Gaining the Benefits of Scholarly Social Networks.

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Introduction

Scholarly social networking sites are becoming an important tool for scholarly communication and academic discourse in many fields.

Scholarly social networking takes a variety of forms, including sharing research and academic ideas via Twitter, Face book, and a multitude of general and specialized blogs. There are a growing number of specialized scholarly social networking sites which focus on sharing information about scholarly publication. They share scholarly articles themselves, and provide a forum for ideas about academic research.

These sites include **Academia.edu** which has more than 36 million users, and **ResearchGate.org** which has more than 9 million users (ResearchGate, 2016). **Mendeley** is one of several online citation management services, but it also has a growing number of article sharing, discussion and other features. **Mendeley** has over 4.5 million users. It has been particularly prominent because counts of article readership from this site are a one of the metrics used for popular "Altmetric" scores.

There are also a large number of subject specific sites, which are much smaller than the general academic sites, but give researchers in particular fields the ability to share their academic work and exchange ideas.

In this discussion, I will focus on the 3 general sites, **ResearchGate**, **Academia.edu**, and **Mendeley**, and on 3 well known subject specific scholarly social networking sites. **Arxiv** is one of the oldest subject specific sites. It covers areas of Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance and Statistics. **Philpapers** which covers the disciple of Philosophy, reports that its membership includes "the majority of professional philosophers and graduate students"(Philpapers, 2016). **Social Science Research Network (SSRN)** covers social sciences, including economics, law, and commerce.

These sites provide many benefits and innovations which are influencing the scholarly publishing system. This brief discussion will focus on key issues and developments which academic libraries must be aware of, and which have an impact on libraries' role in the scholarly information dissemination process. It will also explore some of the challenges presented by scholarly social networking which academic libraries are well placed to address.

Resent Research Data.

A great deal of research is ongoing about different aspects of scholarly social networks. Many questions in this area are still being debated. It is an area where a great deal of data is available to be analyzed, so there is much more work to be done.

Several research studies have been done that provide important data on scholarly social networking. The journal *Nature* published a large study in 2014 on academic use of social networking. This study included responses from 3000 scientist and engineers, and another 480 responses from the Social Sciences and Humanities (Van Noorden, 2014).

A major new survey entitled "Innovations in Scholarly Communication" released summary results and data access in April of 2016 (Kramer and Bosman, 2016). This survey ran from May 10, 2015 to February 10 2016, in 6 languages and received more than 20,000 responses from more than 100 universities and other organizations. This data remains to be fully analyzed, and work by the authors is awaiting peer review.

Open Access - Showcasing Academic Articles.

The scholarly social networking sites have become large full-text databases for locating and accessing scholarly articles. **Academia.edu** lists more than 11 million articles. **ResearchGate** holds over 19 million full text articles and over 81 million articles indexed. **Mendeley** reports indexing over 31 million articles. **Arxiv** provides open access to over 1.1 million articles. **SSRN** provides open full text access to over 550,000 articles, while **Philpapers** hosts over 725,000 full text articles.

Many studies have concluded that openly accessible articles are read and cited more frequently than articles which are subscription restricted. (Hajjem, C., Harnad, S., & Gingras 2005) found that "there is a clear and consistent OA citation advantage across all the disciplines, varying from 36%-172%". (Wang, Mao & Fang 2015) confirmed that open articles receive substantially more citations than subscription restricted access articles, and that this advantage increases over time. They also concluded that open access articles retain visibility much longer than subscription articles.

The **Open Access Citation Advantage Service** from SPARC Europe (2016), lists over 45 studies which found open access articles to have a reading or citation advantage, while identifying 17 studies which do did not find an advantage.

The *Nature* study also found that over 60% of survey respondents indicated that they find scholarly social networking sites useful for raising the profile of their work. %56 indicated that they are usefully for raising their personal profile. The *Nature* study also found that, only 15% of **ResearchGate** and **Academia.edu** users used these services to follow discussions. By comparison, over 40% of Twitter users, used it for discussion (Van Noorden, 2014, p. 127). Media analyst Deni Auclair commented on this finding saying "These are tools that people are using to raise their profiles and become more discoverable, not community tools of social interaction." (Van Noorden, 2014, p. 127)

Katy Jordan has stated that researchers regard scholarly social network sites "as a valuable way of getting publications online and making them publically available, as it is often a lot quicker and less restrictive than processes for depositing items in their institutional repositories"(Matthews. p. 3).

Ward, Bejarano, & Dudás (2015) note that
> "Scholarly reputation and discoverability of research has always been a top priority for scientists. With the increasing popularity of collaborative and citation management applications, as well as new metrics to track scholarly impact, social media gained a new importance in scholarly communication." (p. 176).

Because of the apparent open access advantage, researchers are using scholarly social networks as an important tool for showcasing and promoting their work. The wide spread use of these sites indicates that promotion of scholarly research is increasingly seen as essential. However many researchers remain unaware of these sites. Libraries have a role to play in raising awareness of these resources.

Jordon's (2014) analysis of the *Nature* survey found that more than 35% of respondents are using **ResearchGate**, **Academia.edu**, or **Mendeley** as sources for article discovery.

Both general and specific scholarly social media sites provide a crowd-sourcing method for making large numbers of full-text articles openly accessible, which would otherwise be unavailable. These sites provide the important benefit of adding considerably to the pool of open access materials. Libraries must take this growing body of material into account as a research search source. It is worth noting that at present only materials posted to **Arxiv** are indexed in major library discovery services, **Exlibris Primo, Serials Solutions Summon**.

These large bodies of content available from scholarly social networking sites must also be taken into account in other areas where libraries have an important role, such as interlibrary lending, populating institutional repository collections, and insuring institutional copyright compliance.

Measuring scholarly impact.

Measurement of attention that academic articles are receiving is another benefit which scholarly social network sites provide.

(Min, Abdullah and Mohamed,) found that "Today, almost all top world university rankings are using bibliometric systems, based predominantly on research publication index and web visibility, as the main objective measures to evaluate university performances and academic influences. At various academic levels, journal publication contributes substantially to this numerical game. Therefore, journal publication is now becoming a key indicator used to determine intake, promotion and tenure renewal of academicians.

As universities increasingly use metrics in assessing scholarly output and evaluating faculty, researchers have a growing need to understand the impact of the articles and journals they read, and follow interest in their own work.

Analysis of the *Nature* study found that 30% of survey respondents used **Academia.edu** or **ResearchGate** for tracking usage metrics, while 12% used **Mendeley** to track metrics (Jordan, 2014, p. 127). Data from the "Innovations in Scholarly Communication" survey shows that the majority of respondents still use subscription sources such as Web of Science, and Scopus, to measure article impact, but a substantial numbers of researchers mention Mendeley and Researchgate and SSRN (Zenodo 2016).

Traditional citation counts which measure the numbers of times articles and journals are cited in other articles, remain a very common measure of scholarly impact. Altmetrics which measure mention in blogs, tweets and other internet sources, along with reads in **Mendeley**, have also become popular. A number of scholarly publishers both open access and subscription, now provide altmetric scores for their articles. Download counts which measure how often articles are accessed from online sites are also commonly used to measure relative interest in articles.

ResearchGate makes citation counts, and download counts available. They have also developed their own "RG Score", to measure its members' relative prominence. This score includes numbers of publications posted, numbers of reads and citations. RG Scores also take into account numbers of questions and answers posted to the site, and numbers of followers on the site.   This "scoring" system is not standardized with Altmetrics or other measures.

In contrast, **Academica.edu** uses views of articles on the site as a measurement. Since views count both articles displayed online, as well as articles downloaded, they are not easily compared to download counts from other sources. **SSRN** focuses on download counts as a measure. **Philpapers** also provides download counts. **Arxiv** provides overall download information for the

site but not statistics on individual article use. **Mendeley** focuses on readership counts of materials of service, and **Mendeley** "reads" are also used as one component of Altmetrics.

Unfortunately there is little consistency, quality control or standardization in the metrics provided by scholarly social media; in each case these metrics offer a non-representative sample, only including those who choose to use a particular site.

Citation measurement

Citation measurements are most often provided by subscription services, such as **Web of Science** or **Scopus**, and by associated paid analytical services. **ResearchGate** is just one of several freely available sources which now provide journal citation counts, and a valuable alternative to paid sources; others include **Google Scholar**, and **Microsoft Academic**. Each source can only draw citations from a limited collection of academic materials which they cover. No single source provides comprehensive citation. **ResearchGate** can only draw usage information from materials posted by authors, or which they can collect from the publicly available sources, so citation data is often incomplete. Scholarly social networking sites encourage the posting of working papers, conference proceedings and other unpublished works. For most sites there is little moderation or control over what is posted. Therefore both cited and citing works are not necessarily either peer reviewed or published.

Standardization and best practices for citation measurement are badly needed. The same can be said for Altmetrics. There is an obvious case for including readership counts from Zotero, **ResearchGate**, **Academica.edu**, and other social media as part of Altmetric measurement.

Zotero completed a research study into the feasibility of providing altmetric data in 2015, and is continuing to persue this direction.(Zotero 2016).

The North American Standards Organization (NISO) is in the process of developing much needed standards for Altmetric measurement. NISO released document entitled "Altmetrics Definitions and Use Cases" for review and public comment between March and April of 2016 (NISO 2016).

Libraries and researchers should be taking every opportunity to encourage efforts to expand Altmetrics to include data from **Zotero**, and from other scholarly social media sites. They can be working with **NISO** and other standards bodies to set standard and improve practices. These would be important steps to making the popular and sought after metrics more reliable and more useful.

Download Count.

Download counts are also a widely used measure of scholarly article usage. Libraries use download data from their own institutions routinely to measure the usage of publisher databases and individual journals. Download information is collected by most journal article publisher and aggregator databases. This data is provided by publishers to each subscribing library, but only for their own institution. A growing number of subscription publishers, including Springer, Wiley and Elsevier also provide article download count data to individual authors. However, download data for journals and of individual articles is not generally made openly available. Regrettably it is not possible to gain an overall picture of the download usage of subscription scholarly journals. Overall download information for subscription journals is increasingly becoming a priced commodity.

In October of 2015 Project Counter the agency which mandates industry standard usage statistics for electronic journal and eBook databases, released a first "COUNTER Code of Practice for Usage Factors" (COUNTER, 2015). This work recognizes that counts of the number of times that an article is downloaded by readers are one important measure of the interest in an article, and an important complement to citations measurements and Altmetrics.

Unlike subscription publishers, several of the scholarly social network sites make article download data openly available.   **ResearchGate**, **SSRN** and **Philpapers** make download counts for each article publically available. However, regrettably **ResearchGate** and **SSRN** do not have application program interface (API) tools, or any other method for collecting aggregate download data.

 Arxiv, provides only overall usage data for the site. They choose not to provide individual article download counts. However they are the only site to provide useful institution by institution data on overall downloads from the site. (Arxiv, n.d.b).

A number of open access journals, notably journals from the **Public Library of Science**, now provide total download counts for their articles.   Scholarly social networking sites are part of a growing movement to make this usage data more openly available. Academic libraries should be actively supporting **Project Counter's** work to standardize download usage data that has been done to great benefit for article and eBook databases. They should actively support the movement to make download data openly available, and encourage development of tools to access and make use of this data.

Rapid Dissemination and Pre-publishing.

One of the primary purposes of the scholarly social network sites is to make scholarly material more easily and rapidly accessible. **ResearchGate** stated mission is "to connect researchers and make it easy for them to share and access scientific output, knowledge, and expertise." (ResearchGate, 2016). **Academia.edu** (2016a) states that "the company's mission is to accelerate the world's research". Greg Gordon, President of SSRN recently wrote that "SSRN supports Open Access and was founded to provide an alternative distribution vehicle for scholarly research, enabling work to be shared as quickly and efficiently at the lowest possible cost – in effect providing tomorrow's research today "(Gordon, 2010,p. 18).

Arxiv is mandated to **"**provide an open-access repository of scientific research, which is free to individual end-users, and where individual researchers can deposit their own content"(Arxiv, 2012). **Arxive** focuses on being an e-print service to host pre-publication scientific papers, as does **Philpapers**.

Each site encourages users to post published articles, but also pre-print articles in the process of peer review for publications, as well as working papers, discussion documents and other work which has not been accepted for publication.   These sites are repositories and distribution venues for large amounts of non-peer reviews, and unpublished materials.

Niko kriegeskorte's **"**Selfish Scientist's Guide to Preprint**"**(2016) posted to the blog Open Brain Science sums up some of the reasons researchers are interested in posting as yet unpublished articles.

> "Open access: Preprints guarantee open access, enhancing the impact and ultimate citation success of our work. This is a win for the authors personally, as well as for science and society.

> Earlier citation: Preprints grant access to our work earlier, leading to earlier citation. This is beneficial to our near-term citation success, thus improving our bibliometrics and helping our careers — as well as boosting the impact factor of the journal, where the paper appears.

Preprint precedence: Finally, preprints can help establish the precedence of findings. A preprint is part of the scientific record and, though the paper still awaits peer review, it can help establish scientific precedence. "

David Walsh offered the following comment on acceptance of papers on SSRN.

"Who decides what will be accepted? The answer is, the authors themselves. "We apply no filters other than that the paper should be part of the worldwide scholarly discourse in the area," says Jensen. So once in a while, an editor, or I, or somebody else, will send back a paper as inappropriate. But other than that, we've followed the principle, 'Let a thousand flowers bloom. Many of those flowers are doomed to quickly wilt, of course. But the papers that will be deemed great in the future will show up here first too". (Social Science Research Network, 2016)

SSRN in effect, acts as a large journal article publisher. They have taken the unusual step of creating an International Standard Serial Number for a single journal titled *the SSRN e-journal*. All **SSRN** working papers and other un-published documents and abstracts are registered under this single ISSN. Several thousand such documents are made available each year.

Arxiv takes a less open approach and moderates submissions. The site is described as

"an openly accessible, moderated repository for scholarly articles in specific scientific disciplines. Material submitted to Arxive is expected to be of interest, relevance, and value to those disciplines. .. Submissions are reviewed by expert moderators to verify that they are topical and referee able scientific contributions that follow accepted standards of scholarly communication (as exemplified by conventional journal articles)." (Arxiv, n.d. a)

However, articles which meet these criteria are not required to be approved or even submitted for publication.

This open approach has led to large amounts of copyright restricted material being posted to **Academia.edu** and **Researchgate** in particular. There was considerable controversy in 2013 when the scholarly publisher Elsevier asked for large amounts of copyright protected content to be taken down (Campbell, 2010).

While encouraging the posting of all kinds of materials these sites are working to respect copyright for published materials. Academia.edu states that they respect the intellectual property rights of others, expects its users to do the same, and reserve the right to take materials down. (Academia.edu, 2016b)

SSRN has a similar copyright policy. "When you provide material to SSRN, we ask you to confirm to us that doing so does not violate other parties' copyright or other proprietary rights. SSRN reserves the right in its sole discretion to delete or remove from the public eLibrary material that violates the rights of third parties… "

ResearchGate terms of reference set out that:

"Users may only request storage of such information that they may legally store and publish. Users must not request to store any information that infringes any third party's copyright, trademarks, other intellectual property rights or any other rights." (ResearchGate, 2016b)

Subscription publishers including Wiley, Springer and Elsevier have policies permitting authors to post pre-publication copies of articles in many cases, and giving them guidelines for doing so. It is in their interests to see work they publish openly promoted, if this can be done without losing its subscription value. (Renwick, Vikki, 2014), (Springer, 2016), (Elsevier, 2016)

Scholarly social networking sites are meeting a demand by providing open platforms for pre-prints, working papers, and other unpublished works. This has resulted in speeding up the pace of scholarly communication. It has also changed the nature of scholarly publishing, putting pressure on the peer review process, and raising growing questions about issues of quality.

Resource Sharing

Sharing of articles and other publications is one of the important benefits for Scholarly Social Networking sites. Jordon's analysis of *Nature* survey found that 26% of respondents used **Mendeley** or **Academia.edu** to share full-text articles, while 31% used had used **Researchgate** for sharing (Jordon 2014, p. 17). Date from the "Innovations in Scholarly Communication" survey shows that 46% of survey respondents used **Research Gate** to access full text of scholarly literature. Only 14% of respondents used other sites, which included **Academia.edu, Arxive**, and **SSRN**, as well as a wide selection of other sources (Zenodo, 2016)

It is important to note that the "Innovations in Scholarly Communication" survey data shows that the greatest number of researchers still use traditional subscription databases provided by their institutional libraries as their source for materials. 27% or respondents to the "Innovations in Scholarly Communication" survey also indicated that they had emailed the author directly to get access to academic literature (Zenodo, 2016).

A recent research confirms that that individual distribution of scholarly articles is a wide spread, and long standing and growing practice. (Tenopir, Hughes, Christian, Allard, Nicholas, Watkinson, Woodward, Shepherd, and Anderson 2014), (Gardner, Gardner, 2016) The scholarly social networking sites are one of a number of avenues now available for sharing scholarly articles. Increased sharing from these sites and other sources should be expected to have an impact on traditional library methods of providing fulltext access.

Financial Matters.

A recent article by David Matthews in the Times Higher Education, discusses the financing of the larger scholarly social networking sites. It well known that Mendeley is owned by the Elsevier Company, but SSRN, ResearchGate and Academic.edu are also owned by private for profit companies.

Philpapers is hosted at the Centre for Digital Philosophy at the University of Western Ontario, and receives funding support from them, from the American Philosophical Association, and the Institute of Philosophy. **Arxive** is hosted at the Cornell University, and receives ongoing funding from the Simons Foundation.

ResearchGate is reported to have received $35 million dollars in venture capital funding. **Academica.edu** has reportedly raised 17.7 million dollars. (Matthews, 2016, p2.) Academia founder Price is quoted saying that the site is "absolutely not profitable" (Matthews, 2016, p3). It seems likely that the other commercial sites are also not yet profitable. Like previous general social media sites, they must be expected to seek different ways to monetize, including advertising, sale of

analytic data for marketing purposes, and offering premium services. It remains to be seen if all the current sites will remain in the future. If the development of internet search and general social media sites is any guide, it would seem like that some will go by the wayside.

Very limited financial information is made available about these sites. **Arxive** is the only one currently making financial information available on their website (Arxiv, 2015).   All of the scholarly social networking sites discussed here are seeking sustainable financial models. **Arxive, Philpapers, Mendeley** and **SSRN** are actively pursuing financial support from academic libraries, through memberships, donations and premium services. Academic libraries must be aware of the financial constraints on these services. They are in a strong position to look for more open information about costs, and profits, and enter into discussions about best practices and standards.

In Conclusion.

Scholarly social networks have the potential to transform scholarly communication in many ways. They are popular venues for researchers to showcase and share their work. They provide large bodies of open access material, which would not be otherwise available. They provide a means for making academic research available at a very early stage of publications, much more rapidly than conventional methods. They can provide large volumes of measurement data about, interest in, use and citation of scholarly work.

However these sites raise important questions about best practices, moderation, and quality evaluation, of crowd sourced, author hosted materials. They bring large amounts of unpublished pre-print and "working paper" material into the scholarly conversation. Hopefully they will stimulate explorations of new methods of peer review, scholarly validity and quality control.

Libraries should have a role in educating users in the research use of these resources.   They can provide assistance in understanding the quality considerations when using collections of both published and unpublished materials**.** They should be involved in educating researchers about best practices for promoting and raising awareness of scholarly work.

Libraries have an important opportunity to support scholarly social networking organizations, but also to work with organizations like Project COUNTER, and NISO to apply more uniform standards and practices to scholarly social networking tools and related metrics such as altmetrics, citation and download counts.

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