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**A spreadsheet-based decision model for the choice of indexing
and abstracting data delivery option for academic libraries**

Clarke-Kraut, Karen Rebecca, Ph.D.

University of Hawaii, 1993

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Ann Arbor, MI 48106

**A SPREADSHEET-BASED DECISION MODEL FOR THE CHOICE OF INDEXING
AND ABSTRACTING DATA DELIVERY OPTION FOR ACADEMIC LIBRARIES**

**A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY
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To Richard Kraut and J.V. Hopper for their inspiration, wisdom, and unwavering encouragement.

Abstract

Libraries operated for centuries with two philosophies: the services they provided were of value to society; the value of those services was immeasurable. Today, those philosophies are being challenged as libraries are asked to measure the costs and benefits of the services they provide. Academic libraries in the United States spend large sums on journal subscriptions since most research is made available to others when it is published in journals. Researchers often use abstracting and indexing publications supplied by libraries to identify relevant journal articles. Indexing publications are available through electronic delivery options including networked CD-ROMs, locally loaded tapes, and flat fee online systems. Selecting the best, most cost effective option for access to indexing and abstracting data is a complex task so a cost benefit decision model is needed.

This study is comprised of three parts. First, a prioritized list of costs and benefits that can affect a library's choice of access option was developed using the Delphi method. Second, usage data for each of the three access options was collected from academic institutions that have adopted one of these access options. Data was collected on the use of indexing publications from The H.W. Wilson Company. The data was analyzed to determine if institutional characteristics such as difficulty of admission or funding source affected the amount usage. The data suggests that all three options considered for this project can provide a reasonable level of access for students and faculty regardless of the enrollment of the institution. Furthermore, institutional characteristics had a minimal effect on usage.

Finally, a decision model was developed using the costs and benefits identified by the Delphi participants and the usage data collected for this study. The model, developed with standard spreadsheet software, prompts the user to enter dollar amounts for the costs and benefits associated with each delivery option. Once all amounts are entered, the user can compare the total costs and benefits for each of the three options.

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Chapter I

Introduction

With the globalization of national economies and the rapid pace of industrial, medical, and technological development, businessmen and women, researchers, and students need quick and easy access to published information. At least 40,000 scientific journals (with more than one million articles) roll off presses each year.¹ Our ability to use all of this published information is limited not by technological capacities, but by human capacities. We can easily store and transmit the information; the difficulty lies in assuring that, when it is needed, the relevant data can be located by the person who needs it.

The results of most research is made available to others use when it is published in journals, in conference proceedings, or in research reports. Providing a means to identify the relevant research from among the thousands of journal articles, proceedings, and reports that are published annually has traditionally been the function of indexing and abstracting publications. For most people, access to indexing and abstracting publications is provided by a community, corporate, or academic library. Furthermore, once an abstracting or indexing publication has been used to identify the relevant materials, the library also provides access to the journals, proceedings, and research reports.

¹William J. Broad. "Doing Science on the Network: A Long Way From Gutenberg." The New York Times. 18 May 1993.

Libraries operated for centuries with two underlying philosophies: the services they provided were of value to society; the value of those services was immeasurable. Today, those philosophies are being challenged. Libraries, universities, and other institutions are increasingly under pressure to operate with new levels of accountability. Institutions that once received funding without providing evidence that they had achieved measurable goals are now being forced to measure value as well as cost. According to W. David Penniman, President of the Council on Library Resources and formerly of AT&T's Bell Labs, libraries must be prepared to measure both the costs and the benefits of the services they provide. Cost benefit analyses must be performed both from the standpoint of the user and from the standpoint of the funding agency.²

In the past, libraries tried to maintain subscriptions for all journals necessary to support the teaching and research mandates of their institutions, while eliminating subscriptions for little used journals. A number of factors made this a difficult goal to achieve. First, because most journals do not circulate, it is extremely difficult to assess which journals are used and how much they are used. Second, usage alone cannot be considered an appropriate measure of a journal's worth or contribution to the teaching and research process.³

²W. David Penniman. "Shaping the Future." Library Journal. 117(October 15, 1992): 40-4.

³Melvin J. Voigt "Circulation Studies Cannot Reflect Research Use." Journal of Academic Librarianship. (May 1979): 66.

Academic libraries in the United States spend large sums on journal subscriptions; the average annual subscription price is \$159.⁴ The 1992-93 American Library Directory provides the following figures for periodicals expenditures:

the University of California at Berkeley spent \$4,249,077 on periodicals from a total annual budget of \$31,000,000;

Catholic University of America spent \$624,230 on periodicals from a total annual budget of \$3,326,790;

Franklin & Marshall College spent \$261,989 from a total annual budget of \$1,840,500;

John Wood Community College spent \$7,675 from a total annual budget of \$62,690.⁵

This list of institutions and their expenditures is not comprehensive. It does however, provide an indication of the expenditures for journal subscriptions in academic institutions in the United States.

In the past, library collections were developed with the philosophy that the library's mandate was to have materials readily available in case they were needed by a student or researcher.⁶ Today, collection development philosophies are being changed by the new emphasis on accountability and advances in technology.

⁴Adrian Alexander. "Periodical Prices, 1989 - 1991." Library Acquisitions: Practice & Theory. (London: Pergamon Press Ltd. 1992): 3-19.

⁵American Library Directory. (New Providence, New Jersey: R.R. Bowker, 1992).

⁶David C. Taylor. "Serials Management: issues and recommendations." in Issues in Library Management. (White Plains, New York: Knowledge Industry Publications, 1984): 49-50.

Many libraries now provide on-demand electronic access to materials through full-text online services and document delivery services instead of maintaining journal subscriptions. This new philosophy has been dubbed "just-in-time collection development" as opposed to the older philosophy which is dubbed "just-in-case collection development." In actuality, most libraries use a mix of both the old and the new philosophies.

General context of research

Libraries and indexing and abstracting publications

Although faculty members, researchers, and graduate students may identify materials of interest by scanning the journals within their field of study, they rely on indexing and abstracting tools such as Chemical Abstracts, Engineering Index, or Humanities Index, when they need material beyond their immediate realm of expertise. On the other hand, because undergraduates may have little knowledge about appropriate information sources, scanning is not a realistic option for them; they rely on indexing and abstracting tools.⁷

With increased emphasis on accountability and the increased volume of publication, decisions about the continuation or addition of abstracting and indexing materials also become more important because those tools help researchers identify all potentially relevant materials from the universe of published material.⁸ Indexing and abstracting publications also help researchers identify the most relevant, most authoritative, or most appropriate materials from those identified as potentially relevant.

⁷Joel Rudd and Mary Jo Rudd. "Coping with Information Load: User Strategies and Implications for Librarians." College & Research Libraries. 47(July 1986): 315-22.

⁸Conyers Herring. "Distill or Drown: The Need for Reviews." Physics Today. (September 1968) 21: 27-33.

Significant financial resources are devoted to acquisition of abstracting and indexing materials but those materials provide the only practical means to facilitate access to the information contained in journals. This is true regardless of whether the relevant article is within the library's own collection or the article can be obtained through document delivery. Qualitative analysis, including measurable benefits and costs, is necessary. Therefore, a decision model to systematize and simplify that process should be beneficial and timely.

Abstracting and indexing publications are produced by government agencies, professional associations, for-profit businesses, bibliographic utilities, cooperative efforts among libraries themselves, or combinations of the above. Since there are so many types of organizations that provide indexing and abstracting, many with ties to professional associations or government agencies, it isn't possible to provide accurate figures for expenditures by academic institutions on these tools. Perhaps a single figure will suffice to provide a sense of the magnitude of these expenditures. The H.W. Wilson Company annually receives over \$22 million dollars in gross revenues from subscriptions to the printed edition of the Readers' Guide to Periodical Literature which, at \$180 for an annual subscription, is one of the least expensive indexes available.⁹

Though it is only in the last century that a measure of consistent and comprehensive indexing has been readily available, abstracting and indexing information has been available in printed formats for centuries. For most of that time, printed indexes were available only from the publisher and seldom were there more than one or two sources for indexing within any subject discipline. Today, this remains true for printed indexes, probably because the economics of printed indexes are such that there are extreme barriers of entry for new entrants.

⁹The H.W. Wilson Company Annual Report, 1991.

Access options for indexing and abstracting information

During the last twenty-five years, several options for electronic access to abstracting and indexing data have been introduced, including online, CD-ROM, and locally loaded magnetic tapes. The introduction of electronic access changed the marketplace for indexing and abstracting data. First, since there are fewer barriers to entry, abstracting and indexing data for essentially the same materials is often available from several producers or publishers. Second, the same or similar abstracting and indexing data may be available not only from several producers, but also from several distributors, each of whom may provide the data in a variety of formats or access options¹⁰. This makes the task of selecting appropriate abstracting and indexing publications far more complex than it was when indexing for a discipline was available only in print and only from one or two publishers.

¹⁰There is no established standard for use of the terms "format" or "access option" when referring to electronic abstracting and indexing materials. Both terms are regularly used as if they were interchangeable. For purposes of this study a bit of clarification is required. A CD-ROM disc clearly is a different format than a book, a magnetic tape, or a piece of microfilm. Furthermore, a library patron wanting access to information on a disc uses computer hardware and software to retrieve the information directly from the disc. Therefore, the CD-ROM is an access option as well as a distinct format. Magnetic tape is also a distinct format, but it is not a single distinct access option. Information on magnetic tapes is usually transferred to a computer disk drive; patrons retrieve the information from the disk drives -- not the tapes -- using computer hardware and software. The disk drives may belong to the local library; in such situations, the access option is usually referred to as locally loaded magnetic tapes. The disk drives may belong to an online service; in such situations the access option is usually referred to as online access. Both locally loaded magnetic tapes and online access use the same format -- magnetic tape --for initial delivery of the information.

Recently, two new companies of some significance began producing indexing and abstracting data: Information Access Company (IAC) and University Microfilms Incorporated (UMI). IAC was created with the specific objective of providing electronic versions of indexing for popular magazines.¹¹ On the other hand, UMI developed indexing and abstracting publications as a means of deriving further revenues from their vast store of microfilmed journals.¹² With a few exceptions, such as Dissertation Abstracts from UMI, both companies publish only electronic versions of their abstracting and indexing. Printed editions are not available. Furthermore, IAC and UMI do not, for the most part, provide abstracting and indexing data for subjects or journals not provided by other organizations. The entry of these two firms into the marketplace for abstracting and indexing brought competition to a market that had, theretofore, been largely free of competition.¹³

Organizations such as Dialog, CD-PLUS, and SilverPlatter, distribute electronic versions of indexing and abstracting information produced by others. Appendix C includes selected pages from recent catalogs listing the abstracting and indexing data that is available from each of these companies. Publishers have made their data available through new distribution channels in response to increased competition or because they may not have sufficient financial resources to develop and market electronic products.¹⁴

¹¹Carol Tenopir. "IAC's Document Delivery and More." Library Journal. 109 (June 1984):1104

¹²UMI: Accessing the World's Information since 1938 (company brochure). Ann Arbor, Michigan: UMI.

¹³ Staff Writer. "Printing Library Indexes: H.W. Wilson Co. Has Unique, Non-Competitive Business." Printing. (November 1944) : 36-43.

¹⁴Nancy Garman. "Online Synergies: Powerful Combinations Add Up." Online. 15 (July 1991): 7.

The indexing and abstracting information produced by a single publisher may be acquired from more than one vendor or distributor. It may also be available in a several formats or through several access options.¹⁵ For example, the Modern Language Bibliography is available in print or on magnetic tapes for local loading directly from the publisher. The Bibliography is available online through two vendors, OCLC and The H.W. Wilson Company. Furthermore, it is available on CD-ROM from The H.W. Wilson Company and SilverPlatter Incorporated.

When indexing and abstracting for a given subject discipline was available from only one or two sources, and only in print, librarians focused their attention exclusively on the accuracy, currency, relevancy, comprehensiveness, and suitability of indexing and abstracting data.¹⁶ The professional literature for librarians has always included, and continues to include, review articles that feature in-depth analyses of resources based on content.

Today, however, in addition to analyzing indexing publications for content, librarians must also analyze indexing publications with regard to publisher, format, distributor, and access options. While review articles continue to provide comparisons with regard to content, the professional literature provides less guidance for librarians with regard to the analysis of the costs and/or benefits of various electronic access options.

¹⁵Kathleen Young Marcaccio, ed. Computer Readable Database: A Directory and Data Sourcebook. 8th ed. (Detroit: Gale Research Inc., 1992):xv.

¹⁶John Rutledge and Luke Swindler. "The Selection Decision: Defining Criteria and Establishing Priorities." College & Research Libraries. 48(March 1987): 123-31.

Determining costs for even a single index is a complex task since the index may be available from several distributors, in several formats, or through several access options. Furthermore, content may vary from format-to-format or distributor-to-distributor. For example, the CD-ROM version of the Modern Language Association Bibliography from SilverPlatter contains more years of data than are included on the Wilson version, but, the Wilson version can be used on a network with no additional charge. Both Wilson and OCLC provide online access to the Modern Language Bibliography but Wilson calculates charges according to the method of telecommunications used to access the system, whether the user also subscribes to the printed edition of the index, what part of the bibliographic record is printed or displayed, and how much computer time is required to complete the search. OCLC provides similar online access on its EPIC system with costs based on the same criteria as are used by Wilson. OCLC and Wilson also provide access to the Bibliography on a per-search basis. Users pay a flat-fee for each search, regardless of the length of time required for the search. OCLC recently introduced FirstSearch Subscription Pricing which allows a subscribing institution's patrons to perform an unlimited number of searches (requiring an unlimited amount of computer time) for a single annual fee.

The complexity of determining actual cost is further complicated when comparing indexes that are similar but not identical. For example, UMI produces a product called Periodical Abstracts that indexes many of the same publications included in IAC's Expanded Academic Index and a combination of Wilson's General Science Index, Social Sciences Index, Humanities Index, and Readers' Guide to Periodical Literature. All of these products are available on more than one format, from more than one distributor, and through more than one access option.

Finally, for all electronic access options, there are numerous costs associated with computer hardware and software. These costs vary with the option, with technological advances, and with the distributor or publisher. Despite the fact that the selection of hardware and software may be outside the librarian's primary area of expertise, any librarian faced with the task of selecting abstracting and indexing products must include these costs in the assessment of the total costs.

In addition to determining costs, librarians selecting abstracting and indexing products must include an assessment of benefits. For purposes of this study, benefits are defined as: convenience, maximization of existing resources, simultaneity, and total search capacity. First, each access option provides certain benefits with regard to convenience. One method for assessing the benefits of a particular access option might be to determine the answers to a series of questions or items on a checklist such as the one created at the Pennsylvania State University.¹⁷ Sample questions from that checklist are included below:

Does the user need to learn new search protocols?

Can the user determine, as the abstracting and indexing information is displayed, whether or not the materials are available at a local library?

Can the user access the information from off-campus locations?

How many different sources of abstracting and indexing data can be accessed at once?

How many years of information may be accessed at once?

¹⁷Katie Clark. "A Practical Commentary on the Selection of CD-ROM Vs. Online Databases." CD-ROM Professional. 4(July 1991): 115-6.

There are different types of convenience including the amount of training or equipment that is required to use a product or the ease with which assistance may be obtained. For example, a printed index may be used without computer hardware, electricity, or computer expertise. On the other hand, a single volume of a printed index can be used by only one person at a time. If several people need access to different volumes of an index, all may be served at once. If several people all need access to the same volume, they must each wait for a turn. If a person needs to look for information spanning many years, many volumes will need to be used. With all of the electronic access options, many people may be able to use the same index at the same time. Furthermore, users may, with a single search, access many years or volumes of data.

There are also convenience differences between electronic access options. For example, an online system such as Dialog may allow a user to use the same search commands to access hundreds of databases but the user must have a phone line and a modem and must be proficient in the use of telecommunications software. With locally loaded magnetic tapes, the user may use terminals supplied by the library and may use the same familiar search commands that are used for the library's local catalog, but the number of available databases may be far more limited than are available through an online system.

Another convenience factor is related to the extent to which the user and the abstracting and indexing data must be in the same physical location. Anyone wishing to use a printed index must be physically in the same location as the required volume.

Electronic versions vary with regard to the extent to which users may be far removed from the physical location of the data, but off-campus access to abstracting and indexing data is considered one of the benefits of electronic versions.¹⁸ Some limits with regard to what is called remote access are technological, while others are licensing restrictions from the data producer or the information vendor.¹⁹ On the other hand, remote access can be a disadvantage because the remote user may not have access to anyone who can provide assistance or guidance if he or she cannot locate the required information or materials.

Benefits associated with maximization of resources relate to the extent to which abstracting and indexing data may be accessed with computer hardware and software that is already part of the institution's resources. Further, the extent to which data may be accessed over campus-wide networks is becoming increasingly important.²⁰ Other resources such as training manuals and staff expertise should also be included in considerations of the extent to which existing resources can be utilized.

Benefits associated with simultaneity and total search capacity are closely related. Since a CD-ROM that is not loaded on a network can serve one person at a time, even with constant use, it would not have the potential to provide the same number of searches as could be provided by an online system or a locally loaded magnetic tape system that could serve hundreds of people simultaneously.

¹⁸Marie Kascus and William Aquilar. "Providing Library Support for Off-Campus Programs." College & Research Libraries. 49(January 1988) :29-46.

¹⁹ Peter Jacso. CD-ROM Software, Dataware, and Hardware: Evaluation, Selection, and Installation. (Englewood, Colorado: Libraries Unlimited, 1992): 191.

²⁰Cheryl LaGuardia, Chuck Huber, and Carol Doyle. "CD-ROM Networking in ARL Academic Libraries: A Survey." CD-ROM Professional. 4(March 1991): 36-9.

Technological advances have made computers faster and cheaper, so networked CD-ROM discs with special hardware and software can serve ten to twenty people simultaneously²¹. Nevertheless, CD-ROM versions of abstracting and indexing data cannot provide the simultaneity or total capacity that may be afforded with online or locally loaded tapes. Naturally there are technological and financial limits to the capacity and simultaneity of those systems as well.²²

Online access to abstracting and indexing data was made commercially available in the 1970's and CD-ROM versions of abstracting and indexing data were introduced in the 1980's. With the exception of the a few databases such as National Library of Medicine's Medline Database, Compendex, and ERIC, magnetic tapes for local loading were not widely adopted by academic institutions until the 1990's. The first institutions that adopted each access option had to make assumptions about costs and benefits with little guidance or actual data to verify those assumptions. As indicated by the following data, the situation has changed. Since many institutions have adopted online searching, CD-ROMs and magnetic tapes for local loading, accurate cost and benefit data is available. For example, a 1989 study of CD-ROM use in OCLC's member libraries showed that 66% of the libraries owned or licensed CD-ROM discs.²³ Similarly, the Reference and Adult Services Committee of the American Library Association reported that 51 of the 94 institutions they contacted in 1990 were providing locally mounted databases.²⁴

²¹Jamshid Beheshti and Andy Large. "Networking CD-ROMs: Response Time Implications." CD-ROM Professional. 5(November 1992): 70-7.

²²Raymond G. Taylor. "Measures of Expected Online Catalog Performance for Public Access Terminals." Information Technology and Libraries. 7(March 1988): 28.

²³Nancy K. Herther "1989 OCLC Study Shows Continued CD-ROM Growth in Libraries." Laserdisk Professional. 3(March 1990): 22-4.

²⁴Peggy Seiden. "Survey of Libraries Providing Locally Mounted Databases." RASD Occasional Paper. (Chicago: American Library Association, 1991).

For each access option, accurate, long-term information about costs and usage is now available. For example, data about the remote use of the University of California's MELVYL system were published in 1992.²⁵ Furthermore, as was discussed earlier, the literature of professional librarianship includes considerable information about the content of electronic versions of abstracting and indexing data.²⁶ Nevertheless, since exact cost information is often difficult to determine and a systematic approach to the comparison of the benefits of the various access options has not been developed, even the most conscientious librarian may exhibit the same information avoidance behaviors exhibited by consumers in other situations.²⁷

Furthermore, there is evidence that there is considerable confusion on the part of librarians. In a recent issue of Online, John Piety, Director of the Grasselli Library at John Carroll University, explained his decision to use locally loaded magnetic tapes from IAC in this manner. "Other considerations included ease of use, complexity of the training, and special searching capabilities of the packages."²⁸ Since no software is provided with locally loaded magnetic tapes, his confusion is obvious. The fact that the editors did not question the statement is further evidence of the extent of the confusion.

²⁵Terry Ellen Furl and Larry Milsap. "Remote Use of the University of California MELVYL System: An Online Survey." Information Technology and Libraries. 11(September 1992): 285-302.

²⁶Bonnie MacEwan and Members of the RASD Committee Collection Development and Evaluation Section. "A Study of the Review Literature for Electronic Technologies." Reference Quarterly. 32(Fall 1992): 37-47.

²⁷Jacob Jacoby. "Perspectives on Information Overload." Journal of Consumer Research. 10(March 1984): 432-5.

²⁸John Piety. "The Anatomy of a Decision: Tape vs CD-ROM -- Which Product and Why?" Online. (September 1992): 62.

Decisions about the adoption of electronic versions of abstracting and indexing data are important both from the perspective of the extent to which those publications contribute to the research process and from the perspective that substantial financial resources are devoted to their acquisition. Therefore, a decision model that will systematize and simplify the comparison of the various options for abstracting and indexing data should be beneficial. Clearly such a model must incorporate a comprehensive and detailed analysis of the costs for each option and a mechanism for "what if analysis" that will show the effect of changing benefits on costs.

Definitions

Abstract

The term "abstract" signifies an abbreviated, accurate representation of a document. Such an abstract does not contain added interpretation or criticism and is without distinction as to who wrote it.

Access Option

Information may be delivered on many different media or formats including CD-ROM, magnetic tapes, or in print. When information is retrieved directly from the format on which it was delivered, the delivery format becomes the access option as well. When the information is transferred to another format or medium before it can be retrieved, the delivery format is not the access option. This is true for online services and for locally loaded tapes.

CD-ROM - Compact Disc-Read Only Memory

Small, plastic coated discs from which data is encoded and retrieved using a laser beam. The capacity of a single disc can be equal to 650 megabytes of data, the equivalent of 1,500 floppy disks or 250,000 pages of printed material.

Connect-hour online

A means by which a searcher at a remote location can access and interrogate databases containing bibliographic or other information. Such information may be produced by organizations other than the organization that provides the computers to store the information and the software to allow searching of the data. Users pay a fee for use according to the length of time the computer is used and the portion of the record displayed or printed.

Cost benefit analysis

An examination of the total costs (often but not exclusively expressed as a dollar amount) and of the anticipated benefits (both tangible and intangible) that are inherent in any decision to pursue a course of action.

Distributor/Vendor

A firm or organization that makes available information that they do not produce or create.

Flat fee online

A means by which a searcher at a remote location can access and interrogate databases containing bibliographic or other information. Such information may be produced by organizations other than the host or vendor that provides the computers to store the data and software to allow searching of the data. Users pay a subscription fee for unlimited use regardless of the length of time the computer is used or the portion of the record displayed or printed.

Format/delivery option

Abstracting and indexing data may be made available in print, on CD-ROM discs, through online services, or on magnetic tapes. Each of these is both a format and a means of delivering data to users.

Index/Indexing Service

A firm or institution responsible for creating records concerning books or periodicals (in printed or electronic form) which are sufficient to identify them for purposes of location. In addition to bibliographic information, the record may contain a list of subjects which are discussed in the book or periodical.

Locally loaded tapes

An information delivery option and an access option in which the data is sent to the subscribing institution on magnetic tapes. The data is usually transferred from the tapes to other media such as a disk drive so that it can be accessed randomly (rather than sequentially) and by many people virtually simultaneously. The host institution supplies both the computing equipment and the software for searching.

Per-search online

A means by which a searcher at a remote location can access and interrogate databases containing bibliographic or other information. Such information may be produced by organizations other than the host or vendor that provides the computers to store the information and software to allow searching of the data. Users pay a single fee for each search regardless of the length of time the computer is used or the portion of the record displayed or printed. The definition of a search varies.

Publisher/Producer

A person or firm responsible for creating abstracting or indexing information. Also known as a secondary publisher.

Statement of the Research Questions

Main Research Question

The costs and benefits associated with flat fee online, networked CD-ROMs, and magnetic tapes for local loading of abstracting and indexing information can be identified and incorporated into a spreadsheet-based decision model for academic institutions that will be valid and reliable. This model can incorporate "what if analysis" for varied levels of benefits as defined by convenience; maximization of existing resources; simultaneity and total search capacity. Furthermore, this model may be used without regard to the publisher or distributor of the abstracting and indexing data.

Secondary Research Question

For academic institutions, the maximum potential use and the average monthly use of indexing and abstracting data can be predicted based on the analysis of institutional characteristics including: geographic location; source of funding; enrollment, full-time equivalent enrollment; the degree of difficulty of admission; total institutional budget; total library budget.

Tertiary Research Question

A group of carefully selected library administrators, computer experts, and information industry representatives can develop a prioritized list of factors that can and/or do affect the selection of delivery format for indexing and abstracting data. The resulting list will be valid for the majority of academic institutions.

Overview of dissertation

This study is comprised of three parts. First, a Delphi Study was conducted to develop a prioritized list of costs and benefits that can and/or do affect a library's choice of access option for indexing and abstracting data. Chapter III includes a review of the literature on the Delphi Method, detailed information about the methodology used for this study, and the conclusions.

Second, usage data for locally loaded tapes, networked CD-ROM, and flat-fee online was collected from academic institutions that have adopted one of more these access options. Information was also collected about institutional characteristics such as enrollment and source of funding that might have an impact on usage. Chapter IV includes a detailed explanation of the manner in which the data was collected and the conclusions that can be drawn from analysis of the data.

Finally, the decision-model was developed using the costs and benefits identified by the participants in the Delphi study and the usage data collected for the second phase of this study. After the model was developed, it was sent to selected members of the Delphi study and others with relevant expertise for testing. Their comments and suggestions were incorporated into the model.

Chapter II

Review of the Literature

Choice of Format or Access Option

During the last three years, many articles have been published that compare the attributes of various electronic abstracting and indexing products. A much smaller number of articles compare electronic products with printed editions. If both print and electronic versions of abstracting and indexing data are available, libraries often subscribe to both formats. Nevertheless, most studies and anecdotal records indicate that students prefer electronic versions.²⁹ Further, studies suggest that, when electronic versions of abstracting and indexing data are available, student's papers reflect better research in terms of the number and quality of the sources that are cited.³⁰ The volume and pace of electronic product introductions and enhancements may have shifted the emphasis from questions about whether electronic abstracting and indexing products should be acquired to questions of which ones and in which formats or access options.³¹ Therefore, it is logical to focus attention on the literature that compares the costs and benefits of the various electronic options.

²⁹Kathryn Sullivan. "InfoTrac Version 6.00." CD-ROM Professional. 4(July 1991): 47.

³⁰Daniel Callison. "Methods for measuring student use of databases and interlibrary loan materials." School Library Media Quarterly. 16(Winter 1988): 138-44.

³¹Leonard Kniffel. "Editorial Notes." American Libraries. 23(November 1992): 820.

Cost benefit analysis in libraries

Cost benefit analysis has been applied to different facets of the library acquisitions process. Most notably, the King Research Group³² the Council on Library Resources³³ and William Saffady³⁴ conducted studies about the cost and benefits of computerized library catalogs. These studies, which examined the costs and benefits of library automation, focused on cataloging costs, retrospective conversion costs, the extent to which automated catalogs enable users to complete research more quickly, and whether automated catalogs facilitate resource sharing.

Books such as Guidelines for Selecting Automation Systems³⁵ by Joseph Matthews and The Library Manager's Guide to Automation³⁶ by Richard Boss suggest that cost benefit analysis should be applied to the selection of library automation systems. Cost benefit analysis, when applied to the implementation of library automation systems, is hampered by the difficulty librarians experience in defining measurable and meaningful benefit measures. Matthews does include a list of measurable benefits including reduction in paper costs, recovery of uncollected money such as fines for overdue materials, and faster claiming of items that are ordered but not received.

³²King Research. Alternatives for Future Library Catalogs: A Cost Model. (Rockville, Maryland: King Research, 1980).

³³J. Reed-Scott. Issues in Retrospective Conversion. Report of a study conducted for the Council on Library Resources. (Washington D.C.: Council on Library Resources, Bibliographic Services Development, 1984).

³⁴William Saffady. Computer-output Microfilm: Its Library Applications. (Chicago: American Library Association, 1978).

³⁵Joseph R. Matthews. Guidelines for Selecting Automation Systems. (Chicago: American Library Association, 1986).

³⁶Richard W. Boss. The Library Manager's Guide to Automation. (Boston: G.K. Hall & Co., 1990).

Cost benefit studies have been conducted for other library functions including the manner in which libraries order books and journals.³⁷ Book jobbers and subscription agencies are often employed to help libraries acquire needed materials. The process of ordering materials, submitting claims for missing items, and sending payments may be done either manually or with computerized links between the organizations. The benefits associated with computerization are usually listed as reduced delays in the receipt of materials and the reduction of paperwork.

Despite the number of articles published in the last decade about electronic versions of abstracting and indexing data, few articles contain rigorous cost analyses. Some, such as an article published in 1987 by Tenopir³⁸ include detailed comparisons of licensing or subscription costs, as well as lists of anticipated categories of other costs such as furniture, equipment maintenance and staff time. The lists of costs may be extensive but they often lack sufficient specificity. For example, a CD-ROM workstation should be equipped with anti-virus software that should be listed as an ongoing cost to provide for anticipated upgrades. Furthermore, the benefits cited are often important but not easily quantifiable. For example, Tenopir lists "gives the library a good image" and "patrons like it" as benefits of CD-ROM.

³⁷Susan Bauman. "An extended application of Davis' model for a vendor study" Library Acquisitions. 9(1985): 317-29.

³⁸Carol Tenopir. "Costs and benefits of CD-ROM." Library Journal. 112(September 1, 1987): 156-7.

For libraries whose funding is dependent, at least in part, on the patron's perceptions of the service they receive, those non-quantifiable benefits cannot be ignored. Nevertheless, as Penniman suggests, more emphasis may need to be placed on finding ways to quantify those benefits.³⁹

Two studies which did employ specific cost benefit analysis are a study by John Erikkila that compared costs for online versus CD-ROM and one by Browning and Haas that included an analysis of costs for UMI's Business Periodicals OnDisc product. Erikkila's approach is unique in that he considered many elements of both fixed and variable costs including library space and labor.⁴⁰ Browning and Haas included not only licensing fees but royalty charges and supplies in their analysis.⁴¹

Studies by Richard Meyer⁴² and Douglas Kranch⁴³ specifically employ cost benefit analysis for the comparison of different electronic information options. Meyer compared the costs of locally loaded magnetic tapes with connect hour based online costs. While his study may be criticized because it ignored all costs for locally loaded magnetic tapes with the exception of costs for licensing the data, the study did suggest that per search costs might be a valid number with which to compare options.

Kranch used a mathematical model to compare the costs of purchasing and storing a single bibliographic unit such as a monograph or serial with the

³⁹W. David Penniman. "Shaping the Future." Library Journal. 117(October 15, 1992): 40-4.

⁴⁰John E. Erkkila. "CD-ROM vs. Online: Implications for management from the cost side." Canadian Library Journal. 47(December 1990):421-8.

⁴¹Marilyn M. Browning and Leslie M. Haas. "A Cost Analysis and User Survey." CD-ROM Professional. 4(January 1991): 37-41.

⁴²Richard W. Meyer. "Management, cost and behavioral issues with locally mounted databases." Information Technology and Libraries. 9(September 1990): 226-41.

⁴³ Douglas A. Kranch. "Global Information Retrieval: A Fifty-Year Projection." Information Technology & Libraries. 8 (December 1989): 389-92.

costs of downloading full-text of six articles from an online system. He made several assumptions about the price of computer storage for which he provides no justification. Nevertheless, Kranch presents a thought-provoking case for remote retrieval of materials on an as needed basis.

Comparison of cost benefit analysis in libraries and in businesses for the adoption of computer technology

There is remarkable similarity between the studies about computerization of the library functions and studies performed to analyze the costs and benefits of computerization in the business environment.⁴⁴ The pace with which automated library catalogs are being adopted⁴⁵ and the pace with which businesses are buying personal computers⁴⁶ suggest that computerization of functions previously performed manually is considered beneficial. The business literature includes numerous examples of industries such as L.L. Bean and Federal Express that have been revolutionized by computerization.⁴⁷ Such dramatic success stories are harder to find in the library literature. Similar successes may have occurred in information retrieval but those successes may have been obscured by the volume of new information that must be processed and stored.

⁴⁴John L. King. "Coping with the Perils of Expanding PC Use." Journal of Information Systems Management. (Fall 1986):66-70.

⁴⁵Frank R. Bridge. "Automated System Marketplace 1991." Library Journal. 116(April 1, 1991): 50-62.

⁴⁶Lois Therrien. "Whatever happened to the Corner Computer Store?" Business Week. (May 20, 1991): 131.

⁴⁷Arno Penzias. Ideas and Information. (New York: Simon & Schuster Inc. 1989): 23.

Library automation may not have resulted in personnel reductions because the volume of materials to be handled has increased so dramatically. Much the same situation seems to exist with regard to the use of computers for routine paperwork in businesses. For example, Thurne Engineering, a manufacturer of high speed food machinery, credits computerization with helping them reduce stock by fifty percent without the need to hire additional clerical staff to type invoices and packing slips.⁴⁸ Anecdotal data is readily available; real statistical evidence is not.

⁴⁸Alison Classe. "Thurne turns to a packaged solution." Accountance. 109(March 1992): 114-115.

Chapter III

The Delphi Study

Introduction

The Delphi study conducted for this research project is designed to develop a comprehensive, prioritized list of the costs and benefits associated with the adoption of indexing and abstracting data in one of three access options -- CD-ROM, locally loaded magnetic tapes, or flat-fee online access.

When costs and benefits are clearly identifiable and measurable, there is little need for the use of opinions.⁴⁹ In this case, however, benefits and costs associated with a given access option for indexing and abstracting data are unlikely to be easily and objectively measured. Social or intangible costs and benefits such as increased prestige for an academic institution or decreased interaction between library staff and library patrons may be extremely difficult, if not impossible to measure objectively. In addition, actual cost data for hardware and software components associated with the choice of one option over another may not be readily available due to rapid technological changes⁵⁰. An additional confounding factor is the technological environment that is found on most college campuses.

⁴⁹ Olaf Helmer. Looking Forward: A Guide to Futures Research (Beverly Hills: Sage Publications, 1983), 152.

⁵⁰ William J. Hubbard. "Strategic Planning's Role in the Understanding and Acceptance of Information Systems. in Systems, People and Understanding: Proceeding of the 54th Annual Meeting of the American Society for Information Science. (Medford, NJ: Learned Information Inc., 1991),228.

The access option selected for indexing and abstracting data must be integrated into an already complex and rapidly changing technological environment. This means that the incremental costs and benefits for the same choice of access option may vary from institution to institution.

Furthermore, given this technologically complex environment, the decision about the choice of access option for indexing and abstracting data is likely to involve representatives from academic administration, academic computing, the library, and multiple vendors of hardware, software, and data. Contributions from stakeholders and experts who may not, in the normal course of events, communicate with each other, are essential for this project. It demands contributions from those who may represent competing business enterprises or university departments competing with each other for scarce institutional resources. A careful review of the literature indicates that soliciting opinions from experts and stakeholders using the Policy Delphi method is likely to yield a reasonably comprehensive and accurate list of costs and benefits.

Literature review: the Delphi Method

The Delphi method is used to solicit opinions and ideas on a specific topic from those who are identified as experts or stakeholders. Unlike committee meetings or panel discussions, participants in a Delphi study have no direct communication with each other.

The technique is especially suited to situations in which the participants cannot easily be brought together for face-to-face conversations and situations in which anonymity may elicit more opinions and more truthful opinions than might be elicited if the sources were known. Furthermore, the technique is well suited to situations in which reflection and review of data may be desirable.⁵¹

The Delphi method was developed in 1953 by Olaf Helmer and Norman Dalkey in conjunction with a Rand Corporation project for the United States Department of Defense⁵². In that study, Helmer and Dalkey used an iterative series of questionnaires and interviews with experts. The objective of the Rand study was to identify the industries most likely to be targets of a Soviet nuclear attack. As a further refinement, the experts were to estimate the number of bombs that would be required to annihilate each industry. The experts were asked to respond to the interviews and questionnaires as they anticipated Soviet experts would respond.

The project and the accompanying report of the results were classified as secret until 1963; at that time Helmer and Dalkey published the first paper describing the study and the methodology⁵³. During the ten years between the first Delphi study and publication of the article by Helmer and Dalkey, the Delphi method was used in numerous studies sponsored by the Department of Defense. Even at this early stage, variations in what has become the conventional Delphi method were being developed. For example, studies by Thrall and Caldwell included qualitative rankings of given alternatives.⁵⁴

⁵¹Harold A. Linstone and Murray Turoff, eds., The Delphi Method: Techniques and Applications (Reading, MA: Addison-Wesley Publishing Company, 1975), 86.

⁵²Norman Dalkey and Olaf Helmer. "An Experimental Application of the Delphi Method to the Use of Experts," Management Science 9(April, 1963): 458.

⁵³Ibid.

⁵⁴Coombs Caldwell, C.H. Schoeffler, and R.M. Thrall. "Linear Model for Evaluating the Output of Intelligence Systems." Naval Research Logistics Quarterly 8(1961).

In 1964 Helmer and Theodore Gordon published a Rand Corporation Report that provided details of a study in which the Delphi method was used to make forecasts about long-term technological developments and the impact of those developments on society and the world⁵⁵. Reading Helmer's report of that study almost 30 years after its publication provides the reader with a fascinating yardstick by which to measure the technological advances of the last three decades. The study also provides some evidence for questioning the validity of the Delphi method as a tool for long-term forecasting since the experts were far from accurate in some of their forecasts. Most notably, and most fortuitously, the experts were inaccurate in their assumption that a major nuclear war was a virtual certainty.

Helmer acknowledged the validity of some of the criticisms leveled at the study and the method. In particular, Helmer felt that it was unrealistic to assume the experts could have substantial expertise and knowledge in each of the six topics included in the study. The six topics included scientific breakthroughs, population control, automation, space progress, war prevention, and weapons systems. Further, he conceded that methodological issues such as the time-lag between the rounds of inquiry and the instability in the membership of the group of participants may have affected the reliability and validity of the study⁵⁶.

In Looking Forward: A Guide to Futures Research, Helmer addresses questions about the validity of the Delphi method as a predictive tool. First, the fact that a group of experts can reach a consensus is of little value if the conclusion they reach is not correct.

⁵⁵Olaf Helmer. Social Technology (New York: Basic Books, 1966), Appendix.

⁵⁶Ibid.

Helmer states that evidence from several experiments suggests that such convergence in the right direction does occur, but he acknowledges that further research is necessary. Second, for studies involving long-range forecasts, a great many years must elapse before the forecasts can be verified. Furthermore, if the study includes many topics, as did Helmer's study in 1964, one must determine what percentage of the forecast must be considered inaccurate to invalidate the study. Finally, because the Delphi method relies on experts who have many demands on their time and energy, laboratory tests using even short-term forecasts are not possible.⁵⁷

Nevertheless, during the period from the mid-1960s to the mid-1970's, numerous Delphi studies were conducted in the public and private sectors, including a series of Delphi studies conducted by TRW⁵⁸. From those studies evolved a standard Delphi methodology usually incorporating four rounds of inquiry using questionnaires mailed to a selected group of experts. Although there were variations in the wording of the questions and in the methods used to interpret the resulting responses, all Delphi studies in this period were designed to achieve a consensus among experts, usually with regard to a specific technical issue⁵⁹.

⁵⁷Helmer. Looking Forward, 153.

⁵⁸Helmer. Looking Forward, 146.

⁵⁹*Ibid.*

By contrast, the Policy Delphi, introduced in 1969 by Murray Turoff, seeks not consensus, but the strongest possible opposing points of view or the widest range of possible options for a policy issue⁶⁰. According to Turoff, the Policy Delphi should be able to do at least one of the following: ensure that all possible options have been introduced for consideration; estimate the impact and consequences of any option; or examine the acceptability of any option⁶¹. Unlike the conventional Delphi method that is specifically designed to reduce the adversarial nature of the decision-making process, the Policy Delphi seeks to use the adversarial aspects of decision-making to advantage. For a Policy Delphi, participants are selected not only on the basis of their expertise, but also on the basis of their opposing viewpoints or their tendency to look at issues with an unusual perspective.⁶²

The Policy Delphi has been used to explore such diverse issues as competency-based education⁶³, executive training⁶⁴, and healthcare⁶⁵. Turoff suggests use of the Policy Delphi is appropriate when all or some of the following circumstances exist:

The problem being studied cannot be subjected to exact analytical techniques.

The individuals who will be involved in the decision-making process represent very diverse backgrounds in terms of knowledge and expertise.

⁶⁰Linstone and Turoff. The Delphi Method, 84.

⁶¹Linstone and Turoff. The Delphi Method, 87.

⁶²Linstone and Turoff. The Delphi Method, 94.

⁶³Jeannette S.Martin and Lillian H. Chaney. "Determination of Content for a collegiate course in intercultural business communication by three Delphi panels." Journal of Business Communication. 29(1992):267-83 .

⁶⁴Dorothy Olshfski and Alma Joseph. "Assessing training needs of executives using the Delphi technique." Public Productivity & Management Review. 14(Spring 1991):297-301.

⁶⁵"The year 2000: requirements for the financial manager." Healthcare Financial Management. 40(September 1986):44-6 .

The number of individuals involved is too large for effective face-to-face meetings.

The time and costs involved in face-to-face meetings is prohibitive.

The diverse backgrounds and viewpoints of the participants must be preserved to insure valid results.

The diverse viewpoints or backgrounds of the participants could lead to counterproductive disagreements or conflicts.⁶⁶

The Policy Delphi is not a substitute for further analysis, study, or committee work. In fact, Schneider indicates that the Policy Delphi may often be a precursor to committee activity because it is an organized method for correlating views and information.⁶⁷

The Policy Delphi is subject to many of the same potential problems as the conventional Delphi⁶⁸. First there are questions about the effects of feedback. Does the manner in which feedback is presented affect responses in later rounds? To what extent does the necessary filtering of responses affect later rounds? Second, there are questions about study design, including such aspects as the appropriate number of rounds, scaling methods, and selection of participants. There are also questions about the extent to which the personal characteristics of the participants play a role in the outcome of the study. Turoff suggests that careful design and administration of the study can assure that such problems are minimized.⁶⁹

⁶⁶Linstone and Turoff. The Delphi Method, 86.

⁶⁷Jerry B. Schneider. "The Policy Delphi: A Regional Planning Application." Technological Forecasting and Social Change 3(1972): 68-80.

⁶⁸Fred Woudenberg. "An evaluation of Delphi." Technological Forecasting and Social Change. 40:131-50 (September 1991).

⁶⁹Linstone and Turoff. The Delphi Method, 101.

There are also questions regarding the reliability and validity of studies that use the Delphi method. This seems especially significant for the Policy Delphi with its objective of identifying alternatives and their consequences as part of the overall process of making decisions about policies. To a great extent, the only measure of the Policy Delphi's validity is in the success of the resulting policy. On the other hand, the success of a given policy, or lack thereof, may be entirely unrelated to the validity of the Delphi study. There are numerous accounts of Policy Delphi studies that seem to have satisfied those for whom the resulting information was intended. Most contain suggestions of methodological or administrative changes that might have been incorporated but none suggest dissatisfaction with the overall methodology⁷⁰. Therefore, one must surmise either that the Delphi method yields valid results (that those studies that do not yield valid results suffer from specific design or administrative flaws) or that studies indicating flaws in the overall methodology are not published.

If the goal of this research project were to elicit a single recommendation for choice of indexing access option, Mason's Dialectical Policy inquirer method might be more appropriate than the conventional Delphi⁷¹. Mason's Dialectical Policy inquirer method encourages participants to address underlying assumptions. Many of the stakeholders involved in the decision-making associated with this research project have fundamentally different perspectives as did the executives in Mason's 1969 case study. If time and money constraints could be ignored for this project, the Dialectical Policy inquirer approach could yield some significant results.

⁷⁰Gene Rowe, George Wright, and Fergus Bolger. "Delphi: a reevaluation of research and theory." Technological Forecasting and Social Change. 39:235-51 (May 1991).

⁷¹Richard Mason. "A Dialectical Approach to Strategic Planning," Management Science 15(April 1969): 455-72.

Study Design

Introduction

Design of a spreadsheet-based decision model for choice of access option for indexing and abstracting data, requires development of a comprehensive and prioritized list of costs and benefits for each of the three options to be considered. Identification of those costs and benefits is a complex and time-consuming task for a number of reasons. First, costs and benefits can be classified as tangible or intangible. Second, within each of the three access options -- CD-ROM, locally loaded tapes and flat-fee online access -- there are multiple options that will suffice. For example, a CD-ROM network may be configured with full-featured workstations or diskless workstations. There are significant differences in the costs associated with each of those options, but selection of the less expensive diskless workstations may necessitate selection of a more expensive file server.

Third, no matter what access option is ultimately selected, it must be integrated into an already complex technological environment⁷². The costs associated with a particular selection will be dependent upon hardware, software, and communications capabilities that already exist at the institution making the decision. Extensive knowledge about the existing environment is required to determine the actual incremental costs of a given access option selection.

⁷²J.H. Bovenlander, et al. "CD Net on Ethernet Using Novell Netware 3.10: The Experiences of Erasmus University Rotterdam." CD-ROM Professional. 5(November 1992):30-5 .

Fourth, no single individual possesses all the expertise and knowledge required to evaluate the costs and benefits associated with all three access options. For example, a person who has extensive knowledge about telecommunications networks seldom has the same depth and breadth of knowledge about local area networks.

Fifth, technological developments are occurring so rapidly that basic assumptions are regularly challenged. For example, applications that once required a campus mainframe can now be handled by a workstation located in the library director's office. Furthermore, the rapid pace of change makes price and feature comparisons extremely difficult.

In principle, this study could require five rounds, however, most Policy Delphi studies use three rounds. Turoff suggests the following to limit the study to three rounds: provide participants with a list of options but allow them to add to the lists; ask for a position on an item and underlying assumptions in the first round.⁷³

Objectives

The objective of this Delphi study was to develop a comprehensive, prioritized list of costs and benefits associated with each of three access options for indexing and abstracting data. The comprehensiveness of the list is of particular importance because there is an underlying assumption that the decision model will prompt consideration of costs and benefits that might otherwise have been overlooked.

⁷³Linstone and Turoff. The Delphi Method, 88.

Furthermore, for the model to be valid, it must incorporate all of the costs and benefits that may be relevant for the majority of academic institutions. Since there are many variations in the existing technological environments on academic campuses, only a very comprehensive list of costs and benefits can be expected to cover the majority of situations.

Selection of Participants

A Delphi study is conducted with the help of experts; this project requires experts with knowledge about the costs and benefits associated with CD-ROM networks, locally loaded tapes, flat-fee online access, library automation systems, library administration, library acquisitions, library reference work, library systems management, and data distribution. Since this is a Policy Delphi, the panel of experts must also include people who can be expected to have differing perspectives or viewpoints.

For this study, in addition to participants representing librarians and administrators from academic institutions that have adopted one or more of the relevant access options, participants from hardware, software, and data distributors were included. While these participants may lack knowledge of the day-to-day costs and/or benefits associated with the selection of a given access option, they may have more knowledge about the range of costs or benefits.

For example, a library systems administrator has detailed knowledge about the actual costs involved with locally loaded tapes, but only for systems with similar hardware and software. His or her knowledge of the costs associated with other systems is apt to be minimal. On the other hand, representatives from library automation system suppliers must know the variations in costs associated with different configurations of hardware and software.

Each of the twenty people selected to participate in this study has a national reputation as a speaker or writer and as an innovator. Each is also actively involved, on a day-to-day basis, with some aspect of the issue in question. The people selected to participate are as follows:

a reference librarian who is a regular columnist for a major industry publication;

two library systems administrators for major library systems that provide services to multiple institutions within a state;

three library directors;

five reference and acquisitions librarians;

two Chief Operating Officers for CD-ROM vendors that also provide installation of CD-ROM networks;

a Chief Executive Officer and a Senior Vice President from institutions that produce abstracting and indexing data and make that data available in all three of the relevant access options;

three Chief Executive Officers of library management system vendors;

two senior officials from institutions that provide flat-fee online systems;

Round One

Design

Round One was mailed to the participants with a cover letter from the researcher explaining the purpose of the study, outlining the manner in which the study would be conducted, and requesting the cooperation of the recipients. Since the researcher has maintained a business relationship with each of the participants for some years, there was no need to include a letter from someone else to assure credibility.

One page of instructions accompanied Round One. The instructions, as well as the lists that comprised Round One, were subjected to pre-testing which resulted in several modifications to the charts and to the instruction sheet. The researcher took the proposed Round One charts and instructions to a national library conference and asked attendees who possess the same expertise as the actual participants to pretest the study and to provide feedback on the design and wording. Their suggestions were incorporated into Round One.

The purpose of Round One was to develop a comprehensive list of the costs and benefits for each of the three access options. In order to minimize the time that would be required for participants, the researcher developed lists of tangible and intangible costs and benefits for each of the three access options. The lists were compiled using suggestions from those who participated in the pretest and from the personal experience of the researcher. Delphi participants were asked to make an "X" beside those costs and benefits which they thought should be incorporated into the final decision model. They were also asked to write-in other costs and benefits which they felt should be included but which were not on the lists.

An effort was made to include as many costs and benefits as possible without regard to the relative importance or dollar amounts of the items. The list included relatively inexpensive items such as printer ribbons and more expensive items such as mainframe disk drives. To help participants focus their thinking, the lists of costs and benefits were divided into categories including tangible and intangible costs and benefits. Within each of those categories, the lists were further divided into categories such as hardware, software, and licensing fees.

Providing a list of costs and benefits (as opposed to asking that participants furnish their own comprehensive list) could potentially limit the range of responses⁷⁴. On the other hand, it seemed unrealistic to expect each participant to compile a detailed list. Furthermore, it was hoped that, in providing the list, participants would be more willing to devote their energies to identifying less obvious costs and benefits.

Participants were asked to return their responses using a self-addressed DHL form that was included with Round One. The instructions included the researcher's toll free number; participants were encouraged to call if they had questions or needed clarification. Participants were asked to write their names on Round One (with the assurance of anonymity) so responses could be tracked. They were encouraged to consult others in their organizations, but were asked to inform the researcher if the actual responsibility for completion of the study was to be given to someone else.

⁷⁴Linstone and Turoff. The Delphi Method, 7.

Responses

Ten of the twenty studies were returned quickly. Despite the fact that the instructions clearly state otherwise, three participants called to ask if they needed to provide actual dollar amounts for the costs or benefits they thought should be included in the model. Three additional responses were received following a faxed reminder. Two other participants finally responded after the researcher paid a personal visit in conjunction with a business trip. They promised to respond in a timely manner to the next two rounds. All expressed a desire to participate in the study and an interest in learning the results.

One participant's secretary (library director) called to say that she was on sabbatical in Scotland and would regrettably be unable to respond in a timely manner. A second participant (library systems administrator) injured his eye in a freak accident shortly after Round One was mailed and was unable to continue with the study. One participant (Chief Executive Officer for an automation company) moved to a new position in a new industry in which he had little ongoing involvement with the issues to be considered. Two participants (a reference librarian and a senior official from an institution that provides flat-fee online access) simply did not respond despite repeated calls, letters, and faxes. After consulting with the research committee, the researcher decided to proceed with the study using fifteen rather than twenty participants since the relevant areas of expertise were still adequately represented.

As responses were received they were incorporated into a master chart. A mark was made beside the cost or benefit on the master chart each time a participant marked it as relevant. All costs and benefits suggested by participants were added to the master chart.

The responses indicated some confusion with the use of two words -- "network" and "gateway". For CD-ROM applications, the term "network" is normally associated with a local area network that links two or more campus buildings. For online systems and statewide library systems, the term "network" is generally associated with multimillion dollar computer and telecommunications links. Similarly, the term "gateway" has different meanings for local area networks and for online systems.

As could be expected, most participants used the terms as they are used within their own areas of expertise. That is, participants involved in CD-ROM network applications marked network administration as a relevant cost for CD-ROMs. Those most involved with online systems or big library systems also marked network administration as a significant cost for locally loaded tapes and flat-fee online access. Neither group marked network administration as a relevant cost for the other access options.

This confusion provided an excellent example of the difficulties that library administrators face in trying to gather all the relevant information necessary for informed decision-making. It also pointed out the difficulties in study design since none of those involved in pretesting suggested any confusion. This may be due to the fact that those who participated in the pretesting were specifically selected because they possess broad general knowledge about all three access options to be studied. Nevertheless, since the confusion did not seem likely to invalidate this study, no action was taken to clarify the terminology for the next two rounds.

Round Two

Design

Round Two lists were sent to the fifteen participants with a brief cover letter, a page of instructions, and a DHL form for its return. For Round Two, participants were sent lists of the costs and benefits identified in Round One. A separate list was compiled for each of the three access options with the individual costs and benefits divided into the same categories used in Round One. The lists of costs and benefits sent for Round Two included all costs and benefits that were added by participants in Round One. The list also included all items from the original list that were marked by more than fifty percent of the respondents.

Participants were asked to complete Round Two in two steps. First, for each access option, they were to identify the twenty most significant costs and benefits without regard for the percentage of costs versus benefits that were indicated. After they identified the twenty most significant costs and benefits, they were asked to rank the ten most significant with the item marked with a *10* being the least significant and the item marked with a *1* being the most significant. Participants were also asked to write-in costs or benefits they felt were significant but that had not been included.

The concept of significance is subjective. One person may view something as a significant cost because it requires a large percentage of an existing staff person's time, while another may view the same item as insignificant because no additional staff positions were required for its implementation. Furthermore, an expenditure of \$10,000 dollars is viewed differently by the library director with a multimillion dollar budget than it is by the director with an annual budget of \$500,000.

In order to be sure participants considered monetary costs and benefits as well as costs and benefits that may have less tangible monetary impact, the following criteria for determining significance were suggested:

Do you feel that the cost or benefit may have sufficient impact on an institution's annual library budget to force the consideration of other alternatives?

Do you feel the cost or benefit may have an impact on library operations that may be felt throughout the institution?

Responses

All fifteen responses for Round Two were received within three weeks.

Only two participants required a faxed reminder.

A tally was kept indicating the number of participants who marked a cost or benefit as among the twenty most significant. For costs or benefits ranked among the ten most significant by the participants, the rank assigned by each participant was recorded. For costs and benefits identified by participants as among the twenty most significant, but not among the ten most significant, a value of 11 was assigned. In retrospect, participants should have been asked to rank all twenty of the items they identified as most significant since there was no way to determine the rankings of those items. A value of 21 was assigned to responses that did not list the cost or benefit as among the top twenty.

An example of responses for flat fee online follows:

five participants ranked the fact that access is provided to many databases as the most significant item;

one participant ranked it as the second most significant item;

one participant ranked it as the third most significant item;

three participants ranked it as the fifth most significant item;

one participant ranked it as the sixth most significant item;

one participant ranked it as the seventh most significant item;

one participant ranked it as among the top twenty most significant items but not among the top ten so a value of 11 was assigned to this response;

two participants did not rank this item as among the top twenty so a value of 21 was assigned to their responses.

The mean of the rankings for each cost or benefit was computed by summing the values, then dividing by fifteen, the number of participants⁷⁵. The mean was also computed as indicated above, but with a value of 21 (instead of 11) for responses indicating that participants felt the cost or benefit was among the twenty most significant, but not among the top ten. A value of 21 was also used for items that were not marked as among the twenty most significant. The overall rankings were changed only slightly by computing the mean in this manner (which ignored all indications of significance except the top ten). Furthermore, the costs and benefits ranked as among the top twenty remained virtually unchanged although the rankings for a few items within the groups changed slightly.

⁷⁵Helmer. Looking Forward, 155.

Since the use of a separate value for items ranked within the top twenty (but not in the top ten) does add a measure of refinement to the rankings, participants were sent the chart with the mean computed using a value of 11 for those items. Charts showing both computations are included in Appendix B which includes all Delphi letters and inquiries.

Since the participants did not provide rankings for items considered among the twenty most significant, but not among the ten most significant, computing the median provides no valid information. For each access option, a few costs and benefits were marked as significant by only one or two participants who ranked those items as among the top ten in overall significance. There is obviously a great deal of disagreement about the significance of those items. Most of the costs and benefits that elicited such a disparity in ranking were those that could be categorized as intangible costs and benefits. For example, the extension of library resources to commuting students was ranked as significant by only two participants, one of who ranked it number three, the other as number six in overall significance. Intangible costs and benefits were generally ranked higher by practicing librarians and library administrators than by participants from the information industry. Conversely, participants from industry ranked document delivery options as significantly more beneficial than did practicing librarians and library administrators.

Sixty-five separate items were identified as significant for locally loaded tapes, eighteen more items than were identified for Flat-fee online access and fourteen more than were identified for CD-ROM. This is an indication that there was less overall agreement on the significance of items for this access option than for the others. This is also the access option that has most recently been introduced by OCLC with access to files that will be of interest to a large number of libraries so there is little actual information (based on experience) about this option.

In responding to Round Two, one participant remarked that some items listed as costs could be considered benefits and vice versa. For example, increased use of the library could be a cost or a benefit depending on the particular situation. There are a number of items which seem, intuitively, to be subject to this dichotomy; the decision model needs to address this.

Another participant commented that some items seemed to imply comparisons, but there was no clear indication of what should be compared or if comparisons were appropriate. For example, if, in completing the study, one considers each access option in isolation, the statement "the information is current" will be viewed differently than if one assumes an implied comparison of the currency offered by the different access options.

Round Three

Design and Responses

For Round Three, participants were sent charts with the results of Round Two including the mean ranking for every item marked as significant by at least one participant. Participants were asked to review the results and to respond to a series of open-ended questions designed to elicit their reactions to the results and to seek their comments and suggestions about other factors that will affect the decision making process. The questions for Round Three are listed below with the participants comments.

Is there anything about the results of the first two rounds with which you strongly disagree? If so, with what do you disagree and why?

Most participants commented that the lists of costs and benefits were accurate and complete. Participants had few strong disagreements with the items identified as significant or with the rankings of items. There are, as two participants commented, some inconsistencies in the importance of a given item from option to option. For example, if patron training is a significant cost, then the fact that locally loaded tapes require less training should have been highly ranked as a significant benefit.

One participant thought training should have ranked higher for all options while another thought training was ranked too high as a cost for flat-fee online. Another participant felt that telecommunications costs were ranked too high for flat-fee online. Since this last comment came from a librarian at a university with some experience with flat-fee online, the comment may merit further investigation.

Is there anything about the results of the first two rounds that you find surprising or not as you anticipated? If so, what do you find surprising and why?

For flat-fee online, participants expressed surprise that the search interface is not considered user friendly and that the link to document delivery wasn't ranked higher.

For locally loaded tapes, participants were surprised by the rankings of several items, especially the fact that neither the link to local holdings nor the ability to maximize training programs was ranked particularly high. Two items are closely related: the ability to maximize training and the fact that locally loaded tapes provide a single interface for multiple database. This may account for the lower ranking for maximization of training programs.

Participants with considerable experience using locally loaded tapes were surprised that upgrade installation was considered a more significant cost than the initial installation and that ability to scale use of the system was not ranked higher. They were also surprised that providing access to non-traditional and commuting students was not ranked higher.

For CD-ROM, participants were surprised that enhancement of faculty/student recruitment was not viewed as significant by more participants.

What issues that are not identified as costs or benefits in this study do you feel are a significant part of the decision-making process when people are choosing the format for indexing and abstracting information?

Political considerations such as the overall campus strategy for centralized or decentralized computing may affect choices. Users or funding entities may have perceptions about options that will mandate one choice over another. Local loading may be preferred over flat-fee simply because of a perception of local control or accountability. On the other hand, decisions for a single institution will often be influenced by other institutions with which they have cooperative arrangements.

The software associated with each of the access options has differences in capabilities and ease-of-use. Some participants suggested that institutions will select the access option with the software with the most capabilities. Other participants think this issue will become less important because, as the number of individuals doing electronic searching increases, the access option with search software that is easiest to use will be adopted. Widespread adoption and implementation of the Z39.50 standard may also make software differences less significant.

Many institutions that adopted electronic access options early in the technological cycle have followed what might be called an evolutionary path. First they introduced online searching, then CD-ROM, and finally locally loaded tapes or flat-fee online. Libraries just now making the decision to provide electronic access may be able to forego the turmoil of the evolutionary process by initially selecting the option that best suits their needs. Nevertheless, change may be slow since the inertia factor is always an important factor in whether an institution adopts a new option.

Decisions are often made without the formal decision-making process implied by this study.

What forthcoming trends or developments do you feel may have significant impact on this decision-making process within the next three to five years?

More consortia and state-wide arrangements will be made for access to electronic information.

As telecommunications capacity increases, and the Z39.50 standard is adopted, more use will be made of services over the Internet. Universities will integrate online and document delivery services with Campus-wide Information Systems and OPACs. Use of CD-ROM versions of databases that are available online or over the Internet may decline, but loading CD-ROM databases on magnetic drives may blur the distinction between locally loaded tapes and CD-ROM. A patron at a library workstation will probably not be able to tell where a database is actually stored or on what format.

Older librarians who lack technological background will retire and be replaced with librarians ready to push the limits of technology.

Cost factors -- licensing, computing services and equipment -- will continue to change. As those changes occur, the cost advantages of one option over others (probably flat-fee online) will be more pronounced.

More electronic journals will be available.

Conclusions

Participants consider the resulting lists of costs and benefits reasonably accurate and complete. Overall they expressed no disagreements with the lists although there were minor disagreements about the relative significance of one item over another, especially the importance of training for staff and patrons.

The other major source of disagreement was the relative functionality and ease-of-use associated with the software associated with each of the access options. Every participant ranked software functionality and ease-of-use as a major benefit for the option with which they are most familiar. Similarly they all ranked the software associated with other options as a major cost or as insignificant.

Answers from participants with day-to-day experience with each of the three access options seemed to be most consistent with regard to one option versus another. This group also provided fewer answers that indicated lack of knowledge or understanding than did the participants from the information industry who tend to possess great knowledge about a single option but less knowledge about the range of options.

Answers from participants in the information industry tended to emphasize the importance of new developments such as links to document delivery services. Answers from participants in libraries tended to emphasize the importance of nitty-gritty items such as the cost of troubleshooting. This seems like an entirely logical occurrence. People are most involved with issues that affect their daily lives. The librarians do the troubleshooting, patron training, and upgrade installations. The information industry representatives visit customers who tell them about the features such as full-text delivery, powerful search software, or inexpensive storage that a product or service must have in order to be considered for adoption. Both are important; the fact that the differences exist further validates the use of representatives from both groups to develop the list of relevant costs and benefits.

Even with this group of experts, there are misperceptions. For example, a participant most familiar with flat-fee online expressed surprise that others didn't rank a file server as a significant cost for locally loaded tapes. File servers are not used in the current local loading environments; the term is used almost exclusively with CD-ROMs. For locally loaded tapes, the main computer for the library OPAC is used in lieu of a separate file server.

Another participant most familiar with locally loaded tapes indicated that he did not know there are port charges associated with OCLC's FirstSearch subscription-based (flat-fee online) service. This was surprising since his library system has been involved in lengthy and serious negotiations with OCLC for that service. Since the current port charge is sixty-five hundred dollars per port, this researcher was surprised first, that he didn't know about the charge and second, that he didn't then rank it as a significant cost.

The access options considered for this study represent only a few of the many possible alternatives. Some of the other options are combinations or variations of other options. For example, CD PLUS offers access to databases on pc-based magnetic drives for which updates are provided on CD-ROM. Automation vendors such as CARL, DYNIX and DRA have developed "online" systems that resemble OCLC's FirstSearch. In addition, many institutions are accessing locally loaded databases that are mounted on one or more other institutions' systems.

The COASTNet group in Charleston, South Carolina is a good example of this arrangement. Three academic institutions have each mounted three different databases on their DRA systems. Access to all nine databases is available to faculty and students at each of the three institutions as well as for the local medical school and the public library. Furthermore, several library service centers such as the Florida Center for Library Automation and the Illinois Library Computer Systems Office provide centralized database access for their member institutions. Cost benefit analysis of these arrangements would undoubtedly exhibit a mixture of the costs and benefits associated with networked CD-ROM, flat-fee online and locally loaded tapes.

In studying the lists of costs and benefits considered most important by the participants, this researcher was struck by the extent to which these issues are not addressed by published literature, conference programs, or library education. This is particularly true with regard to technological issues such as troubleshooting and the need for extensive knowledge of hardware, software, and local area networks. It is also true for contract and license negotiations.

Chapter IV

Usage Data Collection and Analysis

Introduction

For the second phase of this study, usage data was collected from institutions that have actually adopted and used one or more of the access options -- flat-fee online, CD-ROM, and magnetic tapes for local loading. The usage data was analyzed for two purposes: to determine whether usage is affected by institutional characteristics that should be incorporated in the model; to determine if actual usage data could provide information that can help in predicting costs and benefits associated with a given access option. Since the purpose of the data collection was to identify factors that should be incorporated in the decision model, no attempt was made to collect data from a statistically significant number of institutions. The model testing in the third phase and the subsequent acceptance of the model for general use will be the ultimate test of the success of the data collection.

Limitations

For purposes of this study, usage data was collected about use of four indexes -- Readers' Guide to Periodical Literature, Social Sciences Index, General Science Index, and Humanities Index -- all produced by The H.W. Wilson Company. There are several reasons for this limitation. First, the four indexes were selected because they (or equivalent publications from other publishers) are available in most academic institutions and are likely to be used by the undergraduates, as well as by graduate students and faculty.

Second, Wilson provides the exact same data in each of the three access options to be considered; this is not true of many other publishers including IAC and UMI. Third, Wilson has agreed to allow the researcher access to the necessary information including proprietary usage information. Finally, since the researcher was an employee of The H.W. Wilson Company, institutions might have been reluctant to share usage or cost information for products from other organizations.

Locally loaded tapes

Limitations

For locally loaded tapes, usage data was collected from institutions using hardware and software from NOTIS Systems Incorporated. There were two reasons for this limitation. First, the NOTIS software provides a count of the number of searches performed within a given time period; other systems do not provide separate data for locally loaded tape usage, or they provide only data about the number of sign-ons or connect hours. Second, the number of NOTIS institutions accessing the relevant Wilson files using locally loaded tapes exceeds the number of institutions accessing tapes using any other single vendor. This allows collection of similar data from many institutions. When other library automation systems develop similar data collection capabilities, it should be easy to verify that the data used for this report are representative of usage at other institutions using other systems.

The NOTIS library management system can be programmed to generate a report that shows the number of author, title, keyword, and subject searches performed on a database for a given period of time. The report also breaks down the searches by the terminal or port from which the search request originated. This allows an institution to tell how many searches were done in the library and how many were done outside the library. All institutions included in this study allow remote or dial-in access to the Wilson files for their faculty, staff, and students. The ability to track usage by port or terminal is particularly significant for institutions that provide database access to other institutions as it allows them to get a separate count of the searches originating from the other institution (provided specific ports and terminal addresses have been dedicated to the other institution).

On the NOTIS system, a search is counted each time a user types *k=*, *a=*, *t=*, or *s=* plus the desired term or terms and presses the enter key. Although it has nothing to do with the focus of this study, it is interesting to note that, at all the surveyed institutions, the majority of searches on the Wilson indexes are keyword searches.

Methodology

Over eighty percent of the institutions loading Wilson files have combined two or more Wilson indexes to create their own customized databases. This complicated the task of collecting usage data about the specific databases in question. The researcher made the following decisions. First, usage data would be collected for three of the four databases.

When possible, Humanities, Social Sciences, and General Science Indexes would be used. When necessary, Readers' Guide (with or without abstracts) would be substituted for General Science or one of the other files.

Second, for institutions with combined files, the number of searches on the combined files would be divided by the number of databases that were combined to create the database, then that number would be multiplied by three. For an institution that had combined five files (including the three in question) the number of searches would be divided by five to provide the number of searches per database. That number would then be multiplied by three to give the total number of searches for three databases. This is not a perfect solution, but the usage data for institutions without combined files (or those from institutions that have combined only the three relevant files) did not differ from those computed in the manner outlined above.

Third, whenever possible, usage data was collected for two time periods, one in the fall semester, one in the spring semester. In addition, a two-month period was used for each semester. For the fall semester, data for the months of October and November 1992 was collected. For the spring semester, data for the months of February and March 1993 was collected. These months were selected to minimize, as much as possible, variations in usage due to vacation periods.

All NOTIS sites that have the relevant Wilson files loaded were contacted by phone and asked to provide usage data. This researcher was surprised to discover that approximately twenty-five percent of the NOTIS sites loading Wilson files do not keep track of usage. Several sites that sent usage data were excluded from the study because they experienced hardware or software problems during the time periods in question.

Several other sites were excluded from the study because the four files in question were scattered among too many of their customized databases. Two sites were excluded because they have so many files merged together (over ten each) that the researcher felt extrapolating usage data on three would be invalid.

Information about the following four institutional characteristics was collected from Peterson's 1993 Guide to Four-Year Colleges:⁷⁶ difficulty of admission; funding source; campus setting; and geographic region. An effort was made to assure that usage data was collected from at least one institution in every category. Few of the NOTIS institutions that keep the relevant usage data have enrollments under 5,000 though more of the institutions mounting files on other systems do have lower enrollments. Institutions with enrollments over 5,000 account for 72.6 percent of the total academic institutions in the United States.⁷⁷

Once the usage data was collected, the total number of searches at each institution was divided by the number of full-time equivalent students and faculty for the 1991-92 academic year to give the number of searches done per student or faculty member. There are two numbers associated with the enrollment at academic institutions: total enrollment and full-time equivalent enrollment. The researcher decided to use FTE (full-time equivalent enrollment) because it can most easily be compared from one institution to another.

⁷⁶Andrea E. Lehman, ed. Peterson's Guide to Four-Year Colleges 1993. (Princeton, New Jersey: Peterson's Guides, 1992).
The 1992 EDUCOM Pocket Guide to Higher Education. (Los Angeles: Center for Scholarly Technology at the University of Southern California, 1992), 12.

The ratio of total enrollment to full-time equivalent varies from institution-to-institution but all institutions compute the full-time equivalent enrollment in exactly the same manner. Since the purpose of this study is to provide an indication of the amount of system usage that can be anticipated, comparisons can most easily be made using full-time equivalent enrollment.

The total number of searches was also divided by the number of days in the relevant time period to give a number of searches performed per day. The actual number of hours each day when the files are accessible varies. At Texas A&M the files are available twenty-two hours a day; maintenance is scheduled from 2:00 A.M. to 4:00 A.M.

The total library budget was also divided by the FTE to get per student or faculty library expenditures. Initially, the researcher planned to use the total institutional budget as well. The researcher abandoned the idea because meaningful, comparable figures for total institutional budgets were unavailable. Institutions use different methods to account for revenues such as grants, government appropriations, endowments, and services. The usage data and the institutional characteristics studied are shown in Figure 1.

	American U.	Binghamton U.	Boston C.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)			
Large (10,000 to 20,000)	11,213	11,883	14,557
Very Large (over 20,000)			
Difficulty of Admission			
Noncompetitive			
Minimally difficult			
Moderately difficult	x		
Very difficult		x	x
Most difficult			
Funding Source/Control			
Public		x	
Private	x		x
Campus Setting			
Major metropolitan area (pop. > 500,000)	x		
Near but not in major metropolitan area			x
Small to medium city (pop. 50,000 to 500,000)		x	
Small city (pop. under 50,000)			
Rural			
Geographic Region			
New England			x
Middle Atlantic	x	x	
East South Central			
South Atlantic			
Great Lakes			
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$1,650,418	\$6,930,221	\$8,016,234
Per Student & Faculty Library Expenditure	\$147	\$583	\$551
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Searches Oct&Nov 92	N/A	51,377	95,413
Searches per day	N/A	842	1,564
Searches per student & faculty	N/A	4.3	6.6
Searches Feb&Mar 93	36,140	38,621	62,726
Searches per day	613	655	1,063
Searches per student & faculty	3.2	3.3	4.3

Figure 1
Institutional Characteristics and Usage Data Locally Loaded Tapes

	Ca. State U. San Bernardino	Catholic U.	Gaulladet U.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			2,721
Medium (5,000 to 9,999)		7,257	
Large (10,000 to 20,000)	12,561		
Very Large (over 20,000)			
Difficulty of Admission			
Noncompetitive			
Minimally difficult			
Moderately difficult	x	x	x
Very difficult			
Most difficult			
Funding Source/Control			
Public	x		
Private		x	x
Campus Setting			
Major metropolitan area (pop. > 500,000)		x	x
Near but not in major metropolitan area	x		
Small to medium city (pop. 50,000 to 500,000)			
Small city (pop. under 50,000)			
Rural			
Geographic Region			
New England			
Middle Atlantic		x	x
East South Central			
South Atlantic			
Great Lakes			
West South Central			
Mountain			
Plains			
Pacific	x		
Canada			
Library Budget 1991-92	\$3,180,104	\$3,260,000	\$1,730,841
Per Student & Faculty Library Expenditure	\$253	\$449	\$636
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Searches Oct&Nov 92	31,788	N/A	N/A
Searches per day	521	N/A	N/A
Searches per student & faculty	2.5	N/A	N/A
Searches Feb&Mar 93	27,789	12,539	4,215
Searches per day	471	213	71
Searches per student & faculty	2.2	1.7	1.5

**Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes**

	George Mason U.	George Washington U.	Indiana State U.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)			
Large (10,000 to 20,000)	14,495	18,106	11,783
Very Large (over 20,000)			
Difficulty of Admission			
Noncompetitive			
Minimally difficult			
Moderately difficult	x	x	x
Very difficult			
Most difficult			
Funding Source/Control			
Public	x		x
Private		x	
Campus Setting			
Major metropolitan area (pop. > 500,000)	x	x	
Near but not in major metropolitan area			
Small to medium city (pop. 50,000 to 500,000)			
Small city (pop. under 50,000)			x
Rural			
Geographic Region			
New England			
Middle Atlantic	x	x	
East South Central			
South Atlantic			
Great Lakes			x
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$3,491,230	\$6,683,675	\$3,792,641
Per Student & Faculty Library Expenditure	\$241	\$369	\$322
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SS I
Searches Oct&Nov 92	N/A	N/A	65,359
Searches per day	N/A	N/A	1,071
Searches per student & faculty	N/A	N/A	5.5
Searches Feb&Mar 93	24,464	35,004	47,868
Searches per day	415	593	811
Searches per student & faculty	1.7	1.9	4.1

**Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes**

	Iowa State U	Macomb Community C.	Marymount U.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			3,192
Medium (5,000 to 9,999)			
Large (10,000 to 20,000)			
Very Large (over 20,000)	20,855	28,003	
Difficulty of Admission			
Noncompetitive		x	
Minimally difficult			
Moderately difficult	x		x
Very difficult			
Most difficult			
Funding Source/Control			
Public	x	x	
Private			x
Campus Setting			
Major metropolitan area (pop. > 500,000)			
Near but not in major metropolitan area		x	x
Small to medium city (pop. 50,000 to 500,000)			
Small city (pop. under 50,000)	x		
Rural			
Geographic Region			
New England			
Middle Atlantic			x
East South Central			
South Atlantic			
Great Lakes	x	x	
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$9,814,330	\$394,585	\$889,990
Per Student & Faculty Library Expenditure	\$471	\$14	\$279
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,S SI
Searches Oct&Nov 92	N/A	N/A	N/A
Searches per day	N/A	N/A	N/A
Searches per student & faculty	N/A	N/A	N/A
Searches Feb&Mar 93	31,868	12,513	5,382
Searches per day	540	212	91
Searches per student & faculty	1.5	0.4	1.7

**Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes**

	Oakland Community C.	Oakland U.	Syracuse U.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)			
Large (10,000 to 20,000)		12,530	15,960
Very Large (over 20,000)	28,410		
Difficulty of Admission			
Noncompetitive	x		
Minimally difficult			
Moderately difficult		x	
Very difficult			x
Most difficult			
Funding Source/Control			
Public	x	x	
Private			x
Campus Setting			
Major metropolitan area (pop. > 500,000)			x
Near but not in major metropolitan area	x	x	
Small to medium city (pop. 50,000 to 500,000)			
Small city (pop. under 50,000)			
Rural			
Geographic Region			
New England			
Middle Atlantic			x
East South Central			
South Atlantic			
Great Lakes	x	x	
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$558,485	\$2,185,515	\$8,929,768
Per Student & Faculty Library Expenditure	\$20	\$174	\$560
Files	GSI,HUM,SSI	GSI,HUM,SS I	GSI,HUM,SSI
Searches Oct&Nov 92	34,425	N/A	N/A
Searches per day	564	N/A	N/A
Searches per student & faculty	1.2	N/A	N/A
Searches Feb&Mar 93	36,881	54,685	52,457
Searches per day	625	927	889
Searches per student & faculty	1.3	4.4	3.3

**Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes**

	Texas A&M U.	U. Detroit Mercy	U. Dist. of Columbia
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)		7,888	
Large (10,000 to 20,000)			12,608
Very Large (over 20,000)	40,997		
Difficulty of Admission			
Noncompetitive			x
Minimally difficult			
Moderately difficult	x	x	
Very difficult			
Most difficult			
Funding Source/Control			
Public	x		x
Private		x	
Campus Setting			
Major metropolitan area (pop. > 500,000)		x	x
Near but not in major metropolitan area			
Small to medium city (pop. 50,000 to 500,000)	x		
Small city (pop. under 50,000)			
Rural			
Geographic Region			
New England			
Middle Atlantic			x
East South Central	x		
South Atlantic			
Great Lakes		x	
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$8,949,216	\$1,056,703	\$4,088,362
Per Student & Faculty Library Expenditure	\$218	\$134	\$324
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Searches Oct&Nov 92	114,422	N/A	N/A
Searches per day	1,876	N/A	N/A
Searches per student & faculty	2.8	N/A	N/A
Searches Feb&Mar 93	108,264	16,161	3,350
Searches per day	1,835	274	57
Searches per student & faculty	2.6	2.0	0.3

Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes

	U. Michigan	Vanderbilt U.	Wayne State U.
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)		9,581	
Large (10,000 to 20,000)			
Very Large (over 20,000)	36,338		22,483
Difficulty of Admission			
Noncompetitive			
Minimally difficult			
Moderately difficult			x
Very difficult		x	
Most difficult	x		
Funding Source/Control			
Public	x		x
Private		x	
Campus Setting			
Major metropolitan area (pop. > 500,000)		x	x
Near but not in major metropolitan area			
Small to medium city (pop. 50,000 to 500,000)			
Small city (pop. under 50,000)	x		
Rural			
Geographic Region			
New England			
Middle Atlantic			
East South Central		x	
South Atlantic			
Great Lakes	x		x
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$16,894,104	\$9827,362	\$10,644,637
Per Student & Faculty Library Expenditure	\$465	\$1,026	\$473
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Searches Oct&Nov 92	82,586	27,842	70,723
Searches per day	1,354	456	1,159
Searches per student & faculty	2.3	2.9	3.1
Searches Feb&Mar 93	77748	25,766	67,234
Searches per day	1,318	437	1,140
Searches per student & faculty	2.1	2.7	3.0

Figure 1 (continued)
Institutional Characteristics and Usage Data Locally Loaded Tapes

Conclusions

The results are not as anticipated by this researcher. First, the number of searches per student or faculty member varies less than anticipated (0.4 - 6.6). Furthermore, with the exception of the community colleges discussed below, there does not seem to be a correlation between the institutional characteristics that were included in this study and usage.

Second, the number of searches per student or faculty member is lower than anticipated. The average number of searches per faculty or student for the group of institutions listed here is 3.08. The numbers of searches for Wayne State University and for Texas A&M are artificially high because both institutions provide some database access for other institutions that are not included in the enrollment figures. The figures for the two community colleges are low; this seems logical since the community college curriculum generally requires less student research. For all institutions, the total number of searches and the number of searches per student or faculty is slightly higher in the fall than in the spring semester.

Third, while the number of searches per day ranges from 57 to 1876, this does not automatically translate into a requirement for computer hardware and software to accommodate large numbers of simultaneous users. For example, neither Indiana State University (1071 searches per day) nor Syracuse University (889 searches per day) has ever exceeded seven simultaneous users though there were no limits placed on the potential number of simultaneous users. At Indiana State there are sixty-two public access terminals in the library and eight telecommunications lines available for remote access. This means a total of seventy users could theoretically access the files simultaneously.

Several institutions provided data on the percentage of searches done on the three Wilson databases as a percentage of the total number of searches done on their library's catalog: California State University at San Bernardino 35%; Indiana State University 16%; SUNY Binghamton 22%; SUNY Buffalo 17%; Texas A&M 30%; the University of Michigan 20%. Further investigation of these ratios might also provide guidelines for anticipated system usage.

If one makes two assumptions, the usage data becomes very important because it implies that all three access options being considered can provide the same level of accessibility, probably at a reasonable cost. The first assumption is that locally loaded tapes provide users with as much electronic searching as they wish without the real or theoretical constraints that are associated with other access options. With locally loaded tapes, the user does not pay a fee to search regardless of the number of searches or the amount of computer time used. The institution pays the same annual subscription fee regardless of the amount of use so students and faculty are actually encouraged to use the files. Familiar search software that does not vary from database-to-database is used. The user can access the databases from terminals located throughout the library or the campus or from other locations using a personal computer and a modem.

The second assumption is that these numbers are representative, that other institutions with other hardware and software and with other institutional characteristics would have similar usage data.

If these two assumptions are valid, then local loading is the "worst-case scenario" in terms of system requirements; the requirements are not great and can be delivered with CD-ROM networks or flat-fee online access.

The ILCSO Project

Usage data shown on Figure 2 was collected from the ILLINET consortium which is using BRS software mounted on the Illinois Library Computer Systems Office hardware. Forty academic institutions in the state of Illinois have access to five Wilson indexes, ERIC, and Current Contents. The University of Illinois campuses at Urbana and Chicago also have access to two additional Wilson databases that are not accessible to others in the consortium. Since this system provides data only on the number of sign-ons and the connect hours, it was impossible to compare these data with those collected from the NOTIS sites. Nevertheless, there are a few interesting observations that can be made. First, while the number of connect hours used by the University of Illinois at Urbana seems large -- 3,701 hours in the month of November 1992 -- that does not necessarily correspond to a large number of simultaneous users. Dividing 3,701 by thirty, the number of days in November, you get 123.36 hours of searching per day. Dividing 123.36 hours by twelve you find that such numbers can be accommodated with ten simultaneous users. Obviously this assumes constant searching by ten simultaneous users, an unrealistic expectation. On the other hand, the searches can be performed in any of nine databases, ten is the minimum number necessary, not the number that may actually have been searching at certain intervals.

Second, because of the range in the size and type of institutions that access the Wilson files on the ILC SO system, this data may serve as a benchmark by which to measure usage at other institutions that measure usage by connect-hour rather than by number of searches and for comparisons with CD-ROM usage.

Third, further investigation may show that, across many systems and at many institutions, there is an average number of searches for each log-in. If such data can be validated, an additional guideline for system usage may be available.

	Eastern IL. U.	Northeastern IL. U.	Governors St. U.	Western IL. U.
FTE 1991-1992 (Faculty & Students)				
Very Small (under 1,000)				
Small (1,000 to 4,999)				
Medium (5,000 to 9,999)			5,600	
Large (10,000 to 20,000)	11,068	10,174		
Very Large (over 20,000)				20,628
Difficulty of Admission				
Noncompetitive				
Minimally difficult		x	x	
Moderately difficult	x			x
Very difficult				
Most difficult				
Funding Source/Control				
Public	x	x	x	x
Private				
Campus Setting				
Major metropolitan area (pop. > 500,000)		x		
Near but not in major metropolitan area			x	
Small to medium city (pop. 50,000 to 500,000)				
Small city (pop. under 50,000)	x			x
Rural				
Geographic Region				
New England				
Middle Atlantic				
East South Central				
South Atlantic				
Great Lakes	x	x	x	x
West South Central				
Mountain				
Plains				
Pacific				
Canada				
Library Budget 1991-92	\$3,008,328	\$2,847,066	\$1,548,986	\$2,959,551
Per Student & Faculty Library Expenditure	\$272	\$280	\$277	\$143
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Hours of Searching Nov 92	174.5	189.7	72.0	155.0
Hours of searching per day	5.818	6.3	2.4	5.2
Hours of searching per student & faculty	0.016	0.019	0.013	0.008

Figure 2
Institutional Characteristics and Usage Data for ILCSO with Locally Loaded Tapes

Networked CD-ROMs

Limitations

Usage data for CD-ROM networks with the relevant Wilson files is extremely difficult to collect for several reasons. First, while the Wilson software will collect usage data, many libraries with discs installed on the network find it cumbersome at best. Second, Wilson has network licensing policies that do not require limitations of usage that would mandate some form of system management that might include collection of usage data. Third, the programs designed to collect usage data are sometimes unreliable. Several of the usage reports reviewed by this researcher showed usage data that was obviously invalid. On one report the total number of hours or minutes searched was smaller than the average number of minutes per session. Finally, a substantial number of institutions do not track usage of any of their CD-ROM products.

Nevertheless, usage data is included for four institutions: Kentucky State University, Ohio State University; the University of Hawaii; the University of Wisconsin - Stevens Point. Each institution, because of licensing restrictions on network software or on other disc products, has limited access to ten or fewer simultaneous users.

Methodology

The hours of searching on General Science, (or Readers' Guide) Humanities, and Social Sciences Indexes were totaled and then divided by the sixty-one days in October and November 1992. The hours of searching on those three files were also divided by the FTE to get a figure for the number of searches done by each faculty member or student.

Information about institutional characteristics was also collected. Since the number of sites is very limited, there is no way to determine whether usage is limited or affected by institutional characteristics. Further study may provide more useful information about usage of networked CD-ROMs. That will be possible only if the software for collecting usage data is made more flexible and reliable.

	Kentucky St.	Ohio St.	U. Hawaii	U. Wisc Stevens Pt.
FTE 1991-1992 (Faculty & Students)				
Very Small (under 1,000)				
Small (1,000 to 4,999)	2,348			
Medium (5,000 to 9,999)				
Large (10,000 to 20,000)			14,479	7,889
Very Large (over 20,000)		40,785		
Difficulty of Admission				
Noncompetitive				
Minimally difficult	x			
Moderately difficult		x	x	x
Very difficult				
Most difficult				
Funding Source/Control				
Public	x	x	x	x
Private				
Campus Setting				
Major metropolitan area (pop. > 500,000)		x	x	
Near but not in major metropolitan area				
Small to medium city (pop. 50,000 to 500,000)				
Small city (pop. under 50,000)	x			x
Rural				
Geographic Region				
New England				
Middle Atlantic				
East South Central	x			
South Atlantic				
Great Lakes		x		x
West South Central				
Mountain				
Plains				
Pacific			x	
Canada				
Library Budget 1991-92	\$617,900	\$16,813,196	\$9,754,608	\$1,642,832
Per Student & Faculty Library Expenditure	\$263	\$412	\$674	\$208
Files	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI	GSI,HUM,SSI
Hours of searching Oct&Nov 92	101.6	777.3	201.4	157.8
Hours of searching per day	1.6	12.7	3.31	2.6
Hours of searching per student & faculty	0.043	0.019	0.014	0.020

Figure 3
Institutional Characteristics and Usage Data Networked CD-ROM

Conclusions

There are numerous articles that attest to the fact that CD-ROMs from Wilson, from SilverPlatter or from others can be successfully used on networks with fewer than twenty simultaneous users. For example, Beheshti and Large published the results of a recent experiment with discs from Dialog, Wilson and SilverPlatter. Regardless of the type of search, all three were capable of performing sixteen searches simultaneously in less than one minute.⁷⁸ There are some limitations on performance depending on the particular mix of hardware and software that is incorporated in the network configuration.

For CD-ROM networks, usage may be limited by factors other than technological or licensing limits on the number of simultaneous users. First, if dial-in access to the network and the discs is not provided, then there are some convenience factors involved since the user must be using a terminal directly connected to the network. Second, each CD-ROM vendor or publisher provides different search software for which patrons sometimes require training.

Nevertheless, CD-ROM networks with fewer than twenty simultaneous users do not seem to provide substantially less access than do systems using locally loaded tapes.

⁷⁸Jamshid Beheshti Jamshid and Amy Large. "Networking CD-ROMs: Response Time Implications." CD-ROM Professional. 5(November 1992): 70-7.

Flat-Fee Online

Limitations

Only OCLC, with its FirstSearch System, provides flat-fee online access to the three files included in this study, so usage data was limited to that system. Connect-hour online was not included since access to such systems is tightly controlled in most academic institutions so the usage data would not be comparable with that of the other options.

Even for the original FirstSearch pricing which was based on a flat fee for each search, usage data is not comparable with that of the other options. For the months of October and November 1992, there were a total of 19,952 searches done on Humanities, General Science, and Social Sciences Indexes on the OCLC FirstSearch System. For the months of February and March 1993 there were a total of 28,768 searches done on the same three files⁷⁹. This represents the use from multiple institutions. Most institutions have rather limited use such as the data from the University of Oregon for November 1992 which show a total of 141 searches in Humanities, Social Sciences and General Science Indexes.⁸⁰ These numbers are substantially smaller than the number of searches done at the institutions that have the files mounted locally. The most obvious reason for the disparity is cost. The least expensive search on FirstSearch is \$.50. At that price, SUNY Binghamton would have paid \$25,688.50 for the 51,377 searches done on their local system during those same two months if those searches had been done on FirstSearch.

⁷⁹OCLC Usage Reports for the Wilson Files, October and November 1992 and February and March 1993.

⁸⁰Barbara Jenkins. Presentation at ALA Midwinter, January 25, 1993.

SUNY Binghamton's total annual licensing fee for the relevant Wilson files is substantially less than that. In fact, if they limit access to ten or fewer simultaneous users, the total annual licensing fee is \$3200 plus a charge of \$6500 per port.

Unfortunately, no actual usage data is available for flat-fee online access to the Wilson files in question. Since OCLC announced the option in January 1993, a number of institutions have participated in trials lasting thirty to sixty days but the usage data for those trials cannot be considered valid measures of anticipated use for several reasons. First, the institutions deliberately limited usage because they did not wish to make the necessary investments in hardware, software, and telecommunications lines during the test period. Second, since the OCLC search software is unfamiliar, students and faculty members may have decided to use more familiar versions of the same products (many of which were already available in their own library). Third, many library patrons may not have been aware of the testing opportunity. This is especially true of patrons who seldom visit the library but regularly use dial-up access for bibliographic searching. A further confounding factor is the budgetary cycle at most academic institutions that provides for a fiscal year beginning in July or August. Institutions were not free to commit funds to flat-fee online access until the 1993-94 fiscal year. The usage data on Figure 4 are provided for informational purposes.

	University 1	University 2	University 3
FTE 1991-1992 (Faculty & Students)			
Very Small (under 1,000)			
Small (1,000 to 4,999)			
Medium (5,000 to 9,999)	5,900		
Large (10,000 to 20,000)			10,500
Very Large (over 20,000)		26,385	
Difficulty of Admission			
Noncompetitive			
Minimally difficult			
Moderately difficult	X	X	
Very difficult			
Most difficult			X
Funding Source/Control			
Public		X	
Private	X		X
Campus Setting			
Major metropolitan area (pop. > 500,000)		X	
Near but not in major metropolitan area			X
Small to medium city (pop. 50,000 to 500,000)	X		
Small city (pop. under 50,000)			
Rural			
Geographic Region			
New England			X
Middle Atlantic	X		
East South Central			
South Atlantic			
Great Lakes		X	
West South Central			
Mountain			
Plains			
Pacific			
Canada			
Library Budget 1991-92	\$3,787,752	\$2,012,501	\$11,669,306
Per Student & Faculty Library Expenditure	\$642	\$76	\$1,111
Files	GSI,HUM,SSI,RGA	GSI,HUM,SSI,RGA	GSI,HUM,SSI,RGA
Searches Feb&Mar 93	212	11,245	1,175
Searches per day	3.5	187	20
Searches per student & faculty	0.04	0.4	0.1

Figure 4
Institutional Characteristics and Usage Data for Flat Fee Online

Conclusions

If institutions provide seamless access to the files mounted at OCLC, there is no reason to assume that the number of searches would exceed those done on locally loaded systems. In fact, the number of searches may well be reduced if access is not available at every library terminal and for dial-in access. Since there will be telecommunications charges involved, libraries may limit access in some manner. Furthermore, unless institutions are using systems that adhere to the Z39.50 standard, the OCLC search software will be different than that of the local catalog so usage may be affected by the learning curve.

For the purposes of this study and development of the model, it seems reasonable to assume that the number of searches on flat-fee online systems will be roughly equivalent to the number of searches done on locally loaded systems at institutions with similar student bodies and enrollments.

Chapter V

Model Development and Testing

Introduction

The model was developed to encourage librarians to use cost benefit analysis techniques, especially in selecting data delivery options for abstracting and indexing data and to assist decision-makers in comparing data delivery options. First, as was discussed in Chapter I, few library functions have been subjected to rigorous cost benefit analysis. Until the late 1960s, librarians had few choices with regard to delivery options for abstracting and indexing data. Furthermore, indexing and abstracting for any subject was usually available from only one publisher. Since there is no question that indexing and abstracting publications are essential tools for researchers, cost benefit analysis was simply not required. With the introduction of new delivery options and new abstracting and indexing publications, cost benefit analysis became desirable, but few librarians have experience in such techniques and there are few models on which to base such an analysis. Therefore, this model was developed to assist users in becoming familiar with cost benefit analysis by making it possible for them to apply those techniques to a specific decision.

Second, because there are many complex issues associated with the choice of delivery option for indexing and abstracting data, decision-makers may base decisions on cost benefit comparisons that are incomplete or inaccurate.

The model was designed to help users make comparisons that are as complete and accurate as possible. To accomplish this goal the model incorporates comprehensive, prioritized lists of costs and benefits for all options. The model encourages users to make explicit assumptions about such things as the number of simultaneous users to be supported. Those assumptions are then applied to all data delivery options. The model also encourages users to make comparisons which include costs for staff time and expertise as well as costs for computer hardware and data licensing fees. Users are also prompted to assign actual dollar values to intangible costs and benefits.

The model incorporates all costs and benefits identified by Delphi participants in the three rounds of the Delphi study conducted as part of this project. As discussed in Chapter III, there was a consensus among the Delphi participants that all relevant costs and benefits for each data delivery option were identified as part of the study. The Delphi participants included working librarians and library administrators, representatives of companies that produce abstracting and indexing data, and representatives of companies that supply the hardware and software for the three data delivery options included in this project. The library Delphi participants represent institutions with different educational mandates, different types of students, and with different computing environments. The industry representatives that participated in the Delphi study include representatives from companies that compete with one another for the libraries' indexing and abstracting funds. This assures that costs and benefits for all data delivery options have been included.

Delphi participants also reached consensus with regard to the costs and benefits that are most significant and those which are least significant for each of the three data delivery options. The significance rankings (as determined by the Delphi participants) for all costs and benefits are displayed for the users of the model. This gives a user who is unfamiliar with one or more of the options a sense of which costs and benefits the experts feel are especially important. For users familiar with all of the options, the significance rankings may help them convince others that certain items merit special attention during the decision-making process.

Selection of Software

To insure that the model can be used by librarians and to make the model a reasonable prototype for the application of cost benefit analysis techniques to other library functions, it was important that the model use software with which many librarians are familiar. It was also important that the model be easy-to-use, even for those with somewhat limited computer expertise. On the other hand, it was essential that users be able to adapt the model to accommodate new products, new costs, and new institutional environments.

Since many librarians use spreadsheet software, the decision was made to use off-the-shelf spreadsheet software for development of the model. Using off-the-shelf software eliminates the need for extensive application-specific documentation to accompany the model. Furthermore, distribution costs and licensing issues are eliminated since only the model, and not the application program, will be distributed.

The model was developed using QuattroPro for Windows™ because, in addition to the fact that QuattroPro meets the criteria listed above, models developed with QuattroPro can be used with other spreadsheet programs such as Excel™ and Lotus™ . The Windows version of QuattroPro allows models to be developed with dialog boxes that prompt users to enter specific information. This makes it possible for the model designer to lead users through the data entry process by asking them to respond to a series of questions. This is especially helpful for novice users.

The model uses the standard defaults for QuattroPro. No special features or functions that make (or require the user to make) global application changes are incorporated. All QuattroPro functions are visible and available to users at all times. Since users may not have the same printer or the same hardware configuration as was used in developing the model, it was essential to insure that users be able to use standard printing and saving functions rather than being limited to those incorporated in the model. Users have full access to extensive Help Screens for QuattroPro and Windows.

At the suggestion of a committee member, Authorware Professional for Windows™ was considered as an option for developing the model. Authorware has been used successfully for individualized instruction programs for which there are a limited number of expected responses and users do not modify program parameters.

™ QuattroPro for Windows is a Registered Trademark of Borland International Inc.

™ Excel is a Registered Trademark of Microsoft Corporation

™ Lotus is a Registered Trademark of Lotus Development Corporation

™ Authorware Professional for Windows is a Registered Trademark of Macromedia Inc.

Potential for user modification and adaptation are critical to the acceptance of this model. Furthermore, Authorware is less suited than spreadsheet software for applications (such as this project) in which manipulation of numeric data is necessary. Therefore, QuattroPro was selected rather than Authorware.

Description of the Model

QuattroPro for Windows uses the analogy of notebook pages to link multiple spreadsheets and accompanying formulas, and macros. This model includes eleven notebook pages, each of which is identified by a labeled "tab" at the bottom of the screen or page. Users click on the tabs to move from page-to-page using the standard Windows scroll bars to display pages beyond those that display on a single screen. Users can also navigate through the pages of the notebook using standard spreadsheet function keys. The model does not affect the display of secondary speedbars which the user may have activated as shown in Figure 5.

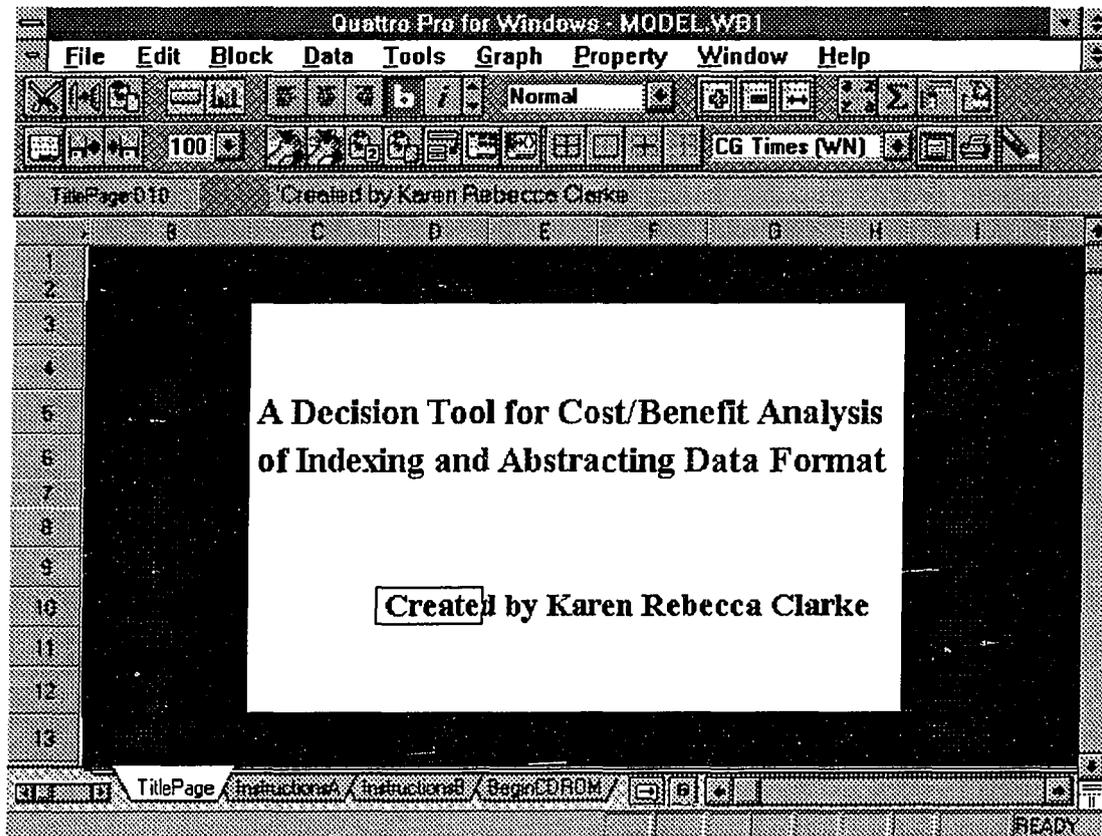


Figure 5
Title Page for Model

The first three pages of the model are a title page and two pages of instructions. On the second instruction page, the user is prompted to save the model under a new file name so that the original model remains intact even after the user enters cost benefit values. Similar prompts appear at other points in the model. Saving the original model is important because all formulas are overwritten with data as the user works through the model.

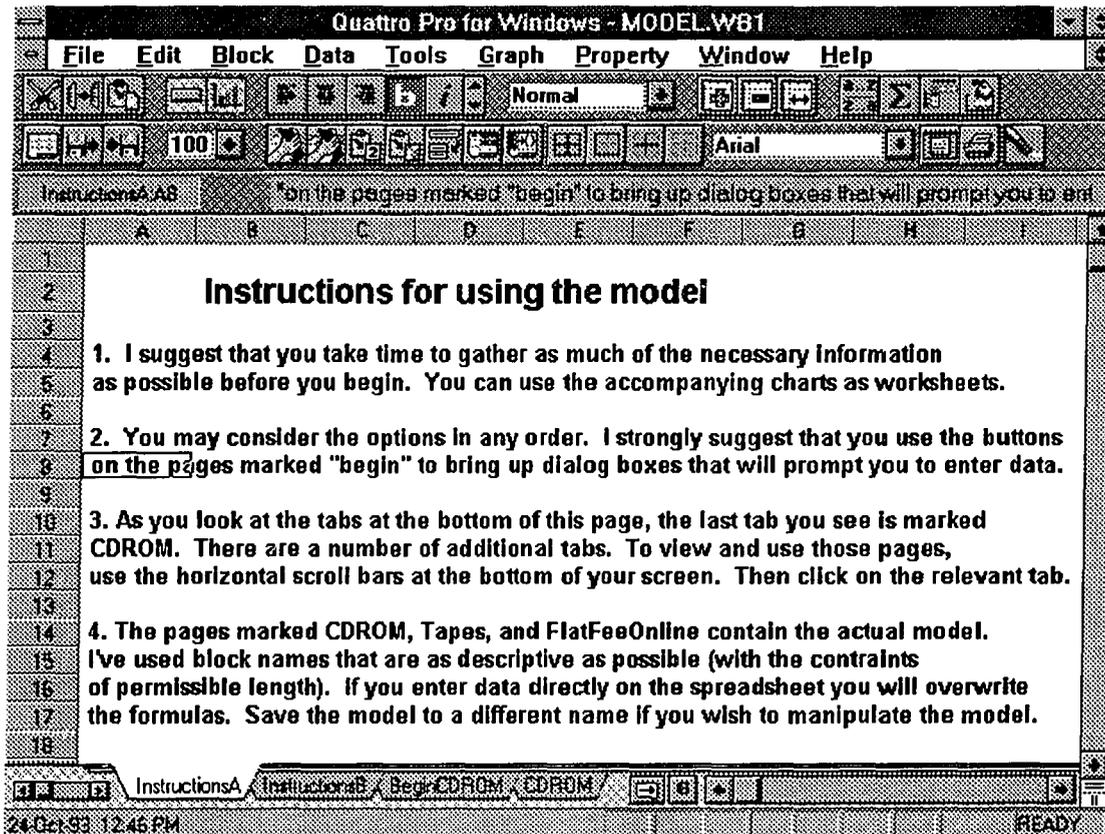


Figure 6
First Page of Onscreen Instructions

Without the original model, it is more difficult for the user to change values to see the effects of changing costs or benefits. In addition, only with the original formulas intact can the user modify the model without completely rewriting all formulas.

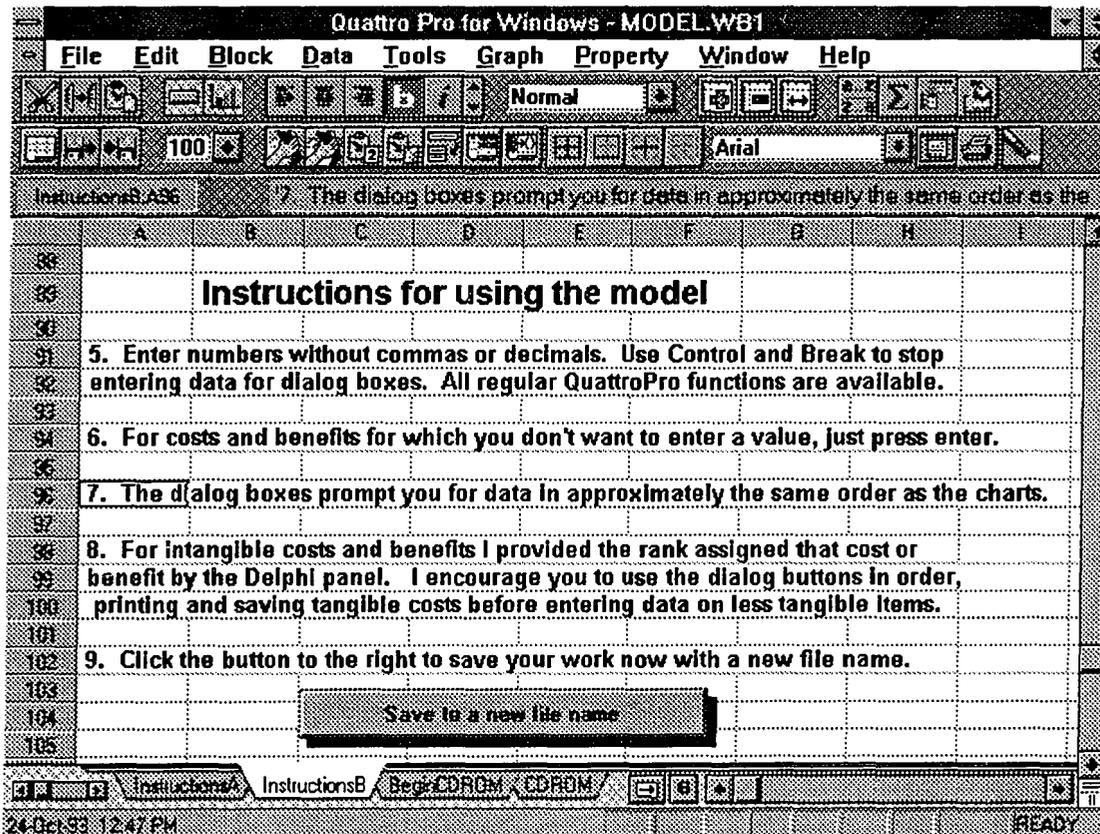


Figure 7
Second Page of Onscreen Instructions with Button to Activate Macro to Save the Model with a Different File Name

At the suggestion of the original group of testers, users are encouraged to gather preliminary information before actually using the model. With the written instructions that accompany the model are worksheets that the user can use to assist them in collecting the necessary information. The instructions and worksheets are included in Appendix C.

Following the introductory pages, there are two pages for each of the three data delivery options. The first page for each delivery option has a series of numbered and labeled buttons. Users click on the buttons to activate macros. Some buttons activate dialog boxes that prompt users to enter specific information such as the cost of a particular piece of hardware or the salary of the person who will perform daily system troubleshooting. Other buttons activate macros that save the file or print parts of the model.

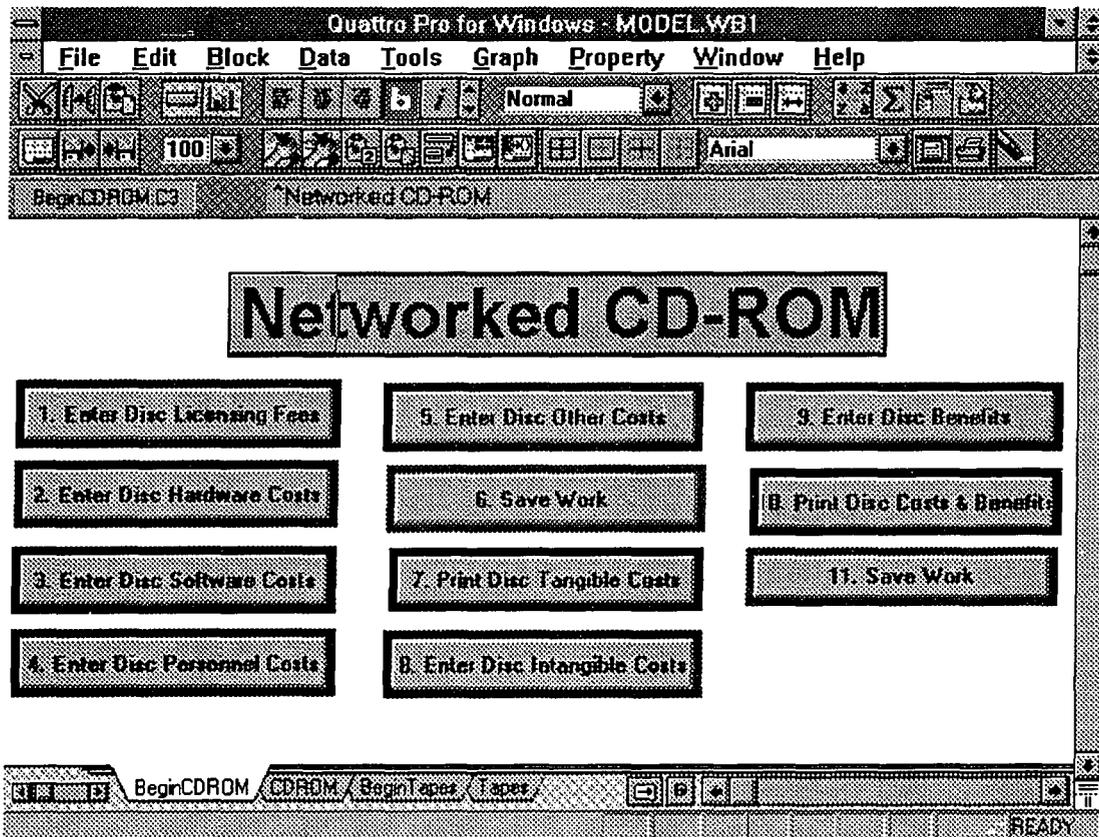


Figure 8
Screen With Buttons to Activate Macros to Activate Dialog Boxes That Prompt Users to Enter Values

Buttons were created for utility functions such as saving and printing despite the fact that users familiar with QuattroPro can accomplish the same tasks using standard program SpeedButtons and commands. Incorporating the utility buttons in the model eliminates the need for users to switch back and forth between model buttons and QuattroPro SpeedButtons.

Each button is labeled with a prompt for the users such as "Enter personnel costs", "Enter Intangible Benefits," or "Print Costs". A complete listing of the macros is included in Appendix C. On color monitors, buttons for each delivery option have different border colors. Buttons for saving and printing have different borders than those that activate dialog boxes.

The buttons were numbered and placed on screen in an order suggested by testers who wanted to enter values for intangible costs and benefits relative to specific tangible costs and benefits. The testers wanted to enter the tangible costs first, print the costs, then enter intangible costs and benefits. If users activate the buttons in order, all tangible costs and benefits will be entered and printed before intangible costs and benefits. This enables users to see specific tangible costs as they are prompted to place a monetary value on intangible costs and benefits. For example, several testers suggested that the less tangible value of a single user interface for many files may be directly related to the tangible personnel costs for staff and patron training.



Figure 9
First Screen of Buttons That Activate Macros That Prompt Users to Enter Values.
Instructions to the User Suggest That the Buttons be Activated in Numeric Order

Costs and benefits are grouped by categories such as hardware costs, personnel costs, and intangible benefits. The initial group of testers said they had to ask several different people for information and specific values. They found it useful to have all similar items grouped so dialog boxes for all items in a category appear one after another. Furthermore, testers said grouping items is important because different categories often call for expenditures of funds from different budget categories.

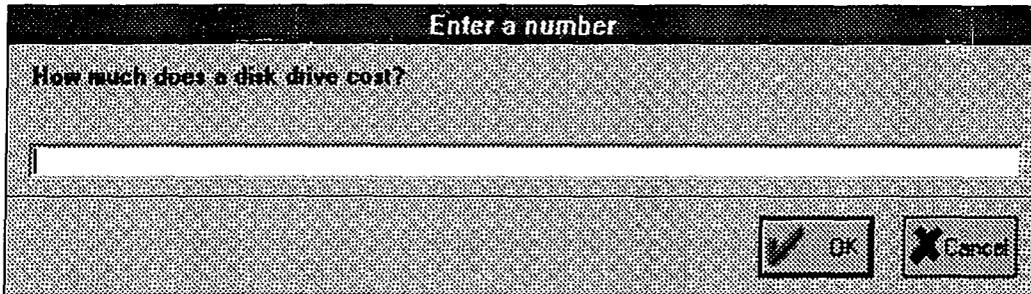


Figure 10
Dialog Box

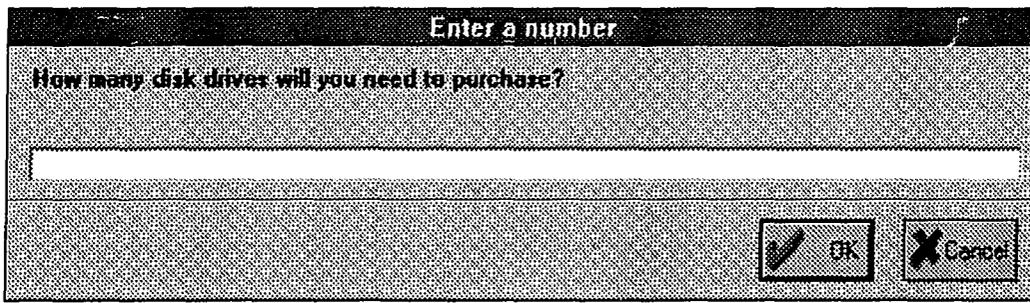


Figure 11
Dialog Box

Pressing control and break allows the user to stop the display of dialog boxes before the end of the category. The user may press enter without actually entering a number to bypass a particular item.

The second page for each delivery option displays a spreadsheet with costs and benefits listed in the first column. The second column includes the significance rank (as assigned by the Delphi participants) for each item. Columns three, four, and five include the formulas used to compute unit costs, first year costs, and ongoing costs. All formulas incorporate descriptive block names as is shown on Figure 12.

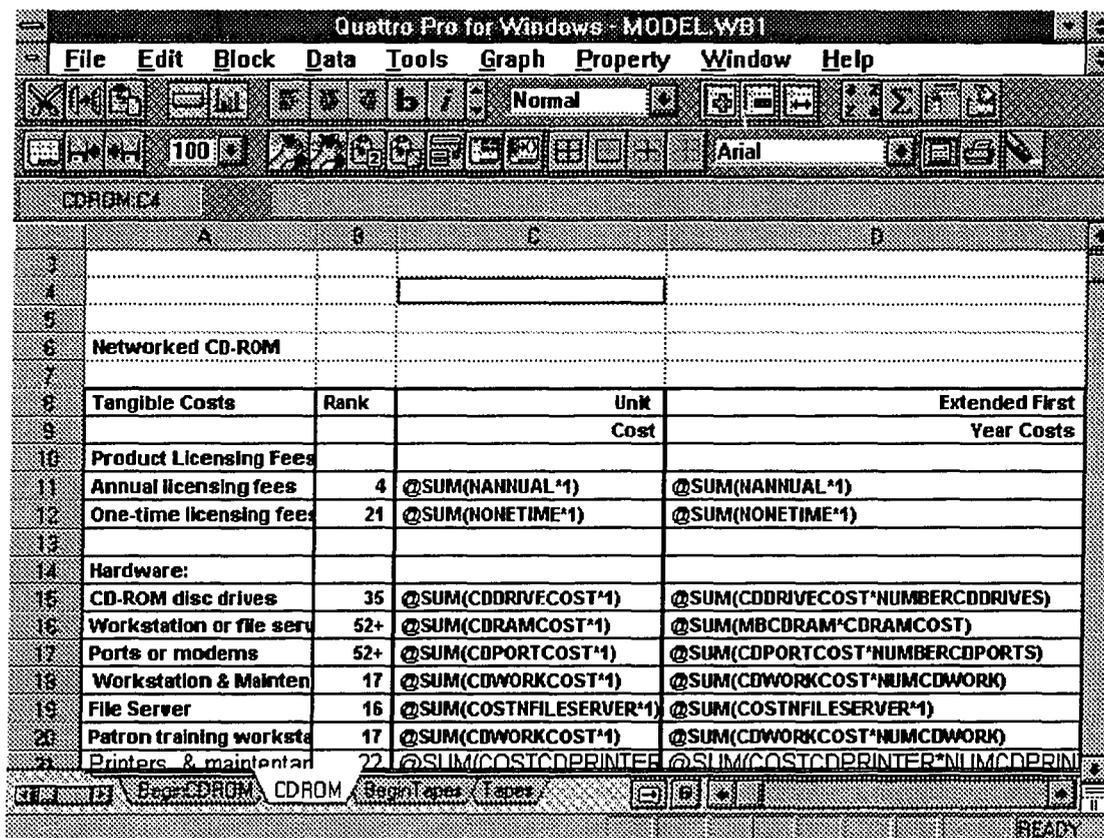


Figure 12
Screen Showing Spreadsheet with Descriptive Block Names

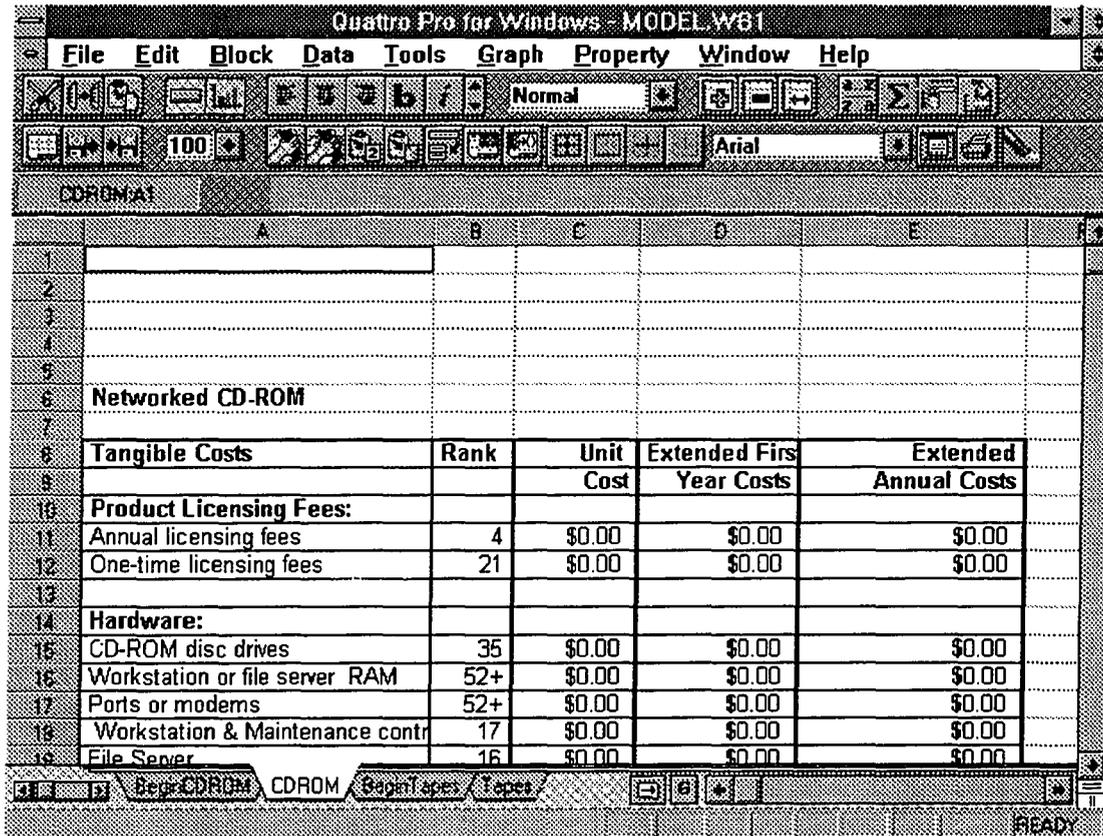


Figure 13
Screen Showing the Spreadsheet Model.

As the user enters the number of units, dollar amounts, and other pertinent information as prompted by the dialog boxes, that information is automatically incorporated into the appropriate cells of the model. On Figure 13 you see the spreadsheet before the user has entered values in response to the dialog boxes. On Figure 14 you see the spreadsheet after the user has entered information about licensing fees.

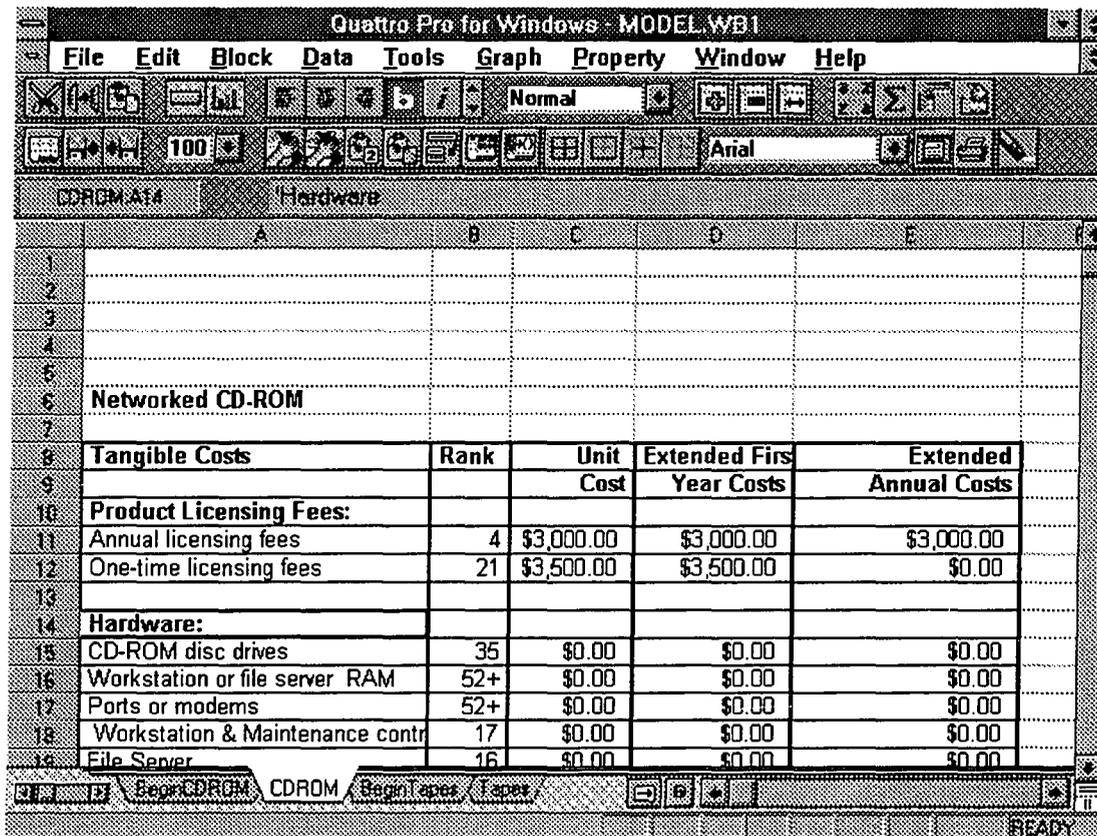


Figure 14
Screen Showing Spreadsheet with Values Entered by User

Figure 14 shows a list of the questions that appear in the dialog boxes for the relevant data delivery option. The list of questions appears at the bottom of each spreadsheet. As the user responds to the dialog box prompts, the responses are entered next to the questions at the bottom of the page (as well as in the appropriate cells). This enables the user to review the values he or she entered in response to the dialog box prompts. Since the values entered by the users are incorporated into the formulas and only the final result is shown (as in Figure 13) this is the only way the user can review his or her responses.

	Responses	Questions
126		
127		
128	\$3,000.00	What are the annual data licensing fees?
129	\$3,500.00	What are the one-time data licensing fees?
130	\$395.00	How much does a cd-rom drive cost?"
131	6	How many disk drives will you need to purchase?"
132	\$65.00	How much does c MB of RAM cost?"
133	10	How many MB of RAM will you need to purchase?
134	\$125.00	How much does a port cost?"
135	10	How many ports will you need to purchase?
136	\$995.00	How much does a workstation cost?
137	0	How many workstations will you need to purchase?
138	1	How many workstations will you need to purchase for patron training?
139	\$4,500.00	How much does a cd-rom or network server cost?
140	1	How many file servers will you need to buy?
141	\$300.00	How much does a printer cost?"
142	11	How many printers will you need to purchase?
143	\$0.00	What are the annual licensing fees for your network operating system software?
144	\$0.00	What are the annual licensing fees for your menuing software?

Figure 15
Screen Showing Prompts from Dialog Boxes and the User's Responses

As you can see in Figures 16 and 17, significance rank is displayed for every item on every spreadsheet. Significance rank is displayed in the dialog boxes only for intangible costs and benefits. Testers indicated that, since tangible costs and benefits would not be affected by significance, they did not need to see the ranking as they entered information. On the other hand, they said the values they assigned for intangible costs and benefits might be affected by significance judgments so they wanted the rankings displayed in the dialog boxes.

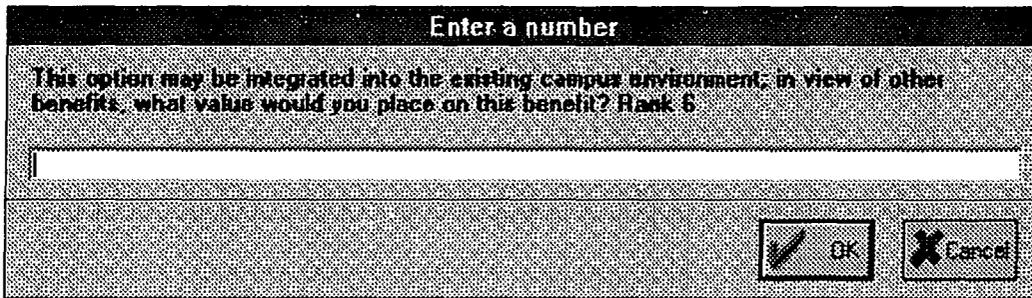


Figure 16
Dialog Box for Intangible Benefit with Significance Ranking Assigned by Delphi Participants

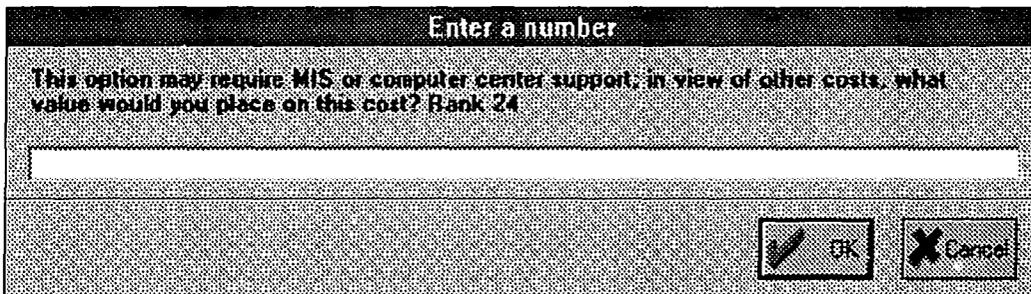


Figure 17
Dialog Box for Intangible Cost with Significance Ranking Assigned by Delphi Participants

Dialog boxes, as shown in Figures 18 and 19, clearly state assumptions such as the fact that personnel costs are computed using a work year equal to 232 days and that licensing fees are computed with the assumption that access is limited to twenty simultaneous users. This helps insure that information entered by users is consistent for all three delivery options included in the model. Since the model was developed using standard spreadsheet functions, users can change the assumptions (and the corresponding formulas) if those assumptions do not reflect the situation at their institution. Users may, in addition to changing the formulas, change the wording of the dialog boxes.

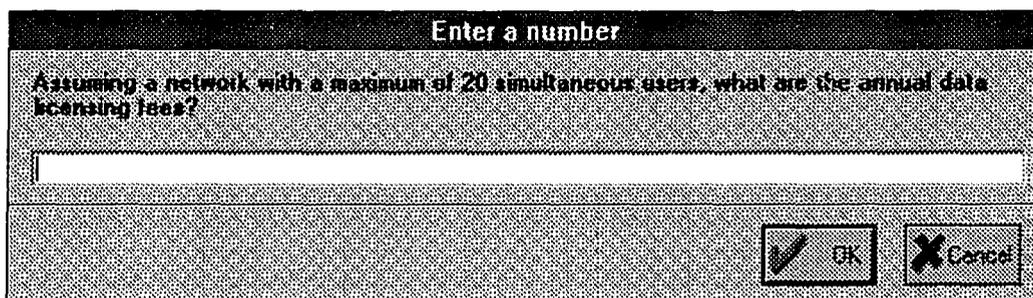


Figure 18
Dialog Box That States Assumptions

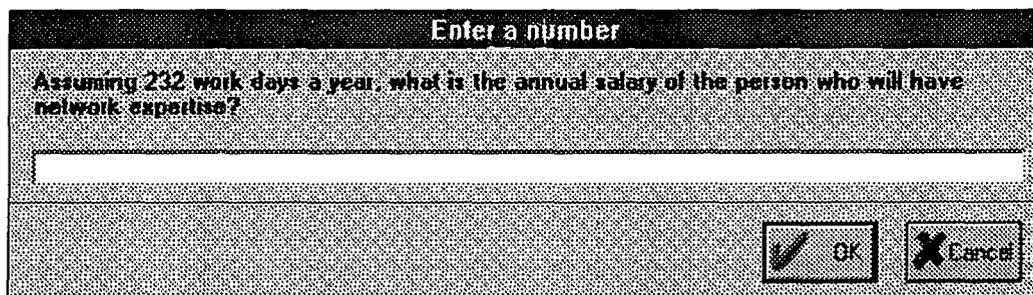


Figure 19
Dialog Box That States Assumptions

Although there are costs and benefits, such as the price for a box of paper, that might seem to be the same from delivery option to delivery option, the user is prompted to enter the cost separately for each option. This was necessary because users may work with the delivery options in any order and because testers indicated that, for items such as desks, the type and cost of desks may vary according to the type of equipment that will be placed on them.

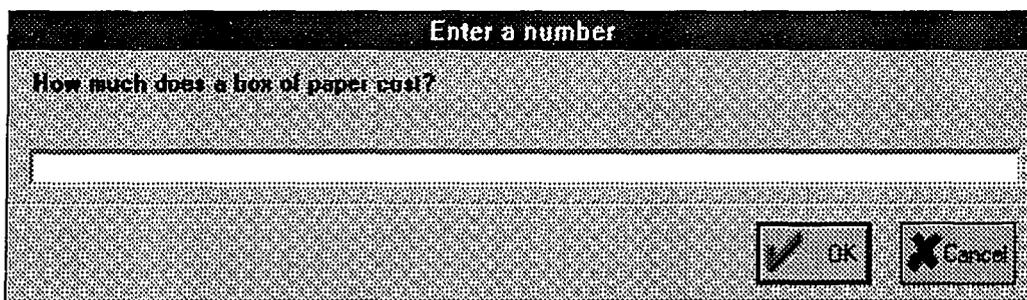


Figure 20
Dialog Box That Prompts the User for Information about Supply Costs

Model Testing

During the development stage, testing to determine that the model was functional, accurate, and complete was done by entering costs and other numeric data in a manner that made it easy to identify errors. For example, salaries were all even dollar amounts, all units were in increments of ten and the same number of days were used throughout. Once initial testing provided consistent and accurate results, further testing was done with more realistic information including uneven dollar amounts, some items omitted, and deliberate errors. The model was developed first for locally loaded tapes. It was repeatedly tested, then the model was expanded to include CD-ROMs and flat fee online.

Colleagues and coworkers were then recruited to test the model for functionality and to give advice on wording and format. They were amazingly adept at finding inconsistencies and errors. They were given no restrictions on using even dollar amounts and units in increments of ten. The first group of testers included two colleagues from Wilson -- a software developer and a sales representative for Wilson's electronic products who has an extensive CD-ROM networking background and much industry experience, the Delphi participant from a CD-ROM vendor, and the Delphi participant from a major library utility. In addition, two librarians who participated in the Delphi study tested the model as I sat beside them to get their immediate feedback and to watch for instances in which they were confused.

This first group of testers was asked if they thought the model did what was intended and if they thought it would be useful. They were extremely positive about the model's usefulness, particularly as a tool for helping them identify those costs and benefits about which they needed to gather additional information. This group had several helpful suggestions for making the model easier to use.

Two models were initially developed and tested. One model incorporated a weighting factor for intangible items that correlated with the significance rank assigned by the Delphi participants. The second model displayed the rank for intangible items, and included the ranks in the dialog boxes but did not apply any weighting. The first group of testers were unanimous and emphatic; they preferred the unweighted model. Subsequent testers received only the unweighted model.

In addition, as mentioned above, this group suggested that users be encouraged to gather the relevant information before actually using the model since, without preparation, they were just estimating values and costs on many items. As a result of these suggestions, the worksheets that are included with the written instructions (in Appendix C) for using the model were developed.

This group of testers also suggested grouping the dialog buttons so that the user would deal first with all tangible items, receive a printout showing those items, and then deal with intangible items. They also suggested some changes in the wording of the prompts for the dialog boxes.

Figures 21, 22, and 23 show representative completed spreadsheets. These spreadsheets incorporate values for tangible costs and benefits that were suggested by the first group of testers.

On the spreadsheets the column marked "Rank" shows the significance rank assigned to each cost and benefit by the Delphi participants. Since there are different numbers of costs and benefits for each of the three data delivery options, the item with the highest rank (or least significance) does not have the same numeric rank from one option to the other. For CD-ROM the maximum number was 52, for locally loaded tapes, the maximum was 66, and for flat fee online it was 48. Items marked with a "+" are items that all had the same rank. For those items one participant identified the item as among the twenty most significant items, but not among the ten most significant while the other fourteen participants ranked the item as not among the twenty most significant items. Delphi participants ranked only the top twenty most significant items.

Networked CD-ROM Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	4	\$2,990.00	\$2,990.00	\$2,990.00
One-time licensing fees	21	\$0.00	\$0.00	\$0.00
Hardware:				
CD-ROM disc drives	35	\$395.00	\$3,950.00	\$0.00
Workstation or file server RAM	52+	\$65.00	\$650.00	\$0.00
Ports or modems	52+	\$89.00	\$890.00	\$0.00
Workstation & Maintenance contract	17	\$1,222.00	\$1,222.00	\$0.00
File Server	16	\$4,775.00	\$4,775.00	\$0.00
Patron training workstation	17	\$1,222.00	\$12,220.00	\$0.00
Printers & maintenance contract	22	\$333.00	\$3,663.00	\$0.00
Software:				
Operating system license/purchase fee	15	\$325.00	\$325.00	\$325.00
Menuing software license/purchase fee	51	\$0.00	\$0.00	\$0.00
Special Expertise Required:				
Network expertise	2	\$172.41	\$27,068.97	\$27,068.97
Hardware/software expertise	10	\$172.41	\$1,724.14	\$1,724.14
Staff time:				
License/contract negotiation	13	\$215.52	\$2,155.17	\$2,155.17
Daily & recurring maintenance	8	\$172.41	\$3,448.28	\$3,448.28
Patron training	7	\$150.86	\$862.07	\$17,500.00
Upgrade installation	12	\$172.41	\$862.07	\$862.07
Staff training	1	\$5,000.00	\$5,000.00	\$5,000.00
Initial installation	26	\$172.41	\$862.07	\$862.07
Library holdings administration	52+	\$40.95	\$491.38	\$491.38
Troubleshooting	3	\$181.03	\$5,431.03	\$5,431.03

Figure 21
Networked CD-ROM
Spreadsheet with Values from Tester

Supplies:	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Signs	50	\$0.25	\$12.50	\$12.50
Paper	33	\$9.00	\$1,800.00	\$1,800.00
Printer ribbons/ink	39	\$3.00	\$375.00	\$375.00
Furniture:				
Desks/tables/chairs/stools	43	\$350.00	\$3,850.00	\$0.00
File Cabinet	52+	\$250.00	\$250.00	\$0.00
Documentation/Training:				
Training course for staff	52+	\$500.00	\$1,500.00	\$1,500.00
Vendor documentation	48	\$25.00	\$25.00	\$0.00
Data producer documentation	52+	\$25.00	\$25.00	\$0.00
Utilities:				
Network costs	52+	\$0.00	\$0.00	\$0.00
Other Equipment Costs:				
Network cabling	28	\$2,500.00	\$2,500.00	\$0.00
Intangible Costs				
Increased reference service needed	11	\$35,000.00	\$35,000.00	\$35,000.00
Problems damage library's image	32	\$50.00	\$50.00	\$50.00
Morale suffers if work increases too much	36	\$50.00	\$50.00	\$50.00
Decisions can be a management distraction	38	\$50.00	\$50.00	\$50.00
TOTAL COSTS			\$124,077.67	\$106,695.60

Figure 21 (continued)
Networked CD-ROM
Spreadsheet with Values from Tester

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Costs
Increases patron productivity	9	\$2,500.00	\$2,500.00	\$2,500.00
Maximizes use of journals	27	\$5,000.00	\$5,000.00	\$5,000.00
Reduces theft & vandalism	37	\$50.00	\$50.00	\$50.00
Patrons expend less effort to do research	44	\$1,000.00	\$1,000.00	\$1,000.00
Intangible Benefits:				
Increases patron satisfaction	5	\$5,000.00	\$5,000.00	\$5,000.00
Improves research	6	\$5,000.00	\$5,000.00	\$5,000.00
Increases use of library	14	\$1,000.00	\$1,000.00	\$1,000.00
Information is current	18	\$1,000.00	\$1,000.00	\$1,000.00
Increases faculty support for library	19	\$5,000.00	\$5,000.00	\$5,000.00
Increases student support for library	23	\$50.00	\$50.00	\$50.00
Uses a pc interface	25	\$50.00	\$50.00	\$50.00
Printing is easy	29	\$2,500.00	\$2,500.00	\$2,500.00
Downloading is easy	30	\$2,500.00	\$2,500.00	\$2,500.00
Extends service to commuters	31	\$2,500.00	\$2,500.00	\$2,500.00
Can link to document delivery	47	\$50.00	\$50.00	\$50.00
TOTAL BENEFITS			\$33,200.00	\$33,200.00

**Figure 21 (continued)
Networked CD-ROM
Spreadsheet with Values from Tester**

Locally Loaded Tapes Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	2	\$20,000.00	\$20,000.00	\$20,000.00
One-time licensing fees	18	\$15,000.00	\$15,000.00	\$0.00
Hardware:				
Mainframe disk drives	4	\$80,000.00	\$160,000.00	\$0.00
Mainframe RAM	8	\$12,000.00	\$24,000.00	\$0.00
Mainframe ports	21	\$400.00	\$1,200.00	\$0.00
Workstation & Maintenance contract	48	\$1,000.00	\$10,000.00	\$0.00
File Server	52	\$7,500.00	\$7,500.00	\$0.00
Gateway	56	\$6,000.00	\$6,000.00	\$6,000.00
Patron training workstation	66+	\$1,000.00	\$1,000.00	\$0.00
Terminals & maintenance contract	66+	\$400.00	\$6,000.00	\$0.00
Printers & maintenance contract	66+	\$1,500.00	\$3,000.00	\$0.00
Software:				
Search software license/purchase fee	13	\$10,000.00	\$10,000.00	\$10,000.00
Data loader license/purchase fee	17	\$2,500.00	\$2,500.00	\$2,500.00
Operating system license/purchase fee	41	\$8,000.00	\$8,000.00	\$8,000.00
Menuing software license/purchase fee	55	\$0.00	\$0.00	\$0.00
Special Expertise Required:				
Network expertise	15	\$215.52	\$21,551.72	\$21,551.72
Hardware/software expertise	23	\$215.52	\$4,310.34	\$4,310.34

**Figure 22
Locally Loaded Tapes
Spreadsheet with Values from Tester**

Locally Loaded Tapes Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Staff time:				
License/contract negotiation	16	\$323.28	\$6,465.52	\$6,465.52
Daily & recurring maintenance	20	\$215.52	\$5,387.93	\$5,387.93
Patron training	32	\$183.19	\$2,586.21	\$18,318.97
Upgrade installation	36	\$215.52	\$2,586.21	\$2,586.21
Staff training	37	\$10,000.00	\$10,000.00	\$10,000.00
Initial installation	40	\$215.52	\$3,232.76	\$3,232.76
Library holdings administration	43	\$4.31	\$51.72	\$51.72
Troubleshooting	50	\$215.52	\$21,551.72	\$21,551.72
Return old tapes	57	\$19.40	\$116.38	\$116.38
Computer room personnel training time	66+	\$5,000.00	\$5,000.00	\$5,000.00
Supplies				
Signs	66+	\$0.15	\$2.25	\$2.25
Paper	66+	\$7.00	\$1,750.00	\$1,750.00
Printer ribbons/ink	66+	\$89.00	\$1,780.00	\$1,780.00
Furniture:				
Desks/tables/chairs/stools	66+	\$350.00	\$0.00	\$0.00
File Cabinet	66+	\$225.00	\$0.00	\$0.00
Documentation/Training:				
Training course for staff	63	\$1,500.00	\$6,000.00	\$6,000.00
Vendor documentation	66+	\$25.00	\$25.00	\$0.00
Data producer documentation	66+	\$25.00	\$25.00	\$0.00
Utilities:				
Electricity	66+	\$100.00	\$1,200.00	\$1,200.00
Network costs	66+	\$0.00	\$0.00	\$0.00
Other Equipment Costs:				
Computer cable installation	66+	\$5,000.00	\$5,000.00	\$0.00
Network cabling	66+	\$5,000.00	\$5,000.00	\$0.00

Figure 22 (continued)
Locally Loaded Tapes
Spreadsheet with Values from Tester

Locally Loaded Tapes Intangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Storage is more expensive than for other options	19	\$80,000.00	\$80,000.00	\$80,000.00
Requires support from MIS staff	24	\$1,000.00	\$1,000.00	\$1,000.00
Ability to change databases is limited	26	\$1,000.00	\$1,000.00	\$1,000.00
Increases demand for full-text	27	\$1,000.00	\$1,000.00	\$1,000.00
Interface may not be easy-to-use	39	\$50.00	\$50.00	\$50.00
More reference service may be required	42	\$35,000.00	\$35,000.00	\$35,000.00
May limit downloading	53	\$5,000.00	\$0.00	\$0.00
May reduce patron/staff interaction	54	\$50.00	\$50.00	\$50.00
Problems damage library's image	62	\$50.00	\$50.00	\$50.00
Morale problems if work overload results	64	\$50.00	\$50.00	\$50.00
Patrons may not learn well	65	\$50.00	\$50.00	\$50.00
TOTAL COSTS			\$496,072.77	\$274,055.53

Figure 22 (continued)
Locally Loaded Tapes
Spreadsheet with Values from Tester

Tangible Benefits	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Can be integrated with current environment	6	\$40,000.00	\$40,000.00	\$40,000.00
Makes use of existing hardware/software	11	\$80,000.00	\$80,000.00	\$80,000.00
Reduced online searching costs	14	\$1,000.00	\$1,000.00	\$1,000.00
Maximizes use of journal collection	25	\$5,000.00	\$5,000.00	\$5,000.00
Maximizes benefit of training programs	35	\$35,000.00	\$35,000.00	\$5,000.00
Less time spent of workstation troubleshooting	38	\$5,000.00	\$5,000.00	\$5,000.00
Reduced print edition charges	54	\$1,000.00	\$1,000.00	\$1,000.00
Lower investment in new equipment	61	\$80,000.00	\$80,000.00	\$80,000.00
Intangible Benefits:				
Provides one interface for many databases	1	\$5,000.00	\$5,000.00	\$5,000.00
Increases patron satisfaction	3	\$5,000.00	\$5,000.00	\$5,000.00
Increases patron productivity	5	\$5,000.00	\$5,000.00	\$5,000.00
Improves quality of research	7	\$5,000.00	\$5,000.00	\$5,000.00
Improves quality of service	9	\$1,000.00	\$1,000.00	\$1,000.00
Can be linked to journal holdings file	10	\$5,000.00	\$5,000.00	\$5,000.00
Enhances faculty support for library	12	\$5,000.00	\$5,000.00	\$5,000.00
Enhances student support for library	22	\$1,000.00	\$1,000.00	\$1,000.00
Can provide easy-to-use interface	28	\$1,000.00	\$1,000.00	\$1,000.00
Can be linked to document delivery	29	\$1,000.00	\$1,000.00	\$1,000.00

Figure 22 (continued)
Locally Loaded Tapes
Spreadsheet with Values from Tester

Intangible Benefits	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Extends library services to non-traditional students	30	\$50.00	\$50.00	\$50.00
Information is current	31	\$50.00	\$50.00	\$50.00
Extends library services to commuting students	33	\$0.00	\$0.00	\$0.00
Can provide statistical analysis of use	34	\$5,000.00	\$5,000.00	\$5,000.00
Enhances faculty/student recruitment	44	\$50.00	\$50.00	\$50.00
Provides ability to scale use of system	45	\$50.00	\$50.00	\$50.00
System is reliable and manageable	46	\$5,000.00	\$5,000.00	\$5,000.00
Reduces theft/vandalism	47	\$50.00	\$50.00	\$50.00
Easy to print results	58	\$50.00	\$50.00	\$50.00
Easy to download results	59	\$5,000.00	\$5,000.00	\$5,000.00
Can be used for collection development	60	\$50.00	\$50.00	\$50.00
Increases staff status	66+	\$5,000.00	\$5,000.00	\$5,000.00
TOTAL			\$54,350.00	\$54,350.00

**Figure 22 (continued)
Locally Loaded Tapes
Spreadsheet with Values from Tester**

Flat Fee Online Tangible Costs	Rank	Unit Costs	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	3	\$3,200.00	\$3,200.00	\$3,200.00
Port charges	11	\$6,500.00	\$65,000.00	\$65,000.00
Transaction fees	19	\$0.00	\$0.00	\$0.00
Hardware:				
Modems	17	\$100.00	\$100.00	\$0.00
Workstation & Maintenance contract	27	\$1,200.00	\$24,000.00	\$0.00
Terminals & maintenance contract	28	\$525.00	\$0.00	\$0.00
Gateway	30	\$7,500.00	\$7,500.00	\$0.00
Printers & maintenance contract	38	\$300.00	\$6,000.00	\$0.00
Software:				
Telecommunications software	20	\$2,000.00	\$2,000.00	\$2,000.00
Menuing software license/purchase fee	48+	\$800.00	\$800.00	\$800.00
Special Expertise Required:				
Hardware/software expertise	23	\$172.41	\$4,310.34	\$4,310.34
Network expertise	26	\$172.41	\$22,758.62	\$22,758.62
Staff time:				
License/contract negotiation	8	\$280.17	\$5,603.45	\$5,603.45
Patron training	6	\$142.24	\$18,775.86	\$18,775.86
Staff training	14	\$4,500.00	\$4,500.00	\$4,500.00
Billing for patrons	24	\$53.88	\$1,077.59	\$1,077.59
Troubleshooting	34	\$172.41	\$4,310.34	\$0.00

Figure 23
Flat Fee Online
Spreadsheet with Values from Tester

Supplies:	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Signs	48+	\$1.00	\$40.00	\$40.00
Paper	48+	\$9.00	\$4,500.00	\$4,500.00
Printer ribbons/ink	48+	\$3.50	\$1,050.00	\$1,050.00
Furniture:				
Desks/tables/chairs/stools	48+	\$0.00	\$0.00	\$0.00
Documentation/Training:				
Vendor documentation	37	\$0.00	\$0.00	\$0.00
Data producer documentation	42	\$0.00	\$0.00	\$0.00
Utilities:				
Telecommunications charges	5	\$2,500.00	\$30,000.00	\$30,000.00
Other Costs:				
Phone line & installation	21	\$2,000.00	\$2,000.00	\$0.00
Space for documentation	39	\$50.00	\$50.00	\$50.00
Space for workstations	40	\$50.00	\$50.00	\$50.00
Intangible Costs				
Interface may not be easy-to-use	9	\$1,000.00	\$1,000.00	\$1,000.00
Increases demand for full-text	15	\$2,500.00	\$2,500.00	\$2,500.00
More reference service may be required	25	\$1,000.00	\$1,000.00	\$1,000.00
Morale problems if work overload results	35	\$1,000.00	\$1,000.00	\$1,000.00
Patrons may not learn well	44	\$1,000.00	\$1,000.00	\$1,000.00
May reduce patron/staff interaction	45	\$1,000.00	\$1,000.00	\$1,000.00
TOTAL COSTS		\$39,732.03	\$215,126.21	\$171,215.86

Figure 23 (continued)
Flat Fee Online
Spreadsheet with Values from Tester

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Benefits
Reduced online searching costs	4	\$2,500.00	\$2,500.00	\$2,500.00
Less time spent workstation troubleshooting	7	\$1,000.00	\$1,000.00	\$1,000.00
System provides speed & performance	10	\$5,000.00	\$5,000.00	\$5,000.00
Charges can be passed to users	12	\$5,000.00	\$5,000.00	\$5,000.00
Reduced print edition charges	18	\$1,000.00	\$1,000.00	\$1,000.00
Maximizes use of journal collection	31	\$5,000.00	\$5,000.00	\$5,000.00
Intangible Benefits:				
Provides one interface and access to many databases	1	\$500.00	\$500.00	\$500.00
Information is current	2	\$1,000.00	\$1,000.00	\$1,000.00
Provides ability to scale use of system	13	\$500.00	\$500.00	\$500.00
Can be linked to document delivery	16	\$5,000.00	\$5,000.00	\$5,000.00
System is reliable	22	\$400.00	\$400.00	\$400.00
Enhances faculty support for library	29	\$300.00	\$0.00	\$0.00
Extends library services to commuting students	32	\$300.00	\$0.00	\$0.00
Easy to download results	41	\$2,500.00	\$2,500.00	\$2,500.00
Can be used for collection development	43	\$300.00	\$300.00	\$300.00
Easy to print results	46	\$300.00	\$300.00	\$300.00
TOTAL BENEFITS		\$30,600.00	\$30,000.00	\$29,400.00

**Figure 23 (continued)
Flat Fee Online
Spreadsheet with Values from Tester**

After the suggestions from the first group of testers were incorporated, the model was sent to three of the librarians who supplied usage data. All three are practicing librarians who have been involved in making decisions about delivery options during the last year. I had sent price quote spreadsheets to two of them so I knew they could test the model without any help with QuattroPro or Windows. All three members of this group have hands-on experience with at least two of the options and all represent institutions that have files other than those produced by Wilson (in addition to Wilson files). Furthermore, one member of this group represents a large multiple institution (colleges and universities) consortium. This group had only a few minor suggestions for wording and for the order of the items in the dialog boxes.

This group also thought the model was effective and useful. All three admitted that they didn't actually enter dollar amounts for intangible costs and benefits. Nevertheless, they all stated that looking at actual dollar amounts for tangible costs and benefits helped them put the value of intangible costs and benefits into perspective. Furthermore, being prompted for actual dollar amounts for those intangible items made them look at the tangible costs and benefits to see which ones were most related to the intangible costs and benefits.

They all indicated that, while the model was functional and easy to use, much of its real value was in the fact that it helped them examine all of the factors for each option without allowing them to get distracted by peripheral issues or to ignore factors that may be outside their areas of responsibility or expertise. They suggested that this will probably be true for most users of the model.

All remarked that they would have used the model at the time they made decisions about delivery options for their institutions. None of the testers made additions or modifications to the model despite the fact that I suggested they do so if they felt something was missing. They also admitted that they loaded the model first, began using it, then decided to gather more information before they continued. From my experience this is normal behavior for sophisticated computer users. There are no negative consequences with regard to the use of the model for those who approach it in this manner.

Figures 24, 25, and 26 show representative completed spreadsheets with values suggested by the second group of testers. Note that, on Figure 24, for some items such as the network server, no cost has been entered. This is because the tester indicated that the institution already owned a workstation that could be used as the server. Furthermore, no purchase of additional CD-ROM drives was required. The same is true with other items on the three spreadsheets.

As indicated, since this group did not enter values for intangible costs and benefits, the sample spreadsheets include no such values. The model asks users to enter a dollar amount for intangible costs and benefits, but as indicated by the testers, this may be difficult for some users. Most financial decisions include at least some tacit measures of value for intangible items. For example, in personal life, when we purchase a car, we may decide to forego leather seats because we decide that the feeling of luxury is not worth the added cost. A university may pay a higher salary to a professor who has recently published a book though there may be little evidence that the publication will translate into research dollars added to the university's budget.

In testing the model, users stated that, even if they didn't actually enter dollar amounts for intangible costs and benefits, they did consider the intangible items in relation to specific dollar amounts for tangible costs and benefits. As was stated earlier, the model can be modified by users to accommodate other numeric values for intangible items.

Networked CD-ROM Tangible Costs	Rank	Unit Costs	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	4	\$1,495.00	\$1,495.00	\$1,495.00
One-time licensing fees	21	\$0.00	\$0.00	\$0.00
Hardware:				
CD-ROM disc drives	35	\$0.00	\$0.00	\$0.00
Workstation or file server RAM	52+	\$33.00	\$396.00	\$0.00
Ports or modems	52+	\$0.00	\$0.00	\$0.00
Workstation & Maintenance contract	17	\$795.00	\$0.00	\$0.00
File Server	16	\$0.00	\$0.00	\$0.00
Patron training workstation	17	\$795.00	\$0.00	\$0.00
Printers & maintenance contract	22	\$1,200.00	\$1,200.00	\$0.00
Software:				
Operating system license/purchase fee	15	\$525.00	\$525.00	\$525.00
Menuing software license/purchase fee	51	\$0.00	\$0.00	\$0.00
Special Expertise Required:				
Network expertise	2	\$181.03	\$28,422.41	\$28,422.41
Hardware/software expertise	10	\$181.03	\$1,810.34	\$1,810.34
Staff time:				
License/contract negotiation	13	\$280.17	\$2,801.72	\$2,801.72
Ongoing maintenance	8	\$181.03	\$3,620.69	\$3,620.69
Patron training	7	\$150.86	\$905.17	\$17,500.00
Upgrade installation	12	\$181.03	\$905.17	\$905.17
Staff training	1	\$5,000.00	\$5,000.00	\$5,000.00
Initial installation	26	\$181.03	\$905.17	\$905.17
Holdings administration	52+	\$40.95	\$491.38	\$491.38
Troubleshooting	3	\$181.03	\$5,431.03	\$5,431.03

Figure 24
Networked CD-ROM
Spreadsheet with Values from User

Networked CD-ROM Tangible Costs	Rank	Unit Costs	Extended First Year Costs	Extended Annual Costs
Supplies:				
Signs	50	\$0.10	\$2.50	\$2.50
Paper	33	\$7.25	\$1,268.75	\$1,268.75
Printer ribbons/ink	39	\$89.00	\$1,335.00	\$1,335.00
Furniture:				
Desks/tables/chairs/stools	43	\$0.00	\$0.00	\$0.00
File Cabinet	52+	\$0.00	\$0.00	\$0.00
Documentation/Training:				
Training course for staff	52+	\$895.00	\$895.00	\$895.00
Vendor documentation	48	\$0.00	\$0.00	\$0.00
Data producer documentation	52+	\$0.00	\$0.00	\$0.00
Utilities:				
Network costs	52+	\$0.00	\$0.00	\$0.00
Other Equipment Costs:				
Network cabling	28	\$1,500.00	\$1,500.00	\$0.00
Intangible Costs				
Increased reference service needed	11	\$0.00	\$0.00	\$0.00
Problems damage library's image	32	\$0.00	\$0.00	\$0.00
Morale suffers if work increases too much	36	\$0.00	\$0.00	\$0.00
Decisions can be a management distraction	38	\$0.00	\$0.00	\$0.00
TOTAL COSTS			\$58,910.35	\$72,409.18

Figure 24 (continued)
Networked CD-ROM
Spreadsheet with Values from User

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Benefits
Increases patron productivity	9	\$0.00	\$0.00	\$0.00
Maximizes use of journals	27	\$0.00	\$0.00	\$0.00
Reduces theft & vandalism	37	\$0.00	\$0.00	\$0.00
Patrons expend less effort to do research	44	\$0.00	\$0.00	\$0.00
Intangible Benefits:				
Increases patron satisfaction	5	\$0.00	\$0.00	\$0.00
Improves research	6	\$0.00	\$0.00	\$0.00
Increases use of library	14	\$0.00	\$0.00	\$0.00
Information is current	18	\$0.00	\$0.00	\$0.00
Increases faculty support for library	19	\$0.00	\$0.00	\$0.00
Increases student support for library	23	\$0.00	\$0.00	\$0.00
Uses a pc interface	25	\$0.00	\$0.00	\$0.00
Printing is easy	29	\$0.00	\$0.00	\$0.00
Downloading is easy	30	\$0.00	\$0.00	\$0.00
Extends service to commuters	31	\$0.00	\$0.00	\$0.00
Can link to document delivery	47	\$0.00	\$0.00	\$0.00
TOTAL BENEFITS			\$0.00	\$0.00

Figure 24 (continued)
Networked CD-ROM
Spreadsheet with Values from User

Locally Loaded Tapes Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	2	\$35,000.00	\$35,000.00	\$35,000.00
One-time licensing fees	18	\$42,000.00	\$42,000.00	\$0.00
Hardware:				
Mainframe disk drives	4	\$65,000.00	\$65,000.00	\$0.00
Mainframe RAM	8	\$45,000.00	\$90,000.00	\$0.00
Mainframe ports	21	\$525.00	\$1,575.00	\$0.00
Workstation & Maintenance contract	48	\$800.00	\$16,000.00	\$0.00
File Server	52	\$0.00	\$0.00	\$0.00
Gateway	56	\$0.00	\$0.00	\$0.00
Patron training workstation	66+	\$800.00	\$800.00	\$0.00
Terminals & maintentance contract	66+	\$525.00	\$5,250.00	\$0.00
Printers & maintenance contract	66+	\$300.00	\$6,000.00	\$0.00
Software:				
Search software license/purchase fee	13	\$12,000.00	\$12,000.00	\$12,000.00
Data loader license/purchase fee	17	\$1,500.00	\$1,500.00	\$1,500.00
Operating system license/purchase fee	41	\$1,200.00	\$1,200.00	\$1,200.00
Menuing software license/purchase fee	55	\$0.00	\$0.00	\$0.00
Special Expertise Required:				
Network expertise	15	\$193.97	\$38,793.10	\$38,793.10
Hardware/software expertise	23	\$193.97	\$4,849.14	\$4,849.14

Figure 25
Locally Loaded Tapes
Spreadsheet with Values from User

Locally Loaded Tapes Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Staff time:				
License/contract negotiation	16	\$258.62	\$1,293.10	\$1,293.10
Daily & recurring maintenance	20	\$193.97	\$1,939.66	\$1,939.66
Patron training	32	\$150.86	\$1,939.66	\$9,051.72
Upgrade installation	36	\$193.97	\$1,939.66	\$1,939.66
Staff training	37	\$8,000.00	\$8,000.00	\$8,000.00
Initial installation	40	\$193.97	\$1,551.72	\$1,551.72
Library holdings administration	43	\$40.95	\$409.48	\$409.48
Troubleshooting	50	\$193.97	\$2,909.48	\$2,909.48
Return old tapes	57	\$40.95	\$204.74	\$204.74
Computer room personnel training time	66+	\$1,000.00	\$1,000.00	\$1,000.00
Supplies:				
Signs	66+	\$0.10	\$2.50	\$2.50
Paper	66+	\$8.00	\$3,200.00	\$3,200.00
Printer ribbons/ink	66+	\$3.00	\$750.00	\$750.00
Furniture:				
Desks/tables/chairs/stools	66+	\$1,500.00	\$6,000.00	\$0.00
File Cabinet	66+	\$225.00	\$0.00	\$0.00
Documentation/Training:				
Training course for staff	63	\$2,500.00	\$7,500.00	\$7,500.00
Vendor documentation	66+	\$0.00	\$0.00	\$0.00
Data producer documentation	66+	\$0.00	\$0.00	\$0.00

Figure 25 (continued)
Locally Loaded Tapes
Spreadsheet with Values from User

Locally Loaded Tapes Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Utilities:				
Electricity	66+	\$0.00	\$0.00	\$0.00
Network costs	66+	\$0.00	\$0.00	\$0.00
Other Equipment Costs:				
Computer cable installation	66+	\$0.00	\$0.00	\$0.00
Network cabling	66+	\$0.00	\$0.00	\$0.00
Intangible Costs				
Storage is more expensive than for other options	19	\$0.00	\$0.00	\$0.00
Requires support from MIS staff	24	\$0.00	\$0.00	\$0.00
Ability to change databases is limited	26	\$0.00	\$0.00	\$0.00
Increases demand for full-text	27	\$0.00	\$0.00	\$0.00
Interface may not be easy-to-use	39	\$0.00	\$0.00	\$0.00
More reference service may be required	42	\$0.00	\$0.00	\$0.00
May limit downloading	53	\$0.00	\$0.00	\$0.00
May reduce patron/staff interaction	54	\$0.00	\$0.00	\$0.00
Problems damage library's image	62	\$0.00	\$0.00	\$0.00
Morale problems if work overload results	64	\$0.00	\$0.00	\$0.00
Patrons may not learn well	65	\$0.00	\$0.00	\$0.00
TOTAL COSTS			\$358,607.24	\$133,094.31

Figure 25 (continued)
Locally Loaded Tapes
Spreadsheet with Values from User

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Benefits
Can be integrated with current environment	6	\$0.00	\$0.00	\$0.00
Makes use of existing hardware/software	11	\$0.00	\$0.00	\$0.00
Reduced online searching costs	14	\$0.00	\$0.00	\$0.00
Maximizes use of journal collection	25	\$0.00	\$0.00	\$0.00
Maximizes benefit of training programs	35	\$0.00	\$0.00	\$0.00
Less time spent of workstation troubleshooting	38	\$0.00	\$0.00	\$0.00
Reduced print edition charges	54	\$0.00	\$0.00	\$0.00
Lower investment in new equipment	61	\$0.00	\$0.00	\$0.00
Intangible Benefits:				
Provides one interface for many databases	1	\$0.00	\$0.00	\$0.00
Increases patron satisfaction	3	\$0.00	\$0.00	\$0.00
Increases patron productivity	5	\$0.00	\$0.00	\$0.00
Improves quality of research	7	\$0.00	\$0.00	\$0.00
Improves quality of service	9	\$0.00	\$0.00	\$0.00
Can be linked to journal holdings file	10	\$0.00	\$0.00	\$0.00
Enhances faculty support for library	12	\$0.00	\$0.00	\$0.00
Enhances student support for library	22	\$0.00	\$0.00	\$0.00
Can provide easy-to-use interface	28	\$0.00	\$0.00	\$0.00
Can be linked to document delivery	29	\$0.00	\$0.00	\$0.00

Figure 25 (continued)
Locally Loaded Tapes
Spreadsheet with Values from User

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Benefits
Extends library services to non-traditional students	30	\$0.00	\$0.00	\$0.00
Information is current	31	\$0.00	\$0.00	\$0.00
Extends library services to commuting students	33	\$0.00	\$0.00	\$0.00
Can provide statistical analysis of use	34	\$0.00	\$0.00	\$0.00
Enhances faculty/student recruitment	44	\$0.00	\$0.00	\$0.00
Provides ability to scale use of system	45	\$0.00	\$0.00	\$0.00
System is reliable and manageable	46	\$0.00	\$0.00	\$0.00
Reduces theft/vandalism	47	\$0.00	\$0.00	\$0.00
Easy to print results	58	\$0.00	\$0.00	\$0.00
Easy to download results	59	\$0.00	\$0.00	\$0.00
Can be used for collection development	60	\$0.00	\$0.00	\$0.00
Increases staff status	66+	\$0.00	\$0.00	\$0.00
TOTAL			\$0.00	\$0.00

Figure 25 (continued)
 Locall Loaded Tapes
 Spreadsheet with Values from User

Flat Fee Online Tangible Costs	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Product Licensing Fees:				
Annual licensing fees	3	\$6,700.00	\$6,700.00	\$6,700.00
Port charges	11	\$6,500.00	\$39,000.00	\$39,000.00
Transaction fees	19	\$0.00	\$0.00	\$0.00
Hardware:				
Modems	17	\$89.00	\$89.00	\$0.00
Workstation & Maintenance contract	27	\$995.00	\$11,940.00	\$0.00
Terminals & maintenance contract	28	\$0.00	\$0.00	\$0.00
Gateway	30	\$0.00	\$0.00	\$0.00
Printers & maintenance contract	38	\$350.00	\$4,200.00	\$0.00
Software:				
Telecommunications software	20	\$1,200.00	\$1,200.00	\$1,200.00
Menuing software license/purchase fee	48+	\$600.00	\$600.00	\$600.00
Special Expertise Required:				
Hardware/software expertise	23	\$172.41	\$3,448.28	\$3,448.28
Network expertise	26	\$172.41	\$34,482.76	\$34,482.76
Staff time:				
License/contract negotiation	8	\$215.52	\$3,232.76	\$3,232.76
Patron training	6	\$116.38	\$17,456.90	\$17,456.90
Staff training	14	\$0.00	\$0.00	\$0.00
Billing for patrons	24	\$107.76	\$1,077.59	\$1,077.59
Troubleshooting	34	\$172.41	\$8,620.69	\$0.00

Figure 26
Flat Fee Online
Spreadsheet with Values from User

Supplies:	Rank	Unit Cost	Extended First Year Costs	Extended Annual Costs
Signs	48+	\$0.10	\$1.20	\$1.20
Paper	48+	\$7.00	\$2,100.00	\$2,100.00
Printer ribbons/ink	48+	\$2.00	\$576.00	\$576.00
Furniture:				
Desks/tables/chairs/stools	48+	\$500.00	\$3,000.00	\$0.00
Documentation/Training:				
Vendor documentation	37	\$0.00	\$0.00	\$0.00
Data producer documentation	42	\$0.00	\$0.00	\$0.00
Utilities:				
Telecommunications charges	5	\$1,200.00	\$14,400.00	\$14,400.00
Other Costs:				
Phone line & installation	21	\$1,200.00	\$1,200.00	\$0.00
Space for documentation	39	\$0.00	\$0.00	\$0.00
Space for workstations	40	\$0.00	\$0.00	\$0.00
Intangible Costs				
Interface may not be easy-to-use	9	\$0.00	\$0.00	\$0.00
Increases demand for full-text	15	\$0.00	\$0.00	\$0.00
More reference service may be required	25	\$0.00	\$0.00	\$0.00
Morale problems if work overload results	35	\$0.00	\$0.00	\$0.00
Patrons may not learn well	44	\$0.00	\$0.00	\$0.00
May reduce patron/staff interaction	45	\$0.00	\$0.00	\$0.00
TOTAL COSTS		\$20,300.00	\$153,325.17	\$124,275.48

Figure 26 (continued)
Flat Fee Online
Spreadsheet with Values from User

Tangible Benefits	Rank	Unit Benefit	Extended First Year Benefits	Extended Annual Benefits
Reduced online searching costs	4	\$1,500.00	\$1,500.00	\$1,500.00
Less time spent workstation troubleshooting	7	\$20,000.00	\$20,000.00	\$20,000.00
System provides speed & performance	10	\$0.00	\$0.00	\$0.00
Charges can be passed to users	12	\$500.00	\$500.00	\$500.00
Reduced print edition charges	18	\$3,000.00	\$3,000.00	\$3,000.00
Maximizes use of journal collection	31	\$6,700.00	\$6,700.00	\$6,700.00
Intangible Benefits:				
Provides one interface and access to many databases	1	\$0.00	\$0.00	\$0.00
Information is current	2	\$0.00	\$0.00	\$0.00
Provides ability to scale use of system	13	\$0.00	\$0.00	\$0.00
Can be linked to document delivery	16	\$0.00	\$0.00	\$0.00
System is reliable	22	\$0.00	\$0.00	\$0.00
Enhances faculty support for library	29	\$0.00	\$0.00	\$0.00
Extends library services to commuting students	32	\$0.00	\$0.00	\$0.00
Easy to download results	41	\$0.00	\$0.00	\$0.00
Can be used for collection development	43	\$0.00	\$0.00	\$0.00
Easy to print results	46	\$0.00	\$0.00	\$0.00
TOTAL BENEFITS		\$31,700.00	\$31,700.00	\$31,700.00

Figure 26 (continued)
Flat Fee Online
Spreadsheet with Values from User

Ultimately, the effectiveness and reliability of the model can only be determined after it is made publicly available. In one sense, effectiveness could be measured in terms of whether the model helps users make better choices. Since the concept of "better" is impossible to define in this context, it seems reasonable to define effectiveness in terms of whether the model allows users to make decisions based on more accurate and complete data than would be the case without the model. The model clearly meets this criterion. Whether this will lead to "better" choices can only be considered in terms of the goals of the institution making the decision.

Another factor that must be considered when making judgments about the effectiveness of the model is the fact that, regardless of the amount of information that is available or the accuracy of the available information, decisions are often influenced by other factors. Factors such as personalities, institutional mandates, decisions made by other institutions, and even politics can affect a library's decision about the delivery option for abstracting and indexing information. In the final round of the Delphi study the participants stressed the impact of these other factors on library decision-making. The model is important because, though other factors may influence the final decision, the decision will be based on information that is as complete and accurate as possible. Furthermore, with information from the model, help library administrators may be able to reduce the impact of the other factors.

Alternately another measure of effectiveness might be the extent to which actual costs for the data delivery option selected by the institution match the estimated costs from the model. Since the model incorporates both initial costs and ongoing costs, the judgment of effectiveness based on this criterion cannot be determined until a year or more has passed.

In a relatively controlled environment the model has proved to be reliable. It gives consistent results each time it is used. It also gives consistent results regardless of the user.

Future Enhancements of the Model

As was stated earlier, the model was developed with QuattroPro for Windows, a standard, widely available spreadsheet program with the specific intent that users would be able to modify the model. Some modifications will be the result of changes in the information marketplace. Other modifications will be the result of specific institutional characteristics or situations. There are a few enhancements that could be added to the model at this time to increase its functionality or to make it easier to use.

First, the model should include dialog boxes to encourage the user to specify the indexing publications and the number of years of data that are being used for completion of the model. Since the number and size of the files being considered can have a major impact on both costs and benefits, these assumptions should be explicitly stated.

The model should include dialog boxes to encourage the user to specify the indexing products and the number of years of data that are being used for completion of the model. Since the number and size of the files being considered can have a major impact on some costs, this should be explicitly stated.

If, as more statistical information about CD-ROM usage becomes available, and as more sites allow dial-in access to CD-ROM files, it becomes clear that users are often denied access because the maximum number of simultaneous users has been exceeded, the model should offer the user a way to incorporate that factor. The same is true of the other options, particularly flat fee online which incorporates per port charges.

As institutions implement resource sharing plans, there may be new costs and benefits associated with a given delivery option. For example, institutions that do not currently have Internet access but who expect to use the Internet to use resources located at other institutions will need to add the initial and ongoing of Internet access to the costs already on the model. In most cases the library will not be expected to pay any of the startup costs but the library may need to add hardware or software to their equipment to make access possible. Furthermore, substantial personnel costs may be associated with the initial phase of such a project. The model may need to be modified to include those costs.

Consortia arrangements may also lead to other types of costs which are not currently part of the model. For example, it is doubtful that a university that has devoted substantial resources to loading files locally will be willing to allow other universities to access those resources without some form of compensation. For some, that compensation will be in the form of reciprocal access to resources at the other institution, but other arrangements may be developed.

The model assumes that a single staff member may be responsible for more than one task. For example, at many institutions the same person is responsible for network installation, day-to-day troubleshooting, and installation of upgrades. The model should be modified to account for the fact that several people may be responsible for the same task. Costs and benefits should be computed accordingly. For example, at many institutions, several staff members are responsible for bibliographic instruction. The model can accommodate multiple people doing the same task if the salaries of all personnel are averaged and the average salary is entered as the salary. The number of days devoted to the task may exceed 365 (for multiple people doing the same task). However, modification of the model is a better solution.

Chapter VI

Summary and Conclusions

Providing access to information is an increasingly complex and expensive task for libraries. The volume of published information is increasing at an ever faster pace. Much information that was once available only in print is now available electronically, while some information is available only electronically, not in print. Today there are many options for electronic access to information, but it is an extremely complex task to compare the advantages and disadvantages of different options.

Furthermore, providing access to electronic information requires library administrators to make decisions about sophisticated computer hardware and software. The decisions of the library administration must, in most cases, be coordinated with campus-wide or system-wide plans for information technology. This means that, in addition to selecting materials based on their merits as tools for research and scholarship, library administrators must decide which option will best comply with technological mandates.

Although providing access to electronic information may be significantly more expensive than providing access to print equivalents, few academic libraries can deny their patrons electronic access to information. Unfortunately, library administrators are faced with the task of providing electronic access to additional information at the same time that library budgets are being sharply reduced. Reductions in library budgets reflect the financial problems being faced by many academic institutions. As is true of other academic departments, libraries are being asked to provide meaningful measures of value for the services they provide.

Libraries are also being asked to justify their decisions with regard to the selection of materials and delivery options. These new realities have challenged the philosophies that have guided libraries for centuries. No longer can libraries operate with the idea that the services they provide are of immeasurable value and thus exempt from measures of accountability. Neither can libraries afford to acquire materials just in case they are needed. Instead, libraries are increasingly under pressure to provide electronic access to shared resources on an "as needed" basis.

One type of information that has traditionally been supplied by libraries is abstracting and indexing publications that help students and researchers find relevant information in books and journals. Abstracting and indexing publications are especially important today because they help researchers identify the most relevant information from the increasing volume of available information. Although abstracting and indexing publications have been readily and consistently available in printed formats for almost a century, they are now available electronically as well. Academic libraries have many choices with regard to electronic delivery options for abstracting and indexing data, however, three options are of particular interest now. Those options are networked CD-ROMs, locally loaded tapes, and flat fee online access. Each of the three options provides the possibility for shared electronic access to important resources, and each provides a means to measure use, and to some extent value.

Although cost benefit analysis has only rarely been applied to library functions, it is clear that such analysis is appropriate. Therefore, this research project was undertaken to develop a cost benefit analysis model for the choice of indexing and abstracting data delivery options.

This research project was comprised of three parts. First, a Delphi study was conducted. Fifteen experts in the field of electronic access to abstracting and indexing data developed a comprehensive, prioritized list of the tangible and intangible costs and benefits for each of the three data delivery options. Participants in the Delphi study included librarians, information producers, and suppliers of computer hardware and software. Since all stakeholders actively participated in the three rounds of the Delphi study during which the list was developed, I am confident that the list is comprehensive and that it reflects the full range of costs and benefits associated with any of the three delivery options.

In addition to developing a comprehensive list of costs and benefits, the Delphi participants were also able to reach a consensus with regard to the costs and benefits that were most significant and those that were least significant. Since the decision-making process includes many complex issues, it is particularly important that the most significant costs and benefits be identified.

For the second part of the project, usage data was collected from institutions that have adopted one or more of the delivery options to determine guidelines for necessary system capacity. Of particular interest was usage data from sites that have loaded tapes for use with their local automation systems. Twenty academic institutions with large IBM mainframe automation systems using library management systems software from NOTIS Systems Inc. were included in this project. These systems approximate unlimited access since they are free of most of the constraints that limit use of CD-ROM or online systems. As such, they provide a measure of the hardware and software capacity that will be required to serve an institution's faculty and students.

Usage data was collected for October and November 1992 and February and March 1993. At the institutions included in the study, the number of searches executed during those two-month periods ranged from 3,350 to 114,422. At first glance this range seems extremely large and the highest number seems impressive. However, if the number of searches is divided by the number of faculty and students that have access to the files, the range of searches per student or faculty is only from 0.3 to 6.6.

Although usage data was also collected from sites that have networked CD-ROMs and from those using online systems, that data is less reliable and less readily available. For networked CD-ROMs, those software programs that do compile the relevant usage data are relatively unsophisticated and unreliable. Furthermore, few CD-ROM programs collect even limited usage data. Online systems such as OCLC's FirstSearch that provide flat fee online access to indexing and abstracting data can easily supply reliable usage data. However, for this study, only limited information was available since the flat fee online access program at OCLC had just been introduced. During the time periods covered by this study, a limited number of academic institutions were testing the feasibility of providing abstracting and indexing data for their faculty and students with access to OCLC's system. Within the next few years more reliable usage data should be readily available.

Using the lists of costs and benefits identified by the Delphi participants, and the knowledge about system requirements gained from analysis of usage data, a cost benefit analysis model was developed as the third part of this project. The model was created using QuattroPro for Windows, a standard spreadsheet program with which many people are familiar.

This eliminates the need for the model to include detailed, application specific documentation and instruction. Furthermore, users familiar with spreadsheet programs can concentrate on the actual cost-benefit analysis rather than on learning to use a new program.

The resulting model encourages the user to consider all costs and benefits. Furthermore, the model encourages the user to compare multiple delivery options in an orderly and consistent manner. It can easily be modified to accommodate consideration of other delivery options and additional costs and benefits.

The model was extensively tested, first by some of the Delphi participants and by librarians who provided usage data. Thereafter, the model was tested by librarians who have adopted one or more of the delivery options considered as part of this project. All stated unequivocally that the model was an extremely effective and useful tool.

It is hoped that the model will also serve as a stimulus for the creation of cost benefit analysis models for other library functions and to encourage the use of rigorous cost benefit analysis techniques. Other factors will continue to have a major impact on purchasing and acquisitions decisions. Nevertheless, it is hoped, that in the future, those decisions will be made with complete and accurate cost benefit analyses in hand.

Additional Research Suggested by This Project

This project suggests numerous opportunities for future research. The same study should be conducted using data from sites with indexing and abstracting data produced by other secondary publishers such as IAC and UMI. Both companies produce indexing and abstracting files that are similar in content to those from Wilson that were included in the study. There is no reason to assume that data on usage of other files would differ, but that assumption should be tested. The model was tested by librarians that have files from other data producers in addition to those produced by Wilson indicating that the model's effectiveness is not affected by the data producer.

It is possible that, especially for locally loaded tapes, usage data might be different for institutions using different hardware and software. Usage data should be collected from sites using hardware and software from other automation vendors such as DYNIX, DRA, and Innovative Interfaces. There are numerous academic institutions using these systems for access to locally loaded tapes. As the vendors develop software to collect usage data, these sites should be studied.

Furthermore, usage data should be collected from more sites with variations in hardware and software configurations for access to CD-ROM databases. For example, CDPLUS will soon provide network access to the same Wilson files included in this study. Since the CDPLUS system software collects relevant usage data it should be possible to analyze that data to see it leads to different conclusions about necessary system capacity.

The same study should be conducted with data from other types of libraries, public libraries in particular. Most public libraries have a larger base of potential users than academic institutions but very little information is available about the amount of electronic database access that will be required to serve a public library's patrons. Furthermore, the Delphi study should be conducted with representatives from public libraries since it seems reasonable to assume that this group would develop a different list of costs and benefits. At the very least, the significance of individual costs and benefits would surely differ.

A similar study should be conducted using data from different databases such as Compendex or The Modern Language Association Bibliography that may have more defined or limited user groups and which represent other subject disciplines. Such a study might indicate whether there are differences in the number of searches executed by students and faculty in one field versus another.

Since flat fee access to online databases may become more prevalent, the usage data should be studied, particularly if analysis of that data can provide guidelines for the number of ports that are required to adequately serve a patron population of a given size.

This study focused on identifying the cost and benefit factors that a group of experts felt should be included in the process of making decisions about delivery options for abstracting and indexing data. It would be interesting to survey the decision-makers at institutions that have recently made such decisions to see the reasons they cite for their decisions match the list developed by the experts. Unfortunately, the real reasons for decision may remain unstated.

Usage data collected for this project provides only a tantalizing glimpse into the realities of database searching. Ideally, future studies would be able to provide data about who actually searches, how they search, when they search (time of year, time of day) and from what location they actually do most of their searching. While privacy issues may always prevent collection of usage data that actually identifies the searcher by name, it should be possible to collect data about usage patterns by categories. At this time there is little emphasis on development of software to collect such data. However, with increased emphasis on accountability and on resource sharing as opposed to collection development, development emphases may change.

Finally, the entire project should be repeated for a different library function. For example, with the vast sums of money that libraries spend on journal subscriptions, and on fees to subscription agencies, it would be interesting to develop a cost benefit model for selection of subscription agency. In addition, a model could be developed to compare the costs and benefits of paying for journal subscriptions (in print) versus supplying access to electronic full-text documents on demand.

Alternately, another measure of effectiveness might be the extent to which actual costs for the data delivery option selected by the institution match the estimated costs from the model. Since the model incorporates both initial costs and ongoing costs, the judgment of effectiveness based on this criterion cannot be determined until a year or more has passed.

In a relatively controlled environment the model has proved to be reliable. It also gives consistent results regardless of the user.

Appendix A Delphi Study

November 9, 1993

**Mr. Clifford Lynch
Division of Library Automation
University of California
300 Lakeside Drive 8th Floor
Oakland CA 94612-3550
(510) 987-0522**

Dear Clifford:

I am writing to you as a doctoral candidate in the University of Hawaii's Communications and Information Science Program, rather than as Director of Database Licensing for The H.W. Wilson Company. As part of my dissertation research I will be developing a spreadsheet-based decision model for cost-benefit analysis of three options for electronic indexing and abstracting data: flat fee online, CD-ROM, and locally loaded tapes. I hope to develop a decision model that will simplify and systematize the analysis of the costs and benefits associated with each option. Furthermore, my goal is to develop a model that will be applicable regardless of the organization that produces the data.

During the first phase of my project I am asking experts from industry, the media, and from academic institutions, to participate in a Delphi study. The objective of the Delphi study is the development of a comprehensive, detailed list of the costs and benefits associated with each of the three electronic formats. In addition, I am seeking opinions about which costs and benefits are most significant.

The Delphi study will consist of three rounds. In the first round, participants will be asked to list all costs and benefits associated with each of the options. In the second round, participants will be asked to prioritize the lists of costs and benefits that were identified in the first round. For the final round, participants will be given an opportunity to respond and comment on the prioritized lists developed as a result of the second round.

I've enclosed the first round in hopes that you will participate in the study despite your busy schedule. The cooperation of knowledgeable individuals not associated with The H.W. Wilson Company is essential for the project to succeed. The results of the Delphi study, as well as the decision model itself, will be made available to all participants.

Sincerely,

Becky Clarke

Director, Database Licensing Service

Appendix A Delphi Study

Instructions for Competing Round One of the Delphi Study: Identification of Costs and Benefits

The first step in developing a decision model for cost benefit analysis of three options for electronic access to indexing and abstracting data is the compilation of a comprehensive and prioritized list of costs and benefits. The three options to be considered are Flat Fee Online; CD-ROM discs in stand-alone and network environments; Locally Loaded Tapes.

In the first round of the Delphi Study, please identify costs and benefits that, in your opinion, should be used in such an analysis. For the first round, no effort should be made to indicate the extent to which you feel a particular cost or benefit is important. Also, there is no need to indicate dollar amounts since actual costs will be collected from institutions that have implemented one or more of the access options. For Round Two of the Delphi Study you will be asked to express your thoughts about the relative importance of the costs and benefits identified in Round One.

I've divided costs and benefits into two categories: tangible and intangible. Your judgment concerning what items belong in each of the two categories is an important part of the study.

To simplify the process and to minimize the amount of your time that will be necessary for completing the study, I've identified some of the costs and benefits. Please place an "X" in the appropriate box for each access option for which you feel the cost or benefit should be considered. There are spaces for you to add other costs or benefits.

Please call me at (800) 367-6770 extension 2758 if you have questions. Feel free to solicit the opinions of others in your organization, however, if you ask someone else in your organization to actually participate in the study, please let me know the person's name and position.

An Airborne Express envelope and form are included for the return of your completed study. Alternately, you can fax the completed questionnaire to me at (212) 538-7507. Once again, thank you for your assistance.

Appendix A Delphi Study

Round One

Tangible Benefits	Flat Fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally Loaded Tapes
Reduced online searching costs				
Reduced print edition charges				
Makes use of existing hardware				
Makes use of existing software				
Maximizes benefit of training programs				
Less time spent of workstation troubleshooting				
Provides a measure of journal use				
Intangible Benefits				
Enhances faculty support for library budget				
Enhances student support for library budget				
Enhances faculty recruitment efforts				
Allows library to serve commuting students				
Extends library services to non-traditional students				
*The data will be kept confidential but, for my purposes, please write your name.				

Appendix A Delphi Study Round One

Tangible Costs	Flat Fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally Loaded Tapes
Product Licensing Fees:				
One-time				
Annual				
First Year				
Hardware:				
Workstation CPU				
Workstation Monitor				
Workstation Keyboard				
Workstation Hard/floppy disk				
Workstation Memory				
Glare screen				
Workstation Maintenance contract				
CD-ROM Player				
CD-ROM Server				
Multidrive Access Unit				
Gateway				
Magnetic drive				
File Server				
Modem				
Printer				
Printer Maintenance Contract				
Terminal				
Terminal Maintenance Contract				
Cable extenders				
Security Locks				
A-B Switch				
Surge Protector				
Mainframe RAM				
Mainframe Disk drives				
Mainframe Ports				

Appendix A Delphi Study

Round One

	Flat fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally loaded Tapes
Software:				
Operating System				
Annual Upgrade				
Network operating system				
Annual Upgrade				
Anti-virus software				
Annual Upgrade				
Backup software				
Annual Upgrade				
Menuing software				
Annual Upgrade				
Password protection software				
Annual Upgrade				
Utility software (Norton "type")				
Annual Upgrade				
Telecommunications software				
Annual Upgrade				
Presentation/Overhead software				
Annual Upgrade				
Search software				
Annual Upgrade				
Data loader				
Annual Upgrade				
Other Equipment:				
Phone				
Fax				
Phone line installation				
Network cabling				
Network cards				
Network connectors, etc.				
Computer cable installation				
Electrical outlet installation				
Tool kit				
Costs continued				

Appendix A Delphi Study

Round One

	Flat fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally loaded Tapes
Supplies:				
Paper				
Xeroxing				
Postage				
Printer ribbon/ink/toner				
key caps				
Floppy disks				
Floppy disk labels				
Floppy disk storage boxes				
File Folders for licenses and documentation				
Cables for printers, CD-ROM players, etc.				
Signs				
Extension cords				
Space:				
Terminals/Workstations				
Documentation				
Supplies				
Furniture:				
Desks/tables				
Chairs/stools				
Shelves				
Lights				
File Cabinet				
Staff time:				
Staff training				
Patron training				
Initial installation				
Daily maintenance				
Recurring maintenance				
Upgrade installation				
Troubleshooting				
Return old discs/tapes				
Billing				
Claiming				
License/Contract negotiation				
Collection moving for initial installation				

Appendix A Delphi Study

Round One

	Flat fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally loaded Tapes
Documentation/Training:				
Staff training course fees				
Patron training workstation/terminals				
Patron training overheads				
Patron training projector				
Patron training materials				
Data producer documentation				
Vendor documentation				
Hardware/software books/documentation				
Utilities:				
Monthly phone lines				
Telecommunications charges				
Electricity				
Transaction Charges				
Special expertise:				
Legal				
Network				
Hardware/software				
Other:				
Intangible Costs	Flat fee Online	Stand-alone CD-ROM	Networked CD-ROM	Locally loaded Tapes

**Appendix A
Delphi Study**

Facsimile Cover Sheet

To: Clifford Lynch

Company: University of California

Phone:

Fax: 510 987-0522

From: Becky Clarke

Company:

Phone: (914) 576-4919

Fax: (914) 576-4919

Date:

Pages including this
cover page: 1

Comments:

This is just a reminder that I have not yet received your responses to Round One of my Delphi Study on the costs and benefits of networked CD-ROM, locally loaded tapes and flat fee online. Please call me at the number listed above if you need additional information or you have questions.

I am most grateful for your participation.

Appendix A Delphi Study

Round Two

November 9, 1993

**Mr. Clifford Lynch
Division of Library Automation
University of California
300 Lakeside Drive 8th Floor
Oakland CA 94612-3550
(510) 987-0522**

Dear Clifford:

Thank you for your prompt and thoughtful response to Round One of my Delphi Study. I am confident that, with your help, I've compiled a reasonably complete list of the costs and benefits for each access option. As many of you suggested when you responded to Round One, the list includes both significant and relatively trivial items.

Enclosed are instructions and forms for Round Two which is designed to identify the costs and benefits that are most significant. Once again your prompt response will be greatly appreciated.

Sincerely,

**Becky Clarke
Director, Database Licensing Service**

Appendix A Delphi Study

Round Two

Your name _____

Instructions for Delphi Round Two

Listed on the enclosed pages are costs and benefits which were marked as relevant by more than 50% of the participants in Round One. Also listed are costs and benefits which were added by participants.

First, for each access option -- Flat Fee Online, CD-ROM and Locally Loaded Tapes-- please circle the 20 most significant costs and benefits. Mark a total of 20 for each access option. It is not necessary to balance the number of costs and benefits.

Second, from the 20 costs and benefits you circled, select the 10 most significant and number them from 1-10 with # 1 being the most significant.

For purposes of this study, please use the following criteria for determining significance.

Do you feel that the cost or benefit may have sufficient impact on an institution's annual library budget to force the consideration of other alternatives?

Do you feel the cost or benefit may have an impact on library operations that may be felt throughout the institution?

Third, please list costs or benefits that you feel are significant but that have not been included.

**Appendix A
Delphi Study**

Round Three

Facsimile Cover Sheet

To: Clifford Lynch

Company: University of California

Phone:

Fax: 510 987-0522

From: Becky Clarke

Company:

Phone: (914) 576-4919

Fax: (914) 576-4919

07/23/93

Date:

Pages including this
cover page: 7

Comments:

At last, this is the final round. Your responses have been most illuminating; some are as I expected, others not at all. Many of your comments and suggestions (including those about the design of the study) were extremely valuable.

For those who don't know, I'm taking the next month to finish my dissertation before joining NOTIS Systems at the end of August. Until September you can reach me at the number listed above. The main number at NOTIS is (708) 866-0150; I look forward to hearing from you.

Please fax your response to the number above. You will get my answering machine. Wait for the beep indicating that it's time to leave a message, then press send on your fax machine.

Appendix A
Delphi Study
Directions for Delphi Round Three

Please review the results of the first two rounds of the study, then respond to the following questions.

Is there anything about the results of the first two rounds with which you strongly disagree? If so, with what do you disagree and why?

Is there anything about the results of the first two rounds that you find surprising or not as you anticipated? If so, what do you find surprising and why?

What issues that are not identified as costs or benefits in this study do you feel are a significant part of the decision-making process when people are choosing the format for indexing and abstracting data?

What forthcoming trends or developments do you feel may have a significant impact on this decision-making process within the next 3-5 years?

Appendix B Sample Usage Data

November 9, 1993

**Mr. Bernie Sloan
ILCSO
502 East John Street
Champaign, Illinois 61820**

Dear Bernie:

I am writing to you as a doctoral candidate in the University of Hawaii's Communications and Information Science Program, rather than as Director of Database Licensing for The H.W. Wilson Company. As part of my dissertation research I will be developing a spreadsheet-based decision model for cost-benefit analysis of three options for electronic indexing and abstracting data: flat fee online, CD-ROM, and locally loaded tapes. I hope to develop a decision model that will simplify and systematize the analysis of the costs and benefits associated with each option. My goal is to develop a model that will be applicable regardless of the organization that produces the characteristics of the institution making the decisions.

In order to gain some perspective on the number of searches that may be anticipated, I am collecting data from existing installations. Specifically, I would like to know the number of searches that were performed at your institution on General Science Index, Social Sciences Index, Humanities Index and Readers' Guide during October and November 1992 and February and March 1993. I will be happy to extrapolate the information from system reports or other standard reports that you generate for your own use. Alternately, I've supplied a brief form for you to complete.

I know this is a busy time but I hope that you can send the information despite your busy schedule. The cooperation of knowledgeable individuals not associated with The H.W. Wilson Company is essential for the project to succeed. The results of the study, as well as the decision model itself, will be made available to all participants.

Sincerely,

**Becky Clarke
Director, Database Licensing Service**

Appendix B Sample Usage Data

FirstSearch Search Usage

Database & Institution	Searches February 1993	Searches March 1993
University 1		
General Science Index	13	43
Humanities Index	7	45
Readers' Guide Abstracts	8	23
Social Sciences Index	6	67
University 2		
General Science Index	1002	627
Humanities Index	1237	766
Readers' Guide Abstracts	2325	1469
Social Sciences Index	2370	1449
University 3		
General Science Index	257	288
Humanities Index	80	58
Readers' Guide Abstracts	79	149
Social Sciences Index	157	107

Appendix B
Sample Usage Data
 IBIS Database Signons by Campus
 11/01/92-11/30/92

Campus	Database				All
	WLSN	WRDG	WRGA	WSSI	
AR	9	0	1	4	30
BA	34	0	13	22	93
BR	17	0	9	2	34
CC	30	1	233	768	3097
CL	44	0	7	13	110
CN	93	0	22	84	304
CT	11	0	2	1	20
EA	725	0	229	262	1834
EL	139	0	16	97	459
GS	132	0	42	78	492
IB	154	0	30	65	435
IM	2	0	0	0	5
IS	1556	0	405	878	4233
IT	247	0	67	53	577
IW	200	0	78	177	753
JO	26	0	31	7	96
KK	14	0	2	0	17
LF	188	0	75	102	553
MK	463	0	154	310	1558
ML	0	0	0	1	2
NC	176	0	34	73	389
NI	670	0	142	257	1835
NL	73	0	19	16	139
NU	325	0	180	263	1580
OA	115	0	70	64	368
RO	221	0	49	67	516
RU	243	0	65	118	508
SA	13	0	3	3	70
SC	847	0	143	530	2632
SH	21	0	4	11	57
SL	40	0	9	20	85
SM	1	0	0	1	4
SS	440	0	98	306	1368
SX	108	0	16	27	253
SY	17	0	3	1	26
TC	85	0	20	12	164
UC	11	0	1239	2493	19886
WE	587	0	122	191	1404
ALL	8077	1	3830	7377	46070

Appendix B Sample Usage Data

CAMPUS	WAST	WBAI	WBPI	WGSJ	WHUM	WJLS
AR	0	0	2	5	9	0
BA	0	0	4	10	10	0
BR	0	0	3	1	2	0
CC	245	98	224	124	188	1186
CL	0	0	15	10	21	0
CN	0	0	39	24	42	0
CT	0	0	0	0	6	0
EA	1	0	221	214	181	0
EL	0	0	80	48	79	0
GS	14	3	127	33	38	25
IB	1	1	77	83	24	0
IM	0	0	0	2	1	0
IS	0	4	413	572	399	0
IT	0	0	43	143	23	0
IW	0	0	98	93	108	1
JO	0	0	11	6	15	0
KK	0	0	0	1	0	0
LF	1	0	67	54	66	0
MK	2	1	244	144	240	0
ML	0	0	0	0	1	0
NC	0	0	30	38	32	0
NI	0	4	266	266	227	0
NL	0	0	19	8	4	0
NU	16	5	337	277	156	19
OA	1	0	31	49	38	0
RO	0	0	83	38	57	1
RU	0	0	93	37	42	0
SA	0	0	1	3	47	0
SC	4	1	277	486	344	0
SE	0	0	4	12	5	0
SL	0	0	7	7	2	0
SM	0	0	0	2	0	0
SS	0	1	274	105	144	0
SX	0	0	17	18	67	0
SY	0	0	2	2	1	0
TC	0	0	16	13	18	0
UV	2596	1092	2353	517	1283	8302
WE	6	3	205	179	116	1
ALL	2892	1213	5683	3624	4036	9535

Appendix C
Model
Worksheet
Flat Fee Online

What are the annual data licensing fees?
How much are the annual transaction fees?
How much does a port cost?"
How many ports will you need to purchase?
How much does a workstation cost?
How many workstations will you need to purchase?
How much does a modem cost?
How many modems will you need to buy?
How much does a gateway cost?
How many gateways will you need to purchase?
How much does a terminal cost?
How many terminals will you need to purchase?
How much does a printer cost?
How many printers will you need to purchase?
What are the annual licensing fees for your telecommunications software?

Appendix C
Model
 Worksheet
 Flat Fee Online

What are the annual licensing fees for your menuing software?
Assuming 232 work days a year, what is the annual salary of the person who will have network expertise?
How many days a year do you estimate this person will spend on network tasks?
Assuming 232 work days a year, what is the annual salary of the person who will have hardware/software expertise?
How many days a year do you estimate this person will spend on hardware/software tasks?
Assuming 232 work days a year, what is the annual salary of the person who will negotiate contracts?
How many days a year do you estimate this person will spend negotiating contracts?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?
How many days a year do you estimate this person will spend training patrons?
In terms of salaries, how much do you think staff training costs?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron billing?
How many days a year do you estimate this person will spend on billing?

Appendix C
Model
Worksheet
Flat Fee Online

Assuming 232 work days a year, what is the annual salary of the person who will be responsible for troubleshooting?
How many days a year do you estimate this person will spend troubleshooting?
How much does a sign cost?
How many signs will you need to purchase?
How much does a box of paper cost?
How many boxes of paper will you need to purchase?
How much does a printer ribbon or cartridge cost?
How many printer ribbons or ink cartridges will you need to purchase?
How much does a desk and chair cost?
How many desks will you need to purchase?
How much does vendor documentation cost?
How much does data producer documentation cost?
What are your monthly telecommunications costs?
What will new phone line installation cost?
What will space for documentation cost?
What will space for workstations cost?

Appendix C
Model
 Worksheet
 Flat Fee Online

This option may increase demand for electronic delivery of full text; in view of other costs, what value would you place on this cost? Rank 15
This option may not offer a user-friendly interface; in view of other costs, what value would you place on this cost? Rank 9
This option may require additional reference assistance; in view of other costs, what value would you place on this cost? Rank 25
This option may reduce patron/staff interaction; in view of other costs, what value would you place on this cost? Rank 45
This option may cause staff morale problems if work increases too much; in view of other costs, what value would you place on this cost? Rank 35
This option allows patrons to search without staff help, tools may not be used effectively. What value would you place on this cost? Rank 44
This option may enable you to reduce online costs; in view of other benefits, what value would you place on this benefit? Rank 4
This option may allow you to pass charges to users; what value do you place on this benefit? Rank 12
This option may maximize use of your journal collection; in view of other benefits, what value would you place on this benefit? Rank 31
This option may reduce time spent troubleshooting workstations; what value would you place on this benefit? Rank 7
This option may reduce costs for printed editions; in view of other costs and benefits, what value would you place on this benefit? Rank 18

Appendix C
Model
 Worksheet
 Flat Fee Online

This option may provide access with one interface for many databases; what value would you place on this benefit? Rank 1
This option may enhance faculty support for the library; what value would you place on this benefit? Rank 29
This option may allow links to document delivery; in view of other costs and benefits, what value would you place on this benefit? Rank 16
This option may provide very current information; in view of other costs and benefits, what value would you place on this benefit? Rank 2
This option may extend services to commuting students; what value would you place on this benefit? Rank 32
This option may provide a means to scale use of system; in view of other costs and benefits, what value would you place on this benefit? Rank 13
This option may be especially reliable; in view of other costs and benefits, what value would you place on this benefit? Rank 22
This option may allow easy printing of search results; in view of other costs and benefits, what value would you place on this benefit? Rank 46
This option may allow easy downloading; in view of other costs and benefits, what value would you place on this benefit? Rank 41
This option may be used to aid in collection development; in view of other costs and benefits, what value would you place on this benefit? Rank 43
This option may offer both speed and performance; in view of other costs and benefits, what value do you place on this benefit?
How much will you spend annually on staff training?

Appendix C
Model
Worksheet
Locally Loaded Tapes

What are the annual data licensing fees?
What are the one-time data licensing fees?
How much does a disk drive cost?"
How many disk drives will you need to purchase?
How much does a MB of RAM cost?"
How many MB of RAM will you need to purchase?
How much does a port cost?"
How many ports will you need to purchase?
How much does a workstation cost?
How many workstations will you need to purchase?
How many workstations will you need to purchase for patron training?
How much does a file server cost?
How many file servers will you need to buy?
How much does a gateway cost?
How many gateways will you need to purchase?
How much does a terminal cost?
How many terminals will you need to purchase?

**Appendix C
Model
Worksheet
Locally Loaded Tapes**

How much does a printer cost?
How many printers will you need to purchase?
What are the annual licensing fees for your search software?
What are the annual licensing fees for your operating system software?
What are the annual licensing fees for your data loader software?
What are the annual licensing fees for your menuing software?
Assuming 232 work days a year, what is the annual salary of the person who will have network expertise?
How many days a year do you estimate this person will spend on network tasks?
Assuming 232 work days a year, what is the annual salary of the person who will have hardware/software expertise?
How many days a year do you estimate this person will spend on hardware/software tasks?
Assuming 232 work days a year, what is the annual salary of the person who will negotiate contracts?
How many days a year do you estimate this person will spend negotiating contracts?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for daily and recurring system maintenance?
How many days a year do you estimate this person will spend on system maintenance?

Appendix C
Model
 Worksheet
 Locally loaded Tapes

Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?
How many days a year do you estimate this person will spend training patrons?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for upgrade installation?
How many days a year do you estimate this person will spend installing upgrades?
In terms of salaries, how much do you think staff training costs?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible initial installation?
How many days a year do you estimate this person will spend doing the initial hardware and software installation?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for holdings administration?
How many days a year do you estimate this person will spend on holdings administration?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for troubleshooting?
How many days a year do you estimate this person will spend troubleshooting?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for returning old tapes?
How many days a year do you estimate this person will spend returning tapes?

Appendix C
Model
 Worksheet
 Locally loaded Tapes

In terms of salaries, how much do you think computer room staff training costs?
How much does a sign cost?
How many signs will you need to purchase?
How much does a box of paper cost?
How many boxes of paper will you need to purchase?
How much does a printer ribbon or cartridge cost?
How many printer ribbons or ink cartridges will you need to purchase?
How much does a desk and chair cost?
How many desks will you need to purchase?
How much does a file cabinet cost?
How many file cabinets will you need to purchase?
How much does it cost to send staff to a training course?
How many staff members will you send to training sessions annually?
How much does vendor documentation cost?
How much does data producer documentation cost?
What are the monthly electrical costs associated with use of your OPAC?
What are your monthly network costs?

**Appendix C
Model
Worksheet
Locally Loaded Tapes**

What will new computer cable installation cost?
What will new network cable installation cost?
Storage may be more expensive than for other options; in view of other costs, what value would you place on this cost? Rank 19
This option may require MIS or computer center support; in view of other costs, what value would you place on this cost? Rank 24
This option may limit your ability to change databases easily; in view of other costs, what value would you place on this cost? Rank 26
This option may increase demand for electronic delivery of full text; in view of other costs, what value would you place on this cost? Rank 27
This option may not offer a user-friendly interface; in view of other costs, what value would you place on this cost? Rank 39
This option may require additional reference assistance; in view of other costs, what value would you place on this cost? Rank 42
This option may limit downloading capabilities; in view of other costs, what value would you place on this cost? Rank 53
This option may reduce patron/staff interaction; in view of other costs, what value would you place on this cost? Rank 54
This option may damage the library's image if problems occur; in view of other costs, what value would you place on this cost? Rank 62
This option may cause staff morale problems if work increases too much; in view of other costs, what value would you place on this cost? Rank 64

Appendix C
Model
Worksheet
Locally Loaded Tapes

This option allows patrons to search without staff help, tools may not be used effectively. What value would you place on this cost? Rank 65
This option may be integrated into the existing campus environment; what value would you place on this benefit? Rank 6
This option may enable you to use existing hardware; in view of other benefits, what value would you place on this benefit? Rank 11
This option may enable you to reduce online costs; in view of other benefits, what value would you place on this benefit? Rank 14
This option may maximize use of your journal collection; in view of other benefits, what value would you place on this benefit? Rank 25
This option may maximize benefits of training programs; in view of other benefits and costs, what value would you place on this benefit? Rank 35
This option may reduce time spent troubleshooting workstations; what value would you place on this benefit? Rank 38
This option may reduce costs for printed editions; in view of other costs and benefits, what value would you place on this benefit? Rank 54
This option may require less investment in new equipment; in view of other costs and benefits, what value would you place on this benefit? Rank 61
This option may provide one interface for many databases; what value would you place on this benefit? Rank 1
This option may increase patron satisfaction; in view of other costs and benefits, what value would you place on this benefit? Rank 3

Appendix C
Model
 Worksheet
 Locally Loaded Tapes

This option may increase patron productivity; in view of other costs and benefits, what value would you place on this benefit? Rank 5
This option may improve the quality of research produced; in view of other costs and benefits, what value would you place on this benefit? Rank 7
This option may be perceived as improving the quality of the library's service; what value would you place on this benefit? Rank 9
This option may link citations directly to serials records; what value would you place on this benefit? Rank 10
This option may enhance faculty support for the library; what value would you place on this benefit? Rank 12
This option may enhance student support for the library; what value would you place on this benefit? Rank 22
This option may provide a user-friendly interface; in view of other costs and benefits, what value would you place on this benefit? Rank 28
This option may allow links to document delivery; in view of other costs and benefits, what value would you place on this benefit? Rank 29
This option may extend services to non-traditional students; what value would you place on this benefit? Rank 30
This option may provide very current information; in view of other costs and benefits, what value would you place on this benefit? Rank 31
This option may extend services to commuting students; what value would you place on this benefit? Rank 33

Appendix C
Model
Worksheet
Locally Loaded Tapes

This option may provide statistical reports of library use; in view of other costs and benefits, what value would you place on this benefit? Rank 34
This option may enhance faculty and student recruitment; in view of other costs and benefits, what value would you place on this benefit? Rank 44
This option may provide a means to scale use of system; in view of other costs and benefits, what value would you place on this benefit? Rank 45
This option may be especially reliable and manageable; in view of other costs and benefits, what value would you place on this benefit? Rank 46
This option may reduce theft and vandalism; what value would you place on this benefit? Rank 47
This option may allow easy printing of search results; in view of other costs and benefits, what value would you place on this benefit? Rank 58
This option may allow easy downloading; in view of other costs and benefits, what value would you place on this benefit? Rank 59
This option may be used to aid in collection development; in view of other costs and benefits, what value would you place on this benefit? Rank 60
This option may enhance the image of library staff; in view of other costs and benefits, what value would you place on this benefit? Rank 66+

Appendix C
Model
Worksheet
Networked CD-ROM

What are the annual data licensing fees?
What are the one-time data licensing fees?
How much does a CD-ROM drive cost?"
How many disk drives will you need to purchase?"
How much does a MB of RAM cost?"
How many MB of RAM will you need to purchase?
How much does a port cost?"
How many ports will you need to purchase?
How much does a workstation cost?
How many workstations will you need to purchase?
How many workstations will you need to purchase for patron training?
How much does a CD-ROM or network server cost?
How many file servers will you need to buy?
How much does a printer cost?"
How many printers will you need to purchase?

Appendix C
Model
 Worksheet
 Networked CD-ROM

What are the annual licensing fees for your network operating system software?
What are the annual licensing fees for your menuing software?
Assuming 232 work days a year, what is the annual salary of the person who will have network expertise?
How many days a year do you estimate this person will spend on network tasks?
Assuming 232 work days a year, what is the annual salary of the person who will have hardware/software expertise?
How many days a year do you estimate this person will spend on hardware/software tasks?
Assuming 232 work days a year, what is the annual salary of the person who will negotiate contracts?
How many days a year do you estimate this person will spend negotiating contracts?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for daily and recurring network and CD-ROM maintenance?
How many days a year do you estimate this person will spend on system maintenance?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?
How many days a year do you estimate this person will spend training patrons?

Appendix C
Model
 Worksheet
 Networked CD-ROM

Assuming 232 work days a year, what is the annual salary of the person who will be responsible for upgrade installation?
How many days a year do you estimate this person will spend installing upgrades?
In terms of salaries, how much do you think staff training costs?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible initial installation?
How many days a year do you estimate this person will spend doing the initial hardware and software installation?
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for holdings administration?
How many days a year do you estimate this person will spend on holdings administration?"
Assuming 232 work days a year, what is the annual salary of the person who will be responsible for troubleshooting?
How many days a year do you estimate this person will spend troubleshooting?
How much does a sign cost?
How many signs will you need to purchase?
How much does a box of paper cost?
How many boxes of paper will you need to purchase?
How much does a printer ribbon or cartridge cost?
How many printer ribbons or ink cartridges will you need to purchase?

Appendix C
Model
 Worksheet
 Networked CD-ROM

How much does a desk and chair cost?
How many desks will you need to purchase?
How much does a file cabinet cost?
How many file cabinets will you need to purchase?
How much does it cost to send staff to a training course?
How many staff members will you send to training sessions annually?
How much does vendor documentation cost?
How much does data producer documentation cost?
What are your monthly network costs?
What will new network cable installation cost?
This option may increase need for reference staff; in view of other costs, what value do you place on this cost?
This option may damage the library's image if there are too many problems; in view of other costs, what value do you place on this cost?
This option may lower morale if the work load increases too much; what value do you place on this cost?
This option may be a management distraction; what value do you place on this cost?

Appendix C
Model
Worksheet
Networked CD-ROM

This option may increase patron productivity; in view of other costs and benefits what value do you place on this benefit?
This option may maximize use of journals in your collection; what value do you place on this benefit?
This option may reduce theft and vandalism; what value do you place on this benefit?
This option may make research easier for patrons; what value do you place on this benefit?
This option may increase patron satisfaction; what value do you place on this benefit?
This option may improve the quality of research; what value do you place on this benefit?
This option may increase use of the library; what value do you place on this benefit?
This option may insure that data is current; what value do you place on this benefit?
This option may increase faculty support for the library; what value do you place on this benefit?
This option may increase student support for the library; what value do you place on this benefit?
This option offers a pc interface; what value do you place on this benefit?
This options offers easy printing; what value do you place on this benefit?

Appendix C
Model
Worksheet
Networked CD-ROM

This options offers easy downloading; what value do you place on this benefit?
This option extends library service to commuters; what value do you place on this benefit?
This option can link records to document delivery; what value do you place on this benefit?

Appendix C Model Macros

```
\|
_TapeDataLicensingfees      {}
                             {GetNumber "Assuming a network with a maximum of
                             20 simultaneous users, what are the annual data
                             licensing fees?",annual}
                             {GetNumber "Assuming a network with a maximum of
                             20 simultaneous users, what are the one-time data
                             licensing fees?",onetime}

\h
_TapeHardwarecosts          {GetNumber "How much does a disk drive
                             cost?",drivecost}
                             {GetNumber "How many disk drives will you need to
                             purchase?",numberdrives}
                             {GetNumber "How much does a MB of RAM
                             cost?",ramcost}
                             {GetNumber "How many MB of RAM will you need to
                             purchase?",MBRAM}
                             {GetNumber "How much does a port cost?",portcost}
                             {GetNumber "How many ports will you need to
                             purchase?",numberports}
                             {GetNumber "How much does a workstation
                             cost?",workcost}
                             {GetNumber "How many workstations will you need to
                             purchase?",numberworksta}
                             {GetNumber "How many workstations will you need to
                             purchase for patron training?",numberpatronwk}
                             {GetNumber "How much does a file server
                             cost?",costfileserver}
                             {GetNumber "How many file servers will you need to
                             buy?",numfileserver}
                             {GetNumber "How much does a gateway
                             cost?",costgateway}
                             {GetNumber "How many gateways will you need to
                             purchase?",numbergateways}
                             {GetNumber "How much does a terminal
                             cost?",termcost}
                             {GetNumber "How many terminals will you need to
                             purchase?",numberterms}
                             {GetNumber "How much does a printer
                             cost?",costprinter}
                             {GetNumber "How many printers will you need to
                             purchase?",numberprinters}
```

Appendix C Model Macros

\s	{GetNumber "What are the annual licensing fees for your search software?",searchsoft}
_TapeSoftwarecosts	{GetNumber "What are the annual licensing fees for your operating system software?",opsys} {GetNumber "What are the annual licensing fees for your dataloader software?",dataload} {GetNumber "What are the annual licensing fees for your menuing software?",menuseft}
\p	{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will have network expertise?",networkexp}
_TapePersonnelcosts	{GetNumber "How many days a year do you estimate this person will spend on network tasks?",daysnetworkexp} {GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will have hardware/software expertise?",hardwarexp} {GetNumber "How many days a year do you estimate this person will spend on hardware/software tasks?",dayshardexp} {GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will negotiate contracts?",negotiate} {GetNumber "How many days a year do you estimate this person will spend negotiating contracts?",daysnegotiate} {GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for daily and recurring system maintenance?",maintain} {GetNumber "How many days a year do you estimate this person will spend on system maintenance?",daysmaintain} {GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?",patrontrain} {GetNumber "How many days a year do you estimate this person will spend training patrons?",daystrainpat} {GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for upgrade installation?",upgrade}

Appendix C

Model

Macros

```
{GetNumber "How many days a year do you estimate
this person will spend installing
upgrades?",daysupgrade}
{GetNumber "In terms of salaries, how much do you
think staff training costs?",trainingsalary}
{GetNumber "Assuming 232 work days a year, what is
the annual salary of the person who will be resonsible
initial installation?",install}
{GetNumber "How many days a year do you estimate
this person will spend doing the initial hardware and
sotfware installation?",daysinstall}
{GetNumber "Assuming 232 work days a year, what is
the annual salary of the person who will be responsible
for holdings administration?",holdingsadm}
{GetNumber "How many days a year do you estimate
this person will spend on holdings
administration?",daysholdings}
{GetNumber "Assuming 232 work days a year, what is
the annual salary of the person who will be responsible
for troubleshooting?",trouble}
{GetNumber "How many days a year do you estimate
this person will spend
troubleshooting?",daystroubleshoo}
{GetNumber "Assuming 232 work days a year, what is
the annual salary of the person who will be responsible
for returning old tapes?",return}
{GetNumber "How many days a year do you estimate
this person will spend returning tapes?",daysreturn}
{GetNumber "In terms of salaries, how much do you
think computer room staff training
costs?",traincomputer}
```

Appendix C Model Macros

```

\o
_TapeOthercosts
{GetNumber "How much does it cost to send staff to a
training course?",stafftraincours}
{GetNumber "How many staff members will you send
to training sessions annually?", howmanytrain}
{GetNumber "How much does vendor documentation
cost?",vendocument}
{GetNumber "How much does data producer
documentation cost?",datadocument}
{GetNumber "How much additional monthly electrical
costs will be associated with locally loaded
tapes?",electric}
{GetNumber "What are your monthly network
costs?",networkcosts}
{GetNumber "What will new computer cable installation
cost?",cableinstall}
{GetNumber "What will new network cable installation
cost?",networkcable}

\o
_TapeIntangCosts
{}
{GetNumber "Storage may be more expensive than for
other options; in view of other costs, what value would
you place on this cost? Rank 19",tapestormor}
{GetNumber "This option may require MIS or computer
center support; in view of other costs, what value
would you place on this cost? Rank 24",tapemisneed}
{GetNumber "This option may limit your ability to
change databases easily; in view of other costs, what
value would you place on this cost? Rank
26",tapenochang}
{GetNumber "This option may increase demand for
electronic delivery of full text; in view of other costs,
what value would you place on this cost? Rank
27",tapeneedfull}
{GetNumber "This option may not offer a user-friendly
interface; in view of other costs, what value would you
place on this cost? Rank 39",tapenotfriend}
{GetNumber "This option may require additional
reference assistance; in view of other costs, what value
would you place on this cost? Rank 42", tapemoreref}
{GetNumber "This option may limit downloading
capabilities; in view of other costs, what value would
you place on this cost? Rank 53", tapenodown}

```

Appendix C

Model

Macros

{GetNumber "This option may reduce patron/staff interaction; in view of other costs, what value would you place on this cost? Rank 54", tapenointeract}
{GetNumber "This option may damage the library's image if problems occur; in view of other costs, what value would you place on this cost? Rank 62", tapebadimage}
{GetNumber "This option may cause staff morale problems if the work load increases too much; in view of other costs, what value would you place on this cost? Rank 64", tapebadmorale}
{GetNumber "This option may allow patrons to do reference work without staff assistance, which might mean that they would not learn to use the tools effectively. In view of other costs, what value would you place on this cost? Rank 65", tapepoorlearn}

vj
_TapeBenefits

{}
{GetNumber "This option may be integrated into the existing campus environment; in view of other benefits, what value would you place on this benefit? Rank 6", tapecanintegrat}
GetNumber "This option may require less investment in new equipment; in view of other costs and benefits, what value would you place on this benefit? Rank 61", Tapelessnew}
{GetNumber "This option may enable you to reduce online costs; in view of other benefits, what value would you place on this benefit? Rank 14", Tapereduceonlin}
{GetNumber "This option may maximize use of your journal collection; in view of other benefits, what value would you place on this benefit? Rank 25", Tapeusejournals}
{GetNumber "This option may maximize benefits of training programs; in view of other benefits and costs, what value would you place on this benefit? Rank 35", Tapemaxtraining}

Appendix C

Model

Macros

{GetNumber "This option may mean staff spends less time troubleshooting workstations; in view of other benefits and costs, what value would you place on this benefit? Rank 38", Tapenotrouble}

{GetNumber "This option may reduce costs for printed editions; in view of other costs and benefits, what value would you place on this benefit? Rank 54", Tapelessprint}

{GetNumber "This option may require less investment in new equipment; in view of other costs and benefits, what value would you place on this benefit? Rank 61", Tapelessnew}

{GetNumber "This option may provide one interface for many databases; in view of other costs and benefits, what value would you place on this benefit? Rank 1", Tapeoneinterfac}

{GetNumber "This option may increase patron satisfaction; in view of other costs and benefits, what value would you place on this benefit? Rank 3", Tapepatronhappy}

{GetNumber "This option may increase patron productivity; in view of other costs and benefits, what value would you place on this benefit? Rank 5", Tapemoreproduct}

GetNumber "This option may improve the quality of research done by patrons; in view of other costs and benefits, what value would you place on this benefit? Rank 7", Tapegoodreserch}

{GetNumber "This option may be perceived as improving the quality of the library's service to the patrons; in view of other costs and benefits, what value would you place on this benefit? Rank 9", Tapemoreservice}

{GetNumber "This option may allow citations to be linked directly to serials records; in view of other costs and benefits, what value would you place on this benefit? Rank 10", Tapehook}

{GetNumber "This option may enhance faculty support for the library; in view of other costs and benefits, what value would you place on this benefit? Rank 12", Tapefacultylike}

Appendix C

Model

Macros

{GetNumber "This option may enhance student support for the library; in view of other costs and benefits, what value would you place on this benefit? Rank 22", Tapestudentlike}

{GetNumber "This option may provide a user-friendly interface; in view of other costs and benefits, what value would you place on this benefit? Rank 28", Tapeinceinterfa}

{GetNumber "This option may allow links to document delivery; in view of other costs and benefits, what value would you place on this benefit? Rank 29", Tapedocdelivery}

{GetNumber "This option may extend library services to non-traditional students; in view of other costs and benefits, what value would you place on this benefit? Rank 30", Tapetoothers}

{GetNumber "This option may provide very current information; in view of other costs and benefits, what value would you place on this benefit? Rank 31", Tapeinfocurrent}

{GetNumber "This option may extend library services to commuting students; in view of other costs and benefits, what value would you place on this benefit? Rank 33", Tapecommuters}

{GetNumber "This option may provide statistical reports of library use; in view of other costs and benefits, what value would you place on this benefit? Rank 34", Tapegivestats}

{GetNumber "This option may enhance faculty and student recruitment; in view of other costs and benefits, what value would you place on this benefit? Rank 44", Tapegetstudents}

{GetNumber "This option may provide a means to scale use of system; in view of other costs and benefits, what value would you place on this benefit? Rank 45", Tapescaleuse}

{GetNumber "This option may be especially reliable and manageable; in view of other costs and benefits, what value would you place on this benefit? Rank 46", Tapereliable}

Appendix C Model Macros

{GetNumber "This option may reduce theft and vandalism; in view of other costs and benefits, what value would you place on this benefit? Rank 47", Tapelesstheft}

{GetNumber "This option may improve the quality of research done by patrons; in view of other costs and benefits, what value would you place on this benefit? Rank 7", Tapegoodreserch}

{GetNumber "This option may allow easy downloading of search results; in view of other costs and benefits, what value would you place on this benefit? Rank 58", Tapeasydown}

{GetNumber "This option may be used to aid in collection development; in view of other costs and benefits, what value would you place on this benefit? Rank 60", Tapecollectdev}

{GetNumber "This option may enhance the image of library staff; in view of other costs and benefits, what value would you place on this benefit? Rank 66 + ", Tapestaffstatus}

**\a
_Printapeall**

**{Print.Block cost1}
{Print.DoPrint}
{Print.Block cost2}
{Print.DoPrint}
{Print.Block Tapebenefits}
{Print.DoPrint}**

**\c
_Printapecosts**

**{Print.Block cost1}
{Print.DoPrint}
{Print.Block cost2}
{Print.DoPrint}**

Appendix C Model Macros

```
\u
_Suppliescosts      {GetNumber "How much does a sign cost?",signs}
                    {GetNumber "How many signs will you need to
                    purchase?",numbersigns}
                    {GetNumber "How much does a box of paper
                    cost?",paper}
                    {GetNumber "How many boxes of paper will you need
                    to purchase?",numberpaper}
                    {GetNumber "How much does a printer ribbon or
                    cartridge cost?",ribbons}
                    {GetNumber "How many printer ribbons or ink
                    cartridges will you need to purchase?",numberribbons}
                    {GetNumber "How much does a desk and chair
                    cost?",desk}
                    {GetNumber "How many desks will you need to
                    purchase?",numberdesks}
                    {GetNumber "How much does a file cabinet
                    cost?",filecabinet}
                    {GetNumber "How many file cabinets will you need to
                    purchase?",numberfiles}

\l
_DiscDatalicensingfees {}
                    {GetNumber "What are the annual data licensing
                    fees?",nannual}
                    {GetNumber "What are the one-time data licensing
                    fees?",nonetime}

\w
_DiscHardwarecosts {}
                    {GetNumber "How much does a cd-rom drive
                    cost?",cddrivecost}
                    {GetNumber "How many cd-rom drives will you need to
                    purchase?",numbercddrives}
                    {GetNumber "How much does a MB of RAM
                    cost?",cdramcost}
                    {GetNumber "How many MB of RAM will you need to
                    purchase?",MBCDRAM}
                    {GetNumber "If you plan to provide remote access how
                    much will a port or modem cost?",cdportcost}
                    {GetNumber "How many ports or modems will you
                    need to purchase?",numbercdports}
```

Appendix C Model

Macros

```
{GetNumber "How much does a workstation  
cost?","cdworkcost}  
{GetNumber "How many workstations will you need to  
purchase?","numbercdwork}  
{GetNumber "How many workstations will you need to  
purchase for patron training?","numcdpatwk}  
{GetNumber "How much does a cd-rom or network file  
server cost?","costnfileserver}  
{GetNumber "How many file servers will you need to  
buy?","numnfileserver}  
{GetNumber "How much does a printer  
cost?","costcdprinter}  
{GetNumber "How many printers will you need to  
purchase?","numcdprinters}
```

```
\r  
_DiscSoftwarecosts
```

```
{  
{GetNumber "What are the annual licensing fees for  
your network operating system software?","nopsys}  
{GetNumber "What are the annual licensing fees for  
your menuing software?","nmenusoft}
```

```
\n  
_DiscPersonnelcosts
```

```
{  
{GetNumber "Assuming 232 work days a year, what is  
the annual salary of the person who will have network  
expertise?","cdnetworkexp}  
{GetNumber "How many days a year do you estimate  
this person will spend on network  
tasks?","dayscdnetworkex}  
{GetNumber "Assuming 232 work days a year, what is  
the annual salary of the person who will have  
hardware/software expertise?","cdhardwareexp}  
{GetNumber "How many days a year do you estimate  
this person will spend on hardware/software  
tasks?","dayscdhardexp}  
{GetNumber "Assuming 232 work days a year, what is  
the annual salary of the person who will negotiate  
contracts?","cdnegotiate}  
{GetNumber "How many days a year do you estimate  
this person will spend negotiating  
contracts?","dayscdnegotiate}
```

Appendix C

Model

Macros

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for daily and recurring system maintenance?",cdmaintain}

{GetNumber "How many days a year do you estimate this person will spend on system maintenance?",dayscdmaintain}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?",cdpatrontrain}

{GetNumber "How many days a year do you estimate this person will spend training patrons?",dayscdtrainpat}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for upgrade installation?",cdupgrade}

{GetNumber "How many days a year do you estimate this person will spend installing upgrades?",dayscdupgrade}

{GetNumber "In terms of salaries, how much do you think staff training costs?",cdtrainingsalar}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for initial installation?",cdinstall}

{GetNumber "How many days a year do you estimate this person will spend doing the initial hardware and software installation?",dayscdinstall}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for holdings administration?",cdholdingsadm}

{GetNumber "How many days a year do you estimate this person will spend on holdings administration?",dayscdholdings}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for cd-rom or network troubleshooting?",cdtrouble}

{GetNumber "How many days a year do you estimate this person will spend troubleshooting?",dayscdtrouble}

Appendix C

Model

Macros

```
\t
_DiscOthercosts
{}
{GetNumber "What will new network cable installation
cost?","cdcablecost}
{GetNumber "How much does vendor documentation
cost?","cdvendocument}
{GetNumber "How much does data producer
documentation cost?","cddatadocument}
{GetNumber "What are your monthly network
costs?","costscdnetwork}
{GetNumber "How much does it cost to send staff to a
cd-rom or network training course?","staffcdtrain}
{GetNumber "How many staff members will you send
to cd-rom or network training sessions annually?","
howmanycdtrain}
{GetNumber "How much does a sign
cost?","costcdsign}
{GetNumber "How many signs will you need to
purchase?","numcdsigns}
{GetNumber "How much does a box of paper
cost?","costcdpaper}
{GetNumber "How many boxes of paper will you need
to purchase?","numcdpaper}
{GetNumber "How much does a printer ribbon or
cartridge cost?","costcdink}
{GetNumber "How many printer ribbons or ink
cartridges will you need to purchase?","numcdink}
{GetNumber "How much does a desk and chair
cost?","costcdchair}
{GetNumber "How many desks will you need to
purchase?","numcdchairs}
{GetNumber "How much does a file cabinet
cost?","costcdfilecab}
{GetNumber "How many file cabinets will you need to
purchase?","numcdfilecab}
```

Appendix C

Model

Macros

\g
_DiscIntangcost

```
{}  
{GetNumber "This option may increase need for  
reference staff; in view of other costs, what value do  
you place on this cost?", discmorework}  
{GetNumber "This option may damage the library's  
image if there are too many problems; in view of other  
costs, what value do you place on this cost?",  
discbadimage}  
{GetNumber "This option may lower morale if the work  
load increases too much; what value do you place on  
this cost?", disclowmorale}  
{GetNumber "This option may be a management  
distraction; what value do you place on this cost?",  
discdistract}
```

\m
_Discbenefit

```
{}  
{GetNumber "This option may increase patron  
productivity; in view of other costs and benefits what  
value do you place on this benefit?", discproductive}  
{GetNumber "This option may maximize use of journals  
in your collection; what value do you place on this  
benefit?", discusejournals}  
{GetNumber "This option may reduce theft and  
vandalism; what value do you place on this benefit?",  
disclesstheft}  
{GetNumber "This option may make research easier for  
patrons; what value do you place on this benefit?",  
disceasyreserch}  
{GetNumber "This option may increase patron  
satisfaction; what value do you place on this benefit?",  
discpatronhappy}  
{GetNumber "This option may improve the quality of  
research; what value do you place on this benefit?",  
discgoodreserch}  
{GetNumber "This option may increase use of the  
library; what value do you place on this benefit?",  
discuselibrary}  
{GetNumber "This option may insure that data is  
current; what value do you place on this benefit?",  
discinfocurrent}
```

Appendix C

Model

Macros

```
{GetNumber "This option may increase faculty support  
for the library; what value do you place on this  
benefit?", discfacultylike}  
{GetNumber "This option may increase student support  
for the library; what value do you place on this  
benefit?", discstudentlike}  
{GetNumber "This option offers a pc interface; what  
value do you place on this benefit?", discpcinterface}  
{GetNumber "This options offers easy printing; what  
value do you place on this benefit?", disceasyprint}  
{GetNumber "This options offers easy downloading;  
what value do you place on this benefit?",  
discdownload}  
{GetNumber "This option extends library service to  
commuters; what value do you place on this benefit?",  
discommuters}  
{GetNumber "This option can link records to document  
delivery; what value do you place on this benefit?",  
discdocdelivery}
```

```
\e  
_Printcdcosts  
  
{  
{Print.Block cdcost1}  
{Print.DoPrint}  
{Print.Block cdcost2}  
{Print.DoPrint}
```

```
\i  
_Printcdall  
  
{Print.Block cdcost1}  
{Print.DoPrint}  
{Print.Block cdcost2}  
{Print.DoPrint}  
{Print.Block cdbene1}  
{Print.DoPrint}
```

Appendix C Model Macros

```
\v
_FileSaveAs      {}
                  {FileSaveAs?}

\q
_Flatfeelicense  {}
                  {GetNumber "What are the annual data licensing
                  fees?", flatdatafee}
                  {GetNumber "How much are the annual transaction
                  fees?", flattransactions}
                  {GetNumber " How much does a port cost?",
                  flatportcost}
                  {GetNumber "How many ports will you need to
                  purchase?", flatnumports}
                  {GetNumber "What are the annual licensing fees for
                  your telecommunications software?", flattelsoft}
                  {GetNumber "What are the annual licensing fees for
                  your menuing software?", flatmenuseft}

\l
_Flatfeehardware {}
                  {GetNumber "How much does a workstation cost?",
                  flatpcost}
                  {GetNumber "How many workstations will you need to
                  purchase?", flatnumpcs}
                  {GetNumber "How much does a modem cost?",
                  flatmodemcost}
                  {GetNumber "How many modems will you need to
                  buy?", flatnummodems}
                  {GetNumber "How much does a gateway cost?",
                  flatgatecost}
                  {GetNumber "How many gateways will you need to
                  purchase?", flatgatenum}
                  {GetNumber "How much does a terminal cost?",
                  flatermcost}
                  {GetNumber "How many terminals will you need to
                  purchase?", flatermnum}
                  {GetNumber "How much does a printer cost?",
                  flatprintcost}
                  {GetNumber "How many printers will you need to
                  purchase?", flatprintnum}

\y
                  {}
```

_Flatfeestaffcosts

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will have network expertise?", Flatnetsalary}

{GetNumber "How many days a year do you estimate this person will spend on network tasks?", flatnetexpdays}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will have hardware/software expertise?", flathardexp}

{GetNumber "How many days a year do you estimate this person will spend on hardware/software tasks?", flatharddays}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will negotiate contracts?", flatcontracts}

{GetNumber "How many days a year do you estimate this person will spend negotiating contracts?", flatcontdays}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron training?", flatpatrainsal}

{GetNumber "How many days a year do you estimate this person will spend training patrons?", flatpatraindays}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for patron billing?", flatbillsalary}

{GetNumber "How many days a year do you estimate this person will spend on billing?", flatbilldays}

{GetNumber "Assuming 232 work days a year, what is the annual salary of the person who will be responsible for troubleshooting?", flattroublesala}

{GetNumber "How many days a year do you estimate this person will spend troubleshooting?", flattroubledays}

{GetNumber "How much will you spend annually on staff training?", flatstafftrain}

Appendix C

Model

Macros

```
\z
Flatfeothercosts      {}
                      {GetNumber "How much does a sign cost?",
                      flatsigncost}
                      {GetNumber "How many signs will you need to
                      purchase?", Flatsignum}
                      {GetNumber "How much does a box of paper cost?",
                      flatpapercost}
                      {GetNumber "How many boxes of paper will you need
                      to purchase?", flatpapernum}
                      {GetNumber "How much does a printer ribbon or
                      cartridge cost?", flatribboncost}
                      {GetNumber "How many printer ribbons or ink
                      cartridges will you need to purchase?", flatribbonum}
                      {GetNumber "How much does a desk and chair cost?",
                      flatdeskcost}
                      {GetNumber "How many desks will you need to
                      purchase?", Flatdesknum}
                      {GetNumber "How much does vendor documentation
                      cost?", flatvendoc}
                      {GetNumber "How much does data producer
                      documentation cost?", flatdatadoc}
                      {GetNumber "What are your monthly
                      telecommunications costs?", flatelecost}
                      {GetNumber "What will new phone line installation
                      cost?", flatphoneinstal}
                      {GetNumber "What will space for documentation
                      cost?", flatdocspace}
                      {GetNumber "What will space for workstations cost?",
                      flatpcspace}

Flatfeintangcost      {}
                      {GetNumber "This option may increase demand for
                      electronic delivery of full text; in view of other costs,
                      what value would you place on this cost? Rank 15",
                      flatdocdelcost}
                      {GetNumber "This option may not offer a user-friendly
                      interface; in view of other costs, what value would you
                      place on this cost? Rank 9", flatnotfriend}
```

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Macros

{GetNumber "This option may require additional reference assistance; in view of other costs, what value would you place on this cost? Rank 25", flatmoreref}
{GetNumber "This option may reduce patron/staff interaction; in view of other costs, what value would you place on this cost? Rank 45", flatlesstalk}
{GetNumber "This option may cause staff morale problems if work increases too much; in view of other costs, what value would you place on this cost? Rank 35", flatbadmorale}
{GetNumber "This option allows patrons to search without staff help, tools may not be used effectively. What value would you place on this cost? Rank 44", flatpoorlearn}

Flatfeetangbene

{
{GetNumber "This option may enable you to reduce online costs; in view of other benefits, what value would you place on this benefit? Rank 4", flatlessonline}
{GetNumber "This option may allow you to pass charges to users; what value do you place on this benefit? Rank 12", flatchargeuser}
{GetNumber "This option may maximize use of your journal collection; in view of other benefits, what value would you place on this benefit? Rank 31", flatmaxjournals}
{GetNumber "This option may reduce time spent troubleshooting workstations; what value would you place on this benefit? Rank 7", flatlesstrouble}
{GetNumber "This option may reduce costs for printed editions; in view of other costs and benefits, what value would you place on this benefit? Rank 18", flatlessprint}
}

Appendix C Model

Macros

Flatfeeintangbene

```
{  
{GetNumber "This option may provide access with one  
interface for many databases; what value would you  
place on this benefit? Rank 1", flatmorefiles}  
{GetNumber "This option may enhance faculty support  
for the library; what value would you place on this  
benefit? Rank 29", flatfacultylike}  
{GetNumber "This option may allow links to document  
delivery; in view of other costs and benefits, what  
value would you place on this benefit? Rank 16",  
flatlikedeliver}  
{GetNumber "This option may provide very current  
information; in view of other costs and benefits, what  
value would you place on this benefit? Rank 2",  
flatinfoew}  
{GetNumber "This option may extend services to  
commuting students; what value would you place on  
this benefit? Rank 32", flatocommuters}  
{GetNumber "This option may provide a means to scale  
use of system; in view of other costs and benefits,  
what value would you place on this benefit? Rank 13",  
flatscale}  
{GetNumber "This option may be especially reliable; in  
view of other costs and benefits, what value would you  
place on this benefit? Rank 22", flatreliable}  
{GetNumber "This option may allow easy printing of  
search results; in view of other costs and benefits,  
what value would you place on this benefit? Rank 46",  
flateasyprint}  
{GetNumber "This option may allow easy downloading;  
in view of other costs and benefits, what value would  
you place on this benefit? Rank 41", flateasydown}  
{GetNumber "This option may be used to aid in  
collection development; in view of other costs and  
benefits, what value would you place on this benefit?  
Rank 43", flatcollect}  
{GetNumber "This option may offer both speed and  
performance; in view of other costs and benefits, what  
value do you place on this benefit?", flatspeed}
```

Appendix C

Model

Macros

Flatfeeprtall	<pre>{ {Print.Block flatfeecost1} {Print.DoPrint} {Print.Block flatfeecost2} {Print.DoPrint} {Print.Block flatfeebene} {Print.DoPrint}</pre>
Flatfeeprtcst	<pre>{ {Print.Block flatfeecost1} {Print.DoPrint} {Print.Block flatfeecost2} {Print.DoPrint}</pre>

Appendix C Model

Introduction:

The Spreadsheet-based Decision Model Cost/Benefit Analysis of Indexing and Abstracting Data Delivery Options

On the following pages are lists of costs and benefits identified as significant by a selected group of individuals. Also enclosed is a spreadsheet-based decision model that you may help you explore the advantages and disadvantages of three delivery options: networked CD-ROM, locally loaded tapes and flat-fee online.

Use the charts on the following pages as worksheets to guide you in collecting relevant information before you actually begin using the spreadsheet model.

For the model, staff time requirements are computed by taking an annual salary, dividing by 232 work days to get a daily salary, then multiplying by the number of days that will be devoted to a particular task.

License fees are generally computed assuming 20 simultaneous users.

For hardware and supplies, you need a unit cost and an estimate of the number of units you will need. Supplies are assumed to be ongoing costs while hardware, furniture, and other durable goods are not.

Work with tangible costs, then work with intangible costs and benefits. This approach may allow you to have a better sense of the relative importance of some intangible costs and benefits.

You may change assumptions that do not reflect your situation.

Appendix C Model

Instructions for Using the Spreadsheet-Based Decision Model for Cost/Benefit Analysis of Indexing and Abstracting Data Delivery Options

1. Open QuattroPro, then load the model file from the disk labeled "Decision Model". The file name is Decision.WB1.
3. Using the horizontal scroii bar, go to the first page of the notebook. Click on the tabs of other pages tomove between pages. Use the horizontal scroll bars to display pages that are hidden from your view.

The spreadsheet pages are as follows:

Page One	Title page
Page Two	InstructionsA
Page Three	InstructionsB
Page Four	Begin CD-ROM (macro buttons for entering data)
Page Five	CD-ROM
Page Six	Begin Tapes (macro buttons for entering data)
Page Seven	Tapes
Page Eight	Begin Online (macro buttons for entering data)
Page Nine	FlatFeeOnline
Page Thirteen	Macros (macro library)
Page Twenty	Block Names (table of block names)

5. After reading the instructions on pages two and three of the model, proceed to the "Begin" page for any format. On each of these pages are buttons you click to bring up dialog boxes that prompt you to enter information for your model. You may click on the boxes in any order, however you may find it helpful to do them in order starting with Number 1. You will be prompted for the information in the same order as it appears on the worksheets. Enter even dollar amounts and even numbers without decimal points. Enter a zero (0) or press enter to leave a response blank. You can stop the dialog boxes by pressing Control and Break simultaneously.
- 7 Save the model under a new name the first time you are prompted to save; this will leave your original model intact.
8. You can view the model for each option with relevant formulas by going to the page following the "Begin" page. If you enter data directly on the model, all formulas will be replaced so in most cases you should use the dialog boxes for entering data!

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PLEASE NOTE

The diskette is not included in this material. It is, however, available for consultation at the author's graduate school library.

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