

Combining Circulation and Citation Metrics to Evaluate an Approval Profile

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Introduction

In May of 2022, Marquette librarians weeded their main circulating collection using OCLC's GreenGlass, generating lists of titles to deselect based on subject-specific criteria developed by subject liaisons. The collection was also shifted to make way for a renovation to Memorial Library, which has since been renamed the Lemonis Student Success Center.

The library weeded nearly 40,000 volumes, and plans for future deselection projects are already underway. Meanwhile, Marquette continues to purchase large amounts of print, mostly via the approval plan. The plan is majority e-preferred, but there are certain disciplines that maintain a strong print tradition, and e-preferred areas continue to autoship print titles that meet profile criteria when electronic access is unavailable.

Given the dwindling amount of physical collection space brought on by the renovation and the continuous influx of print, Marquette's acquisitions team used GreenGlass for another project: evaluating and comparing the circulation rates of its approval profiles, to see where honing may be welcomed. Autoshipped profiles were easily visualized and converted into an Excel heat map using GreenGlass data. Profiles with low circulation rates were candidates to be discussed with subject liaisons and potentially converted to slips.

But the subject areas with strong print traditions also have vocal faculty support. In soliciting faculty feedback for the weeding project, librarians experienced pushback despite finding underperforming circulation rates in disciplines with above average annual expenditures and shipments.

When considering both community feedback and usage data in the decision-making process, librarians can often feel like the qualitative and quantitative are at odds. Additionally, Marquette's Research and Learning team features many new hires, and new and old liaisons alike are hesitant to make major changes to collection profiles and strategies, though for different reasons. In short, circulation numbers are generally unconvincing for liaisons and faculty alike.

Given these barriers to post-assessment action, acquisitions asked: could another metric, in concert with circulation, provide the needed impetus to adjust longstanding print traditions and lead to more sustainable collection practices in a shrinking space? To find out, Marquette's acquisitions unit teamed up with a digital humanities librarian at Penn State and carried out a citation study of autoshipped print books using an R-based text mining approach.¹

Literature Review

Many academic librarians employ a mix of quantitative and qualitative collections assessment approaches, while stressing the flaws of relying on any single indicator in resource decisions.² The traditional quantitative metric is circulation, with iterations in the e-book world like page views and downloads, and there have been numerous circulation studies assessing approval plans, especially from a comparative cost-per-use perspective.³ Approval plan titles have also been assessed by how they circulate at different content levels and formats, how usage at different institutions compares, and through the lens of curriculum mapping.⁴

Overall, in the broader collections assessment landscape, while holistic collections assessment with multiple data points is championed, citation analysis is traditionally regarded as a tool in journal analysis that is too time intensive for monographic assessment.⁵ Despite this, citation data has been used to assess monographic collections at scale.⁶ Information professionals have also pointed to citation data as a concrete demonstrator of library impact on university research, and as a tool in assessing and comparing holdings to citations to determine how effectively different collections are serving researchers.⁷ But while citation analysis can help librarians review approval plans, in addition to demand-driven acquisitions (DDA) plans, publisher-direct plans and other electronic and print acquisitions models, it remains an underused tool in the monographic landscape.⁸ There have been numerous studies that point to citation data as a valuable tool in weeding library collections, but the OCLC product GreenGlass -- a powerful visualization resource in print circulation -- remains the most prominent product in weeding and other collection analysis projects.⁹

GreenGlass and text mining are the two primary tools used in this project that have not been applied to approval plan assessment, specifically as sources of data for the relative efficiency of approval profiles in the metrics of circulation and citation. This experiment sought to remedy the citations barrier in assessing monograph collections, while employing a holistic approach in which one metric's limitation was at least partially remedied by the other. In this case, the limited value of the checkout data could be supplemented by the more substantial use case of the citation, and the limited population involved in citations could be supplemented by the community at large via circulation data. From there, the hope was that a subject liaison presented with this combined data would find it compelling enough to make decisions or know which questions to ask and what to investigate, in order to decide what to do with particular approval profiles.

Method

The first step in this experiment was deciding which approval profile to assess. Since reducing the print footprint was the goal, the profile that delivers the highest volume of print was selected: Philosophy (General), in the Library of Congress Classification (LCC) call number range B1-B5802. Marquette spent roughly double on print philosophy approvals as it did on the second highest profile at the time of the experiment. The indiscriminate nature of the profile, in which anything published in print in the B's is shipped, as long as it meets all non-subject parameters (such as binding, price, duplication), is the legacy decision of a long-retired philosophy liaison.

Once the profile to assess was established, data preparation began. The two crucial pieces of data for this project, and this text mining process in general, are a list and a corpus, in which the list is run against the corpus. For this experiment, the list consisted of print approval titles received over a certain time in call number range B1-B5802, and the corpus consisted of discipline-specific publications in Marquette's institutional repository. The experiment's results would be the occurrence, or "hits," of listed titles in the corpus, or what monographs are cited in institutional faculty publications and ETD's, with false positives filtered out.

Since the approval plan is organized by Library of Congress subject headings, lists were also generated according to subject headings, in this case the Library of Congress subdisciplines of Philosophy (General), as shown in Figure 1:

Figure 1

General	B1-107
Ancient (600B.C.-430A.D.)	B108-719
Medieval (430-1450)	B720-769
Renaissance	B770-789
General works	B790-807
Special topics and schools of philosophy	B808-849
United States	B850-980
England. Ireland. Scotland. Wales	B1111-1800
France	B1801-2520
Germany. Austria	B2521-3499
Western Europe	B3500-4200
Scandinavia	B4301-4510
Eastern Europe	B4670-4999
Asia	B5000-5288
Africa	B5300-5684
Judaism	B5800-5802

The Library of Congress Classification’s subdisciplines of Philosophy (General), B1-B5802.

Since GOBI is the library’s primary approval vendor, each subdiscipline’s title list was generated in GOBI under the “Library Activity” portal, filtered by LCC range and subaccount (Marquette has a subaccount specifically for print approvals). Overall, titles were selected and filtered based on:

- Acquisitions method and format (print approval, or print autoshipments);
- Date received (from 2014, when the approval plan was initiated, to 2022, a year prior to the experiment);
- Call number range (every significant subclass of the B’s, with significance being determined by volume received, and a caveat for low volume subdisciplines of local interest).

Lists were prepared for mining by first separating subtitle from title, using Excel’s value separating function. As experience with the process accumulated, substantially unique author last names were used in place of titles generating a lot of false positives (for example, single word titles like “Phenomenology” or “Epistemology”). Once lists were prepared, they were saved as .csv files to accommodate the parameters of the R-based text mining program.

A corpus was prepared via Marquette’s institutional repository. PDFs of philosophy and religion faculty publications and electronic theses and dissertations (ETD’s) since 2017 were downloaded and saved in a documents folder. Given that the title list constituted monographs roughly published between 2014-2022, and the corpus encompassed publications from 2017-2023, there was not much room for overlap in terms of a monograph’s publication time and its potential to be cited. But given the large volume of titles being analyzed, it was decided that some hits in concert with circulation data would be sufficient for this experiment’s purposes.

Once the corpus and lists were prepared, each list was run, using an R workspace and a custom text mining code.¹⁰ The title lists via GOBI were in all caps, so mining was case insensitive. Citation counts were generated once false positives were edited out of each, which was in large part a check against the window (word strings of five preceding and proceeding the title match) and a data filter for capitalized occurrences of the match (a workaround which compensated for the large amount of hits and false positives produced through case insensitivity). An example of the mining results generated by R, with true hits highlighted among the much larger set of false positives, is shown in Figure 2:

Figure 2

	A	B	C	D	E	F	G	H
1	docname	from	to	pre	keyword	post	pattern	
1197	1196 Ethical Bedrock Under a Chang	817	817	social and political context of	justice	.rights , equality,	JUSTICE	
1198	1197 Ethical Bedrock Under a Chang	1530	1530	bad , fairness , and	justice	. The Value of Ethical	JUSTICE	
1199	1198 Ethical Bedrock Under a Chang	3648	3648	Cobb and Rilkin note ,	justice	issues should cover more than	JUSTICE	
1200	1199 Ethical Bedrock Under a Chang	4285	4285	seriously about fundamental issues of	justice	and fairness , and in	JUSTICE	
1201	1200 Ethical Bedrock Under a Chang	4503	4503	9 (" Let	justice	be done-that is , for	JUSTICE	
1202	1201 Ethical Bedrock Under a Chang	4512	4512	, for my client let	justice	be done-though the heavens fall	JUSTICE	
1203	1202 Ethics and Public Discourse_ E	189	189	, grounded on values of	justice	. respect , tolerance ,	JUSTICE	
1204	1203 Everyday Solidarity_ A Framew	10886	10886	10. Pontifical Council for	Justice	and Peace , Compendium of	JUSTICE	
1205	1204 Everyday Solidarity_ A Framew	13384	13384	73. Pontifical Council for	Justice	and Peace , Compendium of	JUSTICE	
1206	1205 Examining the Political Motiva	7021	7021	five foundations . Therefore ,	justice	, or the fairness /	JUSTICE	
1207	1206 Examining the Political Motiva	7281	7281	that deeply cares about economic	justice	, race relations and the	JUSTICE	
1208	1207 Examining the Political Motiva	11205	11207	focused on the patterns of	action and interaction	among various actors , and	ACTION AND INTERACTION	
1209	1208 Examining the Political Motiva	12124	12124	poverty , war , social	justice	and economic development (Wald	JUSTICE	
1210	1209 Examining the Political Motiva	27078	27078	appointment of a Supreme Court	justice	as reasoning for voting for	JUSTICE	
1211	1210 Examining the Political Motiva	32195	32195	, When Morality Opposes	Justice	: Conservatives Have Moral Intuitions	JUSTICE	
1212	1211 Examining the Political Motiva	32208	32208	may not Recognize , Social	Justice	Research , 20:1	JUSTICE	
1213	1212 Existential Thomism and the Ei	18853	18854	social-historical 99 Desmond , The	Intimate Universal	: The Hidden Porosity Among	INTIMATE UNIVERSAL	
1214	1213 Existential Thomism and the Ei	47239	47239	does not seem to do	justice	to our experience of the	JUSTICE	
1215	1214 Existential Thomism and the Ei	49496	49498	303 Pastanau , Thomas Aquinas	on Human Nature	: A Philosophical Study of	ON HUMAN NATURE	
1216	1215 Existential Thomism and the Ei	55588	55589	that a theology that relies	on universals	or false essentialisms cannot meet	ON UNIVERSALS	
1217	1216 Existential Thomism and the Ei	59857	59857	, papal teaching holds that	justice	requires a restructuring of economic	JUSTICE	
1218	1217 Existential Thomism and the Ei	66858	66859	408 Desmond , The	Intimate Universal	, 329. 409 Cavender-MoCoy	INTIMATE UNIVERSAL	
1219	1218 Existential Thomism and the Ei	70229	70229	oppressive structures , enables social	justice	when it helps individuals (JUSTICE	
1220	1219 Existential Thomism and the Ei	78002	78003	2013. ---- . The	Intimate Universal	: The Hidden Porosity Among	INTIMATE UNIVERSAL	
1221	1220 Existential Thomism and the Ei	78210	78214	Fitzpatrick , Antonia.	Thomas Aquinas on Bodily Identity	: Oxford University Press .	THOMAS AQUINAS ON BODILY IDENTITY	
1222	1221 Existential Thomism and the Ei	79353	79355	, Robert . Thomas Aquinas	on Human Nature	: A Philosophical Study of	ON HUMAN NATURE	
1223	1222 Exodus as New Creation Israel	359	360	I also maintain that Aseneth's	transformative experience	in the narrative is likened	TRANSFORMATIVE EXPERIENCE	
1224	1223 Exodus as New Creation Israel	17138	17139	an extended assimilation of Aseneth's	transformative experience	with the events of the	TRANSFORMATIVE EXPERIENCE	
1225	1224 Exodus as New Creation Israel	66898	66899	between certain events in Aseneth's	transformative experience	and the exodus . I	TRANSFORMATIVE EXPERIENCE	
1226	1225 Exodus as New Creation Israel	74009	74010	supports the connection of Aseneth's	transformative experience	to the motifs and language	TRANSFORMATIVE EXPERIENCE	
1227	1226 Exodus as New Creation Israel	85033	85033	experience the same elements as	justice	.3.3.2.4. Inheritance Reconfigured	JUSTICE	

An example of mining results, with the monograph titles under the “keyword” column, the publication titles under the “docname” column, and the five-word window surrounding each keyword hit under the “pre” and “post” columns.

Sixteen lists, as determined by the LCC subdisciplines listed in Figure 1, were run against the corpus, for ranges where there was a minimum of twenty acquired titles over the eight-year span checked, or where there was relevance to the institution. For example, Judaism (16 titles) and Eastern Europe (19 titles) were included, since librarians were interested in citations from theology, and the library’s local community has a significant Eastern European population. In total, 3,134 titles were checked against a corpus of 296 theology and philosophy publications.

Once the citation data was cleaned up and measurable, experimenters logged overall hits, total citations, unique citations, and spread (total number of articles with citations) for each of the 16 philosophy subdisciplines under scrutiny. This was then combined with circulation data and expenditure data for analysis and presentation to the subject liaison.

Results

Circulation performance was measured relatively. Since 39% of the entire collection's titles never circulated, any subsection of the collection below this mark (with less titles never circulating) would be considered a high-performance area, and anything above it (with a larger percentage of titles never circulating) considered low performance. Degrees of success were determined by distance from the average. For example, 20% not circulating is exceptional, 30% good, 40% average, 50% below average, 60% poor, etc. Citation numbers do not have a baseline, so those statistics were taken at face value, and compared to each other. The full statistical picture is presented in Figure 3:

Figure 3

Philosophy area	Call # range	# of print approval titles 2014-2022	Total Citations	Unique Citations	Spread (articles)	Print titles in collection- total	0 checkouts	0 co's %	Checked out since 2017	% co since 2017	\$ spent on print approval FY 23	# of books shipped on print approval FY 23
Germany. Austria	B2521-3499	634	46	17	12	15,360	8,106	52.77	1,681	10.94	\$5,535	77
General	B1-107	474	27	5	5	4,514	2,355	52.17	468	10.37	\$3,910	54
Ancient (600B.C.-430A.D.)	B108-719	466	19	9	12	8,826	3,545	40.17	1,496	16.95	\$2,592	42
Special topics and schools of philosophy	B808-849	421	41	14	12	3,921	1,961	50.1	379	9.67	\$3,607	47
France	B1801-2520	338	4	1	1	6,887	3,549	51.53	559	8.12	\$2,427	35
England. Ireland. Scotland. Wales	B1111-1800	173	2	1	1	3,035	1,144	37.69	191	6.29	\$1,015	18
United States	B850-980	158	1	1	1	2,026	851	42	142	7.01	\$894	15
Medieval (430-1450)	B720-769	143	28	8	8	5,524	1,839	33.29	983	17.8	\$1,039	16
General works	B790-807	68	1	1	1	1,219	644	52.83	71	5.82	\$525	9
Western Europe	B3500-4200	60	2	1	1	1,883	1,106	58.74	116	6.16	\$688	10
Scandinavia	B4301-4510	57	5	2	1	785	309	39.36	105	13.38	\$34	1
Asia	B5000-5288	44	0	0	0	242	129	53.31	33	13.64	\$442	9
Africa	B5300-5684	42	0	0	0	252	191	75.79	17	6.75	\$408	5
Renaissance	B770-789	21	0	0	0	1,312	558	42.53	178	13.57	\$331	6
Eastern Europe	B4670-4999	19	0	0	0	430	193	44.88	116	26.98	\$621	8
Judaism	B5800-5802	16	0	0	0	84	71	84.52	3	3.57	\$305	3

Circulation and citation metrics for philosophy print approvals, including holdings numbers and expenditures

Given that the focus of this assessment project was reducing the print footprint, it was crucial to look at the profiles that provided the highest volume of print. The table in figure 3 is sorted by volume shipped on approval from 2014-2022, while the column "print titles in collection- total" represents the total number of monographs held in each subdiscipline in the library's general collection. There was a marked correlation in volume and citations, but not necessarily circulation. That said, when there was an inverse correlation in citations and volume, that was noted, especially when circulation figures were low as well.

The French philosophy profile is a standout for that reason. It's one of the top subdisciplines in subclass B in terms of expenditure, volumes shipped on approval, and total volumes held. And while it performed well below the collection average in terms of circulation, it was not alone: all of the top shipment areas underperformed relative to the general collection's circulation average except for ancient philosophy. However, French philosophy was the lone standout for its volume class in terms of citations, with a single unique citation in a single article. The profile was a clear candidate for slips to the experimenters, but more importantly, the philosophy liaison with final say thought so as well.

Given the clarity of this data, the acquisitions team is planning to evaluate Marquette's highest expenditure approval areas to identify more subdisciplines that are candidates for slips, in hopes of

moving forward with a more efficient and strategic collection budget, and a more sustainable print footprint.

Conclusion

The success of this experiment hinged on two factors. One was the ease of pulling citation numbers on monographs, which is a traditionally underused metric due to its labor-intensiveness. Was this novel text mining tool easy enough for a non-programmer to use, and efficient and effective enough to generate analyzable data? The second factor, which is more significant from an assessment perspective, was the value of combining metrics to determine an approval profile's performance. Were these metrics in concert compelling enough to guide a subject liaison's evaluation, path of inquiry and decision-making on collections issues? The answer to both questions was yes.

The text mining process itself proved facile to the non-coding acquisitions librarian, and the data cleanup process became streamlined with experience as well. The text mining tool was used for other collection assessment purposes by the acquisitions librarian, often with quick turnaround, including a quick-and-dirty citation extraction involving a journal package investment through a publisher with hundreds of titles. Titles with unique enough word strings to quickly analyze were run against 1,600+ faculty publications and ETDs across a broad range of disciplines, with a resulting ranked list that proved helpful to the collection development librarian in the selection process.

After analyzing the table presented in Figure 3, the philosophy liaison requested identical reports for political science and history profiles, to establish a baseline for citations. This liaison is also undertaking a more qualitative evaluation of philosophy research at Marquette to move forward with a revision of philosophy approval profiles. The acquisitions librarian and philosophy liaison discussed some potential approaches to said evaluation, including designing a survey for faculty in the philosophy department to interrogate their level of engagement with the print collection.

While this experiment proved successful as a compelling, holistic data baseline for collections decision-making, there are many drawbacks to this circulation/citations-based assessment approach. For one, the window of time may be too narrow to properly assess the various profiles. The approval titles being evaluated are new, relative to the rest of the collection. Ten years is a long time for a library and its staff, but not for a book. That said, the research being interrogated is recent by design, and for the lifecycle of researchers at a particular university, ten years is very a long time indeed. An approval plan is in flux by design, so judging it by the standards of the institutional repository's output is fair. Also, only recent philosophy and theology publications were evaluated, from 2017-2023. That presents the other obstacle mentioned earlier: there are only a few years of proper overlap, and many more where citation would be impossible; approval titles from 2022 for example, would have needed to be cited almost immediately.

In addition to the incompatible lifecycles of books and university researchers, the data in question could be deemed incompatible as well. While the entire general philosophy collection was evaluated for circulation, only titles acquired on the GOBI philosophy approval profile, going back to 2014, were evaluated for citations. So two different samples with only their classification in common were analyzed to determine the performance of the subdiscipline at large. Therefore, any criticism levied at the inconsistency in the data is certainly valid, though this is not reason enough to discount the assessment value of these combined metrics. For the experimenters and subject liaison's purposes, each subdiscipline's performance in these two areas painted a digestible and statistically significant picture.

The other limitation of this experiment was the corpus. While it is reasonable to assume philosophy titles would be cited in philosophy publications -- and to a lesser extent, given the disciplines of ancient and

medieval philosophy, theology publications -- this corpus is limited, and discounts the potential citations of university researchers in other fields. There is an opportunity to evaluate the interdisciplinarity of university researchers with citation metrics in general.

There is also the issue of publication gaps in the institutional repository. Not only are some publications missing, but many that are listed are paywalled, so that citation data could not be extracted. If making major decisions on a particular subdiscipline, deeper inquiry into faculty research is necessary to determine if any gaps went underrepresented in our analysis.

There are a host of future potential applications for this bibliometrics tool, as citation analysis is helpful in virtually any collections assessment project. Future experiments with it might include decisions around journal cuts, journal publisher title swaps, journal additions, foreign language approval plans, publisher-specific evidence-based acquisitions plans, technical papers and other databases without usage data, and film and music collections, to name a few. There is also a role for relative efficiency to play in the assessment landscape at large. GreenGlass proved helpful in this experiment, but it is far from the only tool capable of providing such data, and circulation data is only one metric where relative efficiency could prove a useful lens. Many take deviation from the mean into account in cost-per-use analysis, to cite another instance. With sufficient data, a statistical baseline may be on the horizon for collections-based citation analysis as well.

Bibliography

Ackerman, Erin, and Lisa DeLuca. "Weed 'Em and Reap? Deselection of Political Science Books." *The Journal of Academic Librarianship* 44, no. 1 (January 2018): 88–95.

<https://doi.org/10.1016/j.acalib.2017.10.003>

Alan, Robert, Tina Chrzastowski, Lisa German, and Lynn Wiley. "Approval Plan Profile Assessment in Two Large ARL Libraries: University of Illinois at Urbana-Champaign and Pennsylvania State University." *Library Resources and Technical Services* 54, no. 2 (2010): 64-76.

<https://doi.org/10.5860/lrts.54n2.64>

Attebury, Ramirose Ilene. "Are Patrons Using the Research Books? A New Approach to Approval Plan Assessment." *Collection and Curation* 41, no. 2 (2022): 47-49. <https://doi.org/10.1108/CC-01-2021-0002>

Brush, Denise. "Circulation Analysis of an Engineering Monograph Approval Plan." *Collection Building*, 26, no. 2 (2007): 59-62. <https://doi.org/10.1108/01604950710742095>

Duncan, Cheri Jeanette, and Genya Morgan O’Gara. "Building Holistic and Agile Collection Development and Assessment." *Performance Measurement and Metrics* 16, no. 1 (2015): 62–85.

<https://doi.org/10.1108/PMM-12-2014-0041>

Granström, Beate, and Nadia Hällér. *E-Weeding at Academic Libraries: Digital Collection Management and Weeding Practices at Swedish University Libraries*. Master’s thesis, University of Borås, 2022.

<https://urn.kb.se/resolve?urn=urn:nbn:se:hb:diva-28586>

Haddow, Gaby, and Hollie White, eds. *Assessment as Information Practice: Evaluating Collections and Services*. New York: Routledge, 2022.

Held, Tim. "Curating, Not Weeding." *Technical Services Quarterly* 35, no. 2 (2018): 133–143.

<https://doi.org/10.1080/07317131.2018.1422882>

Kelly, Madeline M. *The Complete Collections Assessment Manual: A Holistic Approach*. Chicago: American Library Association, 2021.

Lantzy, Tricia, Talitha Matlin, and Judy Opdahl. "Creating a Library-Wide Collection Management Cycle: One Academic Library's Approach to Continuous Collection Assessment." *Journal of Library Administration* 60, no. 2 (2019): 155–66. <https://doi.org/10.1080/01930826.2019.1677092>

Martin, Heath, Kimberley Robles-Smith, Julie Garrison, and Doug Way. "Methods and Strategies for Creating a Culture of Collections Assessment at Comprehensive Universities." *Journal of Electronic Resources Librarianship* 21, nos. 3-4 (2009): 213–236. <https://doi.org/10.1080/19411260903466269>

Nelson, Gregory M., Michael C. Goates, David S. Pixton, Megan Frost, and Dan Broadbent. "Collection Weeding: Innovative Processes and Tools to Ease the Burden." *The Journal of Academic Librarianship* 46, no. 5 (September 2020). <https://doi.org/10.1016/j.acalib.2020.102139>

Ramirez, Diana, and Simona Tabacaru. "Incorporating Curriculum Mapping as a Method to Increase Approval Plan Precision." *College & Undergraduate Libraries* 28, no. 2 (2022): 165–179. <https://doi.org/10.1080/10691316.2021.1902446>

Schroeder, Rebecca, and Rebecca Boughan. "Doing More with Less: Adoption of a Comprehensive Ebook Acquisition Strategy to Increase Return on Investment while Containing Costs." *Library Resources & Technical Services* 62, no. 1 (2018): 28-36. <https://doi.org/10.5860/lrts.62n1.28>

Strothmann, Molly, and Karen Rupp-Serrano. "A Comparative Analysis of Evidence-based Selection, Professional Selection, and Selection by Approval Plan." *Library Resources & Technical Services* 64, no. 1 (2020): 15–25. <https://doi.org/10.5860/lrts.64n1.15>

Tabacaru, Simona. "E-Preferred Approval Plan at a Large Academic Library: Assessment and Collection Development Implications." *Collection Management* 43, no. 3 (2018): 155–176. <https://doi.org/10.1080/01462679.2018.1459328>

Thomas, William Joseph, and Daniel Shouse. "Disciplinary Differences in Student Use of Library-Provided Materials in Dissertations." *Technical Services Quarterly* 38, no. 3 (2021): 258–81. <https://doi.org/10.1080/07317131.2021.1934309>

Tyler, David, Brianna D. Hitt, Francis A. Nterful, and McKenna R. Mettling. "The Scholarly Impact of Books Acquired via Approval Plan Selection, Librarian Orders, and Patron-Driven Acquisitions as Measured by Citation Counts." *College & Research Libraries* 80, no. 4 (2019): 525-560. <https://doi.org/10.5860/crl.80.4.525>

Wagstaff, Kiri L., and Geoffrey Z. Liu. "Automated Classification to Improve the Efficiency of Weeding Library Collections." *The Journal of Academic Librarianship* 44, no. 2 (March 2018): 238–247. <https://doi.org/10.1016/j.acalib.2018.02.001>

Woods, Stephen, and John Russell. "Comparison of Journal Usage in Rural Sociology Dissertations Using Text Analysis and CD Rank." *Serials Review* 49, nos. 1–2 (2023): 1–9. <https://doi.org/10.1080/00987913.2023.2174402>

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² Beate Granström and Nadia Hällner, *E-Weeding at Academic Libraries: Digital Collection Management and Weeding Practices at Swedish University Libraries*, Master's thesis, University of Borås, 2022, <https://urn.kb.se/resolve?urn=urn:nbn:se:hb:diva-28586>; Tricia Lantzy, Talitha Matlin, and Judy Opdahl, "Creating a Library-Wide Collection Management Cycle: One Academic Library's Approach to Continuous Collection Assessment," *Journal of Library Administration* 60, no. 2 (2019): 155–66, <https://doi.org/10.1080/01930826.2019.1677092>; Cheri Jeanette Duncan and Genya Morgan O'Gara, "Building Holistic and Agile Collection Development and Assessment," *Performance Measurement and Metrics* 16, no. 1 (2015): 62–85, <https://doi.org/10.1108/PMM-12-2014-0041>.

³ David Tyler, Brianna D. Hitt, Francis A. Nterful, and McKenna R. Mettling, "The Scholarly Impact of Books Acquired via Approval Plan Selection, Librarian Orders, and Patron-Driven Acquisitions as Measured by Citation Counts," *College & Research Libraries* 80, no. 4 (2019): 525–560, <https://doi.org/10.5860/crl.80.4.525>; Molly Strothmann and Karen Rupp-Serrano, "A Comparative Analysis of Evidence-based Selection, Professional Selection, and Selection by Approval Plan," *Library Resources & Technical Services* 64, no. 1 (2020): 15–25, <https://doi.org/10.5860/lrts.64n1.15>; Denise Brush, "Circulation Analysis of an Engineering Monograph Approval Plan," *Collection Building*, 26, no. 2 (2007): 59–62, <https://doi.org/10.1108/01604950710742095>; Rebecca Schroeder and Rebecca Boughan, "Doing More with Less: Adoption of a Comprehensive Ebook Acquisition Strategy to Increase Return on Investment while Containing Costs," *Library Resources & Technical Services* 62, no. 1 (2018): 28–36, <https://doi.org/10.5860/lrts.62n1.28>.

⁴ Ramirose Ilene Attebury, "Are Patrons Using the Research Books? A New Approach to Approval Plan Assessment," *Collection and Curation* 41, no. 2 (2022): 47–49, <https://doi.org/10.1108/CC-01-2021-0002>; Simona Tabacaru, "E-Preferred Approval Plan at a Large Academic Library: Assessment and Collection Development Implications," *Collection Management* 43, no. 3 (2018): 155–176, <https://doi.org/10.1080/01462679.2018.1459328>; Robert Alan, Tina Chrzastowski, Lisa German, and Lynn Wiley, "Approval Plan Profile Assessment in Two Large ARL Libraries: University of Illinois at Urbana-Champaign and Pennsylvania State University," *Library Resources and Technical Services* 54, no. 2 (2010): 64–76, <https://doi.org/10.5860/lrts.54n2.64>; Diana Ramirez and Simona Tabacaru, "Incorporating Curriculum Mapping as a Method to Increase Approval Plan Precision," *College & Undergraduate Libraries* 28, no. 2 (2022): 165–179, <https://doi.org/10.1080/10691316.2021.1902446>.

⁵ Madeline M. Kelly, *The Complete Collections Assessment Manual: A Holistic Approach*, (Chicago: American Library Association, 2021).

⁶ Gaby Haddow and Hollie White, eds., *Assessment as Information Practice: Evaluating Collections and Services*, (New York: Routledge, 2022).

⁷ Heath Martin, Kimberley Robles-Smith, Julie Garrison, and Doug Way, "Methods and Strategies for Creating a Culture of Collections Assessment at Comprehensive Universities," *Journal of Electronic Resources Librarianship* 21, nos. 3–4 (2009): 213–236, <https://doi.org/10.1080/19411260903466269>; William Joseph Thomas and Daniel Shouse, "Disciplinary Differences in Student Use of Library-Provided Materials in Dissertations," *Technical Services Quarterly* 38, no. 3 (2021): 258–81, <https://doi.org/10.1080/07317131.2021.1934309>.

⁸ Lantzy, Matlin, and Opdahl, "Creating a Library-Wide Collection Management Cycle."

⁹ Tim Held, "Curating, Not Weeding," *Technical Services Quarterly* 35, no. 2 (2018): 133–143, <https://doi.org/10.1080/07317131.2018.1422882>; Erin Ackerman and Lisa DeLuca, "Weed 'Em and Reap? Deselection of Political Science Books," *The Journal of Academic Librarianship* 44, no. 1 (January 2018): 88–95, <https://doi.org/10.1016/j.acalib.2017.10.003>; Gregory M. Nelson, Michael C. Goates, David S. Pixton, Megan Frost, and Dan Broadbent, "Collection Weeding: Innovative Processes and Tools to Ease the Burden," *The Journal of Academic Librarianship* 46, no. 5 (September 2020), <https://doi.org/10.1016/j.acalib.2020.102139>; Kiri L. Wagstaff and Geoffrey Z. Liu, "Automated

Classification to Improve the Efficiency of Weeding Library Collections,” *The Journal of Academic Librarianship* 44, no. 2 (March 2018): 238–247, <https://doi.org/10.1016/j.acalib.2018.02.001>.

¹⁰For an explanation of the text mining approach (with code), see Stephen Woods and John Russell, “Comparison of Journal Usage in Rural Sociology Dissertations Using Text Analysis and CD Rank,” *Serials Review* 49, nos. 1–2 (2023): 2-3, <https://doi.org/10.1080/00987913.2023.2174402>.