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Predicting Materials Resource Needs: A Quantitative Response to Changing Curricula

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PREDICTING MATERIALS RESOURCE NEEDS:

A QUANTITATIVE RESPONSE TO CHANGING CURRICULA

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ABSTRACT

General academic libraries use complex formulas to divide acquisitions budgets for materials, a process known as subject fund allocation. Academic health sciences libraries generally do not elect to fund allocate. With the proliferation of academic programs and the scarcity of funds, it is essential to determine: how much should be spent on each discipline, what is spent in clinical areas, and what it should cost to support new programs. This article discusses a needs assessment formula based on client numbers and types and their relative utilization patterns of various library materials.

INTRODUCTION

Librarians must be planners for an uncertain future and assure their participation in that future with adequate resources to fulfill their missions. Being able to document resource needs quickly is a critical skill in the planning process. This article describes a formula for determining the additional funds needed by a health sciences library when new academic programs are instituted, when new laboratories are opened, or when the library approaches one of its various supporting agencies seeking increases in financial contributions.

The Health Sciences Center Library at Saint Louis University holds approximately 116,000 volumes devoted to supporting curricula for schools of Allied Health, Medicine, Nursing, Orthodontics, Public Health and the Center for Health Care Ethics. In addition, it supports the patient care activities of a tertiary care hospital and the active research of a diverse faculty. It is part of a university system including law, divinity, general academic, and aeronautics libraries.

The Library has been free from budget cuts since the 1970s. However, it has not enjoyed adequate budget increases to meet current needs, let alone meet additional demands generated by new programs. Over a short period of time, the Library was asked to support new programs in occupational therapy, dermatology and an emergency medicine residency program, as well as expansions in nursing and public health. The university libraries are routinely asked to submit approximate budget figures for what it will cost to support these new students and faculty. In the past faculty were queried for acquisition suggestions and figures were quoted which did not include media, computer assisted instruction (CAI), Interlibrary loan (ILL) or other library activities necessary to support new users.

Before developing a new acquisition's formula, a search was conducted to find one that was

predictive. Clapp - Jordan[1] and Kohut[2] are familiar formulas in the academic community. These formulas are used to take a known amount of money and divide it across disciplines in an equitable fashion. The following data are usually included: total literature output of the discipline and its average price, university department size, credit hours taught, library use, and total department majors. The formula is applied to the existing materials budget and the money is allocated to each department. Fund accounting is the process of monitoring the allocations.

While exploring existing formulas,[1 -5] it became apparent none were adequate. The formulas provided some valuable guidelines, however they help only if the amount of money available is known in advance. These formulas do not predict money needed to support a new area of study. The following formula is predictive and captures the impact of various kinds of users and disciplines on the use of the library's resources.

THE NEEDS ASSESSMENT FORMULA

Building the formula requires gathering the following data:

- ✓ Average price of journals by call number
- ✓ Average price of books by call number
- ✓ Average price of various media (DVD, Videotape, CDs, etc.) by call number
- ✓ Number of faculty by discipline arranged by call number
- ✓ Numbers of students by discipline and academic level arranged by call number
- ✓ User impact figure (e.g., circulation or ILL statistics) arranged by call number
- ✓ Total materials allocation.

Some of the information required in the needs assessment formula is obtainable from commercial sources including the average cost of books and journals within content areas.

Using the National Library of Medicine (NLM) system, an extrapolation was made from an EBSCO report[6], arranged by subject, for the average journal costs. A Ballen report[7] already arranged by NLM call letter was used for the average costs of books. The NLM classification system assures consistency of definition across reporting sources.

Unique institutional elements gathered from local data sources, include:

- ✓ Numbers of faculty, undergraduates (including medical students), master's degree and Ph.D. students by discipline;
- ✓ Impact value on the use of the book and journal collections
- ✓ Impact value on the use of the audio-visual collection, by format
- ✓ Average cost of each media format by NLM classification number

All acquisition formulas acknowledge a difference in demand by different classes of users by weighting users based on faculty status or level of degree program. For the purposes of this formula, Budd and Adams'[3] relative use factors are modified. The number of faculty is multiplied by a relative use factor of 2.5, the medical undergraduate number by 0.2, other undergraduates multiplied by 0.5, the master's number by 0.7 and the doctoral number by 3.0. The number of faculty and graduate students by level and discipline came from an internal university planning guide. Because medical students utilize a broad cross section of the collection, their total number is divided equally across disciplines. The sum of the relative use factors times the number of users by level represents the total user equivalent by discipline. The formula balances a small department, dominated by faculty and doctoral students, with a large department, comprised predominantly of undergraduate students.

Use by subject area varies. In this Library there is little activity in parasitology (QX) and heavy utilization of neurology (WL). Therefore, it is inappropriate to apply the same value to each discipline when they are used to vastly different degrees. A library that circulates or has access to reshelving data for its journals could employ those statistics to determine usage in each discipline. Statistics from book circulation may also be employed. Because this Library neither circulates its journals, nor maintains a reshelving count, nor has an automated circulation system to account for book usage, those data are not available.

Employing an ILL statistic assumes that users who have discovered the ILL service are the same people who make demands on the library's collections. In 1984 this author performed a study at another university which demonstrated the greater the circulation the greater the interlibrary loan demand by discipline[10]. As part of copyright compliance, documentation is available for journal articles ordered over PHILNET, the Washington University School of Medicine maintained interlibrary loan network and NLM's Docline. Call letters were assigned manually to each borrowed journal based on the first significant subject in the title. For example: *Obstetrics and gynecology* was assigned WQ, obstetrics, not WP, gynecology, and the *Journal of anatomy and physiology* was assigned QS, anatomy, not QT, physiology. The inequities are not significant when the thousands of interlibrary loans for one year are taken into account. Using the ILL statistic inserts the importance of the ILL costs into the formula. The percentage of total interlibrary loan for one year by discipline, provided a use impact factor which is multiplied against the average book and serial value.

Audio-visuals provide another challenge because their use is not recorded. An alternative procedure needed to be devised. The Library's Educational Media Department publishes

catalogs, arranged by format, of its current collection. Call letters were assigned to slides, software and videotapes in the same manner as they were for the interlibrary loan requests. Impact factors were developed. The rationale for employing an impact factor based on the current media holdings, rather than on use, is dependent on the fact that virtually nothing in these formats is added on speculation. Every purchase is made with faculty input. Media materials mirror the curriculum for which they are intended or they would not be owned. It is a collection finely tuned to its user population.

Developing an impact factor for the user population and the average price by material type does not adequately reflect the importance of the materials to the collection or to the clientele. Nearly 80% of the budget is devoted to the purchase of serials. Books account for about 18% and audiovisuals the remaining 2%. Further, health sciences are driven by journal literature. Therefore, it is essential to weight the impact values to indicate their relative importance in the library. Each is weighted in accordance with its share of the materials budget. Therefore, the weighting factor for journals is .80; for books .18, and for audio-visuals .02.

THE FORMULA

This section will describe in detail the calculations of the formula.

As seen in Table 1, Column A is the NLM call letter. In Column B the Journal Value Factor shows the relative cost of a discipline's journals compared to the average price for journals ($254). For example, QS (anatomy) journals cost, on average, $573. That is 2.26 times the average cost of *Index Medicus* ™ journals. That figure is arrived at by dividing the cost of anatomy journals by the average cost of an *Index Medicus* ™ journal. Column C, the Book

Value Factor, is the relative price for a discipline's books, compared to the average price for books ($86). For example QS books cost 1.05 of the average cost of health related books. Column D is the User Impact Factor derived from Interlibrary Loan demand. It indicates the demand on the collection by discipline. Of the examples in Table I, QU (biochemistry) is most heavily used.

The Audio Visual Average Impact Factor reflects the contents of that collection. The three media impacts were added together and divided by three to determine the average use (impact) of educational media on the discipline (Table 1, Column E). In this example QS is heavily represented in the collection and presumed to be most used. The standard is 1 and QS is 2.23. Column F is arrived at by multiplying the Journal Value Factor by .8 and adding that to the Book Value Factor which is multiplied by .18 indicating their relative value to the health sciences. That total is multiplied by the User Impact Factor which is finally added to the Audio Visual Average Impact Factor multiplied by .02. In this example QU has the highest Total Relative Cost : (.8*1.78 + .18*1.21)*1.3 + (.02*0.53) = 2.15.

It was necessary to incorporate the impact factors and value factors into one statistic. Column F of Table 1 unites the two Impact Factors: (1) the ILL data (Column D) and (2) audiovisual holdings (Column E), with the two Value Factors: (1) the amounts over or under the average price of the books and journals (Columns C and E) , and (2) the value of the type of materials to the library's clientele. Journals were factored highest at .8, books at .18 and audio-visuals at .02. The formula reads: (.8B + .18C)D + (.02)E = F. The name for this factor is Total Relative Costs. Cost information for media is unavailable.

TABLE I

CALCUATION FOR THE TOTAL RELATIVE COSTS

Call#	Journal Value Factor	Book Value Factor	Ill User Value	AV Average Impact Factor	Total Relative Costs
A	B	C	D	E	F = ((.8B + .18C)* D)+ (.02E)
QS	2.26	1.05	0.3	2.23	0.64
QT	1.3	0.83	0.6	0.83	0.73
QU	1.78	1.21	1.3	0.53	2.15

The value 1.00 is the standard composite value. Table 1 shows that of the three disciplines presented, QU, biochemistry's impact on the budget is more than 2 times the standard and anatomy (QS) is two-thirds the standard.

In Table 2 Columns G, H, I, J and K are the actual number of faculty and students by grade level derived from either the *Planning guide* or by dividing the medical students by all medical disciplines. The relative use factors presume that the use is higher for faculty and increases by degree level for students. Students in a doctoral program have the highest use factor (3.0), which exceeds the faculty use factor (2.5). Total user equivalents by discipline is the sum of the number of faculty and students (by type) each weighted by the respective relative use factor (boxed under the column labels in Table 2). For example, 37 faculty members in WY (Nursing) are multiplied by 2.5; 400 undergraduate nursing students multiplied by 0.5; 219 master's students multiplied by 0.7 and 0 Ph.D. students multiplied by 3.0. These are added together to equal 445.8, Column L: (G*2.5) + (H*0.2) + (I*0.5) + (J*0.7) + (K*3.0) = L (Table 2).

TABLE 2

CALCULATION OF TOTAL USER EQUIVALENTS

A	G	H	I	J	K	L
CALL#	**FAC#**	**UG#**	**UG#**	**MA#**	**PHD#**	**Total Equivalents**
RELATIVE USE FACTORS USER	2.5	0.2	0.5	0.7	3	L = (G*2.5) + (H*0.2) + (I*0.5) + (J*0.7) + (K*3.0)
QS	13	19.2		2	1.5	42.2
QT	9	19.2		2	10.5	59.2
QU	16	19		26	10	92
WY	37	0	400	219	0	445.8

USING THE FORMULA

Once the required statistics are developed, the next step is to employ the values and apply them to the existing budget. The formula will establish a dollar figure that determines additional money needed to support future programs. If the number of new users is added to the existing tables, it is expecting an already stretched budget to expand to meet the needs of the newcomers. What is needed is to justify new money based on current user patterns.

For illustrative purposes, assume a library has budgeted $500,000 for books, journals and audio-visuals. The Total Relative Costs are applied against the $500,000 to predict the amount needed by discipline (Table 3). The Total Relative Costs for all disciplines equals 26.96. Each separate value is divided by the total to determine the percent of the total acquisitions money each discipline needs. For example, QS, 0.64, is 2.39% of 26.96. The total budget of $500,000 is multiplied by 2.39%. Column M = F/26.96. Column N = M*$500,000 (Table 3).

TABLE 3
MATERIAL ALLOCATION

CALL#	Total Relative Costs	Percent of Materials Budget	Materials Allocation
A	F	M = F/26.96	N= M($500,000)
QS	0.64	2.39%	$11,950
QT	0.73	2.71%	$13,550
QU	2.15	7.96%	$39,800
WY	1.08	4.00%	$20,000
TOTAL	26.96	100.00%	$500,000

These figures can be used to estimate the amount spent by discipline. Also, the amounts spent in the basic sciences and in the clinical sciences can be extrapolated by identifying which call numbers contain the clinical or basic sciences and adding up those figures.

The Allocation per User Equivalent is derived so that the number of new users expected can be multiplied by that dollar figure. That figure is arrived at by dividing the Materials Allocation, Column N, by discipline, by the Total User Equivalents, Column L (Table 4) : N/L = O.

TABLE 4

ALLOCATION PER USER EQUIVALENT

Call #	User Equivalents	User Allocation	Allocation Per User Equivalent
A	J	M	N = M/J
QS	42.2	$11,950	$283
QT	59.2	$13,550	$229
QU	78	$39,800	$510
WY	445.8	$20,000	$45
TOTAL	1,095.90	$500,000	

If one new faculty member comes on board in biochemistry (QU), multiply 1 x 2.5 (the faculty value) times $510.00 (the Allocation per User Equivalent) = $1,275.00 to support that faculty

member and his/her staff. Thus, for any proposed program addition, the added cost to the library can be calculated once one knows how many new students at each level and new faculty members are expected.

CONCLUSION

The needs assessment formula presented here is intended to offer quantifiable, sound management information for use in a health sciences library. As new academic programs are added to the University, it is essential that the planners include the library's financial needs. The formula takes into account the critical variables: the price of materials; the current client demand based on discipline utilization; and the relative value and costs of various formats to the library. New serials formats such as CD-ROM or electronic journals can also be accommodated.

Nine underlying assumptions were made during the creation of the formula.

1. Data from outside vendors can be standardized, and new users and new programs can be categorized using the NLM/LC classification systems.
2. Medical students use the collection evenly across disciplines as they proceed through four years of medical school.
3. Each discipline is used differently.
4. ILL demand mirrors in-house library use by discipline.
5. Quantitative content of the audio-visual collection reflects the demands made upon it.
6. The user weighting statistic is valid, e.g. use varies by user class.
7. Journals in any format are the most important information sources currently accessible in the library.

8. The budgeted percentages for materials is valid as a relative weight for the materials.
9. Past use of the collections and interlibrary loan demand by NLM derived subject will predict future use.

These assumptions will be tested over time as trend data from management reports of the Integrated Library System are collected.

To date the formula has been employed in three ways. The university's graduate board requested financial information as it evaluated the cost of adding several programs in public health. After ascertaining the number of new faculty and students predicted by grade level, reasonable financial projections were made.

A clinical agency of the University supports the Library with an annual contribution. The cost of the clinical use of the collection was determined to justify a request for increased support. By adding together the total dollar amounts for the typically clinical subjects, it was demonstrated that about half of the materials budget is devoted to clinical purchases. This, with other documentation, resulted in a significant increase in the agency's contribution.

Recently, an accrediting body inquired as to what was spent on that discipline in a year and, because of the formula, a prompt response was possible.

Further refinements of the formula are planned as additional information becomes available. Data are being collected so that an audio-visual value factor by format can be included. Further, circulation and in-house reshelving data should become available in the next 12 - 24 months and those statistics can be used to validate and enhance the user impact factor.

Hopefully, other libraries will test the formula and report on its validity.

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