

Math and Aftermath

Impacts of Unbundling a Large Journal Package on Researcher Perceptions and Behavior

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This study seeks to understand the effects of a shift from a near-comprehensive journals package with a single, large publisher to a selective list of individual journal subscriptions on the work of researchers at a large research university. Analyzing historical journal usage, along with turnaway and interlibrary loan trends from the years following the changes, the authors made use of structured interviews with local researchers to bring context and meaning to the quantitative data. The interviews highlighted researchers' strategies for gaining access to literature in their fields to which the library does not subscribe, and revealed assumptions about timeliness of access, as well as relationships between library subscriptions and local researchers' publishing behavior.

Like other academic research libraries worldwide, Cornell University Library has for many years relied on large, multiyear licenses for comprehensive electronic journal packages offered by the world's largest commercial academic publishers. While providing access to major segments of the scientific and scholarly journal literature, these "big deal"-style licenses consume an ever-increasing share of library budgets and reduce libraries' flexibility to make literature from other sources available to researchers. It should also be noted that not every journal in these catch-all packages will match the research profile of every institution or necessarily receive a great deal of use at any one institution. For Cornell University Library (the Library), working with a flat collections budget over several years and facing significant annual increases to the cost of the big vendor licenses, the situation had become unsustainable by 2018,

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when the three-year licenses with our three largest publishers—in terms of expenditure—were coming to a close and up for renegotiation. The Library set a firm goal to arrive at terms by which the average expenditure for 2019, 2020, and 2021 on journals from our three largest journal publishers, based on total spend, would be no greater than our total expenditure in 2018. We built various scenarios that would fulfill this goal and we negotiated terms with all three publishers, letting our negotiation partners at each publisher know the spending constraints the Library had set. Two of the publishers showed little inclination to think creatively about new options, but offered minor concessions; one was more willing to work with us on our challenge. In the end, we determined that our best option was to leave two of the three deals in place, with annual increases controlled as best we were able to negotiate, and to drop one of the deals, shifting to subscription access for a subset of journals from that publisher.¹ The cuts were deep: from a package that provided our campus with full access to over 1,450 journal titles, we moved to a curated set of around 600 subscriptions; among the titles dropped were one hundred journals that received over one hundred uses each, on average, in 2016 and 2017.

We based decisions about which titles to include in the new subscription package on historical usage and cost, along with more subjective factors. Our calculations around holding the total expenditure across the three publishers at the 2018 level were based on the average of total spend over the previous three years. The cuts made were deep enough to accommodate annual increases built into the licenses with all three, and there was significant savings in the first year of the new arrangement. The Library set aside a portion of these savings to support what we expected might be a sharp increase in interlibrary loan (ILL) activity with requests for articles from the canceled titles. We also simplified our ILL form with a new Digital Object Identifier (DOI) lookup feature to reduce friction for our users. Yet as we monitored turnaway counts (i.e., failed attempts to access non-subscribed journals) and interlibrary loan requests over the first year, we saw considerably less activity around the canceled titles than we had anticipated: turnaways from non-subscribed titles amounted to only about 13 percent of average annual usage counts from the same titles from the previous two years; interlibrary loan requests from those titles came to only about 1 percent of the turnaway numbers in that first year. At first blush, in other words, Cornell patrons seemed to be attempting to access articles in these journals to which the Library is no longer providing access at a significantly lower rate than articles in those journals were used historically. And they were requesting these articles through interlibrary loan at a much lower rate than they were attempting to access them.

Before and after unbundling, the journal package under consideration covers affiliates of Cornell's Ithaca, New York, campus (around 1,600 academic staff, 10,000 graduate students, and 16,000 undergraduates), the New York City campus of Cornell's Weill Medical College (around 1,800 academic staff and 400 medical students), and the Cornell Tech campus, likewise in New York City (around 50 faculty members and 600 graduate and professional students). Historical usage and turnaway data includes Ithaca, Weill Medical, and Cornell Tech users, while the ILL numbers reflect affiliates of the Ithaca campus only. Our findings about the ratio of ILL requests to turnaways should be read with this limitation in mind. Turnaway and ILL data from the first year of the new arrangement presents a somewhat skewed picture, because content from years prior to cancelation remained accessible for

nearly all of the canceled titles: we expected that turnaways would increase as time went on. Indeed, three years later, the ratio of turnaways to pre-cancellation usage is about double what it had been in the first year after cancellation: turnaways in 2022 reached 27 percent of average annual usage counts from the same titles in 2016 and 2017, while the ratio of turnaways to ILL requests remained about the same (approximately 1.2 percent in 2022). Yet, even anticipating a rise in turnaway counts, the difference between historical use and current activity around these journals seemed significant. We wanted to understand the real impact on Cornell researchers of the Library's move from providing comprehensive access to the journals supplied by a major academic publisher to a curated subset of the journal list. We concluded that the only way to understand the effects of the changes would be to ask the researchers themselves.

Cornell librarians designed a research project to widen the view of the impacts of leaving a big deal, with the aim of providing a framework for future, local deliberations, as well as some parameters that we hope will be useful for the broader community. In addition to tracking quantitative measures of historical journal usage, turnaway data, and interlibrary loan requests for non-subscribed titles previously in the journal package, we worked with Cornell's Institutional Review Board (IRB) for Human Participant Research on a protocol for structured interviews with Cornell researchers who had recently cited or published in the non-subscribed journals or had requested an article via interlibrary loan. Our study posed the following research questions:

- RQ1. What explains the differences between historical usage, current turnaway attempts, and follow-through to ILL requests?
- RQ2. What strategies did users employ to gain access to an article from a canceled subscription?
- RQ3. What does timeliness mean in different research contexts?
- RQ4. Is change in access impacting where researchers are publishing?

In what follows, we present the results of the quantitative and qualitative aspects of our research and seek to draw conclusions about how researchers' expectations about access and the particular ways in which they use the journal literature relate to licensed access, as well as how libraries' decisions about journal packages impact the work of researchers at their institutions.

Literature review

Interlibrary loan (ILL) refers to a cooperative agreement between libraries that enables books and other materials from one library to be loaned to a patron from another library. Document delivery is “the provision of published or unpublished documents, generally electronically and sometimes for a fee . . . [and] may also refer to the electronic delivery of documents from a library to a patron.”² The practice of sharing resources between libraries to supplement existing collections and limited budgets is a long-established library service that has always faced logistical challenges. The nature of those challenges has changed dramatically over the past thirty years due to rapid technological advancements. In the 1980s and 1990s for example, “enhanced automated discovery and request functionality provided by online catalogs resulted in a bonanza for large academic collections, which were able to capitalize on their

statuses as ‘net lenders’ to fund their [ILL] operations entirely on a cost-recovery basis.”³ Local and regional consortial agreements between institutions paved the way for large academic library consortia that emerged “as a response to shrinking collection development budgets and an explosion in scholarly publishing.”⁴

The growth of electronic resources in the early twenty-first century introduced new problems for ILL and document delivery. “As libraries began to shift from the ownership of print-based serials to the license of access to online resources, the rules that govern the resource-sharing of a collection have undergone significant changes. While ILL staff have always been aware of copyright laws they must now learn licensing provisions, which may restrict access.”⁵ Beyond the complications of licensing restrictions, which often supersede copyright guidelines, there are also the challenges of multiple modes of fulfillment, including “consortial borrowing/lending platforms, third-party article delivery services, pay per view, purchase on demand, and other ‘ad hoc’ means of resource sharing” between patrons themselves.⁶ In addition to these issues is the complication of high patron expectations, which have evolved in lockstep with the technology. “Technological innovations have created faster and more efficient ILL operations over the years, while at the same time users’ expectations are constantly growing—they want their materials fast, electronically, and free (no matter how rare those materials may be).”⁷

The current literature on the impact of journal cancellations on ILL usage indicates that many libraries have encountered only a small increase in ILL requests, similar to what we have seen at Cornell. Simard, Priem, and Piwowar reviewed eleven studies of journal cancellations and their impact on ILL.⁸ Most noted an increase of less than 2 percent in ILL requests for canceled journals in the first year or two after cancellation.⁹

Many of the studies focus on the immediate impacts of journal cancellation. Since most academic articles have a citation window of around five years,¹⁰ and our library was able to maintain post-cancellation access to articles in subscribed journals published prior to cancellation, we had an especially keen interest in Nabe and Fowler’s research at Southern Illinois University-Carbondale.¹¹ In their study, Nabe and Fowler reviewed ILL requests one year after journal cancellations and again five years later. This longer timeline meant a larger pool of inaccessible articles to drive ILL requests and more time for discoverability and requests. Their early review showed a small increase—0.9 percent—in ILL requests for the top 25 percent of journals.¹² The five-year review showed increases in ILL requests each year to a total of 1,118 requests of the canceled journals over that period, which is 10 percent of the total downloads of these journals the year before cancellation.¹³ While the number of ILL requests increased each year, 47 percent of the canceled journals still had no ILL requests over the five-year period. They found that at least 75 percent of the canceled journals received no ILL requests in any given year, so it appears that a small number of journals were driving the requests.

Librarians’ hypotheses concerning the seemingly low rise in ILL requests in proportion to the number of canceled journals after a large cancellation generally fall along two lines: (1) historical download and turnaway counts are inflated by researchers browsing articles that are not necessarily essential to

their work; and (2) researchers are accessing articles in canceled journals by means other than ILL, such as finding publicly available versions, relying on professional contacts or social media. Researcher behavior and attitudes when faced with canceled journals appears to be related to academic discipline, to some degree, and, perhaps not surprisingly, also to researchers' individual roles at the academic institution (faculty, graduate student, undergraduate). Journal cancellations tend to be viewed more negatively in the health sciences and engineering fields and less so in the humanities and social sciences, where the perceived impact may not be as great.¹⁴ When faced with an inaccessible article, undergraduates first look for a substitute article, while graduate students and faculty first look to ILL and then utilize their networks including social media. If those options are not successful, they too will resort to substitution.¹⁵ Although graduate students and faculty tend to be comfortable using ILL, the discrepancy between the large number of downloads of articles pre-cancellation and the small number of ILL requests post-cancellation may be due to the way they research. Knowlton, Kristanciuk, and Jabaily found that users, when presented with an ILL request link instead of full text, requested an ILL copy only 31 percent of the time.¹⁶ In other words, for every article requested, two were not. The authors invoke Nabe and Fowler's suggestion that this apparent hesitation to make an ILL request may be a matter of researchers being more selective when it really matters, in other words that frictionless access to full-text journals inflates usage, with users downloading nonessential items because they can. But Knowlton et al. offer an alternative explanation, namely that the inconvenience of ILL may be artificially depressing demand. They question the notion that ILL, as an alternative to subscription access, satisfies patrons' needs and propose three possible explanations for why so many patrons stop along the path towards a complete ILL request. The authors posit that many patrons have immediate needs for articles that cannot wait, that ILL user interfaces are awkward and confusing, especially to first time users who are required to create an account, and that patrons perceive ILL as additional work for library workers and wish to avoid creating a burden. In the view of Knowlton et al., carefully planned cancellations of serials are unlikely to lead to a large increase in ILL activity. Users want to know if an article is worth the effort. The pre-cancellation download figures could be in part an indication of casual browsing and may be an exaggerated indicator of actual demand.

Other research examines alternative avenues of access, comparing ILL to less formal means. Tenopir et al. used surveys and focus groups to discern patterns of informal sharing of articles among colleagues and motivations for doing so.¹⁷ The authors observe that informal sharing is "intrinsic to scholarship" and serves as an "important means of content discovery and dissemination."¹⁸ Scholars who participated in the study say they share articles primarily to "further scientific and academic discovery," "facilitate collaboration," and "fill an information need."¹⁹ Regardless of rights retention, scholars who took part in the study tended to see the articles they authored as "still the fruit of their intellectual labour" and to feel a responsibility for disseminating them.²⁰ Tenopir et al. observe that one effect of the high rate of sharing is that publisher-supplied usage counts for articles licensed by libraries for full-text access are likely lower than actual use, since they do not capture these "secondary" uses of the shared article.²¹ This creates an interesting counterpoint to the observation of Nabe and Fowler and others that usage statistics may be inflated by ease of access.

Walters surveyed scholars in large-to-medium-sized colleges and universities around the US about the extent to which they access both books (and book chapters) and journal articles via their home institution's library, and how much they rely on various external sources.²² Walters found that the home library together with interlibrary loan accounted for 51 percent of journal articles accessed, with scholars finding the rest through various other means, including (in order of frequency): "freely available online resources," "personal subscriptions/purchases," "departmental subscriptions/purchases," and "authors or colleagues."²³ The Walters study may suggest that the alternative pathways to article access, which are already in place via researcher networks, are preferred to using ILL after cancellation.

Segado-Boj et al. conducted an international survey of researchers on their means of gaining access to articles behind paywalls that are not licensed by their institution. The authors designed the study to account for use of piracy sites (e.g., SciHub), so-called "black OA [open access]."²⁴ They found the most common approach for researchers who did not have access to a paywalled article was to look for open access articles, followed by asking colleagues or authors for a copy. Piracy sites, ILL, and paying for the article themselves fell much lower in the desired approach. While more than half of the respondents had used a pirate site at least once to get a paywalled article, it is not the preferred method.

Kohn describes changing journal usage patterns at Temple University following the library's 2018 renegotiation of its big deal package with Elsevier, which reduced the number of Elsevier journals approximately by half.²⁵ Although usage of subscribed journals declined around 16 percent after the change, this followed a pattern of falling usage for subscribed titles, and the causes are difficult to parse, particularly with the interference of the COVID pandemic as well as enrollment changes at Temple. ILL requests for content from canceled journals did not increase dramatically. Kohn hypothesizes that the general drop in use of subscription content and the apparent drop in demand for non-subscribed content relates to an increase in reliance on open access (she refers to OA's role in users' "compensatory behavior for the loss of some subscriptions").²⁶ Kohn notes that studies focused exclusively on usage data before and after journal cancellation do not address "patrons' feelings about being forced to pursue alternate means of accessing articles."²⁷

The question of which inputs to consider when canceling or retaining journals is of particular importance to collection development librarians. Johnson and Cassady looked at the decision process for journal cancellations at the University of Western Ontario.²⁸ The occasion for the study was a cancellation project that would have shifted from big deal-style access to Wiley journals to subscription access to a subset of Wiley titles. The cancellation project was abandoned because the collection development librarians could not agree on which titles to retain. The study revealed a more or less even split among librarians involved between those who favored "subjective" criteria (discussion with faculty, subject knowledge, attention to disciplinary differences) and those favoring "data-driven" criteria (cost, usage, faculty survey data) in deciding on cancellation and retention. The use of subjective factors in decision-making correlated with strong relationships, as reported by the librarians involved, with faculty in the respective disciplines.

Jabaily provides a review of several studies that looked at “predictability of future use” of journals.²⁹ Where libraries typically use vendor-supplied usage data to predict future use of journals to which they already provided licensed access, Jabaily focuses on indicators of potential use of unsubscribed journals for which local usage statistics are not available. The author discusses the findings of studies that highlight various indicators: the use of similar resources in the collection, citations of a journal and its impact factor, ILL requests, turnaways, and failed link resolver requests. Perhaps most pertinent to our study, Jabaily summarized the findings on turnaway/denial counts in predicting potential use: “The research into the usefulness of denial reports is limited, and the extent to which denials correlate with future use is still unclear.”³⁰

Research libraries use publisher-supplied turnaway data—a measure of past attempts by institutional users to access electronic resources that the library has not purchased or subscribed—to help predict future demand and inform collection development decision-making. Turnaway data might indicate campus interest in a resource that the library has never provided, or in a post-cancellation context, turnaways can indicate the level of continued demand for a journal title that the library offered previously, but has now dropped. Because the cost of supplying individual journal articles from canceled journals weighs against the cost savings achieved by canceling subscriptions, the question of continued demand is an important economic factor in the wake of a large reduction to a journals package. However, the relationship between turnaway counts and user demand expressed in ILL requests is not straightforward. Smith found a moderate correlation between reported turnaways and ILL requests, reporting that the total number of ILL requests represent just over 11 percent of the total number of turnaways across all five publishers in the 2019 study (Elsevier, Wiley, Springer, Taylor & Francis, and SAGE).³¹ Smith suggests that while there is a relationship between turnaway counts and the number of ILL requests, there are other factors at play. Because libraries may make resources available on multiple platforms, not every turnaway indicates a lack of access; some ILL requests for non-subscribed items are placed without the user first generating a turnaway, for example. Smith cites Nash and McElfresh, who conducted a user survey in connection with a 2014 cancellation project at the University of New Mexico Health Sciences Library and Informatics Center, and follow-up examination of turnaway reports and ILL requests. The authors found that canceled journals had not been requested via ILL with any frequency, and they “did not find any correlation after comparing the number of turnaways with the number of ILL requests.”³² Nash and McElfresh point to a shortcoming of the COUNTER Release 4 JR2 turnaway reports: they do not indicate year of publication for the article generating the turnaway, which can complicate efforts to understand post-cancellation demand for new content if there is a journal backfile to which the institution has no access. The authors concluded that turnaway data “did not provide much insight into the success or failure of [their library’s] cancellation decisions.”³³ As part of an evaluation of the SAGE Premier journals package at Auburn University, Grabowsky et al. used linear regression analysis to understand the relative value in predicting future use of a journal represented by past ILL requests alone and ILL requests in conjunction with turnaway counts.³⁴ The authors found that “ILL requests by themselves represent the best predictive model for subsequent journal usage, accounting for almost 30% of the proportion of variance in usage,” while

journal turnaways “were not significantly correlated with usage and did not add any significant increase to the proportion of variance explained by ILL requests.”³⁵

Methods

Quantitative: Turnaways and ILL Requests for Non-Subscribed Titles

We analyzed COUNTER-compliant turnaway reports (Release 5, TR_J2) provided by the publisher to understand Cornell patron behavior on the publisher platform over the four years following cancellation of the 853 titles in our study. A key challenge in working with these reports is matching them to the original list of titles in our study. Scripts in the programming language R were written to match titles by International Standard Serial Number (ISSN) turnaway counts across years, and to reformat and summarize the output. For ILL requests, our ILLiad transaction database was queried using R scripts to match the titles in our study dataset against the journal title field in ILLiad, with text strings normalized to remove punctuation.³⁶

Qualitative: Interviews and Analysis

We developed an interview protocol that was approved by Cornell’s Institutional Review Board (IRB) for Human Participant Research. The ten Library colleagues working with the interview material received required IRB training and certification. To form our interview pool, our goal was to invite Cornell researchers who had a significant relationship with the titles we had dropped from the publisher package. We developed a pool of potential interviewees who had either recently published in one of the non-subscribed journals, cited one of these journals in a recent publication elsewhere, or requested one of the non-subscribed titles via ILL. The author pool included faculty, graduate students, postdocs, and academic research staff affiliated with Cornell’s Ithaca campus. We thought of these researchers as “super-users” of journals in the publisher package.

To identify Cornell researchers who had either published in a journal from the publisher package under consideration or who had cited an article published in one of these journals, two searches were conducted in early February 2021. The Web of Science Core Collection was used to search for Cornell authors on articles published in 2020 in a journal in the package. The Scopus database was used to search for Cornell researchers who cited articles from one of these journals in their own articles, regardless of publisher, published in 2019 and 2020. Despite limitations of these or any bibliographic databases, we felt that Web of Science and Scopus had broad enough coverage of Cornell authorship for our purposes. The result sets were further analyzed to include only Cornell researchers from the main (Ithaca, New York) campus from among multiple co-authors and to identify their affiliated departments at Cornell. An R script was written to match titles from the unsubscribed journal title list to the ILLiad transaction database. Cornell requester names and email addresses were then pulled from those transaction records. The resulting lists were then randomized and researchers were contacted from each of these lists in turn until a pool of acceptable size had been identified.

Interviews

We sent 309 email invitations to these “super-users,” which resulted in scheduling twenty-four Zoom interviews held over the course of two semesters (Fall 2021 and Spring 2022). We set aside an hour for each, but found the conversations tended to run thirty to forty-five minutes. The interviewees were distributed as follows, in terms of their relationship to the non-subscribed titles:

- Twelve had cited one of the titles in their published work
- Seven had requested an article from one of the titles via ILL
- Five had authored an article in one of the titles

And in terms of University status or career stage:

- Thirteen faculty (three emeritus)
- Four graduate students (two former)
- Four academic/research staff
- Three postdoctoral researchers (one former)

The disciplinary breakdown of interviewees roughly matches the profile of the publisher, with heavy representation in the sciences and social sciences and a smaller showing in the humanities. Limiting our study to researchers affiliated with Cornell’s Ithaca campus meant that one of the publisher’s key focus areas—medical science—received less attention than if we had extended our pool to the Weill Cornell Medical campus; participation of Ithaca-based researchers in Veterinary Science and Public Health may have offset this gap somewhat.

Table 1. Representation of broad disciplines and individual academic fields among the interview participants.

Count	Broad Discipline	Fields
2	Engineering	Chemical & Biomolecular Engineering, Environmental Engineering
2	Humanities	Archaeology, Philosophy
6	Life Sciences	Ecology & Evolutionary Biology, Integrative Plant Science, Ornithology, Policy Analysis & Management, Vet Science & Public Health
7	Physical Sciences	Chemistry, Chemistry & chemical biology, Accelerator-Based Sciences & Education, Earth & Atmospheric Sciences
1	Data Science	Statistics & data science
6	Social Sciences	Anthropology, Architecture, Art & Planning, Communication, Global development, Science and Technology Studies & Information Science

Two members of the study team met with each researcher, with one team member asking most of the questions and the other taking notes. The participants universally granted permission to record the Zoom interviews and we retained a Zoom-generated transcript for each. For each interview, then, we worked with three documents: the video, the automated transcript, and the team member’s notes. These were kept in a secure folder in Cornell’s Box file storage cloud; the text documents were anonymized and the videos deleted at the end of the calendar year 2022, as laid out in our IRB agreement.

In our interviews, we named several journals canceled from the publisher package in fields of the respective interviewees, but not necessarily the titles they had published in, cited, or requested. We asked them to discuss their experiences locating material that the Library does not provide, regardless of publisher.³⁷

Findings

The average number of attempts to access one of the 853 non-subscribed titles increased steadily from year to year, more than doubling from an average of just over seven turnaways per title in the first year after cancellation to nearly eighteen in the fourth year out (table 2).³⁸ Since the volume of journal articles from the publisher that were not accessible for Cornell roughly quadrupled from 2019 to 2022 (four years of content up from one year), it is notable that turnaways only grew by a factor of 2.5.

Table 2. Journal turnaway and ILL statistics for 853 journals

Year	Pre-cancellation Usage	Turnaways	Turnaways / Journal	ILL Requests	ILL Requests/ Journal	ILL Request/ Turnaway
2016	64,103	—	—	—	—	—
2017	67,643	—	—	—	—	—
2019	—	6,158	7.2	52	0.061	0.0084
2020	—	11,585	13.6	140	0.16	0.012
2021	—	12,700	14.9	111	0.13	0.0087
2022	—	15,169	17.8	112	0.13	0.0074

The rate of ILL requests for articles in non-subscribed journals also rose after cancellation, growing from 2019 to 2020 before dipping from the highpoint and flattening, but it has remained low compared to turnaways (2022 ILL requests were 0.74 percent of 2022 turnaways) and extremely low compared to pre-cancellation usage of the non-subscribed titles (2022 ILL requests were 0.17 percent of average 2016–2017 usage).

Importantly, we found that the turnaway rate and the relationship between pre-cancellation usage counts and post-cancellation turnaways varied significantly by discipline. Figure 1 shows how Cornell's 2016 and 2017 usage for the journals canceled in 2019 relates to turnaways between 2019 and 2022, broken down by top-level Library of Congress Classification (LCC) class.³⁹ Note that both the highest pre-cancellation usage and the highest turnaways occur in the LCC classes Q (Science) and R (Medicine).

We also observed that the rate of growth in turnaways over the four years varied significantly by LCC class. In figure 2, the numbers have been scaled to unity in 2019 for each LCC class, i.e., every curve in the plot is scaled (up or down) so that the 2019 Y-axis value is one. This makes it easier to see differences in how the Y-axis quantity (the turnaways) evolved between 2019 and 2022 for each of the plotted curves. LCC classes listed at the top right are seeing a higher growth of turnaways than LCC classes at the bottom right. Of all LCC classes B (Philosophy, Psychology, and Religion), L (Education), and P (Languages and

Literature) show the strongest increase in turnaways relative to 2019: a factor of 5 to 11. The average increase is closer to 2.5.

The rising rate, year by year, of turnaways from the non-subscribed titles seemed to confirm our assumption that demand will increase as the amount of non-subscribed content increases and accessible backfile content grows older (of course, this only holds for the journals in the package for which Cornell retained perpetual access to the purchased backfile). The pace of this change over the four years of analysis is a significant finding for us, as is the variation by discipline in the relationship of turnaways and ILL requests to pre-cancellation usage. The results of this short-term longitudinal analysis⁴⁰ were not yet available in spring 2021, when the Cornell team drew up its proposal for the qualitative component of the study.

RQ1. What explains the differences between historical usage, current turnaway attempts, and follow-through to ILL requests?

Subject domain is clearly one significant factor in patrons’ post-cancellation behavior. Judging from the subjects covered in the titles where turnaways are higher, some disciplines on campus appear to have a greater need for canceled journals than others. We do not have data to explain these differences; they could be a matter of larger and smaller departments, or they could indicate that individual patrons in certain disciplines have a greater reliance on journals in their fields than their colleagues in other areas.

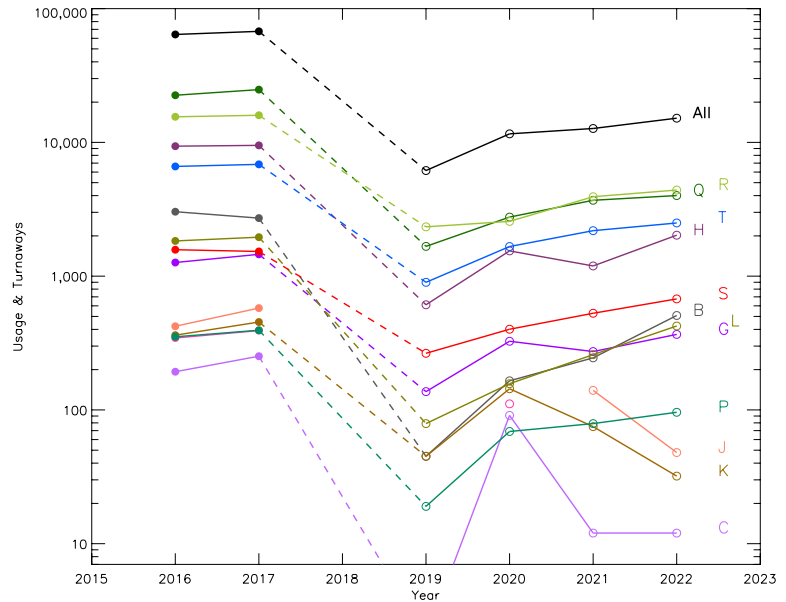


Figure 1. Pre-cancellation usage in 2016–2017 for the titles canceled in 2019 (filled circles) compared to the turnaway statistics for articles published in 2019-2022 (open circles).

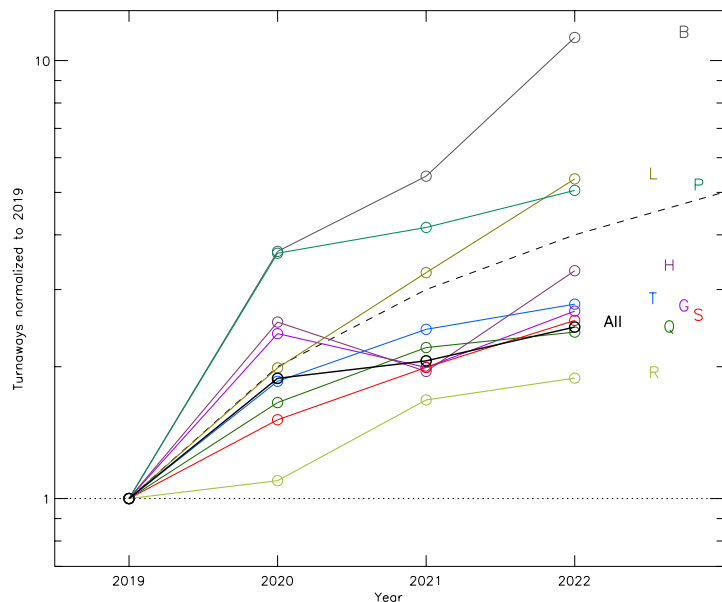


Figure 2. Evolution of turn-aways for journals canceled in 2019. The dashed line indicates the hypothetical evolution of turnaways after quadrupling of the inaccessible content between 2019 and 2022.

RQ2. What strategies did users employ to gain access to an article from a canceled subscription?

The experiences researchers described in locating material that the Library does not provide, regardless of publisher, revealed various strategies. Most of the participants combined different tactics employed at various times, conveying that they tried multiple ways of locating and accessing the needed article, rather than any single way. Although their preferences are very personal, perhaps habitual and idiosyncratic, they reveal five main approaches as summarized in table 3. The most common way the interviewees obtained the needed article was to rely on their own network, whether close disciplinary colleagues, the author of the needed article, or the wider academic community in platforms such as ResearchGate or Academia.edu. A smaller subset of our interviewees described relying on the Library catalog and databases, services offered by reference librarians, or using interlibrary loan. Four participants cited ILL as their first attempt in trying to acquire the article. A small number mentioned using ILL as a last resort, or using it sparingly, with one person specifically mentioning trying to avoid using ILL so as not to create more work for others. This lower reliance on ILL is reflected in the lower-than-expected requests that followed the cancellations described in this study, and this despite the praise that many of the interviewed researchers shared about the efficiency and usefulness of ILL for their research. Many participants reported searching some combination of Google, Google Scholar, ResearchGate, or Academia.edu, often as a first step. Use of preprints or freely available articles via arXiv (on one end of the scholarly communications spectrum) or SciHub (on the other) was not frequently mentioned. Purchasing articles or seeking articles directly from publisher websites was also not as common, although one interviewee said that he will occasionally purchase an article from the publisher if time is limited. Another participant explicitly stated that he never pays for access, even if it means he is unable to acquire the article. One faculty member in the humanities said he will purchase access to an article he needs, but only reluctantly and after all other avenues have failed:

You end up spending your own money and trying to buy it yourself, which I greatly object to doing for articles . . . because the charges are absurd.

Overall, these alternate methods of attempting to acquire articles work well for most Cornell researchers, though it does seem that the time spent hunting down an article can be a concern, especially during article revision and resubmission. One participant, noting specifically discipline-related demands, carves out particular times of the year to work on research and writing; not having a needed article or the entire journal issue where that article was published, presents a significant hindrance. Few participants reported being unable to procure a copy of the article through any of these methods, though one interviewee acknowledged giving up the search when unable to find access to an article through Google Scholar. One participant said that reaching out to colleagues typically works well, with about a 50 percent success rate. Another participant said that requesting articles through ILL works well and reported satisfaction with ILL. The majority of researchers we interviewed seem to prefer to start their search with Google over the Library catalog or databases. Interviewees differed on their opinions of ResearchGate and Academic.edu, with one person reporting that needed articles are

Table 3. Strategies employed by researchers to obtain canceled or unavailable journal articles

Count	Mentioned Strategies	Broad Discipline	Participant Status
15	Network of colleagues; contacting author directly; academic community in Research Gate or Academia.edu	Engineering, Humanities, Life Sciences, Physical Science, Science, Social Sciences	Emeritus faculty, faculty, Graduate Students, Postdocs
10	Library provided services: catalog, databases, reference, ILL	Humanities, life sciences, physical science, social sciences	Emeritus faculty, faculty, Graduate Students, Postdocs
6	Google, Google Scholar	Physical science	Faculty, Graduate Students, Postdocs
3	Publishers' websites, personal subscriptions and purchased articles	Physical science, science	Faculty
2	Preprint services, e.g., arXiv	Physical science, social science	Faculty, graduate student

frequently not accessible there, and another saying that ResearchGate works well. There also seems to be a preference among the researchers we interviewed to reach out to someone they know (a colleague or author), rather than contacting a total stranger, but whether that is because the success rate is higher, or they are just more comfortable requesting access from someone in their professional network is unknown (and not a question we asked).

RQ3: What does timeliness mean in different research contexts?

Most of the interviewees who have obtained materials via ILL do not complain about the time it takes to fulfill their request. On the contrary, most report that delivery is quick. There are exceptions, though, in situations where speed is of the essence. One patron, who was responding to a “revise-and-resubmit” request, for instance, reported that she cannot wait for materials to be delivered via ILL, no matter how quickly the requests get fulfilled. Another faculty member reported that he has only one month to write up his summer research. He therefore has no choice but to buy the books that the Library does not own. Over a thirty-year timespan, this has added up to a sizable collection. He has also found himself, at times, looking for additional timeslots in his schedule to complete preparations for a course because he had to wait for one or more articles to come in via ILL.

It's very often when you're preparing to give a lecture . . . or more typically if you're under a deadline of some sort to return something Of course, the world can wait forty-eight hours, usually, but it does seem to greatly delay the whole process because you put that off and then by the time you come back to it, other things have come along. (Faculty member in the Humanities)

One other faculty member expressed concerns that students working last-minute will not have time to wait for an item to be delivered through ILL. She added that for most of them, ILL presents an insurmountable hurdle in any case.

RQ4: Is change in access impacting where researchers are publishing?

We were interested first and foremost in the impact of the 2019 cancellations on Cornell users' access to content needed for their research and how they navigate access. But our study group was also interested

in registering any impacts Library subscription decisions might be having on Cornell authors' decisions about where to place their own research. Our interview protocol included these questions:

- Has the fact that the Library does not subscribe to some journals or has canceled some journals made you change your mind about where to publish your research?
- Has it affected other decisions in your teaching or research?
- Why do you think that is?

Most participants indicated no direct association between whether the Library provides subscription access to a journal and where they publish. A common response was that they aim to publish in the primary or top-tier journals in their fields, and that they know which those are. Other participants told us they regularly publish in one or a limited set of journals, and do not consider immediate access as a factor. However, five interviewees expressed a reluctance to publish in journals that are not available at Cornell University. Their concern relates to the broad dissemination of their research and similar sentiments were expressed at extreme ends of the career continuum:

The fact that there's a barrier here at Cornell suggests that there is a general barrier to dissemination of that particular journal. It reflects negatively on the journal in terms of whether the work is going to get disseminated broadly or not. (Emeritus faculty member in the Social Sciences)

You want to publish in a journal that is widely accessible. Cornell is a big place and doesn't have access to these papers, so you may think, "OK, maybe it's better to go with another journal that people at Cornell can read." (former post-doc in the Physical Sciences)

One interviewee said that while her own publishing decisions are not affected by whether the Library provides subscription access, access to "second- and third-tier journals" (i.e., the ones she imagines are likely to be canceled first) serves an important function in guiding graduate students' publishing decisions:

Grad students need to learn how to publish . . . and it's very good to practice on lower-end journals. . . . So, if Cornell doesn't subscribe to second- and third-tier journals, you're denying our grad students the opportunity to learn the game of journal article writing. (Faculty member in the Social Sciences)

For several of the participants, discussion of publishing, access, and the visibility of research steered the conversation to open access and the affordability of open access options for authors. These researchers want others to be able to see their work. If their grant funding is no longer available, or the charge for OA is too high, or if the journal does not offer any OA option, the research is not available to everyone.

Discussion

We have seen Cornell's turnaway figures for non-subscribed titles grow from year to year, but at a significantly lower rate than the annual growth of inaccessible articles in those journal titles. It

is difficult to know the presumably multifactorial causes of the patterns of journal use and thus challenging to make predictions. Yet if most journal usage is concentrated on the most recent five years of publication, as the literature review suggests, it seems likely that after we reach five years of inaccessible content, the turnaway numbers will plateau because the number of inaccessible articles that are newer than six years old will remain more or less steady. This would be an extension, beyond 2022, of the timeframe represented in figure 2.

We note that non-subscribed content is less likely than subscribed content to show up in our managed discovery tools, which is likely one factor in the low turnaway and ILL counts compared to historical usage. Users can readily choose whether or not to see results that are not held by the Library in these tools, although many are discovering content in tools that are not managed by the Library, such as Google Scholar, where the system is not likely to filter out results from our non-subscribed content. The most significant changes made to our discovery tools since cancelation of the publisher package to facilitate access to some unsubscribed content were the addition of a DOI lookup functionality to our ILLiad ILL form and including a link to the UnPaywall service on our OpenURL resolver. Both of these services can direct users to open access versions of articles, where available.

We have observed different post-cancelation impacts and user behavior from discipline to discipline, but we note that the patterns we are seeing might be specific to the particular publisher under consideration. A different picture might emerge in the case of a publisher with different disciplinary strengths.

Following Nabe and Fowler, we compared pre-cancelation usage and ILL statistics for canceled journals with and without ILL requests during our 2019–2022 study period and found some striking differences between our universities. At Southern Illinois University-Carbondale (SIUC), where the Nabe and Fowler study took place, 47 percent (283) out of 597 canceled journals showed zero ILL requests, despite 2,361 downloads for these journals in the year prior to cancelation. At Cornell 77 percent (654) out of 853 canceled journals showed zero ILL requests, despite 44,875 downloads in the previous year. For these journals the average pre-cancelation usage was eight per journal at SIUC and 69 per journal at Cornell.

At SIUC 1,118 ILL requests were made for 53 percent (314) of 597 canceled journals during their five-year study period. At Cornell 415 ILL requests were placed for only 23 percent (199) of the 853 canceled journals over our four-year study period. The pre-cancelation usage for these journals with ILL requests amounted to 36 and 106, on average, per journal per year (11,254 and 20,998 uses), respectively. While at Cornell, the pre-cancelation usage for canceled journals that received ILL requests was roughly triple the analogous usage at SIUC, the total number of ILL requests per canceled journal that received such requests comes to 2.1 for Cornell versus 2.8 for SIUC (where figures for the latter are prorated to match our four-year study period). Cornell's ILL figures may be somewhat artificially low in relation to both historical usage and post-cancelation turnaway rates because these latter two measures include the activity of users from Cornell's Weill Medical College, while our ILL counts do not. Still, considering the demographics (the population of students and academic staff affiliated with Cornell's Ithaca campus is

roughly seventeen times that of Weill Medical), this is unlikely to be a decisive factor. It may be that the breadth and depth of Cornell's collection as a whole has provided enough alternatives to the canceled content to satisfy much of the need. It may also be that our decisions about which journals to maintain and which to drop were largely on the mark. Availability of various alternative avenues for gaining access to unsubscribed journal content is no doubt part of the picture as well.

These comparisons show that even when the cancelations pertain to the same publisher, as is the case here, the demand for ILL services can be very different. A likely factor affecting this demand is the quality (e.g., impact factor) of the affected journals.

One thing that seems clear to us from both the usage counts and our conversations with researchers is that ILL is an underutilized Library service at Cornell. The University's decentralization, its exceptionally broad disciplinary span, the heterogeneity of department and disciplinary cultures across the institution all pose challenges to unified communication about Library services and influence their uptake; all of this may play into the low ILL use. Our sample of Cornell researchers made clear that they were more likely to ask a colleague at a subscribing institution for a copy of the article they need—or to ask the author—than to use ILL. This suggests a need to improve both our communication around ILL and pathways we offer to patrons to access the service.

From our sample of researchers, it also became clear that our patrons, even those selected for their close relationship with journals from the publisher in question, do not necessarily associate journals with a particular publisher. Since our communication with researchers around cancelations, etc., has often focused on publisher, this is an important insight for us that will inform our future communication approaches.

Finally, the relationship we have seen over nearly five years between historical usage and turnaways, as well as flux we see in the turnaway counts, reinforce our preference to license for flexibility. Our experience over the past few years at Cornell suggests that, while we can continue to improve our services, at least for one large, commercial publisher, we can provide timely access to the material our researchers need most without licensing the full range of journal offerings. Continuing to watch the patterns of use and attempted use, negotiating for licensing that allows us to swap titles in the package contract year by contract year, and keeping up robust conversations with our researchers puts us in a strong position and offers lessons for future negotiations.

Limitations

We recognize that the findings of our study are not necessarily generalizable to other institutions or to other publishers, especially in light of differences in disciplinary profile from publisher to publisher and divergent practices for working with the journal literature from discipline to discipline. Moreover, our study's timeframe is limited and marked by the events of the global pandemic, which affected work habits and other modes of operation in ways that are difficult to understand.

Conclusions

Our study investigated Cornell University user responses to cancelation of a subset of journals from one large publisher. Despite the limitations described above, our research offers at least partial and tentative answers to our initial research question, the one that first sparked our interest in Cornell's experience with the 2019 changes to our journal package as a possible object of extended study (RQ1): What explains the differences between historical usage, current turnaway attempts, and follow-through to ILL requests?

We learned that intensity of user attempts to access journal content after cancelation varies by academic subject domain, variances that show up in turnaway data as well as ILL requests. The reasons for these differences still elude us and require further investigation. Our interviews with "super-users" of the canceled journals (those who had recently published in them, cited them, or requested them via ILL) clearly indicate that, while library-mediated access to non-subscribed content is widely used, this cohort relies above all on their personal and professional academic networks to provide articles that are not immediately available via library subscription. At the same time, the interviewees did not, for the most part, emphasize specific associations with the canceled titles; the behaviors and workflows they described were offered as applying generally to their research in the journal literature. Perhaps the fact that we did not hear strong advocacy for specific titles can be taken as validation of the Library's method for choosing what to leave out of the subscription list after exiting the big deal-style package: cost per use calculation, modified by librarians' subject knowledge, with a few ex post facto adjustments based on faculty response. For the journals to which the Library no longer provides immediate access, even "super-users" of these titles seem able to get the content they need without significantly impeding their work.

Notes

1. To avoid readers' prior associations with the publisher and keep to the focus on Cornell's model, methodology, and conclusions that we hope are generalizable, to some extent, we have chosen not to name the publisher in this article. The information is not confidential, and the publisher has been named by the Library in other public settings.
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7. Sarah M. McHone-Chase, "Examining Change Within Interlibrary Loan," *Journal of Interlibrary Loan, Document Delivery & Electronic Reserve* 20, no. 3 (2010): 201–6, <https://doi.org/10.1080/1072303X.2010.492003>.

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15. Shannon Delaney, *Buy, Borrow, or Steal: Patterns in Searching for Scholarly Literature* (master's thesis, 2020, UNC School of Information and Library Science), <https://doi.org/10.17615/86z9-xv08>.
16. Knowlton, Kristanciuk, and Jabaily, "Spilling Out of the Funnel."
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18. Tenopir et al., "No Scholar Is an Island," 6.
19. Tenopir et al., 8–9.
20. Tenopir et al., 15.
21. Tenopir et al., 6.
22. William H. Walters, "Beg, Borrow, and Steal: Formal and Informal Access to the Scholarly Literature at U.S. Master's Universities," *The Journal of Academic Librarianship* 45, no. 6 (2019), <https://doi.org/10.1016/j.acalib.2019.102059>.
23. Walters, "Beg, Borrow, and Steal," 5.
24. Francisco Segado-Boj, Juan Martín-Quevedo, and Juan-José Prieto-Gutiérrez, "Jumping over the Paywall: Strategies and Motivations for Scholarly Piracy and Other Alternatives," *Information Development* 40, no. 3 (2024): 442–60, <https://doi.org/10.1177/02666669221144429>.
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32. Jacob L. Nash and Karen R. McElfresh, "A Journal Cancellation Survey and Resulting Impact on Interlibrary Loan," *Journal of the Medical Library Association* 104, no. 4 (2016): 298, <https://doi.org/10.5195/jmla.2016.143>; cited in Smith, "Living in Denial," 37.
33. Nash and McElfresh, 298; cited in Smith, "Living in Denial," 32.
34. Adelia Grabowsky et al., "Journal Packages: Another Look at Predicting Use," *Collection Management* 45, no. 1 (2020): 57–70, <https://doi.org/10.1080/01462679.2019.1607643>
35. Grabowsky et al., "Journal Packages," 66.
36. Our method is biased toward eliminating false positives. Therefore, there is a possibility that we missed some transactions where the title input into ILLiad was close enough for staff to recognize the title and complete the transaction when they were assisting patrons, but not exactly the same as the journal title string that we have in our study dataset. If our data includes examples of this, the numbers are small.
37. See appendix 1 for the interview protocol.
38. In appendix 2 we describe how we filtered out turnaways associated with articles published before our backfiles and subscriptions started (mostly 1997).
39. LCC classes not included in the plot have either no or too few canceled journals in them to warrant inclusion in our analysis.
40. More detail on our findings about turnaway and ILL rates, the change over time, and the differentiation by subject is included in the appendix. See figures A.1, A.2, A.3, A.4, and A.5.

Appendix 1. Interview Protocol

Questions

1. Please tell us your name, position (asst. prof., lecturer, senior researcher, graduate student, etc.), field of study/research and/or areas of research interest.
2. Please tell us about a project that you are working on now or that you worked on recently (could be preparing for a class/course, writing a grant, lab research, doing research for a book, etc.).
3. Recently, the Library stepped away from our previous journals package with the [publisher name] and reduced the number of [publisher name] journals to which we subscribe. Titles such as [*title of journal*]. Do you remember using this journal or other in the last couple of years? Did you have any trouble getting the articles you wanted in those journals from the library?
4. Do you recall using articles from any journal—from any publisher—that you couldn't get through the library, not even via ILL?

[If yes:] Do you remember the title of the journal? Is that a journal that we used to subscribe to?
[Then go to Q5.]

[If no:] That's terrific! What steps would you take if you needed something we didn't have? Or maybe you worked at another institution where you encountered this? *[Modify Q5 for hypothetical.]*

5. I wonder if you could share with us the process you took when the article/source you needed was unavailable via the CU library. What did you do?
6. In the context of searching for resources, how do you browse through issues to discover items of interest? Do you focus on keywords or the abstract, the title or something else?
7. Has the fact that the library does not subscribe to some journals or has canceled some journals made you change your mind about where to publish your research? Has it affected other decisions in your teaching or research? Why do you think that is?
8. If you had \$10,000 dollars to allocate for purchases in the library, where would you put your money? It could be anything—spaces, services, subscriptions, etc. Don't worry too much about real-world pricing if you don't have a sense of the costs—just use your imagination.
9. Any additional thoughts or comments that you would like to tell us about how the library could help you?

Thank you very much for your time.

Appendix 2. Additional Data Analysis

Here we examine on the level of LC class how the precancellation usage for the 853 titles canceled in 2019 resulted in turnaways and ILL requests. Before we can do so, we need to discuss one important assumption we made in deriving the turnaway numbers shown in table 1 and in figures 1, 2, A2, and A5. By design the COUNTER-compliant turnaway reports provided by the publisher do not separate turnaways by publication year. This means that the turnaway reports for 2019 through 2022 contain turnaways also for articles published before our backfiles and subscriptions started (mostly 1997). To be able to study the evolution of purely post-cancellation turnaways, we need to subtract the turnaways for older content. For this we use the COUNTER-compliant turnaway report for 2018 (the year before our cancellations went into effect) in which a total of 2,670 turnaways were recorded. As can be seen in figure A1, the 2018 turnaways were much lower than those for subsequent years: only 30% of the 8,828 turnaways recorded in 2019 and 15% of the turnaways in 2022. Figures 1, 2, A2, and A5, and table 1 all are based on these subtracted counts.

In figure A2, we have normalized the data for each LC class to the average usage over 2016–2017. This makes it easier to look for differences in the evolution of precancellation usage into turnaways for publication years 2019–2022. Clear differences can be seen in the demand for post-cancellation articles. For classes S (Agriculture) and T (Technology),

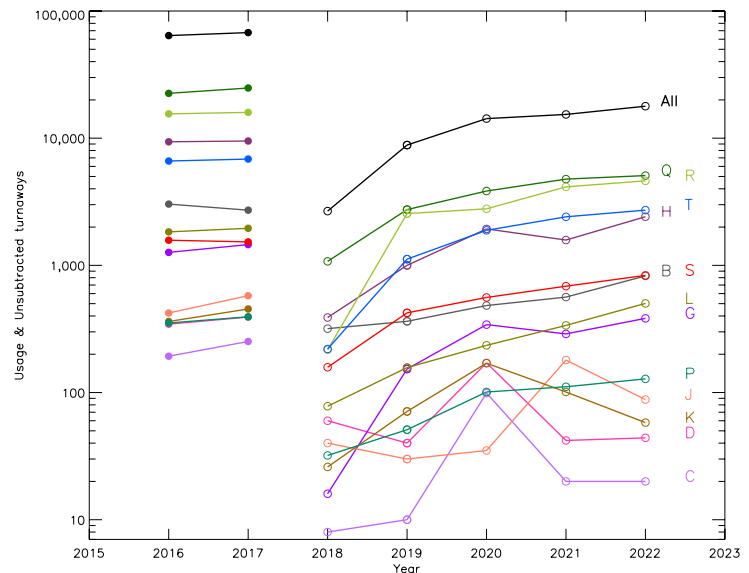


Figure A1. Pre-cancellation usage in 2016–2017 for the titles canceled in 2019 (filled circles) compared to the combined turnaway statistics in 2018–2022 for articles published before 1997 and for journals canceled in 2019 (open circles).

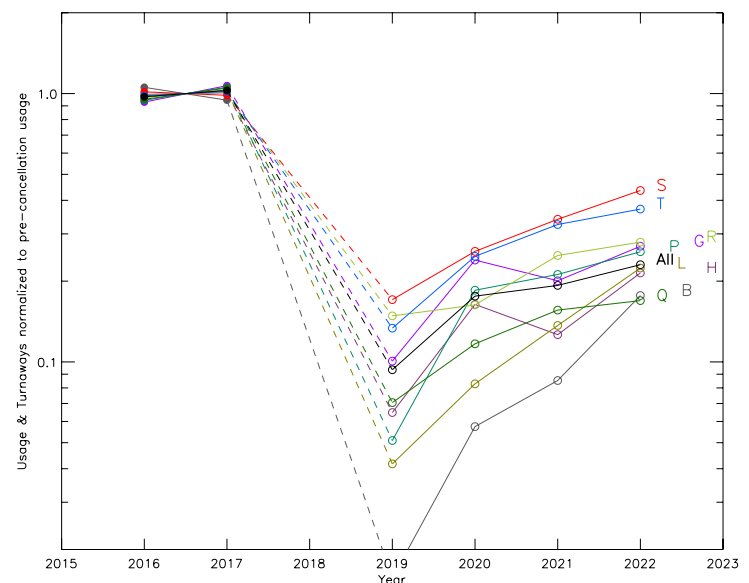


Figure A2. Same data as in figure 2 but scaled by the average pre-cancellation usage for each LC class. The steeper the slope of the post-cancellation turnaways the faster the turnaways are increasing.

the Cornell data shows a higher ratio of turnaways relative to the pre-cancellation usage than, for example, for classes B (Philosophy, Psychology, and Religion) and Q (Science). In fact, for LC class S, the demand for post-cancellation articles had climbed to 44% of the pre-cancellation usage by 2022, whereas for class Q this number is closer to 17%. Overall (black curve labelled “All”) in 2022 the demand for post-cancellation articles is 23% and rising.

As can be seen in figures A3 and A4 the lack of access to the post-cancellation content has not resulted in large numbers of ILL requests. In fact, after an initial tripling from 2019 to 2020 the number of ILL requests has since gone down, despite a quadrupling of post-cancellation content over the same period.

Normalizing the pre-cancellation usage to unity for all classes (figure A4) makes it possible to see for which LC class the ILL requests are high relative to the pre-cancellation usage: class S (Agriculture) with 0.7% in 2022. Relatively few ILL requests are placed for classes Q (Science), R (Medicine), and T (Technology): in 2022 for just over 0.1% of the pre-cancellation article usage.

Note that the class with the highest demand for ILL fulfillment relative to precancellation usage, class S, also has the highest level of turnaways relative to precancellation usage. While both these rankings could

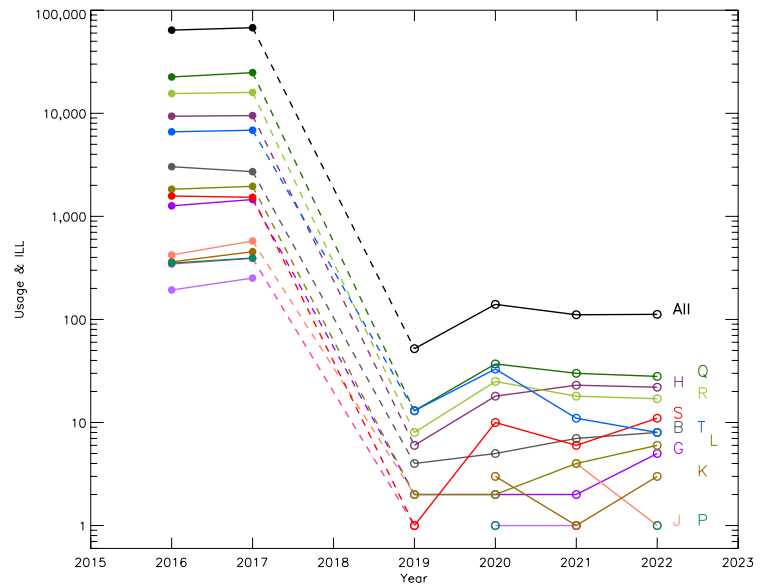


Figure A3. Pre-cancellation usage in 2016–2017 for the titles canceled in 2019 (filled circles) compared to the ILL requests for articles published in 2019–2022 (open circles).

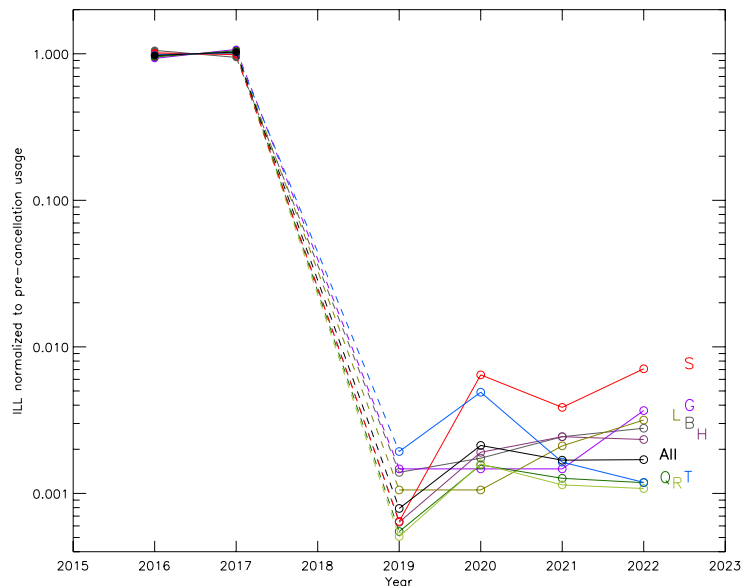


Figure A4. Evolution of ILL requests between 2019 and 2022 for articles published in canceled journals. The curves for the various LC classes have all been scaled to their average pre-cancellation usage over 2016 and 2017.

indicate higher demand at Cornell for the content in canceled class S journals than other journals canceled in other areas, the fraction of turnaways for class S resulting in ILL requests is still unremarkable: a mere 1.5%. This is best seen in figure A5, which compares average 2019–2022 turnaways to average 2019–2022 ILL requests for all LC classes with significant numbers of journals per class. The figure further shows that, averaged by class, the number of ILL requests ranges between 0.5% and 4% of turnaways, with the fraction being lower for classes with high numbers of turnaways per year (0.5–1%) than classes with low numbers of turnaways per year (1%–4%).

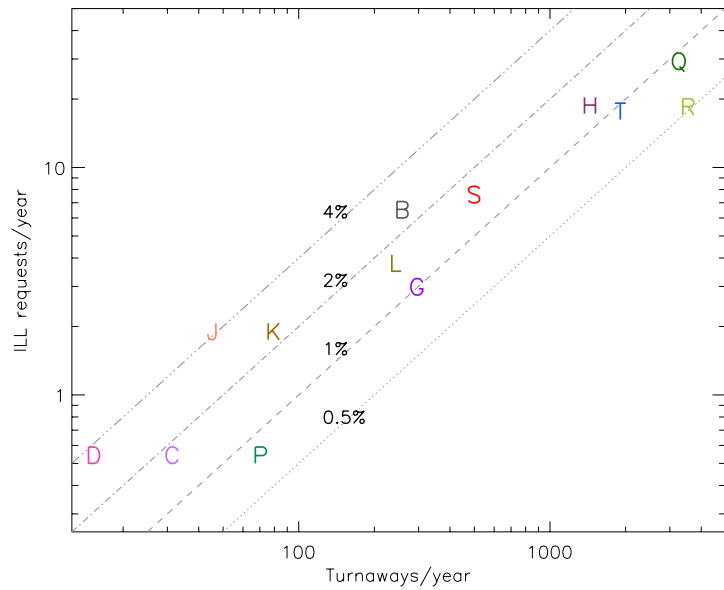


Figure A5. Average turn-aways per year versus average ILL requests per year for various LC classes. The number of ILL requests ranges between 0.5% and 4% of turn-aways.