Discovering User Behavior: Applying Usage Statistics to Shape Frontline Services

Abstract

This investigation sought to develop a broad view of discovery service user behavior by analyzing vendor-provided and Google Analytics usage data from discovery service implementations at two Indiana University campuses. The results of this analysis demonstrate how usage data can communicate both intermediary and end results of user interactions within discovery services. The findings reveal user behavior trends, which may be used to develop strategies to improve information literacy instruction techniques, as well as discovery service interface enhancements.

Keywords

discovery services, Google Analytics, usage statistics, user behavior, usage data

Introduction

Libraries have always cared about assessment, whether their analysis took the form of recording the number of books checked out, questions asked at the reference desk, or simply visitors to the library. Although libraries have conducted assessment for decades, assessment using automated web-based data collection tools has lately become an even more prevalent approach, for many good reasons. Libraries must prove their value every day in the current economy of increasing information service providers and decreasing financial resources. Additionally, as libraries increasingly adopt web-scale discovery services, which are often accompanied by not insignificant price tags, librarians are tasked with explaining the purchase of expensive tools that often only duplicate access to content available elsewhere, such as in existing subscription databases. Usage data from automated web-based data collection tools has proven to be of tremendous benefit in helping libraries assess their collections and demonstrate the value of their resources for users. Such data provides librarians with explicit figures, such as full text downloads and abstract triggers, that testify to definite usage. To only utilize usage data to justify library collection expenditures, though, is to limit the capabilities of these statistics. Beyond demonstrating their value, libraries can leverage their usage data to shape their services and resources and thus deepen user appreciation of the library.

This paper describes how the authors utilized usage data for their web-scale discovery services in order to assess user behavior and inform improvements to frontline library services. Usage data from vendor-provided reports and Google Analytics is reported for two campuses of the Indiana University system – Indiana University Bloomington (IUB) and Indiana University Kokomo (IUK):

- IUB: The flagship campus of the IU system, has a Carnegie classification of Doctoral Research Extensive, and had an FTE of 46,817 during the 2013-2014 academic year (Indiana University, 2013; “Indiana University-Bloomington”, n.d.). IUB implemented EBSCO Discovery Service (EDS) in August 2011. EDS was branded as OneSearch@IU and replaced IUB’s 360 Search federated search product. EDS was added to the libraries top ten resources list and replaced the original OneSearch@IU as a tab on all of the subject research guides. IUB linked EDS from the IUB homepage in May 2013. The library website was redesigned in August 2014 but continued to link to EDS from the search bar on the homepage.
- IUK: A regional campus of the IU system, categorized as a Baccalaureate College--Diverse Fields, and had an FTE of 2,595 during the 2013-2014 academic year (Carnegie citation; Indiana University Kokomo, 2013). IUK implemented EDS in September 2011. EDS replaced the library’s 360 Search federated search tool. EDS was not initially branded in a discernible way, but a single search box containing default text that read, “find articles, books, media, collections…” was placed on the library homepage. In fall 2012, though, the library launched an official marketing campaign in order to brand EBSCO Discovery Service as “EDS” (Thorpe & Bowman, 2013). The library website underwent a significant redesign in August 2013, but the EDS search box remained the focal point on the library homepage.

This paper breaks new ground by not only presenting usage data that depicts how users interact with web-scale discovery services but also by discussing how analysis of usage statistics was used to inform improvements to library services – namely, reference and information literacy instruction. Although some analyses have been conducted of discovery service usage

statistics, few have explicitly applied data findings to frontline service point improvements. Usage data is valuable because it reveals how library users actually interact with library resources, but to get the most out of this data, libraries must also analyze it in order to both understand what user behavior looks like, as well as how librarians may influence user behavior so students and faculty have more positive and successful experiences with library resources. This paper will present data on the intermediary and end results of user interactions with EDS in order to convey patterns of user behavior. The subsequent analysis will assist libraries in converting their own usage data into actionable improvements for services and resources.

Literature Review

Many academic libraries have implemented some form of discovery service, also known as web-scale discovery services (Vaughan, 2011). Web-scale discovery services search a "centralized index of metadata obtained from many publishers and database vendors as well as the subscribing library's OPAC, institutional repository, and other selected resources, returning results almost instantly" (Rose-Wiles & Hofmann, 2013, p. 150). Discovery services are libraries' latest attempt to offer a "Google-like" search experience of library resources (Durante & Wang, 2012; Cassidy et al., 2014; Vaughan, 2011). These tools tend to be more popular with users, especially undergraduates, than traditional library search tools (Ballard, 2011; Rose-Wiles & Hofmann, 2012; Yang & Wagner, 2010).

With more academic libraries implementing discovery services every year (Hofmann & Yang, 2012), libraries need to prove their worth in a new manner. Discovery services are not necessarily the impetus for showing worth, but, given their often substantial price tags, they do require an additional cost-benefit justification. This can be difficult to calculate, though, as

traditional usage metrics do not always show the big picture of user engagement and the value provided by discovery services (Bennett & Loveland, 2013). Some have tackled the question of discovery service value by assessing whether collection use changed pre- and post-discovery service implementation (Calvert, 2015; O'Hara, 2012; Way, 2010). These studies suggest that discovery service usage does affect user behavior, including use of physical library materials. However, these studies only present the end results, such as full text article downloads, of user interactions with discovery tools; they do not demonstrate how users interact with discovery services.

To that end, usability tests of discovery services have been helpful in assessing the navigability and search effectiveness of discovery platforms (Gross & Sheridan, 2011; Cassidy et al., 2014). The limitation of usability tests, though, is that they generally comprise a defined set of tasks, usually determined by a librarian or user experience expert. The tasks may be inspired by or based upon actual user assignments, but, ultimately, they are not native, authentic user activities; they are tests.

In order to observe actual, unobstructed user behavior, then, libraries are turning to web analytics tools. Libraries use Google Analytics and other metric gathering tools to present data that shows user behavior, satisfaction, and engagement with library resources. This data helps libraries demonstrate the continuing usefulness and necessity of their resources (Rose-Wiles & Hofmann, 2013; Loftus, 2012). Several articles discuss the use of Google Analytics on library websites to track user behavior and provide useful usage metrics, such as how patrons enter and exit library websites (Paul & Erdelez, 2013; Barba et al., 2013). Although it has been noted that it can be difficult to establish key performance indicators using web analytics, several articles have focused on different statistics – such as Top Content and keyword reports – that may

provide the most value to libraries (Loftus, 2012; Arendt & Wagner, 2010). It is a logical extension to apply these analytical tools to discovery services. Web analytics can, for instance, provide a window into the implications of discovery tools on information literacy (Fawley & Krysak, 2012). A number of authors have focused on where librarians see discovery tools failing or more instruction is needed (Fagan, 2011; Loftus, 2012; Rose-Wiles and Hofmann, 2013; Fawley & Krysak, 2012; Asher et al., 2013).

The present study is most closely aligned with a discovery service analysis conducted by Janyk (2014). Janyk's review of Google Analytics data identified times of peak discovery activity, where users accessed the discovery tool, and user search strategies (p. 263-264). The library then used these findings to refine instruction methods. The current paper differs from Janyk's study, however, by combining usage statistics from both vendor reports and Google Analytics in order to assess user behavior within EBSCO Discovery Service. It is the first study to examine both sets of usage data to comprehensively assess web-scale discovery services. In addition, this paper employs usage data from two discovery service implementations in order to make distinct recommendations for improvements to library reference and instruction services. Much of the value in this study, then, is to not only report different types of available usage data but also to explain how this data may be meaningfully applied to influence and improve discovery user behavior.

Methodology

This investigation analyzed vendor-provided usage statistics and Google Analytics user behavior data to develop a broad view of user behavior within two EDS implementations. The advantages of using data to assess the use of discovery services – as opposed to qualitative methodologies

such as user surveys, usability tests, and/or focus groups – are both the quantity of data available for evaluation and that the data documents actual user behavior activities. Although there is inherent and unquestionable value in asking students and faculty how they formulate search queries and what devices they use to access a discovery service, usage statistics and user behavior data depict a more robust and wide-ranging picture of discovery service usage. While surveys and focus groups may suffer small sample sizes or groupthink responses, statistics report all captured behavior and therefore, arguably, present the truest picture of user behavior.

In summer 2014, librarians at IUB and IUK analyzed EDS usage data for three academic years: 2011-2012, 2012-2013, and 2013-2014. Each author retrieved EDS usage statistics – a traditional tool used by librarians to calculate cost-per-use metrics – from her respective, campus-specific EBSCO administrative website. These reports included full text download, abstract, and SmartLink statistics.

Vendor-provided statistics are helpful because they present the results of user interactions with EDS. Although this data does not necessarily prove that students or faculty are finding relevant results when they use EDS, full text download and abstract retrievals do suggest users are finding appropriate results that are at least worthy of further review. However, these statistics – which the authors term user engagement metrics – do not present the entire story of user behavior. The question remains as to what happens between the time a user finds the EDS search box on a library website or guide and then subsequently reaches an abstract or full text PDF. The authors turned to Google Analytics data in order to fill in and better understand the user behavior picture.

Usage data from Google Analytics was downloaded for the 2013-2014 academic year. Both IUB and IUK implemented automatically-generated Google Analytics tracking code within

their respective EBSCO platforms in February 2013, so 2013-2014 was the first academic year in which both campuses had complete usage data. The tracking code was placed within the footer of the institutional branding, which allowed it to be rendered on every EDS page generated, including basic and advanced search screens, search results pages, and detailed record pages. The authors reviewed Behavior, Technology, and Site Content reports within Google Analytics in order to examine user behavior patterns.

Results

For the purposes of this study, academic years were defined as August-April. In reviewing three years of vendor-provided statistics, it is obvious that EDS searches, sessions, and user engagement metrics continue to increase at both IUB and IUK. The EDS usage pattern over the course of the academic year – that is, higher usage in the fall than the spring – matches the usage pattern for other research databases on various platforms at both campuses.

Vendor-provided Statistics

Searches

Since implementing EDS, both IUB and IUK have seen a steady increase in the number of searches performed in EDS. At IUB searches increased 242.7 percent between academic years 2011-2012 and 2013-2014. Searches increased 95.4 percent at IUK during the same time frame.

It is important to note that search totals may not be 100 percent reliable. EBSCO records a new search every time a user performs certain search tasks, such as applying a facet (e.g. source type) to a set of search results, clicking linked information (e.g. subject terms), or using integrated search connectors (e.g. links to additional resources outside of the core EDS index)

(EBSCO, 2014 July). As such, when a user searches 50 databases separately, or searches 50 databases concatenated within a single index such as EDS, the vendor records 50 searches – one for each database. Thus, search totals may be inflated, making them largely unreliable as a clear indicator of usage. Instead, the authors turned to sessions and user engagement metrics to better assess usage. Complete user engagement metrics for IUB are presented in Table 1; Table 2 presents this data for IUK.

Sessions

A session is recorded every time the initial (i.e. homepage) search box "Search" button is clicked (EBSCO, 2014 July). Sessions increased 40.5 percent at IUB between the 2011-2012 and 2013-2014 academic years. During the same time period, IUK saw sessions increase by 16.9 percent.

PLACE TABLE 1 HERE

Abstracts

In EDS, when a user clicks into a record or uses the preview icon, an abstract is recorded. Abstract usage increased in the second year but dropped in the third for both IUB and IUK. As shown in Table 1, even with the slight decrease in 2013-2014, IUB saw abstract usage increase 59.1 percent between the 2011-2012 and 2013-2014 academic years. Table 2 illustrates that abstract usage increased 7.7 percent at IUK between the 2011-2012 and 2013-2014 academic years.

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Full text downloads

Users may access full text content directly within the EDS interface or via linking mechanisms known as CustomLinks and SmartLinks. Full text downloads in both PDF and HTML formats have shown overall increases at both campuses since the 2011-2012 academic year, but growth has not been consistent year over year. At IUB (Table 1), full text downloads increased in the second year but dropped in the third. At IUK (Table 2), full text downloads decreased in the second year but rebounded in the third. Overall, full text downloads increased by 56.7 percent at IUB and 5.5 percent at IUK between academic years 2011-2012 and 2013-2014.

CustomLinks and SmartLinks

CustomLinks and SmartLinks connect users with direct links to full text content when the full text is not immediately available within the centralized EDS index. Both mechanisms allow for more seamless full text discovery and access within EDS search results.

CustomLinks allow users to navigate from EDS records to locations where the full text for specific articles, books, or documents may be accessed (EBSCO, 2014 June). At both IU campuses, custom links connect EDS users with other web-based library resources such as IUCAT (the shared IU library system catalog), Interlibrary Loan, Document Delivery Services, and other vendor platforms. For example, catalog records within EDS are accompanied by custom links titled, “View Catalog Record,” and JSTOR records within EDS are accompanied by custom links titled, “Full text from JSTOR.” Both custom links direct users from EDS to the

specific item on the corresponding, non-EBSCO platform. Overall use of CustomLinks increased by 78.4 percent at IUB and 103.4 percent at IUK between academic years 2011-2012 and 2013-2014.

SmartLinks dynamically insert appropriate full text links directly into EDS search results (EBSCO, 2012). SmartLink use is recorded when full text retrieval requires following a link to an EBSCOhost resource (e.g. from Business Source Premier) outside of the central EDS index. At IUB, SmartLink use increased 130.1 percent between the 2011-2012 academic year and the 2013-2014 academic year. During the same time frame, SmartLink use increased 113.9 percent at IUK.

Google Analytics Statistics

Within Google Analytics, to assess EDS interactions, the authors reviewed Audience reports that addressed Behavior and Technology metrics, as well as Behavior reports with Site Content metrics. Analytics data was compiled for the 2013-2014 academic year (August 19, 2013 through May 9, 2014).

New vs. Returning Users

The Visitor Types report is a Behavior report that measures the extent to which a website encourages visitors to return. Table 3 reports that the majority (58.0 percent) of EDS users at IUB were new visitors, but at IUK, slightly less than half (49.7 percent) of EDS users were new visitors.

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Devices

Users at both IUB and IUK overwhelmingly used desktop devices to access EDS. At IUB, 98.6 percent of visitors used desktops, and the figure was only marginally less at IUK, at 98.2 percent (Table 4). It should be noted that Google Analytics identifies laptops as desktop devices for its reports. Desktops primarily ran the Windows operating system, with 53.6 percent of IUB visitors and 60.0 percent of IUK visitors using Windows 7. The MacIntosh operating system accounted for 34.0 percent of IUB desktop traffic. This figure was nearly double that of the MacIntosh operating system traffic at IUK; only 18.0 percent of IUK visitors used this operating system.

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Of those few visitors (1.3 percent at IUB; 1.7 percent at IUK) who accessed EDS using a mobile device, Apple devices were the most popular device: 94.6 percent of IUB visitors used an Apple-branded mobile device; and 91.5 percent of IUK visitors used an Apple device.

Browsers

Browser selection diverged at IUB and IUK. As shown in Table 5, Google Chrome was used most frequently (29.4 percent) by EDS visitors at IUB. At IUK, however, Internet Explorer (IE) was the most popular browser, receiving 40.7 percent of visitor traffic.

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Search Queries

The authors reviewed search query data from the Analytics Site Content report. This is arguably the most valuable report offered by Google Analytics, as it reveals the actual keywords users entered into the EDS search box. Not every search query recorded by Google Analytics is considered a "clean query", as a percentage of the searches contain no actual keyword. Instead, they contain a random set of numbers and letters. For the purposes of this study, these queries were removed from consideration. For both IUB and IUK, the default page on EDS is the basic search page. Users must deliberately navigate to the EDS Advanced Search page in order for queries on those pages to register within Google Analytics logs. When searching in EDS, eight field codes are available. These include:

"TX – All Text

AU – Author

TI – Title

SU – Subject Terms

SO – Source

AB – Abstract

IS – ISSN

IB – ISBN" (EBSCO, 2014 October)

IUB reviewed the first 80,000 search queries logged within Google Analytics for the 2013-2014 academic year. From those search queries, 53,176 (66.5 percent) were considered "clean queries" and contained search terms that could be analyzed. Within those 53,176 queries, 14,534 (27.3 percent) searches were performed on the Advanced Search page in EDS, and 3,243

(6.1 percent) searches used a field code to narrow the search results. Of those field codes, TX (All Text) and AU (Author) were used most often.

IUK downloaded all EDS search queries – 60,360 in total – logged within Google Analytics during the 2013-2014 academic year. Approximately 40,205 (66.3 percent) were "clean queries." Within those 40,205 queries, 4,680 (11.6 percent) searches were performed on the Advanced Search page, and 2,485 (6.2 percent) searches used a field code to narrow their search results. EDS users at IUK used the field codes AU (Author) and TI (Title) most frequently.

Discussion

The purpose of this study was to demonstrate how usage data can communicate both intermediary and end results of user interactions within discovery services. The results reveal similarities among user adoption of discovery services at two IU campuses. For instance, abstract use decreased from the 2012-2013 to 2013-2014 academic years for both IUB and IUK: The decrease was 10.5 percent at IUB and 3.5 percent at IUK. Additionally, CustomLink use increased each academic year between 2011 and 2014 for both campuses, with the largest increases occurring at both campuses between the 2011-2012 and 2012-2013 academic years. During this time period, CustomLink use increased approximately 78 percent (78.4 percent at IUB; 78.3 percent at IUK) at both schools. The decline in abstract usage and the increase in CustomLink usage may be related: As EBSCO offered additional custom links to full text on other platforms, users may have bypassed abstracts on the EDS search results pages and instead used custom links to navigate directly to full text on other platforms.

The statistics also uncover some surprising results. For one, Analytics data showed that more new visitors were observed at IUB than at IUK. At both campuses, student profiles are built and then wiped each time a student logs in and then out of a university-owned computer (e.g. a workstation in a classroom or other library space). For this reason, it is likely that new visits reflect use of library or university-owned computers rather than personal devices. IUB remodeled two of its library spaces in fall 2014 and removed or relocated many of the computers found on those floors in the process. As such, IUB will revisit this report after the 2014-2015 academic year in order to evaluate whether removing library computers affected Visitor Type statistics in any measurable way.

Google Analytics data also dispelled the assumption that, if student use of smartphones and/or tablets is nearly ubiquitous, a sizeable portion of this population must also use mobile devices to access the library's discovery service. Data from both IUB and IUK shows that EDS visitors still mainly use desktops for their research. This data initially appears to contradict results from other studies that have investigated student use of mobile devices for academic activities. In a study of 75 students enrolled in an introductory information literacy class, Bomhold (2013) found that 35 of 42 survey respondents used their mobile devices to find academic information (p. 429). This data corroborated the findings Dresselhaus and Shrode (2012) obtained during their 2011 survey inquiring about student use of mobile technology for academic purposes. The results of both studies indicated that the majority of students use mobile devices for academic objectives (Bomhold, 2013, p. 430; Dresselhaus & Shrode, 2012, p. 89). However, these studies intentionally left the definition of "academic information" or "academic purposes" open-ended for student interpretation. It is, therefore, conceivable that IUB and IUK students also use their mobile devices for academic purposes, but the usage data from the current

study demonstrates that EDS is not one of their preferred mobile destinations for academic resources. Additional research, then, must be conducted to identify why students are not using EDS on mobile devices. Additionally, libraries must work with discovery vendors to evaluate and improve the mobile user experience.

An additional surprise unearthed by Google Analytics data is the difference between browser preferences at two IU campuses. Although librarians, as well as IT and faculty training/development personnel, at both campuses encourage students to use Google Chrome or Mozilla Firefox to access library and campus resources (due to known compatibility issues with IE), IUK users appear to actively choose IE as their browser for EDS research. It is also curious that, even though IE is the default browser on library workstations at both campuses, the majority of EDS visitors at IUB searched in Chrome, not IE. This suggests that IUB users may be more familiar with or particular about specific browsers for their research than IUK users. This data demonstrates the need to know which technologies are used by library visitors. Librarians can leverage this knowledge to ensure resources are accessible across browsers and advocate for technology-agnostic products.

Turning to the Site Content report, it was not surprising that EDS visitors demonstrated both search strategies that were likely successful and strategies that were likely unsuccessful. Search query logs suggest that, in a number of ways, EDS visitors chose search terms that were likely to prove successful. That is, the user was likely to retrieve a set of results that was appropriate and relevant to his/her search term(s). Observed examples of these queries include the correct application of field codes (e.g. AU search for Flannery O'Connor, DE search for "active learning"), use of quotes to indicate phrase searches (e.g. "deforestation effects"), and searches conducted on the Advanced Search page (e.g. American Dream AND home ownership

AND 1930). Since Advanced Search is not the default search option at either IUB or IUK, navigation to this search page suggests a deeper level of engagement and understanding of sophisticated research processes. It is therefore likely that users who conducted searches on the Advanced Search page applied additional thought to their search terms; more consideration of keywords may have lead to better formulated search strings and thus better search results.

Conversely, the Site Content report also reveals that some visitors were likely unsuccessful in their search attempts. Although Google Analytics does not specifically indicate whether a visitor retrieved the results s/he wanted, the authors surmise, based on experience, that certain types of search queries were unlikely to yield precise results. For example, visitors who searched for general terms (e.g. birds, Japan, Psychology) assuredly received millions of results from disciplines across the board. Since it is unlikely – albeit possible – that a user who searched for a broad term would find exactly what s/he wanted on the first page of EDS search results, these search strategies were deemed unsuccessful. Additional unsuccessful strategies included searching for specific source types (e.g. Articles on science, Scholarly articles, and Books in Spanish) and asking EDS questions (e.g. Do animals have emotions?). Unsuccessful search queries are likely to produce overwhelmed, frustrated, and dejected searchers, who are more likely to abandon EDS. Thus, it is imperative for libraries to recognize how their users are interacting with their resources so they can make adjustments to frontline services and improve users' information-seeking behaviors.

Actionable Improvements

Instruction

Evaluating search queries in EDS can generate persuasive implications for how libraries teach information literacy sessions. These queries can help librarians identify where they are succeeding as instructors and where they should invest additional effort to help students develop better search techniques. At IUK, librarians have compared EDS with Google and Amazon in order to help students make connections between the library discovery service and familiar web properties. However, search query records – such as searches for database names and questions – suggest that students may be applying this metaphor too literally. These findings have clear implications for information literacy programs. When teaching the discovery service, for example, librarians should emphasize that students do not need to include keywords such as "articles on" or "books about" within their search queries. Librarians should instead teach students to search for their topics of interest and then use facets, such as Source Type within EDS, to narrow their results. Another area that deserves additional instruction time is correct use of field codes. For example, using an author field code to search for a generic subject query of "euthanasia" is probably not going to give a student the results s/he wants. Librarians need to help students understand how to effectively use these codes so they do not become frustrated with them when their search results do not produce desired results.

Enhance the EDS interface

In addition to shaping campus information literacy strategies, user behavior data analysis can guide discovery service product enhancements. The current study identified three key areas for development: 1) integration with other, non-library systems, such as campus student services systems and Learning Management Systems; 2) improvement of the relevancy of search results, including full text indexing for government documents and more forgiveness for misspelled

queries; and 3) additional tools, such as widgets, to integrate content from resources that are not included in the centralized discovery index. For example, IUB and IUK search query records indicate visitors use EDS to search for database names, such as the library's catalog (IUCAT), JSTOR, CINAHL, and others. Tools such as EBSCO's database placard allow libraries to create customized boxes that appear above EDS search results in order to promote databases of particular interest to individual campuses. The result is that, if a student searches for a database within EDS, the database placard with a link to the searched-for database will appear at the top of the student's search results, allowing her/him to easily navigate to that particular database. This feature is an admirable example of an enhancement offered by a vendor in order to resolve a problem librarians identified as they reviewed statistical data and noticed areas for improvement. This solution shows the value of collaborative relationships between librarians and vendors. EBSCO's Curriculum Builder plugin, which allows faculty to create reading lists of library materials within learning management systems, is another example of this type of synergy (EBSCO, 2015).

Fagan noted in 2012 that a top discovery myth is that, "My discovery tool is the biggest and/or the best" (1). A related myth is that discovery tools will search absolutely everything a library owns or leases. Since both of these statements are false, partnerships between libraries and vendors – and libraries and libraries – must be cultivated. Although the present study shares data from only one discovery product, the campuses themselves widely differ based on student populations and areas of study. However, user behavior looks quite similar across campuses. As such, rather than drawing lines between libraries and vendors or libraries with other discovery products, librarians should reach out to others and share what user behavior looks like for them.

There is ample room to learn, and the findings from these dialogues will allow libraries and vendors to develop discovery services that are more useful and usable for students and faculty.

Limitations

Vendor-provided and Google Analytics statistics offer a variety of quantitative reports that showcase user interactions. The most appealing aspect of this type of data is that it is not limited to survey participants or response rates: It includes and reflects everything. But that also means that the sheer quantity of the data may be overwhelming, and it can take significant periods of time to wade through the abundant heap of statistics. The present study did not analyze all Google Analytics discovery data for both IU campuses, so it is highly probable that libraries will find additional reports of value to improving library services.

Another limitation of quantitative data in general is that it does not offer feedback from actual users. Although Google Analytics records search queries and vendors identify when a full text article is downloaded, neither set of reports – vast as they are – identifies whether users actually found what they were looking for or if they just settled for what was available. Furthermore, statistics do not explain what users think of the discovery service interface or search results or if they gave up on EDS and went somewhere else to conduct their research. Statistics are unable to convey whether library resources actually answered users' research questions and helped them with coursework or creative projects. Therefore, as valuable as statistics are in documenting actual user behavior, qualitative methods such as focus groups or usability studies should be added to analysis strategies in order to paint a comprehensive picture of user behavior within discovery services.

Conclusion

Automated web-based data collection tools have broadened the set of assessment instruments available to libraries. In addition to helping libraries evaluate material expenditures, usage statistics have the power to reveal actual user interactions with library resources. Usage data, then, should be used not only to calculate cost-per-use metrics but also to evaluate existing user behavior and then make changes to frontline library services in order to positively affect future user behavior. Doing so will likely lead to more satisfied library users, which can lead to deeper user appreciation of the library.

This study of discovery service usage statistics will act as a basis for further study of discovery user behavior. As the first study to combine analysis of vendor and Google Analytics data to evaluate EDS user behavior, there is opportunity for libraries with non-EBSCO discovery services to replicate this study in order to assess whether user behavior is similar across discovery tools. A question for future research is whether IU's discovery data may be extrapolated to apply to all or most discovery service implementations.

Additionally, there is room for additional research into Google Analytics data. For one, since Analytics records user search queries, librarians can analyze the terms to identify trends, such as heavy versus light discovery users. For example, do the queries show a substantial amount of business-related searches but few science terms? Analysis of this data can help libraries tailor instruction efforts to different departments: light users may need to better understand the value of the discovery tool whereas heavy users should be taught advanced searching techniques.

Finally, the lack of discovery use on mobile devices should be further investigated. Since other studies have indicated students do use their mobile devices for academic purposes, libraries

should look into those purposes. One idea may be to conduct a student survey to ask students which mobile websites or apps they use for academic purposes. It may be useful to include a specific list of options, among which should certainly be the library's discovery service.

As much as libraries have embraced usage data to assess collections, these statistics are equally important for shaping frontline library services, such as reference and information literacy instruction. Understanding user behavior will help librarians better educate and connect with students and faculty in meaningful ways.

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