Innovations in Discovery Systems: User Studies and the Bento Approach

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Abstract

Over the past 30 years, library discovery services have evolved through expanded OPACs, federated search systems employing broadcast searching; Web-scale discovery systems (WSDS) that aggregate metadata and full-text content into a single integrated index; and, currently, hybrid bento-style systems that use federated techniques over WSDS, OPACs, and local information content. The bento systems partition search results into separate zoned screen displays grouped by content format type and/or local service results. Recent studies on Web-scale discovery systems have identified a number of user access issues centering on problems with blended result displays, problematical relevancy rankings of search results, full-text search problems, and the inability of WSDS to adequately provide access to local library services and resources. The concept of "full library discovery," a phrase first coined by Lorcan Dempsey, has been introduced to refer to discovery approaches that move beyond the retrieval of collection materials to also include local information services and local content and links. The bento-based systems are an attempt to address the identified problems with WSDS and also provide discovery services that address user needs, in particular known item search and streamlined full-text access. This presentation will provide an analysis of the 38 libraries presently employing the bento approach and will look at identified user needs and search behaviors, as revealed in detailed search and clickthrough transaction log analyses. There is a clear need for an evidence-based analysis of user search behaviors in retrieval environments characterized by access to distributed information resources.

Library Discovery at a Crossroads

Discovery of scholarly content remains one of the most important and heavily used service components that we provide for our library user communities. While Google Search is still heavily used by researchers, the utilization of library-delivered Web-scale discovery systems (WSDS), including Ex Libris Primo, ProQuest Summon, EBSCO EDS, and OCLC WorldCat Discovery, have become more ubiquitous within academic libraries around the world. The WSDS aggregate into one resource index online catalog records, articles indexes, institutional repository records, open access resources, and the metadata of other search targets.

Libraries find themselves at a crossroads with regard to discovery. We need to examine where we are with discovery currently and what we need to do to optimize these services. In his report *Does Discovery Still Happen in the Library? Roles and Strategies for a Shifting Reality* (2014), Roger Schonfeld from Ithaka S+R recommended that academic libraries need to "step back to reconfirm (or reconsider) their vision for discovery, to ensure that their visions connect with information-seeking practices and preferences, and to determine whether they have a viable strategy in place to achieve their vision" (Schonfeld, 2014).

A number of libraries have turned to the bento-based approach to discovery and display in an attempt to address identified problems with WSDS and also provide discovery services that address user needs, in particular known item search and streamlined full-text access. See "Discovery Tools, a Bibliography," edited by François Renaville, https://discoverytoolsbibliography.wordpress.com/.

Full Library Discovery

WSDS are vendor-driven and cloud-based and all instances of a vendor system operate over the same aggregated knowledge base. They do not typically provide users with the access to local services, contacts, and resources that a library offers to its user community. The phrase "full library discovery" was coined in 2016 by Lorcan Dempsey of OCLC in his article "Library Collections in the Life of the User. Two Directions." It refers to features that move beyond the retrieval of collection materials to also include local and customized connecting information services and content (Dempsey, 2016). Full library discovery principles hold that discovery should provide access to library websites, local LibGuide finding aids, library subject specialist links, and course management system content.

Evolution of Discovery

The University of Illinois at Urbana-Champaign (UIUC) Library and other academic libraries have gone through several different phases involving search and discovery. These include:

- Supercatalogs with A&I services loaded into the online catalog systems.

- Federated search systems employing broadcast searching.

- Web-scale discovery systems with metadata and full-text content aggregated into a single consolidated index.

- Hybrid bento-style systems with information results presented in a zoned screen display with content grouped by type/material format.

Classic Web-Scale Discovery

Recent studies on WSDS, including an analysis we carried out from our three-year implementation of Ex Libris's Primo, have identified a number of usability and access issues. These include problems with blended result displays, problematical relevancy rankings of search results, full-text search problems, and the inability of WSDS to adequately provide access to local library services and resources.

From our transaction log research, these systems need to better address known-item searches. In the UICU Library systems, over 56% of searches are for a known title. In addition, these systems do not expedite access to full-text content. It typically takes multiple steps to get from a citation to the full-text article or book.

Bento Advantages

Bento systems partition results by material type or format. The bento zones typically present meaningful groupings of content extracted from vendor services' APIs, WSDS search results (often limited by format), and local information services and content such as library websites, pathfinder information, dataset repositories, subject specialist links, and course management system content. This helps address the issues with WSDS blended results and relevancy ranking problems that result from mixing of the data. Bento systems lend themselves to Dempsey's "Full Library Discovery" by displaying vendor/WSDS API results and local information services and content including library websites, pathfinder information, local library services, subject specialist links, and courseware management systems content.

The bento capability of one-click linking to full-text or publisher presentation pages has been the most favored by UIUC library users. This allows users to bypass the OpenURL link resolver and multiple clicks to get to the full-text content.

Discovery at Illinois

Discovery at the UIUC Library has evolved from federated search through to Web-scale discovery (utilizing OCLC's WorldCat Local and Ex Libris's Primo) to a current home-grown bento system based on a hybrid of aggregated and federated search functions. The Easy Search Bento system offers search assistance and suggestive prompts to specific resources or topic-relevant database results.

Additionally, the Easy Search system generates custom transaction logs, which allows us to perform multiple user behavior studies for system improvements and better discovery options. Multiple transaction log analyses have been carried out at Illinois. This study builds on a 2012 transaction log study (Mischo, Schlembach, Bishoff, & German, 2012). The latest transaction log study, compiled between July 2016 and June 2017, resulted in the following analysis:

- Users carried out 1.49 million searches, with 1.15 million clickthroughs.

- There has been a growing number of words per query—5.11 per search (up from 3.76 in 2009 and 4.11 in 2012).

- 10% of the searches were one-word searches and 49.2% were less than 3 words, but 24.7% were greater than 7 words.

- Users perform a large number of copy-and-paste searches of title words, author, and title combined, and full citations—presumably from Google, course management systems, bibliographies, and e-mails.

- There are a growing number of DOI searches (73 searches per day in 2017).

- In a sample of 4,100 searches, known-item searching was high = 56%.

- Users often have a material type in mind when they search.

- Use of our search assistance feature is high.

- Limit operations using Gateway tabs to material types (Books, Articles, Journals, Media) are used in 24% of searches.

From the Easy Search Bento transaction logs, some example searches include:

- Competent Jerks, Lovable Fools, and the Formation of Social Networks (first letter of each word is capitalized, which probably means it was copied and pasted from source).

- The virtual supermarket: An innovative research tool to study consumer food purchasing (probably copied from online catalog—format like bibliographic title entry).

- Mothers and fathers: A study of the development and negotiation of parental behavior (also probably copied from online catalog—format like bibliographic title entry).

- Matouschek, Kellis, Serrano, Fersht Nature (authors' last name and title of journal from citation).

- Kinsella and Phillips 2005 (authors' last name and year of publication from citation).

- Hemenway, D. (2010). Why We Don't Spend Enough on Public Health. New England Journal of Medicine, 362(18), 1657 (full citation copied and pasted into search box).

- University, need for money (use of comma to separate different search terms).

- J. Quant. Spectrosc. Radiat. Transfer (abbreviated journal title).

Illinois Bento Features

The Easy Search Bento system employs context-specific and adaptive search assistance including features such as spelling suggestion links; LibGuide subject information guides links; direct links to specific resources (e.g., Web of Science, JSTOR, Facebook, etc.); limit suggestions to title, phrase, or author searches; DOI identification to provide direct link to content; online chat link; and journal title links. The Bento system will always try to provide a direct link to PDFs when available, and, if not available, provide a DOI, publisher, SFX links for articles, and/or e-book links from online catalog

when possible. We feel it is important to get the user to full-text content with as few clicks as possible. We have also incorporated altmetric badges into the search results of articles to show citation of title in social academic media including news outlets, blogs, Twitter, Facebook pages, Wikipedia mentions, and Mendeley. The system writes out custom transaction logs for all assistance recommendations and what is clicked on by users.

The layout of the Easy Search Bento is set up like a traditional Japanese bento box with separate zones or sections that presents meaningful groupings of information for the user and pulls this together from various sources. In Figure 1, you can see there are various zones that compartmentalize the results returned from the user's search terms. The upper zone offers guided suggestions for direct links (by title, author, or DOI link) if there is a known-item match or offers suggestions to help refine a search to attain better results.

Below this upper zone, to the left side, there are two article sections utilizing (1) EBSCO's EDS API to pull citations of articles from 45 sources activated in the central index (including Scopus, Web of Science, EBSCO's Academic Search Ultimate, IEEE Xplore Digital Library, JSTOR, MLA International Bibliography, PsycARTICLES, etc.) and (2) Additional A&I Services including Scopus, Engineering Village, IEEE. Both article sections incorporate direct links to full-text content when available and altmetric links.

The middle section of the Bento system pulls results from the Library's VuFind online catalog. Ten results are pulled in to show matches on search terms. Direct links are pulled out of the XML feed to provide one-click access to e-books and other digitized resources. Relevancy ranking from VuFind results are usually pretty good for known-item searches with exact matches loading to the top of results. Book or journal cover images and availability information are also displayed in the short display of the record. Users can easily click into the catalog to see the full results of the search.

The right section is the subject suggestions area where results from subject database matches are shown. A separate result section will show Illinois departmental libraries that relate to the search terms entered into the search box. Another search result shows a librarian contact covering related subject area(s) of entered terms. Results from

other resources, including searches against Cross-Ref, I-Share Statewide Consortia Catalog, IDEALS (the university's institutional repository), WorldCat Discovery, Google Scholar, and Easy Search Classic version, appear in the middle zone. Finally, the bottom right section offers an advertised library service that allows the user to click on the image to discover additional information.

Figure 2 displays a sample search within the library's Bento system. The Suggestions box displays options to limit to specific fields or get online assistance. Other sections display Articles (with full-text direct links and altmetrics badges), Library Catalog results with format and direct link to e-books, Subject Suggestions including subject databases, Departmental Library, and subject librarian. The Other Resources section includes other search results and resources.

Bento Clickthrough Percentages

There have been millions of searches performed in the UIUC Library Easy Search Bento since the October 2015 rollout. Transaction logs record all user activities. Bento clickthroughs by category (Table 1) indicate a majority of 56.1% for article links. Book and online catalog content follows closely at 33.6%. Nearly 10% of users clickthrough a system-generated suggestion, with corrected misspelled words having top usage. Exact journal title matches find 3.6% clickthroughs. Only 0.2% of users click on Departmental Library links or librarian contacts.

Characteristics of Bento

Since 2015, the UIUC Library has studied other bento systems at other U.S. and Canadian academic libraries. As of November 2017, there are 38 libraries
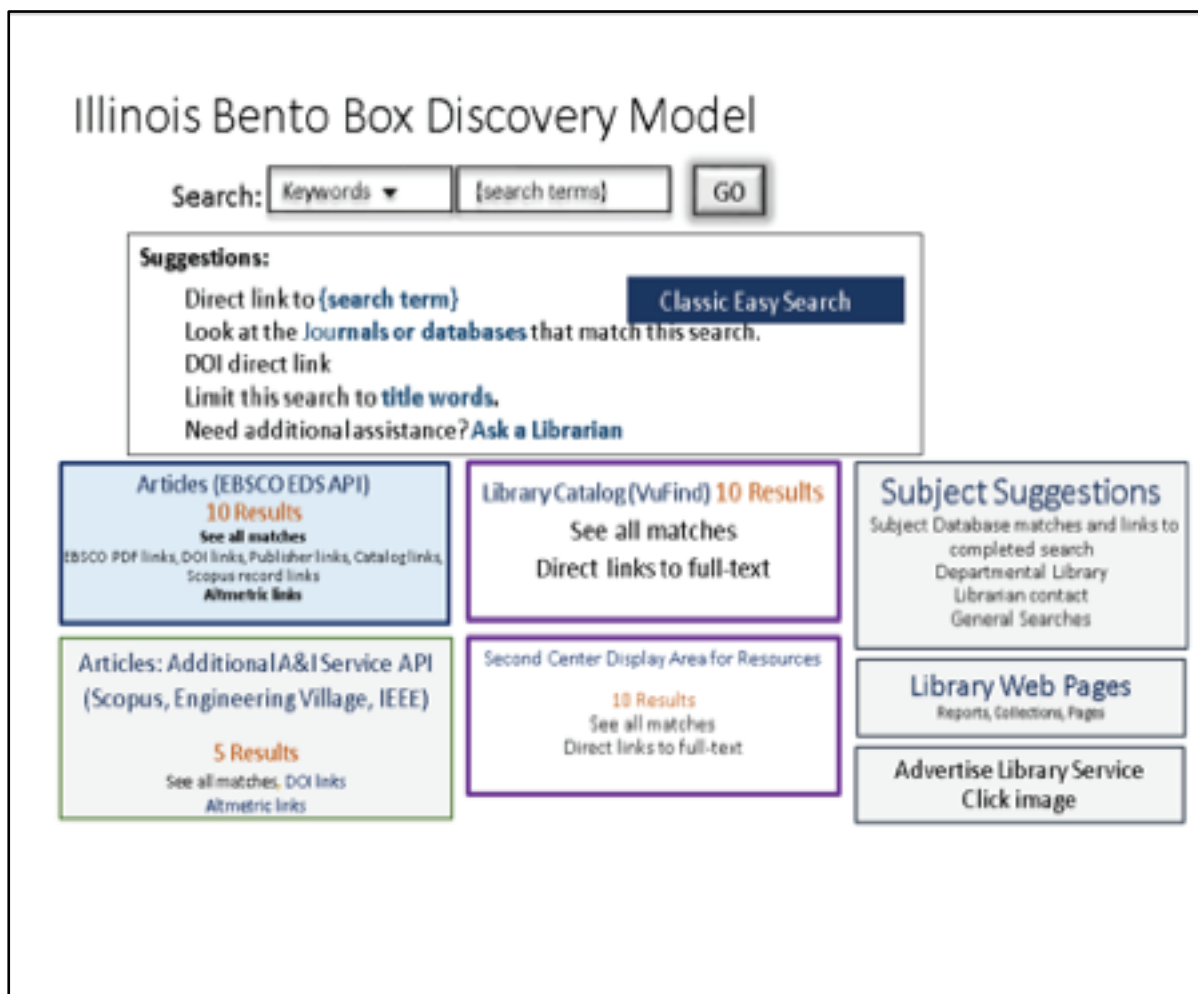
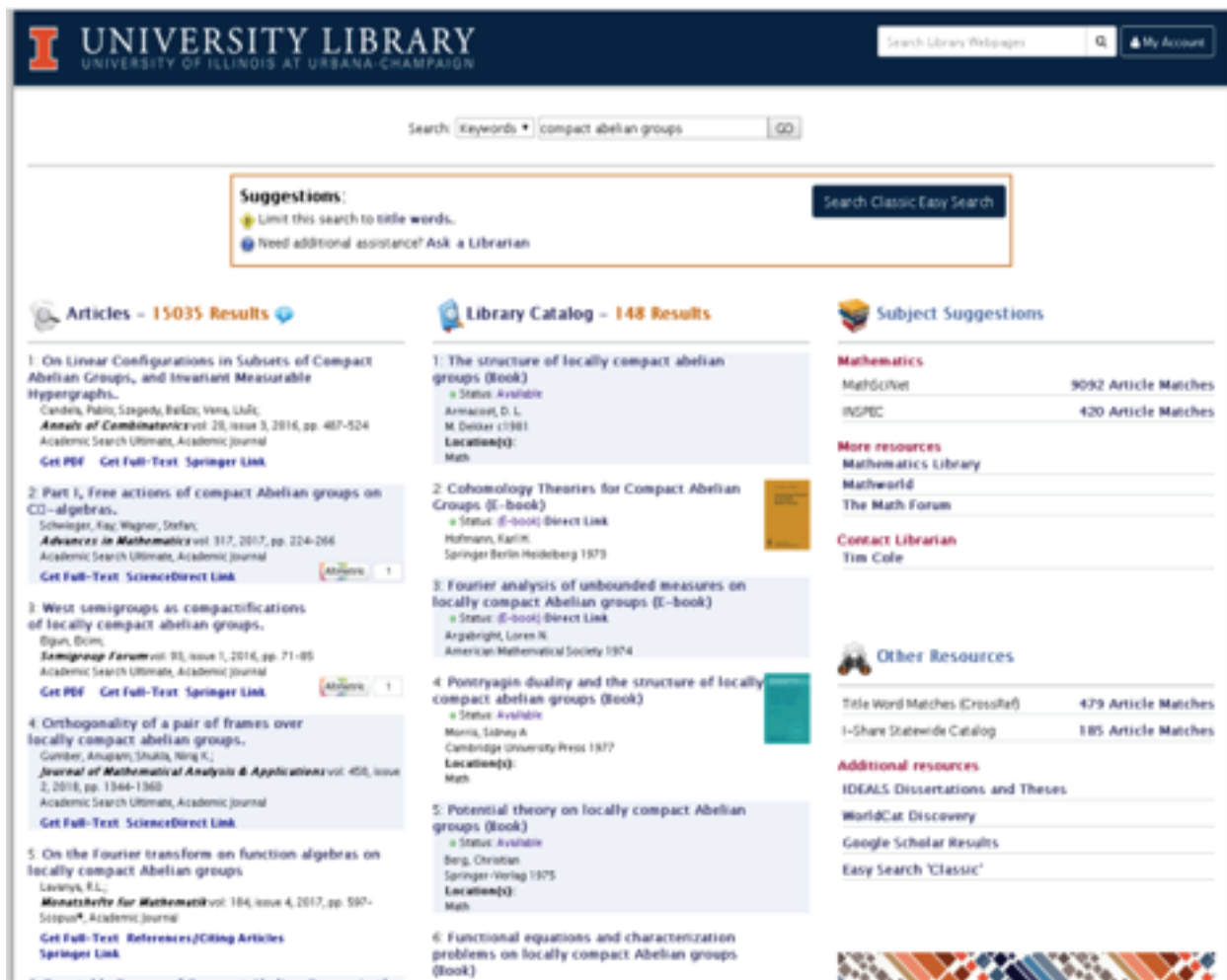

Figure 1. Illinois Bento box discovery model.

Figure 2. Easy Search Bento example search.

Table 1. Bento clickthroughs by category.

User Clickthroughs by Category	Percentages
Article links	56.1%
OPACs and Books	33.6%
Full-text clicks	16.6%
Suggestions	9.2%
Journal Title links	3.6%
Library links or contacts	0.2%

utilizing bento systems. North Carolina State University Library was the first to utilize the bento layout to section out various search results. Others that use bento displays include the universities of Michigan, North Carolina, Pennsylvania, Toronto, Alabama, Oklahoma, Calgary, Alberta, and Virginia; and Columbia, Duke, Stanford, Johns Hopkins, Cornell, Princeton, Vanderbilt, Yale, Brown, Rice, Cal Tech, Villanova, Wayne State, George Washington, North Texas, Simon Fraser, and Bryn Mawr universities as well as Dartmouth, Smith, and Boston colleges.

Characteristics of these 38 libraries with bento instances:

- All have Books and Articles sections.

- Use WSDS for articles: 10 use Summon, 4 use Primo, and 10 use EBSCO EDS.

- Other resources used include website search (17 libraries), Library/Research guides (12 libraries), journal titles (12 libraries), Databases (14 libraries), Digital Collections (11 libraries), Subject Top Picks (10 libraries), and Library Contacts (10 libraries).

- OPAC is often a separate application: VuFind, Blacklight.

Some Observations on Bento

As these bento systems become more prevalent, there is much variation in the implementation of these locally created services. Features vary among libraries. Many bento versions do not have spell checking nor is it easy to integrate open spell-check software. Illinois utilizes Microsoft Bing for this feature. Only three of the libraries employ one-click to full-text. Many systems continue to use their local link resolver and experience associated access issues. Not all WSDS APIs provide the XML metadata required for direct linking to full-text content. This requires programming or server staffing and maintenance, ongoing local control and customization, and a need for cataloged item availability to e-book content.

Conclusions

Locally developed bento systems allow libraries to provide additional control and increased discovery and search capabilities to all their services. Revisiting Lorcan Dempsey's full library discovery phrase, the bento system provides a library's ability to distinguish itself from a Google or other search engine result sets. The goal for academic libraries is effective searches that result in relevant, useful, and easy-to-obtain materials that enable users to retrieve local and connected information content and services. Libraries must ensure both an easy journey for users and also one that is ultimately successful for their research needs. Users need discovery pathways to our library websites, local LibGuide information, subject specialist links, research datasets, archival materials, locally digitized collections, dissertations and theses, and course management system content through an easy-to-navigate discovery system.

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