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Are We Spending Too Much on Print STEM Monographs? A Method and Analysis for Improving Monograph Allocations Based on Circulation Statistics

Abstract

Circulation studies provide evidence of demand for monographs, but it is necessary to determine the goal of any analysis in order to select which statistics will be used. The goal of this analysis was to determine the appropriateness of expenditures on monographs within the STEM fields at Morris Library over a ten year period. Percentage of unique title circulation and average circulation per title are best suited for this purpose. Results show variation among disciplines, but overexpenditure in all. Analysis of disciplines can aid in determining appropriate allocations for monographs, and analysis of subdisciplines can aid in targeting monograph acquisitions within any discipline.

Introduction

Library collection budgets are under pressure from a number of fronts. Declining federal and state support, a long-term problem exacerbated by the recession that began in 2008, have resulted in smaller increases, or in some cases even reductions. Although serial price increases have moderated somewhat in the last few years, they still exceed inflation and exceed increases for most libraries' collection budgets (Bosch and Henderson, 2010). These pressures typically affect monograph budgets disproportionately, and force a closer look at how monograph collections are being used, in order to determine the appropriate allocation of funds and to match purchases with patron needs. This paper describes a method and analysis of monograph circulation in the STEM fields at Southern Illinois University Carbondale.

Circulation statistics provide a window into the needs and behavior of users, and can be used to answer a number of questions pertinent to collection management. The first task for a circulation study then is to determine the goal of the analysis. This influences what statistics are gathered, how they are arranged, and what analysis is applied to them. Inevitably, the goal of the analysis will determine what methods are applied.

There are (at least) three specific questions which circulation statistics can help answer:

One, What is the demand for monographs by local patrons at the institution?

Circulation statistics can be used as one part of an analysis of the total (monographic) demand of local users, but need to be coupled with interlibrary loan borrowing data as well as ebook usage data, and perhaps citation data, pulled from the publications of faculty and students (in the latter case, particularly theses and dissertations).

Two, What is the demand for the institutional collection?

Circulation statistics can be used to assess the use of the collection of not only local users, but all users; interlibrary loan lending data will need to be included in this case. This can be useful, among other things, in determining the role of the library in cooperative collection development, and the collection's importance to other users, including (via public libraries) local and regional users not affiliated with the institution.

Three, What is the adequacy of the local collection for local users?

The goal here is to determine the appropriateness of budget expenditures for monographs (and perhaps the quality of book selection). It is this question which formed the goal and guided the method of the following study.

To determine the appropriateness of budget expenditures on monographs for local users, interlibrary loan lending and some in house use (such as checkouts to preservation) must be excluded from the analysis. For if the goal is to reveal local demand, extra-institutional use is irrelevant. Similarly, reserve circulations should be excluded, particularly when a separate reserve fund exists, since their circulation provides a misleading indicator of the collection's appropriateness.

An important question to decide is whether to include browsing data in the analysis. Browsing data refers to the tracking of in house use of collections other than in house processing events. Thus at SIUC, barcodes from books taken off the shelf but not checked out are scanned; this constitutes a browse which is recorded and attached to the item record, and is available as a separate field in circulation reports. There are a number of problems with such data; first, the percentage of browsed books actually scanned is unknown. Student workers are largely responsible for this function, and compliance is indeterminable. Second, it is unclear what this data signifies. Books are pulled off from the shelf for many reasons, not all of them in furtherance of some academic purpose. Library staff sometimes pull misshelved titles and leave them on a table to be reshelved; these titles may be scanned as a "browse," but drawing any conclusion about their demand from this would be mistaken. It is simply impossible to determine the meaning of a "browse." While the same criticism may be applied to circulated titles - not all of them are read, and many are found to be in some way insufficient - it is known at least that the patron took the trouble to take the book to the circulation desk and check it out. There is this extra step and an assumption of responsibility for the book that make a "charge" qualitatively different from a "browse." Accordingly, browses are not included in this analysis.

Another question that needs to be decided before beginning is the time period to be covered, for both the age of the monographs, and the date of the circulation. This too depends on the goal of the analysis. When addressing the question of appropriateness of budget expenditures on monographs for local users, only recent data will provide an accurate picture of library use and the adequacy of selection practices. The goal is to equate the demand of current users and present and near-future expenditures; how the collection was used twenty or thirty years ago does not help to meet this goal. In fact it misleads, because it fails to account for changes in curriculum, programs, and enrollments. Similarly misleading is the circulation of legacy collections, those that were acquired before these changes in curriculum took place. This is not to say use of legacy collections and analysis of that use has no value; indeed

it is essential in determining the need to maintain those collections. However it does not bear on the question at hand, whether current and recent selections correlate with current and recent use, and how to adjust budget allocations accordingly.

Overemphasis on only very recent data is also misleading. Restricting data to a few years fails to account for fluctuations in programs enrollments, which is common in most institutions. That is, the user base for any particular subject or department will oscillate from year to year, so their use of the collection needs to be averaged over some period of time. Further, current and very recent use fails to capture *potential* use, which must be taken into account. Not all monographs will circulate immediately, though it has been shown that use declines precipitously after a few years. There can be no hard and fast rule, but ten years, for both the age of monographs and date of circulation, is a reasonable compromise.

Once these parameters are established, reports can be run and data compiled. A new set of questions then arises: how is the data to be analyzed? What measurements will provide useful information to answer the question of the appropriateness of the collection and budget expenditures?

Two measurements stand out. One is the percent of titles that have circulated at least once; the other is the average circulation per title. The first reflects the extent of any overexpenditure, by revealing the percentage of unused selections. The higher this percentage, the higher the overexpenditure and the gap between demand (use) and supply (collection). The second measurement, average circulation per title, reflects the extent of the demand for monographs as a whole, by accounting for multiple users of all titles.

Together, these two measurements provide an adequate indication of the appropriateness of budget expenditures for monographs. When arranged by Library of Congress Classification, (LC), they provide the basis for comparison by discipline.

Background

SIU-Carbondale is a Carnegie RU/H university located in Carbondale Illinois, and has both a Law School and a Medical School. Enrollment is 18,847, including 4,700 graduate and professional students in 74 masters and 32 doctoral programs. Morris Library is an ARL Library, with over 3 million volumes and 51,000 serials. The Library has a collection budget of \$5.2 million. The Law and Medical School have their own libraries and budgets, but there are no other branch libraries.

Method

Circulation statistics for a ten year period, from 2002 to 2012, were compiled from the statistics reporter of the Voyager system. Only those titles purchased during this time period were used. Results were restricted to items with charges to faculty, students, and staff of the University, by using the Patron Groups field and removing the circulation counts for all other patron groups. This eliminated interlibrary loans and local charges, such as for in-house use, that do not reflect actual local patron use.

Data fields included in the report were Create Date, Title, Location, Normalized Call Number, Reserves Status, and Historical Charges. The Reserve Status field was used to eliminate titles that were placed on reserves at some point in the ten year period. The Location field was used to eliminate titles in reference and other locations that prohibit circulation.

The resulting spreadsheet contained only those titles purchased in the ten year period that could circulate, had never been on reserve, and had been checked out only to local patrons or had never been checked out.

Separate spreadsheets were created for each call number range at the highest level (for this analysis, Qs, Rs, Ss, and Ts). These were then broken down to match the subjects under review (QC for Physics, QD for Chemistry, etc.). Thus each subject included a list of titles and their historical charges. Analysis was conducted on these subject spreadsheets.

Data calculated included the total number of titles, the total number of charges of those titles, the total number and percentage of titles with at least one charge, and the average number of charges per title for the entire subject.

Results

All disciplines show a percentage of unique title circulation rate below 50%. In other words, for each discipline, fewer than half of the titles purchased in the ten year period were charged at least once. The total percentage of titles with at least one charge is 38%. Average charges per title were below two across all disciplines, and the overall average charge per title ratio is .86.

There is a distinct difference among the disciplines for both percentage of unique titles with at least one charge and average charges per title. Table 1 shows the breakdown of the nine disciplines. Three disciplines (Computer Science, Medicine, and Math) exceeded the average percentage of unique title circulation rate, and each had a charge per title ratio above 1. All other disciplines show a unique title circulation rate below 40%, and two (chemistry and Geosciences) are below 25%.

Field	# of Titles	Total Charges	% titles ≥ one charge
Computer Science	1934	2788	48%
Medicine	9416	10301	45%
Math	3046	3169	43%
Engineering	13265	10908	37%
Physics and Astronomy	2616	2117	36%
Biology	7747	5856	36%
Agriculture	4665	2895	31%
Chemistry	1224	617	23%
Geology	1890	863	23%

Table 1. Circulation statistics for STEM monographs purchased 2002-2012.

Discussion

The unique title circulation rate is similar to that of other studies, including the University of Pittsburgh study from 1979, a recent study at Cornell, and the overall rate at ARL libraries, where the circulation rates were reported at 60%, 45%, and 44% (Stewart, 2011). Similarly, a five year study at the University of Nebraska-Lincoln revealed a 54% circulation rate (Tyler et al, 2011). Those studies examined all subjects, not just the STEM fields, and it should not be surprising to find slightly lower numbers in the STEM disciplines. The University of Colorado reported a 33% unique title circulation rate across all disciplines (Knievel, 2006). At UNLV, circulation rates for science titles ranged from 14-21% and for engineering from 14-24% over a period of five years; the shorter time period may partially account for the lower numbers there (Tucker, 2009).

The difference among STEM disciplines is clearly evident in the unique title circulation rate and the charge per title averages. The advantage of looking at the collection use by call number as opposed to the originating department of the patron is that it incorporates evidence of interdisciplinary demand. What is important is not who checks out monographs, but rather the demand that each discipline exhibits. Clearly, Agriculture, Chemistry and Geosciences are not disciplines with high levels of monograph use. Their low charge per title ratios show that books as a whole are infrequently charged in these disciplines, and the low unique title circulation rate shows that when they are charged, a small number of titles satisfies demand. In contrast, the charge per title rates in Computer Science, Medicine, and Math (all above 1) indicate that books are in demand, and the higher unique title circulation rate shows that there is more diversity in the demand.

The numbers also reveal that over this ten year period, monograph acquisitions have far exceeded demand. When budgets are insufficient to meet patron needs, the opportunity cost of overexpenditure in one area (i.e., purchasing resources that are not used) are too high and cannot be ignored (Carrigan, 1996). As mentioned in the introduction, determination of total demand for monographs would require combining these circulation numbers with data on interlibrary loan borrowing and electronic book use. Nevertheless, on their own they clearly demonstrate that overexpenditure has occurred.

The analysis need not stop here, however. With the LC call numbers available, it is possible to do more fine-grained study of the use of the collection. The data will reveal not just overall demand, but how that demand is distributed among subdisciplines. The depth of the analysis is limited only by the depth of the call numbers employed, and the time of the reviewer. Analysis by subdiscipline allows selectors to target those areas where demand is highest within a specific field, thus maximizing increasingly scarce resources.

Table 2 shows a partial breakdown of the same measurements, unique title circulation and charges per title, for a number of subdisciplines within Math. From this it becomes clear that monographs in certain areas, higher in demand, are more appropriate targets for acquisition than others. A study is underway to determine

whether selection based on this granular analysis leads to higher performance in terms of the two measurements, higher unique title circulation rates and charges per title.

LC Subject	LC Class	# Titles	# Charges	% Titles ≥ one charge	Average charges per title
Analysis General	QA300-QA302	36	81	75%	2.25
Linear Algebra and Matrices	QA184-QA205	62	112	65%	1.81
Popular	QA93-QA99	60	93	63%	1.55
Calculus	QA303-QA316	95	182	61%	1.92
Mathematical Statistics	QA276-QA280	246	439	59%	1.78
Algebra General	QA150-QA161	82	130	59%	1.59
Probabilities	QA273-QA274.9	194	257	53%	1.32
Theory of Functions	QA331-QA355	70	47	50%	0.67
Continuous Groups	QA385-QA387	10	15	50%	1.50
Differential Equations	QA370-QA381	141	189	49%	1.34
Combinatorics	QA164-QA167.2	124	129	47%	1.04
	QA401-				
Analytical Methods	QA402.37	54	43	44%	0.80
Numerical Analysis	QA297-QA299	61	69	44%	1.13
General Geometry	QA440-QA497	64	80	44%	1.25
	QA611-				
Topology	QA614.97	155	151	43%	0.97
Number Theory	QA241-QA247.5	118	100	40%	0.85
Functional Analysis	QA320-QA329.9	61	51	38%	0.84
Group Theory	QA174-QA183	50	41	34%	0.82
Arithmetic	QA101-QA146.8	89	61	34%	0.69
Machine Theory	QA267-QA268.5	33	16	33%	0.48
Differential Geometry	QA641-QA672	52	33	31%	0.63
Math General	QA1-QA63	693	443	30%	0.64
Fluid Mechanics	QA901-QA930	37	13	30%	0.35
Algebraic Geometry	QA564-QA609	45	23	27%	0.51
Analytic Mechanics	QA801-QA835	42	25	26%	0.60

Table 2. Circulation Statistics for select Math subdisciplines for monographs purchased 2002-2012.

Conclusion

Responsible budget oversight and expenditure requires data-driven analysis and decision-making. Particularly in times when journal cancellations are a routine part of conducting business in academic libraries, monograph fund allocations need to be consistent with use, and title selection must be targeted as precisely as possible to

avoid spending money on unneeded resources. Unique title circulation rates and average charges per title ratios provide clear evidence of monograph demand, and can help guide selection decisions appropriate for the institution.

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