
Access	Authorization method and local access URI.
Usage or Evaluative	Number of full-text article downloads and number of searches.



when dealing with serial resources. New serial titles are now identified and described in E-matrix, and then auto loaded into the “catalog” if needed. E-matrix de-emphasizes bibliographic description and focuses on collection information. Resources are associated with localized subject entries providing contextual descriptions that fit our display and discovery purposes. This fundamental shift from the traditional workflow reduces the amount of redundancy involved with maintaining electronic resources for multiple purposes.

### Evolution and Continuing Development

The NCSU Libraries continues to monitor and participate in the development of and adherence to library standards. DLF’s ERM and License and Rights Description initiatives provide the necessary foundation for a common dictionary. It is the Libraries’ hope that vendors utilize these standards when building electronic resource management tools to facilitate the interoperability between disparate systems. The NISO/EDItUER Working Group on Serials Data Exchange should provide at least a de facto standard on how data can be input into various ERM systems on a regular basis. NISO’s work on standardizing meta-search protocols will also help provide more complex ways to search and group electronic resources.

Electronic databases and serials are included in the first version of E-matrix. Analyzed entries for elec-

tronic books will most likely be included in future releases. The NCSU Libraries collects electronic books from over a dozen different sources. Controlling the rights management at the title level for these resources is already a challenge. Other potential applications for E-matrix could include tracking use rights for physical collections within Special Collections and providing digital rights management metadata about locally owned digital objects.

### Conclusion

The NCSU Libraries is realistic that it may prove impossible over time for a homegrown solution managed by an individual library to keep pace with vendor driven solutions. However, with the market edging towards integrated,

traditional ILS centered vendor solutions, the contribution that E-matrix and other local systems can make in pushing the development of interoperable user and library centered ERM solutions is great. Interoperability and standardized data elements are essential if ERM’s are to fulfill the ambitious vision that enables libraries to leverage an authoritative ILS database with other descriptive and administrative metadata for comprehensive display and management. Using an open architecture and emphasizing interoperability ensures that we can meet current needs, which are great, but also maintain the flexibility to meet future demands. If ERM’s, along with reference linking, metasearching, and boundary pushing projects such as Google Print are successful, then the time to re-evaluate the concept of the ILS and its role in research libraries will have come. Eventually libraries and vendors will stop tinkering around the edges of the ILS and completely reinvent or replace it. ERM’s such as E-matrix are a big step towards reinvention.

### References

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2. Timothy D. Jewell, and others. *Electronic Resource Management: The Report of the DLF Initiative*. Digital Library Federation, August 2004. <http://www.diglib.org/pubs/dl-fermi0408/>.

3. For examples of vendor/library collaborative development see Fons, Theodore and Grover, Diane. "The Innovative Electronic Resource Management System: A Development

Partnership," *Serials Review* 30, no. 2 (2004): 110–16 and Ex Libris. *Verde—Managing the Growth of Electronic Collections*. <http://www.exlibrisgroup.com/verde.htm>.

4. For a more detailed discussion on identifying serial works, see Kristin Antelman, "Identifying the Serial Work as a Bibliographic Entity," *LRTS* 48, no. 4 (2004): 238–55.