![ExLibris, a ProQuest Company]

Evaluating the Impact of Web-Scale Discovery Services in Libraries

Results to date, and pointers for future success

Abstract

Academic libraries have adopted web-scale discovery services and made them a strategic part of their users' research and learning experience. This follows a change in user expectations attributed to the rise and popularity of internet search engines, along with libraries' unsatisfactory experience with federated searching. Evidence gathered from research papers and studies highlights that discovery services positively impact libraries, by enabling improved discovery and access of resources across their collections. They are accepted by librarians and users as valuable research tools. With discovery services now established as a strategic resource, further attention to metrics and analytics will enable libraries to continue to capitalize on the momentum that has been achieved.

How We Got Here: The Evolution of Modern Resource Discovery

Over the last 30 years, the evolution of resource discovery in libraries has coincided with the rise of the internet and the changing nature of collections from print to electronic. From the card catalog and microfilm, resource discovery and access to library content and collections has progressed across CD-ROM, subject-specific databases, OPACs, federated search, local systems and solutions, discovery layers, open-sourced systems and more.

The progression has been profoundly influenced by entrants outside of library-specific services. These have impacted the library's traditional role of being the primary point of research.[1] Beginning in the early 2000s, these non-library services:

- Provided new paths and resources for users to conduct their research.
- Established new user expectations for the search and discovery experience in libraries.
- Ultimately, affected use of library systems.

Usability studies by vendors and libraries repeatedly confirmed that library users started with Google to answer their questions and often finished there – due to its accessibility, simple single search box, and relevancy ranking that provided "good enough" answers.[2] The introduction of Google Scholar in 2004 provided another reason for library patrons to start their research elsewhere as it further entrenched the ease of use and simplicity in the minds of users.[3]

With Google and Amazon setting expectations of web-friendliness, library users expected libraries to deliver the same ease-of-use for discovering the current, reliable and timely scholarly information possessed by the library. They were frustrated by what they found.[4] This was especially true for novice users, as their expectations were shaped by web interfaces that were simple, intuitive and generated immediate and useful results.[5] As Schonfeld pointed out, exploratory and known-item searching moved to the network level through Google, Google Scholar, Wikipedia, and several others – routing a higher share of academic discovery (both exploratory and known-item searching) around the library rather than through it.[6]

The library industry's initial response was to embrace federated search technologies. The era of federated search lasted nearly a decade and left libraries with disappointing experiences.[7] The problems of federated search outweighed the benefits, as the system architecture not only affected the speed of results returned, but also relevance ranking, and failed to deliver other user-oriented capabilities.[8] The federated search era was also accompanied by significant levels of frustration, due to a fragmented experience when navigating library portals and the numerous silos containing scholarly journal articles.[9] User expectations remained unmet:

> *Peter Clinton, the director of information technology services for the U of T Libraries (UTL), said at the time regarding searching for library resources, students "want it now, they want it fast and they want it to work like Google."[10]*

The introduction of web-scale discovery services in 2009 came at a time when academic libraries were in crisis[11], and a significantly better and more user-friendly search tool was needed to improve access to collections. Of particular need was to satisfy undergraduate student demands, by providing deep discovery of a library's scholarly content from a single, easy to use interface.

Libraries were quick to adopt discovery layers as a means to address the rise of Google Scholar as an alternative search tool and the rising tide of defection of library users, with an added promise of improved access to resources and increased collection usage.[12] For libraries and librarians, this meant determining a better system to be used across the academic community to find the most relevant and useful content, save time, and ensure use of quality content from reputable sources.[13]

Measuring the Impact of Discovery Layers: Challenges and Considerations

There was a rapid uptake of web-scale discovery services in research libraries in the first four years of commercial availability.[14] Discovery services then experienced significant growth with more than 5,500 sites using services in 2013[15] and then growing to almost 9,500 in 2014.[16] This rapid adoption represented a significant investment for academic libraries and is viewed as an essential strategy to engage users, improve information literacy, influence research outcomes, and enhance the library's standing within its respective institution..

As with prior technologies used within the library, there is considerable interest, value and a need to measure discovery layer performance.[17] However, libraries aren't routinely analyzing the usage of these services and measuring their impact.[18] There are some practical challenges. The data needs to be collected from different places, and libraries lack sophisticated self-documenting systems that record all of these aggregated and objective statistics.[19] Looking at the data points in isolation and without benefit of the broader context, it becomes difficult to objectively judge their meaning.

The challenges have not stopped some libraries from drawing on the wide variety of data and tools available. What follows is a review of available studies that took different approaches to evaluating the impact of web-scale discovery on libraries. Collectively, the following points are evident:

- *Libraries have taken two general approaches to measurement.* These can be quantitative – collected from systems logs – or qualitative – for example obtained through surveys. Regardless of the approach, if the data is accumulated over a period of time, it can be used to evaluate effectiveness and impact at the library.

- *Generally, the impact of discovery layer services has been positive.* The resulting statistical data point to the positive impact and significant importance of discovery services in libraries today.

- *There is no clear consensus on how impact should be measured.* It's acknowledged that analyzing and attributing content usage to a discovery service is a multi-dimensional issue.[20] Though many papers and conference presentations have focused on resource discovery, there is no consensus or methodology published to date for libraries, of any size, to completely evaluate use of discovery services and gauge their effectiveness. The multiple approaches presented below are evidence of that.

Quantitative Analysis: Extracting Insight from Usage Data

Quantitative data include a variety of statistical data available for the library to gather and analyze. It can come from discovery service providers and content providers, as well as library-specific reports.[21] They include, at least:

- Searches
- Full-text downloads
- Link resolver usage

- Page views
- Session data and logins
- COUNTER JR (journal), BR (eBook), and DB (database) reports
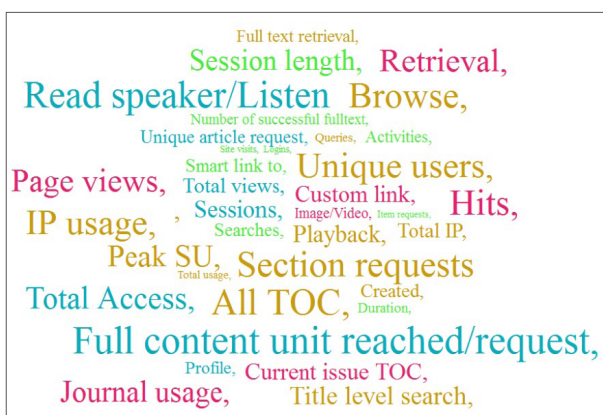
[22]

*Data Types and Categories in Vendor Supplied Usage Reports*

These types of statistics can become valuable in assessing discovery system impact. As Breeding pointed out, libraries can compare analytics of discovery system use relative to comprehensive statistics gathered from publishers in COUNTER format.[23] This can be valuable when first implementing a discovery service, reviewing performance over time, or after switching discovery service vendors.

The following are just some of the examples that point to discovery services creating positive stories within the library setting.

Total Pages and Sessions per Institution using Ex Libris Primo from 2014-2017

Discovery service providers deliver extensive reporting and analytic capabilities as part of their systems. These are typically oriented around service usage, search behavior and search terms. The statistics are available through applications connected to the discovery service itself, though data can be exported and made available to external applications such as Google Analytics for further manipulation.

Ex Libris recently analyzed years of anonymous usage data across all libraries that use Primo, gathered through its Oracle Business Intelligence analytics platform. Aggregated usage statistics demonstrated a positive trend and over a 100% increase in the total number of pages viewed and total user sessions per institution from January 2014 to March 2017.
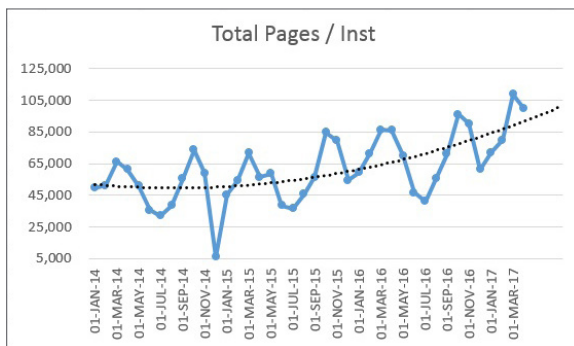

Total Pages Viewed Per Institution through Primo
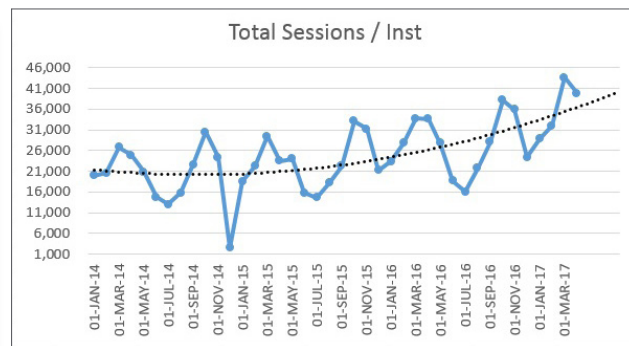
Total Sessions Per Institution through Primo

Impact of Library Technologies – A Report for UKSG [24]

This 2013 study included an evaluation of resource usage across six academic libraries in the United Kingdom, and highlighted a positive correlation between the introduction of discovery services and increased usage. The study concluded that there was a limited impact on e-journal usage, positive impact on e-book usage, and mixed results on database usage. Impacts varied across each library.
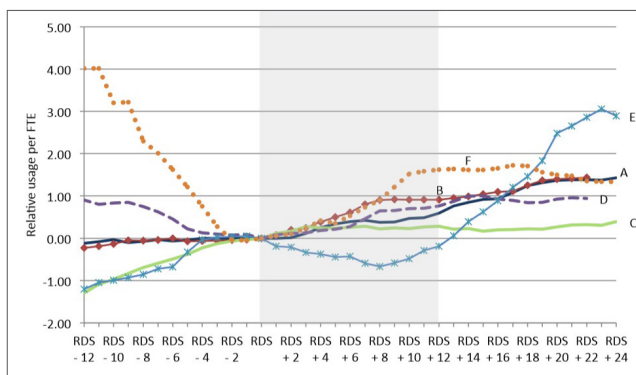

Overall Journal Usage per FTE, Relative to Discovery Service Introduction
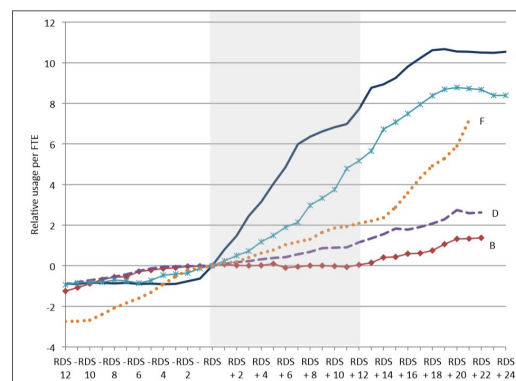
Overall E-books Usage per FTE, Relative to Discovery Service Introduction

Evaluating the Impact of Web-Scale Discovery Services

The Effect of Discovery Systems on Online Journal Usage: A Longitudinal Study[25]

This 2014 report extensively examined the impact of implementing a discovery service on collection use, across several different libraries, publishers and discovery services. It measured COUNTER journal usage. The longitudinal study concluded that discovery services had a positive impact on journal hosted content, with libraries experiencing increased usage.
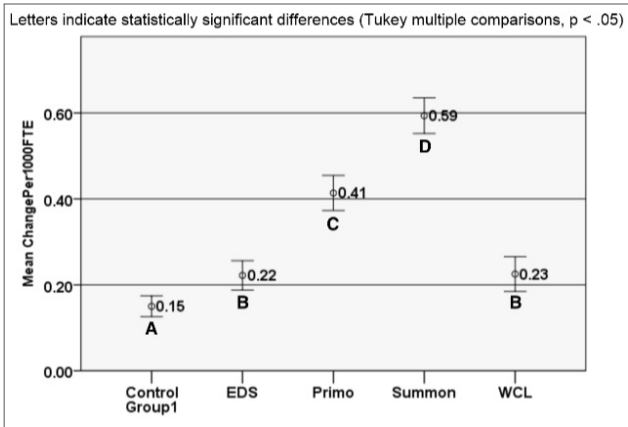
How Usage Change Differs Across Discovery Services

Impact of Ex Libris Summon on E-Resource Use at the University of North Texas[26]

Research at this university leveraged several years of link resolver statistics to evaluate the impact of a discovery service on full-text access prior to and after implementation of a discovery service. The analysis concluded that users were finding the discovery service useful and were taking advantage of it to access the library's full-text resources, as evidenced by the significant increase in requests through the link resolver.
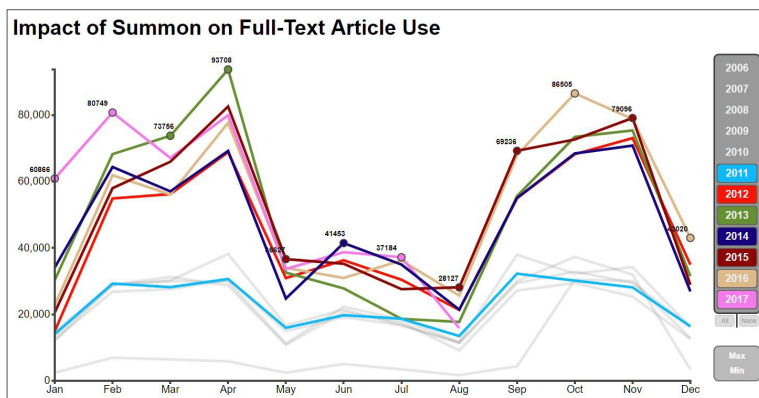
Impact of Summon on Full-Text Article Use

## Use of Publisher Content Increases at the University of Huddersfield [27]

A 2014 study at the University of Huddersfield highlighted how the use of publisher content increased after the library's use of a resource discovery system. The author relied on over six years of COUNTER data to illustrate the effects on specific types of library resources. It paid particular attention to the acceleration and steady increase of resource usage for publisher big deal and society packages, along with a full-text aggregated resource.
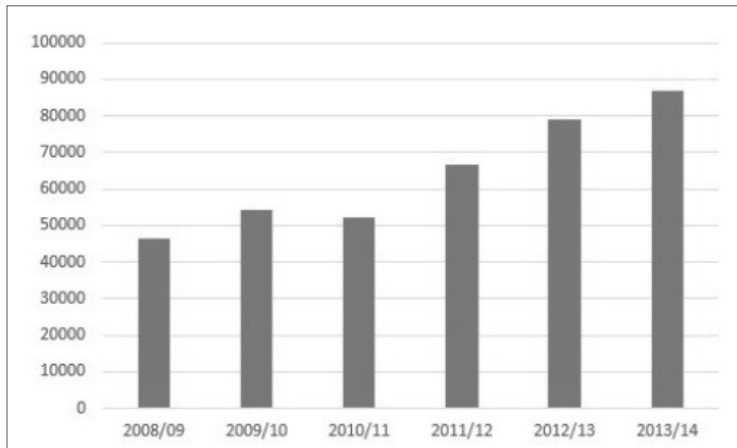
Resource Usage of Full-Text Aggregator Indexed by Summon

Collection Usage Pre- and Post-Summon Implementation at the University of Manitoba Libraries [28]

This Canadian library leveraged three years of COUNTER statistics to determine in 2012 that their discovery service had a favorable impact on e-journal, e-book and database usage. The library identified that e-journal usage increased dramatically, e-book usage increased for four of six providers examined, and searches in citation databases decreased due to the use of Summon.
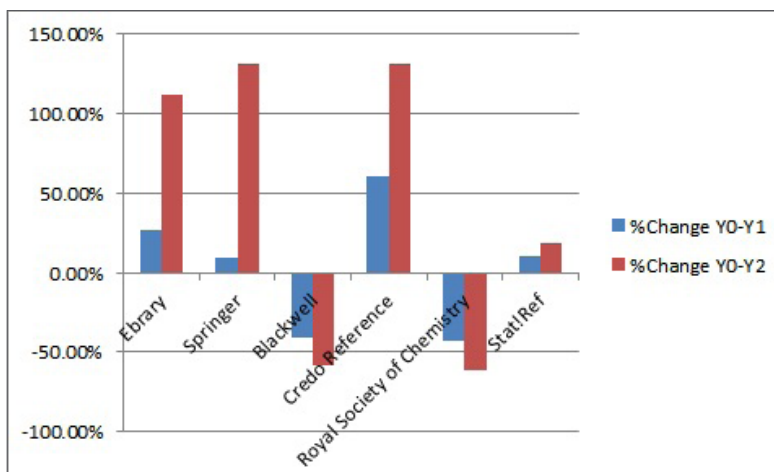
Average E-Books Usage Pre-Summon (Y0, May 2009-April 2010) and Post-Summon (Y1 & Y2, May 2010-April 2012)

Does web-scale discovery make a difference? Changes in collections use after implementing Summon at the University of Texas – San Antonio [29]

The University of Texas – San Antonio anticipated that use of its discovery service would influence collection use by enabling users to find materials more effectively. After extensive analysis in 2012, researchers determined that collection use increased due to the adoption of the discovery service. Link resolver use increased by 84% and full-text article downloads increased by 23%.

Enhancing Access and Usage: the Open University of Hong Kong's Experience in Resource Discovery Service [30]

After implementing a discovery service to make both their print and electronic collections more accessible to users, in 2012 the Open University of Hong Kong (OUHK) analyzed database usage of e-journals, ebooks and databases through COUNTER and vendor usage reports. The library uncovered that full-text access increased for e-journals by 14% and searches within databases or journal platforms decreased by 1%. In its findings, the library acknowledged that full-text access increases may not necessarily only result from use of the discovery service.

The Impact of Web-scale Discovery on the Use of a Library Collection at Grand Valley State University [31]

A 2010 Grand Valley State University analysis used COUNTER statistics gathered over two years to measure the impact of a discovery service implementation across various resources. After implementing the discovery service there was a significant increase in the use of full text resources from library subscribed databases and online journal collections due to the discovery service.

Qualitative Analysis: Evaluating Librarian and User Perceptions

Qualitative data in form of user surveys and usability studies complement quantitative measurements and can be a valuable additional source of information. They are a means to evaluate behaviors, identify user needs, and determine preferences for resource discovery at a given library.[32] Moreover, they demonstrate the positive influence that discovery services have. It's important to acknowledge that assessing the perceptions of librarians and their users provides valuable insight on the impact within the library environment, especially through a better understanding of how these services are perceived and used.

Here are some valuable surveys that focus on librarian attitudes and user perceptions of discovery use.

Jisc library support services report: Enhancing efficiency and effectiveness [33]

This 2016 report analyzed processes and systems, across both discovery and management applications used in the United Kingdom, and detailed perceptions of satisfaction and use. It's notable that in terms of discovery layers, as the figure below represents, respondents were of the opinion that they were comparable to Google Scholar across the range of activities listed.

	Discovery layer	Copac	Google Scholar	SUNCAT	World Cat	Abstract data-bases	Reading list system	Wiki-pedia	None of these
Locate and access known items	93.15% (68)	26.03% (19)	84.93% (62)	6.85% (5)	16.44% (12)	46.58% (34)	46.58% (34)	35.62% (26)	2.74% (2)
Carry out initial subject search	89.04% (65)	5.48% (4)	90.41% (66)	0% (0)	5.48% (4)	56.16% (41)	5.48% (4)	73.97% (54)	2.74% (2)
Get the feel for a topic	76.71% (56)	2.74% (2)	84.93% (62)	0% (0)	2.74% (2)	41.1% (30)	8.22% (6)	89.04% (65)	2.74% (2)
Pursue a line of enquiry	79.45% (58)	12.33% (9)	79.45% (58)	1.37% (1)	4.11% (3)	60.27% (44)	4.11% (3)	57.53% (42)	4.11% (3)
Find recommendations	45.21% (33)	6.85% (5)	46.58% (34)	1.37% (1)	4.11% (3)	15.07% (11)	34.25% (25)	27.4% (20)	17.81% (13)
Make chance discoveries	82.19% (60)	9.59% (7)	84.93% (62)	0% (0)	5.48% (4)	45.21% (33)	2.74% (2)	58.9% (43)	6.85% (5)
Get citations	78.08% (57)	9.59% (7)	75.34% (55)	0% (0)	5.48% (4)	76.71% (56)	23.29% (17)	23.29% (17)	2.74% (2)
Don't typically use this	4.11% (3)	60.27% (44)	0% (0)	83.56% (61)	76.71% (56)	10.96% (8)	26.03% (19)	2.74% (2)	8.22% (6)

= more than 75% = 50-75% = 25-50% = below 25%

*How Users Use Different Discovery Applications*

This table summarized the systems that library administrators believed to be best suited for specific discovery tasks. The discovery layer was most embedded across all types of tasks.

Activity/workflow/process	LMS	Discovery layer	BL services	Copac	Google scholar	SUNCAT	WorldCat	Reading list mgmt	Publisher websites	Aggregator websites	Vendor KB	Inst repository	CORE	Spreadsheet
1. Finding a specific monograph	72	65	45	52	25	8	46	15	62	45	35	13	4	2
2. Finding a specific journal article	22	73	29	12	54	18	15	12	52	44	14	33	8	0
3. Finding a specific Open Access article	12	58	7	3	64	2	5	9	48	38	10	48	23	0
4. Finding without a known title	45	69	20	27	51	8	19	4	40	31	16	17	6	0
5. Locating the best available copy	55	52	31	35	11	15	20	3	27	24	20	10	2	0
6. ILL / Document delivery workflows	58	32	71	43	23	26	36	1	28	16	9	23	6	13
7. Linking core readings to resources	22	20	3	0	0	1	3	43	11	7	5	7	2	8
Total use for discovery activities	286	369	206	172	228	78	144	87	268	205	109	151	51	23

= 30 plus out of 80 libraries = 10 to 29 out of 80 libraries = 2 to 9 out of 80 libraries = less than 2 libraries

Discovery Tasks and System Use

Ithaka S+R Library Surveys of 2013 and 2016

An Ithaka S+R Library Survey study, conducted in 2013, included a question to library directors on the impact of web-scale discovery services in a variety of areas. Respondents indicated that they were having a positive impact in areas that web-scale discovery services were meant to address – notably increasing user exploration and facilitating better access to library resources. [34]
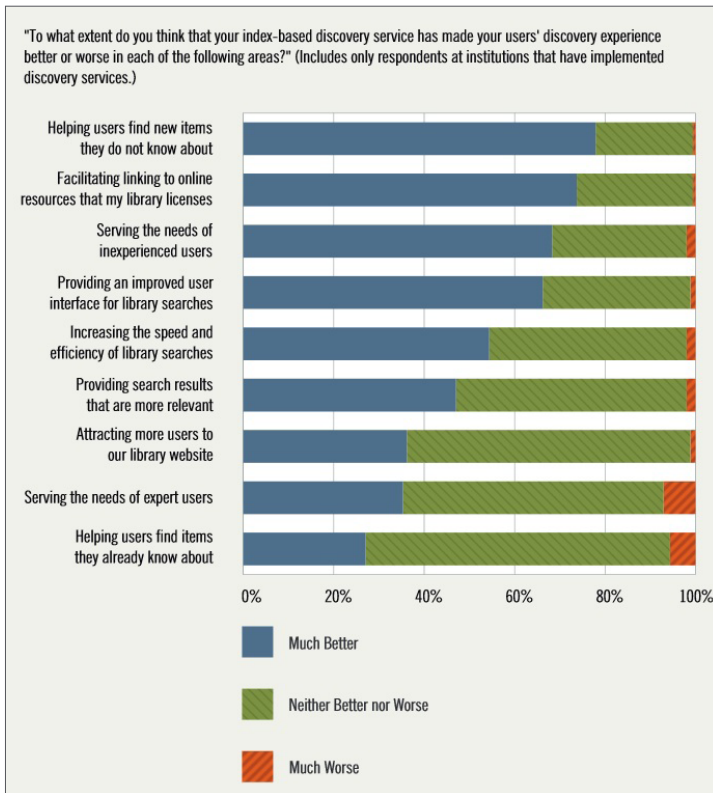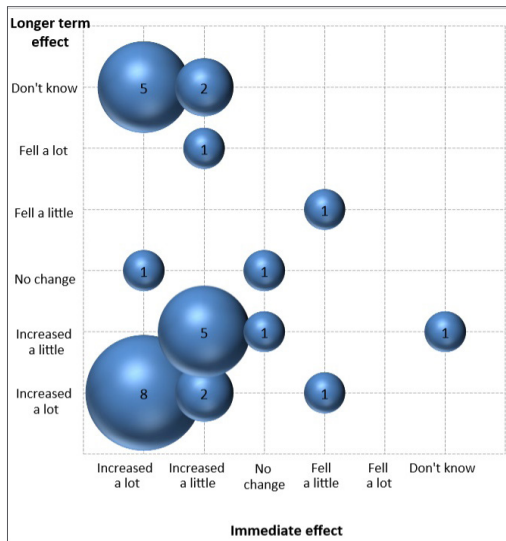

Library Director Perceptions of Discovery Service Impact on Users

Echoing and confirming the 2013 findings, the Ithaka S+R Library Survey 2016 of U.S. libraries revealed that about three quarters of library directors viewed the use and provision of discovery services as a "highly important" priority for their library. [35]

## Impact of Library Technologies – A Report for UKSG [36]

In addition to the quantitative measures reported in this study (shown earlier), many libraries were asked about perceived impact and changes in resource usage immediately and in the longer term. Of those who had the information and felt qualified to respond, a significant majority believed that there was a positive effect on resource usage.

Library Director Perceptions of Discovery Service Impact on Resource Usage

"Know Your Customer" Survey by University of Manchester

In-person and online surveys from 2013 through 2016 indicated that library users were relying on the library's discovery service to find relevant content more often than Google, Google Scholar or course-reading lists. Results from this statistically significant survey, of more than 1,000 respondents comprised of undergraduates and post-graduates, reflected that over a four-year period they were using the library discovery service nearly ten percent more than they were four years earlier. Use of Google and Google Scholar decreased and remained flat, respectively.
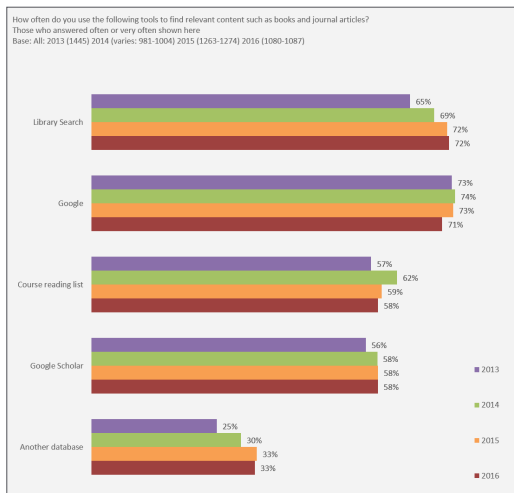
User Perceptions of the Tools Used to Find Books and Journal Articles

Article Discovery Preference and Behaviorial Surveys by University of Michigan

The University of Michigan leveraged a user-centric approach when investigating, implementing and evaluating the launch of their discovery service. Part of this approach included surveying a wide variety of library users (undergraduates, graduates, post-docs, faculty, staff) to determine the five most-preferred discovery features by each group. [39]

Goal	Feature	Summon	Search Tools	Google Scholar
Find useful and relevant content	I can find articles from the top journals in my subject area	●	●	?
Save time	I can get to the full text of an article in one mouse click	●	●	●
Find useful and relevant content	I can perform advanced searches (options are available to search in multiple fields at the same time like year, author, title, keyword)	●	◉	◉
Find useful and relevant content	I can easily narrow down my search results by clicking on different links (such as year or subject)	●	◉	○
Find useful and relevant content	I can limit my search so I only get articles from scholarly (peer-reviewed) journals	●	○	○
	● Full Support ◉ Partial Support ○ No Support ? Uncertain			

*Comparison of Discovery Tools Based on Top 5 User Goals*

Six months after implementing their discovery service the university conducted another survey to evaluate users' experiences to better understand discovery service preference and search behavior across several discovery tool options.[40]

	Articles*Plus* (Summon™)	Google Scholar™	Search Tools Quick Search (MetaLib®)	Other Resources
	n=484	*n*=585	*n*=435	*n*=466
Used First All or Most of the Time	36%	37%	27%	47%
Very or Somewhat Satisfied	74%	75%	56%	85%
Have recommended it to others	41%	62%	22%	26%

Evaluation of Discovery Tools Based on User Behavior

User Satisfaction Evaluation by Ryerson University

Leveraging a combination of online questionnaires and in-person focus groups, Ryerson University examined in 2015 whether its discovery service was meeting the needs of users in light of their Google-like 'one-stop' experience.[41] The library's study confirmed that there were high levels of user satisfaction, and they received positive feedback that the discovery tool was meeting users' research needs and expectations.
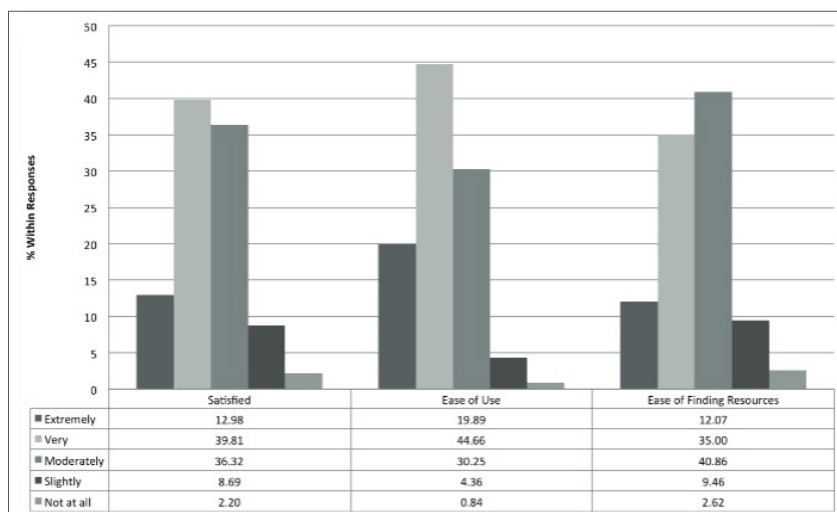
User Satisfaction Ratings for Discovery Service

Web-Scale Discovery Services: Critical to Library Success

Internet based search services brought libraries into a nuclear age of information discovery and access.[42] These non-library services, especially Google, caused librarians to wonder nearly a decade ago if the library catalog would be replaced as the starting point for discovery.[43] Libraries recognized the impact of these services.[44] Web-scale discovery services came at a time when libraries desired and needed a solution that provided near-universal access to library content that met user expectations.[45] These new solutions were based around four key characteristics – content, discovery, delivery and flexibility.[46]

Some have referred to today's discovery services to be an extremely significant advancement for library technology,[47] as they changed how librarians deliver their services. They enable libraries to help their users gain access to their broad collection of proprietary and open access resources,[48] while emulating the user experience found outside the library by offering a one-stop-shop search experience.[49] Discovery services have become widely adopted and are now considered to be critical to academic libraries[50] and an extension of what has historically been discovered inside the traditional library walls.

Initially designed to provide a superior discovery alternative to Google and the library catalogue, discovery layers have now moved far beyond the concept of a single search across print and electronic resources. They provide the library with the additional opportunity to engage with users via help and chat functions, and to recommend and suggest contextual services based on a user's search.

Besides becoming true gateways to research resources the user needs, libraries are capable of embedding discovery services into the research workflows and further into the online environment through dedicated mobile search apps, integrating with reading lists and reference management services, and student portals. This contributes to a library's ability to deliver a learning experience that helps position users for success with their academic and post-academic careers.

What's Next: Need for Further Evaluation and Measurement

Libraries have promoted their websites as starting points for discovery and invested in systems to make the single-search experience a reality, gaining acceptance from users, library directors and librarians alike. In addition, further studies indicate that use of electronic resources goes up and users are satisfied after implementation of a discovery service.

While some point out that libraries have never served 100% of the discovery needs of its users,[51] and discovery does happen outside the library,[52] the fact remains that discovery services have become a critical and strategic resource for modern libraries in the era of Google and the internet.

The future, in fact, looks bright for libraries and discovery services. Millennials are saying, more than any other demographic, that libraries help them find trustworthy information, learn new things, and make informed decisions.[53] It's critical for libraries to move forward with this momentum, and a crucial time to monitor usage, accumulate data, and measure satisfaction with their discovery services.

Those that leverage usage analytics and measure satisfaction and user behavior will be better prepared to apply an evidence-based approach to enable the evolution of the discovery service. They will continue to meet library and institutional strategic goals, and further address the constantly changing needs of their users.

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3 Devin Crawley, "The Infinite Library," *U of T Magazine* 33, no.1 (2005): 32, available at http://magazine.utoronto.ca/autumn-2005/google-impact-on-libraries-digitizing-books/.

4 Gaurav Bhatnagar, et al., *University of Michigan Library: Article Discovery Working Group Final Report* (Ann Arbor: University of Michigan, 2010): 3, available at http://www.lib.umich.edu/files/adwg/final-report.pdf.

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7 Jeffrey D. Daniels, Laura Robinson, and Susan Wishnetsky, "Results of Web-Scale Discovery: Data, Discussions, and Decisions," *Serials Librarian* 64, no. 1 (2013): 81, available at https://scholarworks.gvsu.edu/library_sp/48/.

8 Bhatnagar, et al., *University of Michigan Library: Article Discovery Working Group Final Report,* 3-4.

9 Deodato, "Evaluating Web-Scale Discovery: A Step-by-Step Guide," 19.

10 Crawley, The Infinite Library, 32.

11 Aaron Tay, communication with Ex Libris, August, 29, 2017, cited with permission.

12 Deodato, "Evaluating Web-Scale Discovery: A Step-by-Step Guide," 20.

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17 Marshall Breeding, *The Future of Library Resource Discovery* (Baltimore: NISO, 2015): 37, available at https://groups.niso.org/apps/group_public/download.php/15077/future_library_resource_discovery.pdf.

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20 Spezi, et al., *Impact of Library Discovery Technologies: A Report for UKSG,* 19.

21 Spezi, et al., *Impact of Library Discovery Technologies: A Report for UKSG,* 9.

22 Dr. Kanu A. Nagra, "Usage Statistics of Electronic Resources: A Comparison of Vendor Supplied Usage Data" (presentation, 2014 Library Assessment Conference Lightning Talk, Seattle, WA, August 5, 2014): 9, available at http://old.libraryassessment.org/bm~doc/nagra-kanu-lt-2014.pdf.

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