STEM Librarians' Presence on Academic Profile Websites

Abstract

This study explores STEM librarians' presence on academic profile websites (APWs) at American and Canadian research universities. It was found that Google Scholar Citations was the most used APW, followed by ResearchGate, ORCiD, and academia.edu. The rate of profile without a publication list in ORCiD of these librarians was significantly lower than other users across this platform, suggesting that it may be necessary for ORCiD to improve the publication addition function in order to help other users to increase their presence. The social networking functions were not well adopted, as such, ResearchGate's composite metric, RG Score, adds little new information to bibliometric indicators.

Keywords: academic profile website; ORCID; Google Scholar Citations; ResearchGate; academia.edu; STEM librarian

Introduction

The purpose of this study is to investigate the presence on academic profile websites (APWs) of science, technology, engineering, and math (STEM) academic librarians at American and Canadian research libraries. We included the four most used APWs among researchers for our study: ResearchGate, Google Scholar Citations, academia.edu, and ORCiD (Open Researcher and Contributor ID) (Ortega 2017; Zhang and Li 2020). These websites were checked to find out if the librarian has established a profile. We also investigated the various ways these

librarians were using their profiles – for documenting and promoting their publications, for information gathering, or for other research related social activities.

APWs allow researchers and scholars to create online professional profiles and organize and showcase their publications. Some APWs (e.g., ResearchGate and academia.edu) have moved beyond being mere professional profile spaces to offering social networking functions for academic researchers. Therefore, APWs are also referred to as academic social networking sites or simply social networking sites, and these latter names imply the evolution of the functions of these sites. For this paper, we refer to these sites as APWs. Academics and researchers use APWs to document and share research works and scholarly publications, connect with peers, post research questions, collaboratively reflect on research ideas, find collaborators, and seek peer reviews (Hailu and Wu 2021; Manca 2018).

Each of these APWs has its strengths and limitations. Google Scholar Citations was launched in 2012 as a secondary product of Google Scholar. Because of Google Scholar's search function, publications listed in Google Scholar Citations may be hyperlinked to other sites to help readers to find full-text of the publication, thus providing the potential to increase the reach and impact of the scholarly work. However, since Google Scholar retrieves citations from anywhere on the web into one's profile, there are concerns regarding misunderstanding similar author names, identifying and adding less rigorous works to one's profile/citations, and overall, less transparency regarding data coverage and metrics (Delgado López-Cózar, Orduña-Malea, and Martín-Martín 2019). For example, research has shown that citation counts provided by Google Scholar can be boosted through easy manipulation of publications such as by creating and

uploading false documents on the web (Delgado López-Cózar, Robinson-García, and Torres-Salinas 2014).

Also launched in 2012, ORCiD is a community-driven non-profit organization that aims to resolve name ambiguity issues by assigning researchers unique 16-digit author identifiers. Unlike other APWs, ORCiD does not provide metrics or networking functions. Many funding agencies and publishers expect ORCiD iDs or ORCiD profiles from researchers in order to simplify the grant application process and save time on publication list updating by avoiding repetitive data entry (ORCiD 2021a). Researchers themselves control their data input and can choose to keep their profiles public or private. Furthermore, the ORCiD iD is a persistent identifier, which means the work of a researcher can always be accessed even if they have moved to a different institution. However, despite ORCiD's potential to disambiguate researcher names and accurately attribute authorship of research works, there is a high percentage (45%) of incomplete ORCiD profiles, i.e., ORCiD profile with only a name but without a publication list or other further information (Morgan and Eichenlaub 2018). This incomplete profile issue makes it challenging to distinguish researchers from each other. Recognizing this problem, ORCiD has started a few initiatives such as "Collect & Connect" to validate research affiliations through authentication and to reduce the number of incomplete records (Morgan and Eichenlaub 2018; ORCiD 2018).

ResearchGate is a commercial academic social networking site founded in 2008 and it has close to twenty million users (ResearchGate 2021a). In addition to list publications, ResearchGate has features that allows connectivity, social interaction, resource sharing, and asking and answering

questions related to research. ResearchGate also provides alternative research metrics such as the RG Score. According to its website, the RG score measures scientific reputation based on how one's research is perceived by their peers (ResearchGate 2021b). Although it was meant to be a quality indicator, its value is debatable as the exact algorithm for calculating this score is not available (Shrivastava and Mahajan 2017) and most of the scores seems to be built on asking or answering questions in ResearchGate. In other words, less interaction on RG leads to lower scores regardless of the number of publications submitted to this platform (Deng et al. 2019). Another common concern about ResearchGate is its full-text upload function, which may risk embroiling researchers in copyright infringement issues (Else 2018).

Academia.edu is also a commercial social networking site. It was founded in 2008 and currently has 170 million registered users (academia.edu 2021), and is more popular among social science and humanities scholars (Manca 2018). Unlike the previously mentioned APWs, which do not charge for their services, academia.edu offers both a free version and a paid version; the free version provides only limited functionality, while the paid version allows users to download full-text and provides enhanced analytics. In addition to the fees associated with this APW, a well-known limitation of academia.edu is its inappropriate use of the domain name (.edu) (Bond 2017), which may mislead users to think it is an educational institution, but, in fact, it is a for-profit company. Similar to ResearchGate, there are concerns about full-text uploading and copyright violation issues (Howard 2013).

Literature Review

With the increased popularity of APWs as a channel for scholarly communication in recent years, a significant number of studies have been conducted to explore the use of APWs among researchers in different geographical areas and in different disciplines including science, technology, engineering, health sciences, social science, and humanities (Boudry and Durand-Barthez 2020; Kjellberg and Haider 2018; Mas-Bleda et al. 2014; Mason 2020). Many of the studies concluded that researchers had a much higher presence rate on ResearchGate and Google Scholar Citations than on ORCiD or academia.edu (Mikki et al. 2015; Tran and Lyon 2017; Zhang and Li 2020). In terms of disciplinary difference, it is generally agreed ResearchGate was more popular in science and health sciences, while academia.edu had more users in social sciences and humanities (Boudry and Durand-Barthez 2020; Ortega 2015).

Meanwhile, academic libraries have responded to the changing landscape of scholarly communication and began to offer services to support and educate researchers on the use of APWs (Reed, McFarland, and Croft 2016; Ward, Bejarano, and Dudás 2015). Like other researchers, librarians themselves also use APWs to manage and promote their research work (Brigham 2016). Given librarians' more familiarity with APWs and their surrounding issues (Reed, McFarland, and Croft 2016), are their usage patterns of APWs different from other researchers?

Although many studies have investigated researchers' use of APWS, few have focused on librarian or information science professionals. Of the limited studies, a few looked at library and information science (LIS) faculty. Montesi et al. (2019) analyzed the presence and activities on ResearchGate, Google Scholar Citations and Twitter among 349 LIS faculty from 13 Spanish

universities. They found that ResearchGate was the most popular APW (52.4%), followed by Google Scholar Citations (46.4%), and that Twitter was the least popular platform (36.4%). In another study, Siso-calvo and Arquero-Avilés (2020, 69) investigated the usage of APWs among 255 LIS academics in the "reference areas" from 12 Spanish public universities. Again, it was found that ResearchGate and Google Scholar Citations were the most popular platforms. This study also discovered that ORCiD and academia.edu had a high percentage of incomplete profiles. In addition to the two studies focused on Spanish LIS scholars, Aharony et al. (2019) surveyed heads of library and information science schools from the iSchools Organization (https://ischools.org) and from American Library Association accredited programs on their use of ResearchGate, academia.edu, Linkedin, and Mendeley. They also found that ResearchGate was most popular (90%), followed by academia.edu (47%). In addition, they noticed low use of interaction functions on APWs. However, it should be noted that although both LIS faculty and librarians are likely to be familiar with APWs because of the nature of their profession, their work responsibilities and requirements are different. Therefore, the findings from LIS faculty might not represent the APW usage patterns of librarians.

We found only one good-quality study that included librarians from research university libraries in North America on this topic. Radford et al. (2020) interviewed 10 librarians, along with 20 other faculty and PhD students, from research university libraries in Canada and the United States on their perception and use of APWs. Once again, they found ResearchGate was the most used APW, academia.edu second, and ORCiD last. While all the participating librarians recognized APWs as useful tools for managing and sharing research outputs and connecting with others, they expressed concerns about APWs including time constraints for maintaining these

sites and problems around the for-profit business models of APWs, particularly for ResearchGate and academia.edu. Interestingly, most librarians in the study believed that one single profile website would be enough despite of the availability of several APWs.

In summary, the limited evidence appears to suggest that, to some extent, the APW usage patterns of librarians and LIS faculty align with those of researchers in other disciplines, with Google Scholar Citations and ResearchGate being more popular than ORCiD or academia.edu. Because of the limited sample size in previous studies, Radford et al. (2020) called for additional studies in order to have a more comprehensive understanding of academic librarians' use of APWs. Hence, this present study will investigate the APW use of a different librarian group: STEM librarians who are also active researchers in Canada and the United States.

In the following sections we describe the methods used in this current study, present the findings, and discuss the implications of our findings.

Methods

As discussed in the introduction, through literature review, we identified the four most popular APWs among researchers: ResearchGate, academia.edu, Google Scholar Citations, and ORCiD; therefore, we chose these four APWs for investigation.

We defined librarian researchers in this study as librarians with full faculty status and tenure, i.e., librarians who are likely required to publish and are considered to be faculty members at their universities (Lewis 2018). Because the requirements for these librarians align with those for

regular faculty, we envision that this group of librarians are likely to be active researchers and thus more likely to use APWs. The words librarians and librarian researchers are used interchangeably thereafter.

We used the Academic Librarian Status list compiled by Lewis (2018) to identify the institutions that grant their librarians full faculty status and tenure. The list categorizes academic libraries into five types based on the professional statuses of their librarians: Librarians with full faculty status and tenure, Librarians with faculty or academic status but no tenure, Librarians with a mix of professional statuses, Librarians without faculty status, and Librarians without faculty status but with status similar to tenure. For the reasons stated above, we included only the 164 libraries in the category of "Librarians with full faculty status and tenure".

We then limited the 164 libraries to the member institutions of the Associations of Research Libraries (ARL). ARL is a non-profit organization of research libraries in Canada and the United States and has 124 member institutions. The parent institutions of most ARL members are generally considered as research-intensive universities, as such, librarians in these university libraries are more likely to be involved in research support and collaboration (Association of Research Libraries 2021). Further, because APWs have become increasingly popular among researchers, librarians themselves in ARL libraries may be more likely to be aware of and use these websites, as compared to librarians in non-ARL libraries. Through this step, we identified 24 ARL libraries that granted full faculty and tenure to their librarians, of which two were Canadian university libraries, and 22 US university libraries.

Of the 22 US libraries, two were large multiple campus library system across its jurisdiction. Because not all campus libraries of the two institutions are ARL members, and it was not always clear which campuses granted full faculty and tenure to librarians, we excluded these two institutions from our study.

Due to resource constraints, we randomly selected 10 US libraries from the 20 remaining US libraries. Thus, a total of 12 university libraries (two Canadian libraries and 10 US libraries) were included in the study. A flow chart of the process can be seen in Figure 1.

The data collection of STEM librarian researchers' use of APWs occurred in two phases. In the first phase, we identified the STEM librarians by manually searching the websites of the 12 university library websites. We recorded the STEM fields that a librarian was responsible for. The STEM fields included Agriculture, Astronomy, Biology, Chemistry, Computer Science, Geology & Earth Sciences, Mathematics & Statistics, Physics, and Engineering. The Engineering field was further broken down into chemical engineering, civil engineering, electronic, electrical and computer engineering, mechanical engineering, and interdisciplinary engineering. Fields related to health sciences or interdisciplinary sciences such as toxicology or environmental studies were not included. We divided the list of 12 libraries into halves; Author 1 collected data about STEM librarians on the first half of the list; and Author 2 on the second half.

The second phase was to find if the STEM librarian researchers had established profiles on each of the four APWs by searching ResearchGate, academia.edu, Google Scholar Citations, and ORCiD. Relevant data on each APW was recorded. In this phase, we switched roles: Author 2

gathered APW usage data of the STEM librarians in the first half of 12 libraries, and Author 1 in the second half. This process allowed us to review each other's data and helped minimize and correct invalidation errors in identifying and including STEM librarians from the previously identified ARL institutions. Table 1 lists the relevant data collected on the four APWs. Data collection was completed in June 2021.

Results

A total of 54 STEM librarians from the 12 university libraries were identified, of which 18 were male and 36 female. The number of librarians in each library is listed in Table 2.

Presence on APWs

Out of the 54 librarians, 45 (83%) had established at least one academic profile. Google Scholar Citations is the most popular academic profile website (30/54; 56%), followed by ResearchGate (28/54; 52%), ORCiD (17/54; 31%), academia.edu (10/54; 19%). See Figure 2.

We compared the representation on APW of Canadian librarians and US librarians (Figure 3). The samples of Canadian librarians and U.S. librarians are respectively non-representative of the overall samples of Canadian librarians and U.S. librarians. It was found that, of the 10 librarians in Canada, all have established at least one academic profile: 3 have established 4 profiles, 1 has 3 profiles, 4 have 2 profiles, and 2 have only 1 profile. On the other hand, the presence of US librarians on APWs were slightly lower. Of the 44 STEM librarians in US, 79% have established at least one academic profile. Among Canadian librarians, the most popular APW was Google Scholar Citations (90%), all but 1 had established a profile on Google Scholar Citations.

ResearchGate and ORICD achieved the same presence rate of 60%, while academia.edu had the lowest rate of 40%. Among US librarians, ResearchGate had the highest presence rate (63%), slightly higher than Google Scholar Citations (60%); ORCiD had a presence rate of 31%, with academia.edu the lowest (17%). However, because only 10 Canadian librarians were included, we did not know if the differences in percentages between Canadian librarians and US librarians were significant.

Multiple Profiles

As there are quite a few APWs available, we checked how many profiles a librarian is willing to maintain. Twenty librarians had only one profile, 15 had two profiles, and only 5 had three profiles, and 5 had four profiles (Table 3). The results suggest that STEM librarians are likely to have 1 or 2 profiles. When they maintain two profiles, they are likely to use Google Scholar Citation and ORCiD (7 librarians had both Google Scholar Citations and ORCiD profiles), and Google Scholar Citations and ResearchGate (5 librarians had Google Scholar Citations and ResearchGate profiles).

Incomplete Profiles

In this study, we define incomplete profile as a profile that provides only the name of the researcher but without a publication list or other further information. It was found that all of the 30 Google Scholar Citation profiles were complete, and there was no incomplete profile. ORCiD also had a low rate of incomplete profile; out of the 17 ORCiD profiles, only one (5.9%) was incomplete. On the other hand, the two social network websites ResearchGate and academia.edu

had a significantly higher rate of incomplete profiles, 40% and 50% respectively. Details of the incomplete profiles on each APW are shown in Figure 4.

Number of publications, citations, and h-index

As can be seen in Table 4, the average number of listed publications for the STEM librarians was the highest in Google Scholar Citations (23). ORCiD took the second place with the average number of publications of 13. ResearchGate and academis.edu ranked the third and the last, with 10 publications and 6 publications respectively.

Both Google Scholar Citations and ResearchGate provide two citation metrics: total citations and *h-index*. The average numbers of total citations and *h-index* were higher in Google Scholar Citations than that in ResearchGate.

Social activity and RG Score

ResearchGate and academia.edu provide social networking functions. We compared the social activities on the two APWs. Table 5 shows the number of followings, followers, and Reads/Views on ResearchGate and academia.edu. We found the social networking functions were not used frequently. Out of the 28 ResearchGate profiles, 36% did not follow other researchers, and 29% did not have any followers. In ResearchGate, only one librarian asked questions (total 3 questions), and one answered questions (also 3 questions).

ResearchGate only displays the RG Score when it reaches a minimum of 1 (ResearchGate 2021b). Of the 28 ResearchGate profiles, 14 librarians had an RG score, and 14 did not. The

Average of RG Score of the STEM librarian was 6.83. Because ResearchGate does not provide details on how the RG score is calculated, we did correlation tests to find its relationship to number of publications, citations, *h-index*, followers, followings, and reads. The results are shown in Table 6. It was found that RG Score is highly correlated to number of publications, citations, *h-index*, and reads, somewhat correlated to followers, but not correlated to following. Because only two librarians used the asking and answering question function, we did not test if RG score is related to this function.

Discussion

In this study, we investigated Canadian and American STEM librarian researchers' presence on four APWs. It was found that 83% of the librarians had established at least one academic profile, a rate higher than those reported in previous studies (Martín-Martín, Orduna-Malea, and Delgado López-Cózar 2018; Ortega 2015; Zhang and Li 2020). Two reasons might explain the differences. First, our study was carried out in 2021, several years after the previous studies. During this time period, researchers may have become more familiar with APWs, thus they are more likely to use them. Second, our study objects were STEM librarian researchers in research university libraries in the US and Canada. Because they work in research-intensive universities, providing research supports is an essential component of their responsibilities. As such, they are likely to be more knowledgeable about APWs and be involved in activities in supporting and educating scholars in the use of these websites. In fact, we found that, out of the 12 university libraries included in this study, ten provided guides on APWs on their websites: 10 libraries had guides on ORCiD, 7 on Google Scholar Citations, 4 on ResearchGate, and 4 on academia.edu.

Therefore, these librarian researchers themselves are more likely to use APWs as an alternative method for scholarly communication.

When comparing the popularity of the four APWS, we found that Google Scholar Citations (55.6%) was the most popular APW, ResearchGate (51.8%) second, followed at some distance by ORCiD (31.5%) and academia.edu (18.5%). The popularity ranking of the APWs identified in this study roughly aligns with previous research on the use of APWS not only by LIS professionals (Aharony et al. 2019; Montesi, Villaseñor Rodríguez, and dos Santos 2019; Radford et al. 2020; Siso-Calvo and Arquero-Avilés 2020), but also by researchers in other fields (Mikki et al. 2015; Tran and Lyon 2017; Zhang and Li 2020). As stated above, librarians are likely to be more knowledgeable about APWs and the issues surrounding commercial academic social networking sites, and they have been advocating for the use of ORCiD as the primary platform for author profiles (Akers et al. 2016). Therefore, it is reasonable to expect that the presence rate on ORCiD of librarian researchers would be higher than those on other APWs. However, our finding contradicts the expectation. A further study such as interview or survey is needed to find the reasons why librarian researchers choose a specific APW.

Because of concerns about time commitment to maintain and update an APW, most researchers are willing to maintain only one or two APWs (Radford et al. 2020). We found that, when the STEM librarians are using two APWs, they are likely to use ORCiD and Google Scholar Citations. This is different from previous studies, where it was found that ResearchGate and Google Scholar Citations were the preferred platforms when researchers had only two profiles (Mikki et al. 2015; Zhang and Li 2020). It is encouraging to find the rate of incomplete profiles

on ORCiD among the STEM librarians was only 6%, a rate much lower than 33 - 65% as reported in previous studies (Morgan and Eichenlaub 2018; Siso-Calvo and Arquero-Avilés 2020). Among all the existing ORCiD profiles, the rate of incomplete profiles was 72% (9,176,273/12,794,637) (ORCiD, 2021b), which indicates that incomplete profiles are common across ORCiD platform. While future publications can be added to one's ORCiD profile automatically if a researcher gives their ORCiD iD when submitting a manuscript to a publisher, it is not intuitive to add previous publications. ORCiD offers several options to do this: use "Search & link" function (searching publications in several databases), add by DOI or PubMed ID number, import BibTex file, or add manually. Librarians may think these are easy steps because they work with these kinds of resources on daily basis, therefore the incomplete profile rate of the STEM librarians was low. But to other users, they may see these steps as extra work or burden, thus resulting a high percentage of incomplete profile. One of ORCiD's primary goals is to distinguish researchers with similar names and accurately attribute research works. Without a complete list of publications, it is challenging to achieve this goal. Our results suggest that ORCiD should consider developing functions to simplify the process of adding previous publications to profiles to reduce the overall incomplete profiles among its users. Meanwhile, this finding also sheds light on how librarians could better support researchers in their use of APWs. When providing the support services, librarians may need to pay more attention to guide users on how to add publications into ORCiD profiles from different sources.

The rate of incomplete profiles for ResearchGate and Acdemia.edu were 39% and 50% respectively, much higher than that reported in the study of Spanish LIS scholars, which found an incomplete rate of 6% and 31% (Siso-Calvo and Arquero-Avilés 2020). Because our study

focused on the librarian practitioners in Canada and US, and it might be that librarians in North America are more sensitive to the issues surrounding the two commercial APWs. They set up a profile simply because of the aggressive marketing strategy of ResearchGate and academia.edu, but never added any publications to these profiles, therefore, their presence on these two APWs were merely symbolic.

ResearchGate and academia.edu provide social networking functions, but we found that these functions were used infrequently by the STEM librarians. In ResearchGate, 36% of the librarians did not follow others, and 29% did not have any followers. In academia.edu, the number was 20% for both following and follower. ResearchGate has the asking and answering question function to facilitate information exchange. However, this function was used even more sparsely: only two librarians used it. Our study confirms that most researchers use ResearchGate or academia.edu as an online business card or curriculum vitae, rather than as a social networking site to interact with other researchers (Jordan 2015; Van Noorden 2014). Studies have shown that Twitter and blog were the most used social networking tools by librarians and other researchers for informal professional development and knowledge sharing (Bruguera, Guitert, and Romeu 2019; Luo and Hostetler 2020). Our results suggest that neither ResearchGate nor academia.edu have gained recognition as social networking sites at least among the STEM librarians included in this study.

Bibliometric indicators, such as citation and *h-index*, have been used in academic world for important decision making (e.g., funding, tenure and promotion) despite their inherent limitations. With the advancement of technology, alternative metrics or altmetrics from the web

(e.g., reads and downloads) have emerged as additional indicators for research assessment. ResearchGate's composite metric, RG Score, is one example of altmetrics. Attempting to measure a researcher's scientific reputation based on the perception of their peers, RG Score is built upon three components: publications/works posted by the researcher, interaction with others, and recognition received from other researchers, although the exact algorithm is unknown (Orduna-Malea et al. 2017). Empirical evidence has shown that RG Score is heavily affected by researchers' engagement in social networking activities, especially providing answers, and number of publications plays a second-level role, indicating that RG Score is not a reliable indicator of scientific reputation (Copiello and Bonifaci 2018; Orduna-Malea et al. 2017). For the group of the STEM librarians, we found that RG Score is highly correlated to bibliometric indicators (number of publications, citations, and *h-index*) and reads, and somewhat related to followers, but not related to following. Because social networking functions were seldom used in this study sample, the results suggests that, when researchers use ResearchGate as a business card or online profile, rather than an academic social networking website, RG Score did not add a new perspective to the more established bibliometric indicators.

Limitations

This study has several limitations. First, the study objects were librarians in Canada and the US. The results may not be generalizable to other geographical areas, as different country/region may have different academic cultures, which may affect how they use APWs. Second, this study used STEM librarians as a sample. Studies have shown that different disciplines may have different preferences for APWs (Ortega 2015), so the uptake of APWs by librarians in other disciplines (e.g., social science and humanities) may be different from the finding in this study. Third, we

focused on librarians in research intensive universities, and the presence rate on APWS of librarians in other types of libraries might be different.

Conclusion

APWs have become accepted channels for scholarly communication. We found that most of the STEM librarians (83%) in Canadian and American research university libraries have established at least one profile, with Google Scholar Citations being the most popular APW, ResearchGate next, followed at some distance by ORCiD and academia.edu. Librarians have been advocating for ORCiD as the preferred profile website because of its functions for name disambiguation, potential time saving on updating publication list, and simplified process for grant applications. One would expect that ORCiD presence rate among the STEM librarians would be higher than other APWS. However, our study results did not find this was true. Further study is needed to find why librarians choose a specific APW.

On the other hand, we found the incomplete profile rate in ORCiD was much lower than those reported in previous studies on researchers in LIS field and other fields, indicating that the STEM librarians themselves are more comfortable in using the publication addition functions in ORCiD. This different incomplete profile rate between librarian practitioners and other researchers speak to a need to simplify the publication addition function in ORCiD in order to increase the complete presence of other ORCiD users. It also sheds light on how librarians could improve support services related to the use of APWs; more attention needs to be focused on assisting users to add publications to their ORCiD profiles to fulfill ORCiD's goal for name disambiguation.

Although ResearchGate has the second highest presence rate, it has a higher incomplete profile rate of 39%. The social networking functions were also not well adopted by the STEM librarians. The limited evidence of this study found that RG Score is highly correlated to bibliometric indicators, to a lesser extent to social activity indicators, such as follower and following. The results indicate, when researchers are not actively engaged in social interaction in ResearchGate, the RG Score adds little to traditional bibliometric indicators.

References

Academia.edu. 2021. About academia. Accessed November 17, 2021.

https://www.academia.edu/about.

Aharony, N., J. Bar-Ilan, H. Julien, M. Benyamin-Kahana, and T. Cooper. 2019. Acceptance of altmetrics by LIS scholars: An exploratory Study. *Journal of Librarianship and Information Science* 51 (3): 843–851. doi:10.1177/0961000617742461.

Akers, K. G., A. Sarkozy, W. Wu, and A. Slyman. 2016. ORCID Author identifiers: A primer for librarians. *Medical Reference Services Quarterly* 35 (2): 135–144. doi:10.1080/02763869.2016.1152139.

Association of Research Libraries. 2021. Who we are. Accessed November 18, 2021. https://www.arl.org/who-we-are/.

Bond, S. 2017. Dear scholars, delete your account at academia.edu. *Forbes*. Accessed February 28, 2022. https://www.forbes.com/sites/drsarahbond/2017/01/23/dear-scholars-delete-your-account-at-academia-edu/?sh=4cffe7f42d62.

Boudry, C., and M. Durand-Barthez. 2020. Use of author identifier services (ORCID,

ResearcherID) and academic social aetworks (academia.edu, ResearchGate) by the researchers of the University of Caen Normandy (France): A case study. *PLoS ONE* 15 (9): 1–16. doi:10.1371/journal.pone.0238583.

Brigham, T. J. 2016. Online professional profiles: Health care and library researchers show off their work. *Medical Reference Services Quarterly* 35 (4): 440–448. doi:10.1080/02763869.2016.1220760.

Bruguera, C., M. Guitert, and T. Romeu. 2019. Social media and professional development: A systematic review. *Research in Learning Technology* 27. doi:10.25304/rlt.v27.2286.

Copiello, S., and P. Bonifaci. 2018. A few remarks on researchgate score and academic reputation. *Scientometrics* 114 (1): 301–306. doi:10.1007/s11192-017-2582-9.

Delgado López-Cózar, E., E. Orduña-Malea, and A. Martín-Martín. 2019. Google Scholar as a data source for research assessment. In *Springer Handbook of Science and Technology Indicators*, edited by Glänzel W., Moed H.F., Schmoch U., and Thelwall M., 95–127. Springer, Cham. doi:10.1007/978-3-030-02511-3_4.

Delgado López-Cózar, E, N. Robinson-García, and D. Torres-Salinas. 2014. The Google Scholar experiment: How to index false papers and manipulate bibliometric indicators. *Journal of the Association for Information Science and Technology* 65 (3): 446–454. doi: https://doi.org/10.1002/asi.23056

Deng, S., J. Tong, Y. Lin, H. Li, and Y. Liu. 2019. Motivating scholars' responses in academic social networking sites: An empirical study on researchgate Q&A behavior. *Information Processing and Management* 56 (6): 102082. doi:https://doi.org/10.1016/j.ipm.2019.102082.

Else, H. 2018. Major Publishers Sue ResearchGate over Copyright Infringement. *Nature*

doi:https://doi.org/10.1038/d41586-018-06945-6

Hailu, M., and J. Wu. 2021. The use of academic social networking sites in scholarly
    communication: scoping review. *Data and Information Management* 5 (2): 277-298.
    doi:https://doi.org/10.2478/dim-2020-0050.

Howard, J. 2013. Posting your latest article? You might have to take it down. *Chronicle of
    Higher Education*. Accessed February 28, 2022.
    https://www.chronicle.com/blogs/wiredcampus/posting-your-latest-article-you-might-have-
    to-take-it-down

Jordan, K. 2015. Exploring the ResearchGate Score as an academic metric : Reflections and
    implications for practice. In *Quantifying and Analysing Scholarly Communication on the
    Web (ASCW'15), 30 June 2015*. Oxford, England.

Kjellberg, S., and J. Haider. 2018. Researchers' online visibility: Tensions of visibility, trust and
    reputation. *Online Information Review*. 43(3): 426-439. doi:10.1108/OIR-07-2017-0211.

Lewis, C. 2018. Academic librarian status – A list of academic institutions in the United States
    and elswehere, sorted by the professional status of their librarians. Accessed February 01,
    2021. https://academiclibrarianstatus.wordpress.com.

Luo, T., and K. Hostetler. 2020. Making professional development more social: A systematic
    review of librarians' professional development through social media. *Journal of Academic
    Librarianship* 46 (5): 102193. doi:10.1016/j.acalib.2020.102193.

Manca, S. 2018. Researchgate and academia.edu as networked socio-technical systems for
    scholarly communication: A literature review. *Research in Learning Technology* 26: 1–16.
    doi:10.25304/rlt.v26.2008.

Martín-Martín, A., E. Orduna-Malea, and E. Delgado López-Cózar. 2018. Author-level metrics

in the new academic profile platforms: The online behaviour of the bibliometrics community. *Journal of Informetrics* 12 (2): 494–509. doi:10.1016/j.joi.2018.04.001.

Mas-Bleda, A., M. Thelwall, K. Kousha, and I. F. Aguillo. 2014. Do highly cited researchers successfully use the social web? *Scientometrics* 101 (1): 337–356. doi:10.1007/s11192-014-1345-0.

Mason, S. 2020. Adoption and usage of academic social networks: A Japan case study. *Scientometrics* 122 (3): 1751–1767. doi:10.1007/s11192-020-03345-4.

Mikki, S., M. Zygmuntowska, Y. L. Gjesdal, and H.A.A. Ruwehy. 2015. Digital presence of Norwegian scholars on academic network sites-where and who are they? *PLoS ONE* 10 (11). doi:10.1371/journal.pone.0142709.

Montesi, M., I. V. Rodríguez, and F. B. dos Santos. 2019. Presencia, actividad, visibilidad e interdisciplinariedad del profesorado universitario de documentación en los medios sociales: una perspectiva de género. *Revista Española de Documentación Científica* 42 (4): 246. doi:10.3989/redc.2019.4.1640.

Morgan, M., and N. Eichenlaub. 2018. ORCID ids in the open knowledge era. *Lecture Notes in Computer Science*. 11057 LNCS: 308-311. doi:10.1007/978-3-030-00066-0_29.

ORCiD. 2018. Collect & connect – Improved and updated! Accessed November 16, 2021. https://info.orcid.org/collect-connect-improved-and-updated/.

ORCiD. 2021a. ORCID member organizations. Accesed November 25, 2021. https://orcid.org/members.

ORCiD. 2021b. ORCID statistics. Accessed November 26, 2021. https://orcid.org/statistics.

Orduna-Malea, E., A. Martín-Martín, M. Thelwall, and E. Delgado López-Cózar. 2017. Do ResearchGate scores create ghost academic reputations? *Scientometrics* 112 (1): 443–460.

doi:10.1007/s11192-017-2396-9.

Ortega, J. L. 2015. Disciplinary differences in the use of academic social networking sites.
Online Information Review 39 (4): 520–536. doi:10.1108/OIR-03-2015-0093.

Ortega, J. L. 2017. Toward a homogenization of academic social sites: A longitudinal study of
profiles in Academia.Edu, Google Scholar Citations and ResearchGate. *Online Information
Review* 41 (6): 812–825. doi:http://dx.doi.org/10.1108/OIR-01-2016-0012.

Radford, M.L., V. Kitzie, S. Mikitish, D. Floegel, G.P. Radford, and L.S. Connaway. 2020.
"People are reading your work," scholarly identity and social networking sites. *Journal of
Documentation* 76 (6): 1233–1260. doi:10.1108/JD-04-2019-0074.

Reed, K., D. McFarland, and R. Croft. 2016. Laying the groundwork for a new library service:
Scholar-practitioner & graduate student attitudes toward altmetrics and the curation of
online profiles. *Evidence Based Library and Information Practice* 11 (2): 87–96.
Doi:https://doi.org/10.18438/B8J047.

ResearchGate. 2021a. About us. Accessded November 16, 2021.
https://www.researchgate.net/about.

ResearchGate. 2021b. RG Score. Accessed November 16, 2021.
https://explore.researchgate.net/display/support/RG+Score.

Siso-Calvo, B., and R Arquero-Avilés.. 2020. Plataformas digitales y reputación académica :
análisis del área de biblioteconomía y documentación en España. *Ibersid* 14 (1): 69–77.

Shrivastava, R., and P. Mahajan. 2017. An altmetric analysis of ResearchGate profiles of
physics researchers: A study of University of Delhi (India). *Performance Measurement and
Metrics*. 18(1): 52-66. doi: 10.1108/PMM-07-2016-0033.

Tran, C. Y., and J. A. Lyon. 2017. Faculty use of author identifiers and researcher networking

tools. *College and Research Libraries* 78 (2): 171–182. doi:10.5860/crl.78.2.171.

Van Noorden, R. 2014. Online Collaboration: Scientists and the social network. *Nature* 512 (7513): 126-129. doi:10.1038/512126a.

Ward, J., W. Bejarano, and A. Dudás. 2015. Scholarly social media profiles and libraries: A review. *LIBER Quarterly* 24 (4): 174–204. doi:10.18352/lq.9958.

Zhang, L., and C. Li. 2020. Investigating science researchers' presence on academic profile websites: a case study of a Canadian research university. *Issues in Science and Technology Librarianship* 2020 (95): 1–16. doi:10.29173/istl51.
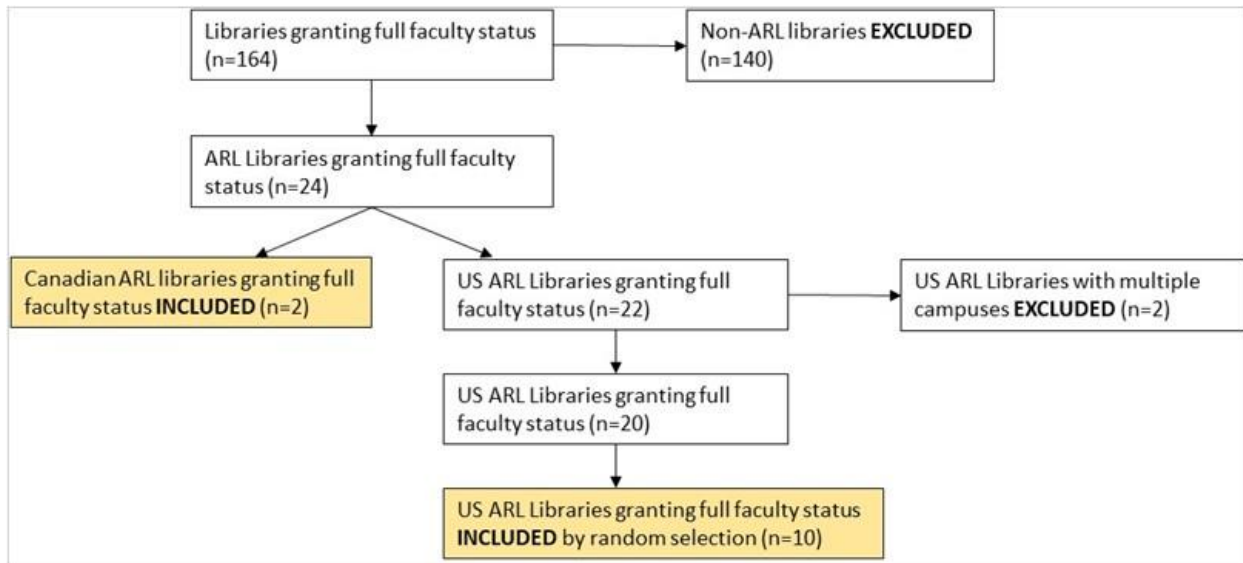
Figures

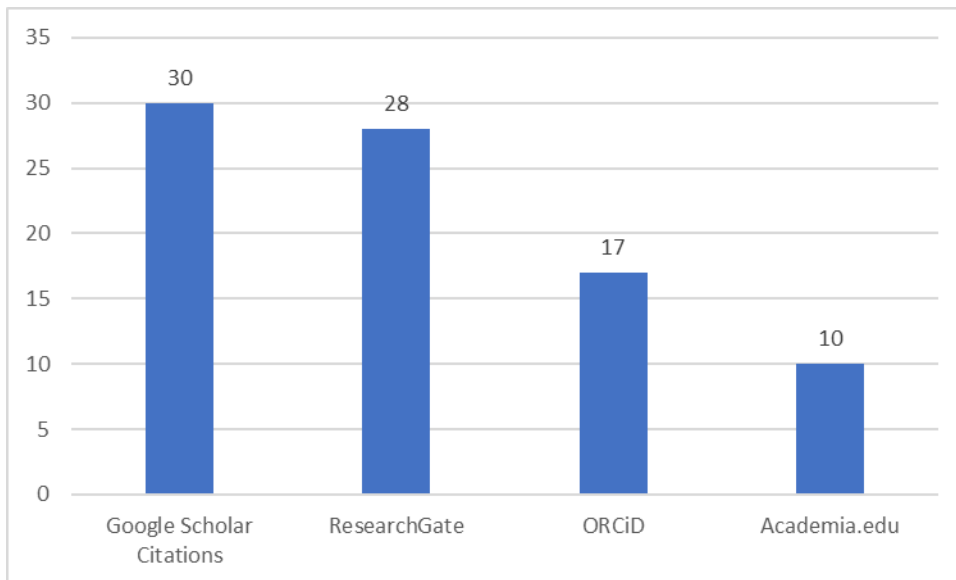Figure 1. Flow chart of institution selection process and numbers at each stage

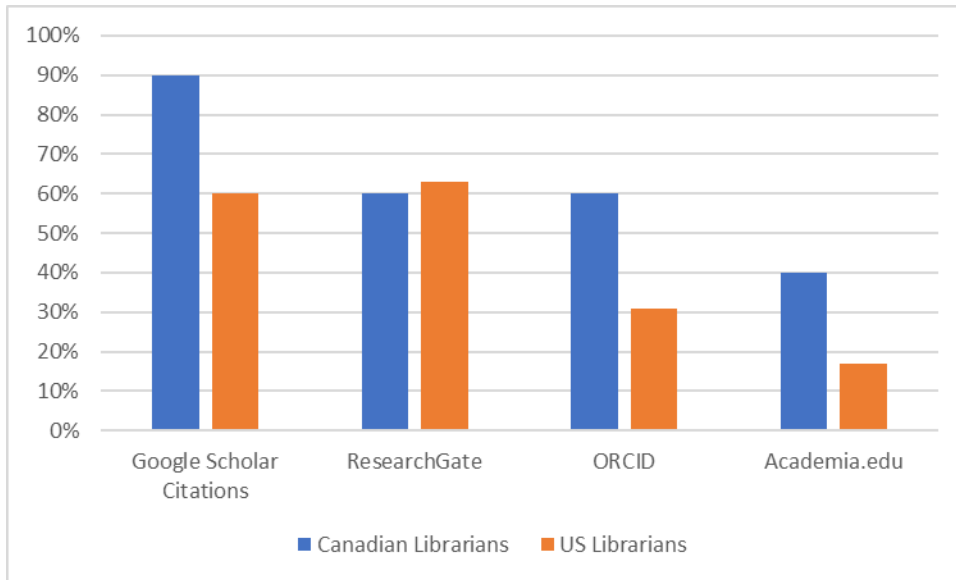Figure 2. Number of librarians who have established a profile on APW

Figure 3. Comparison of presence rate on each APW of Canadian and US librarians
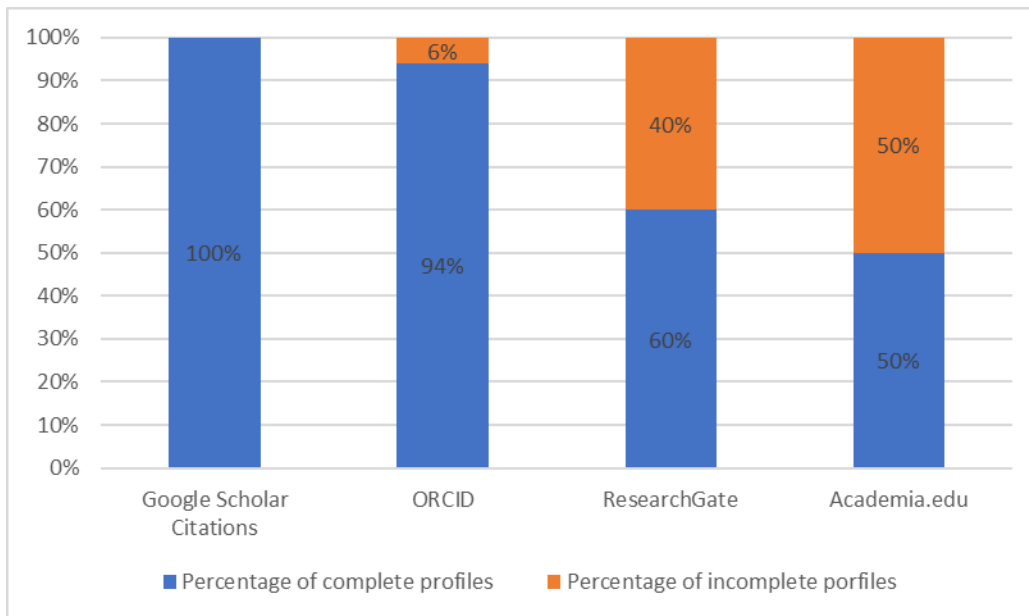

Figure 4. Percentage of complete and incomplete profiles on each APW

Tables

Table 1. Data collected from APWs for each STEM librarian at included institutions

APW	Metrics	Social Activities	Usage
Academia.edu	# of publications	Followers Following	Views*
Google Scholar Citations	# of publications Citations *h-index*		
ORCiD	# of publications		
ResearchGate	# of publications Citations *h-index* # of projects RG Score	Followers Following # of questions asked # of questions answered	Reads#

* A view is counted each time when a profile, a publication or any part of the profile is clicked, as defined by academia.edu
\# A read is counted when a publication, a question asked and answered, a project is clicked, as defined by ResearchGate (https://explore.researchgate.net/display/support/Reads)

Table 2. Number of STEM librarians in the 12 ARL university libraries.

Library	# of STEM Librarians
Indiana University Bloomington Libraries	3
McGill University Library (Canada)	6
New York University Libraries	5
Ohio University Libraries	2
Penn State University Libraries	8
Texas Tech University Libraries	3
The University of Utah J. Willard Marriott Library	8
University of Cincinnati Libraries	3
University of Kentucky Libraries	3
University of Saskatchewan Library (Canada)	4
University of South Carolina Libraries	2
Virginia Tech University Libraries	7
Total	54

Table 3. Number of profiles maintained by individual librarians in the sample

	One Profile	Two Profiles	Three Profiles	Four Profiles
# of librarians	20	15	5	5

Table 4. Average number of publications, citations, and *h-index* listed on each APW (where applicable)

APW	Average # of publications	Average of Total citations	*h-index*
Google Scholar Citations	23	219	4.2
ORCiD	13	N/A	N/A
ResearchGate	10	186	3.59
academia.edu	6	N/A	N/A

Table 5. Following, Follower, and Views on ResearchGate and academia.edu

APW	Total profiles	# of Librarians NOT following others	Median of # of Following for those librarians who are following at least one person	# of librarians with NO follower	Median of # of followers for those librarians who has at least one follower	Median of Reads/Views
ResearchGate	28	10	19.5	8	9.5	276
academia.edu	10	2	3	2	6	42

Table 6. Correlation between RG Score and # of publication, citations, and other variables provided by ResearchGate (RG)

	RG Score	RG # of publications	RG Citations	RG *h-index*	RG Following	RG Followers	RG Reads
RG Score	1						
RG # of Publications	0.94	1					
RG Citations	0.90	0.87	1				
RG h-index	0.92	0.89	0.97	1			
RG Following	0.13	0.25	0.04	-0.01	1		
RG Followers	0.51	0.57	0.42	0.40	0.86	1	
RG Reads	0.85	0.88	0.96	0.96	0.05	0.44	1