Resource Discovery Systems at the UNT LIBRARIES

UNT LIBRARIES

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UNT Libraries
THE POWER OF IDEAS STARTS HERE

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Introduction

The UNT Libraries act as a centralized repository for research-related materials used by the University of North Texas Community and unaffiliated scholars from across the globe. From a tiny cuneiform tablet, created c. 2,033 B.C., to electronic journal articles published within the last month, the Libraries are a true world leader in the collection of ideas and the dissemination of knowledge both past and present.

The Organic Growth of Materials Available in UNT Libraries

As a constantly evolving collection, the Libraries make available a staggering amount of content in both print and electronic forms. As of 2010 this collection consisted of:

- Approximately six million print materials including books, journals, government publications, maps, graphical works, and microforms
- 180,000 unique items in digital collections
- 150,000 cataloged audio recordings
- 30,000 electronic journals and other online-publications
- 30,000 film and video materials
- 1,000s of unique and rare items
- 350 electronic reference and aggregation sources

Investment in these collections is substantial. In 2010, the Libraries spent roughly 1.3 million dollars in the one-time purchase of physical media and committed 4.5 million dollars to electronic serial subscription services. Additionally, hundreds of thousands of work-hours were employed by library staff in attempts to disseminate this information through education, cataloging, programming, and other ongoing curatorial efforts. With such vast holdings, users of the Libraries have at their disposal the types of materials required to sustain robust scholarly activates in numerous academic disciplines, and UNT, itself, is poised to act as a major research institution for years to come.

However, the volume of materials available through the Libraries presents difficult challenges for the institution and its users. Historically, access to information has been mediated by a collection of independent automated systems. In this respect, the Libraries have employed a model similar to those of libraries at many of UNT's peer institutions.

- A library website serves as the information gateway to help discovering all materials and services that the library offers.

- A library catalog manages bibliographic and item records about books, journals, audio-visual materials and other (mostly) physical media.
- One or more web-accessible electronic resource management tools act as gateways to aggregate databases, abstracting services, online subscription journal articles, and streaming media.
- A digital library houses unique digital items curated by the library.
- Finally, numerous smaller systems and ad-hoc strategies are employed in both smaller web applications and traditional webpages to mediate access to a segment of the library's holdings. Examples include finding aids, subject guides, recommendation lists, and the like.

Under this model, each system or tool is a distinct entity, offering disparate search and browsing functions, unique help materials of varying quality, and often radically different user interfaces. In only a few rare cases will the content of one system overlap with another. In many cases the systems are built and maintained by multiple teams of administrators and staff, and operate on different hardware and software configurations. While we may see them as a natural evolution of the types of services which have emerged in libraries over the past several decades, this disjointed service model often frustrates our end-users, and presents sustainability challenges to our library staff.

The challenge of Google, Amazon, and the marketplace

Of the many challenges facing libraries today, few are more axiomatic than those exerted by the search and retrieval strategies that individuals learn when using the World Wide Web. Industry leaders create robust web services that present relevant content to their users' needs in a fraction of a second and large communities develop around these tools. In a few cases, products develop such large user-bases that the usage patterns for those products become the canonical norm for all others in their class. Google's core search, Amazon's storefront, Flickr's photo sharing, and Facebook's social networking service are only a few examples of these industry leading web-based tools.

For better or worse, these flagship products have a clear impact on the expectations users have for other web and information-retrieval services, including those presented by the UNT Libraries. This is made quite clear by two quotes in a recent qualitative study of library services performed at UNT:

> *"Well I Google everything. It's the best way to get the most relevant information."*
>
> *"I use Google sometimes, if, like, I can't find enough at the UNT Library online, I usually just go to Google and look through Scholar to find any articles relating to my subject, preferably the free ones."*

Both cases have clearly indicated that our users' past experience with Google have influenced their information retrieval strategies. According to this same report, 80% of respondents choose to begin research on the wider web, rather than from the search tools provided by the Libraries. This statistic alone should give us pause.

The example of Google and its dominance in search is hardly unique when we consider other types of objects people attempt to locate. As we look at any given class of product or service, we can see that it stands at the top of its field, not because it was the first, but because it did something faster, simpler, and addressed the needs of individuals more efficiently than its competition. Clearly, Google Search's success didn't manifest itself overnight or by chance. We can look at Google's development model and see that the success of its search product is grounded in a careful analysis of usage data from real users, and that the organization has thrived by quickly adjusting and incrementally improving its product in response to this data.

What do we know about our users?

Understanding and effectively serving our users requires that we, as an organization, be both informed by and react to user behavior data. Employing real data provides pointers from which to start to address user needs, allows us to measure the costs and benefits of services we provide, and helps us to anticipate challenges in planning and deploying new technologies or services.

The primary clientele of the UNT Libraries includes the undergraduate students, graduate students, faculty, and staff at the University of North Texas. The following table correlates populations at UNT with the number of respondents to the LibQual Survey from Spring 2009.

User Group	Enrolled/Employed	%	LibQual Responses	LibQual %
Undergraduate	26,156	76%	1,454	70%
Graduate	7,097	21%	532	26%
Faculty	1,035	3%	85	4%
Totals	**34,288**	**100%**	**2,071**	**100%**

SOURCE: UNT INSTITUTIONAL RESEARCH & EFFECTIVENESS FACT BOOK; FIGURES FOR SPRING 2009,
UNT LIBRARIES LIBQUAL SURVEY MARCH – 2009

The data from this LibQual survey shows a pattern of library usage that is fairly consistent with that of enrollment and employment within the university community. However, both above measures lack methods for querying other user populations. As a research university library, many of our services are also open to the local community members, national and international researchers, and unaffiliated web users. In Spring 2009, looking to The Portal to Texas History as an example, we see that system saw 128,502 unique visitors from 172 countries/territories. During the same period of time, library staff recorded 615 queries from users identified as unaffiliated with UNT.

While understanding who our users are is important, understanding what they use is also vital. For 2010 there were over 1.6 million substantive page views within the library website, 4 million views within the catalog, and 6.3 million in the Digital Library and Portal to Texas History. Those numbers, undoubtedly, should bring a sense of urgency for improving the transparency and efficiency of our services, because the primary use of many of our web-services is mediating a user to a final source of information.

A natural question to ask then is: “Are we doing a good job as mediators?” The range of feedback we have received is quite interesting. From the comments gathered and other available data, we may surmise several key trends:

- A number of users are confused by the navigation structures and cognitive space of “The Library Website.” When users experience problems in using either one of the many library-hosted systems, or subscription services, their experience reflects upon the entire range of tools.
- Users are focused on the end-result, the successful discovery of a relevant item given their current context. Use of our current search and retrieval tools appear to be overly-complex and in many cases detrimental to the end-goals.
- Many users were pleased with the cross-electronic-database search provided by the Webfeat federated search system with which the Libraries experimented in 2009.

- Users appear to want both browsing and filtering options and some want the availability of help from real librarians in the resource discovery process. However there is a strong trend for self-reliance and self-discovery, and many from the "Google-generation" prefer smart and relevant search systems that consolidate results and lead to quick/instant answers to current needs.

Addressing the Issues

The UNT Libraries act as a single dissemination point for large quantities of information resources that both the University and the general public require, and many of our current web systems clearly were not built for offering Google-like experiences in discovering resources. However, this problem is not unique to UNT. Data collected from library users elsewhere over the past decade shows time and again the same patterns exhibited by the Libraries' own user population. In a recent issue of Library Technology Reports, Jason Vaughan (2011) illustrates this point with quotations from several of these studies. In summary, he writes, "The library (or systems supported and maintained by the library) is often not the first stop for research—or worse, not a stop at all. Users have defected, and research continues to illustrate this fact."

To address the resource discovery problem—to bring library systems into closer alignment with user expectations and thus make our systems both more effective and more pleasurable to use—a new breed of approach has evolved, and it is enjoying swift uptake among libraries. The Resource Discovery System (RDS) aims to help libraries take a more comprehensive approach to solving the discovery problem by separating discovery from libraries' traditionally fragmented systems environment. Reevaluating the Libraries' current resource discovery paradigm in light of what an RDS might offer is not only logical but imperative. Toward that end, this document explores the current RDS landscape. It examines the nascent yet growing body of literature on the topic; it provides an analysis of data collected from other institutions about their resource discovery environments and an overview of the current state-of-the-art of RDSes. Finally, it concludes by making recommendations on a path forward for the Libraries.

Literature Review

One can divide most of the current literature about RDSes (where one expands "the current literature" to cover blogs, websites, and what might otherwise be considered gray literature) into three basic groups. First are articles designed to explain and contextualize Resource Discovery and to describe, in practical terms, the differences between current systems. Second are items that discuss criticisms, concerns, and other issues surrounding use of RDSes. Finally are items describing individual libraries' experiences: strategic documentation, exploratory studies, implementation procedures, and usability studies.

Defining RDS

As a class of system, RDSes are still very new to libraries. Terminology is not yet standard. Definitions and classifications are fuzzy. The systems themselves are evolving quickly. Some of the systems that appeared in lists of "Next Generation Catalogs" just a few years ago—such as Marshall Breeding's July-August 2007 issue of Library Technology Reports—are now some of the usual suspects in lists of RDSes—such as Breeding's up-to-date Library Technology Guide covering Discovery Layer Interfaces (Breeding, 2011b). Federated Search is also an issue: different sources may or may not include it as part of Resource Discovery—and, either way, the relationship between these two technologies remains fuzzy.

Although the literature may not agree on names and definitions for the types of systems that this report calls "RDS," it does generally agree on a common set of characteristics.

1. RDSes endeavor to make library systems behave more like Web search.

Discovery systems are "modeled on the Google-style approach of building and then searching a unified index of available resources, instead of searching each database individually" (Luther & Kelley, 2011). This can include data from the catalog, digital collections, the institutional repository, open access repositories, journals and databases, and/or individual articles from journals and databases (Vaughan, 2011).

Like Web search engines, they employ query parsing, stemming, and other techniques for matching query terms in the index to boost recall. Antelman, Lynema, and Pace's oft-cited piece about North Carolina State University's Endeca-based catalog (2006) goes into detail about the query-matching options their system allowed in its original incarnation, which was novel in library catalogs at the time. Solr is an open source enterprise search indexer that serves as a component in many RDSes (such as Blacklight (Project Blacklight, n.d.), VuFind (Falvey Memorial Library, Villanova University, n.d.), and Summon (Dartmouth College Library, 2009)) and supports several different query parsers (The Apache Software Foundation, n.d.). Demian Katz, creator of VuFind, goes into some detail on the Villanova

Library Technology Development blog about practicalities of dealing with Solr's multiple query parsers (Katz, 2011).

RDSes employ relevance ranking of search results to mitigate the problem of low precision that comes along with high recall. Antelman, et al.'s piece on the NCSU catalog (2006) devotes a section to a discussion of relevance ranking. More recent sources that provide an overview of existing RDS options point out that relevance ranking is a standard, integral feature of such systems, although each vendor (for proprietary products) uses its own, closely-guarded ranking algorithms (Vaughan, 2011; Hoeppner, 2011; Luther & Kelley, 2011).

2. RDSes endeavor to make library systems behave more like Enterprise search.

Enterprise search refers to a class of software that allows searching of information within the confines of an organization instead of on the open Web. Although enterprise and Web search are similar, the different environments in which they function necessitate a few key differences. RDSes typically exhibit at least two particular features of enterprise search that are not usually features of Web search.

First, they leverage available metadata to provide faceted browsing of search results. Antelman, et al. (2006) describe at length the facets available in the original NCSU next-generation catalog. On the University of Wisconsin's blog about their RDS project, *Moving Forward*, Edie Dixon (2010) writes about the particular MARC data fields powering that system's facets. Like relevancy ranking, sources that provide an overview of existing RDS options cite faceted browsing as a standard, integral feature (Vaughan, 2011; Hoeppner, 2011; Luther & Kelley, 2011).

Second, enterprise search systems must help manage access control over content for different classes of users. Vaughan (2011) discusses that many Web Scale Discovery vendors expose in search results content that libraries haven't licensed alongside content that they have. Furthermore, some vendors allow citation metadata for licensed content to be displayed to users not affiliated with the library at all—such users can see the content in search results but not access it. The system must be able to manage the permissions and authorizations required to honor the many different licenses and contracts that apply to a library's resources.

3. RDSes support principles of modularity and openness.

Traditional library systems such as ILSes have always served multiple purposes with a single system: e.g., inventory control, back-end workflow management, and end-user resource discovery. Having the front-end interfaces, the back-end workflow/inventory management systems, and all of the data that supports them so closely intertwined prevents libraries from easily changing any one of these things. Libraries can't tweak their front-end interfaces beyond what their data will allow. Yet they can't update their data because doing so would break well-established business operations. RDSes take the necessary step of decoupling front-end discovery from back-end processes (Vaughan, 2011; Breeding, 2007a). Breeding's Library Technology Guides website demonstrates this system decoupling with a matrix showing the coincidence of discovery products and ILSes (Breeding, 2011b). Such decoupling allows the flexibility to present library data in ways that make sense on the Web without affecting business

processes. Thinking longer-term, promoting systems that are modular is a good way to make library systems/data generally more adaptable to change.

4. RDSes encourage data interoperability.

Providing effective search facilities across library information resources is, in a way, the opposite problem that Web search engines have tackled. The Web by nature provides an enormous pool of structurally homogeneous, interconnected, full-text information resources. Data interoperability on the Web, at least at a very basic level, is a given. Library data, on the other hand, is siloed—catalog data follows different standards than repository data, which in turn follows different standards than publishers' article-level data. Building the unified index required to perform Web-like searches over library data requires normalization of these and other disparate data formats (Lederman, 2009c; Hoeppner, 2011; Vaughan, 2011).

5. RDSes embody a user-centered philosophy.

To say that the RDS and the User-Centered Design movements are explicitly and directly related would be a stretch. However, RDSes certainly owe their existence to a general philosophy of user-centered-ness. They were created to help library systems better align with user expectations and to give users a more Web-search-like experience, based on several years' worth of user studies conducted by the library and academic community. Vaughan (2011), as part of his exploration of Web-Scale Discovery Systems, offers a snapshot of choice quotations taken from some such user studies conducted between 2003 and 2009. Breeding (2007b), in the opening paragraphs of a brief piece about Next Generation Catalogs, recounts, "One of the most biting indictments of all is that I hear stories about users who find library OPACs so unfriendly that they often go to places like Amazon.com to look for books of interest, and then flip over to the catalog to see if those titles are owned by their libraries." Next Generation Catalogs and RDSes are one possible answer to Breeding's "biting indictment."

6. RDSes support the local development of solutions that meet local users' needs.

Given the resources and the know-how, an enterprising library can pull together multiple components—including those belonging to one or more RDSes—into an architecture that meets users' needs better than any individual system could on its own. Vaughan points this out in Chapter 6 of his Library Technology Reports issue about Web Scale Discovery: "as platforms become more open, libraries with technical staffing can truly customize these tools to their local environments and include additional functionality." Vaughan also states, in an interview published by the ALA TechSource blog, "In some cases, APIs exist which allow the local library, if they wish, to create and design their own interface from scratch, and populate the results, in part, from the discovery index. This isn't just vapor – there are other libraries that have already done this, such as North Carolina State" (Freeman, 2011).

RDS System Typology

To further refine an understanding of RDSes, it is helpful to examine the subtypes of RDSes. For the most part, the literature agrees on two of these subtypes: Discovery Layers and Web-Scale Discovery Systems. Federated Search is a third type that is sometimes lumped together as a type of RDS. Though Federated Search relies on a different type of technology, this report includes a brief discussion here as it may play a role in a library's overall resource discovery strategy.

1. Discovery Layer, or Next Generation Catalog

Next Generation Catalogs began being deployed around the middle of the last decade and have been subsumed into the general category of "Discovery Layer." Marshall Breeding (2010) writes, "Initially, these new tools were called nextgeneration [sic] library catalogs, but now I prefer to call them discovery interfaces." Eric Lease Morgan captures the difference between conceptualizing this type of system as a "catalog" versus something else in a post written to the NGC4lib (or, Next Generation Catalogs for Libraries) listserv in June, 2006. He writes, "I see the information system provided to the patron not as an inventory control system (a catalog), but more like an annotated, extra-functional index to the stuff a library thinks is necessary to help its hosting institution get its work done. This is a superset of the catalog. Thus, such an index (NOT a metasearch engine) would include freely available ebooks, articles from open access journals, electronic theses & dissertations, pre-prints written by the institution, etc." This illustrates the thinking that has led many away from use of the term "catalog" to "discovery layer" or "discovery system."

Typically a Discovery Layer serves as a front-end to library data, decoupled from any underlying inventory/workflow systems. It provides the software to create a unified index (where Solr is often a component) but not the content that goes into the index. Such a system often *is* implemented as a replacement for a library's web OPAC, but it also often contains the local non-catalog data to which a library has easy access—metadata from local digital collections and institutional repositories, website content, and subject guide content, for instance.

2. Web-Scale Discovery Systems

These systems include a Discovery Layer and can index local content, but they also index content that would be difficult for an individual library to acquire on its own—i.e., article-level metadata and full-text resources. Acquiring these requires that a vendor work with a large number of different publishers—they must make agreements, set up harvesting processes, and create data normalization routines for each one (Breeding, 2011a; Hoepper, 2011; Vaughan, 2011). Serials Solutions' website illustrates the scope of this task: "Summon content comes from 6,800+ publishers and 94,000+ journal and periodical titles, with over 500 million items indexed in the centralized index" (Serials Solutions, 2010).

All Web-Scale Discovery Systems are sold by vendors, who put together a base index of content that is then provided to purchasing libraries. The index for this type of system therefore includes resources that any given library may not own or license. Most systems allow users to search the entire index and then present appropriate ILL options for acquiring them (Vaughan, 2011).

Due to the breadth of what they contain, these systems are (arguably) suited to serve as a library's "single-search" interface. That is the heart of the hype surrounding these (although some librarians believe this aspect is over-hyped—see the section, Literature Outlining Issues and Concerns).

Note that some institutions use an open source Discovery Layer in conjunction with a Web-Scale Discovery System—this gives them the benefit of the open source software's flexibility along with the benefit of the Web-Scale Discovery System's content.

Finally, we should note that Web-Scale Discovery is very new. WorldCat Local became available in late 2007; Summon in 2009; ESCO Discovery Service, Encore Synergy, and Primo Central in mid-2010 (Vaughan, 2011).

3. Federated Search Systems

In the literature, one may find Federated Search (also called Metasearch) Systems described as a type of Resource Discovery System because they promote library resource discovery in the generic sense of the phrase. Pradhan, Trivedi, and Arora (2011) make this argument. However, most sources use "Discovery System" specifically to describe one in which resources are aggregated into a single index. Federated Search, on the other hand, refers to a system in which resources remain in their native databases and are searched separately (albeit simultaneously) with one search. Sol Lederman's blog postings from early-to-mid 2009 ("Beyond Federated Search?" "Beyond Federated Search? The Conversation Continues," and "Discovering Discovery Services") exemplify the more common understand of the difference between the two terms.

It is possible that Federated Search might pick up the slack where RDSes leave off. Currently no single RDS searches everything, and one strategy to consider is the use of an RDS as part of a Federated Search along with other databases. Mike Taylor (2011) thoroughly discusses this possibility in a presentation given at the UK National e-Science Centre's Open Edge-Open Source in Libraries Workshop earlier this year.

Differentiating One RDS from Another

Within each category of RDS are many products. How does one begin sorting through the options? What differentiates one product from another?

1. Content/coverage, for Web-Scale Discovery Systems

Hoeppner (2011) shows estimates that, for example, Summon searches over 600,000,000 items and WorldCat Local searches over 750,000,000 items, while Primo Central searches only 250,000,000 items. The breakdown of book records versus article records versus theses and dissertation records etc. further differentiates each system. (The caveat of course is that different vendors collect and define these pieces of data differently.)

2. Completeness of index, for Web-Scale Discovery Systems

How much metadata-only versus full-text content is indexed? HathiTrust, for instance, has recently opened its database to Summon, which gives Summon access to full-text for books that may exist only as print in a library's collection. HathiTrust estimates that, by the time the service is rolled out, they will have approximately a 45% overlap with any given library's print collection (Wilkin, 2011).

3. Record parsing and data normalization

For Web-Scale Discovery Systems, this is generally a big question mark. Hoeppner (2011) discovered that different vendors deal differently with duplicate records that they receive from publishers. Vaughan (2011) echoes Hoeppner's findings. Due to this and other differences between vendors in terms of what data they receive and how they parse it, he says, "Reading between the lines, 100 percent coverage of a particular resource from one vendor may not be precisely the same as 100 percent coverage of that same resource from another vendor." If a library uses a Discovery Layer apart from a Web-Scale system, it has more control over this aspect, as it does much of the data harvesting, parsing, and normalization itself.

4. Back-end systems integration

As this report has already discussed, one of the advantages of implementing an RDS is that it decouples the user interface from the underlying ILS. Mixing and matching different RDSes with different ILSes is both a possibility and a reality. Still, as Vaughan (2011) points out, different RDSes will integrate better, worse, or just differently with different ILSes. Whether a library chooses a vendor product or open source, systems integration is something they will have to face eventually.

5. Interface flexibility

Open source systems are theoretically most flexible, but for Web-Scale Discovery Systems, this varies. Early on, Summon gained a reputation for providing an excellent API—Serials Solutions even maintains a public documentation center for it (Serials Solutions, 2010). EBSCO and WorldCat Local, on the other hand, either explicitly do not (yet) provide an API or are silent on the issue. An examination of data gathered from other institutions, presented later in this report, does indeed support that those using Summon seem to have more successfully integrated the system into their overall website user-interaction model than those using other systems.

6. Relevance ranking algorithms

Proprietary systems of course have proprietary relevance ranking algorithms and allow only very minor customization, if any—e.g., WorldCat Local only allows boosting the ranking of items in the local collection (Hoeppner, 2011). Open source systems allow libraries to customize the relevancy ranking as much as they want, given that they have resources to do so.

The upshot of all of the above differentiators is that the youth of the RDS market gives plentiful options. Constructing an entirely customized Resource Discovery infrastructure out of pieces that are currently available is a possibility. Purchasing an out-of-the-box system and plugging it into one's existing

infrastructure is another possibility. It depends on what an institution believes aligns with its strategic goals and what it can devote resources to support.

Outlining Issues and Concerns

The majority of the literature is overwhelmingly positive about RDSes. However, some of it identifies potential issues and areas of concern. Implementing an RDS is no panacea. Making a deliberate decision requires that we be informed about the potential consequences as well as the possibilities.

1. The first area of concern is content.

Content is key. Any given RDS can only index a portion of library resources—some index more than others. This introduces a couple of potential problems. A library may market its RDS as a one-stop search, and users may like it because it's easy to use. But, because it does not contain *all* of the library's resources, this is misleading (Lederman, 2010). Carl Grant writes, "Libraries and searchers should seek and demand tools that maximize their flexibility to address search problems across ALL resources [libraries have] selected to meet end user needs" (Grant, 2009). A related problem is that, for the time being, an RDS must live alongside other library systems and silos. If the RDS is not well-incorporated into the overall user-experience design of a library's website, it could end up seeming like just-another-library-silo, where the end-user is not exactly sure what he or she is searching. Dean Giustini's complaints about Summon stem from this basic problem. He wonders whether, in teaching activities, "browsing and discovery shouldn't be contextualized more simply. Use a subject guide. Google scholar. Academic Search Premier" (Giustini, 2011). One can apply that statement to the library website: how does a library convey to users simply and accurately what they are searching when they use the RDS without defeating the purpose?

2. The second area of concern is the dumbing down of library search.

Like Web search systems, RDSes tend toward higher-recall and lower-precision—they return a lot of results that might prove difficult to filter through. This is also part of Giustini's problem with Summon. "However, the depth and breadth of Summon (potentially, 700 million records) is also a potential weakness for users, and a source of information overload" (Giustini, 2011).

3. The third area of concern is that all Web-Scale Discovery Systems are proprietary.

Proprietary systems tend to have a black-box effect. In the case of a Web-Scale Dicovery System, libraries cannot know or affect exactly what content the system indexes, how the system indexes that content, how data is normalized, and how relevancy ranking functions (Jastram, 2011; Lederman, 2010). Another potential problem is that vendor-controlled Web-Scale Discovery establishes a pattern whereby selection of resources—which is one of the value-added services that libraries provide their patrons—is no longer controlled by the library (Grant, 2009; Lederman, 2009a; Jastram, 2011). Some are even concerned that, because certain Web-Scale Discovery System vendors are owned by publishers, the potential exists that they might introduce bias into search systems to favor their own content (Giustini,

2011; Jastram, 2011; Lederman, 2009b; Lederman, 2010). Recently EBSCO pulled all of its content out of Primo Central due to development on EBSCO's own discovery system, thus validating some of these concerns. Jastram (2011) goes into great detail about her investigation into this event. Based on her discussions with an EBSCO representative, she writes, "Participating in 3rd party discovery tools is not an opportunity for them to gain market share, and since the other big players aren't participating either it could even open EBSCO up to loss."

As yet, these areas of concern (especially the third) have no simple answers. The first two areas could somewhat be mitigated through planning carefully and following a deliberate, user-centered implementation process. Selecting a system with a flexible user interface and relatively customizable search options allows a library to fit RDS functionality better within its own unique environment to meet its users' expectations—to ensure that users are guided to higher-recall or higher-precision search options appropriately and to ensure that filtering and relevance-ranking functions are useful depending on need and context. The literature discusses two additional potential options. One, combining one or more RDSes with a Federated Search System might possibly allow libraries to shore up any deficiencies present in the RDS' content (Lederman, 2009a; Lederman, 2009b; Jastram, 2011; Taylor, 2011). Two—which is barely mentioned in the literature perhaps because it is not exactly feasible—a library attempting to aggregate article-level metadata itself instead of relying on vendors' systems. Attempting this would no doubt be technically demanding as well as legally risky. Jonathan Rochkind does touch upon this in two consecutive blog postings made earlier this year (Rochkind, 2011a; Rochkind, 2011b).

Library Experiences

Many libraries have published documentation relevant to their experiences with their RDS implementation. One can find exploratory studies, user studies, evaluative studies, strategic documents, and narratives; one can also find less formal documentation (such as blog postings) that offer up-to-date information about the state of a library's system, implementation details that never made it into a more formal document, and examples of how libraries have communicated with their users during the implementation process. See Appendix A for a categorized list of such documentation that was uncovered during the writing of this report.

Excavating this rich body of literature to derive specific requirements and lessons learned about particular systems is beyond this document's scope. However, a cursory reading of the material does illustrate some general trends.

1. Library users' needs have evolved—and continue to do so.

As the UNT Libraries have done, so do other academic libraries: conduct studies and needs assessment of their users to determine how best to serve them. Such studies universally demonstrate that users' needs have evolved beyond what most library websites have traditionally provided, and they continue to change based upon the changes occurring in the outside world. Libraries cannot simply assume that users' needs are what they were a decade ago and act based upon that.

2. Enabling effective search and browse of library resources across system boundaries is a universal challenge.

Library information resources are traditionally contained within siloes. The catalog (and the data therein) is incompatible with the licensed databases, each of which in turn is incompatible with one another, and so on. Each silo has its own interface for accessing content and discovering resources. Because the origin of these silos is not necessarily systemic—but rather historical and political—the default situation has enormous inertia and is quite difficult to work around. The Council of the University of Wisconsin Libraries' Resource Discovery Task Force provides an effective visual representation of the silos involved: http://uwlib.uwsa.edu/committees/userservices/documents/resourcediscovery_report2009uscc.htm (Bren, Dentinger, Doering, Frye, Jennings, et al., 2009).

3. Commitment to implementing an RDS means commitment to a shift in the role of librarians and the library.

Users prefer to use tools such as Google over library research tools because they are quick and convenient. However, libraries still maintain a reputation for providing superior quality content, and most students prefer library resources for classroom assignments. Traditionally, librarians' expertise has been in personally helping researchers navigate the complexities of existing information resources to find quality content appropriate to their needs. RDSes do not represent a shift away from quality; rather, they represent a shift away from the painstaking and cumbersome research process. It is not clear as of yet what the end result of this shift will be, but libraries committing to the RDS path must acknowledge and even embrace that the shift will occur (Housewright & Schonfeld, 2008; Way, 2010).

4. An RDS can improve academic libraries' return on investment (ROI) from their content.

One way to conceptualize the potential value of an RDS implementation is that it will likely increase usage of resources that previously were underutilized because they were hidden behind arcane, difficult-to-use interfaces.

5. RDSes are most helpful for searchers without high domain knowledge.

Experts in a particular field will be familiar with the specific journals and other resources germane to their field and may go directly to those sources to conduct research. Undergraduates, interdisciplinary researchers, and others who do not have much knowledge of a particular domain will more easily discover pertinent resources using an RDS because it flattens the information landscape.

6. When choosing an RDS, pros and cons of open source versus proprietary need to be weighed carefully.

Tradeoffs exist between choosing open source or proprietary software. An open source system requires more staff to install, customize, and maintain; proprietary software is more likely to be vendor-supported or ready to go right out of the box. On the flip side, open source systems are much more flexible—there exists potentially higher payoffs for higher risks.

7. RDS' post-search results-filtering experience needs work.

In a sense, RDSes move the resource discovery problem from searching to filtering. To help users filter their search results, RDSes employ techniques such as relevance ranking and faceted browsing. The faceted browse screens presented to users to help them continue narrowing down their results after they conduct their search tend to be long and complex and thus are often ignored (Ballard, Rector, Lynema, Boyer, Hammond, et al., 2010; Dueber, 2011).

8. The new RDS interface might not be immediately and universally embraced.

Whatever system is chosen and implemented will cause changes to the search interface on a library's website. It will take time for library staff and users to adjust. Documentation, instructions, and guides for students may not be updated immediately. Initial negative feedback (especially from librarians and faculty) is a distinct possibility.

Observations

The literature is clear. Evidence overwhelmingly shows that users expect a search experience from the library that is comparable to Google. On the front end, current RDSes—specifically Web-Scale Discovery Systems—bring libraries closer than ever before to realizing a Google-like access point for their resources. On the back end, RDSes break down traditional silos and allow library data to interoperate at an unprecedented scale. Many libraries have already latched onto this technology—to ignore the possibilities that it would provide us would be folly.

However, especially where Web-Scale Discovery Systems are concerned, the literature also urges caution. That all such systems are proprietary is not merely an interesting detail. Given libraries' history of allowing vendors to dictate the terms on which they provide their services, this is an area of great concern:

- Current RDSes evolved from Next Generation Catalogs. One of the great coups that Next Generation Catalogs achieved, according to the literature, was the separation of concerns of data and interface from the underlying ILS. These systems—even vendor products—liberated library data and gave control over the end-user discovery experience back to libraries. Discovery Layers continue this trend. Web-Scale Discovery Systems represent the pendulum beginning to swing back in the other direction, where libraries have no (or pitifully little) control over important details such as how content is indexed and how relevance ranking works.

- Web-Scale Discovery Systems couple content and interface. When we choose a product, we are not just choosing a system—we are also choosing content. No products that are currently available will index 100% of the content that libraries license, and incorporating other vendors' content meaningfully is not a possibility.

- Vendor control over the system and the content opens up the potential for abuse. EBSCO's decision to pull its content out of competing discovery systems is a prime example, though the capacity for worse abuse (such as intentionally introducing bias into relevance ranking to favor one vendor's content over another's) exists.

With that said, Web-Scale Discovery provides tremendous opportunities. It allows users access to an exceptional amount of article-level content that is available nowhere else. It improves exposure to content that was previously hidden—and, indeed, reports suggest that it improves usage of licensed content across the board. At this point in time, using such a system to serve as a single access point might very well be putting all of our eggs into one basket, but—if used as one component within a larger resource discovery framework—it would give our users much-needed article-search capabilities without tying our entire discovery strategy to one system. It would give us the flexibility to continue working toward making a *genuine* single-access-point search a reality without being beholden to what one vendor will or will not allow.

Institutional Data

To help illuminate the state of RDS implementations at other institutions that have similar environments, user-bases, and needs to those at UNT, an effort was made to collect pertinent data from libraries at UNT's peer institutions—both from within Texas and from around the country. To collect the data, 21 library websites were examined to determine what systems each library used for their catalog, databases, e-journals, link resolver, digital collections, and repository. If the library used any Federated Search or Resource Discovery Systems, those details were recorded, as well. Notes were taken about the overall flow of resource discovery on the library's website. What role did the RDS play, if any? Did the user-interaction design of searching library resources appear to follow a consistent model? After the data was collected, it was entered into a spreadsheet. To supplement this data, a brief, six-question survey was created and sent to the institutions that had implemented an RDS. Sixteen surveys were sent. Eleven responses were collected and added to the spreadsheet. Because it was such a small data set, no attempt at coding survey responses was made.

A copy of the data taken from the spreadsheet appears in Appendix B, and a copy of the survey that was sent to peer institutions appears in Appendix C.

Data Summary

Out of the 21 institutions examined, 17 have implemented and are using some kind of RDS. (UC Santa Barbara is included in this number but the RDS implemented on their website points to UC System's

Melvyl catalog, not to their own implementation.) Of these, 11 are in production and 6 are still in the beta or pilot stage.

The following table shows the breakdown by system. Note that the numbers here add up to 18 because UC Santa Cruz points to the UC System's Melvyl instance along with their own instance of Encore Discovery.

Resource Discovery System	Number of Institutions
AquaBrowser	2
EBSCO Discovery Service	2
Encore Discovery	1
Encore Synergy	2
Summon	3
VuFind	2
WorldCat Local	6

The next table shows the breakdown of RDSes by the role that the system plays in the overall discovery model on the institution's website. Three institutions did not disambiguate the role of their RDS from their other systems well enough to be included, and one had not incorporated the RDS at all into their home page.

Discovery System Role	Number of Institutions	Systems Used for This Role
Article Search	1	Summon
Next Generation Catalog	5	AquaBrowser, Encore Discovery, VuFind, WorldCat Local
Single Search	7	AquaBrowser, EBSCO Discovery Service, Encore Synergy, Summon, WorldCat Local

See Appendix B for the full dataset.

Data Analysis

This was not a rigorous study, and therefore the data that was gathered cannot, by itself, support completely generalizable conclusions. A larger and more random sample of libraries would be needed. However, the data does allow observation of a few apparent trends relevant to this report.

1. The RDSes represented support decoupling of front-end interfaces from back-end systems.

Existing system infrastructure (catalog system, electronic resources systems, digital collections system, and repository) does not seem to correlate with choice of discovery system. For example, there is no single most-used discovery system among Millennium customers—in this particular sample they use Summon, VuFind, WorldCat Local, Encore Discovery, and Encore Synergy. This supports that the major discovery systems are, for the most part, sufficiently decoupled from existing library systems.

2. Different RDS products might be better suited for different roles.

There does appear to be a weak correlation between the discovery system and the role that the system plays in the overall resource discovery strategy on the institution's website (i.e., single-search interface, next generation catalog, or article search). Systems such as VuFind and AquaBrowser that are designed only to be a discovery layer (and don't come with the large unified index of article data as do systems like Summon) mostly play the role of next generation catalog. Summon is a single-search or articles-search interface. WorldCat Local, on the other hand, serves multiple (and, at times, ambiguous) roles.

3. Some RDS products appear to be more flexible than others.

Related to the discovery system's role is the way that (and degree to which) the system's interface is integrated into the website. This factor does not appear in the data because it is difficult to measure quantitatively—however, when one examines and interacts with each institution's website, one begins to recognize patterns. Institutions using Summon or an open-source discovery layer (VuFind being the only such system represented in the data) seem to have integrated their discovery system more thoroughly into their website than those using other systems. Although such judgments are by nature subjective, these institutions appear to have the best, most appealing, most logical overall resource discovery interfaces. Indeed, Summon is supposed to be the most flexible and most customizable of the web-scale discovery systems—and, of course, open source software such as VuFind offers the most opportunity for customization.

4. Certain RDS products might be objectively better than others.

Looking at the responses to the survey sent to peer institutions, there is a strong correlation between which system was chosen and how that system was chosen. As has been mentioned, institutions using Summon or VuFind seem to have achieved the best results. In turn, these systems correlate highly with institutions who report that they actually used a selection process to choose their system *and* those that collected user data before, during, and/or after implementation. Notably, institutions using EBSCO Discovery Service and WorldCat Local did so because they were approached by a vendor, they were part of a consortium, or because an administrator made the decision (University of Delaware notes that

WorldCat Local was what they wanted to use from the beginning, but they do not say why). Furthermore, none of these institutions conducted usability studies.

5. Federated Search Systems may yet have a role to play in resource discovery.

Portions of the literature state that the best approach to meeting the library resource discovery challenge is going to prove to be an architecture that includes both federated searching and Web-Scale Discovery Systems. The data shows that there are institutions employing basic federated searching for resource discovery (either in conjunction with a Web-Scale Discovery System or not)—namely North Carolina State University and Indiana University. During the course of their research, this report's authors also ran across other institutions not in the peer institution list (such as the University of Michigan) that are also taking this approach. Employing federated searching to help integrate a resource discovery system with other library content might be an avenue worth exploring—if not now, then perhaps in the future. (Note: The data also shows that a number of institutions use Metalib, which is a federated search product—however, they are mostly using Metalib as a portal for accessing electronic resources, not as a general resource discovery tool.)

Observations

We had hoped that a thorough examination of UNT's peer institutions might give us data to help inform UNT's own approach for implementing an RDS. According to the way we categorized them, no one approach is overwhelmingly predominant. Seven out of 21 institutions present their RDS as a single-access-point search for library resources. Five libraries use their RDS in place of their web OPAC. One—North Carolina State University—uses a Web-Scale Discovery System for searching articles alongside the Discovery Layer that they use to provide access to their catalog.

During the data-collection process, we looked at many library homepages and tested out searches in many of their systems. What became clear is that the less quantifiable aspects of institutions' RDS implementations tell a story perhaps more important than the data itself. Our observations are subjective, but they help form the basis of some of our recommendations.

1. Several libraries apparently made little effort to incorporate their RDS into their website beyond simply presenting the system as an option alongside numerous others. In these cases, the results were poor—what the systems were and what resources they searched weren't obvious, making it more difficult to figure out which one you might want to use. Even among libraries that apparently chose to use their system as a single access point, if the design and labeling didn't support that approach, the end result appeared confusing. Libraries using WorldCat Local were the worst offenders.

2. A few libraries deliberately chose a particular approach and took steps to design around that approach. Arizona State University, University of Houston, and Rice University clearly chose to implement their RDSes as single-access-point systems (all of them branded their systems "OneSearch" and designed around that concept). Colorado State University and North Carolina

State University chose to implement multiple-access points but divided them along lines that would likely match types of items end-users might be seeking—e.g., Books, Articles, etc. The institutions that took a deliberate approach, no matter which they chose, had better results than the ones that didn't.

3. There were definite correlations among the libraries that seemed to deliberately choose a resource-discovery approach, ones that seemed to have "better" interfaces, the systems that the libraries chose, and the processes that the institutions used during selection and implementation. In short—institutions who reported that they used a selection process to choose a system (instead of relying on administrators or vendors to choose the system) tended to be the ones that also worked user studies or usability testing into their implementation processes. That they put in so much extra effort showed in their interface design.

4. The literature compares RDS technology to Google and Amazon. From a practical perspective, the problem with this comparison is that, when users search Google and Amazon, what they're searching is clear and intuitive. Google searches the Web. Amazon searches through Amazon's inventory, unless you narrow by department. Because RDSes only have partial coverage of library resources, *what* a particular RDS searches—and how to present that information to users—becomes a big issue. Although a single-access-point RDS for libraries sounds great on paper, in practice it requires additional qualification about what's being searched as well as supplemental access points (e.g., to databases and e-journals) to shore up the weaknesses. We haven't seen any user studies that address this, but we would guess that this reduces the effectiveness of the single-access-point search. Web-Scale Discovery Systems are a big step forward from the information silos of libraries' past—but they are not yet able to provide a single-search experience on par with Google.

In the end, we've come away from our examination of our peer institutions with a few best practices:

1. RDSes are not a magic bullet—it's possible to implement one badly. We should give due consideration to the information architecture and user-interaction challenges surrounding the task of incorporating an RDS into our resource discovery framework. We should approach it as a design problem.

2. Not all RDSes are equivalent. The selection process is important and should be done deliberately.

3. Conducting user studies and usability testing is also important. Attention given to satisfying users' needs (beyond the simple directive to implement an RDS) pays off in the resulting interface.

State of the Art of RDS Products

Many RDS products exist and are in use. The table below outlines the systems that illustrate the current state of the art, either because they are used by many institutions or because they are used by a few high-profile institutions.

System	Vendor	Website	Category	Comments
AquaBrowser	Serials Solutions	http://www.aquabrowser.com/	Discovery Layer	
Blacklight	Open Source	http://projectblacklight.org/	Discovery Layer	
EBSCO Discovery Service	EBSCO	http://www.ebscohost.com/discovery	Web-Scale Discovery	
Encore Discovery	III	http://encoreforlibraries.com/	Discovery Layer	
Encore Synergy	III	http://encoreforlibraries.com/	Web-Scale Discovery	
eXtensible Catalog	Open Source	http://www.extensiblecatalog.org/	Discovery Middleware	The XC is more like middleware than a discovery layer *per se*, but it could be a component of a discovery solution.
Information Access Platform	Endeca	http://www.endeca.com/en/products/information-access-platform.html	Discovery Layer	
Primo	Ex Libris	http://www.exlibrisgroup.com/category/PrimoOverview	Web-Scale Discovery	
Summa	Open Source	http://www.statsbiblioteket.dk/summa	Discovery Layer	
Summon	Serials Solutions	http://www.serialssolutions.com/summon/	Web-Scale Discovery	

VuFind	Open Source	http://www.vufind.org/	Discovery Layer	
WorldCat Local	OCLC	http://www.oclc.org/worldcatlocal/	Web-Scale Discovery	

Recommendations

The RDS landscape is in a state of rapid evolution. The transformations that have occurred just in the past few years challenge libraries' collective tendency toward slow, deliberate, carefully-considered change. To withstand the challenge and proceed with resource discovery system implementation, we must first develop a vision, an innovative strategy that will guide the future implementation plans. Building a vision in the face of numerous competing, but not perfect, options requires making difficult choices. Building a strategy that has a chance to withstand the test of time precludes us from making decisions arbitrarily. As a research university library, if we want to stand up to the competition, we must make choices based on who we serve and what we represent; aligning our decisions with our principles makes it more likely that we will follow through.

Our Vision: The RDS Implementation Model

The UNT Libraries' current resource discovery infrastructure—based upon traditional library systems and data—did not develop overnight. Restructuring it will most likely manifest in a series of incremental changes, where each step will involve periods of planning, user studies, trial-and-error, data massaging, interface design, and revisions to the model. As we envision it now, the model involves four phases, although phases beyond the second might need to be refactored by the time we reach them. In articulating each phase, we have attempted to strike a balance vis-à-vis the principles and assumptions outlined in the previous section—one phase might force us to rely more upon proprietary vendor solutions, but the next attempts to mitigate that problem.

To help us more easily present the model, we have drafted diagrams to illustrate each phase. Note the following about the diagrams. First, they focus on the top-level discovery experience, currently embodied by the search box presented in the top, right-hand corner of the library website. Resources that users must delve more deeply into the website to obtain are not shown. Second, the different images represent different architectural components: the cylinders are databases—buckets containing metadata and resources; the square wireframe-websites are applications—a combination of interfaces and business logic; the tabbed folders are search widgets—system-independent components that allow users to perform searches of data and resources. Third, colors represent the degree of access we have to a particular system component's underlying code and functionality. Green components are ones that we have complete access to and control over; red ones are closed to us or are at least partially controlled by vendors.

1. The Existing Environment

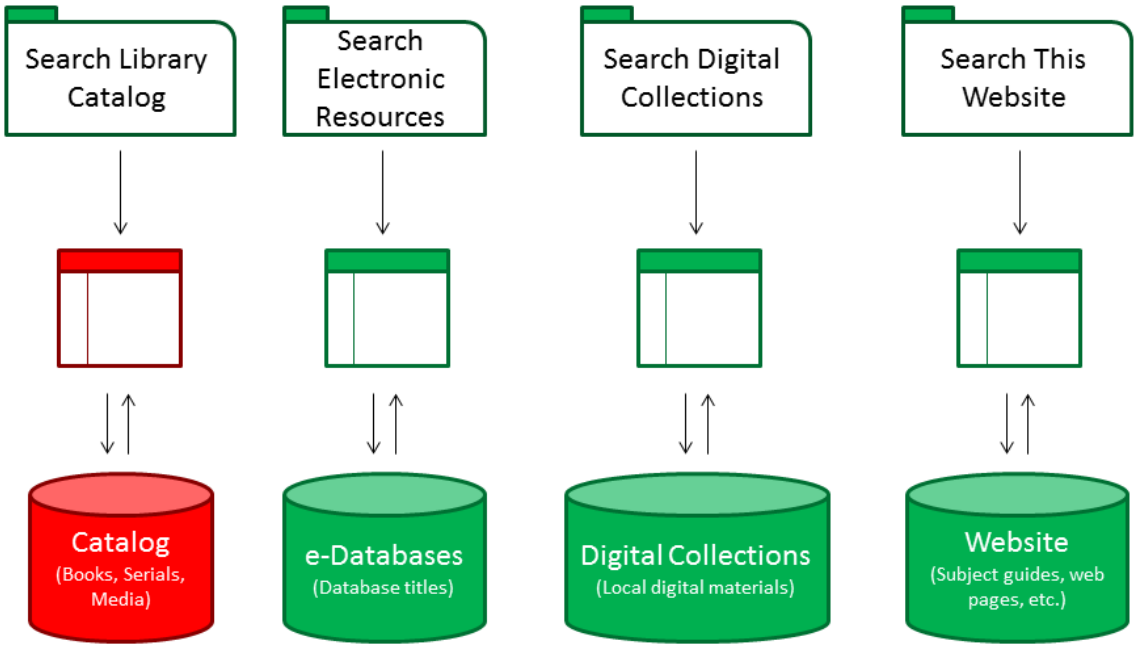

FIGURE 1: THE EXISTING DISCOVERY ENVIRONMENT AT UNT LIBRARIES

Our current website presents users an interface that lets them search the most commonly-needed sets of resources based primarily on the system in which the resources reside. However, functionality is shackled based on the limitations of existing systems. Searching a given search box takes users into the particular application that stores and services those resources—the catalog, the e-Database finder, the Digital Collections, or the website search. Of course, each application searches a conceptually different type of data (items' metadata, databases' metadata, or items' full-text) and puts users into a different interface with different functionality. Furthermore, under the current model, the electronic-resources search is somewhat misleading—one would perhaps expect that such a search would retrieve individual articles; in reality, it retrieves only titles and descriptions of whole databases. Users must still search within individual databases to find articles.

2. Phase One

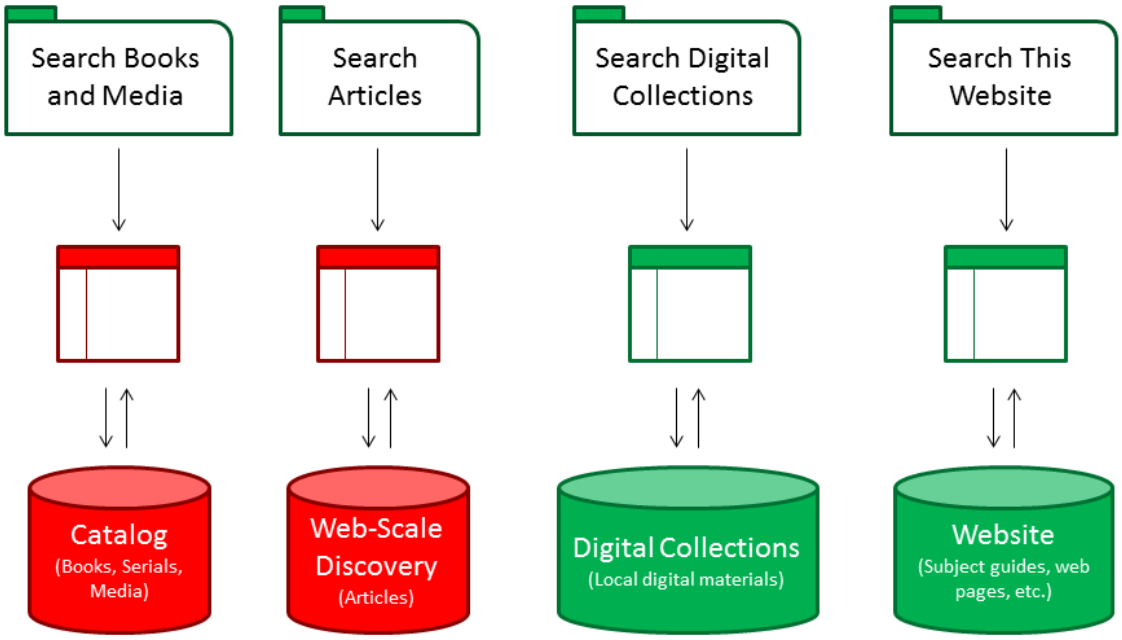

FIGURE 2: UNT LIBRARIES' RDS VISION, PHASE 1

The early phases of our model should focus on shoring up the components within our discovery framework while simultaneously making incremental improvements to the end-user interface. This allows us to improve the user experience in small steps while positioning ourselves to make even more substantial improvements in later phases.

The first step—phase one—will have us deal with the weakest component of the existing framework: the electronic-resources search. Current-generation Web-Scale Discovery Systems could actually do what an electronic-resources search implies: search across a wide array of individual articles. Although such a system—both the application and the data—would be closed-source and vendor-controlled, the functionality that it would provide out-of-the-box would justify incorporating it into our model. Furthermore, at this stage we would lessen the effect of that issue in two ways. First, we would select a system that provides a fully-functional API that would give us flexibility in the future, at least at the application layer. Second, we would refrain from incorporating our catalog data into the system. Though this would prevent us from offering a single-search solution at this point, we contend that such solutions are not yet tenable. They do not actually offer a single search of all resources; they obscure too much from end-users; and they would place us on a path of putting our data into systems in which a vendor controls the content and the system.

3. Phase Two

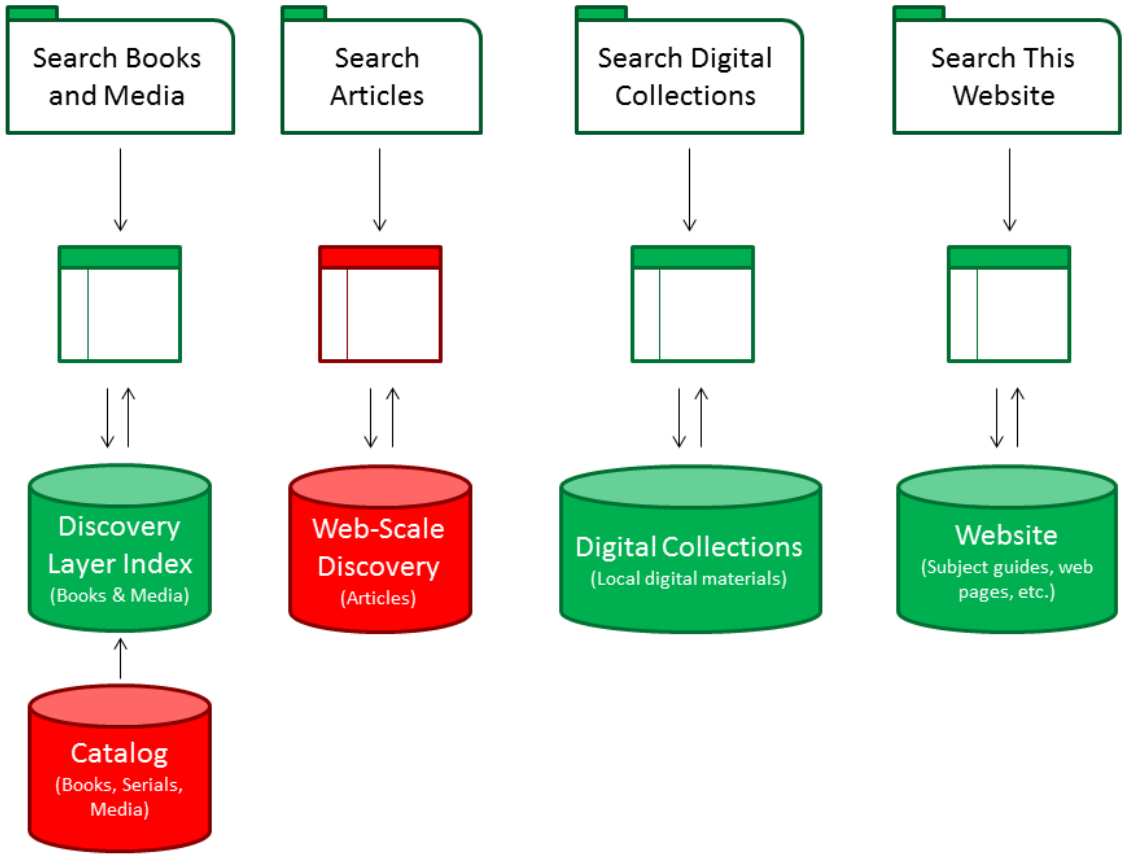

FIGURE 3: UNT LIBRARIES' RDS VISION, PHASE 2

The next step involves implementing a Discovery Layer on top of the existing catalog. This would have two distinct advantages over using the catalog system by itself: added flexibility and frontend interface improvement.

First, it would allow us to take better advantage of our existing catalog system, which contains a wealth of rich metadata but closely couples the user interface and the backend library management system. The interface is limited by how the underlying system functions. Putting a Discovery Layer on top of the catalog would allow us the flexibility to build new interface components that function more independently of the underlying system. If we are working toward a framework that supports modularity and open data, then this is a needed step.

Second, it would, out-of-the-box, provide a large improvement in the interface design of our catalog. All of the Discovery Layer products currently available offer "Next Generation Catalog"-style interface enhancements: streamlined design, faceted browsing, relevance ranking, and social tools.

4. Phases Three and Onward

In phases one and two, we work toward making interface improvements while also improving the modularity of our systems and the openness of our data. After phase two this second class of improvements begin paying off. The below diagrams show possible phases three and four, although we would highly recommend reevaluating the model after phase two. New user data and new approaches could lead us to adjust our thinking and planning. What's presented below gives us a vision toward which we can strive, but we don't intend the vision to shackle us as circumstances change.

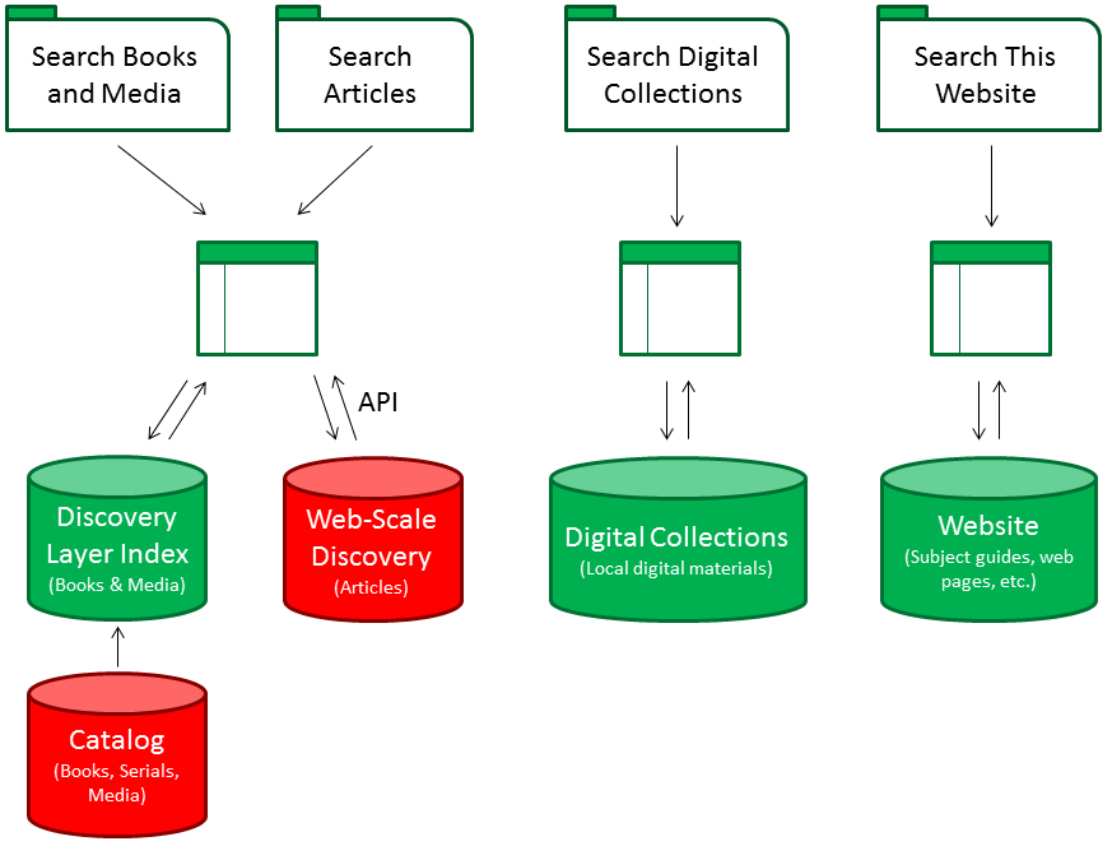

FIGURE 4: UNT LIBRARIES' RDS VISION, PHASE 3

In phase three, we begin our own development at the application layer. It may be unlikely that vendors of Web-Scale Discovery Systems would ever allow third parties direct access to their data, but a good API would allow us to incorporate the system's functionality more fully into our existing applications. Hooking the Web-Scale Discovery System and the Discovery Layer applications together would, for instance, allow us to provide a high degree of consistency to the end user, even if we retain separate Books and Articles searches. Consider Amazon's product search experience: users can conduct separate searches within different departments (Automotive or Movies & TV, for example) but the search results they get after they search don't drop them into different systems. The experience is a unified one. Work at the application layer would allow us to move toward such unification.

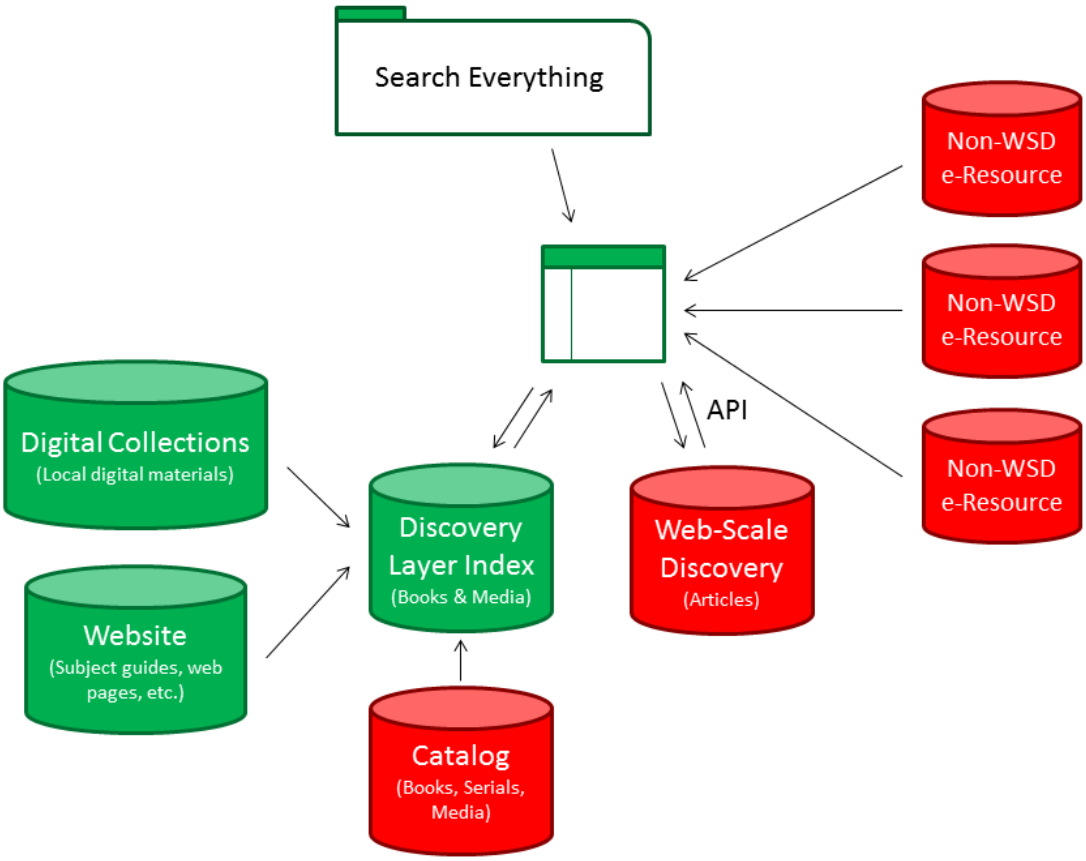

FIGURE 5: UNT LIBRARIES' RDS VISION, PHASE 4

Phase four provides a view of the best-possible solution—based both upon our principles and upon the existing state of RDS technology—for implementing a single-access-point search, which will become a possibility after phase three. In this phase, we incorporate other UNT-owned data buckets (such as the Digital Collections and the Website) into our Discovery Layer's index. We then incorporate federated searching of electronic resources *not* included in the Web-Scale Discovery System into the application that we built in phase three.

Note that we might decide that it is not yet in our users' best interest to implement a single-access-point search. There is no reason we could not build multiple access points on top of our application to search groups of resources that make sense to users. We would still have the benefit of a fully unified interface.

Proposed Phase One Action Plan

Although the library catalog, library website, digital library, electronic resources and interlibrary loan web interfaces are all currently powered by separate systems, they all exist within the UNT Libraries' current resource discovery framework, and are often lumped together and referred to as the "library website" by our users. Improvements to these systems should no longer be considered separate processes, but rather interrelated steps in the larger task of improving resource discovery within the Libraries. With that in mind, we have outlined below ***Phase One Action Plan Objectives*** that are intended to prepare us for advancing to the next recommended phase in pursuing a better resource-discovery experience for our users.

Objective 1: Deal with the weakest component of the existing framework: the electronic-resources full-text search

Actions

- Deploy Serials Solutions' Summon as the discovery system for the majority of our full-text, licensed article content.
- Internally launch Summon Journal Article Search for staff testing and to help with content preparation by June, 2012
- Integrate the Summon Journal Article Search into the new library website site, and officially launch the Summon Search by August, 2012
- Evaluate Summon's performance in Fall 2012 and beyond

Summary

After several months of conducting research and reviewing the literature, we've concluded that the Summon Web-scale discovery service would be the most suitable candidate to provide an immediate solution to alleviate long-standing frustration over full-text article search. Initial implementation of the out-of-box Summon instance should take no longer than 12 weeks and require minimal library staff time. Summon is a good, quick first-phase solution, with a balance between content and features, that also holds unmatchable future potential.

Benefits

- Offers broad coverage of our licensed e-journal content (estimated at approximately 70-80%), which would allow us to provide a full-text article search over most of our existing e-journal content.

- Includes, at no additional charge, more than 40 million records from more than 39 open access archives and 257 institutional repositories.
- Indexes content from the HathiTrust digital archive—a massive repository of digitized books—which would make some volumes in our print collection full-text searchable and also include access to ~2.25 million public domain ebooks.
- Relatively quick "out-of-the-box" installation would enable library staff time to simultaneously focus on other RDS components to help us reach our goals more quickly.
- Index can be expanded to include local collections at no additional cost, allowing us to experiment more easily with integrating our local collections (physical and digital) and our e-journal collection.
- Summon's APIs give us the potential to develop discovery services and interfaces that are more nuanced than the out-of-the-box solution—the flexibility to create solutions more in tune with our users' needs as they evolve (and as our ability to measure them evolves).

Objective 2: Shore up the components within our library catalog, and make incremental improvements to the end-user experiences

Actions

- Collaborate with catalogers in the organization (via the Cataloging Discussion Group) to continue improving data quality in the library catalog.
- Subscribe to selective Syndetic Solutions' OPAC content enhancement services by December, 2011.
- Implement Syndetic cover images, summaries, annotations and reviews to the library catalog by January, 2012
- Fine-tune catalog's usability, and streamline users' interaction with the process for requesting III related services by January, 2012

Summary

Due to lengthy vacancies of the ILS support position, our library catalog became unresponsive to the changes of user demands and remained mostly static for several years. From this, we learned that improvements to the library catalog, or any other system's user interface, can no longer be limited to a multi-year update cycle. The devices used to interact with the library catalog and users' expectations are all evolving with increasing speed. In order to rapidly adapt to the needs of our patrons without also overwhelming them with the changes, the UNT Libraries should strive to rollout incremental enhancements to the system on a per-semester basis. This model has, in fact, already begun. Between spring and summer 2011, UI has rolled out the first round of enhancements to the library catalog and taken the following actions:

- Updated Millennium to the latest 2009B release.
- Incorporated best practices and standards in web design to revamp the user interface of the library catalog.
- Replaced the ILS workgroup with 3 function-driven (but smaller) workgroups: Cataloging Discussion Group, Circulation Workgroup, and WebPAC Workgroup to improve communication efficiency and agility.

Moving forward, UI will focus on fine-tuning usability and adding more user-experience enrichment features to the catalog. Both the literature reviews and several survey results have pointed out that the majority of today's end-users are web savvy. Having experience with other systems, patrons expect the catalog to have Amazon and other bookstore-style features such as cover images, samples & previews, authoritative reviews, and cross-references to related items. During the latest catalog interface enhancement, UI responded to these needs by employing open source solutions that introduced several features that enriched the user experience. However, due to restraints on intellectual property rights (among other reasons), freely available services to enrich catalog content are limited, and their long-term viability is questionable. Syndetic Solutions, although it requires an annual subscription, provides descriptive data for books, CDs, and DVDs that no open source solution can currently match.

Benefits

- Currently, there are over 9 million cover images, summaries, and annotations for books, videos, DVDS, and CDS available through Syndetic Solutions. In order to continue to enhance the Resource Discovery experiences for our users, we believe a subscription to these Syndetic Solutions services could help improve resource discovery for our users.

Objective 3: Improve the overall content quality, design, and user experience of the UNT Libraries' website by migrating it to a more robust, feature-rich, and responsive CMS

Actions

- Continue to improve the UNT Libraries' website usability.
- Migrate the website from Plone to the latest stable Drupal by July 16, 2012.
- Beginning immediately through May, 2012**,** work with the library Web Content Workgroup to refine content organization and content quality.
- Implement new user interface components and features, and launch the new library website by August 6, 2012.

Summary

The Libraries' website was redesigned and migrated into an instance of the Plone 2.5 CMS in 2006. Although this system has remained largely functional, many compelling reasons for starting another round of redesign have emerged.

- Plone 2.X, once a powerful open-source content management system, has lagged behind in meeting our web development needs (such as adding a dynamic event calendar and supporting multiple devices). The developer community for that CMS has also been fragmented, and both support and documentation are now misaligned with our current needs.
- In 2010, the Libraries went through a structural reorganization. Since that time a number of librarians and staff members have retired (and subsequently abandoned content), policies have changed, buildings have been renamed, services added, etc. The library website information architecture, branding, and content strategy need to reflect these changes and be adaptable to other unforeseen changes on the horizon.
- In 2010, UNT began encouraging campus-wide site migrations to Drupal. Although the Drupal migration is not yet mandatory, the ever-growing Drupal development community on campus (not to mention globally) as well as the large number of available add-on modules make a compelling case to migrate our library website to Drupal instead of to Plone 4.

- The current website look is 5 years old and now is out of step with campus branding efforts.
- The current design layout of the website will make it difficult to incorporate additional RDS components into its user-interface.
- UI has extensive experience with Drupal-based website construction.

Benefits

- The large well-supported Drupal development community, with its extensive and readily-available resources, will enable the Libraries to be more responsive and agile in implementing emerging features and services.
- As a result of sharing software architectural components with the wider campus, the Libraries can be more closely aligned to other UNT divisions, departments, and schools with the potential for better integration of library services and those of other campus entities.
- The redesign will also provide the opportunity to better support the Libraries' needs in incorporating and introducing upcoming RDS components into the Libraries' website.

Objective 4: Position ourselves to make even more substantial improvements in later phases

Actions

- Agree to participate in the Innovative Interfaces' Sierra early-adopter program by October 31, 2011.
- Migrate to Sierra per early-adopter agreement, and provide input and suggestions to Innovative Interfaces on Sierra product development as needed.

Summary

III's Millennium, over the years, has gained a reputation as a "black box" for its highly proprietary technology that gives libraries few options for extracting data or customizing functionality. The Sierra Services Platform, as III's strategic response to the call for openness and replacement for Millennium, promises not only to carry over 100% of Millennium functionality, but also to provide open access to its key functionality and data. The deployment of a Services Oriented Architecture (SOA), a PostgreSQL database, a Lucene indexing engine, and an APIs Library will:

- Enable libraries to respond to users' changing demands more rapidly and easily,

- Permit data extraction and manipulation operations,
- Provide flexibility in web-based and web-scale integration, and
- Facilitate interaction with 3rd-party, library-developed applications.

Although III will continue to support Millennium, eventual migration to Sierra is inevitable. Millennium is based on a system that was first launched in 1995 and is approaching the end of its life. We highly recommend that the UNT Libraries consider participating in the Sierra early-adopter program and moving to Sierra as one of the early-adopter partners.

Benefits

We believe this move will:

- Help the Libraries save about 50% of the migration cost,
- Provide us the opportunity to work closely with III during the early stages of product development to help fine-tune its final product, and
- Position us more favorably for implementation of future RDS components in later phases.

Action beyond Phase One

RDS technology and techniques are evolving quickly, as are our end-users' expectations. In order to stay responsive (and in the interest of not over-planning), we will reexamine the state of the RDS art in Fall, 2012. Based on our reevaluation, we will develop a new action plan and revise our RDS implementation vision as necessary.

Estimated Costs – Phase One

Summon™:

- One time implementation fee: $8,000
- Annual subscription fee: $ 56,481

Year one payment: $64,481

Sierra Next Generation of ILS Early Implementer:

*Need to acknowledge the agreement to become early implementer prior to October 31, 2011

- Sierra application server - $12,500
- One time implementation fee - $89,975
- Yearly maintenance costs remain the same as Millennium

Year one payment: $51,237.50

Syndetic Rich Content Solution for Catalog:

- Cover Images - $1,480.00
- Summaries & Annotations - $1,480.00
- Library Journal Reviews - $1,480.00
- Choice Reviews - $2,440.00

Annual subscription fee: $6,880

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Appendix B

Arizona State University Libraries

- Systems Data
  - Website: http://lib.asu.edu/
  - Catalog: Millennium
  - ER—Databases: III ERM
  - ER—E-Journals: KnowledgeWorks/360
  - ER—Link Resolver: 360 Link
  - Digital Collections: None
  - Repository: None
  - Federated Search: None
  - Resource Discovery: Summon
  - Discovery System Deployment: Production
  - Discovery System Use: Single Search
  - Discovery Coverage: Summon's Index, Catalog
  - Home Page Resource Search Model: Tabbed search in content area, includes single "Discovery" search
- Survey Data
  - None

Colorado State University Libraries

- Systems Data
  - Website: http://lib.colostate.edu/
  - Catalog: Millennium
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: CONTENTdm
  - Repository: Digitool
  - Federated Search: Metalib
  - Resource Discovery: VuFind
  - Discovery System Deployment: Production
  - Discovery System Use: Next Gen Catalog
  - Discovery Coverage: Catalog, Repository, Digital Collections, Website
  - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
  - Survey Q1: Staff – Three people were on the development team, a project manager which was my role, a backend java developer, and one UI developer. We also had an

advisory committee consisting of the project manager, a serials librarian, a reference librarian, one help desk staff member, and a catalog librarian.

- Survey Q2: Collaboration – Every section of the library was represented by a member of the advisory team. It was their responsibility to report back to their constituencies. We also held open forums for groups in the libraries at various stages of development.
- Survey Q3: Institutional Support – The library administration was totally behind this project. In fact our R&D department was formed to take on this task as an initial step of delving into next generation discovery tools and now on into web-scale discovery.
- Survey Q4: Product Selection – We reviewed basically three different products, Vufind, BlackLight, and LibraryThing. My group reviewed these three products and I personally talked to the lead developer on each of the projects. The main reason we chose VuFind is that is was PHP and MySQL based and did most of the things that we wanted.
- Survey Q5: Timelines – The project took probably about 6 months to complete. The reason it took us longer was that we added a bunch of features to our implementation. Setting up automated extracts from our III catalog took a fair amount of time as there was no easy way to do it. Also, we added non-MARC harvests from our digital repository and our Library web pages. We were able to implement the project faster than our scheduled timeline. After we had our implementation completed, we did a couple of trial implementation for other libraries and were able to do those in less than a week. Mind you those were not totally finished and may have needed some UI customization, but they were complete for the most part.
- Survey Q6: User Assessment – We did a substantial ethnographic study with graduate students before we started development. Towards the end of development and post development we did usability testing with students. We also have done random surveying of users since its release with a pop-up in the UI. The responses I have seen and heard have been for the most part have been very receptive of the product. Some of our staff also use it as their main search interface for items in our digital repository as the native interface is somewhat slow and clunky.

Georgia Tech Library

- Systems Data
  - Website: http://www.library.gatech.edu/
  - Catalog: Voyager
  - ER—Databases: Metalib/Xerxes
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: Various
  - Repository: DSpace
  - Federated Search: Metalib/Xerxes
  - Resource Discovery: VuFind

- Discovery System Deployment: Production
- Discovery System Use: Next Gen Catalog
- Discovery Coverage: Catalog, Repository
- Home Page Resource Search Model: Catalog search in header

- Survey Data
  - Survey Q1: Staff – I set up a VuFind committee which consisted of me (Technical Project Director), the head of cataloging, the assistant head of circulation, the assistant head of reference, the head of scholarly communications, the web services librarian, an archivist and a reference librarian.
  - Survey Q2: Collaboration – I had bi-weekly meetings with the VuFind committee before I made a beta version of VuFind available to the public.
  - Survey Q3: Institutional Support – none
  - Survey Q4: Product Selection – We looked at Blacklight and VuFind. We decided to go with VuFind because the interface looked so much better.
  - Survey Q5: Timelines – I installed VuFind in August, 2008. During Fall 2008, I made customizations to the software. At the beginning of the Spring 2009 semester, I made a beta version available to our users. For Fall 2009, I put VuFind into production. For Spring 2010 semester, we made VuFind the default search box.
  - Survey Q6: User Assessment – For the beta version, we had a user survey link and the assistant head of reference did an informal usability study. I made changes based on user feedback to the production version. For the production version, we also included a user feedback box. Most of the feedback from our users has been positive. Our users didn't like Voyager. The users complained Voyager was too complicated to use. VuFind was a very hard sell to our reference librarians. The reference librarians liked Voyager.

Indiana University Libraries

- Systems Data
  - Website: http://www.libraries.iub.edu/
  - Catalog: Symphony
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: KnowledgeWorks/360
  - ER—Link Resolver: 360 Link
  - Digital Collections: Various
  - Repository: DSpace
  - Federated Search: Homegrown
  - Resource Discovery: EBSCO Discovery Service
  - Discovery System Deployment: Beta/pilot
  - Discovery System Use: Unknown
  - Discovery Coverage: Unknown
  - Home Page Resource Search Model: Single "Federated" search in content area

- Survey Data
    - Survey Q1: Staff – Head of Digital User Experience, Research & Resource Discovery Librarian, and one Web Developer.
    - Survey Q2: Collaboration – It is still in Beta. But to this point we have held open meetings as well as meetings with various library departments.
    - Survey Q3: Institutional Support – The Libraries supported the subscription.
    - Survey Q4: Product Selection – We were approached by EBSCO to be a beta partner. Because Indiana is an EBSCO state, we decided to move forward with the product.
    - Survey Q5: Timelines – Our circumstances are not typical. We have still not implemented it fully but had we had a fully functioning staff we believe that 6-12 months would have been the amount of time it would have taken us to launch.
    - Survey Q6: User Assessment – NA

North Carolina State University Libraries

- Systems Data
    - Website: http://www.lib.ncsu.edu/
    - Catalog: Symphony/Endeca
    - ER—Databases: Unknown/homegrown
    - ER—E-Journals: Unknown/homegrown
    - ER—Link Resolver: 360 Link
    - Digital Collections: Various
    - Repository: Various
    - Federated Search: Homegrown
    - Resource Discovery: Summon
    - Discovery System Deployment: Production
    - Discovery System Use: Article Search
    - Discovery Coverage: Summon's Index, Catalog
    - Home Page Resource Search Model: Tabbed search in content area, includes single "Federated" search
- Survey Data
    - Survey Q1: Staff – For planning and implementation we had Research and Information Service staff (e.g. reference), Information Technology (our ILS lead person), Digital Library Initiatives (to work with the API and integrate Summon into our main search pages), collections, and metadata services (to integrate and migrate the knowledge-base).
    - Survey Q2: Collaboration – We used a temporary implementation team to get it quickly off the ground with representation from each of those groups. We closed that down when implemented and transitioned our reference linking team to a combined oversight team for reference linking and Summon.

- Survey Q3: Institutional Support – None, we had the resources in the Libraries to make it happen. We did get a lot of input from students and faculty ahead of time, conducted a usability study afterward , and maintained open feedback loops from the community.
- Survey Q4: Product Selection – It was the first web-scale product available and we leapt at the technology. It has outscored WorldCat Local in other institutional reviews I have seen and it did in ours due to a better overall interface, more scholarly article content, and our interest in their reference linking software. We purchased Summon to get access to the millions of articles it provides via the API so we could integrate robust article searching into the search utility on our site (see www.lib.ncsu.edu). We also bought Summon to serve undergraduate needs and expose scholarly content to that audience in an easy and accessible way. We did not buy it, and I do not think anyone should at this point, with a sole or absolute goal of replacing scholarly databases. The combination of Google Scholar, Summon, and other technologies threaten the future of scholarly databases, but I do not think Summon does on its own. My impression is the EBSCO web-scale product does much of the same, but without the open API that was critical to our needs.
- Survey Q5: Timelines – 3.5 months from signing the contract do debuting it live. Our goal was 10 weeks, so close.
- Survey Q6: User Assessment – Quite a bit of analysis - both statistical and usability. My colleague Josh Boyer can share our usability study. Generally positive with students and overnight staff being the biggest fans and certain pockets of graduate students and faculty being the least enthusiastic. Staff reception is generally positive with some having concerns in selecting this type of product and some retaining those concerns. My opinion is it is a no-brainer if you can afford it and accept that this young technology has weaknesses that need to be addressed. It certainly is better that meta-search and provides a lot of next-generation catalog utility as well if that is a secondary goal for you.

Rice University, Fondren Library

- Systems Data
  - Website: http://library.rice.edu/
  - Catalog: Unicorn
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: KnowledgeWorks/360
  - ER—Link Resolver: 360 Link
  - Digital Collections: DSpace
  - Repository: DSpace
  - Federated Search: None
  - Resource Discovery: AquaBrowser
  - Discovery System Deployment: Production
  - Discovery System Use: Single Search

    - Discovery Coverage: 360's Index, Catalog, Archival Finding Aids, Digital Collections, Repository, Website,
    - Home Page Resource Search Model: Single “Discovery” search in header
- Survey Data
    - None

Rutgers University Libraries

- Systems Data
    - Website: http://www.libraries.rutgers.edu/
    - Catalog: Symphony
    - ER—Databases: Unknown/homegrown
    - ER—E-Journals: EBSCO A-to-Z
    - ER—Link Resolver: EBSCO LinkSource
    - Digital Collections: Homegrown
    - Repository: Homegrown
    - Federated Search: EBSCO Integrated Search
    - Resource Discovery: None
    - Discovery System Deployment: N/A
    - Discovery System Use: N/A
    - Discovery Coverage: N/A
    - Home Page Resource Search Model: Search in content area, changes on mouseover of main nav links
- Survey Data
    - None

Texas A&M University Libraries

- Systems Data
    - Website: http://library.tamu.edu/
    - Catalog: Voyager
    - ER—Databases: Metalib
    - ER—E-Journals: SFX
    - ER—Link Resolver: SFX
    - Digital Collections: Various
    - Repository: DSpace
    - Federated Search: Metalib
    - Resource Discovery: None
    - Discovery System Deployment: N/A
    - Discovery System Use: N/A

    - Discovery Coverage: N/A
    - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
    - None

Texas Tech University Libraries

- Systems Data
    - Website: http://library.ttu.edu/
    - Catalog: Aleph
    - ER—Databases: Metalib
    - ER—E-Journals: SFX
    - ER—Link Resolver: SFX
    - Digital Collections: CONTENTdm
    - Repository: DSpace
    - Federated Search: Metalib
    - Resource Discovery: None
    - Discovery System Deployment: N/A
    - Discovery System Use: N/A
    - Discovery Coverage: N/A
    - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
    - None

University at Albany--SUNY, University Libraries

- Systems Data
    - Website: http://library.albany.edu/
    - Catalog: Aleph
    - ER—Databases: Unknown/homegrown
    - ER—E-Journals: KnowledgeWorks/360
    - ER—Link Resolver: 360 Link
    - Digital Collections: Various
    - Repository: None
    - Federated Search: None
    - Resource Discovery: EBSCO Discovery Service
    - Discovery System Deployment: Beta/pilot
    - Discovery System Use: Single Search
    - Discovery Coverage: EDS' Index, Catalog

- Home Page Resource Search Model: Tabbed search in content area, includes single "Discovery" search

- Survey Data
  - Survey Q1: Staff – Initially it was: the Dean of Libraries, the Associate Director for Public Services, and a committee consisting of the Head of Library Systems, myself, and a User Education librarian. Due to some staff changes, the committee later became me, our library web designer, a reference librarian and a subject bibliographer.
  - Survey Q2: Collaboration – When we needed information from staff on library systems and cataloging, we just asked. For the general library faculty I did a presentation at an all-faculty meeting and have done several for our Public Services Forums, which are geared towards staff who provide reference services. We also brought in trainers from Ebsco a few weeks prior to going "live".
  - Survey Q3: Institutional Support – Do you mean the university as a whole? Not sure what you're getting at with this question. The Provost worked with the Dean of libraries to secure funding, if that's what you're asking.
  - Survey Q4: Product Selection – In July of 2009, we were approached by Ebsco to be a beta test site for the Ebsco product. This entailed attending weekly webinars to provide feedback on the "tweaks" they were performing on this service, but they also had an instructional component as well. Although we did do a comparison chart of Summon, Primo Central, and EDS, by the time it was completed it was more of a pro-forma exercise, as our Dean of Libraries had committed to seeking funding for EDS.
  - Survey Q5: Timelines – It took us about a year to be ready to go live. We were a beta test site so we were the "guinea pig" in terms of importing catalog records from an Aleph catalog. There were a lot of issues that will go much easier for others because Ebsco learned from our experience. The integration of the catalog was what took the longest amount of time – about 6 or 8 months, but again, this is because we were a test site. Customizing the interface with University colors and logos was fairly straightforward for our web designer. Choosing the EHIS connectors was a process because it took time for Ebsco to provide us with the information about which of our resources were able to be connected, and then consulting with the bibliographers about which resources they wanted in the list. Once it was obvious we weren't going to have this implemented anywhere close to in time for the Fall 2009 semester, we no longer had a planned implementation timeline. At some point we set the Fall 2010 semester as the "live" date, which we were able to meet.
  - Survey Q6: User Assessment – We did not do any user assessment before the project. We have a user survey currently available for patrons to fill out if they use EDS. It will run all semester and we will review the results at that time. Anecdotal evidence indicates that the students like the service a lot, the librarians—not so much. I think this is because librarians prefer and are accustomed to running very precise searches and EDS works best when one is doing a simple search with only a few keywords.

University of California, Santa Barbara Library

- Systems Data
  - Website: http://www.library.ucsb.edu/
  - Catalog: Aleph
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: Various
  - Repository: None
  - Federated Search: None
  - Resource Discovery: WorldCat Local
  - Discovery System Deployment: Beta/pilot
  - Discovery System Use: Next Gen Catalog
  - Discovery Coverage: WorldCat's Index, Consortial Catalog
  - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
  - None

University of California, Santa Cruz Library

- Systems Data
  - Website: http://library.ucsc.edu/
  - Catalog: Millennium
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: CONTENTdm
  - Repository: None
  - Federated Search: None
  - Resource Discovery: WorldCat Local, Encore Discovery
  - Discovery System Deployment: Beta/pilot
  - Discovery System Use: Next Gen Catalog
  - Discovery Coverage: WorldCat's Index, Consortial Catalog
  - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
  - None

University of Connecticut Libraries

- Systems Data

- Website: http://www.lib.uconn.edu/
- Catalog: Voyager
- ER—Databases: Unknown/homegrown
- ER—E-Journals: KnowledgeWorks/360
- ER—Link Resolver: SFX
- Digital Collections: Various
- Repository: Digital Commons
- Federated Search: None
- Resource Discovery: WorldCat Local
- Discovery System Deployment: Production
- Discovery System Use: Single Search
- Discovery Coverage: WorldCat's Index, Catalog, Digital Collections, Repository
- Home Page Resource Search Model: Tabbed search in content area, includes single "Discovery" search

- Survey Data
  - Survey Q1: Staff – Systems Librarian (who was a part of Catalog and Metadata Services), Digital Initiative Librarian (ITS), DD/ILL Librarian, Undergraduate Education Librarian
  - Survey Q2: Collaboration – We formed a team of staff who either represented the various stakeholders or held specific skills to get the job done. Open meetings were held periodically to keep everyone informed of developments. Frequent emails were sent once the initial product was available and developing.
  - Survey Q3: Institutional Support – Encouragement; dedication of staff time to making the project work.
  - Survey Q4: Product Selection – I have to admit that the primary reason that we implemented WorldCat Local was that the Boston Library Consortium, of which we are a part, decided to use WorldCat Local for resource sharing about the members of the Consortium. Other software that the BLC has previously used for shared holdings was not compatible with the individual institutional catalogs from which the data came.
  - Survey Q5: Timelines – Should I tell you that the project is not over yet? The initial implementation was done in a matter of weeks but at the time that we started there were functions and displays that were still developing. After the initial implementation, we have continued to work on display and bugs. Most of our initial problems have been resolved. One example is that when we had set temporary locations in our OPAC for reserve items, this information did not show up in WorldCat Local, nor did it show that an item was charged out. We are still working on some issues with electronic resources.
  - Survey Q6: User Assessment – We did not do a user assessment before the project. We have continually made it possible to get feedback to the product. OCLC has recently sent a request for statistics and we are collecting them from various staff. I can send you the spreadsheet when we get it filled in as well as the information from OCLC about how they plan to use our statistics. User reactions have been favorable. Patrons like one search box in which they can see what we own along with other materials that are available through DD/ILL since our patrons use that heavily. The additional electronic

holdings was enthusiastically welcomed. We continue to have a few anomalies after reconciling holdings, but certainly no more than may turn up in the OPAC for some other reasons.

University of Delaware Library

- Systems Data
  - Website: http://www.lib.udel.edu/
  - Catalog: Aleph
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: Unknown/homegrown
  - ER—Link Resolver: Unknown/homegrown
  - Digital Collections: Various
  - Repository: DSpace
  - Federated Search: None
  - Resource Discovery: WorldCat Local
  - Discovery System Deployment: Production
  - Discovery System Use: Single Search
  - Discovery Coverage: WorldCat's Index, Catalog, Repository
  - Home Page Resource Search Model: Multiple searches in content area
- Survey Data
  - Survey Q1: Staff – Assistant Director for Library Computing Systems, Head of Acquisitions, Member from Cataloging, Member from Reference, Member from Special Collections, Member from the Instructional Media Department
  - Survey Q2: Collaboration – We had representatives from all areas and everyone felt a part of the process. We kept the group small to be manageable, but still had representation from the units. We met weekly.
  - Survey Q3: Institutional Support – The Director of the Libraries met with the Provost and the Provost is a big library supporter. We had support outside the library and the library staff accepted it after a while.
  - Survey Q4: Product Selection – We didn't look at any other system. We knew from the beginning we wanted to go with WorldCat Local.
  - Survey Q5: Timelines – We started to plan in January of 2007 and were up and running in August of 2007. We met our timeline.
  - Survey Q6: User Assessment – We didn't perform any user assessments before the project. We implemented WorldCat Local at the same time we redesigned our libraries' home page. We designed 2 search boxes - one for WorldCat Local and one for DelCat - the University of Delaware Library Catalog. The user responses have been positive.

University of Houston Libraries

- Systems Data
  - Website: http://info.lib.uh.edu/
  - Catalog: Millennium
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: KnowledgeWorks/360
  - ER—Link Resolver: 360 Link
  - Digital Collections: CONTENTdm
  - Repository: DSpace
  - Federated Search: None
  - Resource Discovery: Summon
  - Discovery System Deployment: Production
  - Discovery System Use: Single Search
  - Discovery Coverage: Summon's Index, Catalog, Research Guides, Digital Collections, Repository
  - Home Page Resource Search Model: Tabbed search in content area, includes single "Discovery" search
- Survey Data
  - Survey Q1: Staff – We had two groups of staff involved. There was a selection task force that was formed under the auspices of a larger website redesign project. That group initially consisted of three subject librarians representing the broad disciplinary areas, the interlibrary loan librarian, and a staff member from our ILS management department (which handles the systems support aspects of our ILS). That staff member left the Libraries mid-process, so the Head of Integrated Library Systems came onto the task force for the last couple of months as the recommendation was finalized. The task force also sought input from elsewhere in the library as they were closing in on a recommendation. I don't recall any library-wide demos of the products under consideration. The task force made its recommendation to library administration, which had the final decision for the purchase. The implementation team was put in place after Summon was selected. I'm nominally responsible for that group and for the overall coordination of the implementation, but it's really a team effort. That group includes myself (Head of Cataloging and Electronic Resources), Rachel (Head of Web Services), a Digital/Web Projects Fellow who is involved with technology projects and training throughout the library, the Head of Integrated Library Systems, and the subject librarian who chaired the original selection task force. In retrospect, I wish there had been more technical input as part of the selection task force. I don't think a different recommendation would have come out of it, but I do think some questions might have been asked sooner and some processes put in place sooner that would have made the eventual implementation go more smoothly.
  - Survey Q2: Collaboration – In terms of communication on the technical side, Web Services, ILS, and Cataloging all had high-level participants on the implementation team. We all work together all the time, so building a collaborative relationship was a non-issue. We held several meetings throughout the busiest phase of implementation, and

shared information via Basecamp which we use for a lot of project management here. There was also a lot of informal communication especially among the department heads. Communication with public services was a little more complicated. We debuted Summon as an integral part of a much more sweeping website redesign, and a lot of the communication about timeline and upcoming changes came from the web team, not from the Summon implementation team. We wanted as much as possible to treat search as integral to the website, rather than a separate entity. That said, when our Summon instance was released and people started to put it through its paces, there were a lot of questions. I had several meetings with the public services group, and I know a lot of questions came up when the web team met with public services to discuss website issues more generally. There haven't been any formal discussions around Summon this semester, but the implementation team is hosting a discovery workshop in June that we hope will bring in plenty of public services participation and discussion.

- Survey Q3: Institutional Support – It was part of a major institutional push for a new website, so we had the complete support of administration. From my perspective, it doesn't seem like there was ever any question of whether the library wanted a discovery tool. We knew we had to have one, it was one of the central assumptions of the site redesign. The selection committee recommended a one-year contract, but the library ended up negotiating a three-year contract because of the pricing. I'm glad they did, because implementing a new service on this scale is an enormous project, and to be faced with considering a new system and possible migration only a year later would have been incredibly frustrating.
- Survey Q4: Product Selection – I wasn't a party to that process, so I have only their report to go on. They looked at Summon, EDS, Encore Synergy, and WorldCat Local. At that time we were using Encore atop our ILS, so it made sense to look at their article integration product. WorldCat Local was perceived as requiring a very involved implementation that we didn't necessarily have the resources to carry out. Summon was a good fit for us because it indexed over 90% of our subscribed resources. The library was already heavily invested in the SerialsSolutions suite of services, so it was thought that Summon would integrate well with those. Summon promised a relatively painless turnkey implementation. And, since they were really the first such product out of the gate they already had a number of large academic library customers who seemed satisfied with the results.
- Survey Q5: Timelines – I don't know when the selection task force actually started their work. Their recommendation came forward in February 2010. Shortly after that, Rachel and I were approached about coordinating the implementation and we formed the existing implementation team. Our timeline was being dictated by the site redesign, which in turn was being dictated by the academic calendar, so our schedule was very tight. Summon promised eight weeks to implementation, and they did it. We gave them our profile data and MARC records in April, and they released our instance at the beginning of June. In-library testing went on throughout June. The new website, including Summon front and center, was accessible to the public (but not yet the

default) beginning in July, and we switched over to the new site in August. I spent most of the summer exchanging email with Summon support ten times a day, tinkering with our MARC mapping and trying to get some of the initial bugs sorted out. Quite a few of the questions and issues that came to me initially were either problems with the data on our end that we needed to get cleaned up (this is the reason I would have liked more lead time before the site was live), or changes that people wanted to things that were not actually customizable. I do report all such requests to SerialsSolutions, but anything that is not an actual functional problem, but just something we'd like to have work differently, goes into the development queue. Their development cycle is very rapid, but some things we are not going to see movement on until a critical mass of customers asks for it.

- Survey Q6: User Assessment – Rachel might be better able to answer the preliminary assessment question, as I was not involved in any part of that process. After implementation, we provided a feedback form that was accessible from the homepage as well as from the Summon interface. We have had surprisingly little feedback through this venue. In terms of Summon-specific comments, I have only had about 40, and a lot of those were public services reporting problems to me. We do get a fair amount of anecdotal feedback from the subject librarians from their classes and one-on-one interactions. Some are still pretty skeptical about it, as are many faculty and graduate students. On the other hand, instructors have mentioned that many undergraduates feel right at home with a nebulous search box. Most of the problems we see are link resolver failure - not a Summon problem per se, but one that our users discover when they use Summon because it pushes all the full-text traffic through the resolver. We have tried to prioritize targets that resolve well in our link resolver configuration, and I think that has helped. The biggest criticism we hear of Summon is that the results are overwhelming and it's too difficult to drill down to a specific item. We hear this a lot from our more experienced researchers - they're used to something like the catalog that delivers very compact result sets for known items. That just isn't how Summon works. We end up directing them to the advanced search or back to the tools they are familiar with. Summon debuted its analytics a couple of months ago. It looks like we're getting over 100,000 searches per month at this point, and our e-resource usage is increasing, so our users are certainly getting somewhere! We'd like to do some more focused usability investigation in the near future.

University of Kansas Libraries

- Systems Data
  - Website: http://www.lib.ku.edu/
  - Catalog: Voyager
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: KnowledgeWorks/360

    - ER—Link Resolver: 360 Link
    - Digital Collections: Various
    - Repository: DSpace
    - Federated Search: 360 Search
    - Resource Discovery: None
    - Discovery System Deployment: N/A
    - Discovery System Use: N/A
    - Discovery Coverage: N/A
    - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
    - None

University of Maryland Libraries

- Systems Data
    - Website: http://www.lib.umd.edu/
    - Catalog: Aleph
    - ER—Databases: Metalib
    - ER—E-Journals: SFX
    - ER—Link Resolver: SFX
    - Digital Collections: Various
    - Repository: DSpace
    - Federated Search: Metalib
    - Resource Discovery: WorldCat Local
    - Discovery System Deployment: Production
    - Discovery System Use: Ambiguous
    - Discovery Coverage: WorldCat's Index, Catalog
    - Home Page Resource Search Model: No resource search
- Survey Data
    - None

University of Nebraska, Lincoln Libraries

- Systems Data
    - Website: http://libraries.unl.edu/
    - Catalog: Millennium
    - ER—Databases: III ERM
    - ER—E-Journals: TDNet
    - ER—Link Resolver: WebBridge
    - Digital Collections: CONTENTdm

- Repository: Digital Commons
- Federated Search: None
- Resource Discovery: Encore Synergy
- Discovery System Deployment: Production
- Discovery System Use: Single Search
- Discovery Coverage: Encore Synergy's Index, Catalog, Digital Collections, Repository
- Home Page Resource Search Model: Single "Discovery" search in content area

- Survey Data
  - Survey Q1: Staff – It was mostly the system staff during the start-up. Technical services was involved as issues came up with coding.
  - Survey Q2: Collaboration – It was handled through the systems office. We had an advisory group made up of staff from all departments to determine customizations.
  - Survey Q3: Institutional Support – Not sure what you mean by that?
  - Survey Q4: Product Selection – We were an early adopter of Encore, at that time there wasn't anything as complete as Encore (we wanted to harvest collections).
  - Survey Q5: Timelines – about a year to plan and implement.
  - Survey Q6: User Assessment – We use google analytics to evaluate systems. We are still in the planning stage for a user assessments. I wrote an article that came out in Journal of Web Librarianship that describes the results from Google Analytics. Undergraduates love the system, particularly the integration of articles. Faculty are more reticent, but some of them actually prefer telnet so this may be a computer comfort issue.

University of Texas at Arlington Libraries

- Systems Data
  - Website: http://www.uta.edu/library/
  - Catalog: Voyager
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: Various
  - Repository: DSpace
  - Federated Search: Metalib
  - Resource Discovery: AquaBrowser
  - Discovery System Deployment: Beta/pilot
  - Discovery System Use: Next Gen Catalog
  - Discovery Coverage: Catalog, Repository
  - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
  - Survey Q1: Staff – The investigation of resource discovery systems was done as a function of our Library's 2009-2011 strategic planning process. The strategic planning

team which researched discovery layer products consisted of staff from Library Systems, Cataloging, Acquisitions, and Reference. Once a decision to implement AquaBrowser was made, the implementation team consisted of staff from Library Systems.

- Survey Q2: Collaboration – Although the implementation was done through Library Systems, other stakeholders were called upon as needed to address specific issues that came up in the course of the implementation. Input and feedback was solicited from staff in Cataloging, Acquisitions, and Reference as the product evolved and all Library staff were asked to provide feedback when a beta site was released.
- Survey Q3: Institutional Support – The implementation of a discovery layer product resulted from our strategic planning process, so institutional support was provided from the outset.
- Survey Q4: Product Selection – The strategic planning team investigated a large number of resource discovery products which were available at the time. They evaluated system functionality, interoperability with our integrated library system, and inclusion of advanced features not readily available in our existing library catalog. That team ultimately recommended two products for consideration by our Library's management team. Finally, the Dean of the Library, in consultation with the Associate Dean and the chair of the strategic planning team, made the decision to implement AquaBrowser. Finances definitely played a major role in the selection of AquaBrowser over the competition. We also made the decision to implement the SaaS version of AquaBrowser, which further reduced initial cost of the implementation.
- Survey Q5: Timelines – The strategic planning team spent a year, from 2009 to 2010, investigating the options for resource discovery products. Implementation of the AquaBrowser system began in the spring of 2010. Technically, our system is still in "beta" mode, although we expect to remove that designation at the end of the current semester. We originally planned to implement the product in six months, but we experienced delays in the integration of our federated search solution with AquaBrowser, and that has pushed out the implementation calendar to almost one year.
- Survey Q6: User Assessment – We did not complete a user assessment prior to implementing the product. As mentioned above, the investigation and selection of a resource discovery product was mandated by our strategic planning process. We have yet to accumulate use statistics and have received very little user feedback on the system to date. The general reception to the system appears to be favorable, but in the absence of actual feedback we don't have any data to support that perception. I would say that if we were doing this again, we would most likely be looking at a different category of products, e.g. the newer web scale discovery and delivery products. We intentionally limited our AquaBrowser commitment to a three year contract with the understanding that more sophisticated products were under development and that we would almost certainly want to migrate to one of these newer products as they become more viable.

University of Texas at Austin Libraries

- Systems Data
  - Website: http://www.lib.utexas.edu/
  - Catalog: Millennium
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: SFX
  - ER—Link Resolver: SFX
  - Digital Collections: DSpace
  - Repository: DSpace
  - Federated Search: Metalib
  - Resource Discovery: WorldCat Local
  - Discovery System Deployment: Beta/pilot
  - Discovery System Use: Ambiguous
  - Discovery Coverage: WorldCat's Index, Catalog
  - Home Page Resource Search Model: Tabbed search in content area
- Survey Data
  - None

University of Texas at Dallas Libraries

- Systems Data
  - Website: http://www.utdallas.edu/library/
  - Catalog: Voyager
  - ER—Databases: Unknown/homegrown
  - ER—E-Journals: Unknown/homegrown
  - ER—Link Resolver: SFX
  - Digital Collections: DSpace
  - Repository: DSpace
  - Federated Search: None
  - Resource Discovery: Encore Synergy
  - Discovery System Deployment: Production
  - Discovery System Use: Ambiguous
  - Discovery Coverage: Encore Synergy's Index, Catalog
  - Home Page Resource Search Model: Single "Discovery" search in content area
- Survey Data
  - Survey Q1: Staff – Senior Associate Director for Public Services and Collections, Assoc. Director for Operating Systems, Head of Reference, Head of Electronic Resources, Head of Cataloging, Assoc. Director for Technical Services, System Administrator.

- Survey Q2: Collaboration – Coordination and collaboration was done through regular meetings and email discussions.
- Survey Q3: Institutional Support – Unclear. Money was available in the budget. No additional staffing needed by the campus.
- Survey Q4: Product Selection – Several representatives were invited to give a day long presentation on specific product. All staff members voted and it was a unanimous choice. Encore best suited our library needs.
- Survey Q5: Timelines – The implementation time estimate was a few months based on the sales rep's information. The actual implementation took over 6 months. It was particularly difficult because our catalog is one system and Encore is another. Keeping them integrated is an ongoing issue. Real time meshing of the data is a problem for some library employees.
- Survey Q6: User Assessment – There was an online survey distributed through the website. Most survey participants prefer to use classic online catalog or both catalogs (classic and discover system). Discover system is used mostly for simple searches. Survey participants agreed to keep both catalogs. Assessment of the discovery layer with students is still pending.

Appendix C

The University of North Texas Libraries is in the early stages of exploring options for resource discovery systems. We realize that [INSTITUTION] has implemented an instance of [SYSTEM], and, as one of our peer institutions, we were hoping that you might be willing to answer a few questions about your process to help us with our own.

(The reason we're contacting you personally is [REASON]. If you aren't the appropriate person to answer these questions, we'd greatly appreciate it if you could put us in contact with the person at your institution who is.)

1. What particular members of library staff were directly involved in the planning and implementation?
2. How did your institution handle coordination and collaboration among the disparate library stakeholders needed to implement your discovery system (e.g., systems, cataloging, public service, etc.)?
3. What kind of institutional support did you receive for the project?
4. Please describe your product selection process. Why did you end up going with [SYSTEM]?
5. How long did the project take you to plan, and how long did it take you to implement? How did the planned implementation timeline compare to the actual timeline?
6. What type of user assessment did you perform before the project to help inform what you did? And what type of user statistics and responses have you gathered since the system went live to help you evaluate what you did? And, if you don't mind sharing, what has the general reception to your system been from your users?