Making Good on the Promise of ERM:
A Standards and Best Practices Discussion Paper

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1. Executive Summary and Key Recommendations

The NISO ERM Data Standards and Best Practices Project is a successor to the Digital Library Federation’s Electronic Resources Management Initiative (ERMI) whose data model and dictionary established working standards for e-resource management, and “ERMI 2,” which provided training for license analysis and helped to develop the SUSHI (Standardized Usage Statistics Harvesting Initiative) protocol and NISO CORE (Cost of Resources Exchange) best practice. The project’s primary goals were to perform a “gap analysis” of standards and best practices and make recommendations on the future of the ERMI Data Dictionary.

Following stakeholder focus group meetings in January 2009, a steering committee for the project was formed that began reviewing recent surveys conducted on Electronic Resources Management (ERM) topics, identifying existing standards and best practices, and collecting workflow-related documents. The environmental scan of the ERM standards landscape focused on 5 categories suggested by Kasprwski, and data elements and values from selected standards and best practices were mapped to the ERMI Data Dictionary, with the following conclusions:

- **Link Resolvers and Knowledge Bases**: KBART (Knowledge Bases and Related Tools) is beneficial and some data elements are superior to comparable ERMI elements. IOTA (Improving OpenURL Through Analytics) is also valuable but data element mapping is not appropriate.

- **The Work, Manifestations, and Access Points**: MARC 21, the ONIX for Serials formats, and Project TRANSFER all offer greater granularity in selected areas than ERMI.

- **Cost and Usage-Related Data**: NISO CORE (Cost of Resource Exchange) is a valuable initiative that should be adopted by system developers. COUNTER has become a mainstay building block for ERM, and the continued refinement of SUSHI (Standardized Usage Statistics Harvesting Protocol) shows the potential for similar limited-scope protocol development.

- **License Terms**: ONIX-PL has been better designed than the ERMI approach to license encoding and expression but has not yet been widely implemented; neither it nor ERMI adequately address library needs. NISO should facilitate discussions of a simpler but scalable “third way” that can be built upon by supply chain community members.

- **Data Exchange Using Institutional Identifiers**: Institutional identifiers hold substantial potential and the NISO I² (Institutional Identifiers) initiative is endorsed. OCLC’s WorldCat® registry is also worthwhile if developed further, and vCard offers additional efficiency opportunities.

There continues to be value to updating and maintaining a data dictionary that encompasses ERM functions and evolves with technologies and business models, but practical considerations override them. It is recommended that NISO not pursue such a project, but continue to encourage narrower initiatives targeting specific ERM functional needs while advocating for and pursuing alternate strategies aimed at interoperability.
The report concludes with a brief discussion of perceived shortcomings in workflow support within current-generation Electronic Resources Management Systems (ERMS) and of related emerging work by vendors and libraries, supplemented by a bibliography and list of illustrative workflow diagrams. Workflow support in future ERMS should be more extensive and robust than at present, and NISO could help mitigate system development risks by organizing a series of topical webinars complemented by discussion and surveys to describe and establish greater consensus among libraries regarding e-resource workflow support needs and priorities.
2. Introduction and Background

a. The DLF ERMI 1 & 2 Projects

Public discussion of standards related to Electronic Resource Management Systems (ERMS) can be traced to a May 2002 “Pre-standardization” workshop held in Chicago and co-sponsored by NISO and the Digital Library Federation\(^{24}\). That event led to creation in October 2002 of the DLF’s Electronic Resource Management Initiative (ERMI), which resulted in the publication of what became known as the “ERMI Report” in August 2004\(^{19}\). The Report asserted the need for “comprehensive electronic resource management systems,” and, following a review of several locally-developed ERMS, identified the following set of goals for the Initiative:

- Develop common specifications and tools for managing the license agreements, related administrative information, and internal processes associated with collections of licensed electronic resources.
- Describe architectures needed for electronic resource management.
- Foster systems development.
- Promote best practices and standards.

The ERMI steering group saw the challenge to be met as one of supporting the lifecycle of electronic resources, including these functions:

- Selection and acquisition
- Access provision
- Resource administration
- User support and troubleshooting (staff and end-users)
- Renewal and retention decisions

To help do so, the report provided a number of closely-related documents, including a data dictionary that encompassed a wide range of data elements (license permissions and constraints, user IDs, passwords, administrative info, contacts for support and troubleshooting, as well as cancellation restrictions and price caps, etc.) The data dictionary was supported and further elaborated upon by a “data structure” document and an entity relationship diagram (ERD). In addition, a full set of Functional Requirements and a set of flowcharts to depict processes needing to be supported by an ERM—such as mounting trials, routing licenses, placing orders, implementing access, and notifying relevant staff—were provided.

Together, these documents constituted the “ERMI Spec,” which was credited by many with helping launch a new application or set of services. For example, in an American Libraries article\(^{28}\) that appeared shortly after release of the Report, Andrew Pace said that “If last year’s hot product was
federated searching, then 2004 belongs to electronic resources management (ERM)” and noted approvingly that “in a nearly unprecedented move, nearly every large automation vendor has used the specifications created by librarians.”

The Report also identified a number of outstanding issues, such as consortium support and functionality, usage data handling and reporting, and data standards—including serials description and holdings, standard identifiers, license term expression, and interoperability. These considerations led to the launch of an “ERMI 2”[17] project, also under DLF auspices, which undertook several sub-projects. Two of these developed into what are now the NISO SUSHI and CORE projects. In addition, training and materials in support of “license mapping”—the practice of analyzing and encoding license terms for incorporation into ERMS—were provided to participants in four workshops offered as part of the project. An effort to review the ERMI Data Dictionary and data structure documents was also identified as part of the initiative, but could not be pursued at the time due to competing commitments on the part of those most able to undertake it.

b. Progress and Pain Points: Market Developments and Results of Recent ERM Surveys

While the ERMI documents functioned effectively as a guide for systems developers, some of whom referred to their products and services as “ERMI compliant,” they were never formally designated as a standard, leaving the status of ERM standards an open question. And despite the first ERMI project’s successes and favorable press notices, the specifications proved challenging to meet, as evidenced by some vendors abandoning ERMS development projects that had been announced with some fanfare, and by reports of slow, difficult, partial, and/or failed implementations by a number of libraries. Concerns with ERMS began to surface in the form of conference programs with titles and themes like “E-Resource Management: the Promise and Disappointment” at the ALA annual conference in 2009, and more recently “Is the Bloom off the ERM Rose? Rethinking and Retooling Electronic Resource Management Strategies” at the 2011 Electronic Resources & Libraries conference; the extent of some of the more recent literature on this problem has been summarized by Gustafson-Sundell[15].

During the same period, economic pressures and funding problems led many libraries to refocus on efficiency while at the same time denying some of the funds needed to acquire and implement ERMS. That has arguably meant less money available to vendors to finance ERMS development and upgrades, and led some libraries to develop what they need locally and share it with others on an open source basis; examples include the CORAL project at the University of Notre Dame and ERMes at the University of Wisconsin-LaCrosse. The more-encompassing Kuali Open Library Environment project, which will incorporate ERM functionality, and an emerging focus by OCLC on “web-scale management services” have also coincided with this reassessment of the ERMS—adding to further questions about the appropriate role of what was known for years as the “Integrated Library Systems” or ILS, and to the role of the ERMS within it.

As these developments have been taking place over the past few years, a number of ERM-related surveys have also been conducted and reported in the literature, at conferences, or less formally. Results of 12 of these surveys were reported widely enough to be of value to members of the Steering
Committee and possibly others, and are listed in Table 1. While many were somewhat specialized (focusing, for example, on a particular vendor’s product, a genre such as e-journals, or other special topics), they provide valuable clues to ERM-related issues considered significant by members of the community.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Survey topic</th>
<th>Conducted</th>
<th>Where Reported or Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowers (UNC-CH)</td>
<td>Impact of E-Resources on Organizational Structure</td>
<td>January 2004</td>
<td>North Carolina Serials Conf., April 2004</td>
</tr>
<tr>
<td>Kriegel (SFPL)</td>
<td>E-journal workflow survey</td>
<td>July 2005</td>
<td>SerialST (July 8, 2005)</td>
</tr>
<tr>
<td>Collins (NC State)</td>
<td>ERM survey</td>
<td>May 2006</td>
<td>SerialST (May 24, 2006)</td>
</tr>
<tr>
<td>Eshelman (UConn)</td>
<td>Environmental scan of commercial Electronic Resource Management (ERM)</td>
<td>July 2006</td>
<td>Provided to Steering Committee</td>
</tr>
<tr>
<td>Downey</td>
<td>License Term Survey</td>
<td>January 2010</td>
<td>ER&amp;L Conference 2010</td>
</tr>
<tr>
<td>Kluesendorf</td>
<td>ERM Systems Usage Trends</td>
<td>February 2010</td>
<td>Against the Grain, April 2010</td>
</tr>
<tr>
<td>Collins &amp; Grogg</td>
<td>ERM Systems</td>
<td>November 2010</td>
<td>Library Journal, March 2011</td>
</tr>
</tbody>
</table>

The recent surveys by Kluesendorf\(^{[22]}\) and Collins and Grogg\(^{[7][8]}\) provide especially useful indications of librarians’ assessments of ERM systems. On the plus side, and in contrast to some of the more negative conclusions that might be reached based on some of the market developments noted above, Kluesendorf reported that 55% of the librarians surveyed were satisfied with their ERM systems, as compared to 24% who were not\(^{[22]}\). ERM systems were generally found to be easy to use, help with collection development decision-making, reduce duplication of effort, and facilitate workflows\(^{[22]}\). Management of e-journal packages was the most important function identified, and the second-highest rated ERM feature or function—indicating a close correspondence between need and functionality.

Yet there is ample evidence of concern. For instance, “94% of all librarians surveyed continue to use spreadsheet applications...either as their primary e-resource management tool or to supplement their ERM.\(^{[22]}\)” Some librarians reported having let their ERM subscriptions lapse because they found them
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not helpful enough and/or too time-consuming to maintain. Particular concerns about ERM functionality that relate directly to the work undertaken for this report had to do with the “ability to import data from other systems (17%) and the ability to eliminate managing data in many systems (16%)”[22].

Tellingly, librarians rated the latter ability as second in importance overall (of 13 on the list), but second to last in ERM performance. Somewhat surprising is the finding that workflow support was ranked only 9th of 13 in importance—the same place it held in the ERM system ratings.

Collins and Groggs’ more recent survey[7][8] had somewhat different aims and relied more heavily on open-ended questions than did Klusendorf’s, and they reached both contrasting and complementary conclusions. The sharpest contrast is in their finding that workflow management ranked at the top of the 15 identified ERM priorities. This is consistent with their identification of workflow management as the prime focus of development for both Notre Dame’s open source CORAL and ExLibris’ Alma systems, and with workflow management and internal communication having become popular conference presentation topics. Other top five priorities that they identified are: license management, statistics management, administrative information storage, and acquisitions functionality. The sixth (interoperability across systems), in their words, “may well affect them all.” We think it is highly significant that so many of these concerns pertain in some way to standards.
3. ERMS and the Current E-Resource Standards Landscape

a. The NISO ERM Data Standards and Best Practices Review

These market developments, anecdotal evidence from colleagues, and in some cases personal experience with ERM development and implementations prompted some ERMI 1 and 2 project participants to begin discussing in 2008 a follow-up project to determine whether the ERMI Data Dictionary and structure should become the bases for formal ERM data standards.

To assess the need for such a project, NISO organized and facilitated focus group meetings with a range of stakeholders during the ALA Midwinter conference in January 2009. Many participants reported that they continued to feel the ERMI data model was still important and the data dictionary plays an important role in promoting interoperability. However, other topics began to surface. For instance, some librarians found their ERMS to be under-developed, faulted them for the perceived limited capacity to import and export data, and expressed concerns over the lack of support for everyday business activities and functions. Others felt they needed help establishing and refining local workflows and best practices. The challenge of making complex license documents comprehensible and actionable for users and staff was another often-expressed concern.

These conversations led to the formation of a steering committee to design and conduct the ERM Data Standards and Best Practices Review under NISO auspices. As described in the proposal[18] that was accepted by the NISO Business Information Topic Committee, the group was charged to:

1) Perform a “gap analysis” regarding ERM-related data, standards, and best practices.

2) Begin the analysis with a review of the ERMI Data Dictionary, mapping elements to other relevant standards projects.

3) Consult with vendors, libraries using ERM systems, and other stakeholders for additional feedback on data requirements and ERM system implementation and management issues.

Project deliverables were to include:

1) Recommendations on the future of the ERMI Data Dictionary

2) Descriptions of typical challenges libraries face in using currently available ERM systems and services

3) An inventory and description of gaps in interoperability and best practices

When the Steering Committee began to meet, members held discussions of the current “state of play” in the ERMS environment and tried to identify lessons learned that would help give direction to its work. For example, while the ERMI Report was influential and highly successful in many ways, it seemed clear that vendors were having difficulty building systems to follow such a comprehensive blueprint. In addition, the environment that ERMS were intended to help manage was obviously prone to rapid change, an argument in favor of designing for flexibility and agility. And as the group was organizing, the potent and highly relevant example of the SUSHI project was in many members’ minds. SUSHI showed
that a carefully-delimited problem (streamlining and automating the intake of usage data) could be quickly and successfully addressed through small-scale development if stakeholders could reach consensus on a technically practical approach and share the work. Just as significantly, SUSHI represented a significant advance in interoperability, relied heavily on the existing COUNTER standard, and then became incorporated into it.

The group also discussed the overall value of standards, and found the excellent November 2009 briefing paper Assessing the Business Case for Standards\(^9\) from the JISC Centre for Educational Technology and Interoperability Standards (“CETIS”) to be invaluable. In answer to the question “Should universities and colleges care about standards,” the paper identifies and discusses “seven key roles” for information standards, including:

1) Reduction of re-keying
2) Reduced maintenance cost and disruption
3) Durability of data
4) Avoidance of supplier lock-in
5) Easier development paths
6) A platform for collaboration
7) Whole system economies

Many who deal with managing e-resources would concur with the paper’s observation that “…almost no-one cares about how e-mail is exchanged but they do care about the services built on the assumption of an infrastructure that uses standards,” and that “standards codify the boring, so that the exciting can happen on top of them.”

As part of its efforts to define the scope of the project, the Steering Committee determined that it would try to be inclusive in its definitions of standards and best practices. That is, both formally balloted and accepted standards like MARC 21 and the ONIX for Serials formats and formally designated best or recommended practices like NISO’s KBART and SERU would be reviewed, while leaving the door open for identification of “local” best practices.

A starting inventory of the more formally designated standards and best practices, as well as a structure for organizing and thinking about them, was provided by Steering Committee member Rafal Kasprowski’s article on Best Practice and Standardization Initiatives for Managing Electronic Resources\(^21\). In it he identifies five categories, which are listed below with the primary examples covered by each:

1) Link Resolvers and Knowledge Bases. Includes Open URL and KBART.
3) Integration of Usage and Cost-Related Data. Includes COUNTER and SUSHI, and CORE (the Cost of Resource Exchange).

4) Coding License Terms and Defining Consensus. Includes ONIX-PL and SERU.

5) Data Exchange Using Institutional Identifiers. Includes I² (Institutional Identifiers) and the WorldCat Registry.

b. ERM-Related Standards, Best Practices, and Related Initiatives

As the committee worked, additional relevant initiatives were identified and added to this list, with the final inventory shown below as Table 2.
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#### Table 2: ERM-Related Standards, Best Practices, and Related Initiatives

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Admin Body</th>
<th>Synopsis</th>
<th>Standard</th>
<th>Best Practice</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Open URL</td>
<td>Open Uniform Resource Locator (URL)</td>
<td>OCLC (under NISO)</td>
<td>A URL that includes a context-sensitive description of a referenced resource and a service request.</td>
<td>x</td>
<td></td>
<td><a href="http://www.oclc.org/research/activities/openurl">http://www.oclc.org/research/activities/openurl</a></td>
</tr>
<tr>
<td>1.2 KBART</td>
<td>Knowledge Bases and Related Tools</td>
<td>NISO/UKSG</td>
<td>Aimed at effecting smoother interaction between members of the knowledge base supply chain.</td>
<td>x</td>
<td></td>
<td><a href="http://www.niso.org/workrooms/kbart">http://www.niso.org/workrooms/kbart</a></td>
</tr>
<tr>
<td>1.3 IOTA</td>
<td>Improving OpenURLs Through Analytics</td>
<td>NISO</td>
<td>Initiative to investigate the feasibility of creating industry-wide, transparent and scalable metrics for evaluating and comparing the quality of OpenURL implementations across content providers.</td>
<td></td>
<td></td>
<td><a href="http://www.niso.org/workrooms/openurlquality">http://www.niso.org/workrooms/openurlquality</a> <a href="http://openurlquality.niso.org">http://openurlquality.niso.org</a></td>
</tr>
<tr>
<td>2.3 ONIX for Serials</td>
<td>OOnline Information eXchange for Serials</td>
<td>EDItEUR</td>
<td>A family of XML formats for communicating information about serial products and subscription information.</td>
<td>x</td>
<td></td>
<td><a href="http://www.editeur.org/17/ONIX-for-Serials/">http://www.editeur.org/17/ONIX-for-Serials/</a></td>
</tr>
<tr>
<td>2.3.1 SOH</td>
<td>ONIX Serials Online Holdings</td>
<td>EDItEUR</td>
<td>A format for communicating serials holdings or coverage information.</td>
<td>x</td>
<td></td>
<td><a href="http://www.editeur.org/120/SOH/">http://www.editeur.org/120/SOH/</a></td>
</tr>
<tr>
<td>2.3.2 SPS</td>
<td>ONIX Serials Products and Subscriptions</td>
<td>EDItEUR</td>
<td>A format for communicating information about serial subscription products.</td>
<td>x</td>
<td></td>
<td><a href="http://www.editeur.org/121/SPS/">http://www.editeur.org/121/SPS/</a></td>
</tr>
<tr>
<td>2.3.3 SRN</td>
<td>ONIX Serials Release Notification</td>
<td>EDItEUR</td>
<td>A format for communicating information about the publication or availability of serials releases.</td>
<td>x</td>
<td></td>
<td><a href="http://www.editeur.org/122/SRN">http://www.editeur.org/122/SRN</a></td>
</tr>
<tr>
<td>2.5 PIE-J</td>
<td>Presentation and Identification of E-journals</td>
<td>NISO</td>
<td>Guidance in the areas of e-journal title presentation and bibliographic history, accurate use of ISSN, and citation practice.</td>
<td>Forthcoming</td>
<td></td>
<td><a href="http://www.niso.org/workrooms/piej">http://www.niso.org/workrooms/piej</a></td>
</tr>
<tr>
<td>2.6 TRANS-FER</td>
<td>Transfer Code of Practice</td>
<td>UKSG</td>
<td>Guidelines for transfer of journals from publisher to publisher ensure that journal content remains easily accessible.</td>
<td>x</td>
<td></td>
<td><a href="http://www.uksg.org/transfer">http://www.uksg.org/transfer</a></td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Admin Body</th>
<th>Synopsis</th>
<th>Standard</th>
<th>Best Practice</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7 ISTC</td>
<td>International Standard Text Code</td>
<td>Intl ISTC Agency</td>
<td>A numbering system to enable unique identification of textual works.</td>
<td>x</td>
<td><a href="http://www.istc-international.org">http://www.istc-international.org</a></td>
<td></td>
</tr>
<tr>
<td>2.9 ISSN-L</td>
<td>Linking ISSN</td>
<td>ISSN Int’l Centre</td>
<td>An ISSN that groups different media versions of a continuing resource.</td>
<td>x</td>
<td><a href="http://www.issn.org/2-22637-What-is-an-ISSN-L.php">http://www.issn.org/2-22637-What-is-an-ISSN-L.php</a></td>
<td></td>
</tr>
</tbody>
</table>

### 3. Integration of Usage and Cost-Related Data

| 3.1 CORE | Cost of Resource Exchange | NISO | Facilitates transfer of cost and related financial information from an ILS to an ERMS. | x | http://www.niso.org/workrooms/core |
| 3.2 COUNTER | Counting Online Usage of Networked Electronic Resources | COUNTER Online Metrics | Sets standards to facilitate consistent recording and reporting of online usage statistics. | x | http://www.projectcounter.org/ |
| 3.3 SUSHI | Standardized Usage Harvesting Initiative | NISO | Defines an automated request and response model for the harvesting of e-resource usage statistics. | x | http://www.niso.org/workrooms/sushi |

### 4. Coding License Terms and Defining Consensus

| 4.1 OLT | ONIX for Licensing Terms | EDItEUR | Family of messaging formats for communication of rights information. | | http://www.editeur.org/85/Overview/ |
| 4.1.1 ONIX-PL | ONIX for Publications Licenses | EDItEUR | XML formats for communication of license terms under which libraries and other institutions use digital resources. | x | http://www.editeur.org/21/ONIX-PL/ |
| 4.1.2 ONIX for RROs | ONIX for Reproduction Rights Organizations | EDItEUR | XML formats for facilitating communication by collective management organizations and the publishers and authors with whom they work. | x | http://www.editeur.org/23/ONIX-for-RROs/ |
| 4.2 SERU | Shared Electronic Resource Understanding | NISO | Set of statements of common understandings for subscribing to Electronic Resources. | x | http://www.niso.org/workrooms/seru |
## 5. Data Exchange Using Institutional Identifiers

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Admin Body</th>
<th>Synopsis</th>
<th>Standard</th>
<th>Best Practice</th>
<th>For More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 i²</td>
<td>Institutional Identifiers</td>
<td>NISO</td>
<td>Provides guidelines for using the International Standard Name Identifier (ISNI) as an institutional identifier for library and publishing environments.</td>
<td>Forthcoming</td>
<td></td>
<td><a href="http://www.niso.org/workrooms/i2">http://www.niso.org/workrooms/i2</a></td>
</tr>
<tr>
<td>5.2 WorldCat Registry</td>
<td>WorldCat® Registry</td>
<td>OCLC</td>
<td>Web-based directory for libraries and library consortia to use as an authoritative single source for information that defines institutional identity, services, relationships, contacts and other key data often shared with third parties.</td>
<td></td>
<td></td>
<td><a href="http://www.worldcat.org/registry/Institutions">http://www.worldcat.org/registry/Institutions</a></td>
</tr>
<tr>
<td>5.3 Shibboleth</td>
<td>Shibboleth® System</td>
<td>Internet2 Middleware Initiative</td>
<td>A standards-based, open source software package for web single sign-on across or within organizational boundaries.</td>
<td>x</td>
<td></td>
<td><a href="http://shibboleth.internet2.edu/">http://shibboleth.internet2.edu/</a></td>
</tr>
</tbody>
</table>
c. **Discussion and Mapping of Standards, Best Practices, and Related Initiatives**

As discussion progressed, some of the initiatives in Table 2 were set aside as too new or out of scope to warrant intensive analysis, leaving the 18 listed in Appendix A for careful review. As indicated in the appendix, data elements and values for 14 of these were “mapped” to the ERMI Data Dictionary by Steering Committee members using this general strategy:

1) Work from related standards and best practices.

2) Determine data element correspondence and overlap.

3) Compare their meanings and typical uses.

4) Determine whether the ERMI Data Dictionary (or more generally, an expanded, “best of breed” ERM data dictionary) should address the topic or area represented by the standard, or if it (with possible revisions) is sufficient to address ERM needs.

Based on their interest in and familiarity with the different standards and best practices, Steering Committee members were asked to analyze them as the limits of their knowledge and available time permitted, compare them to the ERMI Data Dictionary, and answer the following questions:

1) Which elements in the standard correspond to elements in the ERMI Data Dictionary?
   a) Is the meaning of the element identical or partial? (“Partial” indicates differences in the meaning of the data element that limit interoperability.)
   b) If partial, how should the differences be resolved?
      i) Change definition of ERMI element.
      ii) Change definition of standard element.
      iii) Retain differences where meanings are similar but both are valid.

2) Which elements in the standard are not covered by the ERMI Data Dictionary and which ERMI elements are not covered by the standard for the functional area in question?
   a) For those elements, which should be incorporated in the other (i.e., in ERMI or in the relevant standard, as appropriate)?

3) What gap areas exist, if any, in either ERMI or the relevant standard from the perspective of e-resource management? That is, from your review, can you identify specific issues that remain unaddressed?

4) Based on your analysis, is there a need for an ERMI Data Dictionary to address this area, or is the relevant standard (including any suggestions for revision) sufficient to address library e-resource management needs?

Steering Committee members made use of a common spreadsheet “template” to generate the resulting mapping documents. In the case of ONIX-PL, the mapping was based heavily on the extensive two-way (ONIX-PL to ERMI and ERMI to ONIX-PL) mapping work that had been conducted for EDItEUR.
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in 2007; otherwise the analyses are the work of Steering Committee members. During the mapping work, efforts were made to focus on improvements to ERMS functioning that changes to the ERMI Data Dictionary might enable, and relevant comments are included in the “Findings” sections below, following descriptions of each standard or best practice. Briefer comments on some of the initiatives not chosen for full “mapping” analysis are provided later in the report.

1. Link resolvers and knowledge bases. In the article that set out the five categories used by the Steering Committee as its framework for analysis, Kasprowski[21] notes that “access to content is central to electronic resource management” and that link resolvers and knowledge bases serve distinct but complementary functions in connecting users with the content via linking processes. In order to lead the user from a citation source to the full text target, the link resolver relies on the accuracy of the data in the library’s holdings knowledge base. The user end of this knowledge base is the library’s A-Z list or e-journal portal. Two initiatives are currently underway to study problems with knowledge base accuracy and OpenURL linking. KBART is investigating how exchanges of metadata between content providers, knowledge base vendors, and libraries can be optimized to improve the accuracy of the holdings in libraries’ knowledge bases. IOTA seeks to identify where OpenURL links break down in order to enable content providers to improve the quality of their related metadata.

1.1 OpenURL. Formally known as ANSI/NISO Z39.88, The OpenURL Framework for Context-Sensitive Services, this has been described as “one of the most heavily used NISO standards” by Norman and Young[27], who went on to say that “OpenURL linking has become commonplace in electronic information delivery.” As described on the NISO website, “the OpenURL Framework Standard defines an architecture for creating OpenURL Framework Applications. An OpenURL Framework Application is a networked service environment, in which packages of information are transported over a network. These packages have a description of a referenced resource at their core, and they are transported with the intent of obtaining context-sensitive services pertaining to the referenced resource.” OCLC serves as the maintenance agency for this standard, which includes maintenance of the OpenURL Registry. In the library environment, the OpenURL resolver, which oversees the linking in the OpenURL service, checks the metadata of a citation from an abstracting and indexing resource against the library’s knowledge base of holdings and based on these holdings retrieves the appropriate copy for that citation from another resource that has the desired full text.

Findings. OpenURL has become so ubiquitous within the marketplace that it is considered a “given,” with no further analysis or recommendations needed.

1.2 KBART. The Knowledge Bases and Related Tools (KBART) project published a best practice (NISO RP-9-2010, KBART: Knowledge Bases and Related Tools) in January 2010, and Phase II is currently underway to build on it. A joint initiative of UKSG and NISO, KBART explored data problems within the OpenURL supply chain. When all is working well, link resolvers help library users connect to electronic resources provided by their respective institutions. The data that drives such a tool is stored in a knowledge base. The quality of a knowledge base depends heavily on data that content providers (publishers, aggregators, etc.) send to the knowledge base developer, and errors in this data often flow into the knowledge base. Because there is no standard format for
such data, knowledge base developers must expend much effort converting title lists from different providers to a single format, which may introduce additional errors or make error-checking difficult. For ERM, KBART offers improvements in OpenURL linking and improvements in the accuracy and timeliness of metadata in ERM systems.

**Findings.** With only 16 data elements identified, KBART had among the fewest elements of the standards and best practices that were mapped. Eight (half) of the elements mapped to an ERMI counterpart: two (print-identifier and online-identifier) mapped identically, and six (title_url, first_author, title_id, embargo_info, coverage_depth, and coverage_notes) mapped partially. Overall, there seems to be significant potential benefit to adopting the KBART elements in preference to ERMI’s. For example, six of the elements not available in ERMI (first and last date, first and last volume, and first and last issue online) and two that mapped partially (embargo_info and coverage_depth) would provide improved levels of granularity. Consequently the Steering Committee fully endorses the KBART Recommended Best Practice, while noting that KBART’s title_id element might differ from and need to be compared and reconciled with similar elements elsewhere, such as the “Title identifier” included in Project TRANSFER (discussed below).

1.3 IOTA. The IOTA (Improving OpenURLs Through Analytics) initiative builds on a 2009 Cornell University project led by Adam Chandler, which investigated OpenURL link failures. IOTA was formed by NISO in January 2010 to develop a community-recognized index for measuring the quality of source OpenURL links generated by content providers. Too often OpenURL links do not work as expected, and although the OpenURL standard was introduced a decade ago, no systematic method has been implemented to benchmark these links.

The system proposed by IOTA would accept OpenURLs and return scores based on a set of evaluation metrics. This would allow OpenURL providers to see precisely where their links are weakest, letting them target metadata improvement efforts in the most cost-effective manner. As an initial step towards this scoring system, IOTA makes use of log files from various institutions and vendors to analyze element frequencies and patterns contained within OpenURL strings. The reports created from the log file analysis inform OpenURL providers about where to make improvements to their OpenURLs so that the maximum number of OpenURL requests resolve to a correct record. IOTA is supported by the KBART initiative in its Phase I Recommended Practice Report and both groups are investigating the possibility of a joint effort to study the causes of failures in target OpenURLs, which couple link resolvers to content providers.

**Findings.** IOTA is a welcome effort that should significantly help users navigate to the information resources they need with minimal delay and confusion. However, since its contributions seem likely to occur outside the ERMS context (such as by improving the user experience and saving staff time), no detailed analysis or mapping work was undertaken.
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2. **The work, manifestations, and access points.** This category consists of standards and best practices aimed at clearly and unambiguously identifying articles or other entities of interest. As will be clear from some of the discussion below, there is significant overlap between some members of this group (especially DOI) and the previous category (Link resolvers and knowledge bases), and clearer, less ambiguous descriptive information and access points may offer improvements to linking.

2.1 Digital Object Identifier (DOI®) System. The DOI® System was developed and is overseen by the International DOI Foundation (IDF). Its purpose is to persistently identify digital objects across the Internet. NISO published the DOI syntax as a standard (ANSI/NISO Z39.84, *Syntax for the Digital Object Identifier*) in 2000. The International Standards Organization approved the entire System as a standard in 2010 and is in the process of formally publishing the standard (ISO 26324, *Information and documentation – Digital object identifier system*). The System incorporates an identifier syntax, a resolution component, appropriate metadata, and a formal structure to support the standard. Its working principles, established in 2000, are contained in the DOI Handbook (currently undergoing a revision), and the metadata principles underpinning it are contained in the indecs Data Dictionary (iDD). Various registration agencies, such as CrossRef, work with publishers to provide services based on the DOI System that include citation linking. These agencies work alongside, but separately from, the IDF.

An unexpected discovery related to the System but with possibly broader implications came via an e-mail message from Dr. Norman Paskin, the Managing Agent of the IDF, to Steering Committee member Angela Riggio. In it he noted that all DOI terms formerly contained in the iDD have been mapped “into the central registry of the Vocabulary Mapping Framework.” According to its website[^34^], “VMF is a downloadable tool, originally developed with funding from the Joint Information Services Committee (JISC) and currently administered by the International DOI Foundation (IDF), to support interoperability across communities by providing extensive and authoritative mapping of vocabularies from content metadata standards and proprietary schemes.” In its alpha release, the VMF matrix has mapped terms from such vocabularies as MARC 21, MPEG21, Dublin Core, ONIX, LOM (Learning Object Metadata), CDWA (Categories for the Description of Works of Art), and RDA (Resource Description and Access). However, it is only readable by machine or by using the Protégé ontology editor.

**Findings.** Since the indecs Data Dictionary has been incorporated into the VMF, which is readable only via machine or the Protégé ontology editor, its terms were not mapped to the ERMI Data Dictionary. However, the VMF may merit further investigation by some of the oversight bodies of the vocabularies examined in this analysis.

2.2 MARC 21. MARC (MAchine Readable Cataloging) 21 standards provide the systematic capability of reading and transmitting bibliographic data and serve as the foundation of the online library catalog. The MARC standards for Bibliographic, Authority, and Holdings data are developed and maintained by the Library of Congress and the Library and Archives Canada.

[^34^]: [VMF Website](https://www.vocabularymappingframework.org)
Findings. The DLF ERMI Steering Committee envisioned an interoperable ERM system: a world in which pertinent descriptive metadata would be “inherited” from the catalog record/catalog client, as would other data be inherited from relevant ILS modules. Current ERMS rely on basic descriptive metadata to properly identify an electronic resource and distinguish it from other electronic products. The MARC 21 Bibliographic Standard supplies the structure for a robust description, defining hundreds of data fields and subfields. The DLF ERMI dictionary maps identically with most key MARC 21 descriptive fields and/or subfields (i.e., title, system control number, main entry fields, subjects, etc.).

Historically, tracking online journal content when a title changes publishers, providers or platforms has proven challenging in the ERMS environment, although it should be noted that the Transfer Code of Practice initiative, discussed below, is responding to this challenge by encouraging consistency in communication and data sharing between commercial publishing and library communities. Traditionally, MARC 21 has provided fields which can capture journal title changes and changes in publishers. The information, which perhaps exceeds the boundaries of the MARC format, are those associated with the dropping and adding of resources from one online provider, platform, or aggregator to another—in other words, tracking the life of a resource as it moves from place to place.

Commercial ERM systems, driven by a knowledgebase that provides basic information about the identity and location of an online resource, do not track the dropping and adding of titles from one provider to another. Typically, essential information about the history of a resource is deleted (along with the record of that resource), when the knowledgebase provider is informed of a title being added or dropped from its database. This information is subsequently lost unless the library keeps that information in a different location (spreadsheet, database, etc.). In addition, ERMS do not track related information regarding previous and subsequent titles—data which is effectively tracked in MARC.

It is strongly recommended that ERMS should incorporate and make better use of certain MARC-related information—especially Electronic Resource Title Continues (MARC 780); Electronic Resource Title Continued By (MARC 785); Main Entry Uniform Title (MARC 130); and Uniform Title (MARC 240)—in order to preserve essential historical information about a resource, and to ensure that libraries who have carefully negotiated with publishers and providers for perpetual access rights can actually maintain access once a resource has moved to a new online location. Similarly, the ERMS should maintain a record of the history of a resource within the knowledgebase, and refrain from deleting that information when it is no longer current.
2.3 ONIX for Serials. According to the EDItEUR website, “ONIX for Serials is a family of XML formats for communicating information about serial products and subscription information, using the design principles and many of the elements defined in ONIX for Books.” A joint undertaking of EDItEUR and NISO, the three sets of application messages described and discussed below (Serials Online Holdings, Serials Products and Subscriptions, and Serials Release Notification) “have been or are being defined and piloted, each supported by an outline specification, XML schema, and full HTML documentation.”

In reviewing these formats and comparing the relevant data elements to parallel ERMI data elements, differences between the DLF ERMI elements and ONIX message formats and structure (referred to as “ontological differences” in the mapping spreadsheets made available in connection with this report) often made direct 1-to-1 mapping difficult or unclear. For example, where the ERMI Data Dictionary may list a number of data elements and suggest appropriate values, similar elements within the ONIX for Serials formats may appear grouped as possible values under more-encompassing data elements, such as Series Identifier, Title, or Work Identifier “type” codes. And since the three ONIX for Serials formats share some elements, comments on their mapping spreadsheets contain some unavoidable duplication.

2.3.1 SOH. The Serials Online Holdings messages are used for communicating information about the holdings or coverage of online serial resources from a party that holds or supplies the resources to a party that needs this information in its systems. The messages include details of serial versions, formats available, hosted collections in which the serial versions are found, and coverage information for each serial version. SOH coverage information includes the extent of coverage of each resource (date ranges or volume/issue ranges or both) along with details of any applicable embargo.

Findings. None of the 26 data elements identified in the SOH message format mapped identically to elements defined in the DLF ERMI document, but fourteen (just over half) mapped on a partial basis. In at least three of these cases (Epublication format code, Publishing role code, and Embargo type/count back unit), the ONIX values provide greater specificity and control. For example, ONIX supported values for the Epublication format code include: HTML, PDF, XML, SGML, ASCII, LaTeX, and TEX, whereas the best corollary ERMI element would simply be “format.” The ONIX Date format, which does not map to an ERMI data element, supports a range of values and could prove useful.

2.3.2 SPS. The Serials Products and Subscriptions (SPS) format defines a family of messages used for transmitting information about serial subscription products, with or without price information, and with or without subscription information relating to a particular subscriber.

Findings. As is the case with SOH, none of the data elements in this format were identical maps to an ERMI data element. Just over half (18) of the 33 data elements mapped on a partial basis, with the remainder not mapping to any ERMI elements. Of the elements mapping partially, those seeming to provide the most significant
improvements over ERMI data elements are Product form code, Epublication format code, Work identifier type code, Publishing role code, Embargo type/count back unit, Price component type, Serial price qualifier type, and Serial price qualifier type. And as noted in the above discussion of SOH data elements, the ONIX Date format, which does not map to an ERMI data element, supports a range of values and could prove useful.

2.3.3 SRN. The Serials Release Notification (SRN) format defines a family of messages designed to support information exchanges about the planned or confirmed publication or electronic availability of one or more serial releases.

Findings. In this case, only 23 (just under half) of the 50 data elements identified in this format mapped to elements defined in the DLF ERMI document; these again were “partial” maps. In the majority of those cases, some of which were already identified in the discussions of SOH and SPS, we believe there to be significant advantage in making use of the ONIX elements and values, as well as in a few other cases where there was not a match—including the afore-mentioned Embargo type/count back unit, as well as Extent type code and Extent unit code. However, there are a number of other ONIX elements for which an ERM function or application was not immediately apparent.

It was concluded that the ONIX for Serials message formats generally support much more granular value definitions for specific elements, and that that greater granularity could prove useful in the ERM environment. In some cases, the ONIX values could be expanded to include DLF ERMI defined data elements to better support a wider range of values for the term, though in others the ONIX for Serials elements and values did not map to ERMI elements or seem to offer value for ERM applications. Nevertheless, the flexible structure of the ONIX for Serials formats seems better designed to accommodate the need for new data elements and values over the long term, thus providing a relatively stable and predictable basis for software development within a changing market and technological environment.

2.6 TRANSFER. The Transfer Code of Practice responds to the expressed needs of the scholarly journal community for consistent guidelines to help publishers ensure that journal content remains easily accessible by librarians and users when there is a transfer between parties, and to ensure that the transfer process occurs with minimum disruption. When journals change ownership, many critical issues can arise, such as continuity of access during a transfer and whether perpetual ongoing access to archives is retained in journal sale agreements. This has resulted in frustration for end users and librarians as key e-journals became temporarily or even permanently unavailable despite license terms. Publishers who have endorsed the Transfer Code of Practice agree to best practice guidelines and responsibilities that ensure journal content remains easily accessible in the event of a change of ownership. When a publisher endorses Transfer, libraries and end users benefit with minimal disruption in service. For electronic resources management, tracking and managing the movement of titles becomes less problematic.
Findings. The majority (58%) of the 198 data elements identified in this message format did not map to elements defined in the DLF ERMI document. Another 30% were partial maps to ERMI. Partially mapped elements included address, which had a deeper granularity in Transfer than in ERMI. Most of the non-corresponding elements involved data of interest only to the parties (publishers) involved in the process of transferring property (i.e. titles). These elements included payment information, revenue earning method, sales territory, quantity of print copies and files remaining on the platform. Transfer elements that either support a more granular definition of value or are non-existent in ERMI, could be utilized in some form in ERMI included archiving arrangement for back-file content, COUNTER compliancy, online subscription type, re-registration activation code, URL for re-registration, and URL for back-file content archive. NISO ERM fully endorses the Transfer Code of Practice.

3. Integration of usage and cost-related data. Librarians have a long-standing interest in having comparable usage statistics, in facilitating or automating the process of obtaining them, and in connecting this information with cost or expenditure information for assessment purposes. The initiatives described below are all intended to address these issues in one way or another.

3.1 CORE (Cost Of Resource Exchange). The CORE recommended practice (NISO RP-10-2010, Cost of Resource Exchange (CORE) Protocol) is designed to facilitate the transfer of cost and related financial information from an Integrated Library System (ILS) Acquisitions module (the source) to an Electronic Resource Management System (ERMS) (the requestor). The population of ERMS financial data from the ILS Acquisitions system makes cost-per-click and other cost-related reports in the ERMS all the more possible. Note that the CORE recommended practice should not be seen as limited to ILS to ERMS data exchange; any two business applications could make use of this format for simple and efficient data exchange.

Findings. Approximately half of the 37 data elements identified in this message format did not map to ERMI elements. Additionally, NISO CORE relies on communication and “agreements” between trading partners that could result in multiple definitions of a single element when implemented between Party 1 and Party 2 versus Party 1 and Party 3. An example would be the NISO CORE element ProductID. This is an identifier unique to each system between the parties. It could be a subscription agent identifier in the agent’s back office system, which may or may not appear or be tracked in the ILS/LMS or in a vendor ERM system. The general consensus was that NISO CORE does include many valuable data elements that could be incorporated into DLF ERMI but the definitions in NISO CORE and other NISO standards could benefit from a more structured definition of common data elements across the NISO standards.

3.2 COUNTER (Counting Online Usage of Networked Electronic Resources). Beginning in March 2002, COUNTER set standards as an international initiative to serve library, publishers, and intermediaries to efficiently record and report usage data of online electronic resources.
Starting first with online journals and databases, COUNTER set up a method of compliance through formatted reports of usage statistics. Beyond implementing the standards of usage reports, COUNTER cooperates with a number of organizations in usage-related research and services. For example, COUNTER worked with JISC (the UK Joint Information Systems Committee) in 2006 to detail the effects of publisher platforms on usage and develop new metrics. COUNTER initially published two different codes: one for journals and databases (release 3, August 2008) and one for books and reference works (release 1, March 2006). In October 2011, COUNTER issued a draft Release 4 Code of Practice that combined and updated the two separate standards.

**Findings.** Based on its internationalization and industry-wide commitment to format statistics within COUNTER, it is appropriate for the ERMI data model to accept COUNTER fully within its recommended best practices.

### 3.3 SUSHI

The Standardized Usage Statistics Harvesting Initiative (SUSHI) Protocol standard (ANSI/NISO Z39.93) defines a request and response model for the automated harvesting of usage statistics of electronic resources through a web services framework. Its intention is to replace manual downloading and collecting of usage statistics by libraries. SUSHI compliance is required for COUNTER-formatted usage statistics beginning with COUNTER Release 3. SUSHI can also be used to transmit non-COUNTER reports that meet the specified retrieval requirements set by SUSHI.

**Findings.** Because it is a data transmission protocol, it is not necessary to map SUSHI to an ERMI data model, as the protocol simply defines the requirements of system request/response messages rather than the data transmitted. To sustain the operability between SUSHI and COUNTER, NISO maintains the COUNTER XML report schema so SUSHI and COUNTER schemas remain in sync.

### 4. Coding license terms and defining consensus

The two initiatives considered here are aimed at helping to deal with the prevalence of licenses and licensing within the digital and ERM environments, which grew out of perceived needs by information creators and providers for protections not offered under the fair use provisions of copyright law. In Kasprowski’s words, “reviewing and negotiating licensing terms is a time-consuming process...involving significant administrative costs for both content providers and librarians”\(^{[21]}\)."

#### 4.1. ONIX-PL

ONIX for Publications Licenses is a member of the ONIX for Licensing Terms family developed and maintained by EDItEUR. As described on its website, ONIX for Licensing Terms (OLT) is “the generic name for the most recent additions to the ONIX family. Built on a consistent underlying model of rights and usages, OLT formats are specialized to the needs of different user groups and applications.” As one of those formats, ONIX-PL is “specialized to handle the licenses under which libraries and other institutions use digital resources, particularly but by no means exclusively electronic journals.” It is further described there as “…an XML format for the communication of license terms for digital publications in a structured and substantially encoded form, designed to serve the interests of all parties in the licensing chain.” ONIX-PL development has been ongoing for a number of years and has resulted in the publication of a number of documents,
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including the ONIX-PL format specification, version 1.0, published in November 2008, and the ONIX-PL Dictionary, of which issue 3 was released in January 2011. In 2009, an ONIX-PL editor named OPLE was made freely available for local installation and use.

While the bulk of the work to develop and refine ONIX-PL has been undertaken by or on behalf of EDItEUR, as noted on the website there has been a long history of collaborative funding and other support work by various other groups, including the Digital Library Federation and NISO in the U.S. and the Publishers Licensing Society (PLS) and the Joint Information Systems Committee (JISC) in the UK. Discussions of the relationships between ONIX-PL and the approach to license expression taken by the DLF’s ERMI group date at least to October 2004, when a stakeholder meeting was held in conjunction with the DLF Fall Forum.

In 2005, a License Expression Working Group with very wide representation was formed jointly by EDItEUR, NISO, the DLF, and the Publishers Licensing Society. The group met primarily via conference call, but in December 2006 co-chairs Nathan Robertson and Alicia Wise organized an ERMI/ONIX “Mapping Meeting” that was followed the next day by a slightly larger ONIX-PL Implementation Workshop. Among the outcomes from these meetings was consensus on the need to create both “ERMI to ONIX-PL” and “ONIX-PL to ERMI” mappings. EDItEUR and the DLF agreed to co-fund this work, and in July 2007 EDItEUR released draft 2 of the ONIX-PL ERMI Encoding Format\(^{13}\), which included a mapping of ERMI to ONIX-PL, followed in November by draft 2 of Mapping ONIX-PL to ERMI\(^{12}\). Rather than recreate this extensive work, the Steering Committee chose to rely on these documents for its review—but we also take note of a range of subsequent developments, some of which are described below.

In June 2008 the License Expression Working Group was disbanded and replaced by the NISO- and EDItEUR-sponsored ONIX-PL Working Group. That September, NISO sponsored a webinar titled ONIX-PL: Simplifying License Expression\(^{15}\) that featured discussions of a planned collaboration between Serials Solutions and the Statewide California Electronic Library Consortium (SCELC) to implement ONIX-PL as part of a consortial ERM. In December 2009, NISO offered ONIX for Publication Licenses: Adding Structure to Legalese\(^{4}\), for which SCELC’s Rick Burke and EDItEUR’s Mark Bide were speakers. Adding to the favorable exposure for ONIX-PL was a 2010 ER&L conference presentation by Castro and Chen\(^{5}\) that highlighted some of its potential advantages over ERMI. In June 2010, NISO disbanded the ONIX-PL Working Group because it had achieved its goals.

Since then, ONIX-PL uptake in the U.S. seems to have stalled, and vendor development largely ground to a halt. For example, Serials Solutions does not appear to be actively pursuing the development project showcased in the September 2008 NISO webinar. Similarly, Steering Committee members have not been able to identify active development plans by other vendors. Interestingly, OCLC decided to use neither ONIX-PL nor ERMI data elements and values to harvest information about member libraries’ ILL license terms for specific vendors as part of its recent initial Web Scale Management service rollout. However, Andrew Pace suggested during Q & A following a presentation on the topic at the ALCTS/LITA ERM Interest Group Meeting at ALA in June
2011 that ONIX-PL may figure in its development plans for the service—which might prompt a resurgence of interest.

The situation in the UK and Canada appears to be substantially different. For example, during conversations with members of the Steering Group, EDItEUR’s Mark Bide pointed to high demand for UKSG-sponsored workshops on ONIX-PL, and stressed his organization’s ongoing commitment to its support and further development. In June 2009, the final report for the RELI project\(^\text{[30]}\) at Loughborough University described having made use of ONIX-PL in its successful demonstrator system for associating license terms with specific e-resources using a license registry—though that project is now considered complete and not being actively pursued further. The report also encouraged “implementation and support of ONIX-PL by everyone in the supply chain,” and urged that “librarians put pressure on publishers to provide their licences in ONIX-PL format as well as in print.” More recently, Steering Committee members learned that JISC had completed a project to encode some 80 of its licenses in ONIX-PL and had an operational system that enables side by side comparison of licenses\(^\text{[20]}\) and performs other functions. It was also learned that the Ontario Council of University Libraries (OCUL) had encoded roughly 30 of its licenses using ONIX-PL.

**Findings.** It seems appropriate to begin with a brief comparison of the manner in which the ERMI Report dealt with license expression and encoding, and how that is accomplished in ONIX-PL. The ERMI data structure includes a *Terms Defined* entity that includes a large number of elements, including indicators for presence or absence of particular clauses or content, such as Fair Use or an Interlibrary Loan recordkeeping requirement. Many of the terms judged likely to be of most use and value to libraries were put together in a *Terms of Use* group, and a standard set of values was identified for them, including *Permitted (explicit)*, *Permitted (interpreted)*, *Prohibited (explicit)*, *Prohibited (interpreted)*, *Silent (uninterpreted)*, and *Not Applicable*. In addition, a number of free-form *notes* fields offering substantial flexibility are provided.

Partly because it seemed unlikely that many libraries would need or choose to track their licenses as completely as they could using the ERMI framework, a “quick fix” subset of the elements aimed at summarizing the essential points for library practice was identified in Appendix F of the ERMI report. Even so, the extent to which libraries using ERMI-based systems have analyzed and encoded their licenses either completely or in a more limited manner is unknown, but participants in the ERMI 2 “License Mapping” workshops found the process to be quite challenging even for relatively simple licenses, and anecdotal evidence suggests that few libraries have undertaken such a project.

ONIX-PL provides a similarly-encompassing framework based on a careful and detailed analysis, with many similarities to the ontological structure using value “qualifiers” that are evident in the ONIX for Serials formats. In addition, the “ONIX to ERMI” mapping work mentioned earlier resulted in identification of 15 usage and 26 general terms having no ERMI equivalent—thus suggesting to the Steering Committee that it offers a
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more comprehensive framework. Based on conversations with Mark Bide and David Martin, ONIX-PL “text” fields also offer some of the same flexibility offered by ERMI notes fields. Based on its comprehensiveness and careful, extensible design, it seems to offer a more robust basis for the long-term than does ERMI.

Nevertheless, as noted above, uptake and implementation of ONIX-PL has been fairly limited due to what was accurately described in the RELI project final report as a “chicken and egg” problem characterized by a lack of consensus among the key players (libraries, publishers, and ILS and serials service vendors) that it truly represents the best way forward, and willingness to invest the time and other resources needed to overcome inertia.

One publisher’s perspective on this situation was provided by Springer’s Bob Boissy during Q & A following a NASIG 2011 presentation on the status of the NISO ERM Data Standards project by Steering Committee member Bob McQuillan. He acknowledged that the ONIX-PL encoding process requires staff resources that many publishers/aggregators do not currently have, and noted that using the current OPLE editing tool can be complex. However, Swets’ Christine Stamison added that feedback from their customer base does indicate there is interest among libraries in having access to license expression data-related services.

Although, as noted earlier, some librarians have advocated for a move from the ERMI framework to ONIX-PL, developers for recent library-based initiatives like CORAL and Kuali OLE have found it lacking in various ways. In the case of CORAL, ONIX-PL was found to be overwhelming in scope and complexity, and well beyond their needs. While in general agreement, early Kuali OLE analysis indicated that, despite its complexity and apparent comprehensiveness, it still did not address some license management and encoding needs. Members of the Steering Committee generally concur with these assessments and suggest that NISO organize focused stakeholder discussions on a possible “third way” that draws on ONIX-PL work already done but more directly helps libraries manage the most important information that their licenses contain.

4.2 SERU. Launched in 2007 and sponsored by NISO, SERU (NISO RP-7-2008, SERU: A Shared Electronic Resource Understanding) is a statement that describes common understandings related to e-resource subscriptions. SERU was and is meant to be widely applicable, though as this report was being finalized, it was learned that the SERU Standing Committee is working on expanding SERU’s scope to address issues of special relevance to e-books, such as perpetual access and numbers of pages that can be downloaded or printed. Libraries and publishers that utilize SERU elect to forego a license by referencing these understandings. For e-resource specialists, SERU provides the promise of streamlining the acquisition and licensing of electronic resources, thereby providing lower overhead and quicker access for the end user.
Findings. To some extent, SERU was a challenge to map because it is meant to be somewhat ambiguous. As a consequence, some libraries making use of it may find it necessary or advisable to decide how they will interpret it in practical terms, and how to describe or encode that understanding—especially for staff. And unlike other standards and best practices, SERU intentionally did not produce a list of data elements. Of the four data elements identified in the SERU Recommended Practice document, only one term (Subscriber) is clearly defined, while the three others are defined more loosely. Two of these (Authorized User Population and Educational Institution) were partial maps to ERMI while the final element (Public libraries and other cultural memory institutions) did not correspond to an ERMI element. In an effort to identify possible additional data elements, the SERU statement was examined and yielded an additional 33 elements. Of these, ten mapped identically and fourteen partially. Three of these elements (Content Additional to Subscription, Trusted Third Party, and Third Party Archive) could be valuable additions to an expanded ERM data dictionary.

NISO ERM fully endorses the SERU Recommended Practice and encourages its wide adoption, based on its considerable potential for simplifying the license negotiation process for all parties, for which there is already substantial evidence. The extent to which it can and will be used instead of formal agreements where large sums of money and content are involved remains an open question; though its impact even in those cases can be maximized by paying attention to and continuing to address issues specific to emerging genres like e-books over time.

5. Data exchange using institutional identifiers. Another set of longstanding problems shared by information providers and libraries within the ERM environment relates to readily identifying the parties involved and associating contact, demographic, IP range, and other administrative information with them.

5.1 I² (Institutional Identifier). NISO’s Institutional Identifier (I²) project supports the exchange of information within the information supply chain, which includes publishers, vendors, consortia, and libraries. I² was looking to develop a robust, scalable, and interoperable standard that uniquely identifies institutions in the journal supply chain. Concurrent with their work, an ISO working group completed development of the International Standard Name Identifier (ISNI) (ISO 27729; publication pending). The working group realized that this standard could potentially satisfy the requirements for an institutional identifier[26]. The I² group has been working with the ISNI International Agency to harmonize metadata they developed for institutional identification with the metadata profile in the ISNI standard, and has made formal requests for changes to an ISNI requirement concerning institutions. The I² group is also continuing to identify organizations within the information supply chain that would work with ISNI as Registration Agencies[10] and will be issuing a final report, describing how the ISNI will be used for an institutional identifier.

Findings. Seven of the 19 data elements identified in this format did not map to elements defined in the DLF ERMI document, with the remainder mapping either
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partially or completely. In general, ERMI offered more granularity than I². For example, I² identifies country, state, or region but stops at the city level—leaving it to sub-registries to track address information. Since the I² Institutional Identifier element would be useful to ERMS, it could require some ERM vendors to enhance or re-purpose fields to accommodate it. Once I² completes their work on institutional relationships, there may be additional elements of value that could apply to ERMS. NISO ERM fully endorses the I² work.

5.2 WorldCat® Registry. The WorldCat Registry is an online public repository of data on individual libraries and consortia. Participating institutions receive an identifier, which vendors, content providers, or other libraries can use to quickly gain access to such information as administrative contacts and IP addresses. Links to the library’s OpenURL servers, the online catalog, and virtual reference service can be used to make the library’s web services and its content easily accessible to online users. The registry is maintained by OCLC, which distributes the data to open-source services, including its own Worldcat.org, to maximize the participating institutions’ visibility.

Findings. The WorldCat Registry is worth following because it brings together key electronic resource management data. It contains institutional information covering multiple library services, such as acquisitions, online access, and reference that vendors and other libraries can include in a database. It centralizes data storage and automates data transfer through linking, which leads to improved data management efficiency. It would be worthwhile to investigate which of its data elements could be mapped into an ERM, although it does not appear to contain information about vendors and publishers that would make it more useful to libraries.

5.3 Shibboleth®. Shibboleth is open source authentication software that provides single sign-on capabilities across an institution’s web space. It uses SAML (Security Assertion Markup Language) metadata in order to exchange information between an Identity Provider (IdP) and a Service Provider (SP). When a user attempts to access a restricted online resource, the SP intercepts that attempt and determines what kind of IdP is associated with the user. Then, depending on the assigned profile, the user will be automatically logged in to the resource or denied access. Shibboleth metadata is transferred in XML.

Findings. Although a rudimentary mapping can be made to a handful of DLF ERMI data elements, the majority of SAML elements exist for a distinctly different purpose. Shibboleth software holds certain metadata about a particular user and exchanges that data with a service provider, while ERMI defines users in an effort to identify those who should be allowed to access a licensed resource. In essence, Shibboleth authenticates the user that could be associated with the ERMI definitions of user group and authenticated users. There is no need for the ERMI Data Dictionary to expand into the domain of Shibboleth metadata, but an effort to standardize the way institutional software identifies “users” would be recommended.
We would also like to make note of NISO's relevant ESPRESSO (NISO RP-11-2011, *Establishing Suggested Practices Regarding Single Sign-On*) initiative, the results of which were published in October 2011. As explained by working group members Heather Ruland Staines, Harry Kaplanian, and Kristine Ferry “the ESPReSSO Recommended Practice document recommend[s] practical solutions for improving the success of SSO authentication technologies in providing a seamless experience for the user...and has developed a set of best practice recommendations surrounding the use of existing technologies...[and] presents a set of recommendations to both identity provider (IdP) and service provider (SP) sites. The recommendations specifically address typical browser flows, the sequence of pages presented to users, page layout, what information to include in each of those pages, consistent GUI elements, and additional features and functionality to provide users with added value[32].” Though not directly relevant for ERM functions, we actively endorse ESPRESSO and the effort to improve related facets of the user experience it represents.

### 5.4 vCard

The vCard specification was originally developed by an industry consortium called “Versit” consisting of Apple, IBM, AT&T, and Siemens and is now a standard maintained by the Internet Mail Consortium. According to the vCard article in Wikipedia[33], version 2.1 (dated September 1996) is “widely supported by e-mail clients,” although a version 3.0 was released in 1998 (RFC 2425 and RFC 2426). There has also been more recent work on “vCard Extensions for Instant Messaging (IM),” and a related Internet Engineering Task Force (IETF) website shows ongoing development work and discussions as of May 2011. While it is difficult to tell very definitively, vCard seems to be in common use, and 2.1 is the most commonly-used and supported version.

According to the introduction to the specification, “…vCard is intended to be used for exchanging information about people and resources. In today's business environment, this information is typically exchanged on business cards. ...this specification define[s] this information in terms of a paradigm based on an electronic business card object.” According to one commentator, “Many open source applications use vCard internally as data format and many E-mail programs have the capability to attach business cards in vCard format.” A related specification called hCard is designed to translate vCard information into (X)HTML for use in web applications. Although Microsoft was not a member of the industry consortium that developed it, Outlook® does currently support vCard.

**Findings.** Aligning the ERMI Data Dictionary with the vCard standard could be very useful for capturing and storing contact information for sales reps, vendor executives, and library or consortia representatives. While vCard appears to be designed for contact information about individuals rather than organizations, it seems possible and practical to use it for the latter. And since vCard supports structured data (e.g., for *surname*, *given name*, etc.) and the typing of attributes (e.g., *office* vs. *fax* vs. *mobile phone*), it is more flexible than the current ERMI design. Because the current ERMI Data Dictionary
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provides for a more limited set of information about organizations than vCard, it is desirable to investigate it further for possible adoption as an ERM standard.

d. Summary of Mapping Conclusions and Recommendations by Category

Link Resolvers and Knowledge Bases

The Steering Committee began by noting that linking is critically important to the ERM environment and that OpenURL has become a fundamental enabling technology and standard. The two efforts covered during this review that are aimed at improving how it functions (KBART and IOTA) are both welcome developments. The Steering Committee fully endorses KBART, but notes that it would be worthwhile to compare KBART’s title_id element with similar elements in use elsewhere, such as the Project TRANSFER Title identifier, and reconcile any differences. We also see IOTA as potentially offering significant improvements to the user experience and saving staff troubleshooting and support time. However, since it is a URL quality scoring system aimed at helping providers improve their services, there is little need to consider incorporating any of its elements into an expanded ERM data dictionary.

The Work, its Manifestations, and Access Points

Five standards (the DOI System, MARC 21, and three members of the ONIX for Serials family: Serials Online Holdings, Serials Products and Subscriptions, and Serials Release Notification) and one best practice (TRANSFER) were analyzed for this segment of the review project. As described earlier, the DOI System utilized the indecs Data Dictionary (iDD), which is now a part of the Vocabulary Mapping Framework (VMF). This prevented our analysis of individual data elements contained in the iDD, but we believe the VMF may present the standards community with partnership opportunities and may hold promise for furthering interoperability.

The remaining standards in this group were crafted for specific purposes; therefore each offers granularity in those defined areas that was not considered by the creators of the ERMI Data Dictionary. For example, while it includes specific fields from the MARC 21 Bibliographic Standard to provide an accurate identification of a resource, little attention was paid to defining the specifics of each electronic manifestation, especially as they change over time. During the current review we noted that several MARC 21-related fields could be of substantial value in tracking historical information about a resource and associated perpetual access rights, and suggested that such historical information should be maintained within libraries’ knowledge bases—even when no longer current.

We also found that the ONIX for Serials message formats generally provide greater granularity for some elements than the ERMI Data Dictionary. For example, the ONIX for Serials suite describes in great detail the manifestations of a work with regard to price, embargo period, availability, and coverage—and the flexibility built into its structure is more likely to accommodate new data elements and values over the long term. Similarly, we concluded that some TRANSFER data elements support greater granularity than the ERMI Data Dictionary, including data that better accounts for access and metrics (e.g., COUNTER compliance, perpetual access). This information is critical to maintain as a resource moves to different providers or platforms.
In summary, the MARC 21, ONIX for Serials, and TRANSFER schemas all fill gaps in the ERMI Data Dictionary, and selected metadata from them could improve the functioning of current ERM systems.

Integration of Usage and Cost-Related Data

In many respects, COUNTER occupies a similar “foundational” position within this category to the one occupied by the OpenURL standard within the Link Resolvers and Knowledge Bases category, and we believe it appropriate for ERMS and an expanded ERM Data Dictionary to fully support it as it evolves. And as noted, while we view SUSHI as a very worthwhile development and value its close tie to COUNTER, it is a data transmission protocol rather than a description or specification of data content that would have relevance for the contents of a data dictionary.

We also view NISO CORE as a valuable development, but regret that it has not yet been adopted to any significant degree. In addition to hoping that it winds up back in vendors’ development plans, we also noted that it includes many valuable data elements that could be incorporated into an expanded data dictionary. However, some of the data elements and definitions in NISO CORE and other NISO standards could benefit from more structure and consistency.

Coding License Terms and Defining Consensus

From the perspectives of librarians responsible for managing the licensing of e-resources, the prospect of reducing and normalizing a significant amount of that work through SERU is immensely appealing, and we advocate its active promotion. That said, it seems quite likely that formal, negotiated licenses will remain a fixture of the landscape for years to come. If so, libraries will still need to understand, manage, and communicate their contents to staff and users, and a widely adopted encoding scheme definitely seems to be needed.

Following frequent and extended discussions of the advantages and disadvantages of the ERMI- and ONIX-PL-based approaches to encoding and communicating license terms during this project, we concluded that neither quite offers what we believe libraries need. ERMI data elements and values have provided a start for libraries able to invest the time and expertise needed to encode their licenses, but there seems limited evidence to date that many libraries have actually done so. ONIX-PL, on the other hand, resolves some problems with the ERMI approach that surfaced when the two sets of elements and values were mapped, and offers an elegant and extensible design, but strikes most librarians with experience in this area as “overkill.” We believe NISO could provide a very valuable service to the community by facilitating fresh discussions among librarians, vendors, and publishers aimed at developing what we have called a “third way” that overcomes some of these dilemmas. In our view, an environment based on such a third way should be characterized by the following features:

- A shared and extensible encoding scheme—probably based at least in part on ONIX-PL.
- The ability for libraries to “scope” or select how much license information they encode, manage, and present to users and staff—or that others in the supply chain do on their behalf.
Clear paths to expand those encodings and staff and user displays as libraries’ needs and priorities change.

Practical means for sharing “starter” or generic encoded licenses to save libraries the time and effort required to “start from scratch” with licenses in hand.

Editing tools that are easy to implement and use.

Interoperability, or the ability to move and make use of this data as needed.

Active, long-term encouragement of publisher and database vendor participation.

Data Exchange Using Institutional Identifiers

Since management of administrative information continues to be a challenge, members of the Steering Group see this category as one where developments could have significant positive impact for libraries and other organizations within the supply chain, and the I² initiative is particularly promising—though not as granular as ERMI. As noted, its Institutional Identifier element would be useful to ERMS, and we endorse it fully, even though it might require some ERM vendors to enhance or re-purpose fields to accommodate it. We look forward to completion of I² since there may be additional elements of value. We also have identified the WorldCat Registry project as worth following; while currently limited to information about libraries, it does seem to offer some data management efficiencies.

We also noted the potential value to users and libraries of Shibboleth as a viable alternative to reliance on IP and other authentication schemes, and support NISO’s efforts to improve the user experience through the ESPRESSO initiative. However, since they serve somewhat different purposes than ERMI, we did not feel that an updated and expanded version of ERMI needs to incorporate either one. Lastly, we investigated the vCard standard and determined that it could be very useful for capturing and storing contact information, that it is more flexible than ERMI, and that only modest adjustments to the ERMI Data Dictionary would be required to accommodate it. Further investigation of vCard as a possible ERM standard is therefore recommended.

An Updated and Expanded ERM Data Dictionary?

Having reviewed the wide range of relevant standards and best practice initiatives that have been developed over the last several years, we return to the question of whether the ERMI Data Element Dictionary should be updated and maintained. This question extends to the related Entity Relationship Diagram and Electronic Resources Management System Data Structure documents from the ERMI report that together defined the “ERMI data model.”

As noted earlier in this paper, these documents and the Report itself were credited by many with providing a valuable roadmap for development of ERM systems and services that formerly existed only as locally-developed and maintained tools. In addition, many participants in the January 2009 focus
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group sessions that helped validate the need for this review project felt they continue to be important and help foster interoperability.

While Steering Committee members generally agree with these sentiments, our analysis and discussions have consistently led us away from proposing that NISO or another agency take responsibility for updating and maintaining the Data Dictionary and related documents. One major reason for this view is that such an undertaking would be large, time-consuming, and potentially never-ending: as long-time followers of ERMS development know, the ERMI Data Dictionary listed well over 300 data elements, and the e-resources environment has not gotten any simpler since then. Another reason is that we do not believe that the ERM community will or should embrace and continue to modify systems—many of which have been in existence for several years at this point—based on the existence of such a standard, however comprehensive and well-designed.

Just as importantly, initiatives like KBART, IOTA, SUSHI, and CORAL show how much energy, commitment, and creativity can be brought to bear on practical projects of narrower scope. It seems likely that investing time and resources in projects like these will have more positive impact than would an expanded ERM Data Dictionary. Accordingly, we see more value in NISO serving as a catalyst, incubator, and developer of projects and initiatives of carefully delimited scope but strong potential impact. For example, NISO could more profitably help bring together and coordinate work on link resolvers, knowledge bases, and serials holdings and description; re-start active discussion of license description and encoding; and facilitate work on identifiers of various kinds.

However, we continue to have strong concerns about interoperability. For example, CORE was an important and practical initiative that has sadly sat on the shelf, and many libraries continue to be unable to have a link resolver from one vendor communicate successfully with another’s knowledge base. We urge NISO to continue its work to overcome these problems, and we turn next to the “workflow” problem, which seems ripe for further development and an area where interoperability could prove both important and challenging to achieve.

While Steering Group members believe that attention to some or all of the standards issues just summarized will help make ERM systems and services more robust and functional, we also think it is important to try to take a broader view of functionality—especially managing the subset of tasks many refer to as “workflow support.” Rather than proposing work toward an eventual standard, we encourage NISO to foster discussion, identification, and promotion of best practices in this area.

In citing both “Progress and Pain Points” within the ERMS environment in this report’s introduction and background section, we noted that while respondents to the survey reported on by Klusendorf[22] did not identify workflow support as a major problem, many who responded to the more recent survey by Collins and Grogg[7][8] did. We also noted that many respondents to the latter survey felt few existing systems provide the workflow support they would like to see. Those conclusions aligned with steering committee members’ assessments, as it began work in early 2009, of the ERM market and we now believe more firmly that future ERMS and complementary supporting systems or services can and should address workflow support far better than they currently do.

While we believe this to be the case, a key challenge to overcome is that the term “workflow” means different things to different people—as suggested by the diversity and extent of literature related to ERM workflow—and a shared understanding of scope would be helpful. A partial inventory of this literature—which Steering Committee member Deberah England originally developed with a narrower focus on e-journal workflow issues—is included as Appendix B and runs to well over 100 entries. This bibliography includes articles and slide sets covering a wide array of topics, such as workflow analysis and redesign, changing work roles, and core competencies for e-resource librarians. While many describe local circumstances and work, others were intended to be more general or universal.

An early formulation of workflow support requirements that we believe continues to help “anchor” the meaning of the term is available in Appendices A and B to the 2004 ERMI Report cited earlier[19]. These documents respectively provided “a full numbered set of Functional Requirements and a set of flowcharts to depict processes needing to be supported by an ERM, such as mounting trials, routing licenses, placing orders, implementing access, and notifying relevant staff were provided.” The majority of the top-level requirements fell under the “Staff Requirements” category, including at least a dozen pertaining directly or indirectly to workflow support—many of which were elaborated upon in further detail. We would like to draw special attention to requirement 30, which indicates that an ERM should help to:

“Establish a site-defined routing workflow for resources that are approved for purchase. For example, it should be possible to send notifications to designated staff or departments or to place resources in a queue for further action by those units to trigger actions such as the placing of an order, completion of cataloging, and implementations of access management by designated staff.”[19]
While these documents were meant to describe general ERM requirements, a number of libraries have also worked to analyze and rationalize their local ER-related workflows, and we identified and reviewed dozens of documents generated for such purposes by various libraries and related organizations. To further discussion, we have listed and are making available several especially interesting and useful workflow flowcharts. (See Appendix C for descriptions and access details.) To get a sense for commonalities and differences, we decided to analyze them with respect to which of eight functional areas they addressed: trial and selection, licensing, acquisition, cataloging, registration and activation, access maintenance, troubleshooting, and evaluation. While we noted some variations in language and approach, we also noted substantial consensus regarding the tasks and decisions needing to be supported.

Despite that consensus, libraries do differ considerably in size, organization, and local priorities—making it difficult to imagine solutions that will fit all situations reasonably well. Gustafsen-Sundell[15] has recently argued that those local differences and needs should be kept firmly in mind when deciding whether to acquire and implement an ERMS. In addition, R2 Consulting principals Ruth Fischer and Rick Lugg have argued convincingly that many libraries have under-supported their ERM-related activities and should shift resources to them from elsewhere in their organizations[14]. Not only are local needs and priorities critical, but local ERM-related organizational arrangements in many libraries are likely to be in substantial flux over time.

At several points during this project we also became aware of libraries investing time and effort in solving locally-prioritized workflow support problems through the creative uses of various tools and products that were not designed for ERM support. Recent experiments along these lines reported on during the 2010 and 2011 ER&L conferences include Montana State University’s use of blogs for internal communication about e-resource troubleshooting[3], Eastern Kentucky University’s use of DRUPAL to record different workflow “states” for their e-resources[31], use of the JIRA “bug ticketing” system first at Stanford and more recently Reed College[1], the Claremont University Consortium’s development of its prototype “ERATS” system based on the Footprints helpdesk ticketing system[2], and work being undertaken as part of the Kuali OLE project[11].

We have also noted that developers of several ERMS have been focusing on designing workflow support into ERMS applications. For example, Notre Dame’s Ben Heet showed sample slides from the CORAL workflow modules at the 2011 ER&L conference that illustrate that library’s pragmatic focus[16]. Workflow support has also been featured in recent ERMS webinar presentations about ExLibris’ Alma, and OCLC’s and Serials Solutions’ “web scale management” products and services. We also learned from Steering Committee member Tim McGeary, who is heavily involved in Kuali OLE development, that workflow support has figured fairly prominently in that project’s scenario discussions and related “user stories,” and that staff from the Kuali OLE partners contributed over 1200 user stories related to a variety of library workflows. Inherent in its goal to produce a next-generation library management environment is the focus of Kuali OLE to build workflows that encompass both print and electronic resources to reduce parallel, and often competing, processes. Additionally, Kuali OLE and JISC are
exploring a joint project to leverage their respective partnerships and development to manage electronic resources in a more open and collaborative environment.

We enthusiastically welcome and endorse all of these efforts, and note that since the functioning of next-generation ERMS is still being determined to some degree, this is an opportune time to share information about the most promising approaches and pursue greater clarity within the community about needs and priorities.

We see improved workflow support as crucial to the success of the next-generation ERMS, but achieving it poses significant risks to developers of investing heavily but “getting it wrong,” due to the scope, complexity, and local variability issues cited above. In addition, the fluidity and rapid change characteristic of the e-resources marketplace further suggest that libraries’ workflow needs and priorities may shift rapidly. While marketplace competition generally provides a good and powerful impetus, and we are sure that developers are making their best efforts to identify and address their customers’ workflow support needs, we believe NISO can help mitigate some development risks and steer development in the most useful and promising directions through some modest and timely actions.

Specifically, we propose that NISO work to broaden the community knowledge base related to ERM workflow support and help articulate system development and local implementation priorities by organizing a series of webinars on ERM workflow support during the first half of 2012. Developers, innovators, and other “thought leaders” could be invited to present their best thinking about such topics as: approaches to and tools for organizational and task analysis; workflow analyses related to particular e-resource functions or lifecycle stages, such as trial and selection, licensing, and troubleshooting; alternative and emerging approaches to workflow support; and vendor/developer perspectives on workflow support in the next-generation ERMS. Survey feedback to these presentations could be gathered during these sessions, and survey results and highlights presented and discussed at upcoming conferences, such as ER&L 2012, NASIG, or ALA Annual.
5. References


Appendix A: Summary of Mapping Review Findings and Recommendations

(Detailed mappings available at: [http://www.niso.org/workrooms/ermreview/mapping_spreadsheet](http://www.niso.org/workrooms/ermreview/mapping_spreadsheet))

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name</th>
<th>Mapped?</th>
<th>Findings and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Link Resolvers and Knowledge Bases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 OpenURL</td>
<td>Open Uniform Resource Locator (URL)</td>
<td>No</td>
<td>Ubiquitous, widely accepted tool within the electronic environment; no further analysis done.</td>
</tr>
<tr>
<td>1.2 KBART</td>
<td>Knowledge Bases and Related Tools</td>
<td>Yes</td>
<td>Fully endorse; substantial benefits to adopting selected KBART elements in preference to ERMI’s.</td>
</tr>
<tr>
<td>1.3 IOTA</td>
<td>Improving OpenURLs Through Analytics</td>
<td>No</td>
<td>Welcome effort with significant efforts likely, but not directly relevant to ERMS context/functioning.</td>
</tr>
<tr>
<td><strong>2. The Work, Its Manifestations, and Access Points</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 DOI</td>
<td>Digital Object Identifier System</td>
<td>No</td>
<td>Data dictionary not available; Vocabulary Mapping Framework may be useful for relating data elements.</td>
</tr>
<tr>
<td>2.2 MARC 21</td>
<td>MMachine Readable Cataloging</td>
<td>Yes</td>
<td>Several fields helpful for tracking title changes and preserving historical information about specific resources.</td>
</tr>
<tr>
<td>2.3 ONIX for Serials</td>
<td>ONline Information eXchange for Serials [subsets]</td>
<td></td>
<td>Provides more flexible structure and granular information than ERMI, but some ONIX values could be expanded to accommodate ERMI data elements or values.</td>
</tr>
<tr>
<td>2.3.1 SOH</td>
<td>ONIX Serials Online Holdings</td>
<td>Yes</td>
<td>E-publication format codes and ONIX Date format likely to be especially useful.</td>
</tr>
<tr>
<td>2.3.2 SPS</td>
<td>ONIX Serials Products and Subscriptions</td>
<td>Yes</td>
<td>Several potentially useful elements (form and format codes, work identifier code, embargo type, etc.).</td>
</tr>
<tr>
<td>2.3.3 SRN</td>
<td>ONIX Serials Release Notification</td>
<td>Yes</td>
<td>Potentially useful elements/values are embargo type/count back unit, extent type, and unit codes.</td>
</tr>
<tr>
<td>2.6 TRANSFER</td>
<td>Transfer Code of Practice</td>
<td>Yes</td>
<td>Very helpful and fully endorsed; elements of special value include back-file url and archiving arrangement, and COUNTER compliance.</td>
</tr>
<tr>
<td><strong>3. Integration of Usage and Cost-Related Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 CORE</td>
<td>Cost of Resource Exchange</td>
<td>Yes</td>
<td>A worthwhile Best Practice that vendors should implement, but some definitions could benefit from greater structure.</td>
</tr>
<tr>
<td>3.2 COUNTER</td>
<td>Counting Online Usage of Networked Electronic Resources</td>
<td>Yes</td>
<td>Widely accepted standard that ERMS should accommodate.</td>
</tr>
<tr>
<td>3.3 SUSHI</td>
<td>Standardized Usage Statistics Harvesting Initiative</td>
<td>No</td>
<td>Mapping not needed because this is a data transmission protocol rather than a data standard; view as valuable effort and model for other potential applications.</td>
</tr>
<tr>
<td><strong>4. Coding License Terms and Defining Consensus</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1 ONIX-PL</td>
<td>ONIX for Publications Licenses</td>
<td>Yes</td>
<td>Neither ONIX-PL nor ERMI adequately address library needs for license encoding and communication; suggest NISO facilitate further discussions and a &quot;third way.&quot;</td>
</tr>
<tr>
<td>4.2 SERU</td>
<td>Shared Electronic Resource Understanding</td>
<td>Yes</td>
<td>Fully endorse and urge wider adoption, but local interpretation and encoding still needed.</td>
</tr>
<tr>
<td>Acronym</td>
<td>Name</td>
<td>Mapped?</td>
<td>Findings and Recommendations</td>
</tr>
<tr>
<td>---------</td>
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<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>5.1 i²</td>
<td>Institutional Identifiers</td>
<td>Yes</td>
<td>Fully endorse; institutional identifier of wide potential benefit; additional institutional relationship elements could be useful.</td>
</tr>
<tr>
<td>5.2 WorldCat Registry</td>
<td>WorldCat® Registry</td>
<td>No</td>
<td>Worth following for potential ERM data management efficiencies.</td>
</tr>
<tr>
<td>5.3 Shibboleth</td>
<td>Shibboleth® System</td>
<td>Yes</td>
<td>Efficient/effective single sign-on is important within the electronic environment but mostly out of scope for ERM.</td>
</tr>
<tr>
<td>5.4 vCard</td>
<td>vCard (originally Versit Card)</td>
<td>Yes</td>
<td>Could be useful for contact and organization information.</td>
</tr>
</tbody>
</table>
Appendix B: Workflow Best Practices Bibliography

(Note: This is an updated and expanded version of a bibliography by Deberah England titled *Finding Our Direction: Towards Establishing E-Journal Workflow Best Practices* that she developed for the 2009 Electronic Resources & Libraries Conference. Used with permission.)

**Essential Readings**


Recommended Readings and Presentations


Making Good on the Promise of ERM


Making Good on the Promise of ERM


Making Good on the Promise of ERM


Making Good on the Promise of ERM


Electronic Resources Librarians and Related Positions and their Core Competencies


### Appendix C: Workflow Documents List

(Selected documents available at: [http://www.niso.org/workrooms/ermreview/workflow_docs_list/](http://www.niso.org/workrooms/ermreview/workflow_docs_list/))

<table>
<thead>
<tr>
<th>Source</th>
<th>Document</th>
<th>Availability</th>
</tr>
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</table>