

Metasearch and Usability

Toward a Seamless Interface to Library Resources

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Preface

During academic year 2003-2004, the Consortium Library at the University of Alaska Anchorage granted me a sabbatical to investigate the current state of metasearch tools and their usability. The Consortium Library, like many others, seeks to make an increasing number of print and electronic resources available to users in the most intuitive, effective, and satisfying way possible. In focus groups, participants had told us they are seeking a more unified topic-based approach to their library research. Accordingly I designed a sabbatical project with the following goals:

1. Assess current metasearch tools' capabilities and challenges.
 - a. Conduct literature review and Internet research.
 - b. Interview professional colleagues in the field.
 - c. Analyze user searches and problems encountered by users repeating their searches in multiple databases.
2. Investigate the promising metasearch approaches of three leading vendors: Endeavor Information Systems, Ex Libris, and MuseGlobal.
 - a. Interview product managers and others at vendor sites.
 - b. At each vendor site, interview implementation analysts who work with libraries to implement the vendor's product.
3. Conduct evaluations of working configurations of these products at three library sites: National Library of New Zealand, Boston College, and Westminster College (Utah).
 - a. Conduct usability testing where possible.
 - b. Analyze prior usability testing results where available.
 - c. Interview library staff who implemented the product.
 - d. Interview librarians about their experience and their users' experience with the product.

This white paper details the results of my investigation, identifies issues, and recommends a course of action to the Consortium Library at University of Alaska Anchorage.

A note on my choice of software products and libraries: I initially chose to investigate Endeavor, Ex Libris, and MuseGlobal because their metasearch products were well-reviewed and had been in the marketplace serving academic libraries for a number of years. My choice was confirmed by a useful study published in June 2003 just prior to my sabbatical. Researchers from the School of Information Management at the Victoria University of Wellington, New Zealand published a comparative review of current

metasearch software for libraries (Dorner and Curtis, 2003). Their study identified seventy-nine common user interface software features, classified them, and developed evaluation criteria. They surveyed software vendors worldwide about the capabilities of their metasearch products and provided a detailed breakdown of each product's performance against each of the evaluation criteria. The researchers also surveyed New Zealand librarians to solicit their rankings of the importance of the various metasearch software features. Of the ten participating metasearch vendors, the study consistently rated Endeavor, Ex Libris, and MuseGlobal's products within the top four in all six of the raw and weighted scoring methodologies they used.

In choosing the libraries for site visits, I looked for multi-year experience where possible and implementations mentioned in the literature as complete. The National Library of New Zealand and Boston College Libraries had lengthy experience with successive versions of Endeavor and Ex Libris software. In the case of MuseGlobal whose metasearch software is most often licensed to "technology partners" that integrate *MuseSearch* technology into their own products, I wanted to look at the "native" version of the software in use at a library. No sites were live when I began my sabbatical travel. When I was finishing my site visits in spring 2004, Westminster College's library was reportedly nearest to going live and agreed to my visit. As I interviewed vendors and delved into each site's implementation, I realized that I could also benefit from remote investigations of metasearch software at other libraries. Several sites were kind enough to provide login accounts and passwords as well as answering my questions via email and telephone. Those remote investigations are included with each product report together with the on-site library and vendor visits in the appendices to this paper.

It is important to note that this white paper is not a comparative study of the three products but is intended to illustrate the state of library metasearch tools in general by looking at three representative products.

I am deeply grateful to Steve Rollins, Dean of the Consortium Library, and to the University of Alaska Anchorage for providing me with this opportunity. While I enjoyed enormous help and support from many colleagues in the course of this sabbatical research, all errors contained herein are my own.

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Introduction

THE INDISPUTABLE FACT IS THAT INFORMATION AND CONTENT ON THE OPEN WEB IS FAR EASIER AND [MORE] CONVENIENT TO ACCESS AND FIND THAN IS INFORMATION AND CONTENT IN LIBRARIES, VIRTUAL OR PHYSICAL.

(OCLC 2003)

On a recent rainy spring day in a tiny 25-person seminar room on the MIT campus, Tim Berners-Lee spoke to Indian Business Club @ MIT students and their visitors. The man credited with creating the World Wide Web fifteen years ago was preaching the gospel of reusable semantic data, the emerging RDF standard, and XML namespaces. In the course of his talk he revealed that in the early days of the web, "Nobody imagined that Google could work over the web. We didn't think you could have a disk that large." With the intervening advances in disk storage technology, the ability of crawlers to index web pages and store the data, and what he called the "nifty mathematical find" of the Google ranking algorithm, Berners-Lee noted, "The web has become very manageable."¹

In today's marketplace, metasearch software tools promise to provide an analogous level of manageability to the hybrid mix of print and electronic resources currently offered in libraries. In explanations to non-librarians, I characterize these tools as a kind of "Google for the good stuff." With a particular emphasis on usability, this paper attempts to assess the current state of library-oriented metasearch software tools through the field analysis of three leading products and to provide a recommended course of action to the Consortium Library at the University of Alaska Anchorage.

Background

What's the problem?

Access to library resources, particularly digital library resources, has become increasingly unmanageable for users, and increasingly complex even for librarians. At present, library users must navigate a bewildering array of electronic resources provided by numerous vendors using multiple search protocols. And resources keep coming: more databases, more e-books,

¹ Berners-Lee, Tim. "Semantic Web 101," presentation at the *Semantic Web Forum* sponsored by the Indian Business Club @ MIT, Massachusetts Institute of Technology, Cambridge, MA, May 3, 2004.

more e-journals, more digital collections. Each of these valuable electronic resources requires a separate user search and, by inference, knowledge of its existence and its content.

However assiduously we librarians work to organize and present this ever-increasing number of electronic resources, they remain confusing and opaque to our users, most of whom have neither the time nor the inclination to seek extensive instruction in their discovery and use. We want to teach them but they don't want to take the time to be taught (Veldof and Beavers 2001, Cockrell and Jayne 2002, Tallent 2004). As Roy Tennant of the California Digital Library so succinctly puts it, "Only librarians like to *search*, everyone else likes to *find*." (Tennant 2004). In library focus groups and in response to surveys, library users have told us they seek a more unified topic-based approach to their library research. Are we going to listen?

According to a study of the information habits of college students, "From their points of view as library users, students identify several major barriers to their successful use of library resources" including: "[d]ifficulty searching and navigating within the library and its website." The study went on to quote a student: "You have to be an expert to be able to navigate through their system." (OCLC 2002). A more recent study of 1,233 college students quantifies this trend:

When going online to do work for a course, students are more likely to use an Internet search engine (46.5%) than to go to a library sponsored electronic resource (21.9%). However, almost 1/3 of the students report that they use both methods equally. (EPIC 2004)

This problem has long been discussed in library literature as the need for a "common user interface"² but, in truth, it has become more an issue of "metasearching" across disparate resources for users. For purposes of this paper, metasearch is defined as a single search across heterogeneous multiple resources that delivers integrated results. This concept of metasearch continues to be described by many different terms (portal, single search, federated search, cross-search, broadcast-search, etc.) although terms such as portal are also used to describe much wider functionality. In this paper, I will use the terms "metasearch" and "federated search" interchangeably.

The frequent, quite satisfying use of Google and other Internet search engines by students and faculty ("good enough" results) has raised their expectations of library tools. Users are not interested in the difficulties faced by librarians in their quest to provide similar easy access to many competing

² See for example: Arant and Payne (2001).

vendors' offerings. While they appreciate the high quality of the library's information, users understandably prefer the ease of searching to which they've grown accustomed.

At the Massachusetts Institute of Technology (MIT) Libraries, web site usability testing uncovered some general problems, all of which are equally applicable to users' current search experience in libraries:

In general, one might say that **our users still have trouble with the following:**

- choosing the best databases for a particular topic
- understanding the scope of a particular database or of our catalogs
- understanding citations
- when to search for article titles vs. journal titles
- composing and refining effective search queries

One could say that it points to the need for more user education. But we also feel that improving our web interfaces can go a long way toward helping users make the best choices, especially given that so many of our users never ask for help. Our goal is to create "self-teaching" interfaces (MIT Libraries Web Advisory Group 2002).

What do users want?

GOOGLE OFFERS AN UNDAUNTING SERVICE WITH A GENTLE
LEARNING CURVE. (WIGGINS 2001)

Let's start with what we believe our users are seeking from a search tool. We may argue that this is somewhat unique within each group of library users but Roy Tennant, addressing a NISO Metasearch Initiative meeting audience, proposed the following list that likely characterizes the thought processes of most users:

- What must I go through before hitting the search button?
- How difficult is it to review results?
- Are results ranked by relevance? (that will be my assumption)
- Will I get buried? (too many sources, too many results?)
- Do I have methods to easily focus in on what I want?
- Once I find what I want, can I get to the full-text with a click?
- Can I copy a citation and put it in my paper? (Tennant, Oct. 2003)

Only with continued observation of user behavior in our own library settings and listening to what users tell us will we have a more precise view of their actual needs and desires.

A possible solution: metasearch tools

For the past few years, library vendors and others have been putting forward a number of approaches to this problem. Due to a host of problematic questions and issues discussed later in this paper, so far, no clearly superior solution has emerged. The approaches proposed by vendors and research organizations are evolving and will continue to do so. One of the most promising solutions to libraries' widening thicket of resources and our wandering users is the notion of a metasearch tool.

Metasearch Tools

NEAR TERM, LIBRARIANS HAVE AN OPPORTUNITY TO REACH A SIGNIFICANT PORTION OF THEIR UNSERVED POPULATION BY CHOOSING A SIMPLE INTERFACE THAT DEMYSTIFIES THE WEALTH OF RESOURCES AVAILABLE TO THEM.

(LUTHER, APRIL 2003)

A metasearch tool is a software application that:

- uses multiple protocols
- to perform simultaneous searches
- across multiple heterogeneous electronic information resources
- from a single point of entry.

Somewhere between fourteen³ and twenty-three⁴ vendors of such tools specifically geared toward libraries exist in the current marketplace. In the search box of a metasearch tool, a user may enter a simple search string and bring back results from multiple resources including databases, the web, digital repositories, e-journals, library catalogs, images, and e-books. This concept of simple, one-stop searching is extremely attractive to users – witness Google's 200+ million searches per day.⁵

How do metasearch tools work?

Metasearch software makes use of the search functionality built into each target resource it is searching. In general terms, a metasearch application

³ Fourteen metasearch vendors were identified in a report commissioned by the National Library of New Zealand Te Puna Mātauranga o Aotearoa (Dorner and Curtis 2003).

⁴ Twenty-three vendors are listed by LCPAIG: *Federated Search Portal Products & Vendors*. Retrieved from: <http://www.loc.gov/catdir/lcpaig/portalproducts.html> on 5/26/04.

⁵ Achenbach, Joel. "Search for tomorrow; we wanted answers, and Google really clicked. What's next?" *Washington Post*, February 15, 2004, p. D1.

goes through a series of steps to search multiple resources simultaneously and return results to the user.

Metasearch software:

- (1) *converts the user's search into a query that can be understood by the built-in search of each of the target resources chosen to be searched.*

To perform the query translation, the metasearch tool uses input from its own "knowledge database" which contains detailed library- and resource-specific information about each resource's record structures and format, access protocols query syntax, indexes, licensed access URL and authorization, etc.

- (2) *broadcasts the translated query to the selected target resources.*

The metasearch tool must use the appropriate communication protocol from its "knowledge database" to reach the resource and bring back results. Note that it searches target resources directly, not a unified index of their contents.

- (3) *simultaneously retrieves sets of results from all reachable target resources.*

Of course, some resources return results more quickly than others. Some may not be reachable at the time of search or may suffer network traffic problems.

- (4) *formats results into a canonical internal format to allow for further manipulation by the metasearch software.*

Vendors differ in their internal data representations. For example, some use XML and Dublin Core while others use the records' original cataloging format (MARC, etc.) stored in Unicode.

- (5a) *displays the results from each resource in its own ranked or sorted list.*

OR

- (5b) *displays the results in one merged list, ranked or sorted in some fashion.*

There are arguments for both approaches. Metasearch tools choosing the first approach can begin presenting the earliest results to the user immediately. Those presenting a merged list must wait for all the results in the initial subset to come back so they can be merged and sorted before presenting to the user.

While the five steps above are the basic components of metasearch, many products expand on this functionality. Metasearch tools that present results separately by resource may offer the user the ability to create a merged set after the fact. That merged set may then be sorted and/or deduped, either by default configuration or by the user.

In addition to actual federated search functionality, metasearch tools offer an array of other services: authentication and authorization; personalization features that allow a user to create a customized list of resources to search,

save searches, and rerun searches at specified intervals; and export of results to popular citation management software such as EndNote or RefWorks. The ability to print, download, or email results is common to all the metasearch products examined.

How do library metasearch tools differ from Google?

PATRONS HAVE BECOME ACCUSTOMED TO PROMISCUOUS WEB INTERFACES THAT WILL SEARCH ANYTHING; THE CHALLENGE FOR THE LIBRARY PROFESSION IS TO CREATE WAYS TO SEARCH WELL IN ALL THE RIGHT PLACES. (PACE 2004)

Library-oriented metasearch tools differ from Google in five important respects:

- *Google searches only web pages via the HTTP protocol; libraries need metasearch tools that can handle multiple protocols such as Z39.50 (library catalogs and some databases), Application Programming Interfaces (some library catalogs), proprietary XML gateways (some databases), HTTP (web pages), and many others.*
- *Google does not search the entire deep Web” which includes content residing in web-accessible databases retrievable only via specialized query language. Some estimate the deep Web to be 500 times the size of the surface Web.*⁶
- *Google creates a “just in case” index of the web by crawling the web with robot “spiders” on a monthly basis and indexing the web pages it finds.*⁷ That accounts for its speed relative to the “just in time” approach of library-oriented metasearch tools.
- *Google’s great breakthrough has been its relevance ranking algorithm. PageRank™ calculates the number of links by other web pages to a given page and interprets the importance of the sites doing the linking.*⁸ The results data from most resources that library-oriented metasearch tools wish to rank do not have a similar linking structure.

⁶ For an excellent explanation of the deep Web, see University of Albany Libraries site. Retrieved from: <http://library.albany.edu/internet/deepweb.html>

⁷ *Google Information for Webmasters: Getting Listed.* Retrieved from: <http://www.google.com/webmasters/1.html> on 6/21/04.

⁸ *Our Search: Google Technology.* Retrieved from: <http://www.google.com/technology/> on 6/21/04.

- *Google uses machine-based word searching* without benefit of the human intellectual cataloging and indexing typically applied to licensed library resource content.

Capabilities of current metasearch tools

According to Roy Tennant, Project Manager for the Metasearch Infrastructure Project at the California Digital Library, the current library-oriented metasearch products vary in terms of their features, stability, and ease of implementation.⁹ In fall 2002, the California Digital Library began to explore alternatives to the homegrown SearchLight¹⁰ tool they had used for nearly three years. In their report evaluating six metasearch products (including those of Endeavor, Ex Libris, and MuseGlobal which are the focus of this paper), the two University of California at San Diego authors noted that all the vendors were “blurring the line between what their products can do now and what they are expected to do in some future release (or even what they think they could do if you asked for it and they put their mind to it!)”¹¹ These products are evolving quickly and the developers working on them are knowledgeable about libraries, creative, talented, and listening to their customers.

In Mary Jackson’s early article on portals (one of the many words used interchangeably for metasearch) Sarah Michalak, University of Utah Libraries Director, described a 'dream portal' as a “super discovery tool that specializes in high-quality content” having the following characteristics:

- fast and powerful *searches across formats and resources*
- returns *results that are deduped and relevancy ranked*
- *delivers full text or information objects* whenever available
- *integrates appropriate applications* such as course management software
- *supports authentication*
- *permits customization and personalization* (Jackson 2002)

To varying degrees, current metasearch tools provide all of the above. In the sections below, each of these characteristics is discussed in general terms.

⁹ Roy Tennant discussed federated search capabilities and challenges in an interview December 3, 2003 at the California Digital Library office in Oakland, CA.

¹⁰ *Welcome to SearchLight - Public Version*, Retrieved from: <http://searchlight.cdlib.org/cgi-bin/searchlight> on December 30, 2003.

¹¹ Hightower, Christy and Catherine Soehner, *Multi-Resource Search Tool Investigative Report*, November 8, 2002.[internal CDL document provided by R. Tennant]

For more detailed information about each of the three metasearch products investigated in this study, Endeavor's *Encompass for Resource Access*¹², Ex Libris' *MetaLib*¹³, and MuseGlobal's *MuseSearch*¹⁴, please see the appendices.¹⁵ Detailed information is accurate only for the specific version of the software noted; metasearch software is evolving very quickly.

Searches across multiple formats and resources

All three metasearch tools studied search multiple target resources with differing formats via a range of protocols. Z39.50 is perhaps the most prevalent because it is standardized (to a point) among library applications and quite reliable. Metasearch providers also write or use proprietary Application Programming Interfaces (APIs) and XML Gateways to search specific targets. As a last resort, metasearch providers also "screen scrape" via the HTTP protocol, that is, perform ad hoc parsing of the HTML from web pages to collect the author, title, and other metadata needed to provide a reasonable result set listing. At the sites I visited, metasearch tools using all of the methods above could provide federated searching for anywhere from 30 to 90% of the library's electronic resources.

Deduped and relevancy ranked results

Both deduping (also called deduplicating) and relevancy ranking remain problematic as does sorting of results. These features are offered in at least some versions of all three metasearch products investigated; however, deduping, ranking, and sorting are certainly as much a challenge as a capability and are further discussed below.

Access to full-text and information objects

Reference librarians report that users typically want a link directly to full-text content. Some metasearch tools come bundled with an OpenURL link resolver¹⁶ that performs this full-text retrieval or other onward navigation. Link resolver software uses the OpenURL standard¹⁷ to assemble information about the user's privileges, the retrieved citation, and the library's licenses and subscriptions, in order to determine what additional service options to offer the user such as access to full-text or interlibrary loan. Still other

¹² <http://encompass.endinfosys.com/whatis/whatisENC2.htm#ENCRA>

¹³ <http://www.exlibris-usa.com/metalib.htm>

¹⁴ <http://www.museglobal.com/Products/musesearch.html>

¹⁵ <http://www.lib.uaa.alaska.edu/tundra/msuse2.pdf>

¹⁶ For a useful overview article on link resolvers see: McDonald and Van de Velde (2004).

¹⁷ *Starting Out with Portals and OpenURL: An Introduction*. Retrieved from: <http://www.loc.gov/catdir/lcpaig/introduction.html#whatisopenurl> on 5/12/04.

metasearch tools generate OpenURLs themselves or provide support for OpenURL linking with whatever tool the library chooses. Critical as this reference linking function has become, discussion of linking software is not within the scope of this paper which concentrates strictly on federated search products.

The National Library of New Zealand used a heavily customized version of the Endeavor *Encompass for Resource Access* software to provide an excellent example of direct delivery of images and sound in its *Discover* project.¹⁸

Integration with appropriate applications such as courseware

As course management software itself continues to evolve, full-scale integration of these metasearch tools with applications such as WebCT and BlackBoard is in its early stages. It is possible to save suggested or often used searches within the courseware environment by means of a URL query string syntax that launches the metasearch tool and performs a canned search. Some vendors allow a metasearch applet to reside within campus courseware systems or on any other web page the library desires. Results can then be returned to syllabi, course pages, library guides, faculty web pages, and the like. Endeavor offers an *ENCompass Course Content Integrator* that allows instructors to add library electronic content and searches to their courses within WebCT and BlackBoard without library assistance.¹⁹

Integration with institution-level portals, integrated library systems, institutional repositories, and metadata harvesters are all under discussion as well by the metasearch software vendors

Authentication and authorization

Access to library resources involves both authentication (is the user who s/he claims to be?) and authorization (is this user permitted to access this particular resource?). All the metasearch tools investigated offered support for authentication schemes whether they originate with the library, the campus, or some other entity. Among the metasearch tools studied, I found examples of support for directory protocols such as LDAP, library system patron barcode schemes, Novell accounts, and local or vendor-supported proxy servers. There is discussion of Shibboleth²⁰ support for

¹⁸ *Discover Te Kohinga Taonga* – “The Collections of Treasures” website. Retrieved from: <http://discover.natlib.govt.nz/index.shtml> on 2/17/04.

¹⁹ See <http://encompass.endinfosys.com/pdf/CourseContentIntegrator.pdf>

²⁰ See <http://shibboleth.internet2.edu/>

inter-institutional sharing of licensed web resources as well. Once a user is authenticated, authorization is handled in the knowledge base configurations for each target resource.

Customization and personalization

These products excel in their ability to be customized by libraries that deploy them, particularly in their interface design. Given technically skilled staff, almost anything can be achieved. That said, libraries that have enhanced the functionality of the products have had to spend time removing customizations when product upgrades are delivered. Because these products are evolving so rapidly and vendors and implementing libraries are in good touch, libraries may find their custom enhancements incorporated into the base product in the next release. Vendors are very open to suggestion as they strive to improve these new products.

Metasearch software provides personalized alert services, allows users to create customized list of resources to search, and provides a workspace in which users can save their searches and come back to them at a later time. Some tools allow users to configure result set attributes such as sorting method, number of results returned, and deduping algorithm. Personalization is demanded by the marketplace and is perceived as a way to distinguish one metasearch product from another. However, from my investigation of metasearch tools, I found very little data as to whether users actually take advantage of personalized features in these products.

A number of other sources list detailed specifications for the capabilities and functionality desired in metasearch tools (Boss 2002, Dorner and Curtis 2003, LCPAIG 2003). Detailed information about the specific capabilities of the spring 2004 versions of Endeavor's *Encompass for Resource Access*, Ex Libris' *MetaLib*, and MuseGlobal's *MuseSearch* is included in the appendices to this paper.

Challenges to current metasearch tools

Speed of search

Metasearches of multiple heterogeneous resources are inherently slower than Google searches. When a user performs a Google search, that search is sent to "just in case" indexes of the web created in advance, complete with ranking data (Sadeh 2004). A user searching Google is searching that index, not the actual web pages. You can liken it to an online library catalog search where the indexes to the MARC fields are being searched, not the MARC records themselves. Searching an index is a relatively fast operation.

By contrast, metasearches operate on a “just in time” search paradigm, going directly to a target resource when a search is entered by a user. Because metasearch tools broadcast a search simultaneously to multiple databases with differing record structures, search protocols, and capabilities, their performance is dependent on the speed of each resource searched, as well as on local network and Internet performance.

For a library’s locally stored digital data, Ex Libris has created an add-on *MetaIndex* product that functions as a “just in case” index. It uses the Open Archive Initiative Protocol for Metadata Harvesting (OAI-PMH) to harvest metadata from OAI-compliant repositories to enable fast metasearching of these repositories. The California Digital Library and others are interested in “target creation,” harvesting metadata from digital repositories of interest and then making it available to the metasearch tool as a searchable target.²¹

Lack of standards

Current metasearch tools are hampered by the lack of standards in a number of key areas:

Record structures of target resources

At present, there is neither a standard query syntax nor a standard structured record syntax (such as the Z39.50 Generic Record Syntax) across all target resources used by libraries. In order to conduct their searches, metasearch tools use the built-in search functionality of the target resource and retrieve records from it. The result records being returned in response to a metasearch query can vary greatly in their attributes. This leads to problems of results interpretation and display for the metasearch tool.

Native search capabilities

Neither is there an agreed-upon standard set of search capabilities for target resources. For example, if a certain resource does not support subject searching (e.g., JSTOR)²², then the metasearch software must decide what (if anything) to retrieve from that particular resource when a user enters a search such as Subject Keyword = architecture. Some metasearch tools choose not to execute that search in the

²¹ Tennant, loc.cit.

²² “When users search the archive in the native JSTOR search interface, they are required to identify the discipline(s) in which the search should be executed. This feature is lost in a broadcast search to JSTOR, as the metasearch engine has no way to determine which discipline(s) to search.” (JSTOR 2004)

resource and indicate that fact in their intermediate hits screen; others choose to perform a keyword search across all disciplines in that resource rather than the more precise subject search requested.

Protocols

There is no standard search and retrieval protocol for metasearch. The use of Z39.50, APIs, and XML gateways is fairly straightforward, though not without some idiosyncrasies. The most reviled method of searching target databases is via HTTP "screen scraping." Some metasearch service providers refuse to use it, but most consider it a necessary evil because so many resources are searchable in no other way. JSTOR describes the problem succinctly:

The current technique employed by metasearch tools - issuing HTTP requests to JSTOR, retrieving an HTML page with the number of 'hits', then 'screen-scraping' that number from the HTML page to include in a larger, aggregated result set - is neither sufficient nor desirable as a long-term strategy. HTML was designed as a display protocol and was not really built for the robotic data parsing that metasearching requires. As a result, quality suffers (JSTOR 2004).

Using the HTTP protocol for searching and then parsing the returned HTML also has the major disadvantage of needing to be reconfigured each time the screens of the target resource are changed. In the ever-mutable web world, this creates a huge maintenance burden.

Load on content providers' systems

There is so far no standard way to identify a metasearch as such and distinguish it from other incoming searches so the content provider can handle it expediently. Content providers are justifiably concerned about metasearch and the load it will create on their systems if every search is run against every database, no matter how inappropriate that search may be for the subject coverage of the database. Content providers are unprepared to handle the increased usage, especially if the majority of metasearches will not likely result in users actually viewing a record from their databases. Smaller, more specialized databases are likely to be hardest hit if they are included in scattershot metasearches.

User interface design

THE UIS [USER INTERFACES] OF THE CURRENT COMMERCIALY AVAILABLE MS [METASEARCH] PRODUCTS SHOW NO SIGN OF HAVING UNDERGONE USABILITY TESTING WITH UNDERGRADUATES. (LINDAHL & WILDER 2003)

Metasearch software vendors have only recently begun to incorporate user-centered design experts and techniques such as focus groups into their product planning. There is the interesting question of which users these products are designed to serve, a topic covered in a later section of this paper. Some library customers have suggested that metasearch vendors make usability a core part of their user interface design process so as to make their out-of-the-box interfaces simpler and more intuitive (Lindahl and Wilder 2003). The irony remains that a tool designed to ease the burden of searching can be itself difficult to use. However, the metasearch products I saw were heading in the direction of simplified, cleaner interfaces.

Results management and display

When a metasearch engine retrieves a set of results from a target resource, it receives no standard core metadata about the result set itself (total number of hits, record format, etc.) and no standard set of data elements for each record in the result set (title, author, subject, year, etc.) Thus manipulating the results coherently and presenting them to users in a clear and understandable manner is a major difficulty.

Deduping of results

Some metasearch software providers offer deduping in a merged results set. Metasearch tools use a number of different deduping algorithms which may be set as a default or may be offered as a user option. Due to the non-standard nature of the results data being returned from many disparate resources, metasearch vendors are the first to admit that none of the deduping algorithms are perfect. To mitigate the effects of possibly erroneous deduping, the metasearch tool may offer the user the ability to examine duplicate records.

Content providers, in their turn, are concerned about what they term "unfair" deduping. If records in a result set are deduped, which provider's record is chosen for display and how is that choice made? Some metasearch software offers the library an option to weight

databases for purposes of determining which results will rank more highly.

Sorting and relevance ranking of results

Metasearch engines that display results by resource (rather than in a merged set) typically present them in the order they are received from each resource. In many cases, the sort order of results is not at all apparent to the user. Some metasearch providers offer the sort options supported by the source database as a post-search user option.

Predictable problems also occur when trying to sort a merged results list containing unlike items such as web page data, article citations, catalog bibliographic records, and images.

For performance reasons, no matter the total number of hits retrieved, all three metasearch tools in this study limit the initial result subset display to a maximum number of results from each target resource (usually configurable by the library to somewhere between 10 and 100). Typically metasearch tools take the first hits returned by each resource, assuming those to be the “best” hits, as decided by the resource itself. If the metasearch software is sorting or ranking only the first 10 or the first 40 results from each database in a merged set, the goodness of its ranking is totally dependent on the order in which the target resource has returned results. If that order was “newest first,” how can the metasearch tool sensibly apply relevance ranking to the whole result set?

Relevance ranking, like deduping, makes sense in a merged result set, and there is some indication that users assume it because of their experience with Google and other search engines. However, without a standard set of result record data elements from each content provider to compare, metasearch software vendors are struggling to provide this functionality.

Many target resources do not provide relevance ranking with the results they return to a metasearch engine. Even when they do, metasearch software that attempts to merge the results with those from other search targets is left with the task of squaring numerous perhaps undocumented ranking schemes into a single weighted algorithm that makes intuitive sense. Peter Noerr of MuseGlobal puts it this way: “Relevance ranking is a complete myth. There’s no such thing as a decent way to normalize the rankings that are returned and

interfile the results. The data is horrible.” He went on to say that there are ways to approach the problem of relevance ranking by examining the full-text. That solution would come with its own issues given the pay-per-view licenses many libraries use to access full-text and the performance problems inherent in returning large amounts of full-text.²³

There are some other possibilities: in a union catalog, the number of holding libraries may serve as a ranking variable (Tennant, Jun. 2003). There is also some ranking possibility inherent in the citation indexes librarians have long used to pinpoint the key articles within scholarly disciplines; however, this method is not yet being widely used in library-oriented metasearch tools.

Display of results

Besides lack of standards for data elements returned from content providers, display problems include the obvious differences in the types of results returned. What will users make of a mixed results set that includes bibliographic records, article citations, images, directory entries from databases such as Hoover’s, and web pages?

Branding is also an issue for content providers. While many librarians eschew it, many content providers insist that the user see their brands.

Maintenance of knowledge database and customized code

Maintaining the database of target resource configurations is another major concern for libraries that purchase metasearch software. Resource connectors “break” causing down-time in accessing target resources. MuseGlobal has staked out this territory by providing and maintaining an automated 24x7 “Source Factory” of connectors. Several integrated library system vendors that market their own metasearch products (Endeavor, Innovative Interfaces, Sirsi, and VTLs among them) use the MuseGlobal connector service. If the library maintains its own configurations, detailed knowledge of targets and regular testing is required. As North Carolina State University Systems Librarian Andrew Pace commented in a recent column, “Make no mistake, the maintenance and upkeep of these http parsers, or screen-scrapers, is no small task—simple yet tedious and never-ending work.” (Pace 2004)

²³ Peter Noerr, Chief Technology Officer, MuseGlobal, Inc., provided this information in an interview March 16, 2004 at MuseGlobal headquarters in Salt Lake City, UT.

Efforts to meet the challenges

NISO Metasearch Initiative / standards

Interested stakeholders are working toward mutually agreeable standards in the metasearch arena. In the past year and a half, the National Information Standards Organization (NISO) has embarked on an ambitious and fast-moving Metasearch Initiative whose stated goal is to enable:

- metasearch service providers to offer more effective and responsive services
- content providers to deliver enhanced content and protect their intellectual property
- libraries to deliver services that distinguish their services from Google and other free web services. (NISO 2004)

The NISO Initiative grew out of concerns discussed at a 2003 ALA Midwinter open meeting called by Gale, Ebsco and Proquest to discuss the impacts of metasearching on content aggregator databases and other common problems related to metasearching. Subsequently, NISO agreed to host library system vendors, metasearch service providers, content providers, and librarians in a May 2003 Denver strategy meeting where several key issues were discussed: authorization and authentication, statistics, possible ways of metasearching (protocols), identifying incoming searches as metasearches, target resource description, and results set management (NISO 2003).

Groups with international representation are currently meeting to work on the broad areas of access management, collection description, and search and retrieval, with the shared idea that a pragmatic solution is needed. They will establish a common vocabulary, survey content providers on search protocols and results set management, and review the SRW/SRU protocol for use as the basis of a metasearch standard.²⁴ While no explicit timetable has been announced, there is general agreement that the effort is moving quickly. The high level of participation and cooperation by libraries, vendors, and publishers is a welcome and propitious start (Pace 2004).

How libraries currently use metasearch tools

By the end of 2002, a special issue of *Library Technology Reports* on library portals reported that "A small minority of libraries – fewer than one-half of 1% -- has implemented portals." (Boss 2002) At that time, Endeavor

²⁴ Jenny Walker of Ex Libris (USA), co-chair of the Initiative, briefed the ARL *MetaLib* Portal Implementors Group at their spring meeting, Cambridge, MA, April 29, 2004.

reported 24 installed sites²⁵ and Ex Libris 40+ institutions²⁶ with their metasearch products. By 2003, less than 5% of libraries had implemented metasearching.²⁷ In 2004, Endeavor reported *Encompass* “in place at 138 institutions,”²⁸ Ex Libris reported 332 *MetaLib/SFX* customers (as separate from their 216 *SFX* only customers),²⁹ and MuseGlobal had three individual library customers.³⁰ While these numbers continue to grow, the vendors interviewed for this study noted that many libraries purchase metasearch software and then take their time implementing it, or begin by implementing a part of the software other than metasearch. Of the three libraries I visited, only Giovale Library at Westminster College in Utah has implemented metasearch over most (95%) of their licensed databases. They were also unique in that MuseGlobal staff set up the initial configurations for all their resources and fine-tuned them in response to extensive Library testing.

While users and many librarians want a Google-type search tool covering all library-provided electronic content, in the course of this study I observed libraries using metasearch tools in a more limited way, at least at this stage of the products’ development. Libraries were deploying metasearch tools successfully:

- As resource discovery tools
- To search a limited number of popular full-text resources

Libraries use metasearch tools for resource discovery, the newest incarnation of the homegrown “Find database” tools long used by libraries. Most metasearch products offer some version of a “Find database” tool. While University of Rochester chose not to implement that feature in the Endeavor software, a University of Kansas reviewer noted that Endeavor’s metasearch tool “worked well as a resource discovery system.” (Warner 2003)

User feedback shaped Cornell’s “Find Articles/Find Databases/Find e-Journals” service which evolved over ten years. In 2001, their popular

²⁵ Boss 2002

²⁶ Cox and Yeates 2002

²⁷ Luther, Apr. 2003

²⁸ Retrieved from <http://encompass.endinfosys.com/pdf/ENCompass-customer-list.pdf> on 6/30/04.

²⁹ Jenny Walker, Vice President of Marketing and Business Development, Information Services Division, Ex Libris (USA), Inc., provided this information in an interview March 30, 2004 at Ex Libris Information Services Division headquarters in Watertown, MA.

³⁰ Jed Gilmore, Vice President of Sales at MuseGlobal, Inc., provided this information in an interview March 15, 2004 at MuseGlobal headquarters in Salt Lake City, UT.

homegrown “e-Reference” service averaged over 55,000 monthly connections to resources. On the down side, “Users had been trying to execute article level searches [instead of searching for databases] from the front page of e-Reference for years, not understanding that their searches were too specific.” After two rounds of “paper prototyping” and focus groups with students and faculty, some key recommendations emerged from user testing of their new Endeavor metasearch tool:

- The screen design was far too cluttered. Users were looking for a Google-like search box with very little text.
- Combining searching and browsing ... on one screen, did not work.
- As they had with e-Reference, users still expected article level searching from the front page, and now that we had this capability, we needed to present it in an intuitive way (Chandler 2003).

Libraries I visited recommend their metasearch tool as a starting place for research, definitely not the only place. The supremacy of the native interface for complex research is not threatened by the use of these tools and, in fact, easy access to the original interface designed for each resource is a hallmark of most metasearch software. When users need sophisticated search capabilities, the native interface is still the clear choice. Metasearch tools also prove quite useful in interdisciplinary research where a user needs to choose search targets in disparate subject areas with which they may be unfamiliar.

Some libraries such as those at the University of Rochester and Boston College provide a default search of a limited number of resources. At Boston College more than 90% of their students’ metasearches occur in *Quick CrossSearch*, a simplified keyword search that defaults to their ten most heavily used resources. They have so far been unable to include one of their top ten, LexisNexis, because it is not searchable via their Ex Libris metasearch tool.

Detailed reports of how the National Library of New Zealand, Giovale Library at Westminster College in Utah, and Boston College Libraries are using the Endeavor, MuseGlobal, and Ex Libris metasearch products are included in appendices to this paper.³¹ Details and screen shots of remote explorations for three additional libraries using Endeavor and MuseGlobal software are also contained there.

³¹ <http://www.lib.uaa.alaska.edu/tundra/msuse2.pdf>

Findings and conclusions

Early days of product development

Several key findings emerged from my research. Chief among them was the recognition that it is very early days for these library-oriented metasearch products, most of which were introduced in 2001 and 2002 (Boss 2002). The fact that some have been in production for more than two years in library settings may be misleading. While not exactly beta products, these products continue to evolve significantly with the guidance of their librarian users.

During my investigation of libraries' use of three specific metasearch products, it was apparent that librarians in all three sites spent a great deal of time communicating with vendor staff. The National Library of New Zealand lobbied Endeavor for adherence to emerging standards such as RDF (Resource Description Framework)³² and developed workarounds to load their RDF data into the latest update of the *ENCompass* product. Giovale Library at Westminster College fed back the results of their extensive testing of resource connectors to MuseGlobal staff, the acknowledged experts and keepers of the largest "Source Factory" of connectors in the industry. Staff at Boston College Libraries, together with other *MetaLib* customers among the Association of Research Libraries (ARL) libraries, meet regularly with Ex Libris development staff to chart library needs and future product directions. At the larger libraries, staff were clear about their intent to influence product development to meet the needs they see in their own libraries, while at the same time recognizing the vendors' need to solve quite basic metasearch problems for the wider library market.

Issues for libraries and librarians

Vendor relationships / early adopter role

WE'RE PUTTING A LOT OF EGGS IN ENDEAVOR'S BASKET.
(STEVE KNIGHT, NATIONAL LIBRARY OF NZ)

The metasearch products' early stage of development raises several issues for libraries that deploy them. These libraries are early adopters in every sense of that label and can expect to invest a large amount of time in metasearch implementation and its continued improvement cycle. Their

³² RDF is a language for representing information about resources on the web. See <http://www.w3.org/TR/rdf-primer/>

relationship with the metasearch vendor is typically close and collaborative. In choosing a vendor, libraries need to select the vendor as carefully as the product. The product will change, perhaps quite rapidly. It is the vendor relationship that lasts.

Staffing needs

From interviews with staff at all three libraries, I believe a library planning to implement a metasearch product would be wise to devote at least one full-time-equivalent librarian to the effort. Initial implementation timelines vary widely but typically range from six to twelve months with libraries tending to implement a reference linking product (such as *SFX* or *LinkFinderPlus*) first. As metasearch products improve and the library's knowledge grows, the need for full-time staff support may lessen. However, I encountered a situation in one library where no new resources were being added to the well established metasearch tool because there was no one available to configure them. The maintenance of existing configurations for target resources can also be very time-consuming.

New skill sets

In some cases, new skills are required of librarians who implement these products, including knowledge of Extensible Markup Language (XML) and Extensible Stylesheet Language (XSL). At the National Library of New Zealand, with its highly customized implementation of Endeavor's product, an XSL specialist and two analysts spend the preponderance of their work days keeping up with software upgrades and configuring many additional resources to be searchable within its interface.

In addition, someone on the library staff must have extremely comprehensive knowledge about the library's electronic resources. Library staff must document not only authorization methods and other specifics required for access to each database, but thoroughly understand each resource's finer points: record structures, supported searching mechanisms, display vagaries, and the like. At this stage of product development, testing of each resource is a prudent path. Libraries must be able to answer their own users' help requests as they come across questionable search results or find themselves trapped in the native interface of a resource that doesn't gracefully return them back to the metasearch tool's results display.

Librarian “buy-in”

AS FAR AS USER EVALUATIONS [IN GENERAL], END USERS SAY,
“THIS IS GREAT!” LIBRARIANS SAY, “IT’S NOT PERFECT.”

KAREN GEGNER, ENDEAVOR

When looking at metasearch in these early days, there is also an overall issue of librarian “buy-in.” Some would go so far as to term it “librarian resistance” (Luther, Oct. 2003). Librarian users of these tools perhaps disagree with novice users as to how effective they are. In a series of interviews with reference and bibliographic instruction librarians at Boston College Libraries (BCL), it was clear that there is uneven acceptance of the Ex Libris metasearch product among librarians although it has been in place at BCL since early 2002. Some BCL librarians introduce the metasearch tool in their instruction sessions; others do not. Some reference librarians still prefer to steer patrons to the familiar database list (now more than 300 resources strong) rather than risking what they term the “quick and dirty” search provided by *MetaQuest*, their local metasearch tool. BCL users however, are voting with their keyboards; they have logged more than 199,000 *MetaQuest* searches over the ten months since the latest version went live.³³ The bulk of those searches (92%) were clustered in the 10 resources default-searched by the *MetaQuest Quick CrossSearch*. In other words, the user did not have to choose the databases to search.

Mix of resources that can be metasearched

Librarian buy-in is also heavily influenced by the mix of resources able to be effectively metasearched. In the case of the Ex Libris product at Boston College, while all 300 resources can be listed in the *MetaQuest* interface, only a third are actually searchable via the metasearch tool. The other resources must be searched individually within their own native interfaces. Librarians serving students whose discipline resources are not well covered by the metasearch tool are justifiably loathe to recommend its use. For disciplines such as Nursing where very complex searching is typically required, again librarians have found the metasearch tool lacking when compared to the native search interface of each resource.

Because MuseGlobal makes greater use of HTTP searching, Giovale Library is able to search more than 95% of its approximately 100 database and catalog resources via *MuseSearch*. Since their metasearch implementation has only recently gone live (June 2004), it remains to be seen how useful

³³ See Appendix C: *MetaLib* Search Statistics – Break-down by: Resource at <http://www.lib.uaa.alaska.edu/tundra/msuse2.pdf>

the Westminster College librarians and students will find it. The small size and cohesion of their reference staff, the strong support of the library director, and the excellent cooperative relationship between the metasearch vendor and the library will likely play a positive role.

Impact on library organization and practices

BUILDING FLEXIBILITY AND RESPONSIVENESS INTO PROCESSES, PRODUCTS AND ORGANIZATIONAL STRUCTURE WILL BE REQUIRED TO TAKE ADVANTAGE OF MANY OF THE EMERGING TECHNOLOGIES—GOING 'PERMANENTLY BETA' MAY BE THE TREND. (OCLC 2003)

Introducing a metasearch tool can have far-reaching effects in a library setting, some perhaps unforeseen. Libraries with metasearch tools have revisited their database acquisition practices and questioned their organizational structures, particularly the interplay of systems and reference staff. Some have found that metasearch encourages a new, more user-centered focus. Metasearch tools can also have a significant impact on bibliographic instruction. In a number of both library and vendor sites, an interesting idea is being floated: should the metasearch engine replace the online public catalog interface? Giovale Library has designed its *MuseSearch* interface with this ultimate goal in mind.

Who are the users?

LIBRARIANS WILL TAKE THE LEAD IN SELECTION AND EVALUATION OF DIGITAL LIBRARY SYSTEMS ... AND YET THEY ARE ULTIMATELY INTERMEDIARIES. THE NEEDS AND PREFERENCES OF LIBRARIANS, WHO ARE DRIVING THE SELECTION PROCESS, OFTEN DO NOT ACCURATELY MIRROR THE NEEDS AND PREFERENCES OF THE LARGER INSTITUTIONAL COMMUNITY. (LYNCH 2003)

The question of librarian buy-in hints at another interesting issue that affects the development of library-oriented metasearch tools. Of the three vendors examined, two sold their products directly to libraries and librarians. The third vendor sold primarily to integrated library system vendors who in turn sold to libraries and librarians. None of the companies had first-hand experience with the intended end-users of their products. The vendors rightly see their customers as librarians; they are pleased to report that they use focus groups of librarians to design their user interfaces.

Increasingly, I would argue, the way in which librarians use search tools has come to vary tremendously from the way in which ordinary users search for information. An August 2004 Pew Internet & American Life Project survey revealed that 84% of Internet users have used a search engine and 87% of search engine users say they find the information they want most of the time. The average search engine user scrolled through 1.8 result pages during a typical search (Fallows and Rainie 2004).

Because librarians are in fact intermediaries, we need a great deal more research into the needs and information-seeking habits of library users. When we've done the research, we must find a way to factor what we learn about our users' ways of searching into our buying decisions and communicate that research to the vendors of our systems. While libraries are indeed conducting usability testing and other types of user studies, it is clear that librarian preferences rather than user preferences still rule the design of library-oriented metasearch tools.

Librarian attitudes toward users

IF WE DESIGN FOR *US*, THAT'S NOT WHAT OUR PATRONS WANT. WE NEED SYSTEMS THAT WILL BURY THE TECHNOLOGY AND THE COMPLEXITIES. (WAYNE PEAY, UNIVERSITY OF UTAH, ECCLES HEALTH SCIENCES LIBRARY³⁴)

Gate count and circulation statistics show that we are losing library users; perhaps the fact that our systems make users feel stupid is a contributing factor. We must accept the fact that we will never get the chance to instruct each and every user of our systems. Librarians must insist on systems designed to help our users succeed. This is especially critical since users exhibit a preference to use those systems in self-service mode (OCLC 2003).

In talking to librarians not already involved with metasearch tools, I found a curiously judgmental attitude on the part of some librarians (though none were librarians at the three library sites visited.) The most striking example occurred at a library conference convened for users of specific integrated library system software. Seventy or more librarians crowded into the session on usability testing, demonstrating the heightened interest librarians have in this topic. However, when the academic librarian presenter showed the *Camtasia*-recorded capture³⁵ of the user's search and the audience heard

³⁴ Comment made during discussion of metasearch tools among Utah academic library directors at the Utah Academic Library Consortium spring meeting. St. George, Utah, March 2004.

³⁵ *Camtasia* is software that records screen activity and narration. See <http://www.techsmith.com/products/studio/default.asp>

the user's voice "thinking aloud" as the screen showed his search steps, the librarians couldn't stifle their laughter. Although the user was conducting a perfectly logical search *in web terms*, every librarian in that room knew that he wasn't doing it the *right way*, the *library way*. Rather than question the search tool, librarians blamed the user. This is a condescending attitude toward our users that I believe we librarians must abandon.

Usability issues found in metasearch tools studied

Although it is difficult to generalize, I found a number of usability problems in the metasearch tools I investigated. These can be grouped into five main areas.

Navigation

In a metasearch product, clicking on a result title doesn't always get you to full-text. Sometimes it provides a fuller bibliographic or descriptive record. Sometimes it launches a new search for that title across multiple databases. Users of all three products had trouble with basic navigation within each product's interface. The products didn't always do what they expected. "What?" and "Where?" questions were common in both the 2004 MuseGlobal metasearch tool usability tests at the Westminster College library and in the archived reports of the National Library of New Zealand's Endeavor product testing conducted in 2002

In particular, testers had trouble with the small plus and minus icons signifying Endeavor's Expand/Collapse hierarchy, a design element also used in Fretwell-Downing Informatics' *ZPORTAL* metasearch product. According to librarians at Boston College, students there have trouble with the myriad choices on the busy Ex Libris screens. The options to select a Resource Category, Locate a Resource by keyword, and View an A-Z list of Resources, are presented via multiple pull-down menus on the same screen, causing confusion for students. In usability testing the MuseGlobal product with library work-study students, 60% of the testers used the browser Back button, some repeatedly, even though it did not work for navigation within the product. This was true in the Endeavor product as well.

In fairness to the vendors, the interfaces to these products are eminently customizable. All three libraries in this study had customized their interfaces, some extensively. Metasearch products do show movement toward simpler navigation; for example, Ex Libris is about to release a new version of their metasearch product with a much less cluttered interface.

Adherence to Web and Graphical User Interface (GUI) conventions

Related to the browser Back button navigation issue encountered above, students in the MuseGlobal metasearch tool usability tests expressed aloud their wish to use common web conventions when navigating through result sets. One user said that it “would be good if titles were the blue links” as on most web pages. Another mentioned she was “Looking at bottom [of page] for something like ‘you’re on page 1 of 6’.” Three of the testers wondered aloud if quotes to signify exact phrase worked [they do not.]

The Ex Libris product makes use of GUI conventions for their Sort function; rather than invoking a separate Sort button, *MetaLib* result sets are sortable by title, author, or date using the GUI convention of clicking on the column header.

Utah students testing the MuseGlobal product didn’t notice the separate Sort option at the bottom of the screen, even when they wondered aloud about the ability to “sort by video” or asked, “Is there a date thing I could do?” Metasearch tools that use common web search and GUI conventions to the extent possible are likely to provide an easier learning curve for novice users.

Choice of resources / choice of search options

Most larger libraries today provide access to somewhere between 100 and 400 databases. Research confirms that choosing the databases in which to search is among the hardest tasks a novice user faces (Lack 2001, Veldof and Beavers 2001, Cockrell and Jayne 2002, MIT Libraries Web Advisory Group (2002). In this study, Boston College librarians underscored the finding. BCL’s Manager of Instructional Services goes even beyond to say that students’ “biggest challenge is to choose the [subject] category.”³⁶

While most metasearch products require the user to choose a category or specific resources to search, BCL has used the Ex Libris *QuickSearch* to good effect. Librarians chose their ten most heavily used resources (excepting LexisNexis which is not searchable under *MetaLib*) to be the default target resources for *Quick CrossSearch*. Fully 92% of their *MetaQuest* searches take place in those ten resources. Students clearly appreciate the convenience of a preselected broad set of resources and librarians are reasonably happy with the interdisciplinary mix of resources they chose.

³⁶ Kwasi Sarkodie-Mensa, Manager of Instructional Services at O’Neill Library, provided information about bibliographic instruction and user experiences with *MetaQuest* in an interview April 16, 2004 at O’Neill Library, Boston College, Chestnut Hill, MA.

University of Rochester (UR) libraries designed a very streamlined implementation of the Endeavor metasearch tool with just four default full-text resources. The choice of resources was dictated by speed, searchability with the connectors they have, coverage, and the return of useful results. Based on usability testing, UR eliminated search progress screens and reduced the number of clicks it took to get to full-text (Lindahl and Wilder 2003).

Students in the Utah usability tests also had some problems choosing the type of search to perform. They didn't always understand the library and/or MuseGlobal terminology ("description as a search type) or the Boolean grouping options on the advanced search screen.³⁷ Endeavor users too had questions about terminology ("keyword anywhere"). Boston College librarians reported their users found the terms "resources" and "browse" confusing; the BCL web accessibility group has taken up the issue.

Feedback regarding search progress

Speed of federated searches, or lack thereof, is a known challenge to all metasearch products. User expectations have been set by their Google experience. One self-described "impatient searcher" in the Utah usability tests put it succinctly: "It needs to be faster." All the student testers had trouble judging the progress of MuseGlobal's search; they often initiated a new search strategy before letting the original search run its course. At the library's request, MuseGlobal added a moving progress bar to improve feedback on search progress. Many libraries have found it necessary to add such a customized progress feedback bar to the metasearch products they chose. Further usability testing is needed to determine whether the addition of the feedback bars sufficiently mitigates the speed issues for users.

In another effort to prevent user frustration, Ex Libris allows the library to set a timeout value in the product's administrative interface. If the search of a particular resource takes longer than the timeout value set, the Search Hits summary page shows a "Suspended" message for that database and the search of that resource terminates with zero hits. Other products have a Stop or Cancel Search option that can be invoked by the user.

Results display

This is perhaps the area of greatest difficulty for metasearch tools. The fact that metasearch tools handle limited subsets of the results at any one time for performance reasons is an impediment to accurate sorting, relevance

³⁷ See Appendix E at <http://www.lib.uaa.alaska.edu/tundra/msuse2.pdf>

ranking, and deduping. The trade-off between speed and result set handling is a thorny one. If the NISO Initiative is successful in achieving standards in the areas of result set metadata and single record metadata, that could be a key development. There is tension between the need for a simple protocol and the need for rich metadata in order to provide features such as deduping, sorting, and relevance ranking (Randall 2003).

The three products have differing approaches to the actual display of results.³⁸ The Endeavor product presents an intermediate hits screen by resource with an “all results” button that allows the user to choose a merged subset of results from all resources. The Ex Libris product displays an intermediate Search Hits screen by resource and offers the user the ability to create a merged set of results only if the total number in the result subset (from all resources) is under 200. Depending on the configured default sort setting, MuseGlobal displays merged results immediately, while also displaying resource names that a user can click to display results from one resource at a time if desired.

Both the sorting and deduping options in these metasearch tools are primitive but improving with each new version. Often it is not immediately clear to the user how the results are ordered. Relevancy ranking, when it is offered at all, is hard to accomplish and uneven across a universe of MARC bibliographic records, URLs, full-text and abstracted resources, directory databases, etc.

MuseGlobal presents the most user options for manipulating results sets (Boss 2002); however, students testing the product at Westminster College appeared to look mainly at titles and uniformly ignored those options.³⁹

While presenting results in a coherent unified list is a major challenge for these tools, I suspect that further usability testing will indicate that users expect a merged list. Unless they are using the metasearch tool for resource discovery, I’m not sure the intermediate screen of results is helpful to users and in fact may be seen as slowing them down. However, at the present speed of metasearch tools, it does serve as feedback that the search is still working.

Usability testing – who does it and who *should* do it?

DISCOVERING USERS’ SEARCH BEHAVIORS AND THEIR NEEDS
WAS A TRANSFORMING EXPERIENCE, ESPECIALLY FOR THOSE
LIBRARIANS WHO ACTUALLY ADMINISTERED THE USABILITY
TEST. (COCKRELL AND JAYNE 2002)

³⁸ See sample screens in Appendices at <http://www.lib.uaa.alaska.edu/tundra/msuse2.pdf>

³⁹ See Appendix E at URL above.

While I found good faith attempts at usability testing on the part of libraries using metasearch software, I also found:

- not enough testing being done with actual (as opposed to staff) users,
- testing not occurring early enough or often enough in the implementation cycle,
- concern that testing might prejudice the user population against the metasearch product, and
- not enough attention being paid to the results of user testing.

Library staff at two library sites I visited expressed concern about usability testing in the early implementation stages giving the product a potential “black eye” among both users and uninvolved library staff. In one case, administrators moved the testing to a closed area out of the hearing of other staff so they would not develop negative ideas about the product. It will be difficult for libraries to contribute to the improved usability of these products if we are unwilling to test them with users before they are “perfect.”

When I explored the question of who should be conducting user testing, the answers varied. David Lindahl at the University of Rochester thought vendors owed it to their customers who might use their out-of-the-box interfaces. Wayne Hay at Westchester Library System in New York didn't believe vendors were best for that task.

As frontline staff in close contact with users, reference librarians often conduct usability testing. Systems librarians are equally likely to test. However, both these groups bring their own bias to the task. Both know too much about the record structures and inherent workings of metasearch software. Systems librarians may be too wedded to the software and unable to admit its usability flaws. Reference librarians may have a view of users based mainly on those they see at the reference desk. Is it possible that library users who are willing to seek expert help may differ significantly from those who go it alone in their use of library systems? After all, research has shown that users believe they are successful searchers (OCLC 2003, Fallows and Rainie 2004). It may be that some other group in the library could better conduct testing with users. In the Consortium Library at the University of Alaska Anchorage where I work, circulation staff might be likely candidates. They earn high praise for their service ethic, deal with a cross-section of patrons, and could perhaps test with a more arm's length viewpoint.

That said, the live experience of watching a patron try to use a library system is a powerful spur for change. If librarians prove willing to identify

with the basic intelligence of their users, the use of screen recording software such as *Camtasia* might still provide some flavor of the testing and perhaps sufficient incentive to better the user's experience.

Are these metasearch tools usable?

I believe these tools are usable if thoughtfully deployed. As Adeane Bregman, Head of the Bapst Art Library at Boston College asks rhetorically, "Is it the best usable? It's usable." As a firm believer in the "serendipity of results," Bregman says their metasearch tool takes that "to the nth degree."⁴⁰

The usability problems of these products are being tracked and tackled by metasearch software vendors. Iterative testing with small numbers of actual users in the earliest stages of new product development will make a difference. In all likelihood, a mix of vendor and library testing will continue to be both useful and necessary.

Recommendations for the Consortium Library

THREE BIG ISSUES REMAIN FOR LIBRARIANS. THEY MUST UNDERSTAND METASEARCH'S POTENTIAL ROLE IN SERVING THEIR USERS, RETHINK HOW THE LIBRARY'S RESOURCES ARE PRESENTED, AND DEVELOP REALISTIC EXPECTATIONS OF THIS EVOLVING TECHNOLOGY. (LUTHER, OCT. 2003)

In the past five years, the Consortium Library at the University of Alaska Anchorage has radically increased its holdings of electronic materials, licensing or purchasing more than 189 different electronic databases, full-text from more than 20,000 journals, in excess of 1,000 e-journals, some 4,650 e-books, and two web-based catalogs. The first phase of the new Alaska's Digital Archive went public in June 2004, no doubt only the first of many local resources to be digitized. We're overdue: we have provided a wealth of content and now we must provide easier and more effective access methods and resource discovery tools for our users.

Recognizing the early nature of the metasearch products in the market, I recommend that the Consortium Library identify a population within our user base for a pilot metasearch project. The pilot group could be specific discipline majors for whom the major resources in their field are well-

⁴⁰ Bregman provided information about the Library's *MetaQuest* instruction in an interview April 23, 2004 at the Bapst Art Library, Boston College, in Chestnut Hill, MA.

represented in the existing metasearch configuration knowledge bases. Alternatively, the pilot effort could target the general undergraduate population with a metasearch “panic button” product that offers full-text from a limited number of databases that cover many subject areas (Soehner and Hightower 2003). No doubt other potential pilots could be identified by student focus groups and by library faculty and staff.

Given the ubiquitous adoption of BlackBoard course management software on the University of Alaska campus and its role in the library’s bibliographic instruction planning, a BlackBoard tie-in within our pilot project would provide us with constructive experience. It would also offer opportunities to work closely with faculty in other disciplines on a promising research approach for their students.

Staffing a metasearch effort is likely to be a challenge in light of the state’s threatened fiscal crisis and current budget-cutting mode. The newly reorganized Consortium Library Systems Department is undergoing significant staff turnover at present. This may provide an opportunity to factor in needed skills to support the implementation of metasearch as we hire new staff over the next several months.

As we choose a metasearch vendor, we should investigate the three products analyzed in this paper as well as the Sirsi metasearch product. Sirsi *SingleSearch* uses the MuseGlobal connectors and was also highly ranked in the New Zealand study (Dorner and Curtis 2003). *SingleSearch* is provided by our long-time integrated library system (ILS) vendor (formerly DRA and now Sirsi) with whom we enjoy an excellent working relationship. As I note above, the relationship with the vendor is a key element in implementing a metasearch tool. There may also be pricing implications and an opportunity to purchase a metasearch product bundled with our ILS.

In a similar light, we may want to investigate the possibility of a University of Alaska (UA) metasearch pilot or even a statewide pilot. We have profitably cooperated with other UA campuses, the Alaska State Library, and other libraries in the state to license significant electronic content for our users. The successes of other shared projects such as the SLED portal, the Databases for Alaskans project, and the multi-year Alaska’s Digital Archive effort are encouraging. These collaborative projects bode well for a joint metasearch pilot. Based on the initial and long-term focus of our metasearch project, we may be able to identify external funding sources to cover at least the initial pilot phase of the project.

The need for metasearch software in libraries

Having spent the past ten months immersed in an investigation of library-oriented metasearch software, I remain convinced that libraries must work with vendors to provide metasearch tools to their patrons in the near term, particularly to their undergraduate students and novice users. We have an immediate need that is not being met within libraries. Our students and patrons are increasingly going to Google to find “good enough” sources to meet their research needs. Study after study has made it clear that students are abandoning library research because they are finding what they need more easily and conveniently using web search engines (OCLC 2003, Thompson 2003, EPIC 2004). Librarians are distressed, knowing we have tens of thousands of dollars invested in high quality, well-indexed resources that students have a difficult time accessing without our expert help. We know they are not always finding authoritative sources and worry that they cannot reliably evaluate the quality of the information they find on the web. However, we also know that students’ time is valuable and they logically seek the convenience and ease of web searching.

As content progressively migrates to the web, business decisions will be made to expose increasing amounts of it to search engines, perhaps even content that was previously available only via restrictive licensing agreements. Research libraries and OCLC (the Online Computer Library Center) have already begun to work with Google and other search engines to expose their collections to a wider audience (Hafner 2004). In the meantime, given the current licensing environment, if libraries believe it is worthwhile to license electronic content, it is vitally important that we commit to improving access to that content by revamping our navigation and search tools. Let us strive to make our digital library space at least as manageable as the web has become for our users. Not necessarily perfect, but *manageable*.

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General

California Digital Library [in April 2004 became an Ex Libris *MetaLib* customer]

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Ex Libris *MetaLib* Customer Libraries

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Kwasi Sarkodie-Mensah, Mgr., Instructional Services, O'Neill Library
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ARL *MetaLib* Portal Implementers Group (ARMPIG)

Larry Woods, Associate Director, University Libraries, Univ. of Iowa,
and his member colleagues

MuseGlobal, Inc.

Jed Gilmore, Vice President Sales
Peter Noerr, Chief Technology Officer

MuseGlobal *MuseSearch* Customer Libraries

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Glossary

API or Application Programming Interface

Specification that allows a program to access the functionality of a pre-built software module through well-defined data structures and subroutine calls.

Clustering see Dynamic document clustering

Deduping or deduplicating

Removing the duplicate records in a result set based on a predetermined set of match points.

Dublin Core

XML-based standard Metadata Element Set produced by the Dublin Core Metadata Initiative; a core set of descriptive elements that can be used across a broad range of disciplines.

Dynamic document clustering

Process by which search results are automatically organized into meaningful hierarchical categories.

Federated search see Metasearch

Generic Record Syntax or GRS-1

Z39.50 standard structured record syntax for a retrieval record representing a database record.

HTTP or Hypertext Transfer Protocol

Standard format for transmitting hypertext files across the Internet.

HTTP connectors or plug-ins

Pieces of code that define individual target resource configurations including the protocols as well as the parsing and translation of the target's search language and retrieval functions.

ILS or Integrated Library System

Library management software packages that typically offer modules such as online catalog, circulation, cataloging, authority control, acquisitions, serials control, etc.

Knowledge base

Collection of rules for searching and retrieving records from individual target resource configurations, including local library details that allow library access to target resources such as authorization, access protocols, direct access URLs, etc.

LDAP or Lightweight Directory Access Protocol

Standard for querying and updating a directory based on the standards contained within the X.500 standard, but significantly simpler.

Link resolver

Software that combines information about the retrieved citation, the user's permissions, and the library's subscriptions, policies, and services in order to determine what additional service options to offer the user.

MARC or Machine Readable Cataloging

Z39.2 communication standard for bibliographic and related information in machine readable form.

Metasearch

A single search across heterogeneous multiple resources that delivers integrated results.

Metasearch tools or engines

Specialized search engines that allow a user to enter a single search and have it broadcast to a large number of heterogeneous search targets simultaneously.

METS or Metadata Encoding and Transmission Standard

A standard for encoding descriptive, administrative, and structural metadata about objects within a digital library, expressed using XML.

MODS or Metadata Object Description Schema

XML-based schema that is a derivative of MARC for encoding bibliographic information using natural language identifiers.

Native interface

The primary interface designed by the target resource provider, e.g., the look and feel, search capabilities and methods, and navigation design of the screens in Ebsco's *Academic Search Elite* database.

OAI /PMH or Open Archives Initiative Protocol for Metadata Harvesting

An interoperability framework based on metadata harvesting that allows data providers to expose metadata and service providers (e.g., libraries) to harvest and use the metadata as a basis for offering enhanced services.

OpenURL

An enabling technology that uses a web-based request to link metadata for a resource to services for that resource. An OpenURL transports metadata and/or unique identifiers for a resource from an "OpenURL-aware" source to a link server that acts on the information to deliver requested services.

Portal

A single user interface for access to resources; also a web site that is intended to be a starting point for finding and accessing information.

RDF or Resource Description Framework

A proposed metadata standard for representing descriptive information about web resources.

Result set

The list of hits returned by a metasearch tool as the result of a query.

Search target see Target resource**Screen scraping**

Parsing the HTML in web pages with programs designed to retrieve particular content. Screen scraping 'maps' the location of the screens and input boxes and then emulates user search input.

Shibboleth

An authentication system and architecture that facilitates resource sharing between institutions.

Target Resource(s) or Target(s)

Local and remote electronic resource(s) accessed by a metasearch tool, e.g. licensed databases, library catalogs, websites, digital repositories, or aggregators of such resources.

Target enhancement

Improving the ability of a target resource to be metasearched effectively by making changes such as adding an option to output results in XML.

SRW/SRU or Search & Retrieve Web Service/Search & Retrieve via URL

SRW is a SOAP-based web service for searching databases containing metadata and text and non-text objects. It builds on Z39.50 semantics. SRU is a companion service to SRW, whose primary difference is its access mechanism based on HTTP GET requests and a simple XML response package.

SUTRS or Simple Unstructured Text Record Syntax

Specified as an acceptable record syntax in Z39.50. Used in a Search or Present response. No elements are explicitly defined in a SUTRS record; it is a string of textual data terminated by ASCII LF (X'0A').

XML or eXtensible Markup Language

A data format derived from SGML, the international standard metalanguage for text markup, and used for structured document interchange on the web. Allows a document creator to define tags.

Z39.50

National standard that defines communication for computer-to-computer information retrieval. Enables searchers to query other systems without knowledge of the remote systems' native searching syntax.

ZING or Z39.50 International: Next Generation

A number of initiatives by Z39.50 implementors to make the intellectual/semantic content of Z39.50 more broadly available and to make Z39.50 more attractive to information providers, developers, vendors, and users.

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