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Reconfiguring the Library Systems Environment

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Context

Think of some of the ways in which the environment that library users operate in has changed in recent years. Behaviors and expectations have been reconfigured in a network environment as more of what people do enters a network space.

- **Discovery happens elsewhere:** People discover items of interest in a variety of ways: on search engines, in their RSS aggregators, in the resource networks created on social network sites, in consumer recommendations, on collaborative bookmarking sites, in reading and course lists, and so on. Increasingly, we cannot expect users to seek out individual Web sites or resources.
- **In the flow:** Now that readers and writers increasingly organize their work in network environments, we must build library services around their workflow (or learnflow, or researchflow, or…). This flow is supported by a range of personal tools (RSS aggregators, toolbars, …), network services (Facebook, del.icio.us, …), and by prefabricated workflow support systems (course management systems, for example). Readers and writers expect to work with information resources in those environments, to "gather, create and share."[i] An important issue here is that the applications that manage the flow (whether it is a social networking site, an RSS aggregator, or a course management system) become the consumers of resources. This creates a demand for machine interfaces: RSS feeds, portlets, Web services, and so on.

- **Information is abundant; attention is scarce:** As resources, tools, and environments proliferate so does the attention available for any single one of them decline. The implication here for libraries is clear: readers and writers have many choices, so convenience of use is really important.
- **Social value and personal value:** Scholarly, cultural, and information products are social creations, and their reception is often social. The library model supports this in various ways, but the social aspect of the creation and reception of knowledge has tended to happen outside the library, in the seminar room, the conversation, the review. However, we are now seeing social value created around scholarly and cultural products in network services (think of Flickr, Connotea, LibraryThing, …). Libraries have begun to think about pushing services into social networking sites and adding social networking features to their own services. How do we create social value within library information services?
- **The rich get richer—aggregation of supply and demand:** Our network experience is characterized by large hubs that exert strong gravitational force on users. Google, Amazon, Realtor.com, eBay, expedia, and so on all aggregate supply. They provide a service that connects a unified discovery experience to multiple fulfillment services; they reduce the effort of getting things done on the network by removing clicks. They also aggregate demand by mobilizing large numbers of users. In this way, hubs provide incentives for both suppliers and

consumers to participate; the more users who participate, the more valuable hubs become. I have discussed this dynamic at some length elsewhere in relation to library resources.[ii]

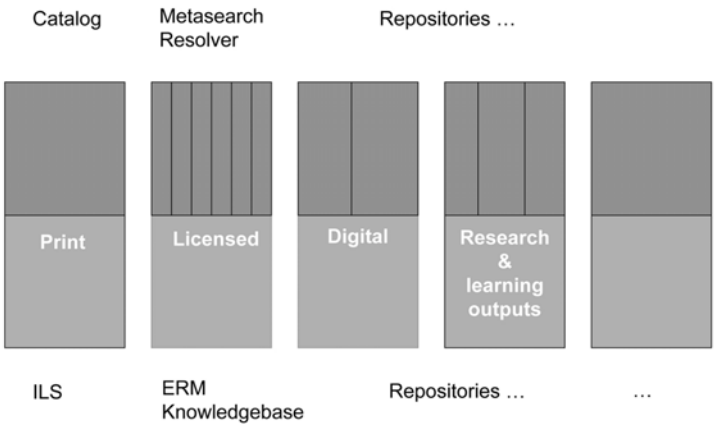
- **Data works hard:** On the network, we shed data about what we do; we leave tracks. The mobilization of this data is now a central part of our Web experience. Services adapt what they do based on what they know about you (such as Amazon recommendations); they create new services by comparing what they know about different people; they provide contribution platforms for data (for example, reviews and recommendations).

These and other factors have radically changed the user and service environment in which libraries operate. Libraries are also working through what it means to offer services in this type of environment. However, a major issue has emerged. The library systems environment was, by and large, shaped before the current period, and it was shaped by different requirements. In the remainder of this brief article, I want to consider that systems environment and suggest some possible directions as we look to better align our capacities to changed circumstances.[iii]

The Library Systems Environment

One of the main issues facing libraries as they work to create richer user services is the complexity of their systems environment.[iv]

Consider these pictures:



Reductively, we can think of three classes of systems that have grown up around three main categories of materials workflow in libraries—(1) the classic ILS, substantially focused on "bought" materials, (2) the systems framework emerging around licensed materials, and (3) potentially several repository systems for "digital" resources. Of course, there are other pieces, but I will focus on these. These three areas are the main areas of systems investment in libraries and tend to be managed independently.

In each case, what we see is a backend apparatus for managing collections, each with its own workflow, systems, and organizational support, and each with its own—different—front-end presentation and discovery mechanisms. What this means is that the front-end presentation mirrors the organizational development over time of the library backend systems, rather than the expectations or behaviors of the users.[v]

You have the catalog over here, maybe several options for licensed resources (a-to-z, metasearch, Web pages of databases, and so on) over there, and potentially several repository interfaces (local digitized materials, institutional repository) somewhere else.

This is one reason that people have difficulties with the library Web site. Effectively, it is a layer stretched over a set of systems and services which were not designed as a unit. Indeed, in some cases, they were not originally designed to work on the Web at all. Here are some thoughts about each of these main systems strands:

> **ILS:** a management system for inventory control of the "bought" collection (books, DVDs, and so on). The catalog is layered onto this and gives a view of this part of the collection. In effect, by virtue of its integration with inventory management, the catalog provides discovery (what is in the collection), location (where those things are), and request (get me those things) in a tightly integrated way. The ILS and catalog may be part of a wider apparatus of provision and may have mechanisms for interfacing to resource sharing systems of one sort or another. The management side may have interfaces to a variety of other systems for sharing and communicating data: procurement, finance, student records. There also will be a flow of data into the system from jobbers as part of a shared cataloging environment, and so on.

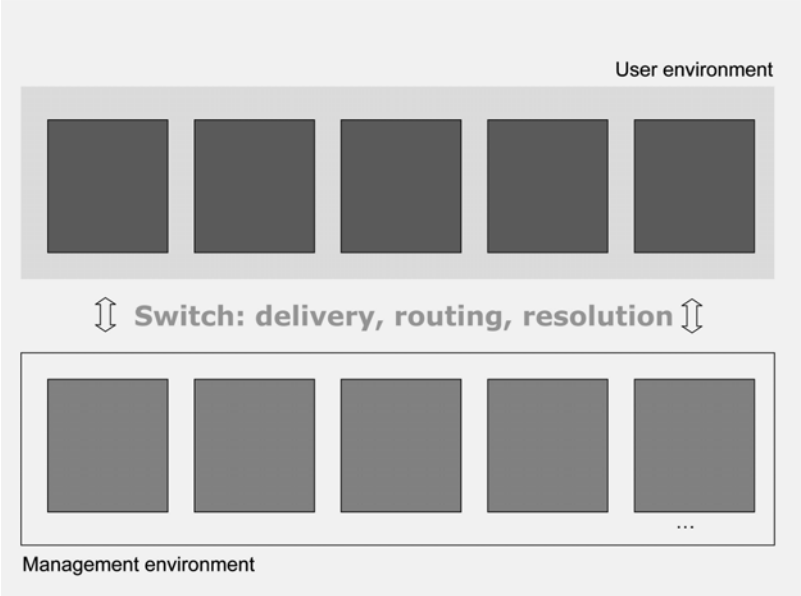
Licensed: This has been an area of rapid recent development as the journal literature moved to electronic form. On the backend, we now see a variety of approaches; and the frontend can be very confusing with lists of databases and journals presented in various ways, often in uncertain relation to the catalog (Where do I look for something?). We are now seeing the emergence here of an agreed set of systems around knowledge-base, ERM, resolution and metasearch; and there is rapidly developing vendor support. This is the range of approaches for which Serials Solutions has proposed the ERAMS name. These systems require the management of new kinds of data; and mechanisms are being put in place, certainly not yet optimal, for the creation, propagation, and sharing of this data. With journals, discovery, location, and request operations are not so tightly coupled as they were with the catalog. Discovery has happened in one set of tools (A&I databases) but then the appropriate title may have to be located in another tool (the catalog, for example), and—if not available locally—requested through yet another system. The importance of the resolver and the enabling OpenURL has been to tie some of these things together and remove some of the human labor of making connections between these systems. Metasearch has been seen as a way of reducing human labor by providing a unified discovery experience over disparate databases. However, this whole apparatus is still not as well seamed as it needs to be, and users and managers still do more work than they should to make it all work.

Repository: Libraries are increasingly managing digital materials locally and supporting repository frameworks for those. This includes digitized special collections, research and learning materials in institutional repositories, Web archives, and so on. There are a variety of repository solutions available, some open source. Typically, the contents of the repository backend may be available to repository front-ends on a per-repository basis. Here, discovery (what is there), location (where is it), and request and delivery are typically tightly integrated. Repositories may also have interfaces for harvesting or remote query. On the management side, metadata creation and material preparation may still be labor-intensive.

Here are some general observations about this environment:

- There is still a major focus—in terms of attention, organizational structures, and resource allocation—on the systems and processes around the ILS and the bought collection. In academic libraries, we will surely see some of this move toward the systems and processes around the licensed collections, given the rising relative importance of this part of the collection. The repository strand of activity, associated with emerging digital library activities, may, in some cases, be supported from grant or other special resources. It will need to become more routine.

- The fragmentation of this systems activity, the multiple vendor sources, the different workflows and data management processes, and the absence of agreed simple links between things mean that the overall cost of management is high.
- There is also another cost: diminished impact and lost opportunity. The awkward and disjointed structures described above also mean that it is difficult to mobilize the consolidated library resource into other environments—course management or social networking systems for example. By "consolidated library resource" I mean the ability flexibly to put what is wanted where it is wanted
- There has been much discussion of library interoperability, but it has tended to be about how to tie together these individual pieces or about tying pieces to other environments (for example—how do I get my repository harvested?). There has been less focus on how one might abstract the full library experience for consumption by other applications—a campus portal, for example.



For many of the reasons identified above, we are seeing a growing interest in separating the discovery and presentation front end from the management backend across this range of systems, as shown in this picture (see figure 2). Why? Well, because it is becoming clearer, as I suggested in my opening, that legacy system boundaries do not effectively map user preferences and because fragmentation adds to effort and accordingly diminishes impact.

What about the discovery side? Metasearch emerged as a partial response to fragmentation of A&I databases. We are now seeing a new generation of products from the ILS vendors that looks at unifying access to the library collection: Encore, Primo, Enterprise Portal Solution. However, discovery has also moved to the network level. So, people can discover resources in Amazon, Google, Google Scholar, and so on. OCLC is working to create discovery experiences that connect local and network through Worldcat Local, Worldcat.org, and Open Worldcat. In addition, discovery is moving to personal and social spaces (RSS aggregator, del.icio.us).

On the management side, the variety of workflows and systems adds cost, as resources are managed on a per-format basis. We can expect to see simplification and rationalization in coming years as libraries cannot sustain expensive diversity of management systems. The National Library of Australia's discussion of a "single business" systems environment or Ex Libris' discussion of Uniform Resource Management is relevant here.[vi] It is likely that there will be a growing investment in collaboratively sourced solutions, as libraries seek to share the costs of development and deployment.

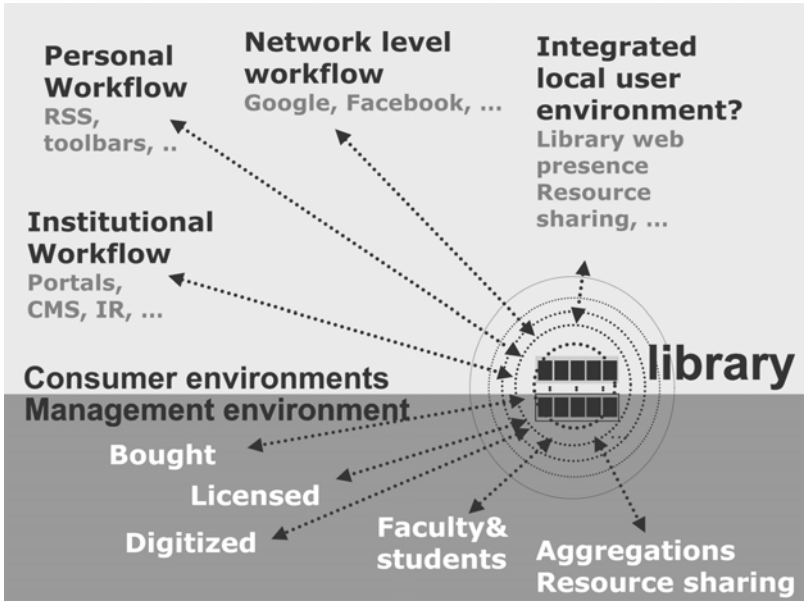
As discovery peels off, then the issue of connecting discovery environments back to resources themselves becomes very important. It is interesting to look at Google Scholar in this regard since different approaches are required for the three materials categories identified above. It has worked with OCLC and other union catalogs to connect users through to catalogs and the ILS; it has worked with resolver data to connect users through to licensed materials; and it has crawled repositories and links directly to digital content.[vii]

Given this evolution toward separate presentation and management environments, several issues become very important:

- Routing, resolution, and registries become critical, as one wants to enable users to move easily from a variety of discovery environments to resources they are authorized to use. We need a richer apparatus to support this.[viii]
- Libraries have thought about *discovery*. There is now a switch of emphasis to *disclosure*; libraries need to think about how their resources are best represented in discovery environments that they do not manage. See, for example, a discussion of these issues in relation to the catalog.[ix]
- Again, how we present library services for consumption by other environments becomes an issue. For example, we are lacking an ILS Service Layer,[x] an agreed way of presenting the functionality of the ILS so that it can be placed, say, in another discovery interface (to present shelf status, place a hold, and so on in Worldcat Local or Primo, for example).

- Better discovery puts more pressure on delivery, whether from a local collection, throughout a consortium, or in broader resource sharing or purchase options. Streamlining the logistics of delivery and providing transparency on status at any stage for the user (as they can do with UPS or Amazon) become more important.

Some Conclusions



We are accustomed to thinking about better integration of library services. That is a means, however, not an end. The end is the enhancement of research, learning, and personal development. The issue here is not so much the integration of library resources with each other as it is their flexible recombination and integration into multiple user environments.

As discussed, these might be the personal digital environments that we are creating around RSS aggregators, toolbars, and so on or the prefabricated institutional environments such as the course management system or the campus portal. They may be the emerging service composition environments like Facebook or iGoogle, as well as in network-level discovery environments like Google or Amazon that are so much a part of people's behaviors. This seriously changes the way in which we think about resources.

A new pattern has not yet emerged, so here are some tentative suggestions about direction as we learn how to better provide services in network environments:

In the flow: The impact of technology on the research and learning behaviors is a much more important issue for libraries than the impact of technology on library operations per se. As libraries move to provide services to readers and writers where they are, they need to understand how people are organizing their working and learning lives and how they expect to interact with information resources. Increasingly, this interaction is across the lifecycle as they gather, create, and share resources. Providing information resources that are adaptable to multiple purposes and that can be used in a course management system, an RSS aggregator, or in other future environments, moves beyond our current provision models and raises various implementation issues.

Disclosure: A major consequence of reaching into the flow is the adoption of a disclosure model in which data, services, and links are syndicated into other environments. Think of each of these in turn. A library may want to synchronize

data with union catalogs, Google Scholar, and other network-level discovery services. As noted above, the activity associated with different materials workflows (ILS, licensed, digital repository) will probably go in different directions. There is merit in exposing metadata for unique digital collections, whereas data for licensed materials or for "bought" materials will need to be "switched" by an intermediate service for effective use. Libraries are syndicating services through RSS feeds, toolbars, Web services, HTML fragments, and so on. This is an area that is in its early days and is linked to existing practices. We do not have much data yet on what the impact of some of these initiatives is.

Consolidation: A major issue for libraries is fragmentation—fragmentation of their management systems that adds cost and complexity, fragmentation of their presentation environments that reduces gravitational pull, diminishing demand. Accordingly, libraries do a poor job of aggregating supply and demand in a network environment. Consolidation may occur at multiple levels:

- ***Management environments*:** We are likely to see greater use of collaboratively sourced or commercially sourced management environments. We can already see a trend to shared consortial systems. There are three drivers here. The first is to reduce the overall cost of ownership. The second is to facilitate integration and shared practices across the current different systems. The third is to generate network effects. Think, for example, of generating recommendations across the

aggregate circulation data of many libraries. In line with this trend will be the emergence of more software-as-a-service offerings, parallel with the general trend in other sectors.

- ***Discovery environments*:** We will also see greater consolidation in the way libraries present themselves. Think of the value of the OhioLink model, in which Ohio universities have a rich aggregate resource available to them in an integrated way. Think of DEFF in Denmark or Libraries Australia. There are also multiple drivers here. Again, one is to improve service while reducing cost of ownership. Think of the complexities surrounding metasearch or the difficulty for a single library to contemplate locally loading A&I data. A consortial approach may be more helpful. Another is to create a stronger network presence, a place for libraries on the Web. Again, OhioLink is a good example. Another is to act as a switch between other network services and library fulfillment options.

Boundary reconfigurations: We have seen two major service developments that resulted in a shift in how libraries allocated resources. The first was around shared cataloging and resource sharing. The second was around the move to externalize through licensing arrangements the journal literature and its indexing tools. The pace of current adoption of network approaches suggests that we may be ready for other ways of collaboratively, or commercially, sourcing shared operations. For example, does it make sense for there to be library by library solutions for

preservation, social networking, disclosure to search and social networking engines, and so on. It makes sense to look to larger units for a growing range of activity. Our organizational contexts are not quite keeping pace with this reality.

Customer relationships and business intelligence: Although libraries may have very good individual relationships with faculty and students, these do not scale across whole populations. Increasingly, we expect data-driven adaptations in the services we use, and libraries need to think about how to meet these expectations. Libraries will begin to make more use of data (from circulation systems, resolvers, request systems, and so on) to refine choices and to target services. This data needs to be aggregated across libraries.

In summary, we can see trends to consolidation at the same time that there is a need for greater diffusion of services into users working and learning environments. Our current systems environment is not very well suited to support either of these trends. At the same time, there is a need to rebalance local activity and shared or outsourced activity, maximizing the library resources available to engage with readers and writers in shaping new services.

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Notes

[i] "Gather, create, share" is the suggestive formulation of Raymond Yee. Raymond Yee, GatherCreateShare, http:www.raymondyee.net/wiki/GatherCreateShare (accessed January 11, 2008).

[ii] Lorcan Dempsey, "Libraries and the Long Tail: Some Thoughts about Libraries in a Network Age," *D-Lib Magazine* 12, 4 (April 2006), http://www.dlib.org/dlib/april06/dempsey/04dempsey.html (accessed January 15, 2008).

[iii] This article expands my blog entry with a similar title: "The network reconfigures the library systems environment." Dempsey, Lorcan Dempsey's Weblog: On Libraries, Services and Networks (July 2007), http://orweblog.oclc.org/archives/001379.html (accessed January 11, 2008).

[iv] See the discussions of this arena by John Wilkins. John Wilkins, "Next generation library systems," John Wilkins' Blog on Libraries, Library Technology, and Pizza, http://scholarlypublishing.org/jpwilkin/archives/7 (accessed January 11, 2008); see also Jonathan Rochkind, "Notes on future directions of Library Systems," Bibliographic Wilderness, http://bibwild.wordpress.com/2007/09/28/systems_directions/ (accessed January 11, 2008).

[v] This issue is very well discussed in: Krisellen Maloney and Paul J Bracke, "Beyond Information Architecture: A Systems Integration Approach to Website Design," *Information Technology and Libraries* 23, 6 (December 2004): 145–52.

[vi] *National Library of Australia IT Architecture Project Report, March 2007*, http://www.nla.gov.au/dsp/documents/itag.pdf (accessed January 11, 2008); see Oren Beit Arie's contribution to the Library of Congress Working Group on the Future of Bibliographic Control as summarized in the report of the meeting. Nancy J. Fallgren, "Users and Uses of Bibliographic Data Meeting, March 8, 2007, Mountain View, CA.: Brief Meeting Summary," Library of Congress, http://www.loc.gov/bibliographic-future/meetings/2007_mar08.html (accessed January 11, 2008).

[vii] See Google Scholar's "Support for Libraries" page for partial details. Google Scholar beta, "Support for Libraries," Google, http://scholar.google.com/intl/en/scholar/libraries.html (accessed January 11, 2008).

[viii] I have discussed the role of registries in "Registries: the intelligence in the network." Dempsey, Lorcan Dempsey's Weblog: On Libraries, Services and Networks, http://orweblog.oclc.org/archives/001105.html (accessed January 11, 2008).

[ix] Dempsey, "The Library Catalogue in the New Discovery Environment: Some Thoughts," *Ariadne* 48 (July 2006), http://www.ariadne.ac.uk/issue48/dempsey/ (accessed January 11, 2008).

[x] Dempsey, “A palindromic ILS service layer.” Dempsey, Lorcan Dempsey's Weblog: On Libraries, Services and Networks (January 20, 2006), http://orweblog.oclc.org/archives/000927.html (accessed January 22, 2008).