Gaps in the Google Scholar conversation

Sarah Sammis

LIBR 244

Dr. Amelia Kassel

San José State University

May 15, 2012

Abstract

Since its debut in 2004, Google Scholar has been a popular topic of discussion in academic circles. Some librarians fear it will hinder scholarly research, especially among students, while faculty see it as another tool for tracking their citation counts and keeping current with research in their field. This paper attempts to gauge the impact of Google Scholar in academia by tracing its history, examining its strengths and weaknesses, and looking at its current usage.

Keywords

Google Scholar, information literacy, citation count, subscription database, open access

Introduction

Google Scholar's 2004 debut offered a new way to search for scholarly articles, presentations, pre-prints and other academic materials through a web browser. As libraries began linking their database subscriptions to the service, users had the option of searching for materials through the Google user interface, even those only available through a library subscription. Google's entry into scholarly research, though, has spawned dozens of papers critiquing every aspect of its performance and numerous other papers criticizing it for luring students away from the library. This paper attempts to track the evolving relationship between Google Scholar and academic research as it matures as a service.

History of Google Scholar

Google Scholar (http://scholar.google.com), developed by Anurag Acharya, for Google, debuted in beta form on November 19, 2004 (Quint, 2004, York 2005). The service offers a searchable index of scholarly materials including journal articles, PowerPoint presentations, books, and conference proceedings. This index is automatically generated, though Google doesn't share how exactly how exactly their programming selects materials for Scholar. Initially Google also didn't disclose the exact set of materials deemed scholarly or the publishers its index included.

To improve the depth and breadth of its search results, Google representatives approached various journal publishers and aggregators. The earliest sign, though that Google Scholar was gaining acceptance in scholarly circles was OCLC freely sharing most of its WorldCat database with Google and Google Scholar (Callicott and Vaughn, 2005).

Since leaving the beta testing phase, Google Scholar, now offers a list of the top 100 publications in a variety of languages (Google, 2012). While still not an inclusive list, it does give a sense of what is crawled by the scholarly arm of the search engine behemoth.

In development at the same time as Google Scholar, Google Books has been scanning the library collections of participating libraries. While lawsuits have forced Google to change the scope of its Google Books project, the initial scanning included journal articles from the pre-fee-based academic database days, thus forcing researchers to use both Google Scholar and Google Books to find information. In 2008, Google Scholar started its own scanning project to include "'journals that would otherwise never get digitized'" (Quint, 2008).

In 2009, Google Scholar expanded its index to include "U.S. Supreme Court opinions from 1791 and U.S. federal district, appellate tax and bankruptcy courts since 1923." Subscribers to Lexis/Nexis or Westlaw will still need to use their subscriptions for "the editorial work they provide on top of caselaw — *e.g.* headnotes and cite checking features." Nor does Google Scholar include statues or regulations (Tsai & Minick, 2009). Further more, Google Scholar does not provide "any sort of system to check the validity of the case, nor does it offer any type of taxonomy of the case" (Chanen, 2010).

In 2011, Google demoted Google Scholar, removing it from the top level of navigation options on their tool bar. To find Google Scholar through Google, one must click through two sub-menus or know the direct URL. Madgrigal (2012) of *The Atlantic* worries that this demotion to the "Even More" section signals that "projects without much revenue are endangered under Larry Page's reign."

Taken, though, in the context of continued developments, including a redesign launched during the writing of this paper, and a blog dedicated to announcing Scholar developments, Google Scholar appears to be settling into a niche environment. By keeping Google Scholar separate from Google's commercial ventures — namely services that offer personalized, targeted advertising to its users via AdSense, Google is signaling its most vocal critics — academic librarians — that its journal indexing service is, in fact, a scholarly one. Van Orsdel and Born (2006) mentions Google using AdSense to provide advertising to online journals, but beyond their article, I've found no evidence of AdSense being used in conjunction with Google Scholar.

In 2012, Google introduced metrics to Google Scholar. Scholar calculates a publication's h-index (*Hirsch index*). Journals with higher numbers of citations will be ranked higher in Google Scholar search results than other journals — just as web pages receive higher billing on search results based on their PageRank (Kovalchik, 2012; Suzki, 2012). Google Scholar. The h-index ranking of results in Scholar, though, can make it difficult to find more recently published materials as I will show later in this paper.

Literature Review

From the moment Google Scholar was introduced, the reviews and studies of it — mostly in the form of testing its ability to find relevant content against established, federated services — have come at a steady pace. The literature can be divided into four categories: informational updates from Google, neutral reports on features or changes to features by third party sources, and reviews, both positive and negative. Among those reviewing Google Scholar (as opposed to just commenting on its features), the debate focuses on two questions: how scholarly are the

returned articles (compared to established fee based services) and "does that scholarliness vary across disciplines?" (Howland, Wright, Boughan & Roberts, 2009, p. 227).

As time was limited for a comprehensive literature review, I selected more than five-dozen relevant articles that represent the wider scope of the on-going Google Scholar debate. Articles were found via these sources: Dialog Classic, Nexis.com, Factiva, Google Scholar (both for original research and for tracking down citations) and Google web search. As the Google Scholar debate is larger than academic circles, I chose to include non-peer reviewed sources.

The beta launch of Google Scholar was fraught with problems as noted most vocally by Jasco (2005, 2006, 2008, 2009). Jasco noted problems with citations both in terms of accuracy and number. Problems with crawling password protected, federated indices and publisher websites resulted in citations for P. Login and Password (Jasco, 2009). Although, the worst of these citation problems have been fixed, they remain a popular point of contention for reviewers.

A remaining problem with citations in Google Scholar is citation count. Meho and Yang (2007) like Jasco (2006), found rampant duplication of citations due in part to the inclusion of "non-scholarly sources (e.g. course reading lists), phantom or false citations ... errors in bibliographic information (e.g. wrong year of publication), as well as the lack of information about document type, document language, document length, and the refereed status of the retrieved citations. (p. 2118).

The lack of transparency in how Google selects its sources for scholarly is the second most cited concern (Donlan & Cooke, 2005; Meho & Yang, 2007; Tenopir, 2005; Vine 2006). For Cathcart and Roberts (2005), the lack of a list of resources or publishers, prevents novice searchers from gaining a "better understanding of the topic," leaving them instead to an

"overwhelmingly complex and unnecessarily time-consuming process." Wleklinski and Ojala (2005) question Google's estimate that Scholar contains "tens of millions" of scholarly items in its index, saying that without a comprehensive list of sources there is no way to gauge how Google "determines scholarly materials" (p. 22).

The Advanced Search form lacks the level of refinement that the federated databases offer — namely controlled vocabulary, ISBN, publisher, geographic or date range (for instance) (Tenopir, 2005). Hawkins (2009) paraphases Stephen Arnold, who calls Google a "disruptive force" for its "content intact, management, assembly, and delivery, as well as monetization and usage tracking" (p. 27). In the recent Scholar redesign (April 2012), Advance Search has been hidden behind a arrow in the simple search box. This change may further hinder the search process for power users and prevent novices from learning more complex search techniques.

Google Scholar offers libraries a way to link their federated databases to Google Scholar. As early as 2005, libraries were taking sides. Those who embraced Google Scholar and provided full linking to staff and students, saw Google as another tool for introducing students to scholarly research (Jacobs, 2012; Poe, 2007). Those who refused to link, wanted to protect the relationship of the library/librarian in the teaching of information literacy and research techniques (Vine, 2006; York, 2005).

Noruzi is among the earliest of enthusiastic reviewers of Google Scholar. He cites the growing need for "multidisciplinary information retrieval accentuated the need for improved retrieval methods" as his primary excitement over Google Scholar. He also predicts that Google Scholar's ability to improve the performance of Open Access research would bring down the prices of academic journals and databases (Norzui, 2005). In May 2012, ProQuest launched a

lower cost service, Udini, to provide access to scholarly research to "'real people'" (Quint, 2012). Udini may well be the first sign of Norzui's prediction coming to fruition.

Other options

Many of Google Scholar reviews and studies attempt to compare Scholar to other established services: Dialog, Lexis/Nexis, Factiva — or subject focused databases such as EcoLit, Pubmed, Historical Abstracts, and so forth. The majority of these comparisons are done not by librarians, but by subject experts — researchers or academic faculty. The interest in Scholar is therefore skewed towards their specific subject of expertise and their other research methods.

Kirkwood and Kirkwood did a number of subject comparisons of Google Scholar against the established, favorite tools of different disciplines. For the purpose of this paper, I looked at three of their 2011 studies. These three focus on EconLit (Kirkwood & Kirkwood 2011a), Historical Abstracts (Kirkwood & Kirkwood 2011b) and BIOSIS (Kirkwood & Kirkwood 2011c). As Kirkwood and Kirkwood used the same method for each of their studies — finding subject experts to help them formulate both expert and novice subject searches for both services — their results show that Google Scholar's ability to perform as well or better than the for fee services varies across disciplines. Librarians and faculty, therefore, should be aware of the potential shortfalls of Google Scholar by subject and include that in any information literacy training they do.

Howland, *et. al.,* (2009) worked with librarians to create a rubric of questions to test Google Scholar's performance against subscription based databases. The rubric included sample

student questions, a structured query and a list of the databases to test. The results were then graded against six criteria to gauge the scholarliness: accuracy, authority, objectivity, currency, coverage and relevancy. Google Scholar performed higher across the board against the fee based databases.

Chen (2010) reported similar positive results for Google Scholar's coverage of *known* scholarly materials. The test used four hundred articles chosen at random from eight databases. They were then searched for in Google Scholar. Only two articles were not found. While Chen's test doesn't show how Google Scholar's interface compares in terms of constructing simple or complex searches to its subscription based counterparts, it does demonstrate that its coverage of articles is of similar depth and breadth.

Since Google Scholar's launch, librarians have expressed concern that students will bypass the federated databases, and find one more excuse to not seek help from the library or librarians. While they are for scholarly research over the basic search engine approach, they continue to worry about the accuracy and scholarliness of Google Scholar's results. Creagh's (2011) main concern for Google Scholar is that it will further encourage college students to treat all searches like a keyword search and further expand the divide between students and librarians.

Librarians who do connect their database subscriptions to Google Scholar, cite Scholar's friendly, expected user interface as an opportunity to help students "'evaluate the information they find and using it ethically' (Sophie McDonald, Information Services Librarian at University of Technology Sydney) (Creagh, 2011).

The on-going debate over Google Scholar is "how good is good enough." As a relatively new service — and as one that is offered free of charge — Google Scholar receives more

scrutiny than the for-fee alternatives. Le (2008) wondered at what point will Google Scholar have proved itself as being "'there yet.'" Four years later, that question hasn't been answered, though there does seem to be a reluctant acknowledgment that none of the other services are "there yet" either. In other words, all methods of computer-based search are somehow flawed. Information literacy training should, therefore, include not only a wide array of available tools but also tips on how to recognize and work with their inherent flaws.

Current Performance

Google Scholar functions best at finding recent articles, especially those posted on the internet — a growing trend as Jones (2005) notes. For older — pre-2000s articles — Scholar mostly finds citations and not the actual articles. That said, Scholar's ranking algorithm tends to favor articles published in the last two years, versus those currently published. For pre 2000 articles where only a citation exists, a researcher will have to either find the article through their library's subscriptions, in the actual library or possibly in Google Books if the print journal has been scanned. Coverage of different fields of study ranges anywhere from 70% up to 100% (Lewandowski, 2010).

While numerous articles suggest that college students are turning first to Google Scholar (Amjadali, 2012; Baudino, Johnson & Jenkins, 2005; Breeding, 2005; Cathcart & Roberts, 2005; Creagh, 2011, Devine & Egger-Sider, 2004, Donlan & Cooke, 2005), the literature shows that usage is actually highest among college faculty (Baldwin, 2009; Bauer & Bakkalbasi, 2005; Beel & Gipp, 2010; Howland, Wright, Boughan & Roberts, 2009; Mr. Zero, 2102). Tenure is in part dependent on one's published and cited articles. Other citation services don't include books or

book chapters in their calculations (Uggen, 2011), giving Google Scholar an advantage for researchers who primarily publish in book form.

Since 2011, Google Scholar has offered a profile page for authors to track their citations (Connor, 2011), and automated alerts that can be tracked either through email. In fact, email alerts can be set up for any citation profile page, as Google demonstrates with the Richard Feynman page (Google, n.d.). Though flawed in how it counts citations (especially when there are articles with more than one version available online), Google Scholar is "a worthwhile alternative source of citation data" (Harzing and van der Wal, 2009).

While Google Scholar's performance and coverage has improved considerably from the time of its beta launch, it still has some points of vulnerability, especially in how it counts and tracks citations. Dougan (2010) notes that Scholar places the most heavily cited articles at the top of its search results, thereby hiding the most recently published articles — even if they are written by a well cited author. A quick search of authors who have published articles within the last two years, shows that their 2010 articles rank higher (due to citation count) than their 2012 published articles. I ran the test looking for articles by I. Sammis, G. Sammis and C. G. Sammis — an applied mathematics PhD, an organic chemistry PhD and a geophysics PhD respectively. In each case their older works (and thus, most cited) ranked highest. To find their latest articles, I had to use Scholar's time range to limit the results, as there is no sort results by date option.

As Scholar is a Google product, Beel, Gipp and Wilde (2010) tested to see if the index could be affected through a specialized form of search engine optimization, one they have called academic search engine optimization (ASEO). They define the practice as "the creation,

publication, and modification of scholarly literature in a way that makes it easier for academic search engines to both crawl it and index it" (p. 176).

The original article by Beel, Gipp and Wilde outlined thirteen ways an article could be tailored to catch Google Scholar's attention during the crawling process. While these tips were presented to help authors have their work found and cited properly, the response from academic circles was one of concern, citing the possibility the that their techniques could be used to clog up Google Scholar with academic spam to artificially boost citation counts, and thus an author's h-index (Rochking, 2010; Humble, 2011; Kenny, 2011; Norman, 2012).

Beel (2010) followed up on the original ASEO suggestions to test the viability of creating false references through those techniques. He created false articles that were slightly modified from the original peer-reviewed articles and gave them new titles. Inside these articles he embedded text as invisible keywords that were nonsense strings of characters used to track the indexing of these bogus articles. Beel found that his articles were indexed and concludes that "Google Scholar applies no or only very rudimentary mechanisms to detect and prevent spam" (Beel, 2010, p. 298). Beel includes the strings he used in his test and a search on Google Scholar reveals that the bogus articles are still indexed two years after the original study. For now, at least, it appears Google is relying on academic honesty on the part of the authors, rather than filtering for spam and citation inflation.

Current Usage

Google Scholar's appeal to users stems from its design as a '"blended' resource" (Hartman & Mullen, 2008). It offers web-based scholarly search, citation analysis (though still somewhat flawed), an access point to Open Access materials, as well as another method to search

subscription based databases and other commercial federated search products depending on what academic affiliations the user has. By connecting to the library subscriptions to Google Scholar, libraries are able to offer the simplicity "which users expect" while offering them the scholarly content "which users need" (Luther & Kelly, 2011, p. 166). Liu and Cabrera (2008) also praise Google Scholar's wide range of scholarly access, especially it's ability to find pre- and post-print articles, conference presentations and other educational e-repositories. While greater and wider information sounds good, the larger number of results can also mean more work in vetting the results on the part of the researcher.

As Google Scholar includes multi-language support, something that most of the aggregators and subscription based databases don't, the service is gaining usage outside of the United States. There is a developing trend in the Google Scholar research to compare the service against local, non-English federated or open source databases (Dinakaran, 2012). Google Scholar's performance in other languages, though, is beyond the scope of this paper.

Among all the reviews and discussions of Google Scholars *scholarliness*, there is a lack of actual user testing studies. I found two papers reporting the results user testing. Hightower and Caldewell (2010) at the University of California, Santa Cruz, found a fairly wide adoption rate of Google Scholar among faculty and students as a *secondary* source of research among their medical and science disciplines. A study of 3,000 faculty done by Walters (2011) found Google and Google Scholar were the third most popular resource for scholarly research after electronic databases and following citations from journal articles.

From my discussions with Google Scholar users, the inconsistent coverage is a major reason why Scholar is used primarily to find specific articles, rather than as a starting point for

research. I posted a question to my friends who are in academia (a mix of sciences and library and information science, both as faculty and as students) on Twitter and Facebook. I asked "Do you use Google Scholar?" Among the dozen responses, most popular answer was, "What is Google Scholar" followed "Never heard of it." The third response was "Never." The last response from only two, one a librarian and one a biologist, was "only for secondary research." This survey was an impromptu one, piqued by my curiosity on the lack of Google Scholar user studies. If I were to readdress the impact of Google Scholar on scholarly research, I would try to conduct a user study that included a wide range of universities and academic settings. That level of research though is beyond the scope of this paper.

Conclusion

"Just Google it," is an expression that sums up everything that's troublesome about Google's dominance in search engine services. While Google Scholar has improved significantly in the depth and breadth of its coverage of scholarly materials, librarians and faculty need to be diligent about teaching scholarly research methods. Kazan's blunt "It's not Google's fault if users create stupid queries," (2010) suggests that Google Scholar is gaining acceptance as another tool to be taught in information literacy training. Google Scholar training, though, should also include methods for gauging the search results (Luther & Kelly, 2011) the service produces as well as how to use it in conjunction with federated databases, library books, and print references.

As Open Access indexing of scholarly work continues to gain in popularity (Koskinen, Lappalainen, Liimatainen, Nevalainen, Niskala & Salminen, 2010), Google Scholar is positioned to be the starting point for finding articles, especially among the growing number of discipline specific open indexing sites (Jones, 2005). In Google Scholar's early years, Yahoo! and

Microsoft both offered competing scholarly indexing and search services. Quint (2004) suggested that Google Scholar would inspire further and aggressive competition — especially from Yahoo (as Bing wasn't on the market yet). The opposite happened with the closure of Microsoft's service. If Yahoo still offers scholarly content through it's Content Acquisition Program, it is more buried than Google Scholar. I could find no way of accessing it or testing it.

In testing the Google Scholar and using it in conjunction with other scholarly aggregators and databases, I suspect the next wave of competition will come from the well established services — especially as they move towards adopting web standard UIs and web based search options. These established services need to compete if they wish to have a say on how the entry of Google Scholar changes the nature of computer based scholarly research (Timpson & Sansom, 2011). The first for free service to directly compete with Google Scholar is ProQuest with the introduction of Udini (Quint 2012). How well Udini will compete with Scholar or what niche it will fill is yet to be determined. Outside of these for-fee services, I see the early adopter, the OCLC and it's WorldCat database being the next big source of competition to Google Scholar.

References

Amjadali, S. (2012) More than just a search engine. Stuff.co.nz [website] http://www.stuff.co.nz/technology/digital-living/6621648/More-than-just-a-search-engine (Accessed April 2012)

Beel, J. (2010) On the robustness of Google Scholar against spam. *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia*. Toronto, CA: ACM. 297-298

Beel, J. and Gipp, B. (2010) Academic search engine spam and Google Scholar's resilience against it. *Journal of Electronic Publishing 13*(3) http://dx.doi.org/10.3998/3336451.0013.305

Beel, J., Gipp, B. and Wilde, E. (2010) Academic search engine optimization (ASEO): Optimizing scholarly literature for Google Scholar & co. *Journal of Scholarly Publishing 41*(2) 176-190. 10.3138/jsp.41.2.176.

Callicott, B. and Vaughn, D. (2005) Google Scholar vs. Library Scholar: Testing the performance of Schoogle. *Internet Reference Service Quarterly 10*(3/4) 71-88

Cathcart, R. and Roberts, A. (2005) Evaluating Google Scholar as a tool for information literacy. *Internet Reference Services Quarterly 10*(3/4) 167-176. doi:10.1300/J136v10n03_15

Chanen, J. S. (2010). Wired! Innovation. Competition. Lower-cost alternatives. The battle for your legal research dollars heats up. *ABA Journal 96*(34)

Connor, J. (2011) Google Scholar citations open to all. Google Scholar Blog [website]. http://googlescholar.blogspot.com/2011/11/google-scholar-citations-open-to-all.html (Accessed April 2012)

Creagh, S. (2011) US studies Google has changed the way students research — and not for the better. *The Conversation* (28 August) https://theconversation.edu.au/us-study-shows-

google-has-changed-the-way-students-research-and-not-for-the-better-3087 (Accessed April 2012)

Devine, J. and Egger-Sider, F. (2004). Beyond Google: The invisible web in the academic library. *The Journal of Academic Librarianship 30*(4) p. 265-9

Dinakaran, R. (2012) Of Google and scholarly search. *The Hindu*. http://www.thehindu.com/sci-tech/internet/article2985394.ece (Accessed April 2012)

Donlan, R. and Cooke, R. (2005). Running with the devil: Accessing library-licensed full text holdings through Google Scholar. *Internet Reference Services Quarterly 10*(3/4). 149-157. doi:10.1300/J136v10n03_13

Dougan, K. (2010) Music to our eyes: Google Books, Google Scholar and the Open Content Alliance. *Portal: Libraries and the Academy 10*(1). Baltimore, MD: The Johns Hopkins University Press. p. 75-93.

Google (n.d.) Richard Feynman — Google Scholar. [webpage]. http://scholar.google.com/scholar?q=richard+feynman&hl=en (Accessed May 2012).

Google (2012). Google Scholar: Top publications in English. [website]. http://scholar.google.com/citations?view_op=top_venues (Accessed April 2012).

Hartman, K. A. and Mullen, L. B. (2008) *New Library World, 109*(5), 211-222. doi:10.1108/03074800810873560

Harzing, A.W. and van der Wal, R. (2009) A Google Scholar h-index for journals: An alternative metric to measure journal impact on economics and business. *Journal of the American Society for Information Science and Techology 60*(1) 41-46. DOI: 10.1002/asi.20953

Hawkins, D. T. (2009) Google meets publishers and librarians. *Information Today 26*(8) 27-9

Hightower, C., and Caldwell, C. (2010). Shifting sands: Science researchers on Google scholar, Web of Science, and PubMed, with implications for library collections budgets. *Issues in Science and Technology Librarianship 63*. http://www.istl.org/10-fall/refereed3.html (Google Scholar)

Howland, J. L., Wright, T. C., Boughan, R. A. and Roberts, B.C. (2009) How scholarly is Google Scholar? A comparison to library databases. *College & Research Libraries 70*(3). 227-234.

Humble, L. Google Scholar: A critical review. *Pub802: Technology and Evolving Forms of Publishing*. [website] http://tkbr.ccsp.sfu.ca/pub802/zarchive/papers2011/round-3/google-scholar/ (Accessed April 2012)

Jacobs, A. (2012) Google-trained minds can't deal with terrible research database UI. *The Atlantic*. http://www.theatlantic.com/technology/archive/2012/02/google-trained-minds-cant-deal-with-terrible-research-database-ui/ (Accessed April 2012)

Jasco, P. (2005) Google Scholar: the pros and cons. *Online Information Review 29*(2) 208-214.

Jasco, P. (2006) Deflated, inflated and phantom citation counts. *Online Information Review 30(*3) 297-309.

Jasco, P. (2008) Google Scholar revisited. *Online Information Review 32(*1) 102-114.

Jasco, P. (2009). Google Scholar's ghost authors, lost authors and other problems. [Newsire Analysis] *Library Journal 134*(18) http://www.libraryjournal.com/article/CA6698580.html (Accessed April 2012)

Jones, D. Y. (2005) Biology article retrieval from various databases: Making good choices with limited resources. *Issues in Science and Technology Librarianship*. http://www.istl.org/05-fall/refereed.html (Accessed April 2012)

Kazan, C. (2010). Does Google make us smarter? The world says resoundingly, "Yes" (See why below). *The Daily Galaxy* [website] http://www.dailygalaxy.com/my_weblog/2010/02/-does-google-make-us-smarter-new-research-says-yes.html (Accessed April 2012)

Kenny, L. (2011). Get your work noticed: How authors can help readers to find annals papers online. *The Annals of Occupational Hygiene 55*(6). p. 563-564

Kirkwood, Hal P. Jr, & Kirkwood, M. C. (2011a). EconLit and Google Scholar go head-to-head. *Online, 35*(2), 38

Kirkwood, Hal P. Jr, & Kirkwood, M. C. (2011b). Historical research: Historical abstracts with full text or google scholar. *Online, 35*(4), 28-32.

Kirkwood, Hal P. Jr, & Kirkwood, M. C. (2011c). Researching the life sciences: BIOSIS previews and google scholar. *Online, 35*(3), 24-28.

Koskinen, K., Lappalainen, A., Liimatainen, T., Nevalainen, E., Niskala, A. and Salminen, P. J. (2010). The Current state of open access to research articles from the University of Helsinki. *ScieCom Info 6*(4)

Kovalchik, S. (2012) Google starts ranking journals. *Significance Magazine*. http://www.significancemagazine.org/details/webexclusive/1788885/Google-starts-ranking-journals.html (Accessed April 2012)

Le, M.L. (2008) Google Scholar: an outcast in the library world. *Libraries and Publishing 3.0 1*(October) 39-44. http://hdl.handle.net/10388/357 (Accessed April 2012)

Liu, M. and Cabrera, P. (2008). The New generation of citation indexing in the age of digital libraries. *Policy Futures in Education 6*(1). http://dx.doi.org/10.2304/pfie.2008.6.1.77

Luther, J. and Kelly, M. C. (2011) The Next generation of discovery; the stage is set for a simpler search for users, but choosing a product is much more complex. *Library Journal 136*(5).

Madgrigal, A. (2012). 20 services Google thinks are more important than Google Scholar. *The Atlantic*. http://www.theatlantic.com/technology/archive/2012/04/20-services-google-thinks-are-more-important-than-google-scholar/ (Accessed April 2012)

Meho, L. I. and Yang, K. (2007) Impact of data sources on citation counts and rankings of LIS faculty: Web of Science versus Scopus and Google Scholar. *Journal of the American Society for Information Science and Technology 58*(13). p. 2105-25

Mr. Zero (2012) "G"STOR? The Philosophy Smoker. [Blog] http://philosophysmoker.blogspot.com/2012/03/gstor.html (Accessed April 2012)

Norman, E. R. (2012) Maximizing journal article citation online: Readers, robots and research visibility. *Politics & Policy 40*(1) DOI: 10.1111/j.1747-1346.2011.00342.x

Noruzi, A. (2005) Google Scholar: The new generation of citation indexes. *Libri* 55 p. 170-180

Poe, J. W. (2007). A comparison of Articlefinder and Google Scholar: How well do they work for the distance student? *Journal of Library & Information Services in Distance Learning 2*(4) 98-102.

Quint, B. (2004) Google Scholar focuses on research-quality content. [News Breaks] *Information Today, Inc*. http://newsbreaks.infotoday.com/nbreader.asp?ArticleID=16324 (Accessed April 2012)

Quint, B. (2008) Changes at Google Scholar: A conversation with Anurag Acharya. *Journal of Library Administration 47*(1/2) doi:10.t080/01930820802110910

Quint, B. (2012) ProQuest for everyone: The Udini service officially launches. *Info Today*. http://newsbreaks.infotoday.com/NewsBreaks/ProQuest-for-Everyone-The-Udini-Service-Officially-Launches-82448.asp (Accessed May 2012)

Rochkind, J. (2010). Spamming Google Scholar, artificially inflating link counts. Bibliographic Wilderness. [blog] http://bibwild.wordpress.com/2010/12/30/spamming-google-scholar-artificially-inflating-link-counts/ (Accessed April 2012)

Suzuki, H. (2012) Google Scholar metrics for publications. *Google Scholar Blog*. [website]. http://googlescholar.blogspot.com/2012/04/google-scholar-metrics-for-publications.html (Accessed April 2012)

Tenopir, C. (2005) *Google in the academic library 130*(2). [Online Databases] p. 32. http://www.libraryjournal.com/article/CA498868.html (Accessed April 2012)

Timpson, H. and Sansom, G. (2011) A student perspective on e-resource discovery: Has the Google factor changed publisher platform searching forever? *Serials Librarian 61*(2) 253

Tsai, D. and Minick, C. (2009) Google Scholar: A new way to search for cases and related legal publications. LLRX. [Website] http://www.llrx.com/features/googlescholar.htm (Accessed April 2012)

Uggen, C. (2011) Google Scholar and high-impact publication. Chris Uggen's Blog [blog] http://chrisuggen.blogspot.com/2011/11/google-scholar-and-high-impact.html (Accessed April 2012)

Van Orsdel, L. C. and Born, K. (2006) Journals in the time of Google. *Library Journal*. http://www.libraryjournal.com/article/CA6321722.html (Accessed March 2012)

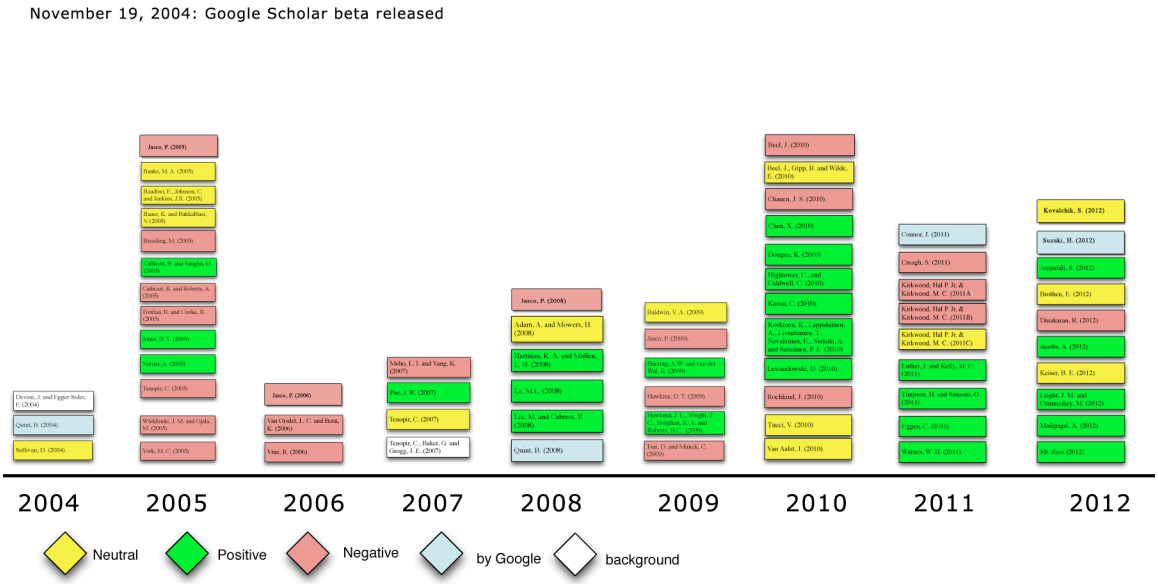
Vine, R. (2006) Google Scholar. [Review]. *Journal of the Medical Library Association 94*(1). p. 97-99. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1324783/ (Accessed April 2012)

Walters, W. H. (2011) Comparative recall and precision of simple and expert searches in Google Scholar and eight other databases. *Portal: Libraries and the Academy 11*(4). Baltimore, MD: The John Hopkins University Press. p. 971-1006

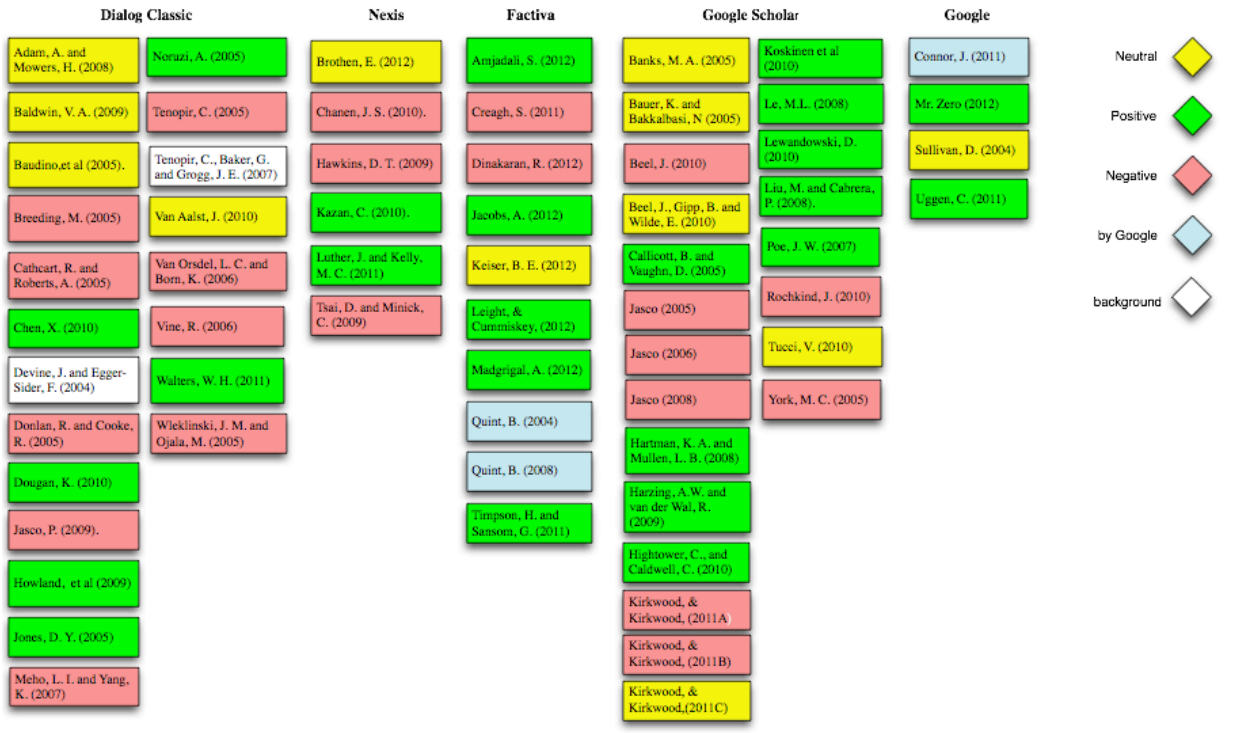
Wleklinski, J. M. and Ojala, M. (2005). Studying Google Scholar: Wall to wall coverage? *Online 23*(2).

York, M. C. (2005). Calling the scholars home: Google Scholar as a tool for rediscovering the academic library. *Internet Reference Services Quarterly 10*(3/4). 117-133. doi:10.1300/J136v10n03_11

Appendix 1: Cross section of the types of reviews of Google Scholar



Appendix 2: Sources of the references cited



Three quarters of my references come from Dialog Classic and Google Scholar. Dialog Classic was my primary reference source, with Google Scholar (linked to my San Jose State library account) serving as my method to track down citations. Nexis provided some news articles about the state of Google Scholar over the years. Factiva, though, helped me track down some crucial development information, thanks in part to two interviews conducted by Barbara Quint. Finally, I do have four references — blog posts — found via web search through Google.com.