Cost benefit analysis: a summary of the methodology

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Introduction

Throughout the world, library researchers have initiated projects designed to estimate the dollar value of services offered by public libraries. Recent efforts now occupy individuals or teams in Norway, Germany, Brazil, New Zealand, Canada and the USA. Almost all of these projects rely on the tools that are part of the cost-benefit analysis (CBA) technique by which to estimate library-services value. Interest in this application remains high as demonstrated in the number of requests for presentations and articles that our team has had from library professionals in the USA and abroad.

At the beginning of this project, we laid out our methodology steps of CBA (Holt et al., 1996). This special issue of the journal allows us to present an overview of the current methodology, along with statements about why we made changes in research tasks and outcome expectations. We hope that other practitioners will find this article a convenient introduction to the methodology and how it can be applied to the valuation of library services.

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Rationale for CBA study of public libraries

CBA is a methodology by which economists calculate the value to the public of the services that an agency or organization delivers to its constituents. Economists have developed CBA over many decades and applied it to many different activities including those as variant as estimating the devastation caused by the Valdez oil spill and the benefits a community receives from a new swimming pool.

The St. Louis team has applied CBA to libraries to estimate a dollar value of their services against an institution's annual income and as a return on invested capital. After completion of a CBA study, library spokespersons can state in a brief sound bite that for every $1 of public funds, this library system is returning $2.00 (or $5.00 or $8.00) to its direct users. The spokespersons also can
say that the rate of return on invested capital is 3 per cent (or 10 per cent or 25 per cent). Used in this way, CBA provides institutional leaders with a convenient and succinct communications tool.

CBA methodology also allows dollar estimates of value derived from particular services. A study, for example, may show that 35 per cent of institutional value to constituents is derived from patron use of its materials collections although only 20 per cent of all income is spent on that category. The library management team then can decide if they can increase net benefits to the public by reallocating library resources or budget support from one service to another.

At the inception of the project in 1994, the team made the decision to use CBA rather than economic impact analysis. Economic impact methodology measures the change in regional economic activity derived from new factories that manufacture products for sale outside of the region or from expenditures by tourists who travel to the region. Hardly any libraries perform similar functions. Instead, libraries operate to benefit local and regional residents, not to attract new jobs and spending. CBA, which estimates the dollar value that local residents place on library services, therefore does a better job of analyzing the benefits from library operations than does economic impact analysis.

The desired outcome of this project always has been the same: the development of a conservative, transportable and relatively affordable methodology that can be used in library systems of many different sizes with variant demographics, economics and racial circumstances. The principal cost in our CBA study is interviews with user-cardholders. The current phase of the project, which we call CBA II, is to design and demonstrate a methodology that requires fewer and shorter interviews. Hence, it is less expensive than CBA I. There is further information on project expenses later in this article.

The current research task is to find out if the methodology used in CBA I, with some modifications, is as applicable to mid-size and smaller libraries (down to 50,000 cardholders) as it was to the larger libraries examined in the first study. The methodology previously demonstrated its replicability in a re-analysis of the St. Louis library operations that produced benefits for general users similar to the St. Louis pilot study. Across the five libraries in CBA I, the methodology demonstrated sensitivity through its ability to detect substantial differences in valuation among libraries based not only on service consumption, but also on constituent demographics and their ability to pay (Holt et al., 2000).

CBA I involved five systems: Baltimore County, MD; Birmingham, AL; King County [Seattle] WA; Phoenix, AZ; and a methodological re-test in St. Louis, MO. CBA II involves nine systems in three states. These are Pasadena, Bay City and Montgomery County, all within the Houston, TX, metropolitan area; Joliet, Skokie and Schaumburg, all within the Chicago, IL, metropolitan area; and Everett, Pierce County, and Mid-Columbia, all within the Seattle, WA, metropolitan area. In addition, one library in the Lewis and Clark Regional Library System [Granite City], immediately across the Mississippi river from St. Louis, is serving as a test bed for refining the methodology at the beginning of CBA II. The systems were chosen for their great variety in budgets, services and populations served. In addition, all were chosen because of their proximity to a major metropolitan airport, thereby limiting project travel costs.

**Research steps in CBA II**

The research steps for CBA II are summarized as follows:

- *Develop service/user matrices.* Within the constraints of their institutional mission statements, staff teams from the individual libraries work with the researchers to categorize their library services and users into a service/user matrix. This matrix makes explicit the relationships among major classes of users like households and educators, and services, like reference, adult materials and networked computers. Each intersecting cell represents a stream of benefits from a library service delivered to a particular class of customer. In user surveys or interviews that follow, customers will be...
asked how much of which services they use. These counts will translate into benefits that customers receive directly. In CBA II, the research team is expanding its investigation of electronic and computer services offered by participating libraries.

- **Consolidate matrices.** Project staff have worked with staff from all partner library systems to consolidate the matrices from the nine libraries into a common framework. Staff from each of the libraries have critiqued the common framework to ensure its applicability to each of the individual libraries.

- **Decide which CBA methods will be used.** Benefits can be classified as direct or indirect, individual or collective. As in CBA I, hard-to-measure library functions, like the library’s contribution to community literacy, are ignored. Any increase in their number would drive up the costs of each research survey and could undermine the credibility of the study. Prior experience in CBA I has demonstrated that the value of direct library services in a community is typically more than sufficient to demonstrate system value. Counting only direct benefits reinforces the assertion that the study’s estimates are conservative.

### Measuring direct benefits

To measure direct benefits, the project uses two different CBA “contingent valuation” techniques to estimate direct benefits to library users. The first is a service-by-service approach using the economist’s tool “consumer surplus”. This tool measures the value that library users place on separately valued library services in excess of what they must pay to get such services. A typical set of consumer surplus survey questions might go as follows: “How many children’s books do you check out of your library each month?” The respondent then answers. “If your library didn’t exist, how many more books would you buy?” The respondent then answers. With several statistical adjustments, the researchers can estimate the dollar value that the consumer places on books borrowed from the library. That figure would yield a consumer surplus figure for one service for one patron. The same set of questions is used for other services. Calculated together, the total becomes the consumer surplus, first, for each user, next, for all users surveyed, and, then, for the totality of a library’s direct users across the library’s primary services.

The second approach measures the value of the library as a whole through users’ “willingness to pay” (WTP). In CBA I, WTP produced the most conservative estimates of value and had a consistently small refusal rate (i.e. most users were willing to answer the question). As in the large-library study, the CBA II study will ask library patrons how much they would be willing to pay rather than forego library usage or, if their local libraries were closed indefinitely due to a natural disaster, how much they would be willing to pay (in taxes) to restore and maintain the library privileges they have today.

A few “must haves” in the process include:

1. **Design survey instruments and develop interviewing software.** Relying on the experiences of CBA I, the project team has redesigned the survey instrument and is developing interviewing software.

2. **Price library services.** In order to complete the study, the researchers have to price alternatives to library service. Finding private-sector prices for services that libraries deliver takes considerable time. Our tentative pricing for CBA II has involved calls to contract research firms, calculations based on the Bowker annual and other library publications, and inquiries to bookstores, movie theaters, children’s museums, etc. The researchers have consistently used conservative figures in the pricing of all alternatives to library services.

3. **Select samples of users.** Names and addresses of 2,500 households in each of the nine systems will be drawn from the cardholder database, limiting that sample only to those who have used their cards within the past year. The sample is drawn as close in time to the survey as possible in order to lose fewer persons by movement and changes in telephone number. The more up-to-date and accurate the database, the more likely that the completion rate of
interviews will be sufficiently high to achieve statistical validity.

(4) **Ensure compliance with human subject guidelines.** All research will be conducted in conformity with Federal guidelines for human subject research as applied by the Human Subjects Research Committee at Southern Illinois University Edwardsville. The research will comply with all appropriate state laws protecting the privacy of library transactions and the highest standards for user privacy articulated in the principles documents of the American Library Association.

(5) **Complete 4,500 telephone surveys, 500 for each test site library.** This process has several steps. First, computer services staff at each of the nine sites will draw a random sample of 2,500 cardholders who have used their cards within the last 12 months. A sample of at least 500 completed interviews will allow the extrapolation of sample statistical results to estimate the benefits to all cardholders from the tax investment of each public library.

(6) **Develop and implement techniques to hold down costs.** Obviously, CBA methodology will not be used very much if its expense is too great. One project objective is to reduce costs. The research team is attempting several different strategies to reduce the costs of completing a CBA study:

- Savings can be accomplished by reducing the number of services about which patrons are questioned. CBA I demonstrated that most patrons found “books for adults” or “books for children” far more valuable than “using encyclopedias, atlases and other similar general reference books.” Rather than creating a full compendium of services, the researchers have focused on those attributes that consistently furnished major benefits in the study of larger libraries.
- Reducing costs can be accomplished by reducing the number of CBA estimates used. In CBA II, the researchers will focus only on willingness-to-pay and consumer surplus approaches. The team has eliminated the willingness-

to-accept and value of time methods of measuring benefits used in CBA I. Both strategies A and B reduce the length of each interview and the cost per completed survey. Reducing the length of each interview is also expected to have a favorable impact on response rates.

(7) **Reduce the number of user groups by querying only general users (households) and possibly teachers.** CBA I demonstrated that other user groups (like senior centers and daycare) were insufficient in the total number surveyed to allow reliable statistical inference. Other user groups important to large urban libraries, such as businesses, play a much bigger role in the mission of smaller and mid-sized libraries. Restricting the sampling and surveys to only one user group rather than three cuts the survey expense to a third of the costs of the survey design used in CBA I.

(8) **Software developed.** Develop computer software that embeds the survey instrument and performs most statistical calculations in a CBA study, thereby reducing the consulting and surveying costs to individual libraries. Experiment with a combined personal interview and web-based survey format in some test site libraries that, if successful, will reduce costs greatly and increase response rates.

(9) **Research each library’s operating expenditures and capital assets.** In cost-benefit analysis, benefits that the public receives from a government agency or activity are compared with its costs. To measure costs, a library has to calculate its complete annual operating expenditures and value its physical capital assets. The latter will be valued at replacement cost excluding depreciation.

(10) **Measure direct benefits from annual income.** In CBA I, annual local taxes spent for library operations yield substantial direct benefits. Each library returned more than $1 of benefits for each $1 of annual taxes. Baltimore County Public Library returned more than $3 in benefits per tax dollar. Birmingham Public Library returned at least $1.30 in benefits per tax dollar. King County Library System returned almost $5
in benefits per tax dollar. Phoenix Public Library returned over $10 in benefits per
tax dollar. SLPL returned more than $2.50 in benefits per tax dollar. The research
team will calculate the same benefits ratios for all the libraries in CBA II.

(11) Measure return on invested capital. Each
library studied in CBA I yielded a good
annual return on invested capital.
Baltimore County Public Library returned
a minimum of 72 per cent. Birmingham
Public Library returned a minimum of
5 per cent. King County Library System
returned a minimum of 94 per cent.
Phoenix Public Library returned over
150 per cent. SLPL returned a minimum
of 22 per cent.

(12) Conduct statistical tests for reliability. In
CBA I all results were subjected to
standard statistical tests for reliability, and
the study proved to be reasonably valid
and reliable. The research team expects
CBA II results to be statistically valid and
reliable.

(13) Report results to the participating libraries.
Assist them in interpreting the results and
communicating those results to internal
and external constituencies. Of course, the
methodology will be evaluated, not only by
the project team but by staff from all the
libraries participating in the project. After
evaluation, the methodology will be
disseminated. The dissemination will
include a training model for the use of
individual systems and publications for the
general library population.

Final thoughts

The applicability of the proposed methodology
to other educational and cultural institutions is
an open question. The central building blocks
of the methodology all appear to be applicable
to other publicly supported institutions, such as
museums or performance arts organizations.
The use of a matrix to display mission as an
array of services versus subgroups of users is
appropriate to a variety of public service venues.
Contingent valuation as a means of
estimating benefits is also widely applicable.
The use of consumer surplus is more
problematic, as there may not be readily
available market substitutes for services of some
public institutions. Return on taxpayer support
and return on invested capital are easily applied
to almost any publicly supported institution.
Nevertheless, the project’s first purpose is to
refine and demonstrate the methodology in the
context of mid-size and smaller libraries. The
methodology may be extended at a later date to
serve other institutions, including museums and
historical societies.

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