**Engineering a powerfully simple interlibrary loan experience with InstantILL**

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2019

16th IFLA ILDS Conference
9–11 October 2019
National Library of Technology
Prague, Czech Republic
BEYOND THE PAYWALL
FREE
resource sharing in a disruptive ecosystem

# Engineering a Powerfully Simple Interlibrary Loan Experience with InstantILL

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**Abstract:**

*IUPUI University Library (UL) has long recognized the need to advance open access and the crucial role resource sharing services play in bridging between the subscription-based world and an Open world. Resource sharing professionals frequently use library services to search for and retrieve known items, and thus have a key role not only in the provision of services but in demanding better discovery systems, promoting new and better discovery and delivery tools, and educating users. As services such as Primo, EDS, and Google Scholar combine with library website design to promote central indexes, it is increasingly unrealistic to expect the average user to search multiple unpromoted channels for what they need, and so libraries must work to make all aspects of discovery and delivery similarly straightforward.*

*Resource sharing professionals can make significant inroads in improving discovery and delivery of open access and subscription content by partnering with Open projects to improve the library user's experience when searching for known content. This paper will share how UL has taken a concrete step in this direction by working with the Open Access Button to develop InstantILL, a simple, community-owned, search tool for students and researchers to get free, fast, and legal access to articles. With a simple interface that users expect, InstantILL integrates searching library holdings, searching open access materials, and submitting interlibrary loan requests into a single action. Attendees will learn why the library chose to pursue this project, what InstantILL is, how it was designed and developed, and the results of the implementation.*

**Keywords:** resource sharing, interlibrary loan, open access, delivery, InstantILL

## Introduction

The Open Access Button is a non-profit project that builds free, open source, community-controlled tools that make doing research without subscriptions simple. In 2013, the project launched the Open Access Button tool, which took users from a paywall to an Open Access version in one click, (SPARC 2015) and has since evolved to encompass a suite of researcher and library tools designed to help libraries create and utilize Open content to save money, improve services, and accelerate progress towards Open.



Indiana University-Purdue University Indianapolis (IUPUI) is an urban public university comprised of academic units from both Indiana University and Purdue University. IUPUI enrolls approximately 30,000 undergraduate, graduate, and professional students and employs more than 2,800 faculty and 4,600 staff (IUPUI n.d., IRDS n.d.). IUPUI University Library (UL) serves two colleges and fourteen of the seventeen schools on the IUPUI campus. The professional schools of law, dentistry, and medicine each have their own library, providing their respective faculty, staff, and students with library services, including resource sharing. UL's Resource Sharing & Delivery Services department provides interlibrary loan (ILL) to UL and Herron Art Library users and maintains a shared ILLiad server, which holds the ILL management systems used by all campus libraries.

UL has a longstanding commitment to Open Access, which has had a library-wide influence, including within Resource Sharing & Delivery Services. This is reflected in the scholarship of Tina Baich, who led UL's resource sharing services for twelve years. Baich has long recognized the crucial role resource sharing services play in bridging the gap between the subscription-based world and an Open world. Resource sharing professionals frequently use library services to search for and retrieve known items, and thus have a key role not only in the provision of services but also in demanding better discovery systems, promoting new and better discovery and delivery tools, and educating users (Baich 2017).

## Literature Review

Kristof (2018) provides an excellent overview of the issues that currently affect interlibrary loan (ILL) in academic libraries, including what can be referred to as our "dueling fears." For some time, ILL practitioners have been caught between fearing their workloads will

significantly increase due to decreased purchasing/licensing caused by budgetary constraints and/or significantly decrease due to increased availability of Open Access content. Both are largely false fears as demonstrated by Calvert and Fleming (2013) and Mak and Baich (2016). Calvert and Fleming (2013) examined the effects of journal cancellations on interlibrary loan and, as cited by Kristof (2018), found that "small increases in ILL requests were noted, [but] they were not significant" (p. 399). Mak and Baich (2016) conducted a study of interlibrary loan (ILL) article requests for evidence of a decrease that could be attributed to the spread of Open Access. Despite the assumption that the impact of Open Access on interlibrary loan would be most visible in a decline for requests for articles in the period immediately post-embargo (likely 12-24 months post-publication), no significant impact on request volume could be directly attributed to Open Access (Mak and Baich 2016). The authors conducted a second, expanded study to specifically look for an impact on ILL as a result of the NIH Public Access Policy. This study did find a decline in demand for health sciences content; however, the decline was in the first year post-publication when the articles were most likely to be under the NIH-permitted embargo (Mak and Baich 2017). This finding runs counter to the assumption that Open Access contributes to decreases in ILL volume.

The true driver of ILL volume may, in fact, be discovery (or the lack thereof). There have been numerous studies regarding the impact of discovery on interlibrary loan, including the tendency of library users to request owned/licensed items (e.g. Yontz et al. 2000, Janke 2007, Kress et al. 2011, Gaffney 2012). Librarians have, in fact, proven that improved discovery reduces the volume of interlibrary loan requests for material readily available whether through subscriptions or Open Access versions. This finding has been described by Musser and Coopey (2016), who found that "the overall reduction in requests for locally owned or licensed content was 58 percent for articles and 56 percent for loans" two years after implementation of a discovery system (648). As a result of these and other studies, a number of U.S. academic libraries, IUPUI University Library included, continuously pursue streamlined discovery, as well as integration of Open Access content.



Recent efforts specifically within resource sharing to improve discovery and delivery for library users are the Big Ten Academic Alliance's (BTAA) series of Discovery to Delivery Reports (BTAA 2017), the Private Academic Library Network of Indiana's (PALNI) OneButton (Magnuson et al. 2018), and Project ReShare. The BTAA reports outline a clear vision for the future of library discovery to delivery systems that prioritizes interoperability and communication and breaks down the silos in which many of our systems currently operate. In short, BTAA advocates for a unified, "smart" patron-facing system that creates a seamless user experience (BTAA n.d.). PALNI's OneButton is an attempt to achieve that vision using a PHP application developed to replace "multiple fulfillment buttons in institutional discovery interfaces with a single OpenURL link" to the best fulfillment option for a particular user (Magnuson et al. 2018, 1). Finally, Project ReShare, launched in October 2018, is a collaborative, community-driven initiative to create "a user-centered, app-based, community-owned resource sharing platform for libraries" that, at the outset, will largely be geared toward library consortia (Project ReShare n.d.).

Baich has specifically spoken to the need for improved discovery of Open Access content, which would help to both reduce interlibrary loan requests for these materials and improve overall patron experience with library services (Baich 2017, Baich 2018). In recent years, Open Access discovery tools have been introduced outside the library in the form of browser extensions such as the Open Access Button (OAB) and Unpaywall. Libraries are promoting

the use of these extensions to their users, and both OAB and Unpaywall have made headway into library systems and services. For instance, Unpaywall data can be used in conjunction with library link resolvers (Unpaywall n.d.) to supplement existing Open Access "subscriptions" that can be activated in electronic resource management systems to surface open content. The Open Access Button's ILLiad addon has been used by libraries more than 300,000 times to supplement staff discovery of Open Access content in the course of their normal workflow. A recent study found that the "proportion of ILL requests that may be filled by using OA Button or Unpaywall is significant enough to provide a substantial benefit," showing that libraries should continue their implementation of Open Access discovery tools (Emery et al. 2018). While both build tools with broad usage, Our Research, the parent organization of Unpaywall, is focused on more researcher-facing, Open Science infrastructure (Our Research 2019), while OAB creates tools with and for libraries to improve their services and thus library users' experience, while still fulfilling their mission to advance Open.

**What is InstantILL?**

InstantILL aims to reduce dependency on subscribed resources by providing a cost-effective route to delivering articles from many sources through a unified interface in the spirit of the BTAA Discovery to Delivery Reports (BTAA 2017). The open source tool is designed to replace or augment existing ILL forms by finding and checking metadata, as well as content availability, during the search for a known item. These functions allow patrons to access content instantly when a subscription or Open Access version is available and reduce the amount of information to be manually entered. By ensuring full and accurate metadata, InstantILL also shortens the processing time for ILL staff. The tool connects to many subscription and ILL management systems without complex integrations, embeds into existing workflows, and receives hosting and maintenance centrally through the Open Access Button.



The figures (Fig. 1a-5) below illustrate one way in which InstantILL can be integrated into existing library webpages. Users input whatever information they have, and InstantILL fills in the gaps using data from Crossref and other repositories. InstantILL returns minimal metadata to aid the patron in confirming the accuracy of the match and provides the delivery options available to them (i.e. subscription full-text link, Open Access full-text link, or ILL request submission button), or provides the user with the opportunity to supplement and/or correct metadata (Fig. 1b).

In Figure 2a, the user is prompted to submit an ILL request. When the user chooses to submit the ILL request, InstantILL passes the metadata via OpenURL to the library's existing ILL management system for submission, without retaining any patron information. In Figure 2b, the ILL request is submitted into UL's ILLiad system, but InstantILL is designed so that any OpenURL compatible system, including e-mail, can be used. ILL practitioners see all the metadata found by InstantILL and are made aware of the content availability checks conducted. The metadata includes standard numbers (i.e. ISSN), which allows for automated processing into systems like RapidILL or OCLC's Article Direct Request. Figures 3 and 4 illustrate other possible delivery options.

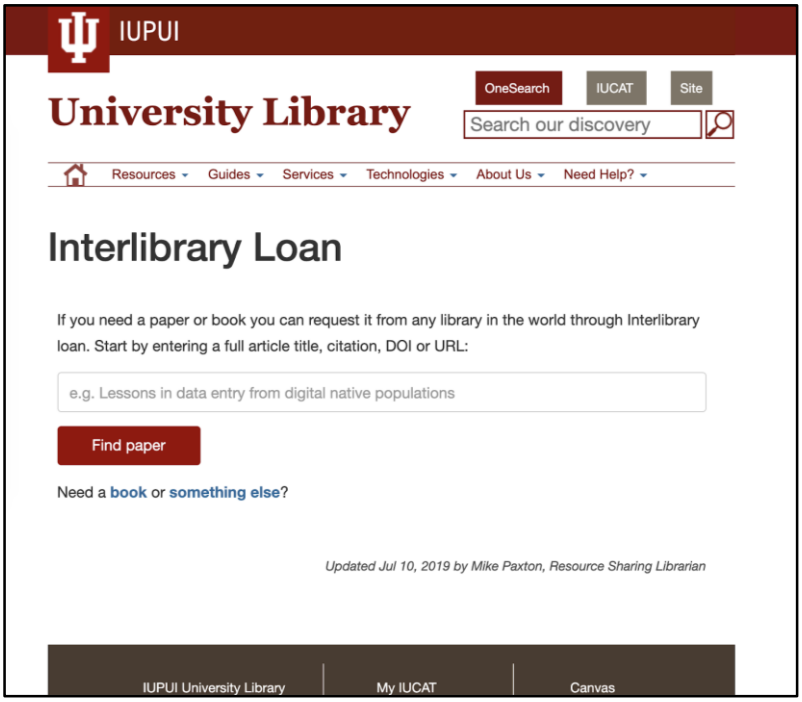


**Fig 1a.** Users input whatever information they have about a known item, and InstantILL fills in the gaps using data from Crossref and other repositories.

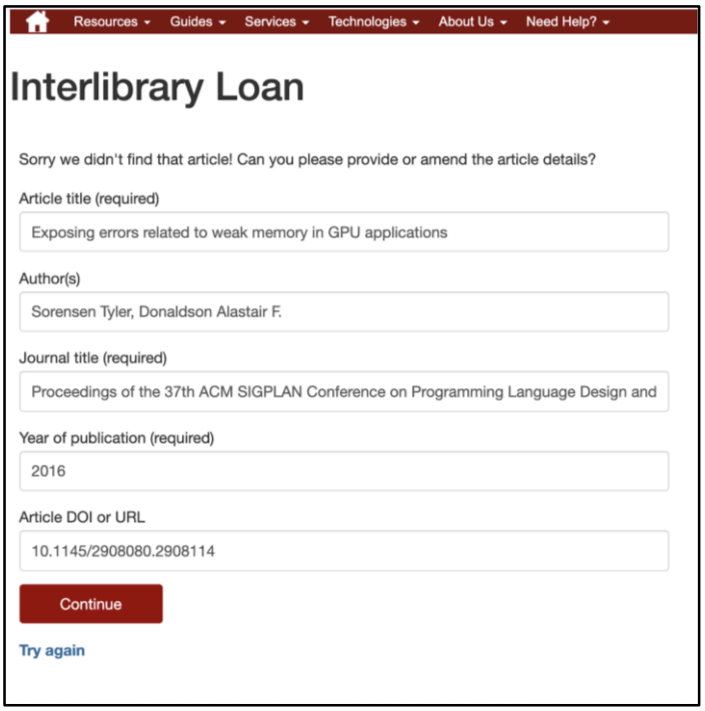


**Fig. 1b.** If InstantILL can't find, or wrongly matches, an article, details can be manually entered through a streamlined form. These details can then be enriched before submission.

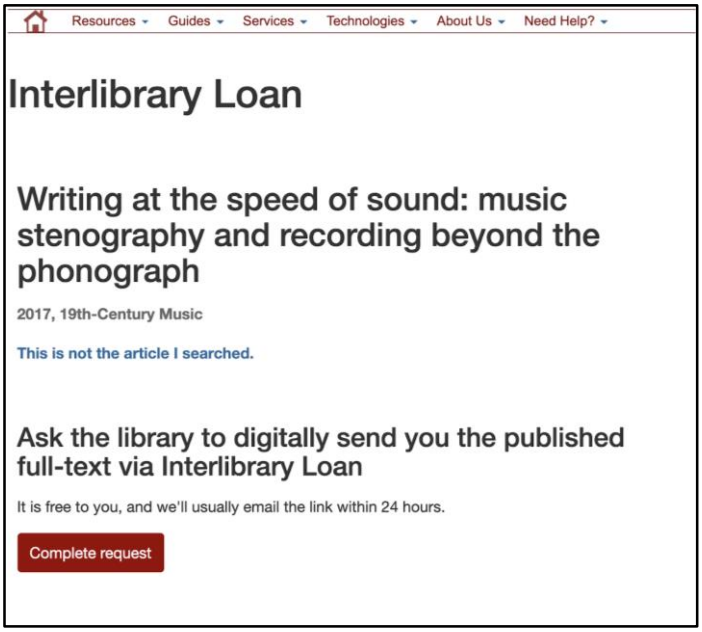


**Fig. 2a.** Patrons are offered the delivery options that are available to them. In this instance, the user is prompted to submit an ILL request.

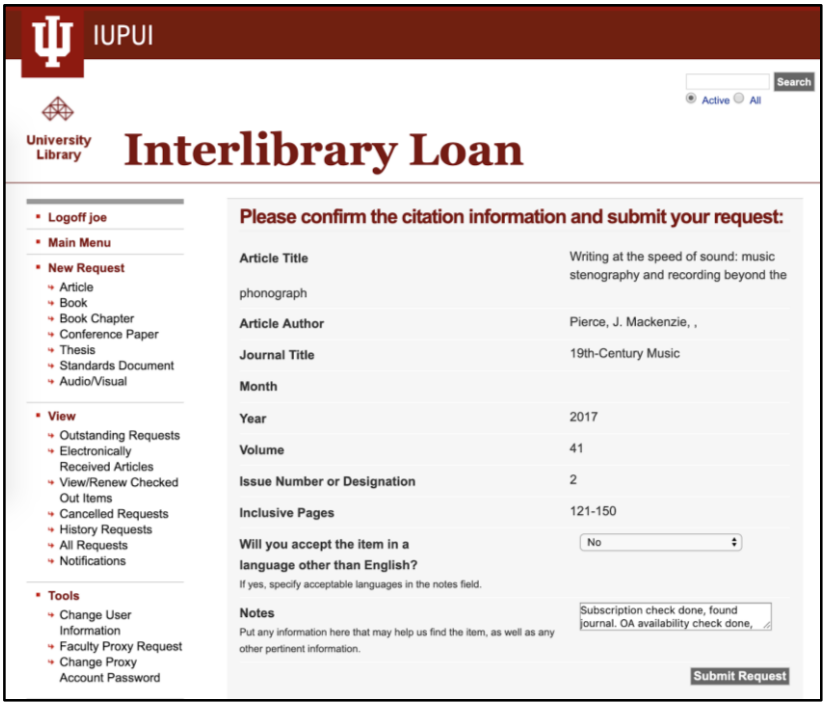


**Fig. 2b.** When the user chooses to submit an ILL request, InstantILL passes the metadata to the library's existing ILL system for submission via OpenURL, without retaining any patron information. An ILLiad request form is shown here.

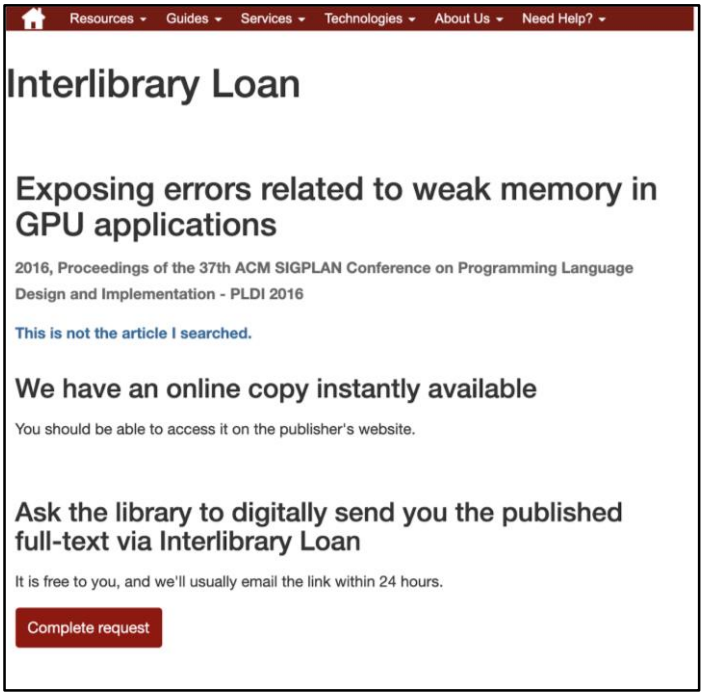


**Fig. 3.** Patrons are offered the delivery options that are available to them. In this instance, the user is given the option to use an Open Access copy or to submit an ILL request.

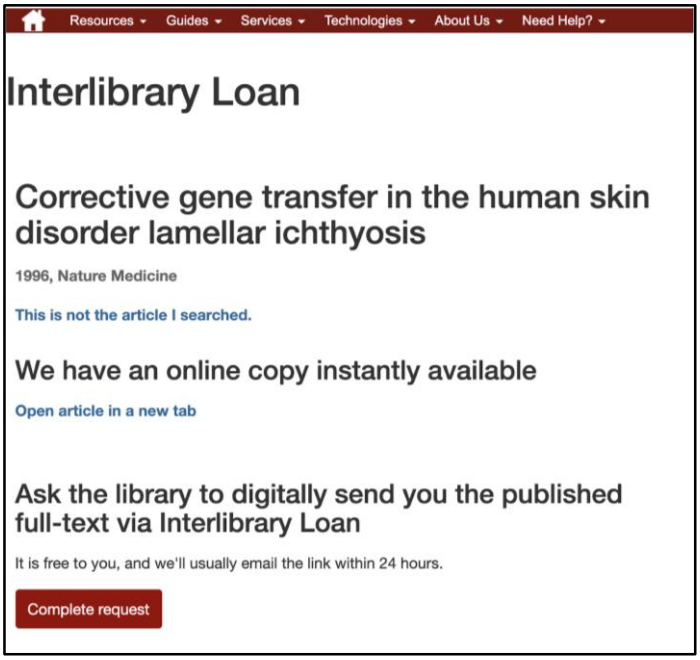


**Fig. 4.** Patrons are offered the delivery options that are available to them. In this instance, the user is prompted to utilize an already paid-for copy of research.



## Designing and Developing InstantILL

The design of InstantILL was rooted in the origins of the Open Access Button (OAB), which has always aimed to provide user-friendly access to content behind paywalls. In 2016, OAB

began to focus its efforts on libraries, motivated by the desire to support institutions with journal negotiations. Early discussions at Imperial College London pointed OAB towards Interlibrary Loan as a key leverage point, and this was confirmed during broad consultations and discussions with approximately one hundred librarians from across the world. During those consultations, three potential routes were identified, and OAB did case studies with libraries to explore these routes (Jisc 2017, Open Access Button 2017). InstantILL represented the most ambitious of those routes, one that built on the other case studies and a clear articulation of what OAB thought it was truly positioned to deliver to fulfill a need within the community (McArthur n.d. *Case 3*).

Reconciling OAB's lofty aims with the constraints of time, resources, and the desires of users, required several key design elements that, once accepted, defined what InstantILL could become. For example, knowing the importance of ILL as a local service meant embedding the service into web pages controlled by libraries. This necessity put huge constraints on the design elements OAB could use, while maintaining confidence that InstantILL would display and work properly in multiple contexts. OAB also knew it wanted InstantILL to reach hundreds, if not thousands, of campuses, and, given its small team, this aim necessitated a simple and independent implementation process for libraries. Further, set up must not require developer assistance, which may or may not be available within a library. Understanding that patrons don't want to manually enter information, use complex interfaces, or always know common identifiers (e.g. DOI) meant designing input mechanisms that could accept almost any type of input and simplifying a complex process into just one key action at a time.



Partnering with IUPUI University Library (UL) allowed OAB to take broad strategies and reconcile them with on-campus realities to develop a working tool at one library that could be implemented by others. This involved a series of planning meetings to discuss, learn, and agree on what was required to advance the project. Throughout, OAB benefited from the expertise and pragmatism of UL staff, and maintained a strong action orientation, always looking for what it could do to reach the next milestone. In this process, OAB was lucky to find most of its broad ideas would work in some form; however, few, if any, of the expected specifics remained.

OAB worked with Cottage Labs, its development partner, to build InstantILL based on the design prototypes. InstantILL uses a RESTful, JSON API built on the Open Access Button's existing infrastructure, which itself is built with NodeJS with Coffeescript and Elasticsearch. Meanwhile, the front end is a static site built in HTML, CSS (Bootstrap), and Javascript (Jquery). Open Access Button, and therefore InstantILL, runs on a cluster in the cloud to provide scalability and reliability. These languages and tools are well-known, with lots of tooling available in order to enable the OAB team to focus on building with them.

OAB and Cottage Labs code openly on Github, delivering updates weekly (or sooner, if possible) in alignment with the agile development philosophy. An iterative release approach allowed UL to take elements of InstantILL live as they became viable and test various subsystems at scale before the full tool was complete. This let the team observe results from the search box's performance in a real-world setting and get feedback from a wider array of users.

## User Testing InstantILL

To prepare InstantILL for release, the team tested it with potential users to better ensure they would be able to successfully complete their requests. The process for finding materials needed to be transparent enough to allow savvy researchers to understand exactly what they were getting, but seamless enough that users who simply wanted to get an article could do so without difficulty. Balancing the needs of these two types of researchers was important to the team, as was ensuring that less experienced researchers found the tool usable and not overly onerous.

It was particularly important to test the language and directions in InstantILL. Any product or process that relies on a user making decisions needs to provide clear, understandable directions and prompts. This need can be complicated when the audiences possess various levels of knowledge and expertise. Related to the directions, the team tested to ensure that the interface was approachable and usable. This included concerns like the order in which results were displayed and the use of buttons versus text.

For user testing, the team created prototypes of the web page with Figma, a web-based tool that allows users to quickly create sample web pages and then link them to other sample web pages, allowing testers to interact with a fake website in a natural way. To test these prototypes, the team employed a scenario-based approach with participants who were from IUPUI University Library's population of users. This approach tasks participants with several scenarios to complete, while a team member stays in the room to give them tasks and handle any kind of technical errors that might occur during testing. The rest of the team usually is able to view a participant's screen and hear their voice through a screen-sharing service. One of the benefits of this type of testing is that it requires only a few participants, but the team gets to spend more time with each one. This makes recruitment of participants easier and allows the team to focus on immediate issues with the design. Standard practice is between three to five participants for each round of testing.



Participants were presented with several of these prototypes in order to complete their tasks, all of which followed the same basic structure. Participants were given printed citation information and asked to find the item with the prototype. The difference between each task was the results returned by the search. For example, in one test, the item had an Open Access version; in another, the item needed to be requested through interlibrary loan; and, in yet another, the result the search returned wasn't the item the participant was requesting. As participants worked through the tasks, the team observed how they interacted with them, what steps seemed problematic, and any sources of frustration. While completing the tasks, participants were asked to voice their thoughts, or "think out loud." This is standard practice for task-based tests, as it allows the team to better understand what participants are thinking and their motivations throughout the test. After completing the tasks, participants were asked several questions about their experience with library systems and if they had used interlibrary loan in the past. This provided the team more context for the way participants behaved and more information about how users may expect the tool to function.

Conclusions were made quickly after every test, with each member of the team aggregating their notes and then discussing the results. Changes were made in the prototype between each testing date, based on the results. The team conducted user tests three different times, with a

month between each test. The tests provided a rich amount of information to improve the design of InstantILL, particularly with the language used.

In the course of testing, the team identified several challenges with the prototypes, language, and recruitment and took steps to eliminate, or at least offset, each of these. The first shortcoming was the inability of users to type in a search box within the Figma prototype. To replicate the search, the team still made users click the "Search" button to progress, and then a "loading" screen was presented to the users that had the title of the item they were tasked to find in the search box. Clicking anywhere on this screen advanced the prototype to the next step. Since InstantILL is based on users' ability to search for a specific item, this limitation caused several issues. Firstly, it meant that participants couldn't interact with the tool as it was intended. The second was that the team felt participants didn't truly "own" the search. In other words, the participants didn't actually think about the item for which they were asked to search. This was of particular concern when the prototype was designed to return the wrong item to the user. To remedy this, the team began to require participants to write down what they wanted to search on a piece of paper with a pen. While the participants found this to be odd, especially since they had the article information on a printout, the team felt this aided the way in which the participants interacted with the prototype.

Recruitment for these types of tests can be a challenge, depending on the population being targeted. The team tried to recruit students at different levels (i.e. undergraduate, graduate) and created a small marketing campaign with IUPUI's graduate office. While the team received some interest and scheduled one graduate-level participant, they ultimately did not participate. Participants were then found by interacting with students as they entered the library. This means that our population was narrow (on-campus students that were users of the library), when the team had hoped it would be broader.



**Implementing InstantILL**

The Minimally Viable Product (MVP) consisted of checking the search terms against Open Access repositories and metadata sources (e.g. Crossref, Europe PMC, Unpaywall Data, DOAJ) and then linking users to either the Open Access text or a pre-filled Interlibrary Loan request form. Before moving to production, a search box was added to a live (but unlinked) page, and an InstantILL-specific request webform was created for testing. Once the MVP was deemed functional, UL moved InstantILL into production by adding it to the Interlibrary Loan pre-login page on April 26, 2019, the beginning of IUPUI's spring semester finals week. The team chose this location in order to give patrons access and an option between the new InstantILL request box and "classic" request forms. The search box was given a place of prominence on this page, along with descriptive text.

Mike Paxton, UL's Resource Sharing Librarian, shared an overview of the project with the Library's subject librarians during early development, and gave a more detailed presentation to this group when InstantILL moved into production. This was both to prepare them in case of questions about the new search box through University Library's chat reference service and to familiarize them with the new interface, especially for those who include interlibrary loan in instruction sessions.
The new ILLiad article request form created for user testing continued into the production environment. By using ILLiad's OpenURL mapping functionality, requests created with verified metadata supplied by InstantILL are sent to a unique form rather than the standard

article requesting form, and much of the article metadata is added to the final request invisibly to the user. Though the initial configuration did not include integration with University Library's link resolver, the team continued to iteratively design and test this functionality. Link resolver integration was accomplished mid-summer 2019, clearing the way for redeployment in UL's interlibrary loan requesting pages.

The iterative implementation process used by the team allowed for continuous development of InstantILL and has ensured a simple and independent implementation process for other libraries, which was a key goal of the project. The tool now connects to many content and ILL systems, without complex integrations or technical infrastructure, and embeds into existing workflows.

**Results**

InstantILL was successfully developed and released at IUPUI University Library (UL), to the agreed specifications. From April 26 to July 18, 2019, eleven patrons affiliated with UL and other campus libraries used the InstantILL search located on UL's ILL pre-login page to submit seventeen ILL requests, all of which were completed. In this early release phase, it was anticipated that InstantILL may not gather enough data to show its performance, which is borne out by the data just presented. Therefore, several bulk tests of individual systems were conducted on previously processed ILL requests. An anonymized dataset of article requests processed in the past year was exported from ILLiad containing article metadata and transaction records. This dataset of 13,000 requests was deemed to be representative of expected future requests.



Open Access Button (OAB) ran three tests on this dataset to assess various sub-systems of InstantILL, including OAB's ability to find Open Access alternatives for records and metadata for article processing, as well as the efficacy of the subscription systems. In each case, OAB used its API through OAsheet, another OAB tool, or inside a Google Sheet using ImportJSON to conduct the test. To stress test the system, OAB used only one field, article title, as a starting point for tests, as this is a reasonable requirement for all ILL requests. In actual usage, the team expects to have more metadata or identifiers when looking for items.

In OAB's first test of InstantILL's search system, 12.7% of the searches were matched to Open Access articles, which is within the expected Open Access availability range in testing. Based on existing studies, OAB expected at most 23% (Emery et al. 2018), and at least 5% (McArthur n.d. Case 1) of ILL records to match an Open Access item, with the large variability down to the interests of the schools and library subscriptions. From previous tests, OAB had established its accuracy with title searches at around 83%, while a recent study using DOIs found the Open Access Button to have a precision rate of 98.58%, as measured by automated analysis (Knoth and Cancellieri 2019). OAB deemed these accuracy results acceptable for an initial release, given that users are given a clear option to make an ILL request if the Open Access option is wrong.

OAB's metadata gathering systems ensure patrons don't need to complete long forms, while providing the information staff need to fulfill requests, ideally automatically. When OAB tested 1,000 records, the system found the essential information (article title, year published, journal title) for allowing ILL submission without patron intervention and the metadata needed (ISSN) to automate submission to RapidILL 80% of the time. Full citation records,

where the system found every field (volume, issue, DOI, etc.), were found 30% of the time. On average, metadata searches took 15 seconds with titles, with a range of 1 to 30 seconds, and an average of only 5 seconds with DOIs (Digital Object Identifiers).

Finally, to test InstantILL's subscription integration, OAB used a dataset of 100 ILL requests filled via a library subscription to assess the tool's ability to find either an article URL or another confirmation of subscription access. When given just an article title, InstantILL found just 64 of 100. When given an article title and journal name, InstantILL found 91 of 100 (91%). For 60 articles (66%), InstantILL could provide a direct link and could only confirm access for the remaining articles. This was deemed acceptable, with plans to improve the success rate over time.

**Next Steps**

Now that InstantILL is installed on the IUPUI University Library (UL) website, the team will conduct a new round of task-based tests. Since participants will be able to interact with the tool directly, the team should be able to get better information without contending with some of the issues faced when using the prototype. In particular, the team is interested in analyzing the tool with graduate students and faculty members. UL intends to maintain the existing search box on the ILL pre-login page and integrate InstantILL in its ILLiad webforms. This is expected to resemble the "Simple Search" and "Advanced Search" options present in many library electronic resources. Based on patron feedback and, as part of the ongoing review of UL's discovery services, the team may explore other possible locations for embedding the InstantILL search box, such as LibGuides, the campus learning management system, or the library homepage. When the tool is more fully integrated into interlibrary loan pages, Resource Sharing & Delivery Services will hold information sessions for UL librarians. Though exact branding has not yet been determined, it is unlikely that "InstantILL" will be used in patron-facing messaging, since "instant" refers to the request creation process rather than time to access (though access is indeed instant in some cases).



By making InstantILL part of the regular interlibrary loan article requesting process, the team expects InstantILL usage to increase, giving patrons faster access to articles. One anticipated consequence of embedding the InstantILL search box within the interlibrary loan request forms is a statistical decrease in the number of interlibrary loan borrowing requests. However, if UL is referring patrons to its electronic holdings or to Open Access versions of the content and information they need, this should be viewed as a success. Because InstantILL searches take place outside of the interlibrary loan requesting system and without patron-identifying information, the statistical effect will need to be accounted for in annual statistics and reporting, possibly by comparing any drop in overall number of requests with past requests that were filled from local holdings or Open Access sources. Resource Sharing & Delivery Services may also be able to point to other service improvements as a result of InstantILL integration, such as improved turnaround times.

OAB's most immediate next step will be to deploy InstantILL at other institutions. However, building on InstantILL's systems, OAB also hopes to build tools that bring these features to users wherever they are on the web. OAB expects to continue working to ensure patrons have easy, legal access to every article by improving InstantILL. Obvious and requested routes to do so include integrating more sources of subscription data and interlibrary loan systems, including purchase on demand as a way to deliver articles, and exploring the possibility of

using InstantILL as a link resolver or alternative to library search. Finally, OAB will continue to collaborate with ILL systems providers, especially those who share the values of open source and community ownership, to use InstantILL's features and ideas.

## Conclusion

For IUPUI University Library, partnering with Open Access Button seemed the perfect way to actualize the concepts and values espoused by its librarians, including Baich (2018) and Lewis (2017), among others. The organizations' visions for marrying discovery and delivery of Open Access content with resource sharing workflows were aligned. By combining our expertise, the team has been able to, in a timely and cost-effective manner, replace manual workflows for resource sharing staff, while surfacing Open Access content in a way that is more transparent and educational for the end user. The joint development of InstantILL increases our potential to not only integrate with library systems but also to bring the library to where users are.

This successful partnership between a library and a mission-driven, open-source developer can be a model for future creation of community-owned infrastructure. Though the Open Access Button team did not have significant previous experience in library-specific development, by consulting with University Library staff OAB was able to build a tool that integrates well with existing software. The specific scope of InstantILL made this a quick, low-cost project by leveraging existing available infrastructure. Going forward, libraries could adopt this partnership model to achieve goals quickly, affordably, and independent of traditional library vendors.



## Acknowledgments

Thank you to Teodora Durbin, Kevin Petsche, Rich Wing, and Kristi Palmer at IUPUI University Library for their support of this project. Thank you to SPARC for their support of the Open Access Button. Thank you also to Arcadia, a charitable fund of Lisbet Rausing and Peter Baldwin, which has generously supported building this and other tools for libraries to support discovery and delivery of Open Access. The Open Access Button would also like to thank Mark MacGillivray and Cottage Labs for developing InstantILL. Thanks also goes to Sam Ballard, who contributed heavily to the design of InstantILL. Finally, thanks go to previous members of our team and the many libraries and librarians who've supported the design of InstantILL, notably the staff at the University of Huddersfield (especially Christopher Beevers and Janet Chandler) for their time, expertise, and openness.

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