Google Scholar and Academic Libraries: An Update

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Abstract

Purpose -This paper updates the authors' original 2005 study of Google Scholar's integration into ARL libraries web sites. Had more ARL libraries added Google Scholar?

Design/methodology/approach – The library homepages of the 113 ARL academic institutions were examined for paths or links to Google Scholar. The coding scheme focused on noting if Google Scholar appeared on the library homepage, in the OPAC, and on various database lists and subject guides.

Findings – The 2007 data indicate continued acceptance of Google Scholar and integration of this resource on the web pages of ARL libraries. The mean number of paths to Google Scholar more than doubled from 2005 to 2007. Partnering institutions were more likely to include paths to Google Scholar and the number of partnering institutions dramatically increased.

Practical implications – This study is useful for those making decisions about integration of Google Scholar into library collections and services, particularly the web site.

Orginality/value – This paper illustrates future directions for integrating new categories of resources into the academic library web site.

Keywords – Google Scholar, Library web site, federated search, scholarly search engine, Windows Live Academic Search

Paper type – Research paper

Introduction

When Google Scholar appeared on the scene in November 2004, many librarians quickly moved to evaluate and analyze its usefulness and potential value as an addition to current resources. Academic libraries began wrestling with what to do with this new free Google product, and wondered whether it should be fully integrated into collections and services through representation on the library web site. Google Scholar can be labeled a "blended" resource because it does not easily fit into a single resource category in today's research library. It can function as a web-based scholarly search engine, a citation analysis tool, a portal to open access materials on the open web and in repositories, a connection to library journal subscriptions as well as book collections, and an adequate alternative in some cases to native subscribed databases or commercial federated search products.

In the early days of Google Scholar, librarians discussed whether it should be added to alphabetical lists of indexes and databases, lists of citation analysis resources, library catalogs, and subject research guides. The price was right, but ironically Google Scholar's free status meant that librarians might not have any leverage in the development of the product. The Google name was already ubiquitous and easily recognizable to students, teaching faculty, and librarians alike. Google Scholar was able to provide a familiar starting place to researchers, and became even more valuable by its ability to connect affiliated library users to available subscribed content through use of local link resolvers.

The authors were members of committees charged with making decisions about whether to add Google Scholar to the collections and services of the Rutgers University Libraries. Once a decision to add Google Scholar was reached at Rutgers University Libraries, the knowledge base of subscribed journals was shared with Google, and the resource was fully integrated into the lists of indexes and

databases, subject research guides, and other relevant areas of the library web site. When Google Scholar had been available for less than a year, the authors studied whether other university members of the Association of Research Libraries (ARL) had decided on a similar level of integration for the resource. At the time, this was relatively unexplored territory, treating a free internet resource such as Google Scholar in a similar way to a subscription resource. Since many librarians had been trying to dissuade students from starting with Google, the authors were not sure that many ARL libraries would offer Google Scholar a prominent position on the library web site, particularly the homepage. The authors undertook a study of the 113 ARL academic libraries to ascertain what decisions others had reached, and the results and analysis were published in the March 2006 issue of *College and Research Libraries*. As expected, only six libraries (5%) placed a link to Google Scholar directly on the library homepage. Other potential paths to Google Scholar were similarly underutilized. For example, only twenty-seven of the 113 ARL institutions (24%) included Google Scholar on their alphabetical list of indexes and databases, the resource appeared on subject guides at only fourteen institutions, and inclusion of Google Scholar in the OPAC occurred at just six libraries. Overall, in the summer of 2005 the majority of academic ARL libraries had not incorporated this resource into their web sites (Mullen and Hartman, 2006).

In the two years since the original study, libraries have turned more often to free web or open source solutions for all kinds of applications. From open source integrated library systems such as "Evergreen," to the Zotero citation management tool that is rapidly gaining favor with academics, free web resources seem to be an acceptable and enticing solution for today's academic libraries. Along with Google Scholar, other Google products such as Google Books and YouTube have become accepted in many libraries, not as peripheral, but as extensions of the collections and services. Noticing the ubiquitous presence of Google products in society and in libraries, Siva Vaidhyanathan has recently

started a blog entitled "The Googlization of Everything," and the word "Google" has been added as a verb to the vernacular lexicon [1].

Has Google Scholar changed in the past two years?

Some things have not changed about Google Scholar. It is still a product in beta, will not divulge the sources that it covers or the publishers it partners with, and includes some decidedly non-scholarly content. Google Scholar is not updated on a consistent basis and does not allow Boolean searching. Its algorithms, which include "citedness" as a relevance ranking factor, are not published. Librarians question the lack of controlled vocabulary, the lack of authority files for author names or journal titles, and the lack of a method to restrict results to links that will return full text only. More shortcomings include no capability to sort results in ways other than what's presented, and no satisfactory way to save or export citations to all of the citation managers that students and faculty are now using (Walters, 2007). Google Scholar's terms of service are still problematic, and although librarians are welcomed in the discussion, they are still not part of the development of the product. It may be difficult for users to determine how "scholarly" the search results really are.

On the positive side, users have discovered Google Scholar and flocked to it. Libraries that are able to report use, such as numbers of users coming to link resolvers through the proxy, can see high levels of activity. At the authors' institution, Rutgers University, a brief look at usage coming through the proxy from remote authenticated affiliates, shows robust and continuously growing use of the product [2]. Many people have a comfort level with Google searching that extends to a willingness to use any of their many products. Google Scholar searches for terms from the full text of scholarly sources, not just abstracts or titles, and so provides a high level of discoverability for many interdisciplinary topics. Pomerantz, in his article, "Google Scholar and 100 Percent Availability of Information," discusses two ways that this maximum access can be realized; by lowering real or

perceived barriers, and by making information available when the user needs it. Google Scholar is one resource in the researcher's tool kit that attempts to both cover the variety of scholarly content, and provide easy access to electronic information at the user's convenience. Users coming to Google Scholar from ARL institutions, even from the comfort of their homes, have especially good fortune due to seamless linking to subscribed content (Pomerantz, 2006).

As for the publisher partner program, more scholarly, commercial, and open access publishers have come on board. Publishers, such as Elsevier, who had not exposed their content to Google Scholar at the time the first study was conducted, have since brought a tremendously enhanced level of linked content to the search capability. Publishers recognize that use of their products will increase as more means of web discovery are provided. Prospective authors may begin to insist that publishers make their articles widely available to search engines in order to aid discovery by a wider audience, thereby potentially increasing research impact. Reticent publishers will lose out on important segments of the community of scientific searchers if they don't partner with the industry giants, even though they may fear risks to proprietary content through this type of collaboration.

Updated Literature Review

The articles published since the authors' original literature review have not shown any unexpected or surprising results about any aspect of Google Scholar. Librarians continue to follow enhancements to the product's usability, content, citation analysis possibilities, and capability as a comprehensive one-stop search across the whole corpus of subscribed journal literature, as well as the free open access scholarly literature available through the web.

The literature on library web site issues remains focused on usability studies, rather than on the decision making aspects of adding databases, indexes, or other resources to web lists or research guides. One study by Dinkelman and Stacy-Bates describes the decision making process that ARL

librarians face when adding certain categories of electronic resources, specifically electronic books to web sites (Dinkelman and Stacy-Bates, 2007). This is another emerging group of resources, in some ways similar to Google Scholar in defying easy categorization on library web sites. Dinkelman and Stacy-Bates describe two difficulties in dealing with new types of resources on the web site; the fact that resources must be placed in a category that is a natural "fit," easily understood by the searcher, and that the resource must never be too many clicks away from the homepage. Google Scholar shares these issues with other "fuzzy" categories of resources, and it is difficult to know where the user might expect to find it on the web site. It defies description in some ways, crossing boundaries of distinct categories of electronic resources.

Detlor and Lewis' article on the current practice and future directions of the library web site makes specific suggestions to enhance and make more robust the design and content of the site to attract faculty and students in the ways that Google does (Detlor and Lewis, 2006). Detlor and Lewis advocate that by "embedding library resources and services directly into the scholarly work process, library Web sites can give academic libraries the leverage and ammunition they need to outperform competitor Web sites and regain the loyalty of students, teachers, and researchers alike." Clearly, as ARL libraries move forward, the library web site must take center stage as a tool for enticing all members of the academic community. Usage statistics and other methods of assessment will be increasingly demanded by administrators to justify funding of library collections at current or increased levels, and the web site will have to draw users to the resources. This is especially true as in-person library visits and reference encounters continue to decline in ARL libraries (Kyrillidou and Young, 2006). One recommendation of many that Detlor and Lewis make is that ARL library web sites should focus on the information seeking activities of library users rather than the typical administrative "about the library" content that is the focus of many sites. It is advocated that Google Scholar be combined

with other search facilities into one integrated search tool (Detlor and Lewis, 2006). However, it is not known whether Google Scholar is indeed "federatable" into typical commercial library federated search products**.** As resources are integrated for optimal visibility and successful use, librarians that work to make decisions about positioning resources on the library web site, or including them at all, will drive use of the library's electronic collections. Effective library web sites will decrease frustration of library users, and become the default starting point for all researchers seeking scholarly literature.

Google Scholar has also been the focus of numerous articles on citation analysis, and many researchers are interested in web visibility as a way of increasing research impact. Any tool that provides "cited by" references, and that can provide information to researchers about who is citing their work will gather many devotees, even if the algorithms are automatic, and the content searched a mixed bag. Since the original study, many new scholarly metrics have emerged, and indices such as h-index, g-index, and eigenfactor are now dotting the landscape of citation analysis. Harzing's "Publish or Perish," a popular web-based citation analysis metric has been developed, and is based on Google Scholar results [3]. "Publish or Perish" has gained traction among the many who are seeking alternatives to subscription citation products. Newer fields focused on citation analytics, such as informetrics or scientometrics have brought the discussion of alternatives to various forums on the web. Google Scholar has gained popularity as a free and effective alternative to Web of Science and Scopus, the more traditional subscription citation analysis tools found in most academic libraries. It remains to be seen whether the inconsistent results seen in Google Scholar's "cited by" listings will become more acceptable to promotion and tenure committees, and whether Google will make this aspect of searching a priority for future development. This feature certainly enhances the potential value of Google Scholar to researchers, especially to those faculty seeking promotion and tenure, or others seeking to quantify their research impact.

Recent studies have directly compared search results between Google Scholar and Web of Science. Schroeder points out Google Scholar's added value in its coverage of all of the material that is not covered in Web of Science, even though that scholarly content is of importance to many fields. This material includes conference proceedings, books, preprints, material in institutional repositories, and open access resources. Schroeder gives an overview of ten studies completed between 2005 and 2007 that directly compared Google Scholar's citation analysis to results found in Web of Science. For the ten studies, positive and negative attributes of each search engine are detailed. Schroeder makes the point that reference and instruction librarians must understand the similarities and differences between citation products in order to appropriately suggest resources for patrons in this changing environment. Two of the differences that Schroeder emphasizes are that while Web of Science utilizes superior indexing, Google Scholar is attractive to novice users of databases, and is useful for libraries that do not subscribe to Web of Science (Schroeder, 2007). Another citation analysis study of more than 10,000 citing documents by Meho and Yang points out the very complementary results between Google Scholar, Scopus, and Web of Science. For the library and information science subjects areas, Meho and Yang found that using all three of these different citation resources produces a more accurate and comprehensive picture of impact (Meho and Yang, 2007).

The literature focusing on Google Scholar's ability to link the searcher to high quality scholarly content has focused on studies of efficacy of the search engine to return at least “good enough” results in comparison to subject indexes and databases. As for newer studies comparing content of Google Scholar to that of subscription and other free subject databases, Neuhaus, Neuhaus, Asher and Wrede completed a comparative content analysis of forty-seven online databases and Google Scholar in November 2006. In the study of twenty-one free internet databases and twenty-six restricted access databases, Neuhaus, et al. found that content covered by Google Scholar varies greatly from database to

database and discipline to discipline. Content strengths were greatest for Google Scholar in science and medicine databases, open access databases, and weaker in social sciences and humanities (Neuhaus, Neuhaus, Asher and Wrede, 2006). Of course, Google Scholar plans to continue on its projected development path, which includes the crawling of more scholarly content, adding more publishers as partners, and increasing international content [4].

Recently, there have been many studies that focus on the amount and quality of content that can be accessed through Google Scholar. Christianson's study "Ecology Articles in Google Scholar: Levels of Access to Articles in Core Journals" studied 840 articles from core ecology journals to determine level and completeness of indexing and access, both from on and off campus. Christianson found that 57% of test articles had full citations, and 77% had some type of citation. Christianson noted that older articles were less likely to be included, and that highly cited articles were more often represented in Google Scholar (Christianson, 2007). Walter's paper comparing Google Scholar for coverage and efficacy to seven other subscription subject databases focusing on the multidisciplinary subject area "later life migration" during a ten year time span provides a good example of the scrutiny that Google Scholar has come under from librarians when doing comparisons for content against subject databases. In the Walters article, Google Scholar compares very favorably in indexing "the greatest number of core articles." However, some incomplete citations are returned (Walters, 2007).

Since Google Scholar's debut in November 2004, librarians have subjected the search engine to many evaluations of its content, appropriateness and relevance for inclusion in academic libraries, and even level of functionality in search itself. Robinson and Wusteman carried out a small-scale quantitative evaluation of Google Scholar's capability as a search engine. Google Scholar was compared with the search engines Ask.com, Yahoo!, and Google to measure ability to retrieve scholarly information. The search engines were evaluated based on specific measures of precision,

result ranking, relative recall, and ability to retrieve top ranked pages. The results of this small-scale study show Google Scholar to be most useful for searching for scientific information in comparison to the literature of other non-scientific disciplines (Robinson and Wusteman, 2006).

Another area of interest to librarians is the potential usefulness of Google Scholar for finding materials in institutional and subject repositories worldwide. Many of these open access materials, along with published conference proceedings, can benefit from more widespread indexing. The open access literature has matured and evolved, and Google Scholar is always mentioned as an effective portal to this vast array of valuable content. With major emphasis, especially in STEM (science, technology, and medicine) fields on open access, Google Scholar may become a major player in the search for these materials. The point has been made that as open access materials proliferate, a need has arisen for an adequate means of searching across OAI compliant repositories, integrating this content with other scholarly materials. Silos are to be avoided, and Google Scholar is able to search across many types of content from open access journals and repositories. Markland's study in part compares Google Scholar to Google for use in searching across institutional repositories for specifically that content. Results show Google Scholar to be the more effective of the two search engines for searching across repository content exclusively, and for showing all versions of an article together in one place. Markland points out the importance of search to open access. Google Scholar may be poised to be the search engine of choice for scholarly open access content, and libraries will want to be cognizant of the type of material existing directly outside the traditional electronic peer-reviewed journal literature to which libraries subscribe (Markland, 2006). Of course, since the authors' last study, the amount of scholarly open access material on the web has greatly increased. Search is of paramount importance for material not covered in traditional indexes and abstracting services.

Given the continued attention to Google Scholar in the literature, and a growing acceptance that

free tools can give libraries more options to serve users, it would certainly be reasonable to expect Google Scholar to now have a greater presence on the web pages of ARL libraries. In March of 2007, the authors replicated a major portion of their original study to document the growth in Google Scholar's representation on library web pages.

Follow-up Study

Methodology

Following Mullen and Hartman (2006), the web sites of the 113 university members of the Association of Research Libraries (ARL) were examined for paths or links to Google Scholar. As was the case in the earlier article, links to Scirus, a similar science-oriented free resource, were also investigated. In both July, 2005, when the original data were collected, and March, 2007, when the follow-up data were collected, the coding scheme focused on the following six questions:

- Does Google Scholar appear anywhere on the library homepage?
- Is Google Scholar represented in the online public access catalog (OPAC)?
- Does Google Scholar appear on the alphabetical list of indexes/databases?
- Does Google Scholar appear on any database list organized by subject (e.g., biology or history databases, etc.)?
- Is Google Scholar listed on any subject research guides?
- Is Google Scholar listed on a web page of search engines/internet search tools?

The last four questions were also asked about Scirus. Additionally, the authors again noted whether each of the 113 university libraries had granted Google Scholar institutional access to its subscription holdings. This information was obtained by searching for each institution by name on the "Scholar Preferences" page. It was hypothesized that the partner institutions would provide more links to Google Scholar.

Results

The data collected in 2007 indicate continued acceptance of Google Scholar and integration of this resource on the web pages of ARL libraries. This is strongly seen in the number of libraries that include Google Scholar on their alphabetical list of indexes and databases. Only twenty-seven of the 113 ARL institutions (24%) listed Google Scholar on the alphabetical list of indexes and databases in 2005, but in 2007 the number increased to seventy-three libraries (68%). Similarly, in 2007, thirty-six of the 113 libraries (32%) included Google Scholar in lists of databases organized by subject, compared to sixteen libraries (14%) in 2005.

Although very few ARL libraries in 2005 placed a link to Google Scholar directly on the library homepage (six or 5%), the number doubled to twelve (11%) in 2007. Among these, the Google Search box was used by two of the six libraries in 2005 and by five of the twelve in 2007. Twenty-six of the libraries (23%) had entered Google Scholar in their online catalog in 2007 compared to only six libraries (5%) in 2005.

The inclusion of Google Scholar on subject guides and on web pages devoted to search engines/Internet search tools showed the same pattern over time. Google Scholar appeared on subject guides at only fourteen institutions (12.5%) in 2005, but by 2007, it appeared on subject guides at forty-two institutions (38%). Moreover, in 2007, thirty-five institutions (31%) listed Google Scholar on a web page of search engines/Internet search tools, compared to twenty-two institutions (19.5%) in 2005.

An index was created in both 2005 and 2007 that counted the six paths or links listed above. In 2005, 47% of the ARL institutions had at least one path, but by 2007, 87% of the libraries had at least one path. In theory, the index could range from 0 to 6, however in 2005 the highest score obtained was 4, with a mean of .81. In 2007, the highest score was 5, with a mean of 1.98. Thus, the mean number of paths to Google Scholar more than doubled from 2005 to 2007. This growth over two years is

significant, $t(112) = 11.17$, $p < .001$. The results are illustrated in Figure 1.

****take in Figure 1 ****

Google Scholar through its "Library Links" program gives libraries the opportunity to provide users with seamless access to subscribed resources, and for the original study and this follow-up, the authors noted whether each of the 113 university libraries had granted Google Scholar institutional access to its holdings. It was expected that more paths to Google Scholar would be found at those universities that had provided the access. In 2005 only forty-three of the 113 university libraries were partners and, counter to the hypothesis, there was no significant association between being a partner and the number of links to Google Scholar. However, in 2007 the number of partners more than doubled to ninety-three, well more than half of the academic ARL institutions, and unlike 2005 there now is a significant association between partner status and number of paths to Google Scholar. Partnering institutions provided an average of 2.09 paths compared to 1.5 paths provided by non-partnering institutions. This difference is statistically significant, $t(111) = 1.90$, $p < .03$, one-tailed.

The association between those libraries that included Scirus, another free scholarly search engine, and those that provided links to Google Scholar was also examined. It was hypothesized that libraries which provided links to Google Scholar would also provide links to Scirus. Figure 2 depicts the percentage of ARL libraries in 2005 and 2007 that included Scirus and Google Scholar on the alphabetical list of databases, on lists of databases organized by subject, on subject guides, and on search engine guides/internet search tools pages. In 2005 Scirus was noticeably less visible than Google Scholar on the library web sites. However, those libraries that included Scirus as a research tool on their web sites were significantly more likely to provide links to Google Scholar. As seen in Figure 2, the same pattern of results occurs in 2007; Scirus is still less visible than Google Scholar, but once again, in every case there was a statistically significant relationship between those institutions that

provide links to Google Scholar and those that provide links to Scirus, tau b ranging from .12 to .52. ****take in Figure 2****

Discussion

In 2007, the presence of Google Scholar on ARL academic libraries web pages is clearly more pervasive than seen two years ago. Partnering institutions are particularly likely to include paths to Google Scholar and the number of partnering institutions has dramatically increased. Alongside this trend, libraries have also seen the emergence of commercial federated search products as well as free competitor search engines.

Libraries have subscribed to available commercial federated search products such as Ex Libris' "Metalib" or Serials Solutions' "360 Search" in an attempt to provide a one-box "place to start" for scholarly search from the library web site. In a cursory look at the 113 library web sites at the time of this follow-up study, Metalib was the most commonly implemented federated search product. Interestingly, in this survey of web sites approximately half of ARL libraries did not appear to be utilizing a commercial federated search product. Is it possible that libraries have decided that Google Scholar is effective enough as a "place to start" when users are confounded about which database to choose from the long lists on the web site? Haya, Nygren and Widmark's study of 32 undergraduates' use, with and without prior instruction, of both Google Scholar and Metalib at Uppsala University showed that Google Scholar "performed better in almost all measures." Many students found Metalib's complexity of use a problem (Haya, Nygren and Widmark, 2007). It would be valuable to see expanded usability studies comparing Google Scholar to commercial federated search products to see whether Google Scholar could suffice for institutions where subscribed content is able to provide enough full text articles to searchers. Both Google Scholar and commercial federated search products, although different types of products, have value as a more simple "place to start" for inexperienced

searchers, or for those looking for a few scholarly articles on interdisciplinary topics.

Microsoft's new scholarly search engine, Windows Live Academic Search (WLAS) has emerged since the authors' last study, and although initially focused on the fields of computer science, electrical engineering and physics, will provide competition for Google Scholar. A cursory look at ARL library web sites at the time of the updated study shows very little integration of WLAS into these academic libraries. The question remains as to whether libraries will move to integrate this or other emergent scholarly search products into web sites and collections, or whether it is felt that Google Scholar will suffice. This product is not being developed in isolation, but as part of the larger Windows Live, and is intended to garner loyalty to Microsoft products by academic searchers.

Google Scholar continues to market enhancements to the product while promoting relationships with librarians. Where it was once surprising to see the Google booth at library conferences, now it may not raise eyebrows. Google Scholar has become another commonly-known database used in academic libraries. With libraries experiencing budget constraints and cancellations of databases, the value added to all academic libraries by partnering with corporations outside of the library world may be too immense to ignore. Librarians may have enlarged their mindset about what belongs in the library as library users find Google Scholar just another alternative for their scholarly search needs. Academic libraries, in providing a variety of choices to users, are taking into consideration the needs of various user groups in terms of searching for research materials. Effective library instruction can help users in choosing the type of search engine best suited to their needs, whether native searching of a subject database, commercial federated search product such as Metalib, or free scholarly search engine such as Google Scholar accessed through the library web site. The goal should be connecting users to appropriate scholarly resources, while remaining current and relevant in presenting a variety of choices from the library web site. The challenge for the library web site will include reducing complicated lists

and use of library jargon while presenting materials in ways that make sense to library users. With user behavior changing to a model that relies on remote access, and the ubiquitous experience of using Google as a search engine, the attraction of researchers to Google Scholar linked with library collections will be great.

Implications of further integration of Google Scholar into ARL library web sites

Google Scholar has found its place as a "search and find" tool in ARL libraries. Librarians have placed Google Scholar in places of prominence on the web site, sometimes even placing it directly on the homepage. Google continues to develop the product, and it has been found to have great value as a search tool for the burgeoning corpus of open access material found in repositories and open access journals. As OCLC's OpenWorldCat continues to develop, Google Scholar searching will lead searchers to even more materials in books. Windows Academic Live Search, Scirus, OAIster, and other free search engines are useful for specific subsets and fields of scholarly search, but have not yet been widely added to academic library collections and services. With more libraries as well as more publishers on board, the future use of Google Scholar in academic libraries looks bright indeed.

Notes

1. Googlization of Everything [http://www.googlization of everything.com]; Merriam-Webster OnLine [http://www.merriam-webster.com/].
2. Statistics were gathered in selected months over a two year period and only for remote users authenticated through the proxy server and connecting to Google Scholar through the library web site and its indexes and databases page. Access was counted when the user clicked the link resolver.
3. Harzing Publish or Perish [http://www.harzing.com/resources.htm#/pop.htm].
4. Google Librarian Central [http://www.google.com/librariancenter/articles/0612_02.html].

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Walters, W.H. 2007, "Google Scholar coverage of a multidisciplinary field", *Information Processing and Management,* vol. 43, pp. 1121-1132**.**

FIGURE 1
Number of Links to Google Scholar from Library Homepages of ARL Institutions

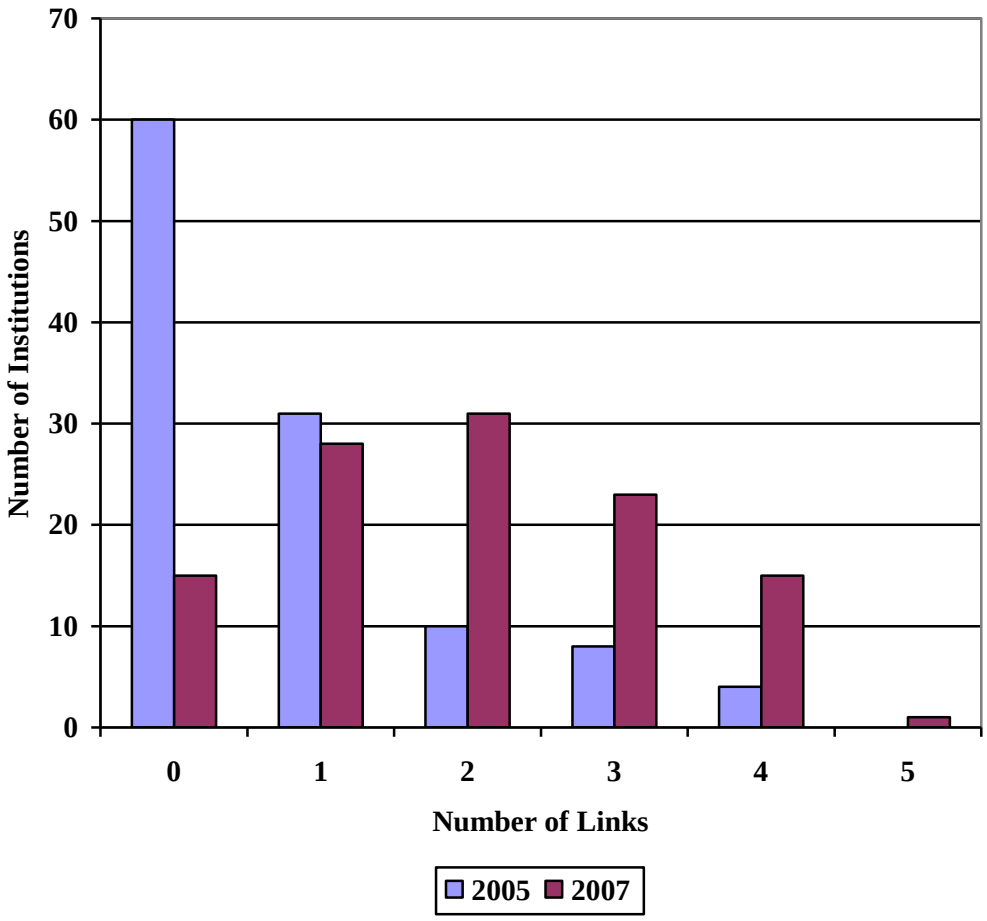

FIGURE 2
Scirus – Google Scholar Comparison