uniquely burdened is therefore simply without substance.

In regard to describing which libraries fine and which do not, the most useful variable investigated was the nature of institutional support. State-supported institutions clearly tend toward punitive measures, while privately supported institutions do not.

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STEPHEN TONEY

A Cost Database for Branch Library Resource Allocation and Performance Evaluation

A major gap in the knowledge of the management of the Smithsonian Institution Libraries (SIL), as in most libraries, is in the precise allocation of expenditures in terms of library goals. Traditional accounting systems are primarily concerned with expenditures by fund and by type of item purchased, i.e., object class or line item. However, management purposes (by which is meant planning and resource allocation, as opposed to accounting purposes) are better served by knowing: (1) for what organizational goal an expenditure was made; and (2) what users were benefited by an expenditure.

Management Control in Nonprofit Organizations by Anthony and Herzlinger offers a brief survey of accounting methods that illustrates how accounting practices have reflected the increasing importance being placed on the budget as a planning tool, in addition to the budget's traditional role as a request for funds.[1]

In effect, planning at the top level consists of making decisions about how resources should be allocated to fulfill the goals of the organization, and modern budgeting methods result in a document that expresses those decisions. A budget resulting from one of these modern methods clearly reflects the priorities of the organization, and thus will probably have resulted from an evaluation of priorities.

The executive branch of the federal government now practices zero-base budgeting, in which all programs are reevaluated each year in terms of the goals of the organization. However, although the Smithsonian designs its budgets using the zero-base method, the method is not reflected in its accounting systems. That is, the accounting systems used by most recipients of federal funds, including the Smithsonian, have only rudimentary capabilities to assign to expenditures the purpose of the expenditure in terms of goals. Accounting reports show expenditures by object class, which are of little use in evaluating the degree of success in fulfilling the goals stated in the budget.

Analysis of the Problem

Conversations among the director, the budget officer, and the author established the need to tag each SIL expenditure according to fiscal year, library goal, object class, fund type, fund source, cost center, and benefit center (these items are defined below). The expenditures so tagged could then be manipulated to show total costs by any of these classifications. The most essential of these classifications to the project's purposes were the library goal and the benefit center (i.e., the branch library). Tagging in this detail also enabled cross-tabulations; for example, the expenditures by any branch for fulfilling any goal could be isolated.

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Fiscal year was included so that expenditures could be compared from year to year.

Library goal was coded according to a goal classification established as part of SIL's routine annual planning.

Object classes of a high level of detail were judged not to be of interest. Expenditures were broadly coded for the classes (and subclasses) of: personnel (direct and contracted); library materials (monographs, serials, standing orders, and other); automated services and computer equipment; other equipment; supplies; training; travel; buildings and space; and other.

Fund type showed whether the expenditure was from Smithsonian federal funds, Smithsonian trust funds, or non-Smithsonian funds.

Fund source showed whether the expenditure came from the SIL budget, from the budget of the *beńefittor*, or from "other source." (Some Smithsonian units donate services, rent, etc., to the branch libraries that serve them; these units are the *benefittors* of the services of the branch, the branch being the *benefit center*. A gift to the library system as a whole would be coded "other source.")

Cost center is a coded designation for the SIL department or other Smithsonian unit authorizing the expenditure. For example, Cataloging "authorizes" the costs of salaries, OCLC services, etc., for its work. Cataloging might also "authorize" the expenditure of non-SIL funds, as when a cataloging contract is paid for by the benefittor.

Benefit center shows where services were received. Since the SIL organization reflects that of the Smithsonian, to say that the branch library serving the Museum of American History is the *benefit center* is to say that the museum itself is the *benefittor*. By this concept, the cost of providing service to each component of the Smithsonian is made clear.

The difference between a cost center and a benefit center may be illustrated this way. If the Cataloging Department buys a typewriter or purchases OCLC services or hires employees, those expenses are assigned to Cataloging as the cost center—the unit incurring the cost. However, the *ultimate* beneficiaries of the typewriter are the SIL users. Thus, in order to determine resource allocation among the user groups, it is useful to allocate proportionally the cost of the typewriter among them. For practical purposes, benefit centers are the reader services branches of the SIL and certain independent libraries in the Smithsonian.

The cost centers and benefit centers were coded in such a way that breakdowns on several levels were possible. Thus the tag SILR-MNH-ANTH is attached to costs for the *Anth*ropology subbranch of the *M*useum of *N*atural *H*istory branch of *SIL R*eader Services division.

Methodology

Recent rental of a Lanier stand-alone word processor provided the basic method for storing, manipulating, and printing the data. The Lanier can sort records of up to 256 characters on both fixed-length and variable-length fields, can extract records based on certain characteristics, and can print selected records or parts of records. The Lanier also has certain arithmetic functions. For the purposes of the cost database (informally called the costgrid), sorting and column addition were the only special functions used.

For simplicity, a fixed-length record format with fixed-length fields was chosen. Table 1 shows the fields in the record, their positions, their lengths, and their purposes.

Gathering of the Data

Expenditures of the SIL in fiscal year 1979 (FY79) were gathered from Smithsonian accounting reports (for salaries and benefits), from acquisitions accounts (for library materials), and from examination of all SIL purchase orders for FY79. From these sources, each SIL expenditure was tagged, but goals were not assigned to personnel costs at this stage.

For expenditures represented by purchase orders, assigning the goal was easy—shelving supports the goal of physical care of the collections, a binding contract supports the binding goal. We avoid goals like "support research," which is based on someone else's goals, preferring those like "provide reference service" or "perform research," which are based on library goals. A single goal consolidating the whole materials budget, such as "build the library collection," is much easier to work with than trying to determine how many of the materials support reference service, how many the curriculum, etc.

TABLE 1

COSTGRID RECORD FORMAT

Field Order	Field Name	Field Length in Characters	Purpose
1	Fiscal year	2	Fiscal year of expenditure
2	Goal	4	Classification number of library goal that expenditure supported
3	Object class	3	Type of item or service purchased with expenditure
4	Object name	13	Name of item or service purchased with expenditure
5	Fund type and source	2	(See text)
6	Cost center	13	What SI organization or department within the SIL made the expenditure
7	Benefit center	13	What SI organization or department within the SIL benefited from the expenditure
8	Cost	7	The amount of expenditure
9	Source of cost	2	A number that refers to a note of where cost information was gathered from and what adjustments were made

Personnel costs in technical services were also easy to assign to goals. However, the activities of Reader Services staff, at least at SIL, touch on nearly all of SIL's goals. For example, the filing of catalog cards in the branches supports the goal of providing cataloging (at least the way we view it). Therefore, branch staff were asked to provide estimates of how they spent their time. This gave only a very rough idea of cost by goal, but time constraints prevented the thorough recording of activities that was needed.

To identify expenditures for library services by Smithsonian units other than SIL (which had *never* been determined), a questionnaire was sent to the head of each major unit. Only object class and fund type were asked. The year, fund source, and cost center were evident. The benefit center was always the cost center. Breakdown by goal was not attempted for non-SIL expenditures, since those goals govern only the SIL.

Allocation of Indirect Costs

In order to provide a true picture of the cost of serving each component of the Smithsonian, technical services costs had to be apportioned to the branch libraries. This was done on the basis of the amount of work done in each technical service unit for each branch, rather than by a general formula.

In order to be as accurate as possible, each technical service unit was analyzed to identify its major activities; then the records for each activity were used to determine how much of the work was for each branch library. In some cases, however, allocation of technical services costs was hampered by lack of knowledge of exactly how time is spent. In general, lower-level tasks and automated activities were fairly easy to assign, but planning, for example, was harder. Generalizations were made when needed, small amounts of time were ignored, and analogies were used when possible. Supervisory and administrative time at all levels except the central administration was prorated into the various units.

Costs of the central SIL administration could have been allocated to branch libraries. However, no meaningful way of doing so was discovered.

Certain figures had to be adjusted. For example, since expenditures for OCLC services are for both the cataloging goal and the acquisitions goal (preorder searching), the line in the costgrid for OCLC expenditure (added during examination of the purchase orders) was struck and replaced by two lines, with the OCLC cost for each goal reflected in the line for that goal. Notes were kept of the adjustments made, and coded in the costgrid in the "source of cost" field (see table 1). To illustrate, the resulting two lines were:

```
79 1C2 3 COMPUTER  FC SILT-AD SILT-ACQ 10460 7
79 1A  3 COMPUTER  FC SILT-AD SILT-BSS 31381 7
```

Thus, SIL spent *$10,460* in FY79 for goal *1C2* (acquisitions), for object class *3*, *computer* services, of *f*ederal funds, from the *c*entral libraries budget, authorized by the *A*ssistant *D*irector for *SIL T*echnical Services and

benefiting the *Acq*uisitions department. Likewise *$31,381* benefited the *B*ibliographic *S*upport *S*ection in fulfilling goal *1A* (cataloging). (The number 7 at the end is the "source of cost" field, and refers to note 7.)

This example illustrates another point—that there are several levels of beneficiary. As mentioned before, the costgrid allocates all expenditures except those for central administration to a branch library. But in the example, it appears that a technical services unit is a benefit center. However, this was only a technique for grouping costs into the BSS unit, as a step preliminary to allocating BSS costs to the branch libraries.

Thus it can be seen that the allocation process may have several cycles, but to skip one cycle results in loss of the audit trail and thus loss of information. Unfortunately, the above technique does result in rather more notes than were desired, in order to explain the two levels of cost allocation.

Because of these two levels of allocation, technical services costs appeared twice in the costgrid if an adjustment had not been made. To illustrate: assume that SIL has only three branches, A, B, and C. (These will be coded SILR-A, SILR-B, and SILR-C. The *R* stands for Reader Services.) Also assume that A gets 50 percent of the effort of the BSS unit, B 30 percent, and C 20 percent. The costgrid then shows, for the OCLC costs discussed above:

79	1C2	3	COMPUTER	FC	SILT-AD	SILT-ACQ	10460	7
79	1A	3	COMPUTER	FC	SILT-AD	SILT-BSS	31381	7
79	1A	3	COMPUTER	FC	SILT-BSS	SILR-A	15691	8
79	1A	3	COMPUTER	FC	SILT-BSS	SILR-B	9414	8
79	1A	3	COMPUTER	FC	SILT-BSS	SILR-C	6276	8

The dollars column now adds up to $73,222 for OCLC services, rather than the actual $41,841 spent. This is a result of the two phases of allocation. To correct this, a line was inserted into the costgrid containing a negative amount equal to the amount that would be doubly entered—in this case -31,381.

A final methodological point is that of data integrity. More than 500 lines of data were entered for FY79, and the possibilities of accidental error were great, as with any numerical or coded data. Thus two quantities were carefully checked after each update of the grid. First, the number of lines was calculated by programming the Lanier to print a certain number of lines per page. Second, a total for expenditures was kept. Each new listing of the grid was compared against the previous, as adjusted with the new data input.

A second technique for checking data integrity, which should be employed for any data-processing project or for any large word-processing project, was to keep a backup diskette with a second copy of the costgrid. After each update to the grid was verified, the old backup was erased and a backup of the new master made. The diskettes were named COSTGRID-MASTER and COSTGRID-BACKUP, and the versions of the grid were named for the date of their creation, e.g., COST800610.

Discussion and Conclusions

This paper has attempted to show how libraries can improve their knowledge of resource allocation. At the Smithsonian Institution Libraries, we now have new knowledge of where the money goes. The figures on degree of support given to each branch we are quite confident of; the figures on allocation by library goal are only indicative, not precise.

However, any management information project, even one as rudimentary as that described, is a developmental process. At SIL we now know the general outlines of the territory and can work toward more precise knowledge each year.

It is hoped that several improvements to the database will broaden its usefulness. First among these is to develop the output side of the data. Expenditures are one way to quantify the inputs to the library system (the staff, the materials, etc.). What is needed to discuss library efficiency is a quantification of outputs (reference questions answered, circulations, etc.). If these were added to the database, routine evaluations of *efficiency* could be made.

Of course, efficiency is only part of the effort to measure performance. What is ultimately desired is a means of measuring library *effectiveness*. Then comparisons between branches or between libraries can be meaningful. One way to do this in the context of the costgrid is to modify the measures of quantitative branch output with coefficients of effectiveness for each branch activity. The coefficients might come from an annual study of the branch's effectiveness in performing each of its services. This study would need to

focus on the needs of users in fulfilling their goals, a task notoriously difficult in the library context. Some ideas for pursuing this have been gathered from Lancaster's *Measurement and Evaluation of Library Services*,[2] and also from the papers presented at the preconference on library effectiveness of the 1980 ALA Annual Conference.[3]

Two intermediate steps between the purely quantitative efficiency rating and the true effectiveness rating can be imagined. The first might be a quality measure used to adjust the raw quantitative measures of output. The supposition made here is that high-quality output is more effective that low-quality (that is, it better fulfills the library's goals). The quality measure has the advantage over the true effectiveness measure in that the users' true needs need not be studied, but only the library's products.

The second possible intermediate step in approximating a true effectiveness rating is to employ what has been referred to as the "managerial rating model."[4] This model adds to the rating formula an assessment of the relative importance of each of the library's products (obviously based on the importance of the library goals). The assessment is usually performed by the director; however, to reflect the diverse user needs in each branch library, a ranking of the product importance by each branch chief could be used to modify further the scores for his or her branch.

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sophistication using an example. (The example comes from technical services, which of course can be rated in ways similar to branch libraries).

The first, or purely quantitative, step would be a formulaic comparison between outputs and inputs, such as:

$$S_1 = \frac{\sum_{i=1}^{n} a_i x_i}{c}$$

where S_1 = final score; x_i = the quantities of various products completed (titles originally cataloged, copies added, etc.); a_i = a coefficient that expresses the relative effort required for each product (so that one title cataloged is "worth," for scoring purposes, ten copies added (the actual coefficients must be derived from time studies); and c = the cost of the department during the time period under study.

The next step would be to have the outputs of the department evaluated for quality in some way; original cataloging, for example, could be evaluated by recataloging a random sample and comparing the results with the original work. The formula to score this method might be:

$$S_2 = \frac{\sum_{i=1}^{n} a_i x_i q_i}{c}$$

where q_i = the quality scores (on a one-to-ten scale, a percentage scale, or some other ratio scale).

The next step employs the managerial rating model, in which each product is ranked for importance, again on a ratio scale. The formula might then be:

$$S_3 = \frac{\sum_{i=1}^{n} a_i x_i q_i r_i}{c}$$

where r_i = the ranking given by the library administration to the relative importance of each product.

To reiterate, none of these formulas have addressed the true effectiveness question, namely whether the user has received the service he or she needs. This is a question almost impossible to answer, since users themselves often cannot express, indeed sometimes do not realize, their information needs.[5] Solving the problems of such assessment will be the work of years.

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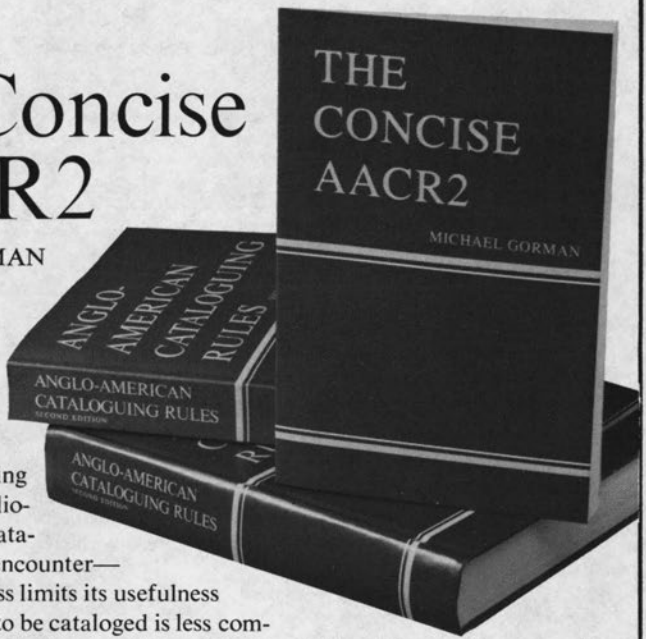
The Concise AACR2

MICHAEL GORMAN



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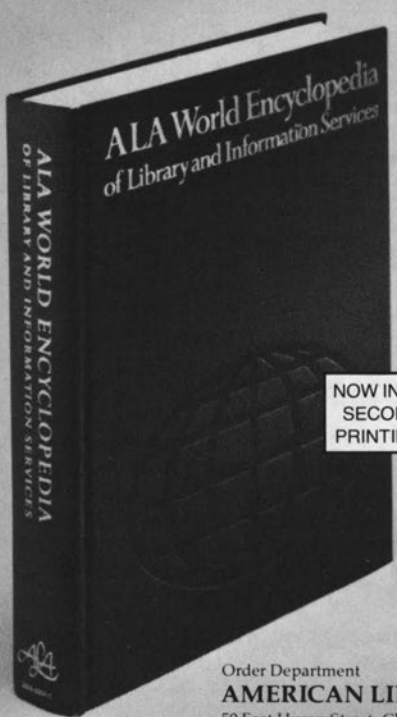

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