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Research Access and Discovery in University News Releases: A Case Study

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INTRODUCTION Many universities promote the peer-reviewed articles of their researchers in online news releases. However, access to the articles by the public can be limited, and information to help find articles is sometimes lacking. This exploratory study quantifies article access, the potential for immediate article archiving, and the presence of discovery aids in news releases at a large research university. **METHODS** A random sample of 120 news releases over an 11-year period were evaluated. **RESULTS** At publication, 33% of the peer-reviewed articles mentioned in news releases were open access. Immediate archiving in the institutional repository has the potential to raise the access rate to 58% of the articles. Discovery aids in news releases included journal titles (96%), hyperlinks (67%), article titles (44%), and full citations (3%). No hyperlink was in the form of a referenceable digital object identifier (DOI). **DISCUSSION** Article availability is greater than published estimates, and could result from the university's STEM focus or self-selection. Delayed access by journals is a significant source of article availability and provides an additional rationale for hyperlinking from news releases. **CONCLUSION** Most articles promoted in the university's news releases cannot be accessed by the public. Access could be significantly increased through immediate archiving in the institutional repository. Facilitating article discovery could increase the credibility and outreach value of news releases.

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IMPLICATIONS FOR PRACTICE

1. Evidence regarding article access in university news releases and the potential for immediate archiving informs the case for establishing an archiving collaboration involving researchers, the news service, and the institutional repository.
2. Libraries could partner with news services in establishing best practices for research discovery, enhancing the outreach value of news releases. Increased hyperlinking has the potential to help readers, enhance news release credibility, and contribute more fully to altmetrics.
3. Initiatives to increase public access to research may require stronger evidence of its benefits. Evidence of public research usage could be collected by university repositories and news services.

INTRODUCTION

The peer-reviewed articles of researchers are often publicized by their universities in online news releases. However, access to the peer-reviewed article may be limited due to the subscription business model which is used by most academic journals (Ware and Mabe, 2015). While university libraries provide institutional access to many peer-reviewed journals by paying for subscriptions, access is not available to those without a university affiliation. Researchers themselves do not have access to all peer reviewed articles, because university libraries cannot afford subscriptions to every journal. In some cases, publishers permit online access to an article version (such as the author's accepted manuscript) at the time of publication in an institutional repository, providing immediate alternative access. Some institutional repositories have begun collaborations with university news services and the researchers they promote to provide an openly accessible version of the research article (Finnie Duranceau and Kriegsman, 2015; Smith, 2014; Walton, 2015). A hyperlink to the article version can then be included in the news release so that all readers will have access to the research. Smith (2014) summarizes this process:

...at Duke we have a relationship between the office of Scholarly Communications and that of News & Communications whereby we are notified of upcoming articles about research done at Duke. In many cases, we are able to work with authors to get a version of the article in question into our repository and provide an open link that can be included in the article when it is released, or added shortly after release. Our researchers find that putting such links in news stories leads to much better coverage of their discoveries and increased impact on their disciplines. (para. 10)

Three primary research questions are examined in this exploratory study of news releases at the author's institution, Virginia Tech. First, how often can the public access research promoted by the university? Second, how much could access improve if a coordinated archiving process were in place? Third, to what extent do news releases facilitate article discovery? Quantifying public access to university-promoted research, and the extent to which it could be improved, provides an evidence base for determining the potential value of a coordinated process to archive those articles. In addition, the degree to which discovery aids are present in news releases indicates the ease with which readers can locate research, and may inform best practices in research promotion.

Virginia Tech (Virginia Polytechnic Institute and State University) is a large public land-grant university with approximately 30,000 students and 4,000 faculty located in Blacksburg, Virginia, USA.¹ The university has a strong focus on science, technology, engineering, and mathematics (STEM), and its largest college is the College of Engineering. Virginia Tech News (VT News) is a daily news service of the Office of University Relations, which employs approximately 50 communicators who are assigned to various colleges, institutes, and university units.² In addition to on-campus distribution to faculty and staff, VT News also reaches about 10,000 off-campus individuals without an institutional affiliation, a number which it seeks to increase (M. Owczarski, personal communication, August 4, 2015).

A random sample of 120 news releases (spanning 11 years from VT News) that referred to a peer-reviewed journal article were evaluated for article access, the archiving potential of non-accessible articles, and the presence of discovery aids. Access was primarily evaluated from the perspective of a member of the public who lacks the institutional access available to faculty, staff, and students, though access through the institution was evaluated as well.

LITERATURE REVIEW

Open access for peer-reviewed literature is defined as “digital, online, free of charge, and free of most copyright and licensing restrictions” (Suber, 2012). Open access research is therefore available to anyone around the world with an internet connection. Open access benefits both authors and readers. Authors benefit from broader dissemination of their work, and there is evidence of an increase in citations and media attention for open access articles (McKiernan et al., 2016). Because different institutions subscribe to different

¹ <http://www.vt.edu/about/factbook.html>

² <http://vtnews.vt.edu/contact.html>

combinations of journals, not all researchers will have access to a particular article. Access to research is a problem in developing countries, many of which cannot afford journal subscriptions (Willinsky, 2013). Open access also facilitates text and data mining, which can generate new knowledge, improve literature searches, and provide other benefits (Tennant et al., 2016). University students lose most of their access to research upon graduation. In a survey of recent college graduates, half were frustrated that they no longer had access to research-related resources (Head, 2016).

Zuccala (2009) delineates the opportunities and challenges for access to research by the public. Open access can benefit the public in many ways, including informing citizen scientists (Stodden, 2010) and potentially increasing scientific literacy (Zuccala, 2010). Evidence of public interest in peer-reviewed research articles has come from PubMed Central (Lipman, 2010) and Latin America (Alperin, 2015). Access stories are solicited from the public by repositories at Harvard University³ and the Massachusetts Institute of Technology (MIT).⁴ Recently, server logs from the pirate website Sci-Hub indicated extensive global demand for access to research (Bohannon, 2016). However, there is a need for further research into the benefits of public access since most evidence is anecdotal (Nunn & Pinfield, 2014). Additionally, access does not ensure understanding, a barrier that can be overcome through effective science communication (Kelly & Autry, 2013). Science journalists, who are a target audience of research news releases, sometimes lack access to research as well, particularly to related articles, and must find alternative access (Lenzen-Schulte, 2015).

Immediate access to research articles is necessary for hyperlinking from news releases, which are usually issued soon after the appearance of a research article, if not the day of publication. Various estimates of the percentage of articles published open access (sometimes called “gold” open access) have been made, some of which are summarized by Ware and Mabe (2015). These estimates range from 5.3% (Björk et al., 2010) to 16.6% (Jubb et al., 2015), and include articles published in open access journals as well as hybrid journals (subscription journals that offer an open access option). The rate of open access article publishing has been increasing for several years (Laakso et al., 2011), and varies by discipline (Archambault et al., 2014). There are more than 28,000 active English-language peer-reviewed journals (Ware & Mabe, 2015), of which nearly 9,500 are open access as of early 2017, according to the Directory of Open Access Journals.⁵ In 2013, there were more than 8,000 hybrid journals

³ <https://dash.harvard.edu/stories/>

⁴ <http://libraries.mit.edu/scholarly/comments-on-open-access-articles>

⁵ doaj.org

(Björk & Solomon, 2014), and that number is probably higher today. For example, the table of contents service JournalTOCs⁶ claims over 11,000 hybrid journals in its database. Björk (2012) counted 78 publishers of hybrid journals in the Sherpa/Romeo database,⁷ after subtracting duplicates. In mid-2016, the same count found 248 publishers, indicating a vast expansion of the open access option. However, uptake of the option by authors is low at 3.8% of all articles published from 2011 to 2013 (Laakso & Björk, 2016).

Open access archiving (sometimes called “green” open access) can also provide immediate access to research articles. Laakso (2014), using Scopus data, studied articles from the 100 largest publishers (covering over 18,000 journals) and found that, according to publisher policies, 47.4% of the accepted manuscripts could be archived immediately in an institutional repository. Statistics from the Sherpa/Romeo database of journal archiving policies⁸ show that, as of mid-2016, 79% of its 2214 publishers allow archiving for some version of an article. However, publisher policies have become increasingly restrictive in regard to immediate archiving, as well as to hosting by an institutional repository (Gadd & Troll Covey, 2016). While there is evidence of the potential for immediate open access archiving, little research is available about how much actually occurs. A study of two archives, the University of Michigan’s Deep Blue and PubMed Central, found that less than 0.5% of articles were deposited within one month of publication (Björk, Laakso, Welling, & Paetau, 2014). Björk (2014) estimates that more than half of archived articles are not deposited until at least a year after publication.

Cooperative processes involving the university news service, the institutional repository, and researchers take advantage of the potential for immediate archiving. These cooperative processes have been implemented by at least five universities, and MIT’s institutional repository provided access to 40 articles in the first four months of a pilot program (Finnie Duranceau & Kriegsman, 2015). At Duke University, most researchers respond to archiving requests, and many articles are highly viewed and downloaded (Walton, 2015).

Access to archived research through a hyperlink could benefit news releases, which are a form of public outreach. Public relations in science is not well studied by communications scholars (Borchelt, 2008). Studies of news releases about peer-reviewed research tend to focus on whether the research is described accurately or exaggerated (for example

⁶ <http://www.journaltoocs.ac.uk>

⁷ <http://www.sherpa.ac.uk/romeo/PaidOA.php>

⁸ <http://www.sherpa.ac.uk/romeo/statistics.php>

Sumner et al., 2014; Woloshin, Schwartz, Casella, Kennedy, & Larson, 2009). The author is not aware of research quantifying access to articles from news releases, and there is little available evidence on the extent to which news releases provide discovery aids for the research articles they describe, such as hyperlinks, article titles, and citations. An informal analysis of ten news releases from each of ten U.S. universities (n=100) showed that 67% provided a full citation, and 59% provided a hyperlink to the research article, with 7% employing a digital object identifier (DOI) in the form of a persistent hyperlink (Maynard, 2014a). When the analysis was expanded to 30 universities, the average rate of hyperlinking declined to 52% (Maynard, 2014b).

Studies of hyperlinking are available for online news, but not news releases, and do not focus on peer-reviewed research. In the context of journalism, hyperlinks enhance interactivity, credibility, transparency, and diversity (De Maeyer, 2012). Trench (2007) remarked on the barrier that subscription journals present to readers of online news, and noted that even when resources are openly available, journalists often fail to link. Credibility is a primary reason that hyperlinking to external sources is prevalent in blogging, “allowing readers to see for themselves” (Coddington, 2014). On the other hand, many online newspapers rarely provide external links (Tsui, 2008). Journalists communicate scholarship to the public, and in the case of open access it has been suggested that this communication could be strengthened “by providing interested readers with direct links to the relevant articles, which the public can access without encountering prohibitive price barriers” (Rubow, Shen, Schofield, & the Samuelson Clinic, 2015). Beyond attracting media coverage, research news releases have multiple uses. They include: internal university communication, as an accessible plain-language description, a web alert for fellow researchers, a notice of accountability for public funds, and addressing broader impacts required by funders, like public education (Meredith, 2010).

METHODS

VT News offers several topical feeds for its news releases, including one for research-related items.⁹ The research feed was copied from a web browser into a spreadsheet for analysis, and included the date and hyperlinked title for 1,920 news releases issued between September 2, 2003 and July 24, 2015. An initial exploration of the most recent releases revealed that most of the items in the research feed did not refer to a peer-reviewed research article, but instead announced grants received, honors awarded, or other research-related news. Only about one in five releases referred to the publication of a peer-

⁹ <http://www.vtnews.vt.edu/feeds/research.html>

reviewed research article. With a goal of gathering at least 100 news releases that referred to a peer-reviewed journal article, the author evaluated 600 of the 1,920 items (31%). The target of 100 was chosen to establish a sample size large enough to provide a reasonable indication of access and discovery in the news releases, particularly given the labor-intensive nature of the research. While automated methods might have been employed in this study, news releases that referred to peer-reviewed articles without hyperlinking to them might not have been detected.

The VT News research feed is presented in reverse chronological order. To eliminate the effect of possible changes in access and discovery aids over time, the news releases were put in random order. A random number was assigned to each of the 1,920 news releases using a spreadsheet random number generator. The spreadsheet was then sorted to display the random number in ascending order, and the first 600 entries were checked, which yielded just over 100 news releases referring to a peer-reviewed article as follows: 257 news releases were eliminated based on their title (for example, “Virginia Tech forms Center for Drug Discovery” and “National Tire Research Center to open”). During the initial data exploration, news releases with similar titles, along with announcements of academic appointments and grant awards, were found very unlikely to refer to a peer-reviewed article. For the remaining 343 entries, the hyperlinked title of each news release was followed, and the resulting text was examined. A news release became part of the study group if it referred to the publication of a research article in a peer-reviewed journal. Thus, 120 news releases spanning just over 11 years (June 2004 to July 2015) were identified using this method.

Access to articles proved difficult to characterize, because the news releases in the study group were of varying age, and some journals provide access to articles on a delayed basis. In addition, those having an institutional affiliation with Virginia Tech would benefit from subscription access provided by the library. Therefore, access was recorded for three conditions: 1) public access at the time of article publication, 2) public access at the time of this study, and 3) university-affiliated access at the time of this study. Data for the first two conditions was gathered while off campus and logged off of any university-related accounts, in order to avoid internet protocol (IP) address recognition from the university by subscribed journals or publishers. All three access conditions were checked and recorded in February 2016. Access at the time of article publication was determined by checking public access to the most recent articles in a journal. While journals sometimes change from a subscription model to an open access model, or vice versa, the author is not aware of any changes in the access model for the journals referenced in this study. Care was taken to note which articles were published using an optional (hybrid) open access model. For articles that could be accessed upon publica-

tion (condition 1), the source of the access was recorded (for example, publication in an open access journal).

The extent to which article archiving could increase the number of accessible articles was evaluated using the Sherpa/Romeo database,¹⁰ as well as spot checks of archiving permissions on journal web sites. Archiving permissions for journals were recorded in February 2016. Permissions for immediate (embargo-free) archiving of postprints (the accepted version) in institutional repositories were counted. Permissions for archiving postprints on personal websites, as well as for preprints (the submitted version) were also recorded.

Discovery aids were evaluated for each of the 120 news releases in the study group, in order to assess how easily readers might find the referenced research article. Each news release was checked for the presence of the journal title, a hyperlink to the article, an article title, and a full citation. In addition, each hyperlink was checked to determine whether the URL was in digital object identifier (DOI) form.¹¹

RESULTS

Article access was evaluated for three conditions (Figure 1). Of the 120 peer-reviewed articles referred to in the press releases, 39 (33%) were openly available at the time of their publication. 65 articles (54%) were openly available in February 2016, due to the delayed access model of some journals. The use of institutional affiliation for access to the remaining 55 articles in February 2016 increased cumulative access to 116 (97%) of the peer-reviewed articles.

An additional analysis of the 39 articles with access at the time of their publication revealed the origin of article access (Figure 2). Of the articles in this category, 23 (59%) were published in an open access journal, and 10 (26%) were published in an optional open access (hybrid) journal. An additional 5 articles (13%) were accessible due to a journal policy, and 1 (2%) was archived by the author.

The archiving policies of the journals in which non-accessible articles appeared were evaluated to assess immediate archiving potential (Figure 3). Results showed that 30 articles could have been archived in the university's institutional repository at the time

¹⁰ <http://www.sherpa.ac.uk/romeo/index.php>

¹¹ For example, <https://doi.org/10.1126/science.1129709>

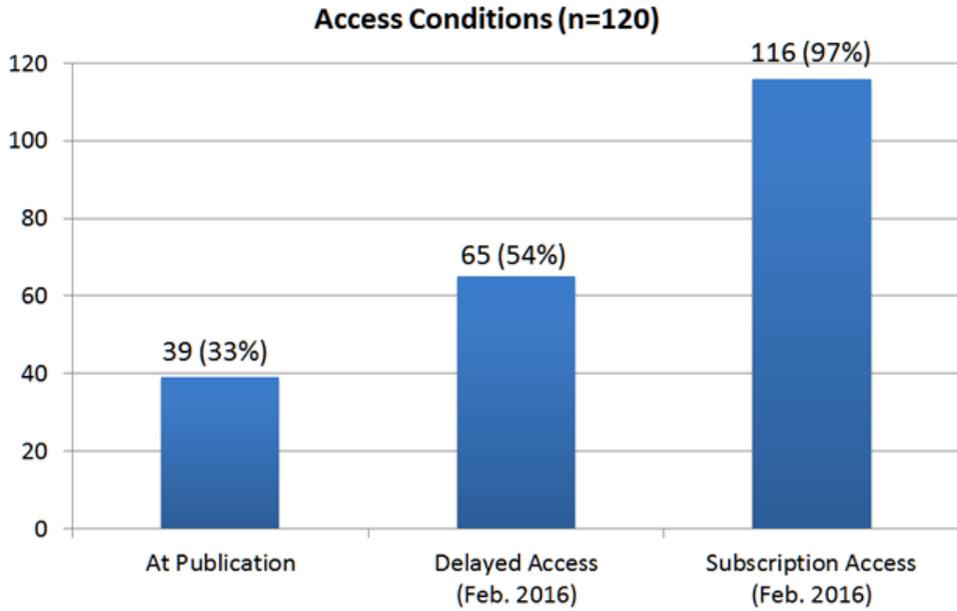


Figure 1. Access Conditions

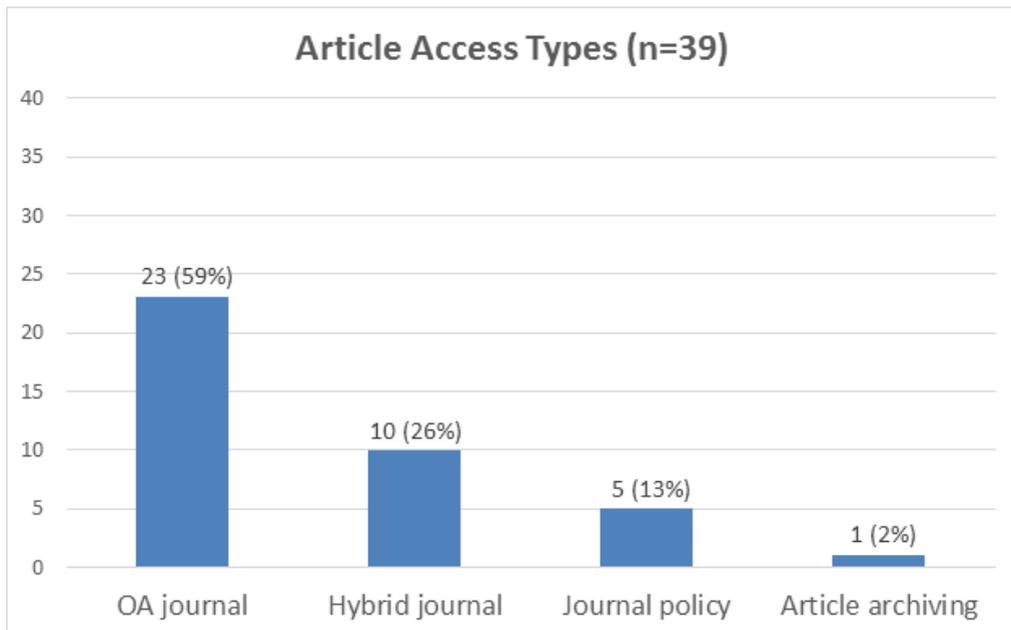


Figure 2. Sources of Article Access

of publication. Immediate archiving could have increased article access at the time of the news release from 39 (33%) to 69 (58%). An additional 17 articles could have been made accessible by the author on a personal website, but not the institutional repository, which would increase the number of accessible articles to 86 (72%). Preprint permissions were also noted and, when applied to the remaining non-accessible articles, resulted in an increase in access to 107 articles (89%).

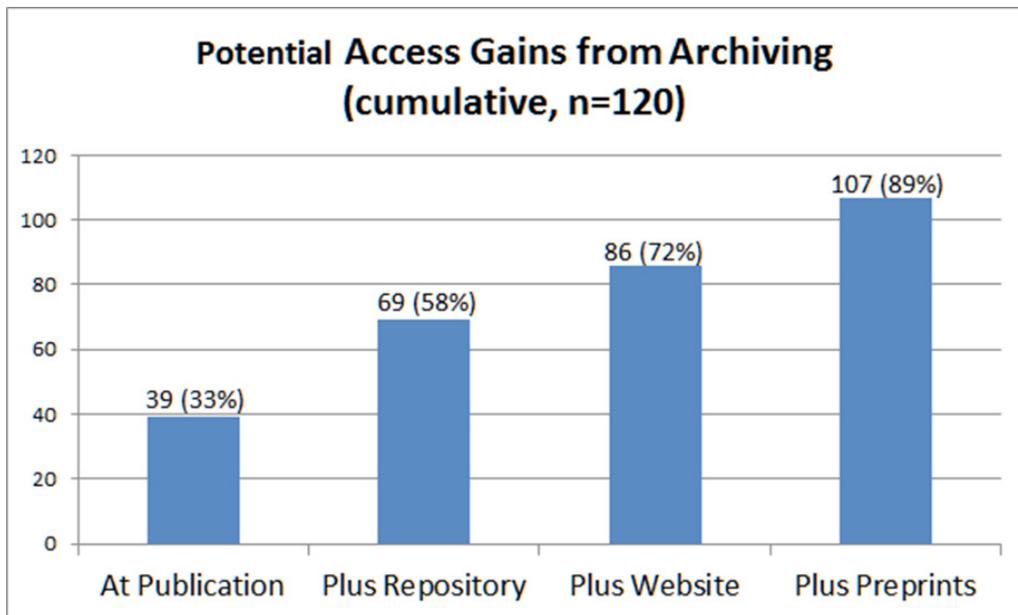


Figure 3. Potential access gains from archiving (cumulative)

News releases were examined for four discovery aids: a journal title, a hyperlink, an article title, and a full, formatted citation (Figure 4). Of the 120 news releases, 115 (96%) contained the journal title in which the article appeared. A hyperlink for the article was provided in 80 (67%) of the news releases. However, 7 hyperlinks did not resolve correctly, resulting in 73 working hyperlinks (61%). Additionally, 14 hyperlinks resolved to the journal homepage,¹² leaving 59 (49%) working hyperlinks resolving directly to the peer-reviewed article. None of the hyperlinks employed the digital object identifier (DOI) in its referenceable form. 53 news releases (44%) included the title of the peer-reviewed article, and 4 (3%) included a full citation.

¹² For example, www.nature.com

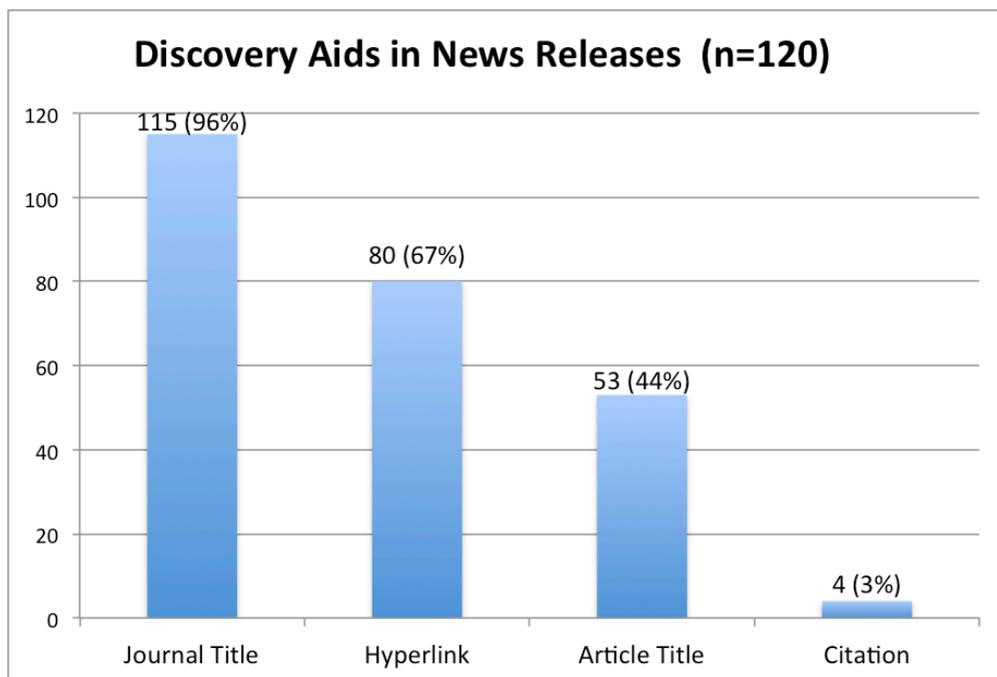


Figure 4. Article Discovery Aids

DISCUSSION

The number of openly accessible articles (39, or 33%) in this sample is higher than might be expected from studies of open access publishing (also called “gold” OA)., For example, the highest estimate of the number of articles published open access is 16.6% for articles published in 2014 (Jubb et al., 2015). Even removing the six articles in this study which were not published in a full or hybrid OA journal results in a rate of 27%, which is significantly higher than estimates across scholarly publishing. This is especially notable considering that rates of open access publishing were lower in 2004, at the beginning of the 11-year span of articles in the study group. Estimates of the percentage of open scholarship of all types on the web range from 24% (Khabsa & Giles, 2014) to 50% (Archambault et al., 2014).

In addition to those articles available through publishing in a fully open access journal or a hybrid open access journal, some articles were made available by journal policy. For example, the Nature Publishing Group established a policy to make available any articles that are publishing the primary sequence of an organism’s genome for the first time (Nature, 2007). Three articles in the study group were made available upon publication as a result of this policy. Other sources of access were difficult to determine, but could include an editor’s

choice of best paper or society membership (Ware & Mabe, 2015). The number of articles made available through hybrid open access is also higher than might be expected (10, or 8% of the study group). For example, Laakso & Björk (2016) estimated that 3.8% of articles were published through this method, though rates varied considerably by discipline and journal. Hybrid publishing rates at the *Proceedings of the National Academy of Sciences*, the journal which published the most articles in the study group, varied from 17-23% (Björk 2012). Access by way of archiving was rare, with only one occurrence in the study group. This article was hosted on a university website rather than the institutional repository.

There are some possible explanations for the relatively high availability rate of articles in this study. First, Virginia Tech’s STEM focus may explain this result, because open access publishing in these disciplines is more common (Archambault et al., 2014; Bjork et al., 2010). A list of the journals with two or more occurrences in the study group (Table 1) gives an indication of its STEM focus. Second, it is possible that VT News covers research in STEM fields more than in other fields. Third, self-selection may play a role, because research-related news releases are often initiated by faculty researchers themselves (M. Owczarski, personal communication, August 4, 2015). It is possible that authors of open access articles may be more willing to engage in outreach since their articles will be available to any interested reader.

Journal Title	Occurrences
<i>Proceedings of the National Academy of Sciences</i>	14
<i>Science</i>	9
<i>PLOS ONE</i>	8
<i>Environmental Science and Technology</i>	5
<i>Annals of Biomedical Engineering</i>	3
<i>Nature</i>	3
<i>Journal of Biological Chemistry</i>	2
<i>Journal of Consumer Research</i>	2
<i>Journal of Neuroscience</i>	2
<i>Journal of Neurosurgery</i>	2
<i>Nature Geoscience</i>	2
<i>The Plant Cell</i>	2
<i>PLOS Computational Biology</i>	2
<i>Scientific Reports</i>	2

Table 1. Journals with two or more occurrences in the study group

This study shows that delayed access is a significant contributor to article availability. Several journals make peer-reviewed articles openly available (though not openly licensed) after a period of time, such as 6 or 12 months. Though the access check in February 2016 only provides a snapshot of a group of articles spanning 11 years, it reveals that public access increased from 39 articles (33%) to 65 articles (54%). However, 11 of those 65 articles were published in journals that require site registration and log-in to freely access the full text (for example, the journal *Science*). Two journals in this study employ a paywall window in which articles are free to access after one year but are put back behind a paywall after a few years (for example, the *Journal of Neurosurgery*).¹³ Laakso and Bjork (2013) found almost 500 delayed access journals making 77.8% of their articles open after one year, and 85.4% after two years. The delayed access model indicates that researchers (and their libraries) place a premium on immediacy of access. This immediacy is also important for news releases, which would not be able to access these articles at the time news releases are issued. However, news releases remain online and indexed in search engines for years after they are released, as demonstrated in this study. Therefore, hyperlinking to articles will, over time and with no additional effort, facilitate access to an increasing number of the articles mentioned, from one-third to over one half.

Building on the articles already immediately open or through delayed open access, university library subscriptions raise cumulative access to almost all of the articles studied (116, or 97%). This may indicate that the library is providing access to journals in the researchers' disciplines. However, subscription access was checked at a single point in time for articles covering an 11-year period. Because library subscriptions change over time, this result is a snapshot of an ever-changing situation. The non-accessible articles show that, just as the library cannot provide access to all of the journals that faculty need to consult, it cannot access all journals in which its faculty publish.

Immediate archiving of journal articles in the institutional repository could have provided access to an additional 30 articles, increasing the access rate from 33% to 58%. Permission for immediate archiving is important because news releases would need to link to an accessible version of the article at the time of their issuance. VT News does not have the staff to update news releases once they have been issued (M. Owczarski, personal communication, August 4, 2015). Researchers often fail to archive their work for a variety of reasons, such as not being asked to deposit, not understanding journal policies on copyright and archiving, or lacking the time or knowledge to archive (Cullen & Chawner, 2011). These problems are mitigated for promoted research by universities with a coordinated archiving

¹³ <http://thejns.org/page/lib-faq.jsp>

process. Archiving rights can also be expanded by including them in library licensing agreements (for example, the LibLicense Model License Agreement¹⁴), or through university rights retention policies.

Immediate archiving on a personal website would be possible for an additional 17 articles, increasing cumulative access to 86 articles (72%). Archiving on a personal website would not benefit the institutional repository and, if the personal website is on the university's domain, risks deletion of the archived article if a researcher retired or moved to another university. Broken hyperlinks over time could result if hyperlinks to an article archived on a personal website were used in news releases, although the one example of archiving found in this study had a working link. The institutional repository is preferred for archiving because it offers preservation, in addition to persistent links, full metadata, and interoperability with discovery systems that aggregate articles from numerous sources. However, the researcher and VT News could benefit from linking to a personal website if advised of the possibility by repository staff.

Permissions for preprint (the submitted version) archiving would have resulted in access for an additional 37 articles in this study. While there may be reluctance to refer to a version of an article that has not been peer reviewed, a recent study showed that most preprints differ little from the published version (Klein, Broadwell, Farb, & Grappone, 2016).

In the case of archiving embargoes, repository staff could record the future archiving date and contact researchers for deposit at that time, although a hyperlink to it could not be included in the news release. It is worth noting that cumulative potential access involving the institutional repository (to 58%), personal websites (to 72%), and preprints (to 89%) are maximums, and that actual researcher responses would likely result in lower rates. Maximum archiving rates could decrease if the trend of greater restrictions by publishers demonstrated by Gadd and Troll Covey (2016) continues.

Discovery aids in news releases allow interested readers to find the peer-reviewed article, and their absence can lead to time-consuming searches. A journal title was almost always present in the news releases, perhaps due to its value as a sign of prestige and peer-reviewed status. Journal titles can be used by altmetrics services to find mentions of research (Adie, 2015). The use of hyperlinking in the online environment is particularly important since it enables readers to immediately go to the article. Of the 120 news releases, 40 (33%) did not include a hyperlink to the peer-reviewed article. Adding broken and journal homepage hyperlinks

¹⁴ <http://liblicense.crl.edu/licensing-information/model-license/>

to this number, about half of the news releases (61, or 51%) do not hyperlink directly to the research they describe. Some media organizations have a policy of providing hyperlinks only to a journal homepage, due to concerns about changing URLs and lack of subscription access by readers (Bradshaw 2010). A hyperlink to the article on the journal site should be provided regardless of its access status (Bradshaw, 2010; Shipman, 2015). Even for articles that cannot be accessed, the abstract and author details can provide valuable information to readers (Bradshaw, 2010). In the case of delayed open access, a hyperlink would provide full access at a later time.

Lack of an article hyperlink during a press embargo could be a contributing factor to the 54 news releases with a missing or journal homepage hyperlink. Of these, 20 were released the day of article publication or prior to it (for example, "...published today in the journal *Nature*..."). No link to the article is available during a press embargo, and in some cases, articles are not made available when an embargo lifts (Oransky, 2010). Interestingly, science journalist Yong (2010) expresses frustration that hyperlinks don't resolve because the articles are not available when the embargo lifts:

People *expect* to be able to tumble down the rabbit-hole of links to find original sources and check them out for themselves, if they are so inclined...

This practice punishes scientists who are unable to see, comment on, or discuss work that is outed in the mainstream media, it punishes journalists who are trying to link to original sources, and it punishes readers who are inquisitive and skeptical enough to try to verify the information they read. None of these is acceptable. (para. 8&c9)

Though only 7 (6%) of the hyperlinks did not work, using a DOI hyperlink may help ensure future function. Hyperlinking via DOIs is recommended as a best practice in journalism (Kille, 2015). Although DOIs are not perfect (Bilder, 2013), they are a unique identifier used by many scholarly journals, and in URL form provide a persistent hyperlink to content. Some science communicators have called for increased and more timely use of DOIs by journals so they can be included in news releases (Oransky, 2010).

The DOI registration agency CrossRef has drafted a recommendation that DOIs be assigned and registered before articles are made available online.¹⁵ When a hyperlink is not available, VT News could consider waiting to issue a release that includes one. News releases remain online for years where they are discoverable through search engines. In-

¹⁵ https://github.com/CrossRef/rest-api-doc/blob/master/funder_kpi_metadata_best_practice.md#assigning-and-registering-dois-for-manuscripts-that-the-publisher-has-not-yet-made-available-online

cluding hyperlinks to research articles may make news releases more involving and credible (Meredith, 2010), balancing the possible perception that university news releases are one-sided promotions (Maynard, 2014a).

Altmetrics, the aggregation of online attention to scholarly content, utilizes hyperlinks, and their absence is a challenge for the field (Liu & Adie, 2013):

A pressing day-to-day issue stems from this reliance on links. Although most tweeters, science bloggers and digitally native media outlets diligently include direct links to the journal articles they discuss, traditional news outlets have no such standard practice. As a result, a large number of science, health and technology news reports fail to include links to the research that they mention. (para. 13)

Only about 8% of online news articles that mention scholarly journals provide hyperlinks to them (Adie, 2015). Altmetrics tend to be more common in the STEM disciplines (Liu & Adie, 2014), a topic which is the focus of most VT News releases. The linked network of research mentions created by altmetrics enables reverse discovery as well. For example, researchers or members of the public who first encounter the article on the journal site would be able to follow an altmetrics link to a plain language account that places the research in context. University news offices can use altmetrics to identify trends in attention to research as well as to measure the effectiveness of news releases and other research promotion efforts (Liu & Adie, 2014). However, in order to leverage altmetrics, university news services need to diligently hyperlink to research and ensure that their news releases are tracked by altmetrics services such as Altmetric.com¹⁶ and Plum Analytics.¹⁷

Additional information is essential when hyperlinks are missing, broken, or simply refer to the journal domain, because interested readers must combine metadata (journal name, author's name, and/or article title) to locate the article. An article title was present in 53 (44%) of the news releases. While some say that there is no need to include an article title in a news release (Lenzen-Schulte, 2015; Meredith, 2010), its absence complicates discovery, because readers must then use the journal name, author name, and time of release to find the article. This problem was encountered several times in carrying out the present

¹⁶ <https://www.altmetric.com/about-altmetrics/our-sources/>

¹⁷ <http://plumanalytics.com/integrate/load-your-data/>

study. Article titles also enable browser extensions such as the Google Scholar Button¹⁸ to find articles. Full, formatted citations are the standard way to refer to scholarly literature, ensuring that all article information is provided, but citations were found in only 4 (3%) of the news releases. Some university news services follow a policy of providing a full citation at the end of research news releases, including a hyperlink to the journal article.¹⁹

This exploratory study's limitations include a relatively small sample size (n=120) at a single university. Temporal changes in journal access, archiving policies, and subscription access over the 11-year span of news releases were not addressed due to the labor-intensive nature of those investigations. Stated archiving rates are probably conservative, due to the trend of increasing restrictions in journal archiving permissions.

Future investigations of research promotion and access could collect a larger data set across multiple universities, perhaps employing automated methods. Greater evidence of public usage of research is needed, some of which might be provided by server logs or website analytics for followed hyperlinks. This study provides a window on access to research at one university, which could be repeated at other universities. Ideally, data on access for all of a university's peer-reviewed articles would be available. The resulting benchmark could then be used to target improvements in access and enable comparisons among universities.

CONCLUSION

Most of the peer-reviewed articles promoted by Virginia Tech are not available to the public when a news release is issued. However, immediate access to one third of the articles is a higher proportion than expected. While promoted articles may not be a representative sample of all articles produced at an institution, they provide a useful window on access. Coordination between the news service, the institutional repository, and the researcher could improve access through immediate open access archiving. This opportunity remains significant despite a trend of increased restrictions on archiving by publishers.

Discovery aids that can help the public locate research are sometimes absent in the university's news releases. Increased hyperlinking could help readers, enhance news release credibility, and contribute more fully to altmetrics, which measure attention to research

¹⁸ <https://chrome.google.com/webstore/detail/google-scholar-button/ldipcbpaocekfooobnbcddclnhjkcpn>

¹⁹ For example, <http://www.cam.ac.uk/research/news/scientists-double-number-of-known-genetic-risk-factors-for-endometrial-cancer>

and help put it in context. Hyperlinks to open access articles are ideal, but are useful even when an open access version is not available.

There is an inherent conflict between the promotion of research articles by universities and their lack of availability to the public. The restrictions that many journals place on access to research inhibit university outreach and reduce the attention that its researchers might otherwise receive. Barriers to access such as paywalls and archiving restrictions are not in the university's interest, and could be considered incompatible with research promotion. A university, particularly one dependent on public funding, should make access and discovery of its research as easy as possible.

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