Use of Circulation Statistics and Interlibrary Loan Data in Collection Management

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ABSTRACT. This article reports the use of "percentage of expected use" (Mills 1981) and "ratio of borrowings to holdings" (Aguilar 1986) to analyze data gathered from the automated circulation and interlibrary loan system of the central university libraries, Baylor University, Waco, Texas. The study, limited to circulating monographs with selected LC classification subclasses, revealed the areas of the collections attracting heavy usage and high interlibrary loan requests. The study concluded that although the libraries are meeting the needs of undergraduate and graduate programs, there is need for a closer scrutiny of some areas of the collection that attract less circulation and interlibrary loan requests. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com>*

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INTRODUCTION

The growth of both print and digital library resources at Baylor University libraries in Waco, Texas, attests to the on-going commitment to a

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philosophy that embraces both the "just-in-case" and the "just-in-time" approach to collection development. The rapid growth of the collection and the initiative of creating a Twenty-First Century Library with adequate space for study areas and for the information commons to provide access to digital resources have put shelving space at a premium. For this reason, the library now uses an off campus building as a remote storage location. Another building on campus is being renovated for the library to use as an additional remote storage site. Due to the need occasioned by the dilemma of what to remove to remote storage sites, as well as questions related to other collection development issues such as what areas to emphasize or de-emphasize, this study was conducted. Its purpose was to identify the parts of the collection that are heavily used as well as those areas that are under-utilized and to make recommendations for areas that could be targeted for off-site storage and where to focus scarce resources.

Baylor University is located in the north central part of Texas. Chartered in 1845, Baylor is the oldest university in Texas. With an enrollment of about 14,000 students and approximately 700 faculty members, it has become the largest private university in the state. Moody Memorial and Jesse H. Jones are the central libraries of Baylor University. The libraries, together with other special libraries on campus, currently own approximately 1.6 million volumes, 4,381 paid paper periodical subscriptions, 2.8 million microforms and government documents, and 270 electronic databases.

LITERATURE REVIEW

The works of three professionals in library and information science have demonstrated that it is possible to combine circulation statistics and interlibrary loan data to assess the usefulness of a library's collection. Bonn (1974) formulated the concept of "use factor" to note the disparity between circulation and holdings. He calculated the use factor by dividing the circulation percentage of a subject by the holding percentage of the same subject. He reasoned that the use factor would be 1.00 if circulation and holdings percentages were identical.

Mills (1981) added another concept to Bonn's use factor with a method known as "percentage of expected use" to determine the level of expected use of materials within specific subject areas. To compute the percentage of expected use, he took Bonn's use factor and multiplied it by one hundred. The underlying assumption was that the expected use of a subject would be 100 per cent.

William Aguilar (1986) outlined a procedure that advocated the analysis of holdings data, circulation records, and interlibrary loan statistics to assess the use of library materials. He maintained that by comparing circulation statistics with interlibrary loan data it is possible to confirm or deny the results of local analysis. To accomplish this, he devised a method known as the "ratio of borrowings to holdings." The ratio compares the number of interlibrary loans relative to the holdings and is calculated by dividing the percentage of interlibrary loans on a given subject with the percentage of holdings in the same area. He then recommended the use of standard deviations and the means to determine whether the materials are being overused or underused.

Although the approach that combines the computations of use factor, percentage of expected use, and ratio of borrowings to holdings provides a reliable method for assessing the usefulness of a library's collections, there appears to be no reported study that has attempted to use it.

LIMITATION

This study was limited to circulation statistics and filled interlibrary loan requests for monographs reported in the central university libraries in March 2000 to October 2001. For the purposes of this study, circulation was defined as a documented process showing that an item has been checked-out by a library patron. Periodicals, reference works, non-book media, and electronic resources were not included in this study. For reasons that will be explained below, the data were also limited to selected Library of Congress classes and subclasses shown in the Appendix.

The integrated analysis of circulation and interlibrary loan data was chosen because circulation data in and of itself may not provide adequate proof of use or disuse. By using a combination of circulation statistics and interlibrary loan data it is possible to provide reliable proof of use or disuse of materials (Aguilar 1986). The circulation database of the Moody and Jones libraries are maintained on the automated system that keeps circulation (checkout) statistics according to the Library of Congress (LC) subclasses. The LC subclasses were chosen for analysis because of their level of specificity. Investigating usage performance within a class is useful to avoid drawing generalized conclusions on the "over-performance" or "under-performance" of an entire class (Britten 1990).

During the process of extracting circulation data for the subclasses, it was discovered that the automated system had not been configured to keep precise circulation data for all of the 173 LC subclasses that were

targeted for the study. For instance, in LC class B (Philosophy, Psychology, Religion), the system kept specific data for subclass BL (Ethics), BM (Judaism), BP (Islam), and BQ (Buddhism). However, subclasses such as B (Philosophy), BC (Logic), BR (Christianity), and others did not have specific data. To maintain consistency, only 91 LC subclasses with precise circulation data on the automated circulation module were included in this study.

Other areas of the collection that were intentionally excluded from this study were K (Law), M (Music), and N (Fine Arts). These classes represent subject areas that belong to special libraries on campus and are therefore not related directly to the collections in the central libraries. Also left out of this study were U (Military Science), V (Naval Science), and Z (Bibliography, Library Science, Information Resources).

Despite the limitations explained above, this study was conducted to serve as a pilot for a future project that will include a more comprehensive scope.

METHODOLOGY

This study makes use of the holdings data, circulation statistics, and interlibrary loan records in 89 LC subclasses. Aguilar's (1986) method for computing the Ratio of Borrowings to Holdings (RBH) and Mills (1981) technique for calculating the Percentage of Expected Use (PEU) were used in analyzing the data in this study. The RBH was used to identify subject areas that are experiencing over 100 per cent usage and those receiving the usage below this benchmark. The RBH compares the number of interlibrary loans relative to the holdings in a particular subject area. To compute the RBH for each subject area, an Excel database containing interlibrary records was queried to format filled requests into the same LC subclasses used in circulation analysis.

To find the number of books the library owns in each LC subclass, call number searches were performed in the Baylor libraries online catalog (known as BearCat) according to LC subclasses, the number of holdings in each area was extracted, and the percentages computed. The percentage of interlibrary loan was then divided by the percentage of holdings in each area to provide the ratio of borrowings to holdings. The means and the standard deviations were calculated. The ratio of borrowings to holdings that deviated negatively from the mean was interpreted as representing underused subject area. Likewise, those that

deviated positively were regarded as indicating overused subject areas. SPSS, a statistical package, was used to perform the computations.

PEU, a method for determining the extent of expected usage of materials within a specific subject areas, was the second method of analysis used in this study. To compute the PEU, the number of holdings in a given subject area was determined and the percentage of total circulation represented by that subject was calculated. The "use factor" (Bonn 1974) was then calculated by dividing the circulation percentage of a subject by the holding percentage of the same subject. The result (use factor) was then multiplied by one hundred to provide the percentage of expected use. This concept is driven by the assumption that the expected use of materials within a given subject will be 100 percent. Subjects that experience over 100 percent usage are regarded as overused; those falling below the benchmark are considered as underused (Aguilar 1986). The results of the ratio of RBH were then compared with the results of the PEU to see the direction of the comparisons and to group the subclasses into specific sets.

RESULTS

The foregoing statements explain the procedures that were followed for collecting and analyzing the circulation statistics and interlibrary loan data in this study. This section presents the results of the analyses. It has been mentioned above that the approach adopted for this study was selective. The study included only circulating and filled interlibrary loan requests for monographs with LC classifications and subclasses found on the library's automated circulation system. For items that met these criteria, there were 360,325 monographs with a total count of 148,962 circulations and 4,513 filled interlibrary loan requests during the period covered in this study. These data are listed in Table 1.

As shown in Table 1, Language and Literature and Social Sciences posted the highest scores in circulation and interlibrary loan rates. Language and Literature alone contributed 41 percent of circulations and 37 percent of interlibrary loans. Another contrast occurred in the area of Medicine where interlibrary loan requests of 11.19 percent were much higher than circulation rates of 5.19 percent.

Analysis of the RBH for each subclass revealed a substantial variation in the level of usage in various subclasses. With the standard deviation (2.50) greater than the mean (1.75), it is quite clear that some areas

were experiencing extremely high circulation while others rarely circulated. For instance, within class J (Political Science), one of the most overused subclass was JX (International Relations), a very small collection with only 95 titles but with RBH of 18.67. Within the same class, subclass J (General Legislative and Executive Papers) had 2,685 titles with a zero RBH, indicating one of the most underused subclasses. Table 2 shows the overused subclasses, that is, the subclasses whose ratio of borrowings to holdings were either equal or greater than the mean.

The second procedure in the data analysis was the computation of the PEU to determine the expected use of materials within specific subclasses. In this procedure, the subclasses whose PEU was 100% or greater, and those whose PEU was less than 100% were identified. The details of the results for the subclasses that had the PEU of 100% or more are shown in Table 3.

The final process in the data analysis involved the comparison of the results of the PEU with those of the RBH in each subclass. To accomplish this process, the mean and the standard deviation were computed for both PEU and RBH. The results are shown in Table 4.

Comparisons of the results of the PEU with those of the RBH revealed four sets of subclasses. The first set consisted of subclasses whose PEU and RBH deviated positively from their respective means, a clear indication that the monographs belonging to these subclasses were being used heavily and that there was also a high demand for interli-

TABLE 1. Holdings, Circulation, and Interlibrary Loan Data

LC Class		Holdings	%	Circulation	%	ILL	%
P	Language & Literature	146,325	40.61	60,958	40.92	1,691	37.47
H	Social Sciences	50,213	13.94	27,017	18.14	653	14.47
D	History	27,549	7.65	10,157	6.82	294	6.51
Q	Science	67,168	18.64	14,372	9.65	582	12.90
T	Technology	12,781	3.55	5,506	3.70	249	5.52
J	Political Science	8,451	2.35	3,842	2.58	89	1.99
B	Phil., Psych., Religion	14,535	4.03	8,578	5.76	120	2.66
G	Geography, Anthropology	11,957	3.32	5,892	3.96	158	3.50
R	Medicine	12,197	3.38	7,730	5.19	505	11.19
L	Education	6,558	1.82	3,637	2.44	96	2.13
S	Agriculture	2,591	0.72	1,273	0.85	76	1.68
	Totals	360,325	100.00	148,962	100.00	4,513	100.00

TABLE 2. Overused Subclasses and Their Ratio of Borrowings to Holdings

LC Class		Subclass		RBH
J	Political Science	JC	International Relations	18.67
D	History	DH	Low Countries – Benelux	12.00
		DR	Balkan Peninsula	3.00
		DF	Greece	2.40
R	Medicine	RB	Pathology	7.20
		RC	Internal Medicine	3.99
		RA	Medicine – Public Aspects	3.09
P	Language and Literature	PA	Greek, Latin	3.51
		P	Philology, Linguistics	1.95
		PM	Hyperborean, Indian, Artificial Languages	1.80
L	Education	LD	Educational Institutions (US)	5.88
S	Agriculture	SF	Animal Culture	5.89
		SB	Plant Culture	3.14
		SD	Forestry	2.20
		SH	Aquaculture, Fisheries, Angling	1.80
T	Technology	TH	Building Construction	5.88
		TT	Handicrafts, Arts and Crafts	2.91
		TP	Chemical Technology	1.81
		TL	Motor Vehicles, Aeronautics	1.82
		TK	Electrical Engineering	1.78
		TC	Hydraulic Engineering	1.75
H	Social Sciences	HS	Societies: Secret, Benevolent	3.25
Q	Science	QM	Human Anatomy	2.60
G	Geography, Anthropology	GF	Human Ecology	2.70
		GN	Anthropology	2.25

Mean = 1.75; SD = 2.50

brary loans in those areas. The classes and subclasses that met this criterion were:

- Agriculture–animal culture, plant culture, forestry, aquaculture
- Education–educational institutions in US
- Geography and Anthropology–human ecology, anthropology
- History–Low countries–Benelux
- Language and Literature–Greek, Latin, philology and linguistics
- Medical–internal medicine, pathology, public aspects of medicine
- Political Science–international relations

- Science–human anatomy
- Social Sciences–secret societies
- Technology–building construction, hydraulic engineering, chemical technology

The second set included the subclasses whose PEU deviated positively from the mean but whose RBH deviated negatively. This inverse relationship between the PEU and RBH indicates that the monographs in those subclasses were being used and the patrons did not find it necessary to make many interlibrary loan requests. The classes and subclasses that emerged in this category were as follows:

- Education–special aspects
- History–Spain, Italy and Malta
- Language and Literature–Modern Celtic languages, Romanic languages, Oriental philosophy and literature, West Germanic languages
- Medical–medicine (general)
- Political Science–political theory
- Religion–Judaism, Buddhism, Islam
- Science–microbiology, physiology, astronomy
- Social Sciences–social pathology, family and marriage, socialism and communism, industries, land use and labor, commerce, transportation and communication, statistics
- Technology–photography, environmental technology, engineering (general)

The third set contained the subclasses whose PEU deviated negatively from the mean but whose RBH deviated positively from their mean. This revealed that the library owned books in those subclasses but for some reason, the patrons did not check out those books. Instead, the patrons frequently resorted to interlibrary loans to get what they needed in those subjects. The classes and subclasses that ended up in this category were:

- History–Balkan peninsula, Greece
- Language and Literature–languages of Eastern Asia, Africa, and Oceania, Hyperborean, Indian, and artificial languages
- Technology–handicrafts, arts and crafts, electrical engineering, motor vehicles and aeronautics, mechanical engineering

TABLE 3. Subclasses with PEU 100%

Class	Subclasses
Religion	Religions - 142.00; Judaism - 129.00; Islam - 173.00; Buddhism - 144.00
History	Greece - 116.00; Spain - 181.00; Low Countries - 200.00
Geography	Human Ecology - 150.00; Anthropology - 240.00
Social Sciences	Statistics - 378.00; Transportation and Communication - 210.00; Finance - 109.00; Family, Marriage - 230.00; Societies - 175.00; Communities - 102.00; Social Pathology - 186.00; Socialism - 134.00
Political Science	Political Theory - 139.00; International Relations - 200.00
Education	Special Aspects of Education - 138.00; Individual Educational Institutions in US - 106.00
Language & Literature	Philology, Linguistics - 133.00; Greek, Latin - 228.00; Modern Language - 211.00; Romanic Languages - 158.00; West Germanic Langs. 293.00; Uralic, Basque - 100.00; Oriental Philosophy & Literature - 176.00; Eastern Asia, Africa, Oceania - 112.00; Hyperborean, Indian, and Artificial Languages - 120.00; American Literature - 111.00
Science	Astronomy - 200.00; Human Anatomy - 120.00; Physiology - 125.00; Microbiology - 279.00
Medicine	Medicine (General) - 178.00; Public Aspects of Medicine - 138.00; Pathology - 380.00; Internal Medicine - 142.00
Agriculture	Plant Culture - 159.00; Forestry - 180.00; Animal Culture - 144.00; Aquaculture, Fisheries - 340.00;
Engineering & Tech.	Engineering (General) - 352.00; Hydraulic Engineering - 125.00; Environmental Technology - 144.00; Building Construction - 175.00; Electrical Engineering - 102.00; Motor Vehicles; Aeronuatics - 100.00; Chemical Technology - 150.00; Photography - 271.00

TABLE 4. Descriptive Statistics for PEU and RBH

	N	Mean	Std. Deviation	Variance
PEU	91	123.63	81.65	6666.84
RBH	91	1.75	2.50	6.26

The fourth set was comprised of subclasses with negative deviations for both of their PEU use and RBH. This implied that books owned in those subclasses were being used little, or not at all. There were also very few requests for interlibrary loans in those areas. The subclasses in this category were:

- History–Great Britain, France and Monaco, Germany, Netherlands, Austria and Hungary, Russia and Soviet Union, Switzerland
- Language and Literature–American literature, English literature, literature (general), French, Italian, Spanish and Portuguese, German, Dutch and Afrikaans, English language, Slavic, Baltic, and

Albanian languages, Indo-Iranian philosophy and literature, Uralic and Basque languages
- Political Science–political institutions and public administration
- Science–mathematics, biology, chemistry, physics, botany, zoology
- Social Sciences–communities, classes and races, finance, recreation and leisure
- Technology–geology, home economics, manufactures, mining engineering

DISCUSSIONS

The criteria for collection development for central libraries at Baylor University consist of five collecting levels: basic information level, undergraduate level, master's level, doctoral and faculty research level, and exhaustive level. All the subclasses mentioned in the first two sets above belong to undergraduate and graduate level disciplines at Baylor. These results clearly show that the central libraries have over the years developed relevant resources for subjects associated with these sets according to the collection development criteria and that the library patrons maximize the use of these resources. Only a small number of subclasses shown in the third set did not seem to attract much use and forced the patrons to resort to interlibrary loans to find relevant materials.

The areas that deserve attention is in the fourth set where some large collections in several subclasses did not seem to attract much circulation, nor were the patrons eager to use interlibrary loans in those subject areas. There are possible reasons for explaining the low use of these materials. Examination of the holdings data indicates that the bulk of materials in the library were within the subclasses associated with arts disciplines such as history, language and literature, and social sciences. It is possible that the materials in these subclasses were actually being used but the usage level was not so visible as in other areas due to the large number of items in the collections. This suggestion might be true, particularly for the subclasses representing the huge collections in the history of European countries, American literature, and English literature.

There are also possible reasons for explaining why the subclasses related to some science, engineering, and technology disciplines did not appear to attract much use or interlibrary loans. It could be that books that are several years old are not the main source of learning and research for patrons in those fields. They might be depending heavily on current textbooks, journals, and electronic resources to meet their learning and research needs.

Lack of circulation and lack of demand for interlibrary loans in certain areas may also be attributed to elective subjects or to subjects not offered on a regular basis. This explanation could be true for a number of subclasses in the fourth set.

RECOMMENDATIONS

The results of the analysis of circulation statistics and interlibrary loan data presented above reveal an active use of library materials as well as a high demand for materials not owned by the central libraries of Baylor University. This is particularly evident in the subject areas highlighted in the first two sets in the results section of this study. This was not a serendipitous finding because those first two sets are comprised of subclasses that represent the core of the University's graduate and undergraduate programs. In light of this finding, it was recommended that the books associated with those first two sets be housed in the central libraries. It was also recommended that the current levels of acquisitions for those subject areas be sustained. To use Britten's advice, "those areas that are deviating from the average in a positive way should be 'rewarded' with enlargement" (Britten 1990, 18).

The results of this study also revealed low demand for owned materials listed in the third set, an indication that the materials were of little relevance to the needs of the library users. It was, therefore, recommended that the books pertaining to these subclasses be examined more closely with a view of deselecting the irrelevant or dated titles. The subject scope for the approval plans related to the subject areas in this set should also be examined to ensure that the library acquires materials that are relevant to the patrons.

The study also found a lack of circulation for owned materials as well as a lack of demand for interlibrary loans for the subjects mentioned in the fourth set. A closer examination was recommended for titles associated with those subclasses. Titles with evidence of little research value, those in poor condition, outdated older editions, and surplus copies should be deselected. It was further recommended that once de-selection is completed, the remaining material, especially those belonging to science, engineering, and technology disciplines with imprint dates of over 20 years be removed to the remote storage. Those measures would help to create room in the library for materials with high circulation performance.

Finally, it was recommended that a more comprehensive study covering all the relevant LC classes and subclasses and employing the methodology

used in the present study be conducted in the future. In preparation for that study, the library online system has been re-tooled and began keeping circulation statistics for all of the LC subclasses since June 1, 2002.

CONCLUSION

The worth of a library cannot be measured by the quantity of its resources alone. The quality of those resources, proven by use, is the ultimate worth of a library (SACS 1996). There are diverse procedures for evaluating the quality of library collections. Analysis of library holdings data, circulation records, and interlibrary loan statistics is one of the most effective ways. The benefits associated with the analysis of collection use are many. The information gained can be useful for developing a collection that reflects the patrons' needs and interests. The library can use the results to prove use or disuse of collections in various academic disciplines and to set priorities for acquiring materials and establishing services with the needs of the patrons in mind. Many libraries lack adequate shelving space. For those libraries, remote storage or de-selection of materials offers the best relief. The questions of central importance to these options are: Which areas of the collection can be placed in the remote storage and which areas should be targeted for de-selection? This study has demonstrated that analysis of circulation and interlibrary loan data is a basic way for providing answers to those problems.

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APPENDIX

LC subclasses included in the study:

B – BL, BM, BP, BQ
D – D, DA, DAW, DB, DC, DD, DE, DF, DG, DH, DJ, DJK, DK, DL, DP, DQ, DR
G – G, GF, GN, GT, GV
H – H, HA, HD, HE, HF, HG, HQ, HS, HT, HV, HX
J – J, JA, JC, JF, JZ
L – LC, LD
P – P, PA, PB, PC, PD, PE, PF, PG, PH, PJ, PK, PL, PM, PN, PQ, PR, PS, PT
Q – Q, QA, QB, QC, QD, QE, QH, QK, QL, QM, QP, QR
R – R, RA, RB, RC
S – S, SB, SD, SF, SH
T – T, TA, TC, TD, TH, TJ, TK, TL, TN, TP, TR, TS, TT, TX