# Making the Connection: An Examination of Institutional Repositories and Scholarly Communication Crosslinking Practices

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Institutional repositories (IRs) remain a powerful tool for opening, sharing, and preserving scholarship. Scholarly communication (SC) services and resources are essential to promoting and supporting IRs. Linking SC services within an IR offers support to users at their point of need. This study investigates the prevalence of web linking between IR and SC services in 145 Association of Research Libraries and Carnegie R1 libraries. This quantitative analysis identifies gaps and offers practical recommendations for developing connections between SC and IR websites at academic libraries.

## Introduction

It has been well established that at the turn of the twenty-first century, amid new publishing house mergers,[1] exorbitant serial costs,[2] restrictive licensing, and static or decreasing budgets, academic libraries struggled to provide access to the critical scholarship that users required. In response, and with the maturation of the web and the introduction of new software applications, libraries and research scholars promoted a shift in principles for sharing scholarly output: open access (OA) or freely available, open, online scholarship.[3] Subsequently, DSpace, an open source repository platform developed by MIT and HP Labs in 2002,[4] and other institutional repository (IR) resources were born, and new IRs[5] were launched, aiming to provide a solution to challenges the larger research community faced. Libraries, as key sources for the discovery of, access to, and preservation of research and other scholarly materials, took on the role of establishing and managing IRs. Libraries also facilitated scholarly communication (SC) services and related resources to educate their users on considerations related to emerging open practices.

Crow[6] and Lynch,[7] prominent voices for the value of IRs, set the stage for a period of institutional investment in repository infrastructure. Despite their slightly divergent arguments for such services,[8] both were clear that repositories would require libraries to invest in and offer new services in support of these efforts. Their work set the stage for several decades of IR and SC service development. Subsequently, the Association of College and Research Libraries

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(ACRL) issued a white paper detailing principles and techniques to reform SC efforts, which identified areas where libraries could take action to advocate for the "reform" of scholarly communication, that is, the "system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use."[9] The Association of Research Libraries (ARL) also collected data about its member organizations and their IR services,[10] which were most often cited as being established to "increase global visibility of, preserve, and provide free access to the institution's scholarship."

As IRs became more widely adopted, expanded, and matured in the first decades of the 21st century, academic library literature asked numerous questions about engaging and encouraging their communities of users to openly share research via IRs. Researchers have explored the value of IRs;[11] strategies for building content in IRs;[12] the role of librarians in relation to IR support;[13] faculty perceptions of and participation in IRs, or lack thereof;[14] education and outreach efforts;[15] and the cost of maintaining IRs.

Following a period of examination that questioned their relevance,[16] IRs recently experienced renewed attention due to their vital role in providing open access to critical research during the 2020 COVID pandemic. For example, the 2020 Confederation of Open Access Repositories (COAR) Community Framework for Best Practices in Repositories released guidance "to assist repositories to evaluate and improve their current operations based on a set of applicable and achievable good practices."[17] In 2021, the Scholarly Publishing and Academic Resources Coalition (SPARC) and COAR launched an effort to "support and better organize the repository network in the US."[18] Following the May 2022 release of the National Science and Technology Council's Desirable Characteristics of Data Repositories for Federally Funded Research,[19] the White House Office of Science and Technology Policy's updated its policy guidance, which brings repositories to the forefront in helping to meet the federal government's Open Science goals in August 2022.[20] IRs remain a vital element of the research enterprise.

## *Research Questions*

IRs continue to be "an essential component of our national research infrastructure, offering rapid and open access to research,"[21] while also nurturing a more bibliodiverse[22] scholarly ecosystem that supports gray literature,[23] student work,[24] and other collections that may not otherwise be readily and openly available for use and/or preserved for the long term. As efforts to further invest in IRs continue to evolve, it is an opportune time to take stock of the ways in which online SC services and IRs are situated in academic libraries and interconnect to meet user needs.

In this study, the authors aimed to investigate the alignment of IRs and SC services related to discoverability,[25] user engagement,[26] and web design.[27] This research grew from the authors' evaluation of their institution's emerging IR-related and SC services, including developing a SC web presence. As detailed in the ACRL's Scholarly Communication Toolkit,[28] SC encompasses many topics (e.g., IRs, copyright, open access).[29] For IR-related SC services, it is essential that a dedicated SC page links to relevant resources and vice versa.[30] Doing so provides a mechanism for discoverability, where users can "encounter new content or functionality that they were not aware of previously."[31] SC efforts also require outreach and education to thrive.[32] Making users aware of available SC resources can help them navigate copyright and article version (e.g., pre-print, post-print, version of record) questions, and providing at-hand support can disentangle complexity in the self-deposit process.[33] Because

many library users prefer online access due to accessibility and ease of use, an easy-to-navigate and action-oriented site is invaluable to encourage researcher engagement.[34]
To explore these issues, the authors asked:

- Are academic libraries building informational connections between IRs and SC services for users?
- Does IR software influence the informational connection between IRs and SC services and resources?
- Do academic libraries need to consider practices that better connect IRs and SC web pages to provide an easier path to engagement with open practices for users?

Each institution's IR has its own collection scope and other locally specific information. And IRs have a diversity of users (e.g., faculty, students, and external users) with varying needs. These stakeholders may need or seek assistance engaging with the institution's IR, and building a connection between the IR and SC services helps the institution establish trust between the library and user. The goal, in turn, is that with increased trust, users will be more likely to return to the IR to read and share openly available scholarly work. This study's results offer baseline, practical recommendations that may help library colleagues who are launching and formalizing their SC programs and IRs, or institutions that are expanding SC programs or updating a web presence for SC and IR services, to establish trust with users by building easy-to-navigate connections.

## Literature Review

Engagement and participation are key elements of successful SC work. As researchers are invited (or compelled) to shift very personal research practices related to openly sharing their scholarship, the academic library's role in encouraging and mediating open practices requires both a compelling call to action and clear information supporting that request. Such clarity can help reduce friction for researchers interested in engaging with library-supported SC and IR efforts as they reconsider tried-and-true practices and engrained disciplinary norms. Navigating versioning, publishing agreements, and terms of use required for IR submission may feel overwhelming for time-strapped researchers. Institutional and funder open access policies may feel like additional administrative burdens. Until incentives clearly align with and reward open practices, and the resources associated with them (e.g., IRs and SC services) are less complex, researchers may not take advantage of the benefits of openly sharing their work in IRs. The request of authors must be clear, and help must be readily available. Salo's continued relevance[35] in the literature supports this assertion.

### *Optimizing User Engagement*

Library-based web pages are the standard method for delivering information to researchers about SC services and related resources, frequently answered questions, and points of contact. However, providing clear, reliable, up-to-date information that serves the diverse range of audiences, both in- and outside an institution, can be a challenge,[36] as Manness et al. explored in their repository's personas work.[37]

To understand how academic libraries might better bridge the gap to successfully engage researchers in IR participation, an exploration of interaction design by Silver[38] offered a compelling consideration. Silver indicates that user interaction with systems and their design is a "conversation," and he asserts that service providers should "focus on the quality of the

conversation that is the root of behavior." To that end, academic libraries need to be clear in the online conversation they are conducting with researchers through their services—informative, truthful, purpose driven, and relevant.[39]

## *Identifying and Addressing Speedbumps*

In their work, González-Pérez et al.[40] applied the Technological Acceptance Model as a method to explore two key variables affecting user interaction: ease of use and perceived usefulness. They identified barriers to IR depositor participation, which can include time, copyright issues, and versioning. These known speedbumps, as well as others, can cause researcher confusion about what may be required for IR self-deposits or about the potential benefits of IR participation, and can further deter well-established faculty and researcher behavior. Advocacy and training are part of the answer, González-Pérez et al. suggest, coupled with good interface design as a tool for "effective action." They note, "[i]t is vital to know users' feelings when interacting with the system and address subject qualities such as motivation,"[41] rather than simply focusing on task execution. IR deposits can feel like a complex task. To encourage user participation, in partnership with education and support, IR usefulness needs to be clear to depositing authors and the submission process needs to be easy to navigate. By connecting IRs with the educational resources in SC web pages, the self-deposit process can become less burdensome. In turn, this small, technical shift may help promote broader adoption of open scholarly sharing via IRs.

As academic libraries do the slow and sustained work required to change disciplinary cultures that reward and sustain open practices, they also need to make IR deposit protocols less complicated. However, academic institutions are limited in the degree to which they can control the design of IR systems, with greater or less flexibility depending on the IR software they are using[42] and the resources at their disposal. In their user experience study of the self-archiving process, Betz and Hall[43] explored the ways in which microinteractions of the IR deposit process can create concern or confusion for depositors. They noted that, "[s]tandard installations of popular IR software … do little to help facilitate easy and efficient IR deposits for faculty."[44] Even though it has not been established that positive user experience can increase IR participation, removing barriers to participation by "providing comprehensive instructions at points of need" or "goal-based triggers" can help, assuming the help is clear and concise.

In a similar spirit, Narayan and Luca[45] deployed user experience design methods to update their IR interface. Much like Betz and Hall,[46] they found that researchers' reluctance with using IRs included a lack of branding, opaque jargon, and lack of direction. They spoke to the challenge of bridging the gap between "emotional and psychological needs" of IR users and "design decisions." This and other institutionally specific examinations provide a good reference point for the recommendations herein concerning well-articulated linking practices. From the above-mentioned studies, an author's confusion and resulting hesitance to navigate a submission process appears generalizable; there are low-impact solutions providing a user-friendly system that can address these challenges and increase IR user engagement and participation.

## *End Users*

While not the focus of this exploration, several studies have examined the IR end user experience. From St. Jean et al.,[47] readers learn that IRs are generally viewed favorably by end users, yet there is still room for providing clarification on collection scope and criteria for deposit

to increase an IR's trustworthiness. Subiyakto et al.[48] identified a suboptimal interface at the root of poor end user experience, which perhaps speaks to the low percentage of returning users. COAR's[49] efforts toward establishing a global framework for shared practices for IRs addresses the importance of clear documentation to the integrity of IRs, as well. All told, providing context, clarity, and transparency encourages user trust, which serves to improve the conversation with users and increase their engagement with efforts to open access to their scholarship. While the authors' examination and recommendations focus on depositing users, end users would benefit from the authors' findings as well.

## Methods

### *Sample Institutions*

This study selected and evaluated 145 North American ARL[50] and Carnegie Classification of Institutions of Higher Education (2018)[51] academic research library websites to identify whether the institution offered SC services and resources and IRs, and whether there were linked connections between the two. Coupling the ARL institutions, which by definition "[advance] research, learning, and scholarly communication," [52] with Carnegie Classification of Institutions of Higher Education (2018)[53] R1 universities not represented in the ARL list allowed the authors to explore those institutions with very high research activity from well-established university categorization systems. This group of institutions demonstrate a high level of research activity, making it more likely that they would incorporate SC services on their library websites. Additionally, the authors removed the French language libraries since they did not want to rely on machine translation services and misevaluate content.

### *Data Collection*

This study used summative content analysis principles,[54] that is, identifying and counting keywords and interpreting context, to review these library SC and IR websites. In doing so, the authors examined whether and how (e.g., via reciprocal linking) SC topics were included on library websites. As Clyde[55] noted in 1996, "the best preparation for creating a home page" is looking at other library sites; in the authors' opinion, this practice is still true. Indeed, as the authors were looking to formalize their library's SC web presence, they aimed to identify what topics other library SC web pages addressed and how they did so. In doing so, the authors sought to determine trends among similar institutions.

For this evaluation, the coding scheme focused on thirty-five scholarly communication elements influenced by the ACRL Scholarly Communication Tool Kit (e.g., copyright, author rights, repositories, Open Educational Resources, and digital humanities).[56] The authors were intentional about creating guidelines at the project's start to establish common data collection practices and reliability. To create interrater reliability, a sample set of websites was reviewed from the list at random. Using Randomizer.org, a free service offered by the Social Psychology Network, institutions were randomly assigned to each coauthor. They then compared and discussed initial results. From this sample data, the authors created definitions for each topic and added search strategies and examples to the definition list to further support consistent data gathering. Decisions from the subset review process were formalized in a codebook and followed through the rest of the data collection process.

In spring 2021, the researchers collected the first data for all SC terms. For each website the researchers looked for a link to the SC web page from the main library site and then explored

top-level links to determine if one was available. If this was not identifiable from dropdown information, the library's LibGuide system, embedded Google search, or Google search with "scholarly communication" link:library URL were used. This study focuses on a review of IR-specific SC data for targeted analysis, rather than the comprehensive spring 2021 dataset.

In November 2021 (hereafter fall 2021) a second close review of each institution's web content was conducted to explore the IR-specific data. This data collection focused on the connection between SC websites and IRs. These data identified crosslinks between IRs and SC web pages. While documenting these crosslinks, additional free-text information that each site provided about the other was gathered. Text data were analyzed using Excel, aiming to answer the following:

- Which institutions support IRs (if so, what platform was used)?
- Which institutions offer a SC web page?
- Is there a connection (i.e., a crosslink) between the institution's IR and SC service page, and vice versa?

Replication data are publicly available.[57]

The authors completed a final IR subset data review in March 2022 (spring 2022) to see if there was any change in the data over time and to identify repository platform to address a final question: Are there any trends in crosslinking practice related to IR software? With this final pass, rather than start the review from the existing spreadsheet, the researchers returned to library home pages to identify SC information. If they still were not able to identify any SC services page, they returned to the original spreadsheet to identify if there was a URL from a previous search, and, if so, whether it was still active.

In this review, the authors documented differences between the earlier and current data. The authors also explored secondary pages on the IR to determine if these sites linked back to library SC services. If found, the authors made note of where the links were situated, as well as SC information that was available within the IR. In addition to the quantitative data, elements of the IR and SC page that provided additional information about the institution's approach to both IR and SC services were noted. These free-text notes are not coded and are not included in the replication data.

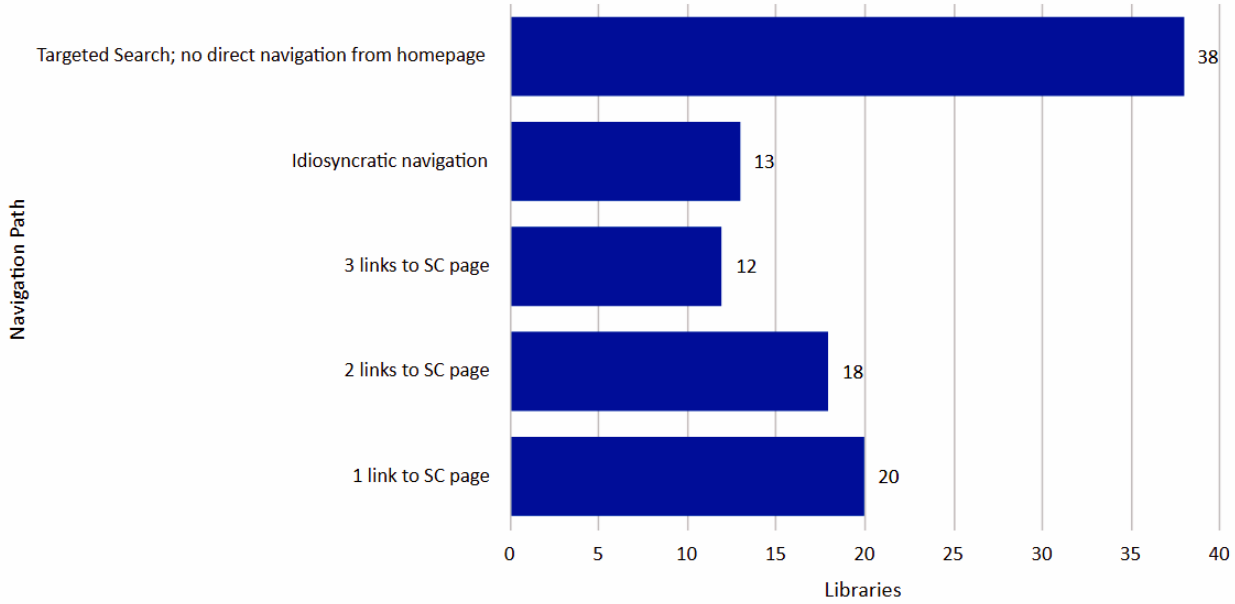
This study investigates the availability of SC content and IRs, examines the relationship between academic libraries' SC content and their IR library support page, and explores whether IR software influences whether there are crosslinks between SC service pages and the IR. Based on this work, the authors assert that to optimize coordination between IRs and SC educational content and increase user engagement, libraries must clearly connect IR and SC services to improve user interactions, build trust, and further the utility and reliability of the IR.

## Results

### *IR and SC Webpages: Current Landscape*

In the spring 2021 round of data collection, the authors identified whether an institution had a SC page and hosted an IR. In the spring 2021 data, 142 of 145 (97.9%) of the libraries hosted an institutional repository. Of those, 101 of 145 (69.7%) maintained a dedicated SC web page. Additionally, the authors documented the number of link levels necessary to navigate to the page, to determine whether the SC page was readily discoverable from the library's home page. For 20 (19.8%) of the institutions, SC information was located one link in; for 18 (17.8%) institutions, it took two links; for 12 (11.9%) institutions, three links. Thirteen (12.9%) institu-

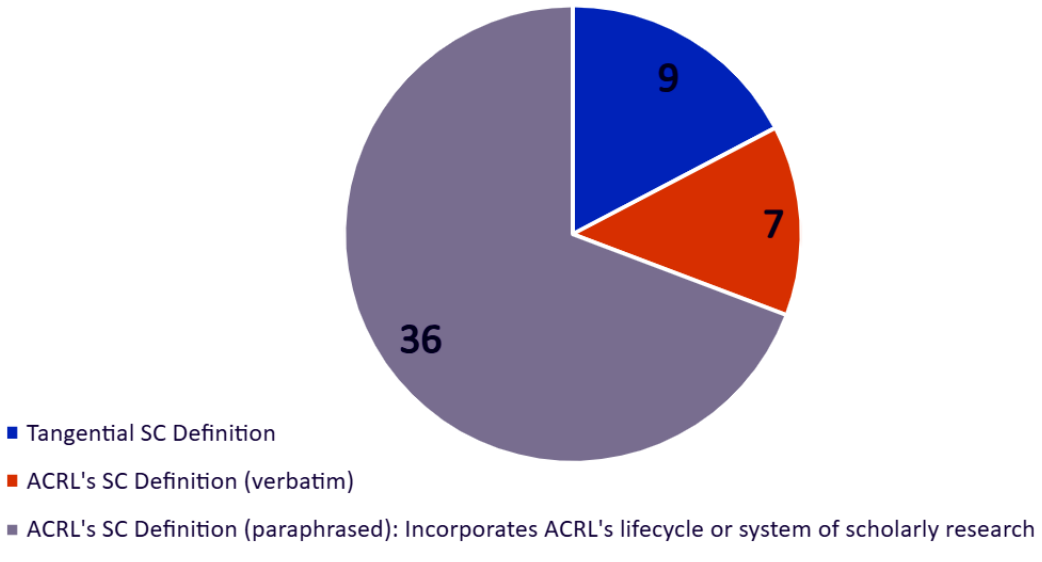
**FIGURE 1**
**SC Navigation Paths**




tions had what the researchers characterized as "idiosyncratic" navigation, where finding the page took some digging; and 38 (37.6%) institutions required a targeted search to find SC information (see Figure 1).

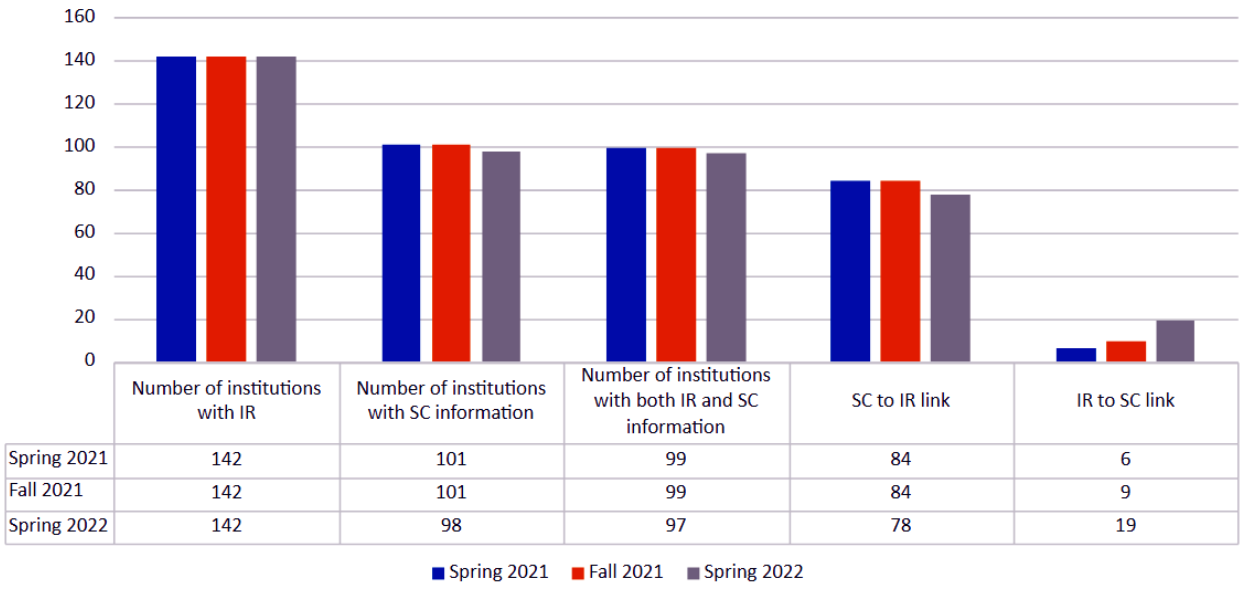
The researchers then identified whether SC was defined on the SC page. The authors found that of the 101 institutions that supported an SC web page, 52 (51.5%) of those institutions provided a definition of scholarly communication; and, of those 52 institutions, 7 (13.5%) directly referenced ACRL and 36 (69.2%) referred to what ACRL identifies as the lifecycle or system of scholarly research, whereby scholarship is "created, disseminated, evaluated, and preserved" (see Figure 2).

**FIGURE 2**
**SC Definitions Used on Library SC Websites from Spring 2021 Data**



To identify discoverability opportunities for users between SC pages and IRs, the authors noted whether the two services were linked. Of the study's 145 libraries, 99 (67.6%) featured both an IR and a SC web page. Of those 99, 84 (84.8%) of the SCs linked to the IRs, and only 9 (9.1%) of the IRs contained a link to the SC page (see Figure 3).

**FIGURE 3**
**Frequency of Crosslinks Observed in Spring 2021, Fall 2021, and Spring 2022**




| | Number of institutions with IR | Number of institutions with SC information | Number of institutions with both IR and SC information | SC to IR link | IR to SC link |
|---|---|---|---|---|---|
| Spring 2021 | 142 | 101 | 99 | 84 | 6 |
| Fall 2021 | 142 | 101 | 99 | 84 | 9 |
| Spring 2022 | 142 | 98 | 97 | 78 | 19 |

## Common SC Elements

The researchers further explored the link location and guiding calls to action for the nine institutions where the IRs did crosslink to the library's SC page. There were several common SC elements between these nine IRs, which included links to author rights information or author rights services and points of contact for SC topics. Two of the libraries linked to the SC web page directly on the IR homepage, and another two had links to the SC page on the IR's "About" page. Five linked to the SC page on a sidebar under headings such as "Author Corner," "Useful Links," "About," and "Other Resources."

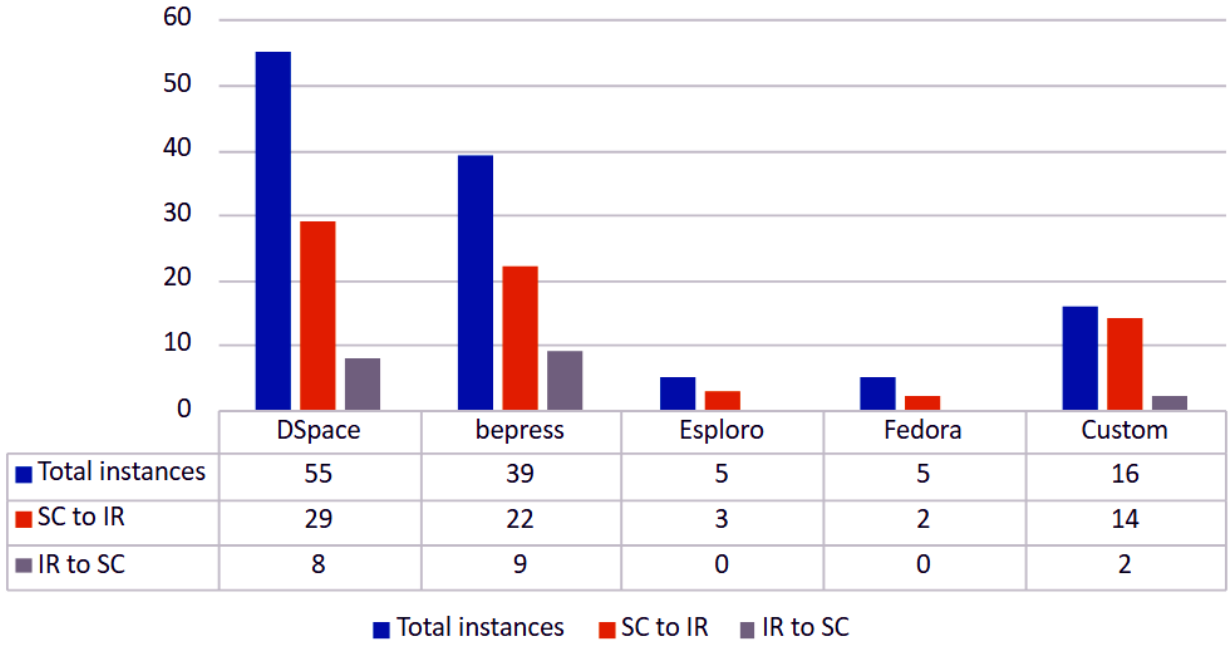
### *Changes Over Time*

Recognizing that webpages are dynamic, the authors revisited the SC and IR websites collected in fall 2021 to track any changes. As in spring 2021, 142 (97.9%) institutions maintained an IR and 101 (69.7%) provided an SC page to their uses. Similarly, 99 (68.2%) institutions offer users both an IR and SC information. When exploring the crosslinking practices at these institutions, 84 (84.8%) SC pages linked to the institution's IR, while 9 (9%) IRs linked back to the institution's SC page.

The spring 2022 website review identified 98 (67.6%) SC web pages. Interestingly, 11 (7.6%) SC pages from the original 145 were no longer available, and an additional eight (5.5%) library sites that did not have SC pages in spring 2021 had a newly available site. The number of IRs remained consistent and were supported at the same institutions in both the original spring 2021 and fall 2021 data collection. Additionally, the number of sites that had both an SC page and an IR dropped to 87 (60.0%); a decrease of 7.6 percent. Of those, 20 (23.0%) of

the IRs linked to the SC page and 77 (88.5 percent) of the links were reciprocal (see Figure 1). What stands out in Figure 3 is a 13.9 percent increase in crosslinks from IRs to SC pages over the course of a year.

**FIGURE 4**
**IR Software Crosslink Trends**




## *IR Software Trends*

Last, in the spring 2022 data, 142 of the 145 (97.9%) libraries maintain an IR. Of those 142 institutions, the following software platforms were used: 55 (38.7%) used DSpace; 39 (27.5%) bepress; 5 (3.5%) Esploro; 5 (3.5%) Fedora; and 16 (11.3%) presumed and confirmed custom builds (seven of which were in the University of California system, which use a shared repository across their campuses). The remaining institutions used other IR software, including ePrints, Samvera, Hyrax, Pure, Invenio, FigShare, Hydra, Sobek, and Jupiter.

Looking more closely at IR software to explore the crosslink trends (see Figure 4):

- Of 55 DSpace institutions 8 IRs linked to SC page, 29 SC pages linked to IR.
- Of 39 bepress institutions 9 IRs linked to SC page, 22 SC pages linked to IR.
- Of 5 Esploro institutions 0 IRs linked to SC page, 3 SC pages linked to IR.
- Of 5 Fedora institutions 0 IRs linked to SC page, 2 SC pages linked to IR.
- Of 16 custom build institutions 2 IRs linked to SC page, 14 SC pages linked to IR.

The trend in SC pages more commonly linking to IR, rather than the other way around, follows across all IR software platform. IR software does not appear to be a significant determinant of crosslinking practice.

## Discussion

With this study, the authors aimed to first address the question of whether academic libraries are facilitating connections between IRs and SC services. The findings show that 97.9 percent of the academic libraries reviewed host an IR. This indicates that the work involved

with libraries supporting IRs has evolved and advanced over the past twenty years since the Budapest Open Access Initiative promoted the benefits of self-archiving, and by extension, repositories.[58] Repositories have become integral tools for providing access to and preservation of an institution's scholarly output, with open distribution in IRs showing an increase in the visibility and use of vital institutional research.[59] Hosting an IR is a significant undertaking, however, and offering a platform is a fraction of the work. The education, outreach, and mediation underlying IR services[60] are where institutional intention becomes action. One of the fundamental methods for providing information about IRs and IR-related services is via SC resources (see Figure 3).

With this understanding, the authors expected a comparable number of SC pages at institutions that had IRs. However, over 30 percent of the study's library websites did not feature a dedicated SC web page. Furthermore, it is noteworthy that between spring 2021 and spring 2022 there was a 10 percent decrease in the number of institutions that offer SC services information to their user community. This merits further exploration. While webpages evolve, possible explanations for these datapoints may include SC services being rebranded, distributed under different services, or suspended entirely. Shifts in what SC services are called and where they are situated may offer a bellwether of changes in how institutions frame SC-related services. At the very least, exploring these shifts further may provide insight into where SC services fit within an organization's structure and priorities.

It is reassuring that the number of IRs remained consistent. Another bright spot is the nearly 14 percent increase in links made from the IR to SC services between spring 2021 and spring 2022.

## *Crosslinks for Discoverability*

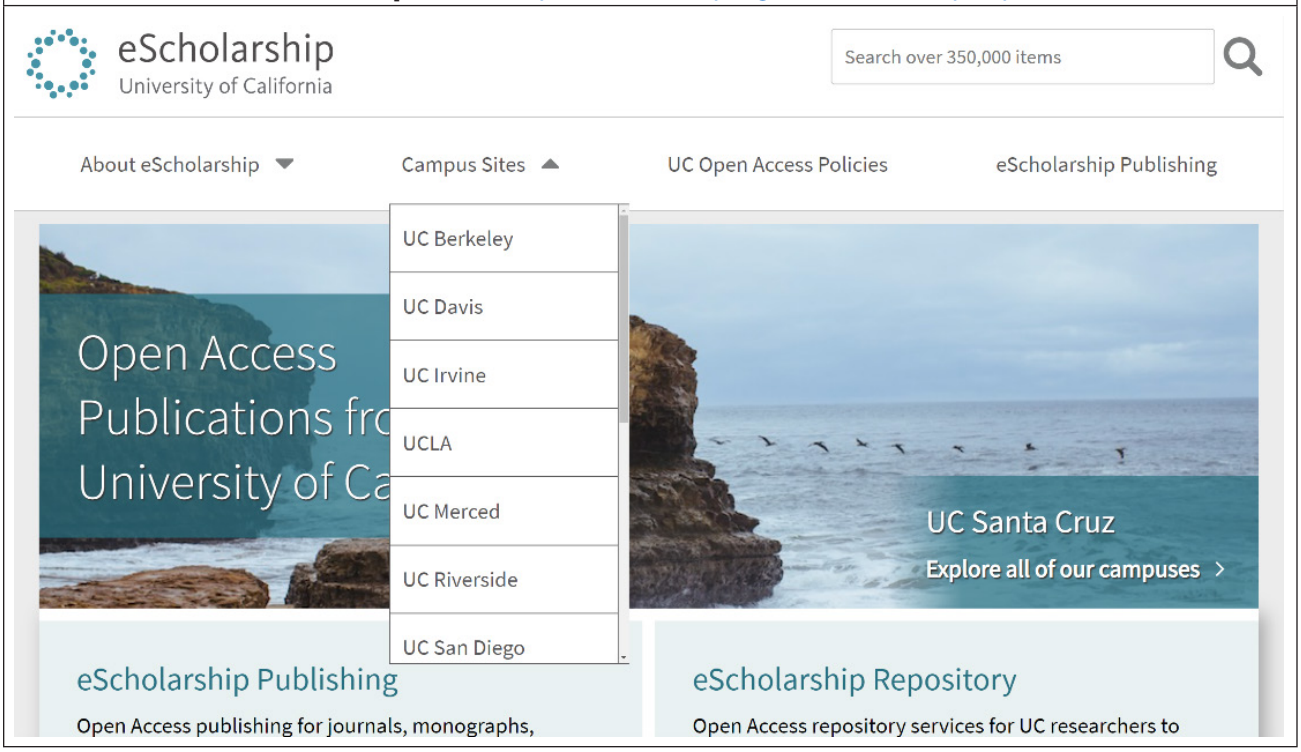
IR services are readily available at a significant number of the institutions yet, at most, 67 percent have web-based information to direct users to SC and IR services in tandem. Most institutions that have both an SC webpage and IR service linked from the SC webpage to the IR. However, only 23 percent linked from the IR back to SC services. Most libraries did not include a clear, direct path for users to their SC webpage from their homepage. Of the institutions examined, thirty libraries nested their SC content under a larger content category such as "Services" or "Research Support." The University of Oklahoma Libraries, for example, nests their SC webpage (titled "Scholarly Communications") under three sub-categories: "Faculty Services,"[61] "Research Support," and "Publication Services." This breakdown can help provide different paths for users to find relevant SC support, depending on how they identify their own information need.

Returning to the assertion that IR and SC pages are critical tools in academic libraries' efforts to open and preserve an institutions' scholarly record, how then might academic libraries do better at building connections for and trust with users? Most directly, and most immediately, one practical recommendation is linking from the SC page to the IR and back again. Whether the SC and IR are different units in an institution, libraries should crosslink the two services to bolster user interactions and invite participation. For those institutions without an SC page, the authors recommend creating one with basic elements contextualizing the IR and considerations related to sharing scholarship openly. The few IRs in the study that did crosslink back to SC pages (9.1% in spring 2021; 23.0% in spring 2022) often included the SC link directly on the repository's homepage. If the repository platform permits direct

linking, this provides an unambiguous option for placement. Including the SC link under the repository's "About" or "Frequently Asked Questions" page or section could also serve the dual purpose of providing information to end users who seek to learn more about the purpose and aims of the repository.

This study found that sixteen institutions used consortial or shared repositories. In cases where an institution is part of a consortium or a shared repository, the IR will see users from various home institutions. Including a link to each institution's SC page is warranted for users of a shared service. By localizing a shared service, participating institutions can build credibility and trust among users. At the same time, local users can quickly locate relevant information for their needs. In building space for the local user, the shared instance can feel more personalized. One method for doing so is by creating a shortlist or an accessible dropdown menu with institution-specific links to SC pages. The University of California's eScholarship "Campus sites" exemplifies this sort of subtle localization.[62] By selecting a specific campus from the dropdown, users are directed to home points of contact and websites (e.g., University of California Berkeley, see Figure 5).

**FIGURE 5**
**University of California's System-wide Repository, eScholarship, Including the Dropdown with Links to Local Campus IRs** (https://escholarship.org/, archived at https://perma.cc/BRJ6-HVP2)




## *IR Software Influence*

The authors also aimed to determine whether IR software influenced the informational connection between IRs and SC services and resources. The data collected indicate over half of the institutions studied (66%) use DSpace (55 institutions) or bepress (39 institutions) for their IR software. Looking more closely at the institutions that do crosslink from the IR to SC services and back again, 9 of them use Dspace (16%), 8 use bepress (20%), and 2 use custom software (12%). There is not a clear outlier that indicates, or hints at, one IR software offering a clear

advantage, or disadvantage, for crosslinking between IR and SC services. The gap between crosslinking practice, then, seems to indicate either institutional oversight or intention.

### *Recommendations to Encourage Engagement*

Might academic libraries need to consider practices that better connect IRs and SC web pages to provide an easier path to engagement with open practices for users? The findings herein seem to offer a cautionary tale. While crosslinking may seem self-evident, the data collected demonstrate a significant opportunity to improve the connection between IRs and their users and SC support, which can aid IR user goals and advance the benefits of OA.

New visitors, whether depositing to or accessing content from the IR, may not be familiar with IR and SC topics. There are several ways to increase the usability of IR systems and SC services that provide familiar functionality that can improve the likelihood of users having a "satisfactory experience."[63] Brief introductory information can help reduce a user's frustration and confusion and focus user action.[64] Link labels should be clear and descriptive, explaining what the user will find if they follow the link. A link to "The Office of Scholarly Communication," for example, may not mean much to a new visitor. A more effective link label would be "Scholarly Communication Services" or "All Scholarly Communication Services," which directly sends the user to the web page that covers relevant services and support. Clearer still would be targeted calls to action for known areas of ambiguity or concern, such as, "How to Deposit," as found in Duke's IR, DukeSpace page (see Figure 6), which links users to the institution's SC page that features additional calls to action (e.g., "Learn more about copyright").[65] As Lucaites, Fletcher, and Pyle[66] note, "[u]sers rely on clickability cues to know where on the page they can click and how they can interact with the site." Call-to-action buttons are an unambiguous way of doing so.

One of the primary responsibilities of libraries is to connect users with information. IRs provide an excellent venue to freely share and access information. The data herein indicate that, while the number is slowly growing, only 23 percent of IRs maintain a link with SC services. Libraries can and should institute practices that better connect their IRs to SC resources.

**FIGURE 6**
**Duke's IR DukeSpace, Linking to Duke's SC Page ScholarWorks with a "How to Deposit" Call to Action** (https://dukespace.lib.duke.edu/home, archived at https://perma.cc/WW66-RJDD)

Inserting services, support, and points of contact to help clarify and focus a user's information seeking helps nurture a positive experience for users. While academic libraries may clearly invite contributions to IRs, do they similarly invite information seeking that clarifies the details and supports the practices attendant with IR deposits? With adequate support at the point of need, with the goal of making regular and confident visitors to IRs, the academic libraries' collective call for behavior change in support of a more open, sustainable scholarly landscape may become an easier reach for potential users. An unambiguous method for doing so is to employ "triggers," such as call-to-action buttons or menu items, that invite active engagement.[67] Academic libraries need to be clear and direct in their communication, using plain language and prominent links to support the deposit process.[68] Doing so will help empower users and may affect whether they choose to deposit content in an IR or not.

## Limitations

The authors were deliberate and aimed to be thorough in their study of IR and SC service crosslinking; however, several limitations to this work bear acknowledging.

First, the decision to use ACRL's SC definition is a limitation of this study by design. ACRL's term is well recognized, as evidenced by the Association's roadshow and toolkit of the same name, but academic libraries do not consistently use "scholarly communication" to characterize their SC-related services. As a result, ARL and Carnegie R1 institutions with digital initiatives, digital scholarship, and similarly titled services and support were not considered in this review. Additionally, these data were only collected during the spring 2021 data period. Potential shifts in local SC definitions over time were not captured, since crosslinking trends were the focus of this study.

Another intentional decision was to limit this study to ARL and R1 institutions. Again, the authors anticipated that these institutions would have SC services and IRs because of their high research activity. The findings herein do not consider, and may not be applicable to, non-research-intensive colleges and universities that are mainly teaching-focused.

This study explores the publicly available interfaces of SC resources and IRs. As such, the authors did not have access to submission-side resources that may be embedded within IR software; for example, definitions and links to SC services or external resources for submission support may be in place at these institutions. Access restrictions rendered such guidance invisible to this study.

A related limitation is that institutions employ different methods for collecting content for their repository. These strategies may include mediated deposit, harvesting, publisher autodeposit, and other tools, such as research information management systems (e.g., the U.K.-based Publications Router and U.S.-based Public Access Submission System). Self-deposit is neither the only nor the fastest way to increase content to a repository. However, since these alternatives require additional resources and institutional commitment, these findings offer fundamental recommendations for all institutions, which may help smooth the path and make clearer connections to better support researcher participation in IRs.

## Conclusions

Creating clear, comprehensive SC webpages, action-oriented instructions in the IR, and building direct links between IRs and SCs, these services can together help grow and evolve the attitudes and practices required to broaden a researcher's reach and expand access to valuable scholarship.

This study examined whether 145 ARL and Carnegie R1 institutions maintain and connect IRs and SC websites. An analysis of the data indicates that SC pages are more likely to link to the IR rather than the reverse. As much as IRs are common at the study's institutions, these findings indicate it may be time to reconsider what SC information is provided via IR pages and how this information is framed. Doing so would better support an author's efforts to take advantage of OA distribution in IRs with the support of institutional SC services.

As academic libraries continue to invite participation from their community of users, the authors consider whether grounding the request of researchers—to shift practices and invest time in making their work OA—can be better supported with some common crosslinks that provide clear information and targeted actionable steps. By connecting services and systems more seamlessly with some small, tangible steps, academic libraries extend the range of their invitation to researchers to shift their practices.

Following from this work, the authors encourage further research in the linking practices and language libraries use to help direct user self-deposit. More specifically, the qualitative reason for the decrease in SC websites at the study's institutions merits exploration. A survey to a random sample of institutions that deactivated their sites, those that remained active, and the newly added institutional sites may help determine trends in the SC field.

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