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Supporting Scholars: An Analysis of Academic Library Websites' Documentation on Metrics and Impact

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ABSTRACT

A number of indicators and metrics have been devised, especially in the past 10 to 15 years, to assist scholars in making a case for themselves and for their work. These metrics describe the impact of traditional venues (i.e. scholarly journals) as well as the impact of the scholars based on the number of times their work has been cited in traditional and nontraditional venues. Academic librarians assist faculty in explaining their impact and productivity in their respective fields in part through information published to their websites. Terms/concepts associated with common metrics relating to scholarly impact were searched in the library websites of the 62 Association of American University (AAU) members. A total of 61 libraries had web pages or LibGuides providing information on these topics, with *Journal Citation Reports* and the Impact Factor being the most commonly discussed (100%; 98.4%). Slightly over 90% (90.2%) supplied information about the h-index and 80.3% addressed altmetrics. We conclude that AAU librarians are assisting with the understanding and use of both traditional and new metrics as part of their service to their community of users.

INTRODUCTION

As universities find themselves under increasing pressure to quantify the value of the work that their scholars produce, metrics for the venues in which scholars publish and the impact of scholarly work are needed. A number of indicators and metrics have been devised, especially in the past 10 to 15 years, to assist faculty in making a case for themselves and for their opus. These metrics describe the impact of traditional venues (i.e. scholarly journals) as well as the productivity and impact of the faculty themselves based on the number of times their work has been cited in scholarly publishing venues. Alternative metrics have also been proposed that are sensitive to the scholarly conversation beyond traditional journals (National Information Standards Organization, 2014).

As part of their missions, academic libraries support faculty and their scholarly endeavors. In particular, academic librarians assist faculty in explaining their impact and productivity in their respective fields, including during particular stages in their careers whether they are seeking tenure, promotion, funding, or employment. Academic libraries and librarians often provide both the guidance and resources to meet their scholars' needs.

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THE ASSOCIATION OF AMERICAN UNIVERSITIES

The Association of American Universities (AAU) (http://www.aau.edu/) is a group of 62 prestigious universities, 60 of which are located in the United States (About AAU, 2014). Universities are invited to join the AAU based on the high quality of their programs at the undergraduate, graduate and professional level, "as well as general recognition that a university is outstanding by reason of the excellence of its research and education programs" (AAU Membership, 2014, para. 2). The AAU Membership Committee evaluates the research and education profiles of its members and potential members (AAU Membership, 2014) and productivity of an institution's scholars is one way that quality can be assessed. Citations are a component of this productivity assessment, and the citations currently used by the AAU to compare member universities are prepared by a single company, Thomson Reuters (AAU Membership Indicators, 2012), owners of InCites™, ISI Web of Science, the *Journal Citation Reports* (JCR), and the author-disambiguating ResearcherID. Libraries at AAU institutions, therefore, will likely want to support faculty and their administrators in understanding how a scholar's work is represented using the Thomson Reuters metrics and with other metrics that might be better-suited to represent their impact depending on a faculty member's discipline and stage in his or her career.

The AAU is not the only group interested in comparing universities with the intent of ascertaining excellence. Other accrediting bodies including higher education accreditation and program-based accreditation may prefer to use resources other than the Thomson Reuters products to compare productivity metrics. University ranking organizations may use

citation metrics from differing data sources. For example, the QS World University Rankings include data from Elsevier's Scopus database while the Times Higher Education (THE) World University Rankings includes citation data from Web of Science (QS Staff Writer, 2014; TES Global Ltd., 2015). These same data sources used for institutional-level productivity assessments, along with others provided by libraries, play a role in the assessment of individual scholars. In an environment of assessment of productivity as a way of establishing excellence, librarians find themselves in a position of supporting faculty who potentially need to understand how their work is considered in a number of different systems and using a variety of metrics.

RESEARCH QUESTION

Through an investigation of AAU library websites, this study seeks to address the following research question and sub-question:

- To what extent are AAU library websites promoting traditional and non-traditional metrics and tools to demonstrate a scholar's impact?
- What conclusions can we draw about this information?

Understanding which metrics exist and which are being used in evaluations is important to faculty and administrators, especially during the assessment that is part of the promotion and tenure process. As partners in this process, the campus library stands as a place of primary importance for education on matters relating to scholarly communication in general and bibliometrics in particular (Herther, 2009). Its work informing the campus community of the various metrics used to evaluate impact dovetails with this mission of service to the campus community. Faculty should be able to rely on the library for assistance in understanding how administrators may view them, and in learning about new metrics that might be more able to present their productivity and impact in a way appropriate to their career stages and respective disciplines.

REVIEW OF THE LITERATURE

We begin this review of the literature by describing some of the major metrics used for assessing impact — those relative to the peer-reviewed journals in which scholars publish. Next, we present impact metrics for scholars based on scholarly work in both traditional and non-traditional venues. Tools used to calculate these metrics followed by methods of disambiguating scholars through unique identifiers are then presented. Finally, we provide an overview of the work of academic librarians in supporting the knowledge and understanding of the metrics and tools described. In this final section, we focus in particular on web-based resources created by librarians.

JOURNAL RANKING METRICS

The impact of the journal in which the scholar publishes has long been used as a proxy for the impact of the scholar's work. Building on a method first developed by Gross & Gross (1927), Garfield and Sher developed the Journal Impact Factor, or Impact Factor, in the 1960s as a tool for selecting journals for indexing (Archambault & Larivière, 2009; Garfield, 1972, 1999). Calculating the Journal Impact Factor is relatively straightforward; it is the number of citations in the current year to any items published in the journal in the previous two years divided by the number of substantive articles published by the journal in the previous two years (Garfield, 1999). The Journal Impact Factor, the archetypal metric of research quality, is still frequently used by academic scholars and institutions, and the *Journal Citation Reports* (JCR), officially launched in 1975, is the official source for this metric (Bensman, 2007; Garfield, 1999, 2007). Criticisms of the Journal Impact Factor are a key component of the San Francisco Declaration on Research Assessment (DORA) and include that the Impact Factor can be manipulated by journal editors and that the data are not available to the public (American Society for Cell Biology, 2012). Critics also note that the skewed distribution of citations calls into question the ability of the Journal Impact Factor to reflect the impact of an individual article, and discipline-dependent citation patterns make it difficult to compare across fields (Bladek, 2014).

Several additional journal-ranking metrics have been created in the past 10 years. The Eigenfactor score, from 2007, ranks journals by weighting citations using algorithms similar to those used by Google to rank webpages; it relies on data from Thomson Reuters (Bergstrom, 2007). SCImago Journal Rank, from 2008, takes a similar approach, applying the Google PageRank algorithm to data from the Scopus database (Falagas, Kouranos, Arencibia-Jorge, & Karageorgopoulos, 2008). Finally, Source Normalized Impact per Paper (SNIP), developed in 2010 and modified in 2013, uses data from Scopus and attempts to compensate for the varying citation behaviors in different research fields in its journal ranking process (Moed, 2010, 2011; Waltman, van Eck, van Leeuwen, & Visser, 2013). Newer journal metrics like Eigenfactor, SCImago Journal Rank, and SNIP try to address some of the criticisms of the Journal Impact Factor and provide alternatives for scholars to consider (Bergstrom, 2007; Bornmann, Marx, Gasparyan & Kitas, 2012; Falagas, Kouranos, Arencibia-Jorge, & Karageorgopoulos, 2008; Leydesdorff & Opthof, 2010; Moed, 2011).

IMPACT METRICS FOR SCHOLARS

In the past ten years, interest in metrics has broadened from the quality of the journal to focus on the scholar him- or herself. The most well-known metric for scholars is the *h-index*. The h-index was proposed by Hirsch (2005) as a "particularly simple and useful way to characterize the scientific output of a researcher" and is defined as "index h if h of his or her Np papers have at least h citations each and the other (Np-h) papers have ≤h citations each" (p. 16,569). In other words, a scholar who has written five papers, each of which have been cited twice, would have an h-index of 2 (two papers have been cited at least twice); once three of the papers are cited at least three times, the h-index will increase to three. As with the Journal Impact Factor, several disadvantages of the h-index have been identified, including its dependence on the career length of the scholar, its lack of sensitivity to highly-cited papers, its inability to account for group-authorship, and its field-specific dependence, among others (Bornmann, Mutz, Hug, & Daniel, 2011).

The h-index has served as a point of departure for other metrics based on a scholar's publications and citations that seek to address the weaknesses of the h-index. Hirsch (2005), in the same paper where the h-index is presented, even suggested a variant of the h-index that would compensate for differing career lengths when comparing scholars. The *m-quotient* is calculated by dividing the h-index by the number of years since the scholar's first publication was published; it can be easily calculated from the h-index, using the publication date of the scholar's first publication. Bornmann, Mutz, & Daniel (2008) later proposed the *m-index*, a metric whose calculation is distinct from the m-quotient proposed by Hirsch (Bornmann, Mutz, & Daniel, 2008; Bornmann, Mutz, Hug, & Daniel, 2011). The m-index is the median number of citations received by papers ranking smaller than or equal to h, and is designed to evaluate the impact of the scholar's core, rather than adjusting for a scholar's career length (Bornmann, Mutz, & Daniel, 2008). The similarity in the names of the m-quotient and the m-index and the in-depth knowledge required to differentiate these two metrics may potentially lead to confusion both for librarians and faculty.

The expansion of the h-index did not stop with the m-quotient and m-index. Shortly after Hirsch's introduction of the h-index and m-quotient, Egghe (2006) proposed the *g-index*: "a set of papers has a g-index g if g is the highest rank such that the top g papers have, together, at least g^2 citations" (p. 132). The g-index addresses the h-index's lack of sensitivity to highly cited works by placing more weight on a scholar's highly cited articles. Additional variants of the h-index continue to be

developed and evaluated, both for individuals and for groups of scholars (see the following for more thorough review of these variants: Alonso, Cabrerizo, Herrera-Viedma, & Herrera, 2009; Bornmann, Mutz, & Daniel, 2008; Bornmann, Mutz, Hug, & Daniel, 2011).

ALTERNATIVE METRICS FOR DOCUMENTING IMPACT

Altmetrics, a term originated by Jason Priem in 2010 and currently associated with both alternative metrics and article-level metrics, are emerging metrics that can be used by scholars to supplement more traditional metrics (National Information Standards Organization, 2014). Traditional metrics do not capture the scholar's impact beyond standard journal articles, especially on the social web (Piwowar & Priem, 2013), meaning that for some scholars, their productivity and influence is not captured through traditional metrics. Altmetrics can include page views, downloads, saves to reference managers, discussions in blogs and mainstream news outlets, mentions on social media platforms like Facebook, LinkedIn, and Twitter, and favorites on Slideshare or YouTube, among others. These metrics can also capture the impact of a broader range of scholarly products beyond the journal article, such as research datasets (National Information Standards Organization, 2014).

Information science researchers have begun to evaluate correlations between these emerging metrics and more traditional citation counts. Mendeley is a free reference manager and academic social network (https://www.mendeley.com/) and Mendeley readership counts, where a user saves an article to a Mendeley account, have so far been shown to have the highest correlations with citations (Mohammadi & Thelwall, 2014; Zahedi, Costas, & Wouters, 2014). Correlations between activity on Twitter (tweets) and citations have been lower (Haustein, Peters, Sugimoto, Thelwall, & Larivière, 2014). Thelwall, Haustein, Larivière, & Sugimoto (2013) evaluated PubMed articles and found associations between higher citations and activity on blogs, mainstream media, Facebook and Twitter. The authors state that activity of all altmetrics except Twitter were so low "it is not clear if they are prevalent enough to be useful in practice" (Thelwall, Haustein, Larivière, & Sugimoto, 2013, p. e64841). While correlations to traditional metrics may not yet be clearly established, alternative metrics also represent an opportunity for scholars to demonstrate attention to their work outside the scholarly community, which is not possible with traditional metrics (National Information Standards Organization, 2014).

TOOLS FOR ASSESSMENT

A number of online resources are available to assist scholars in demonstrating their effectiveness, through the use of online calculators and other resources. Impact Factors are available with a subscription to *Journal Citation Reports*. Eigenfactor values are also accessible in JCR and freely available from the Eigenfactor Project (http://www.eigenfactor.org/). SCImago Journal Rank and SNIP values are freely available online (http://www.journalmetrics.com/) and also found within Scopus.

The h-index is calculated by the previously mentioned subscription bibliographic databases Web of Science and Scopus, and is provided by Google Scholar (http://scholar.google.com) through its Google Scholar Citations product to scholars with profiles. It can also be calculated by Harzing's Publish or Perish (http://www.harzing.com/pop.htm), a free tool to help scholars calculate impact based on entries in Google Scholar or Microsoft Academic Search (http://academic.research.microsoft.com/). Unlike Web of Science and Scopus, Publish or Perish is not subscription-based.

Three commonly referenced altmetrics tools are Impactstory, Altmetric.com, and Plum Analytics's PlumX. The tools aggregate altmetrics data related to scholarly work products and provide context. Impactstory (https://impactstory.org/) is a subscription, nonprofit service based on open source software. Impactstory primarily focuses on subscriptions to individual scholars and the company does not have an institutional subscription option at this time. Altmetric.com (http://www.altmetric.com/) provides a free browser bookmarklet that individual scholars can use to see the altmetrics for an individual article. Their institutional platform, Altmetrics for Institutions, allows users to collect altmetrics data on groups of publications or scholars, but requires a subscription. Altmetrics.com also markets directly to publishers, who are able to embed the altmetrics data feed on their website; Scopus has added this to their interface. Plum Analytics (http://www.plumanalytics.com/), a third alternative metrics resource, is an EBSCO Company. Their tool, PlumX, is only available through an institutional subscription, not to individual scholars. PlumX, similar to Altmetrics for Institutions, allows users to collect altmetrics data on journal articles. The PlumX platform can also track other types of scholarly output, including books and videos.

SCHOLARLY IDENTIFIER SYSTEMS

Scholarly identifier systems are other tools that have become more critical to successful evaluations of productivity and impact both for individual authors and institutions, by helping to ensure scholarly work is correctly attributed to the scholar. One author identifier system, ResearcherID, is a product of Thomson Reuters and has been freely available to the researcher community since 2007 and has over 300,000 members (Rotenberg & Kushmerick, 2011; Thomson Reuters, 2014). ResearcherID helps to ensure that scholarly work identified within the Thomson Reuters' environment is properly attributed to the scholar and institution. The Open Researcher and Contributor ID (ORCID, pronounced like the flower) initiative began in 2009, using code from ResearcherID licensed from Thomson Reuters (Fenner, Garcia Gomez, & Thorrison, 2011). Incorporated as a non-profit in 2010, ORCID's mission is to provide "a central registry of unique identifiers for individual researchers and open and transparent linking mechanisms between ORCID and other current research identifier schemes" (ORCID, nd, para. 1). ORCID is funded by grants and membership fees charged to participating organizations who wish to integrate ORCID into their systems, including publishers, research organizations, higher education institutions, and research funders. Individual scholars can register, maintain and share their own ORCID ID for free and the ORCID registry now has over one million members (Haak, 2014; Haak, Fenner, Paglione, Pentz, & Ratner, 2012). Unlike other identifiers, ORCID IDs are not proprietary nor are they limited by discipline or geography (Haak, Fenner, Paglione, Pentz, & Ratner, 2012).

ACADEMIC LIBRARIES' SUPPORT FOR FACULTY

Librarians are experts in scholarly communications, and can provide information to scholars related to bibliometrics, citation analysis and altmetrics as part of their missions to support information needs specific to faculty members and graduate students (Corrall, Kennan, & Afzal, 2013; Hendrix, 2010; Lapinski, Piwowar, & Priem, 2013). Herther (2009) comments that the "traditional role that librarians have played with citation information has been similar to support provided for other types of databases or reference needs", focusing on workshops and offering assistance on request to users (p. 368). Herther (2009) calls on librarians to work closely with users to provide their perspectives on the meaning of Journal Impact Factors, h-index and other metrics of impact. With the development and interest in altmetrics, Roemer & Borchardt (2013) have called for libraries "to continue to provide accurate and appropriate altmetrics information for faculty" (p. 18) in addition to educating administrators regarding the use and limitations of altmetric data. Lapinski, Piwowar, & Priem (2013) suggest librarians familiarize themselves with the altmetrics literature, understand the tools, and integrate altmetrics into library outreach and education, saying librarians "need to make researchers aware of the choices that are available to them in evaluating the impact of scholarship, and the relevant research, helping them make informed choices" (p. 294).

One way that libraries communicate with their patrons is through their websites. Accordingly, library websites have been evaluated to

see how they are being used to communicate messages to stakeholders. Salisbury & Griffis (2014) reviewed the presence and accessibility of library mission statements on the websites of Association of Research Libraries (ARL) member libraries and found that 84% had their mission statement accessible. Library websites have also been evaluated to detect trends and adoption of Web 2.0 technologies; Rod-Welch (2012) noted that members of the Association of Research Libraries (ARL) were less likely to have reference and social networking tools on their homepage than other pages of their websites while Boateng & Liu (2014) assessed library websites of the top 100 colleges from US News & World Report 2013 rankings and found that all the libraries had a social networking presence (Facebook and Twitter), with wikis, podcasts and social bookmarking/tagging as the least applied Web 2.0 tools.

LibGuides (http://libguides.com) is a proprietary software product that allows libraries to create pathfinders on specific topics. Pathfinders assist remote patrons with finding web-based or otherwise accessible resources (i.e. those licensed by the university) in certain areas such as an academic discipline or problem relating to library research. Evaluations of library websites and LibGuides have provided information and guidance to other librarians, as in the case of assessment of LibGuides in nursing (Stankus & Parker, 2012), electrical and mechanical engineering (Osorio, 2014) and geology (Dougherty, 2013). Little, Fallon, Dauenhauer, Balzano, & Halquist (2010) successfully collaborated with faculty members to create a LibGuide on research methods to be used by students and faculty in their classes; the guide went on to be near the top of their most popular guides list. Brown (2014) reviewed citation analysis tools available to faculty members for promotion and tenure and created a LibGuide "to provide an easy access point for all faculty" (p. 75). However, based on our search of the literature, students are more typically the target audience for the LibGuide. While Roemer & Borchardt (2013) performed a quick Google search indicating over 100 LibGuides that mentioned the word altmetrics, more detailed information about what resources are found on the library websites or LibGuides of other universities is not available in the literature. This paper aims, in part, to fill that gap.

METHODOLOGY

Between February 28th and March 31st, 2015, the library webpages of all 62 AAU libraries were browsed and searched for a series of keywords related to demonstrating impact in the scholarly communication process. By searching for specific terms, such as "Impact Factor", "h-index", and "altmetrics" or concepts such as finding one's h-index in Scopus, we approximated one way scholars might use the library's website for assistance in finding information about known metrics. A total of 18 terms or concepts were searched during the course of the study. For a list of the terms and concepts, see Appendix A.

If a library being investigated used the LibGuides platform, the LibGuides were searched using the included search box. If the LibGuides search was not implemented or if the library did not use LibGuides, the site search bar available on the library website or a "Google search" of the site was used. Guides covering bibliometrics, citation analysis, scholarly metrics or related concepts were also browsed to identify terms. If a term appeared on the library's website or LibGuides, it was recorded in an Excel spreadsheet.

In some cases, search terms were found on guides for a specific discipline (e.g. Biochemistry), a class (e.g. Graduate Library User Education), or a database (e.g. pathfinder explaining Web of Science or Scopus). For the h-index, a metric that may be difficult to calculate for scholars, we also noted if any resources to assist faculty were included with the presentation of the metric.

One university was excluded from further analysis as none of the search terms were identified during searches of its LibGuides and library website. Results presented, therefore, are for a total of 61 AAU libraries, all of whom supported their faculty's access to library-provided metrics information through the library website.

RESULTS

JOURNAL RANKING METRICS

Journal metrics are ways that scholars can demonstrate the quality of the journals, which represent traditional venues in which they formally publish. When searched in quotes as terms on the 61 AAU libraries' websites, the *Journal Citation Reports* and the Impact Factor were the most frequently found of the journal metrics, being virtually ubiquitous. Newer journal-related metrics such as the Eigenfactor and SCImago Journal Rank appeared in roughly 80% of library websites, with the newest metric, SNIP, appearing in roughly half. See Table 1 for tabular representation of these results.

IMPACT METRICS FOR SCHOLARS

Scholars demonstrating their impact can use a number of metrics to describe their value. The h-index was found on nearly 90% of library websites. Thomson Reuters's Web of Science was the most frequently listed tool to find an author h-index. This is unsurprising in this population of university libraries since the AAU officially makes use of Thomson Reuters' products. Finding one's h-index was the next most frequently discussed in the free-to-use Google Scholar (71% of libraries; n = 43) and then in the subscription product Scopus (48%; n = 29). Offshoots of the h-index include the m-index and the m-quotient. Only 10% of libraries (n = 6) mentioned these metrics, and we note that several of them seem to have misunderstood the idea or used m-quotient and m-index interchangeably, when in fact, the two are different. Many more library websites (41%; n = 25) mentioned the g-index. Altmetrics (or alternative metrics), the next new family of metrics after the h-index and its derivatives are mentioned on 80% (n = 49) of websites. See Table 2 for a tabular representation of these metrics, sorted by date introduced.

TOOLS FOR ASSESSMENT

Of the tools searched, one supporting standard metrics and one supporting alternative metrics were most popular. Sixty-six percent (n = 41) of websites mentioned Publish or Perish. Of the tools for demonstrating alternative metrics, Impactstory (66% n = 41) was more frequently identified than Altmetric.com (59% n = 36) and Plum Analytics (44% n = 27). To assist academic libraries, Impactstory, created two LibGuides on altmetrics, one for researchers and one for librarians. The LibGuides were first unveiled on the Impactstory Blog on January 28, 2015, but had been taken down with only their contents preserved by March 19 of the same year (Konkiel, 2015). The availability of the Impactstory LibGuide during the period of data collection did not appear to have influenced the results of the current study, as only one institution in the study acknowledged modifying content from the Impactstory LibGuide. Plum Analytics, the least frequent of the altmetrics tools, may

Table 1
Journal metrics.

No.	Journal metrics	Year introduced	Libraries (n = 61)	Percentage mentioning
1	Journal Citation Reports	1975	61	100.0
2	Impact Factor	1972	60	98.4
3	Eigenfactor	2007	51	83.6
4	SCImago Journal Rank	2008	47	77.0
5	Source Normalized Impact per Paper (SNIP)	2010	32	52.5

Table 2
Metrics for scholars, by year introduced.

No.	Metrics for scholars	Year introduced	Libraries (n = 61)	Percentage mentioning
6	h-index	2005	55	90.2
7	in Web of Science		50	82.0
8	in Google Scholar		43	70.5
9	in Scopus		29	47.5
10	m-quotient/m-index	2005/2008	6	9.8
11	g-index	2006	25	41.0
12	Altmetrics or alternative metrics	2010	49	80.3

reflect the fact that this tool is not available to individual scholars unless their institution subscribes. See Table 3 for the percentage of libraries mentioning the tools under study.

SCHOLARLY IDENTIFIER SYSTEMS

The free resource ORCID (82%; n = 50) was listed more frequently on AAU library sites than the Thomson Reuters ResearcherID (69%; n = 42). These results are resumed in Table 4, below.

UNIVERSITY LIBRARIES AND METRICS

Finally, of the library websites searched, only two of the 61 libraries listed all 18 terms. As mentioned, the library with no information for patrons about metrics and impact was excluded from study. The mean number of terms found was 12.1, and the median and the mode were both 13; 9 library websites investigated had 13 of the terms. For specifics on how many libraries listed the terms, please see Fig. 1.

DISCUSSION

Based on our analysis of the literature and the results of our study, we now consider our research question regarding the promotion of traditional and non-traditional metrics on library websites.

MAINSTREAM ADOPTION OF METRICS

Across the board, newer metrics were less commonly discussed on AAU library websites than older, more widely-known metrics. JCR and its Impact Factor are virtually synonymous with journal-related metrics among this group of libraries. Less interest has been paid to the newer journal metrics, although the reasons for this were not investigated in this study. Part of the interest in the JCR and in the Impact Factor may relate to their use, as Thomson Reuters products, by the AAU membership.

When compared to the Journal Impact Factor, the h-index is a relatively new metric yet it was found the next most frequently, which may suggest that its use has been adopted by libraries and scholars of AAU institutions. Variants of the h-index are less commonly mentioned which may be due to the lack of adoption by the community. Even though the m-quotient is recommended in Hirsch's (2005) paper for junior scholars, it is slightly more difficult to calculate than the h-index and may be inferior to other methods for junior faculty to describe their impact overall. Web of Science and Scopus do not currently offer g-index calculations, but Harzing's Publish or Perish can calculate the g-index based on information from Google Scholar. The lack of an automatic calculation for these h-index variants in the commercial databases Web of Science and Scopus may be another reason they are less frequently found as this may make it more challenging or time-consuming for librarians and faculty to calculate them.

Table 3
Tools for assessment

No.	Tool	Standard or alternative metrics	Libraries (n = 61)	Percentage mentioning
13	harzing.com's Publish or Perish	Standard	40	65.6
14	Impactstory	Alternative	40	65.6
15	Altmetric.com/Altmetric	Alternative	36	59.0
16	Plum Analytics/PlumX	Alternative	27	44.3

Table 4
Scholarly identifier systems.

No.	Scholarly identifier	Libraries (n = 61)	Percentage mentioning
17	ORCID	50	82.0
18	ResearcherID	42	68.9

Despite its relative newness, the term altmetrics and its related resources were found at fairly high rates. We can infer that there must be a market for such metrics among certain scholars at AAU institutions, and that this market extends beyond the products offered by Thomson Reuters. Interest is solidly placed on altmetrics, perhaps because junior scholars are more interested in demonstrating a more robust view of their impact in alternative publishing venues. Faculty working heavily in new media venues may prefer to demonstrate their impact through the use of altmetrics instead of competing through more traditional metrics that are unable to capture their impact. Additionally, altmetrics may better support faculty members from non-STEM disciplines (Roemer & Borchardt, 2013) and may enable libraries to better serve their diverse scholarly communities. The interest in altmetrics from librarians may also suggest support for criticisms of the Journal Impact Factor as discussed in DORA, even though few AAU institutions have signed the declaration.

In terms of unique identifiers, ORCID's prevalence over the Thomson Reuters ResearcherID was surprising as it is newer and AAU institutions have chosen to make extensive use of the Thomson Reuters products. However, ORCID is a non-proprietary system and has been adopted by more publishers and other platforms. Therefore, it may be advisable to focus attention on the more universal identifier of the two.

POTENTIAL SCHOLAR–LIBRARY PARTNERSHIPS

Given the current environment of quantifying scholarly contributions, now is the time for librarians to support scholars at their institutions. Librarians must continue to support the more traditional metrics such as the JCR and Impact Factor, since these metrics are still being used by their institutions and scholars. In support of early-career scholars and more inclusive narratives of institutional and scholarly impact, however, librarians should continue to respond to the call of Lapinski, Piwowar, & Priem (2013) to learn about and potentially, subsequently, promote the use of specialized metrics and methods that will better explain their contributions and productivity.

LIMITATIONS AND FUTURE STUDY

In this study of AAU library websites, we did not survey librarians or scholars directly or obtain the usage statistics of the sites; we can only infer potential patron demand for these topics based on information on their websites and LibGuides. We did not assess the usability of the sites nor the quality of the guidance provided, two factors that potentially contribute to the utility of the information to the academic community. We searched and reviewed LibGuides and websites over a single timeframe and for a limited set of terms in this area. Future work may expand upon our list, seeking, for example, to investigate

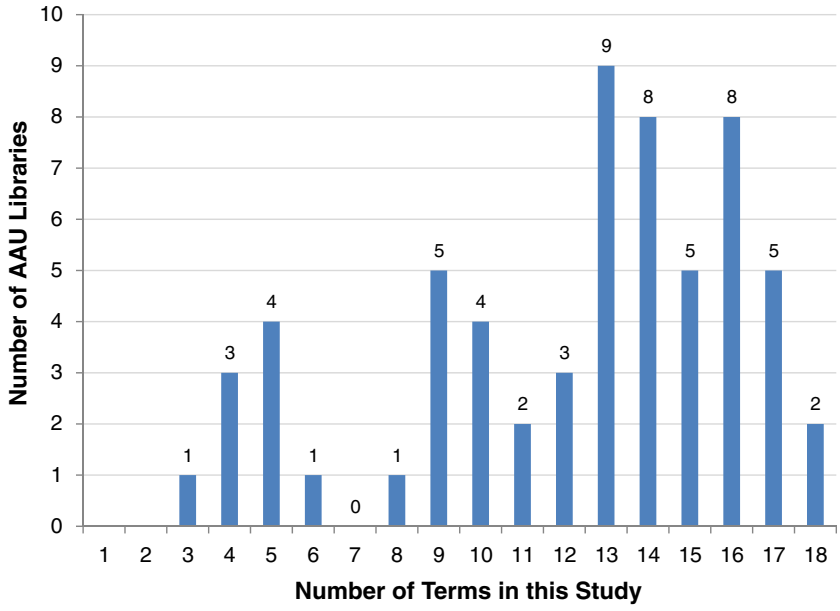

Fig. 1. Number of libraries including the eighteen terms reported in these results.

social, web-based resources for scholars such as ResearchGate and Academia.edu. Future work might also compare the frequency of these terms at other institutions outside of the AAU.

CONCLUSION

Academic libraries have an essential role to play in scholars' understanding of the metrics used to describe their work. In the current study, we investigate the library websites of the AAU academic libraries, seeking to understand the extent to which they are promoting metrics to assist scholars in documenting their impact. We find extensive reference to the *Journal Citation Reports* and its long-standing metric, the Journal Impact Factor. Additionally, we find metrics to assist faculty in understanding how their traditional work is being cited, such as the h-index. We also find that librarians are providing information to their communities about altmetrics and scholarly identifiers. We observe that the more long-standing and institutionally-relevant metrics are more often promoted on library websites, and we find that altmetrics may also be promoted, potentially supporting junior faculty or those in non-STEM disciplines.

In light of these results, we conclude that librarians are providing support for their institutions' faculty through curated online resources, providing faculty with a number of tools and metrics with which to appropriately demonstrate the extent of their impact. Librarians should continue to support the use and understanding of the more traditional metrics such as the JCR and Impact Factor since these metrics are used by their institutions. However, librarians should also continue to promote the use of specialized metrics and methods that will better explain non-traditional scholarly contributions and productivity.

Through our review of the literature, we have shown that the area of scholarly metrics is in flux; librarians face the daunting task of supporting their scholars' use of traditional metrics and resources while keeping up and encouraging the use of emerging metrics as appropriate. Based on our results, it appears that the librarians in the AAU are rising to this challenge through the creation and maintenance of targeted online resources for their communities.

APPENDIX A. TERMS/CONCEPTS SEARCHED IN THE STUDY

No.	Terms and concepts searched
1	"Journal Citation Reports"
2	"Impact Factor"
3	"Eigenfactor"
4	"SJR" OR "Scimago" Journal Rank
5	"SNIP" OR "Source Normalized Impact Per Paper"
6	"h-index"
7	how to find your h-index in Web of Science
8	how to find your h-index with Google Scholar
9	how to find your h-index in Scopus
10	"m-index" OR "m-quotient"
11	"g-index"
12	"altmetrics" OR "alternative metrics"
13	Harzing's Publish or Perish
14	Impactstory
15	Altmetric.com OR Altmetric
16	"Plum Analytics" OR "PlumX"
17	ORCID
18	ResearcherID

References

AAU Membership (2014). Retrieved April 24, 2015, from https://www.aau.edu/about/default.aspx?id=4020

AAU Membership Indicators (2012). Retrieved April 24, 2015, from https://www.aau.edu/WorkArea/DownloadAsset.aspx?id=10972

About AAU (2014). Retrieved April 24, 2015, from https://www.aau.edu/about/default.aspx?id=58

Alonso, S., Cabrerizo, F. J., Herrera-Viedma, E., & Herrera, F. (2009). h-Index: A review focused in its variants, computation and standardization for different scientific fields. *Journal of Informetrics*, *3*(4), 273–289. http://dx.doi.org/10.1016/j.joi.2009.04.001.

American Society for Cell Biology (2012). San Francisco Declaration on Research Assessment. Retrieved April 23, 2015, from http://ar.ascb.org/sfdora.html

Archambault, E., & Larivière, V. (2009). History of the journal impact factor: Contingencies and consequences. *Scientometrics*, *79*(3), 635–649. http://dx.doi.org/10.1007/s11192-007-2036-x.

Bensman, S. J. (2007). Garfield and the impact factor. *Annual Review of Information Science and Technology*, *41*(1), 93–155. http://dx.doi.org/10.1002/aris.2007.1440410110.

Bergstrom, C. (2007). Eigenfactor: Measuring the value and prestige of scholarly journals. *College & Research Libraries News*, *68*(5), 314–316.

Bladek, M. (2014). DORA: San Francisco Declaration on Research Assessment (May 2013). *College & Research Libraries News*, *75*(4), 191–196.

Boateng, F., & Liu, Y. Q. (2014). Web 2.0 applications' usage and trends in top US academic libraries. *Library Hi Tech.*, *32*(1), 120–138.
Bornmann, L., Marx, W., Gasparyan, A. Y., & Kitas, G. D. (2012). Diversity, value and limitations of the journal impact factor and alternative metrics. *Rheumatology International*, *32*(7), 1861–1867.
Bornmann, L., Mutz, R., & Daniel, H. -D. (2008). Are there better indices for evaluation purposes than the h index? A comparison of nine different variants of the h index using data from biomedicine. *Journal of the American Society for Information Science and Technology*, *59*(5), 830–837. http://dx.doi.org/10.1002/asi.20806.
Bornmann, L., Mutz, R., Hug, S. E., & Daniel, H. -D. (2011). A multilevel meta-analysis of studies reporting correlations between the h index and 37 different h index variants. *Journal of Informetrics*, *5*(3), 346–359. http://dx.doi.org/10.1016/j.joi.2011.01.006.
Brown, J. D. (2014). Citation searching for tenure and promotion: An overview of issues and tools. *Reference Services Review*, *42*(1), 70–89.
Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and research data management services: Emerging trends in library support for research. *Library Trends*, *61*(3), 636–674. http://dx.doi.org/10.1353/lib.2013.0005.
Dougherty, K. (2013). Getting to the core of geology LibGuides. *Science and Technology Libraries*, *32*(2), 145–159.
Egghe, L. (2006). Theory and practise of the g-index. *Scientometrics*, *69*(1), 131–152. http://dx.doi.org/10.1007/s11192-006-0144-7.
Falagas, M. E., Kouranos, V. D., Arencibia-Jorge, R., & Karageorgopoulos, D. E. (2008). Comparison of SCImago journal rank indicator with journal impact factor. *The FASEB Journal*, *22*(8), 2623–2628. http://dx.doi.org/10.1096/fj.08-107938.
Fenner, M., Garcia Gomez, C., & Thorrison, G. A. (2011). Collective action for the Open Researcher & Contributor ID (ORCID). *Serials*, *24*(3), 277–279. http://dx.doi.org/10.1629/24277.
Garfield, E. (1972). Citation analysis as a tool in journal evaluation. *Science*, *178*(4060), 471–479. http://dx.doi.org/10.2307/1735096.
Garfield, E. (1999). Journal impact factor: A brief review. *Canadian Medical Association Journal*, *161*(8), 979–980.
Garfield, E. (2007). The evolution of the Science Citation Index. *International Microbiology*, *10*, 65–69. http://dx.doi.org/10.2436/20.1501.01.10.
Gross, P. L. K., & Gross, E. M. (1927). College libraries and chemical education. *Science*, *66*(1713), 385–389. http://dx.doi.org/10.2307/1651803.
Haak, L. L. (2014). 1 million ORCID identifiers! Retrieved April 18, 2015, from http://orcid.org/blog/2014/11/17/1-million-orcid-identifiers
Haak, L. L., Fenner, M., Paglione, L., Pentz, E., & Ratner, H. (2012). ORCID: a system to uniquely identify researchers. *Learned Publishing*, *25*(4), 259–264. http://dx.doi.org/10.1087/20120404.
Haustein, S., Peters, I., Sugimoto, C. R., Thelwall, M., & Larivière, V. (2014). Tweeting biomedicine: An analysis of tweets and citations in the biomedical literature. *Journal of the Association for Information Science and Technology*, *65*(4), 656–669. http://dx.doi.org/10.1002/asi.23101.
Hendrix, D. (2010). Tenure metrics: Bibliometric education and services for academic faculty. *Medical Reference Services Quarterly*, *29*(2), 183–189.
Herther, N. K. (2009). Research evaluation and citation analysis: Key issues and implications. *Electronic Library*, *27*(3), 361–375.
Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences of the United States of America*, *102*(46), 16569–16572. http://dx.doi.org/10.1073/pnas.0507655102.
Konkiel, S. (2015). Steal these altmetrics LibGuides! Retrieved April 18, 2015, from http://blog.impactstory.org/steal-altmetrics-libguide/
Lapinski, S., Piwowar, H., & Priem, J. (2013). Riding the crest of the altmetrics wave: How librarians can help prepare faculty for the next generation of research impact metrics. *College & Research Libraries News*, *74*(6), 292–300.
Leydesdorff, L., & Opthof, T. (2010). Scopus's source normalized impact per paper (SNIP) versus a journal impact factor based on fractional counting of citations. *Journal of the Society for Information Science & Technology*, *61*(11), 2365–2369.
Little, J. J., Fallon, M., Dauenhauer, J., Balzano, B., & Halquist, D. (2010). Interdisciplinary collaboration: A faculty learning community creates a comprehensive LibGuide. *Reference Services Review*, *38*(3), 431–444. http://dx.doi.org/10.1108/00907321011070919.
Moed, H. F. (2010). Measuring contextual citation impact of scientific journals. *Journal of Informetrics*, *4*(3), 265–277. http://dx.doi.org/10.1016/j.joi.2010.01.002.
Moed, H. F. (2011). The source normalized impact per paper is a valid and sophisticated indicator of journal citation impact. *Journal of the American Society for Information Science and Technology*, *62*(1), 211–213. http://dx.doi.org/10.1002/asi.21424.
Mohammadi, E., & Thelwall, M. (2014). Mendeley readership altmetrics for the social sciences and humanities: Research evaluation and knowledge flows. *Journal of the Association for Information Science and Technology*, *65*(8), 1627–1638. http://dx.doi.org/10.1002/asi.23071.
National Information Standards Organization (2014). *NISO Altmetrics initiative phase 1 white paper*. Retrieved April 27, 2015, from http://www.niso.org/apps/group_public/document.php?document_id=13809&wg_abbrev=altmetrics.
ORCID. (nd). Our mission. Retrieved April 18, 2015, from http://orcid.org/content/mission-statement
Osorio, N. L. (2014). Content analysis of engineering LibGuides. *Paper presented at the ASEE Annual Conference and Exposition, Conference Proceedings*.
Piwowar, H., & Priem, J. (2013). The power of altmetrics on a CV. *Bulletin of the Society for Information Science and Technology (Online)*, *39*(4), 10–13.
QS Staff Writer (2014). QS World university rankings: Methodology. Retrieved April 27, 2015, from http://www.topuniversities.com/university-rankings-articles/world-university-rankings/qs-world-university-rankings-methodology
Rod-Welch, L. J. (2012). Incorporation and visibility of reference and social networking tools on ARL member libraries' websites. *Reference Services Review*, *40*(1), 138–171.
Roemer, R. C., & Borchardt, R. (2013). Institutional altmetrics & academic libraries. *Information Standards Quarterly*, *25*, 14–19.
Rotenberg, E., & Kushmerick, A. (2011). The author challenge: Identification of self in the scholarly literature. *Cataloging and Classification Quarterly*, *49*(6), 503–520. http://dx.doi.org/10.1080/01639374.2011.606405.
Salisbury, P., & Griffis, M. R. (2014). Academic library mission statements, web sites, and communicating purpose. *The Journal of Academic Librarianship*, *40*, 592–596. http://dx.doi.org/10.1016/j.acalib.2014.07.012.
Stankus, T., & Parker, M. A. (2012). The anatomy of nursing Libguides. *Science and Technology Libraries*, *31*(2), 242–255. http://dx.doi.org/10.1080/0194262X.2012.678222.
TES Global Ltd. (2015). World university rankings 2014–2015 methodology. Retrieved April 27, 2015, from http://www.timeshighereducation.co.uk/world-university-rankings/2014-15/world-ranking/methodology
Thelwall, M., Haustein, S., Larivière, V., & Sugimoto, C. R. (2013). Do altmetrics work? Twitter and ten other social web services. *PloS One*, *8*(5), e64841, http://dx.doi.org/10.1371/journal.pone.0064841.
Thomson Reuters (2014). *ResearcherID fact sheet*. Philadelphia, PA: Thomson Reuters.
Waltman, L., van Eck, N. J., van Leeuwen, T. N., & Visser, M. S. (2013). Some modifications to the SNIP journal impact indicator. *Journal of Informetrics*, *7*(2), 272–285. http://dx.doi.org/10.1016/j.joi.2012.11.011.
Zahedi, Z., Costas, R., & Wouters, P. (2014). How well developed are altmetrics? Cross-disciplinary analysis of the presence of "alternative metrics" in scientific publications. *Scientometrics*, *101*, 1491–1513. http://dx.doi.org/10.1007/s11192-014-1264-0.