Students and Federated Searching: A Survey of Usage and Satisfaction

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This study assessed student use of and satisfaction with a WebFeat brand federated search tool implemented by the library at Sam Houston State University. Students voluntarily responded to an electronic survey, providing feedback on how often they conducted class research using the federated search tool, individual databases, and online search engines and how well each search tool satisfied their class research needs. The study found a high rate of federated search use but only moderate satisfaction; for most students, federated search did not replace individual databases and online search engines, which also saw frequent use for class assignments. Federated search use was highest among lower-level undergraduates, and both usage and satisfaction declined as student classification rose. Classification—which can be seen as the amount of experience in an academic environment—played a larger role in federated search use and satisfaction than did age or subject area of study.

Students have almost unlimited avenues to gather information for conducting research, both in libraries and online. Recent years have seen an increase in the quantity and popularity of free web-based resources, such as *Wikipedia*. Regardless of the comparable quality of data, these tools present information in a simple, user-friendly way and require little formal knowledge of information organization and searching techniques. Such straightforward simplicity attracts many students, and academic libraries face challenges in capturing and keeping students' attention in order to assist them in finding authoritative and appropriate research materials in the library.

BACKGROUND

Federated search systems—alternatively called metasearch—aim to search a collection of databases from one interface and present one set of results, thereby reducing the amount of time and energy that a researcher must invest in learning and using individual database interfaces.

Although federated search systems are, conceptually, an ideal way to simplify the search process, in practice they often suffer from certain weaknesses, including slowness, fewer advanced search refinements, and poor integration of results from multiple sources. Many problems stem primarily from a lack of consistency between database systems. However, in spite of such common weaknesses, federated search systems can provide a relatively quick and simple mechanism for conducting a broad search of multiple resources in one step.

In the spring of 2007, several teams of students enrolled in Dr. John Newbold's class in Strategic Marketing Management at Sam Houston State University (SHSU) were given the assignment of producing a marketing plan for the university's Newton Gresham Library. Some of the teams surveyed students on campus, asking how the library could better market its online resources, while other teams relied on their own preferences and suggestions.

The opinions from the teams and survey respondents showed a desire for a more "Google-like" approach to searching library resources; students were accustomed to using

Google and other Internet search engines to search once and retrieve a single, simple list of results from many websites, ranked by relevancy. That familiarity created the expectation that the library ought to provide a similar capability for quick, convenient academic research: perform one search in one place and retrieve a clean, readable, self-explanatory list of results from multiple sources. In response to this finding, the Newton Gresham Library researched metasearch options and finally implemented the federated search product WebFeat, which was marketed on the library's website under the name "E-Z Search."

The federated search tool was released in a beta version on the library website in August, 2007. E-Z Search was marketed through the library website, library instruction sessions, and handouts available at the library Reference Desk. In addition to the new E-Z Search tool, students still had access to the library's online catalog (branded SamCat) and the native search interfaces for approximately 180 subscription databases. After about six months of use, the library collected information about how many users were searching with E-Z Search and whether it was satisfying their academic search needs. Inquiry was conducted through an electronic survey, which was designed to answer the following questions:

  1. Which students are using E-Z Search? How are they using it, and how often?

  2. How do students perceive E-Z Search, and how well does it satisfy their academic search needs?

  3. In student opinions, how does E-Z Search compare to other library search tools (the online catalog and individual database interfaces) and Internet search engines?

This article highlights the Newton Gresham Library's findings concerning the use and perception of the E-Z Search federated search implementation.

LITERATURE REVIEW

Much of the literature on federated search is comprised of discussion about creating and implementing federated search tools, and comparisons of various tools and usability studies.[1] At the time this article was written, there was not a large pool of quantitative data about user desires and satisfaction with federated searching in an academic environment.

Students have multiple tools at their disposal when conducting research for academic purposes, including their library's catalog and databases as well as websites and Internet search engines. The Electronic Publishing Initiative at Columbia (EPIC) online survey concluded that almost 50% of students started searches for class assignments using a commercial search engine.[2] Jillian R. Griffith's research found that "45% of students use Google as their first port of call when locating information, with the university library catalogue used by 10 percent of the sample."[3] Helen Laurence and William Miller believe that this is because "library patrons expect to find it all in cyberspace…, but for the purposes of academic research, such expectations are unrealistic and even dangerous."[4]

Libraries have tried adapting to the expectations of users by providing a single search box interface that mimics popular Internet search interfaces. Eric Lease Morgan asserts that commercial websites' characteristics such as aesthetics and navigation are the benchmarks that patrons use to judge the viability of a federated search interface.[5] Students want a very simple interface and have no desire to read instructions before starting a search.[6] For instance, Google does provide advanced tools for more experienced searchers, but an individual with only average or limited search experience can begin searching with Google almost instantaneously; it requires virtually no instruction to begin searching and interpreting results. In fact, Selkyung Jung concluded that providing interfaces similar to commercial search engines is crucial to getting undergraduates to use federated searches because the familiarity will increase their confidence in starting their search.[7] Users also expect relevance, speed and spell check functions that are comparable to popular search engines.[8]

Meeting these expectations can be a challenge. Users often perceive federated searches as slow: one federated search generally takes longer than one search in the typical Internet search engine, because data is gathered across multiple databases from various vendors, some of which may respond very slowly.[9] Compared to the repetition of a search in multiple tools, however, one federated search can actually save time: the user does not have to repeat the process of finding each individual database, opening or logging into it, constructing a search, and evaluating the results. Instead, the user only has to open or log into one interface (the federated search), construct one search string, and evaluate one set of results. The process is streamlined: C. Jeffrey Belliston found that "federated searching was, on average, 11 percent faster" than repeating the same search in multiple databases.[10] Unfortunately, such overall time-savings may be difficult to convey to some users as they wait for their federated search results. A search which may take only 0.1 seconds in Google may take upwards of 30 seconds, 60 seconds, or more in a federated search tool, even when using a high-speed Internet connection.[11] Even though the federated search condenses the tedious process of interacting with multiple search interfaces, the search itself may still seem to take too long, especially for student users who are accustomed to the rapid response of Google and other Internet search engines.

In addition to issues of speed, usability testing shows that users also find results confounding and are underwhelmed by the design of the result page.[12] In Rong Tang's 2007 study, 69% of student respondents found that federated search was "useful but complex and hard to figure out."[13] Users tend to experience difficulty in navigating results pages and confusion with library-specific terminology and icons.[14] Due to this confusion, Susan Elliot concludes that students also have trouble accessing full text content from a federated results page.[15] In stark contrast to common Internet labels, which are clear and concise—"Get it now," "Download it," "Read it now," and similar—and usually accompanied by familiar pictorial icons, the links which lead to full text in federated search engines are usually textual. They are sometimes

labeled with library jargon; other times vague labels such as "View" may fail to distinguish between functions which produce very different results, such as searching for full text with a link resolver versus opening the citation record in its native database interface. And on occasion, the full text link may simply be overlooked in the vast jumble of confusing text on the screen.

Most of the existing literature focuses on undergraduates. Graduate students, according to Bennett Claire Ponsford, seek a higher level of searching capability: "If libraries are going to 'trump' Google…we will need to provide a default search that works much like Google for our less experienced users, but also a more advanced, fielded, and Boolean-capable search for those of our users who know more about what they are doing."[16] Overall, Dennis Warren provides a concise summation of most research conclusions on federated searching: "[it] is still a long way from delivering the hoped for seamless cross-database access."[17]

METHODOLOGY

Data was gathered through an electronic survey: an email invitation to participate was distributed to a random sample of students, faculty, and staff at Sam Houston State University. The university's Office of Institutional Research supplied the population sample based on enrollment lists for the fall 2007 semester. The sample included: 1,008 students from a list of enrolled freshmen; 3,026 students from a combined list of enrolled sophomores, juniors, and seniors; and 1,029 students from a combined list of enrolled Masters and PhD students.

Survey participation was not mandatory. A drawing for several prizes—including an Apple iPod Shuffle as the grand prize—was provided as an incentive to promote survey participation. The original survey invitation was distributed on March 20, 2008, with a reminder after two weeks and closure at the end of a month. A total of 475 student survey responses were analyzed.

The survey contained a maximum of 27 questions; however, the electronic format allowed "skip logic" to be used, whereby certain questions were presented or skipped based on

responses to previous questions. Therefore, a given user might be asked to complete anywhere from 9 to 27 questions total, depending on his or her class level, experience, etc. A student who had used all the different search tools referenced in the survey would probably be presented with a maximum number of questions, whereas a faculty or staff member who had not used the referenced tools would probably be presented with a minimum number of questions.

The survey collected demographic information and then explored the respondent's experience using E-Z Search, individual electronic databases (e.g., JSTOR, Ebsco's Academic Search Complete, or any of the approximately 180 databases to which SHSU subscribed at the time), the library's online catalog, and Internet search engines. Comparative satisfaction levels and preferences between these various search tools were also investigated. Personal information for the prize drawing could be entered, but was not required for survey submission. A copy of the survey questions can be found online at http://library.shsu.edu/libfac/EZSearch_Survey.pdf. Red asterisks indicate questions where an answer was required; bracketed notes preceding a question indicate any "skip logic" that determined when that question was shown or not shown to the respondent.

RESULTS

Using E-Z Search

When considering students that were familiar with E-Z Search, almost 75% stated that they use E-Z Search in completing class assignments at least some of the time (Figure 1). At the undergraduate level, freshman, sophomores, and juniors relied on E-Z Search approximately 80% -82% of the time for coursework. Use of E-Z Search by seniors was lower compared to other undergraduates, with usage approximating 65%. Seventy percent of masters students reported using E-Z Search at least sometimes, while 32% of these students used it often or always. Doctoral candidates also were fairly prominent users of E-Z search, with 62% reporting use for academic initiatives.

Differences Between Colleges

The survey also measured differences in the use of the federated search engine among students from various colleges within the university (Figure 2). The range of students who responded that they used E-Z Search at least sometimes fell between 70-80% depending on the college. The College of Criminal Justice students landed at the top of the range (80%) while College of Business and College of Humanities students were at the bottom of the spectrum with 70% usage.

Demographic Differences

Gender differences in the use of E-Z Search were also tabulated. While 75% of all students use E-Z Search at least some of the time, this varied from 64% of males to 80% of females. This difference in use between genders narrowed when considering use "often" or "always". Females used federated searching 37% of the time while males used it 30% of the time.

Age variances among E-Z Search users were also analyzed. In the age range of 16-19, 84% of students used E-Z Search sometimes, and 50% used it often or always. The percent of students who used it often was 51% for 20 year olds and 37% for 21 year olds. Students that were 22 used it often 9% of the time. When broadening the range to include students who used it at least sometimes, the percentage increased to 91% (20 year olds), 70% (21 year olds) and 52% (22 year olds) respectively.

When looking at students outside of the traditional age range, the use of E-Z search ranged from 69 to 88 percent, for those who reported that they use E-Z search at least sometimes. Respondents who were between the ages of 40-49 reported the most use (88%), followed by those ages 30-39 (73.8%), students 50 and above (71.5%), and students ages 23-29 (69%). Students who reported using it often or always ranged from 29 to 44 percent. The highest usage

was among the 40- to 49-year-old group (44%), while those 23 to 29 and 50 and above reported 29% usage.

E-Z Search Results

When considering search results, 55% of students stated that results were mostly to always easy to understand, while 2% of students found that the results were never easy to understand. The results ranged from 51 – 60%, when considering the percentages by college (Figure 3). When considering the % by classification, the results ranged from 52 – 63% with sophomores finding it the easiest. Between 52% and 54% of students in other classifications reported that results were mostly to always easy to understand.

The number of search results were just right approximately 41% of the time, ranging from 36-52% for undergraduates. When considering the percentages by college, the range went from 30% in the College of Humanities to 40% for students in the College of Arts and Sciences. Six percent of students felt the results were too high. When also factoring in students that thought the results were somewhat too high, this percentage increased to 28% among all students. Five percent, meanwhile, felt that there were too few results. Another 25% of students felt that the number of results was somewhat too low.

E-Z Search satisfied the needs of students most or all of the time at a rate of 35%. When looking at these percentages by classification, they ranged from 17% at the doctoral level to 52% of sophomores. The average satisfaction for undergraduates was approximately 43%. When considering the rates by college, 30% (Business) – 40% (Arts & Sciences) of students were satisfied most or all of the time.

E-Z Search Versus Other Resources: Preferences

Among students who were familiar with both E-Z Search and individual database interfaces, the preference for individual databases over E-Z Search rose as the student's classification increased. Doctoral students showed the strongest preference with a ratio of almost

7:1 preferring individual databases. Masters students shared this preference almost 4:1, while senior level undergraduates showed a more modest preference of 2:1. Junior, sophomore, and freshman level undergraduates reported close to a 1:1 ratio across the board, split almost evenly in their preference for individual databases or federated searching. The freshman respondents actually reported a slightly higher preference for federated searching with E-Z Search.

Within the entire group of 257 respondents who had used both E-Z Search and individual databases, students reported a preference for individual databases at nearly 66%, compared to a 34% preference for E-Z Search. If one focuses only on frequent Internet users—the subgroup of students who ranked their use of Internet search engines for class assignments at 4 or 5 on a 1-5 scale (where 1=Never, 3=Sometimes, and 5=Always)—then preference for E-Z Search followed the same trend across classifications as among all student respondents: preference for E-Z Search declined and preference for individual database interfaces increased as classification advanced (Figure 4).

Fifty-two percent of students reported that Internet search engines satisfied class assignment search needs most or all of the time. This number differed at the doctoral level, where only 25% of students reported the same level of satisfaction with Internet search engines.

When looking at college rather than classification, an average of 46% found Internet search engines most satisfying, compared to 41% most satisfied by other library resources and 13% most satisfied by E-Z Search. These averages did not vary significantly according to college affiliation within the university.

DISCUSSION

Use of Federated Search and Other Search Tools

The survey responses show that the federated search engine was used frequently during the first year of implementation. However, given the middling levels of satisfaction reported for E-Z Search, the researchers suspect that the frequency of E-Z Search use may be due in part to

the tool's prominent placement, bright color, and "one-search-box" simplicity, rather than just to students specifically seeking out federated searching for research.

When considering the classification of users, undergraduates showed a greater likelihood of use of federated search tools compared to graduate students. This result was expected based on specificity of research needs. Even given this factor, the number of masters and doctoral students that used federated searching was still higher than initially expected. This may speak to prominent placement of the tool, lack of knowledge of resources or need for continued training of all students about research methods.

The specificity of research needs and knowledge level of students are also very important factors when one considers the use of federated searching versus other resources. Doctoral, Masters, and senior undergraduate students are more likely to have a greater familiarity with their subject area, a greater knowledge of which specific databases are best for certain topics, and a higher comfort level with research and database interfaces in general. They are also more likely to be performing in-depth research in a specific area. They can benefit from the more specialized and specific array of search options available via individual database interfaces, as opposed to the necessarily more limited search options available in a federated search interface.

In contrast, freshmen are likely to have less familiarity with research in a specific discipline and are likely not researching at the same depth as more advanced students. With less need for discipline-specific advanced search options and less time spent becoming comfortable with complex and varied database interfaces, they may be drawn to the federated search tool's visible placement and apparent simplicity. Some may be attracted to the greater efficiency of searching multiple sources at once: with less practiced knowledge of which specific databases are best for certain topics, they prefer instead to cast a wide net via federated search. Others may simply use the most visible tool, which closely resembles familiar Internet search engines, and

are not making a reasoned, deliberate choice to engage in federated searching; they may not even recognize that the E-Z Search tool performs a unique function.

Use of federated search among undergraduates was similar among classifications although senior status had an impact on use. While approximately 82% of freshman reported using E-Z Search at least sometimes to conduct research, this number went down to 65% among seniors. Similar to what one would expect of graduate students, senior level students with a greater familiarity of library resources and more specific search needs, may have bypassed federated searching for specific tools.

Although there were differences among the colleges in the use of federated searching, it was not as dramatic as one might expect when considering the varying research stipulations of each college. At least 70% of students from each college used federated searching at least sometimes. This went as high as 80% among Criminal Justice students. The general consistency of the responses implies that students at each classification level tend to approach their searches in similar ways, regardless of the subject area of their inquiries.

The library implemented E-Z Search in an attempt to respond to the student request for a simple, "Google-like" one-box search. Therefore, one might expect a correlation between students who frequently use Internet search engines for class work and students who prefer E-Z Search over individual databases. However, such a correlation was not found in this survey. The preference for E-Z Search declined and preferences for individual databases increased along with the complexity of the student's search needs as they got further into their given area of academic study. Internet usage did not predispose student respondents to like or prefer E-Z Search, even if it aims to be a simpler, "more Google-like" search option. In this study, more experienced students researching deeper in their disciplines demonstrated a preference for individual databases over federated searching, even if they also regularly use Internet search engines for class assignments.

Satisfaction with Federated Search and Other Search Methods

Although federated searching proved to be a popular method of access, satisfaction with results was shown as fairly weak. Approximately 35% of all students surveyed reported satisfaction with search results. This weakness correlates to conclusions reached by others who have researched federated searching.

When further considering satisfaction with results, variances by college were less than by classification. The range of satisfaction by college ranged between 30% – 40%, which is lower than desired. When considering satisfaction by classification, the range was between 17% - 52%. Sophomores were the only grouping to report satisfaction above the 50% threshold. The satisfaction of doctoral and masters level students came in at the very low end; this fit with researcher expectations that highly focused, graduate-level research would be less well suited to E-Z Search's lack of search limiters and abundance of search results.

Compared to the relatively low (35%) percentage of students who reported that E-Z Search satisfies their class assignment search needs most or all of the time (4 or 5 on a 1-5 scale), satisfaction with Internet search engines was surprisingly high. Internet search engines satisfied class assignment search needs most or all of the time for 52% of the student respondents. This number drops noticeably at the Doctoral level—down to 25%—but otherwise is consistently high, especially in comparison to the levels of satisfaction with E-Z Search.

When considering the number of results, 41% of students found that the number of results returned was just right. Approximately 32% of students found that there were too few results and 28% believed there were too many results. When comparing colleges, the percentage of students who believe the results were just right ranged from 30% - 48%. The variation among colleges was greater in this measure than in the use of or overall satisfaction with federated searching. When considered from a classification perspective, there was also greater variance (25% - 52%) than with use and overall satisfaction. Doctoral students and seniors reported the

least amount of satisfaction with the number of results which was fairly consistent with what the research team expected.

When looking further at federated search results, 55% of students reported that results were mostly to always easy to understand. The research team initially believed that this could potentially be an area of dissatisfaction and confusion for students, given that the federated search tool is required to bring together disparate chunks of information into a format that can be understood with no further guidance. A slight majority of students found the results relatively easy to understand in spite of the challenging task required of the federated search tool, a subjective lack of visual appeal, and minimal guidance for interpreting the content of the search results page.

Search Tool Preferences

In an overall comparison of E-Z Search, Internet search engines, and other library search resources (including individual databases and the online catalog), undergraduates showed the greatest preference for search engines, while graduate students preferred library resources other than E-Z Search. Only among freshmen did E-Z Search even rank second; in every other classification, it took a distinct third place (Figure 5).

When student respondents were broken down by college rather than classification, no significant differences in preferences could be seen: an average of 46% found Internet search engines most satisfying—compared to 41% for other library resources and only 13% for E-Z Search—regardless of college affiliation within the university.

CONCLUSIONS

Areas for Further Study

There were some interesting differences that were observed in the data regarding a preference for federated search between males and females. Studying gender differences was not a goal of this study. However, it is an area of research that could be further explored to determine

whether the findings in this study were an anomaly, or if there is a pattern of preference by gender for the use of federated search tools.

Age was also not a factor that this survey intended to thoroughly analyze when looking at searching and satisfaction with federated search tools. This survey found that a substantially higher percent of students outside of the traditional college age range were using federated search regularly. Additionally, the highest levels of satisfaction with the use of Internet search engines for class assignments was seen among "traditional" college-age students (16-22 years) and "non-traditional" students 50 years and older. Though E-Z Search is still not the most widely satisfactory tool in any group, it too saw a higher level of satisfaction among the youngest and oldest groups of students. For students between 23 and 50, library resources other than E-Z Search seemed by far to be most satisfactory for class assignment search needs. Given all of these factors related to age, further consideration should be given to attitudes toward federated search and satisfaction with searching tools based on age or generation.

Recommendations

If federated search engines are made available to students in a prominent location, they will use them. Students generally feel comfortable with searching and reviewing results. However, the level of satisfaction with the usability of federated search results is lower than what one should expect for such a tool or service, especially when it is made available to patrons in such a central and visible manner. The level of satisfaction with search results should be improved; this goal would be best accomplished by improving the precision, relevancy, and ranking of the results, as well as the readability of their display.

Libraries need to continue to educate students on information literacy and help them understand contexts where federated searching is the most useful course of action, versus instances where other tools may be more appropriate. Prominence should not be the sole factor in why a student chooses a particular course of action.

New products frequently appear on the market with new features and enhancements; for instance, Summon from Serial Solutions attempts to improve issues of speed by searching one regularly-updated index of data harvested from multiple resources, as opposed to performing a live real-time search of each resource and waiting for those individual responses. Every new product seeks to make some new progress towards a better federated search tool. However, a truly effective federated search engine will likely not appear until we see further improvement in the use of common standards among vendors (for metadata and querying or harvesting), as well as the improvement of federated search algorithms and relevancy rankings. Until that day comes, it will be up to libraries to voice their needs to vendors and to continue to educate students on how to utilize the other search tools available to them.

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