DOCUMENT RESUME

ED 108 704 IR 002 242

AUTHOR Olson, Paul E.; Pletzke, Chester J.
TITLE Analysis of the Midwest Medical Union Catalog. Final Report.
INSTITUTION Midwest Health Science Library Network, Chicago, Ill.
SPONS AGENCY National Library of Medicine (DHEW), Bethesda, Md.
PUB DATE May 75
NOTE 87p.

EDRS PRICE MF-$0.76 HC-$4.43 PLUS POSTAGE
DESCRIPTORS *Cost Effectiveness; Data Bases; Information Dissemination; *Interlibrary Loans; *Library Cooperation; Library Networks; *Library Research; Medical Libraries; Medicine; National Libraries; Program Evaluation; *Union Catalogs
IDENTIFIERS *Midwest Medical Union Catalog

ABSTRACT

A cost-benefit analysis of the 43-library, 260,000-title Midwest Medical Union Catalog (MMUC) of books, conducted from June, 1973, through May, 1975, under a grant from the National Library of Medicine, studied the 49-year-old catalog in the context of the interlibrary loan activity of the Midwest Health Science Library Network. The study tested the MMUC against other methods of locating materials and against the alternative of using a large backup library--the National Library of Medicine--to fill requests instead of routing requests through the network. The results of the hypothesis testing, a theoretical model of library cooperation, and eight evaluation criteria were applied to eight options for locational control of monographs. It was recommended that the network utilize existing or developing computerized data bases of monograph titles but that the current catalog be maintained at a minimum level until such time as these data bases provide the locational probability currently possible with the MMUC. Other recommendations pertaining generally to union catalogs are included. (Author/SL)

FINAL REPORT

Analysis of the Midwest Medical Union Catalog

MHSLN
Midwest Health Science Library Network
ILLINOIS / INDIANA / IOWA / MINNESOTA
NORTH DAKOTA / WISCONSIN

ED108704

ANALYSIS OF THE MIDWEST MEDICAL UNION CATALOG

FINAL REPORT

Submitted by

Paul E. Olson
Research Associate

Chester J. Pletzke
Principal Investigator

Midwest Health Science Library Network
The John Crerar Library
Chicago, Illinois
May, 1975

This publication was supported in part by NIH Grant LM 01397 from the National Library of Medicine

ABSTRACT

A cost-benefit analysis of the 43 library, 260,000 title Midwest Medical Union Catalog of books, conducted from June 1973 through May 1975 under a grant from the National Library of Medicine, studied the 49 year-old catalog in the context of interlibrary loan activity of the Midwest Health Science Library Network. The study tested the Midwest Medical Union Catalog against other methods of locating materials and against the alternative of using a large backup library (The National Library of Medicine) to fill requests instead of routing requests through the network. The results of the hypothesis testing, a theoretical model of library cooperation, and eight evaluation criteria were applied to eight options for locational control of monographs. It was recommended that the network utilize existing or developing computerized data bases of monograph titles but that the current catalog be maintained at a minimal level until such time as these data bases provide the locational probability currently possible with the Midwest Medical Union Catalog. Other recommendations pertaining generally to union catalogs are included.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

Many people have participated in various parts of this study and we thank them all for their help. A number of people helped with gathering, summarizing, and interpreting data. Mr. Alan Vognar has been patient and careful in collecting and reducing data. Ms. Doris Lowe of the Library of the Health Sciences, University of Illinois at the Medical Center helped with Hypothesis 3. The staff members of the John Crerar Library assisted in data collection. Mr. Richard Klein, Illinois College of Podiatric Medicine, pretested several of the forms used. All the network libraries returned questionnaires promptly. Libraries contributing to the catalog helped in determining their costs for production of cards contributed to the catalog. Dr. Nick Thomopoulos, Illinois Institute of Technology, provided expert consultation on hypothesis testing and statistical evaluation.

We also appreciate the effort of those who participated in the development and formulation of the recommendations. The Monographs Subcommittee of the Assembly of Resource Libraries, chaired by Ms. Ann Howard of the School of Medicine Library, Southern Illinois University, assisted with evaluating the results and formulating recommendations. Members of the Subcommittee are: Ms. Mary Hanley, University of Minnesota Bio-Medical Library; Ms. Gloria Kharibian, Southern Illinois University School of Dental Medicine Library; Ms. Barbara Millar, University of Illinois at the Medical Center Library of the Health Sciences; Ms. Carol Strauss, Northwestern University Dental School Library, and Ms. Natalie Zimmerman, Chicago College of Osteopathic Medicine Library. We also appreciate the evaluation of the recommendations by the Assembly of Resource Libraries.

We are grateful to those who have previewed a rough draft of this final report and have put up with reading it in spite of grammatical errors and disjointed ideas. Those previewing the report were: Mr. Arthur Broering, National Library of Medicine; Mr. Glenn Brudvig, University of Minnesota Bio-Medical Library; Mr. William S. Budington, The John Crerar Library; Ms. Eleanor Este Campion, Union Library Catalogue of Pennsylvania; Ms. Virginia Holtz, University of Wisconsin, Middleton Health Sciences Library; Ms. Ann Howard, Southern Illinois University School of Medicine Library; Mr. Jack Key, Mayo Clinic Library; Mr. Frederick G. Kilgour, The Ohio College Library Center; Ms. Lillian Kozuma, National Library of Medicine; Ms. Mary Jane Laatz, School of Medicine Library, Indiana University; Dr. Joseph Leiter, National Library of Medicine; Ms. Barbara Evans Markuson, Indiana Cooperative Library Services Authority; Ms. Linda Pletzke, Northwestern University Library; Dr. Harold Schoolman, National Library of Medicine; Mr. T. Dan Tonkery, National Library of Medicine; Mr. William J. Welsh, The Library of Congress; Mr. Richard T. West, National Library of Medicine; and Ms. Natalie Zimmerman, Chicago College of Osteopathic Medicine Library.

Thank you all for your cooperation.

Paul Olson
Chester Pletzke

NOTE

At the time of publication of this report, the recommendations contained in it that pertain to the Midwest Health Science Library Network have been presented to the Assembly of Resource Libraries and have been acted upon by the Assembly.

MEMBERS OF THE ASSEMBLY OF RESOURCE LIBRARIES

Mr. Charles Bandy, Librarian
Harley E. French Medical Library
School of Medicine
University of North Dakota

Mr. Glenn Brudvig, Librarian
Bio-Medical Library
University of Minnesota

Mr. William S. Budington
Executive Director & Librarian
The John Crerar Library

Mr. Richard Eimas
Assistant Librarian for the
Health Sciences
The Health Sciences Library
University of Iowa

Dr. Arthur Hafner, Ph.D.
Assistant Professor and Director
Educational Resources
School of Medicine
University of Minnesota--Duluth

Ms. Virginia Holtz, Librarian
Middleton Health Sciences Library
University of Wisconsin

Ms. Ann Howard, Medical Librarian
School of Medicine Library
Southern Illinois University

Mr. Jack Key, Librarian
Mayo Clinic Library

Ms. Mary Jane Laatz, Librarian
School of Medicine Library
Indiana University

Mr. Irwin Pizer, University Librarian
Library of the Health Sciences
University of Illinois at the
Medical Center

Ms. Mary Post, Librarian
Boeckmann Library
Ramsey County Medical Society

Ms. Bessie Stein, Director
Medical-Dental Library
The Medical College of Wisconsin

RECOMMENDATIONS:

Recommendations Specific to the Network:

Recommendation #1:

That location of monographs for interlibrary loan in the Midwest Health Science Library Network be achieved by utilizing existing or developing computerized data bases of monograph titles instead of the Midwest Medical Union Catalog.

Recommendation #2:

That the Midwest Health Science Library Network continue to study the various existing and developing systems, continue to encourage the participation of the network libraries in these systems, and continue to encourage the compatibility and interface between the various systems used by the libraries of the network.

Recommendation #3:

That the network maintain the present Midwest Medical Union Catalog, if only at a minimal level, until such time as these other computerized data bases provide the locational probability currently possible with the Midwest Medical Union Catalog.

General Recommendations:

Recommendation #1:

That in a network in which interlibrary loan requests are referred in a hierarchical manner to the larger libraries, and in which the union catalog is used only for locational purposes, only the 15 or 20 larger libraries, or libraries with special, unique collections be included in a centralized catalog.

Recommendation #2:

That the problem of locational control (traditionally the primary function of a union catalog) not be treated as separate and distinct from the problems of cooperative acquisitions, cooperative cataloging, and bibliographic control.

INTRODUCTION:

At a time when costs of books and journals, and the amount of available scientific literature have increased dramatically, libraries are turning to cooperative efforts in order to continue to provide adequate services to their patrons. Union catalogs and union lists are usually considered the first step necessary in such cooperative efforts. This study attempts to determine whether or not a regional union catalog of health science monographs does measurably aid such efforts. The study attempts to determine whether or not the benefits derived from that catalog justify the costs of maintaining it.

While the catalog studied is an existing catalog, future alternatives are also examined; the study is based on the present, but looks toward the future. The present analysis is unique in that a union catalog is thoroughly examined in the context of requests against that catalog rather than as an isolated collection of cards. Finally, the study examines not only the physical characteristics of a catalog, but also the theory upon which that catalog is based.

History of the Midwest Health Science Library Network (MHSLN):

The Medical Library Assistance Act, which was passed in 1965 and extended in 1970 and 1973, authorized among other grant-in-aid programs the Regional Medical Library Program to establish a formal network to equalize and improve access to the world's biomedical information. This program provided for a hierarchical structure within each region for sharing of resources. Interlibrary loan requests within a region are routed from the

smaller libraries (primarily hospital libraries) to the medical school libraries, to the Regional Medical Library, and finally to the National Library of Medicine (NLM) as library of last resort.

Region 7 within this network is known as the Midwest Health Science Library Network (MHSLN) and includes the states of Illinois, Indiana, Iowa, Minnesota, North Dakota, and Wisconsin. MHSLN began in 1968 as a centralized region when the John Crerar Library was designated as the Midwest Regional Medical Library. In 1973 the Midwest Regional Medical Library decentralized and became the Midwest Health Science Library Network. Currently eleven Resource Libraries share the responsibility for coordination of resource sharing within the region. Further sharing of local resources has been encouraged through an interlibrary loan program which gives incentives to libraries that join consortia or share their resources in other ways.

A primary form of cooperative activity within MHSLN is that of interlibrary loans. In 1971 there were over 100,000 items loaned by health science libraries in the region, of which about 20% were supported by National Library of Medicine funds. (Crawford, p. 17)

Development of the Midwest Medical Union Catalog (MMUC):

The Midwest Medical Union Catalog assists with the location of monographs in MHSLN. It is a main-entry card catalog containing 260,000 cards reflecting the holdings of 43 health science libraries in the six-state network. The catalog is in two parts: Part One started at the John Crerar Library in 1926, before the existence of MHSLN and shows the health-science holdings of seven Chicago-area libraries (The John Crerar Library, Northwestern University Medical School Library, University of Chicago Biomedical Libraries, Chicago Medical School Library, University of Illinois at

the Medical Center's Library of the Health Sciences, Loyola University Medical and Dental School Libraries and Rush Medical College Library). This catalog contained 161,000 cards in 1969 when additions to it ceased.

Part Two of the catalog began in 1969 when MHSLN started. Twenty-seven libraries from throughout the region contributed cards at that time and eventually 43 libraries contributed cards. Currently 35 libraries contribute main entry cards, and Part Two of the catalog contains cards for 100,000 titles. A list of contributing libraries appears in Appendix I.

In June, 1973 under a grant from the National Library of Medicine, a cost-benefit analysis of MMUC was begun. In May, 1974, Progress Report #1 of this study was published. It contains the objectives of the study, a review of the literature, a description of the hypotheses, and a description of the methodology. The Final Report you are now reading goes beyond Progress Report #1 by updating the literature review, giving the results of the hypothesis testing, analyzing the options for locational control, and presenting the recommendations of the study.

Update Of The Literature Review:

A summary of the literature review in Progress Report #1 stated that,

> . . . the literature on union catalogs can be characterized as having much information about the objectives of union catalogs and about the procedures to be used in creating and maintaining union catalogs, a few generally applicable studies with quantitative information, much information relevant to particular catalogs only, and several studies of the Midwest Medical Union Catalog. The literature also indicates that little reliable data about costs are available, that union catalogs have only infrequently been studied in the context of the traffic against these catalogs, and that technological developments are forcing changes in our thinking about union catalogs. It is in the context of this historical material and these current trends that the present study is taking place. (Olson & Pletzke, p. 15)

The literature on union catalogs has developed further in the last few years. There have been several excellent reviews of the literature on union catalogs that were written as preliminaries for studies of specific catalogs. Goldstein, in a study done for the New England Library Information Network (NELINET), provides an excellent literature review, especially of union catalogs in New England. Goldstein's review also gives good background information concerning numerical registers. (Numerical registers use a format such as that in NUC's Register of Additional Locations.)

Gleaves and Martin, in a study of the Nashville Union Catalog, provide a good review of the literature, and in addition, give cost estimates for microfilming a union catalog and for converting union catalog information into machine-readable form.

Keller uses California as a microcosm for the country, surveying union catalogs first on a national level and then in California. Keller

also provides an excellent bibliography of materials on union catalogs. Palmour, in a study conducted for the National Commission for Libraries and Information Science, presents an inventory of statewide union catalogs and indicates the dates of coverage, format, and types of libraries included.

Progress Report #1 of the Analysis of the Midwest Medical Union Catalog indicated a lack of generally applicable studies with quantitative information. That situation has been partially remedied recently. Arms developed a mathematical model of duplication likely to occur in a union catalog. The model was based on a random sample of titles in the catalog of each library studied. These titles were then searched in the catalogues of other libraries. Results of testing the model indicated that the percentage of unique titles held by a library depends not on the size of the library, but on the type and age of library, and that when adding new libraries to the set of contributing libraries, the law of diminishing returns acts more slowly than previously thought. (Arms, pp. 378-379)

Also attempting to predict the uniqueness of materials in library collections and to quantify the overlap, O'Neill used marginal analysis to determine the distribution of resources in a network. McGrath, in a study of the Louisiana Numerical Register analyzed the correlation between the number of titles contributed by a library to the register and the number of titles searched by that contributing library. McGrath found a negative correlation (-.30) and, noting that this was not as strong a negative correlation as anticipated, concluded that the results support the inclusion of the collections of small libraries in a union catalog.

Research Population:

Of the interlibrary loan requests sent to the eleven resource libraries of the network each year, 60-70% of them are filled by the resource libraries. The remaining requests are referred to other libraries in the network that hold them, or to other Regional Medical Libraries, or to the National Library of Medicine. Generally, the requests for monographs that are unfilled by other resource libraries are sent to the John Crerar Library for searching there, and then, if not found, for searching in MMUC. It is these requests, about 2,500-3,000 a year, that the study concerns itself with: requests that have been searched in at least The John Crerar Library, not located there, and then searched in MMUC.

The data collection took place from December, 1973 through August, 1974, and all 1811 requests searched against MMUC during that time are included in the population. However, of the 1811 requests studied, 159 did not have adequate verification, and these were not examined. Appearance in an unpublished paper, correspondence, or a publisher's catalog were not considered adequate verification. Thus, 1652 requests were used as the population from which the samples for the various hypotheses were drawn. Of these requests, 34% had been searched by another resource library before being sent to the John Crerar Library.

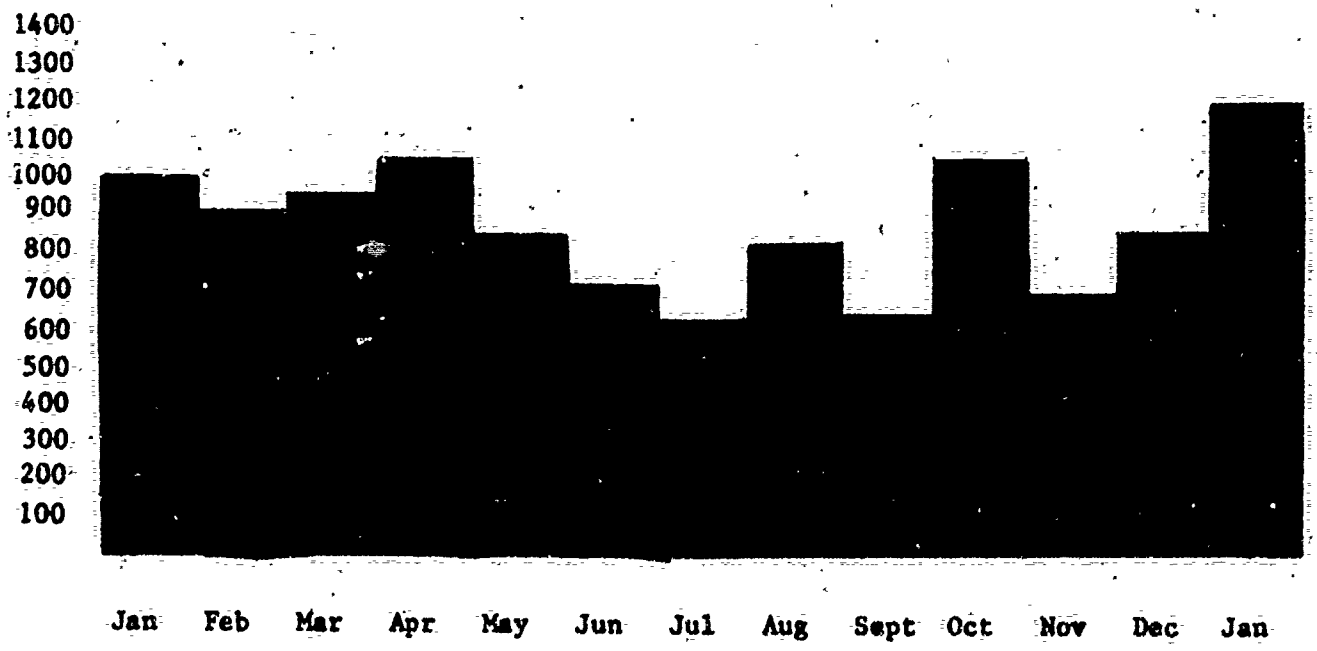
For purposes of this study, it is assumed that the research population is infinite, and that these 1811 requests are representative of

that infinite population. For this assumption to be accurate, the testing period should be a normal one for interlibrary loan activity in the network.

There are several difficulties with this assumption. The period under study was one during which the network was implementing new interlibrary loan procedures, particularly following May, 1974. However, available interlibrary loan statistics do not reflect any great change in activity. Figure 1 indicates the number of requests sent to the John Crerar Library by the network from January 1974 through January 1975. While there are variations from month to month, they are not unique to the period under study.

FIGURE 1

REQUESTS SENT TO THE JOHN CRERAR LIBRARY, JANUARY 1974 - JANUARY 1975



Furthermore, the imprint date of monographs searched in MMUC does not vary much during the test period. Table 1 indicates month by month the percentage of requests for titles published within various time periods. These figures vary little from month to month. Other statistics collected show the

TABLE 1

PUBLICATION DATE OF REQUESTS SEARCHED IN MMUC

	To 1899	1900-55	1956-64	1965-68	1969-72	1973-74	NO DATE
Dec - Jan	6%	7%	15%	14%	38%	18%	2%
February	4	11	18	18	28	21	0
March	13	9	14	13	25	25	1
April	10	8	12	13	37	18	2
May*	22	10	12	13	24	15	4
June	14	12	14	14	30	16	1
July	5	6	14	14	32	22	7
August	4	12	14	12	24	31	3
TOTAL	10%	9%	14%	14%	31%	20%	2%

same minor monthly variation, indicating that the program changes that occurred at about the midpoint in the testing period did not markedly change the nature of the monograph requests searched in MMUC.

*During May, 1974, and to a lesser extent June, 1974, a higher percentage of requests for older materials were searched in MMUC. These requests for older materials came primarily from one library and arrived in batches at this time, presumably because that library, with the advent of the new fiscal year, had a quota of subsidized ILL requests available.

Results of Hypothesis Testing:

The hypotheses below were framed to provide a thorough analysis of the Midwest Medical Union Catalog in the context of interlibrary loan requests searched in that catalog. These hypotheses are also relational in that they test the catalog against other methods of location. Finally, the hypotheses take into account the role of the National Library of Medicine as a backup library to the network.

For most of the hypotheses, only a statement of hypothesis and a statement of the result are given. Discussion of the implications of the results appears later in this report. Since Progress Report #1 described the methodology used in each hypothesis, such a description appears below only where the methodology was altered from that in that report.

Only the sample mean or the sample probability appear in the "Result" section of each hypothesis. Appendix II contains the statistical statement of the null and alternate hypotheses, type of test used, level of error, and result of the statistical analysis. Finally, the hypotheses below are statements of the Research (Alternate) hypotheses rather than of the Null hypotheses.

Research Hypothesis 1: A greater number of interlibrary loan requests for monographs can be located in the Midwest Medical Union Catalog (MMUC) than in the National Union Catalog (NUC).

Result: The research hypothesis cannot be accepted. The probability of a request being located in MMUC is 40.2%. The probability of a request

being located in NUC is 66.6%.

Research Hypothesis 2: Of the requests located in NUC, more than 50% either have no location given (cataloged only by the Library of Congress) or are located outside the geographic area included in the Midwest Health Science Library Network.

Result: The research hypothesis is accepted when NUC's Register of Additional Locations is not utilized in the experiment. In this case, 68.8% of the requests located in NUC do not have locations within the six-state area of the network. However, when the Register of Additional Locations is utilized, the hypothesis is not accepted, since 48.5% of the titles located in NUC cannot be located within the region. This means that, using NUC and the Register of Additional Locations, the probability of locating a requested title in NUC and within the region is 34.4% It should be noted that location of a requested title within the region by using NUC does not necessarily mean that the title is held by a health science library in the region.

Research Hypothesis 3: A greater number of titles requested can be located in MMUC than can be located by using an extended directory to select the probable holding library without checking any union catalog.

Selection using an expanded directory was done in two ways. First, a student assistant with an undergraduate degree in the sciences created a coordinate index to the subject areas covered by 63 of the health science libraries in the region. Then the student assistant selected a sample of

requests, and using the index, assigned the requests to probable holding libraries on the basis of subject implied in the title of the request. The requests were then sent to the selected libraries for searching in their catalogs.

Since the student assistant's background in the sciences and the fact that he had created the subject index, might have influenced the results, the experiment was later repeated using another sample of requests and the same coordinate index. However, a clerical person without a science background and formerly unfamiliar with the index made the selections in the second sample.

Result: The student assistant had a success rate of 41.4%. In this case, the research hypothesis cannot be accepted, since the success rate for MMUC was 40.2%.

The clerical person had a success rate of 30.0% and in this case the research hypothesis is accepted.

Research Hypothesis 4: It costs less to search MMUC for titles requested than to search NUC.*

Result: This research hypothesis is accepted. Cost is here expressed in terms of time for manual searching, since all other costs were the same for both methods. The average time to search MMUC was 113.6 seconds. The average time to search NUC (Not including the Register of Additional Locations) was 270.6 seconds.

---

*Cost here is a partial cost for searching the files only and does not include maintenance costs.

Research Hypothesis 5: It costs less to maintain MMUC than to maintain NUC.

Maintenance costs of MMUC include both the cost to the contributing libraries of making one extra card per set for the union catalog and the cost of combining and interfiling cards into the union catalog. A standardized cost-analysis form was used to obtain card production information from 32 of the 43 libraries and cost data from 22 of these libraries. This form was combined with visits by the researcher to 8 of the libraries to obtain cost information. (The form used in the cost analysis and the unit cost per type of reproduction method are in Appendix III.)

The cost of the National Union Catalog is the yearly cost of obtaining the monthly and annual volumes, plus 1/5 the cost of purchasing the quinquennial edition plus the average yearly cost of obtaining the Mansell volumes. This is a rough estimate only, not including the cost to six of the libraries in the network of contributing cards to NUC, nor accounting for the percentage that the use of NUC as a locating device would be of the total use of NUC in a library. However, the primary focus of this study is the cost of MMUC rathar than the cost of NUC.

Result: It cost more to maintain MMUC than to maintain one set of NUC. The yearly cost for one set of NUC was $2437, while the yearly cost for MMUC was $4559 ($2358 for local card production and $2201 for combining and filing 34,000 cards). However, if it were assumed that the same libraries contributing to MMUC also contributed to NUC, and if the cost of card production were added to the single-set NUC cost, then the National Union Catalog would cost $4795 versus $4559 for the Midwest Medical Union Catalog.

Finally, when the cost of MMUC is expressed in unit cost--the cost of maintaining the catalog and searching MMUC divided by the total

number of requests searched against the catalog--then the cost is $1.90 per request.

Research Hypothesis 6: In the case of a request located in MMUC and referred to another library in the region, of the total time from origination of a request to receipt of the monograph or status report indicating nonavailability of the monograph; over 20% of that time is spent transmitting the request to MMUC, processing it there, and sending it to a holding library.

Result: The hypothesis is accepted. The amount of time taken to send a request to MMUC, locate it there, and refer it on to another library is 49.1% of the time necessary to process the request in the network. Of the time spent processing a request, 80% is time for transmitting a request to and from MMUC by mail or teletype.

Research Hypothesis 7: Of the requests located in MMUC, the percentage of items that could not be located in the *Index-Catalogue of the Surgeon General's Office*, the *National Library of Medicine; Current Catalog*, or CATLINE is greater than 30%.

This hypothesis and hypothesis number 9 examine MMUC in relation to the National Library of Medicine, the backup library of the network.

Result: The hypothesis is not accepted. The percentage of requests located in MMUC that could not be located in the *Index-Catalogue of the Surgeon General's Office, Current Calalog,* or on CATLINE was 23.0%.

Research Hypothesis 8: The percentage of titles requested and located in MMUC that are held by only one library is greater than 30%.

Result: The hypothesis is not accepted. When the catalog is examined outside

of the context of ILL requests, there does indeed appear to be a high number of unique items (52% of the 1969-Present imprints are uniquely held--the only years when all currently contributing libraries were sending cards to the catalog). However, the percentage of requested items held by only one library is 30.2%. This is not sufficiently greater than 30%, according to standard statistical criteria, to accept the research hypothesis.

Research Hypothesis 9: Of the above titles in MMUC held by one library, the percentage that cannot be located in the *Index-Catalogue of the Surgeon General's Office*, in *Current Catalog*, or CATLINE is greater than 30%.

Result: The hypothesis cannot be accepted. Of the titles held by only one library, 33.9% could not be located in the *Index-Catalogue of the Surgeon General's Office*, in *Current Catalog* or CATLINE. This is not sufficiently greater than 30%, according to standard statistical criteria, to accept the research hypothesis.

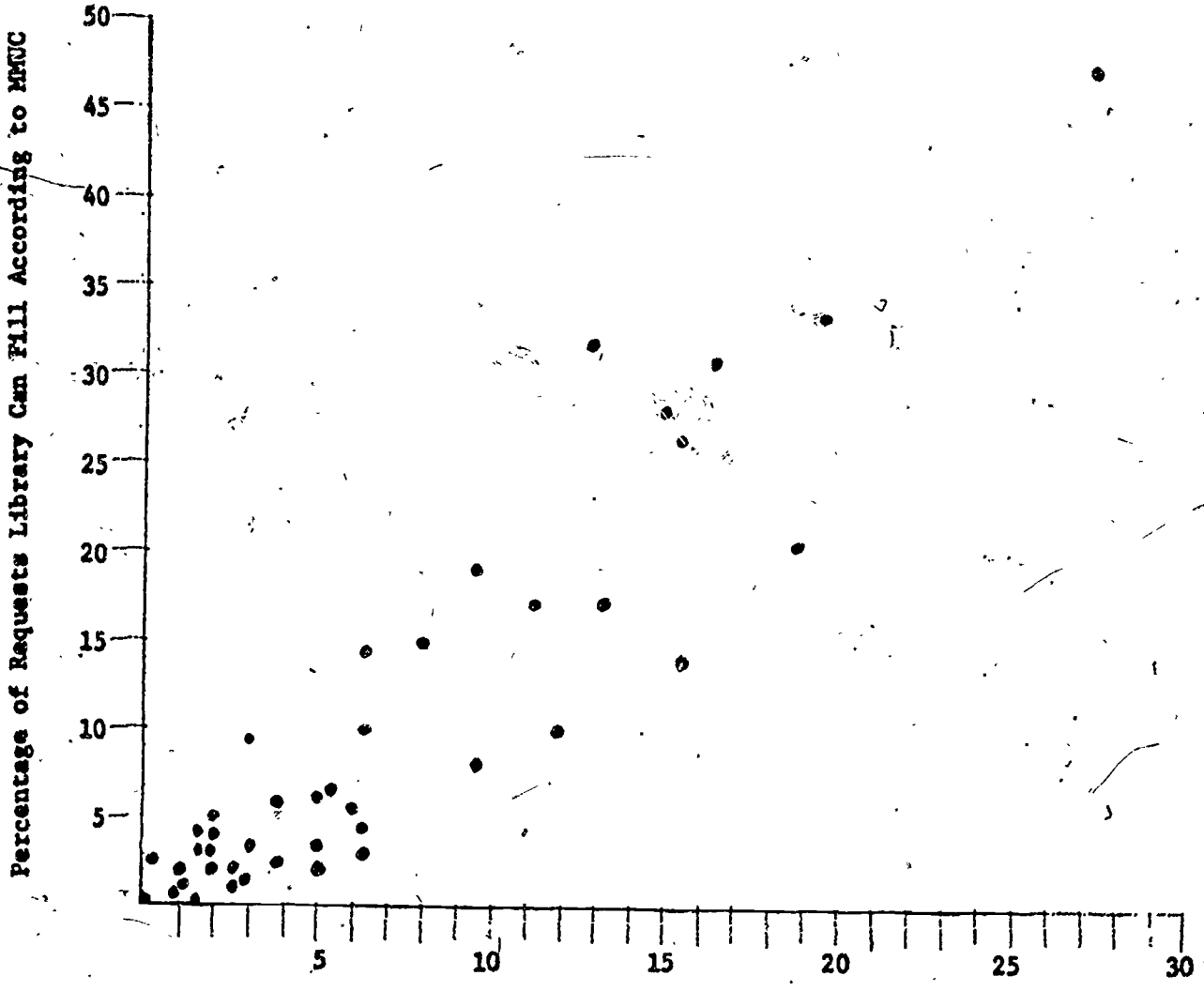
Research Hypothesis 10: There is a positive linear correlation between size (in terms of number of cards contributed to the union catalog) of contributing library and ability of that library to satisfy requests referred to the Midwest Medical Union Catalog.

A positive linear correlation indicates that the ability to satisfy requests increases with an increase in the size of the contributing library. This hypothesis has implications for the problem of which libraries should be included in any union catalog.

Result: The hypothesis is accepted. The Pearson product-moment correlation coefficient is a positive .89, indicating a high linear correlation between

FIGURE 2

PERCENTAGE OF REQUESTS A LIBRARY CAN FILL CORRELATED WITH PERCENTAGE OF CARDS IN MMUC CONTRIBUTED BY THAT LIBRARY



number of cards contributed to the catalog and ability to satisfy requests. This result is graphically depicted in Figure 2: As the percentage of cards contributed to MMUC increases, so also does the percentage of requests that a library can fill.

Research Hypothesis 11: There are libraries contributing to the Midwest Medical Union Catalog whose contributed cards can satisfy less than 1% of the interlibrary loan requests referred to the catalog.

Result: There are no currently contributing libraries that can satisfy less than 1% of the requests. However, there are fourteen libraries that can satisfy 1-5% of the requests searched in the catalog, and some of these libraries have had few requests referred to them in the five years they have contributed to the catalog.

These, then, are the results of the hypothesis tests. In addition to the information obtained from the literature search and the results of the hypothesis testing, a theoretical model of library cooperation and some evaluation criteria are used in deriving the recommendations of the study. First, the theoretical model of library cooperation is described.

THEORETICAL MODEL:

Theoretical models often have the advantage of crystalizing and clarifying ideas. One way to create a theoretical model is to apply structures or patterns from one realm of ideas to a different realm. In the theoretical model below, some concepts of mathematical set theory are applied to cooperative efforts of libraries. First, a short introduction to some set theory concepts.

A set is a collection of distinct objects of any sort, and these objects are called elements. For example, if we consider the monograph titles held by one library to be a set, then the individual titles would be the elements of that set. A union of two sets involves all the elements contained uniquely in each set and the elements in both sets (See Figure 3).

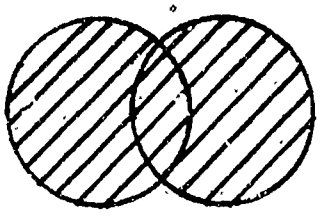


FIGURE 3

Union of Sets

If the sets were the monograph collections of two libraries, then the union of these two sets would be all the monograph titles held by either library or both libraries.

An intersection of two sets involves only those elements which are contained in both sets (See Figure 4).

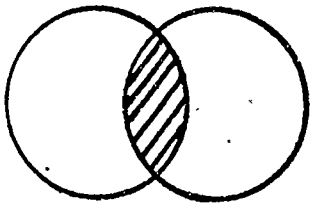


FIGURE 4

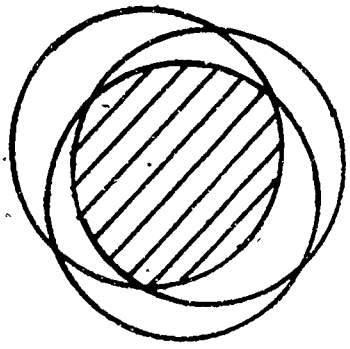
Intersection of Sets

For example, if we again consider the sets as the monograph collections of two libraries, then the intersection of these two sets would be only the monograph titles that appear in the collections of both libraries.

Figure 5 represents an intersection of sets where the intersection is large. An example of such a set configuration using libraries, would be

FIGURE 5

Large Intersection of Library Collections



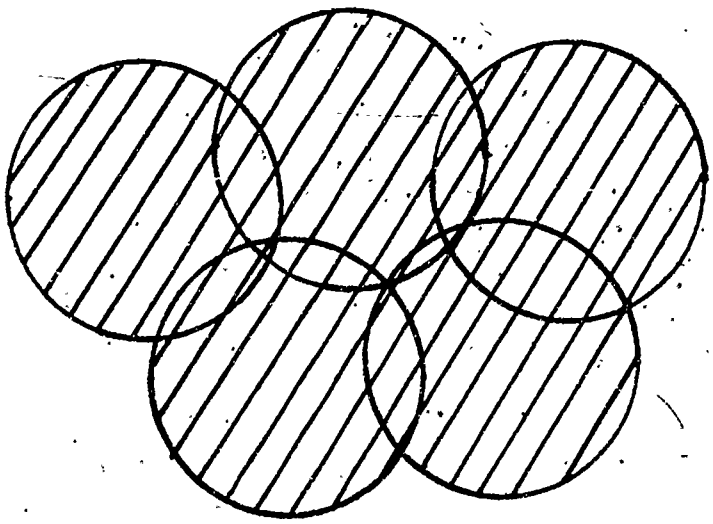
a public library system with many branches, where the sets are the monographic holdings of the branches, and where the collections in the various branches are quite similar, so that one title may be held by a number of libraries. In such a case, the intersection of all the branches (sets) is large because the number of common titles held by all branches is high. Libraries with this

type of intersection are traditionally considered ideally suited for co-operative cataloging and book processing ventures because one title may be processed for many libraries at the same time, thus cutting costs.

Figure 6 represents a union of sets where the union is large.

FIGURE 6

Large Union of
Library Collections



An example of this set is a group of libraries not having many monographic titles in common (the intersection is small), but the total number of titles held by all the libraries together is high. Such a group of libraries would be a consortium of multitype libraries, with collections in many subject areas. A grouping of libraries with a large union is well suited for cooperative ventures such as interlibrary loan and coordinated collection development.

Another kind of set mix (possible variations are many) is one in which there is a large basic set that encompasses most of the items in

the smaller sets (Figure 7). Such a set arrangement exists with libraries

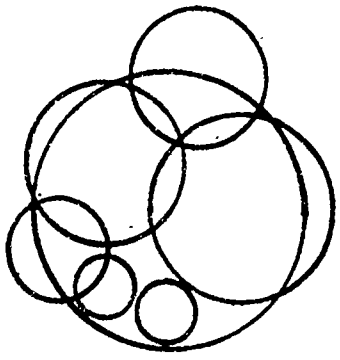


FIGURE 7

Large Basic Set

that cooperate using a large data base of bibliographic records in an interactive way for purposes of cooperative cataloging. The Ohio College Library Center (OCLC) is an example of such a system. In this arrangement the large set represents the records in the OCLC data base, whether MARC records or records added by member libraries. The smaller sets represent the member libraries. In this set mix, it does not matter so much for purposes of cooperative cataloging and processing, that there is not a large intersection of member libraries, since in many cases, the basic set contains the bibliographic record. And since the union of the member sets is not diminished by striving for a large intersection (normally desired for cooperative cataloging), the opportunities for interlibrary loan and cooperative collection development remain strong. However, the key to this type of set mix is the large Basic Set. This kind of set configuration, represented in Figure 7, is making possible different approaches to the

union catalog function. This theoretical model will be applied later in the recommendations section of this study.

CRITERIA EVALUATION:

In addition to the review of the literature, the results of the hypothesis testing, and the theoretical model, eight criteria are used in evaluating the options for locational control. These criteria are:

--Location probability: Probability that an interlibrary loan request will be located as held by one of the libraries in the network. This is the primary criterion for evaluation of a union catalog.

--Coverage: Extent to which the records in the union file reflect the total collection of health science titles in the network.

--Currency: Rapidity with which new titles cataloged in member libraries are added to the union file.

--Speed of delivery: Time necessary for locating and filling interlibrary loan requests.

--Cost: Dollar costs to the network and participating libraries in the network to maintain a file or to keep access to a file.

--Enhancement of Cooperative Efforts: Extent to which a type of union file facilitates cooperative efforts other than interlibrary loan.

--Network interface: Degree to which a union file facilitates cooperation with other networks, such as state and national networks.

--Survival: Probability that a union file will continue to exist even without government subsidy.

These eight criteria are applied to eight options for locational control of monographs. For a summary of that evaluation, see Table 2 on page 43.

NO UNION CATALOG:

In this arrangement, libraries in the network would follow a set pattern of sending a request through the network--to one resource library and then to the National Library of Medicine as a backup library--or else they would make one or two educated guesses about possible holding libraries before sending the request to the National Library of Medicine.

--Location probability: The probability of locating a request by sending it directly to a resource library is fairly good. Resource libraries currently fill 60%-70% of the requests sent to them. However, the probability that a resource library will in turn be able to locate a holding library in the network if it cannot fill the request is unknown.

The probability that NLM owns the materials is fairly good. NLM holds 61.2% of the requests searched in MMUC and 77% of the requests located in MMUC (Hypothesis 7). Also, NLM holds 66.1% of the requested items that are listed in MMUC as being held by only one library (Hypothesis 9).

--Coverage: Not applicable.

--Currency: Not applicable.

--Speed of delivery: Unknown. The average number of calendar days for a request to be initiated, be checked in MMUC, be referred to and filled by a holding library, and be received by the requesting library, is 20.6 calendar days (Hypothesis 6). However, there are no comparable statistics

for the total time it would take if requests were sent to one other resource library or directly to NLM.

--Cost: The cost of maintenance would be nonexistent; however, repeated searching for requests in different libraries would be costly.

--Enhancement of cooperative efforts: This method would not enhance other cooperative efforts.

--Network interface: Lack of a union file diminishes the chances of network interface success, because without knowledge of the various collections, the location of items in the region by libraries outside of the region is difficult.

--Survival: Not applicable.

EXPANDED DIRECTORY:

This type of location device also depends on the backup role of NLM. In this method, an expanded directory of health science libraries is created. In addition to usual directory features, such as those found in the 1971 Directory published by the Midwest Health Science Library Network, this directory would contain a detailed subject index representing collection strengths of libraries. Such a subject index was used in Hypothesis 6.

Interlibrary loan personnel, when deciding where to refer a request, would determine the implied subject of the request from the title of the monograph, look up the subject in the subject index, and assign the request on the basis of subject strength and collection size. Such a directory would augment the educated-guess approach discussed in the previous option.

There is precedent for such a device. Markuson reports that Connecticut prepared a similar directory as an interim location device for monographs held by libraries in that state. (Markuson, p. 75)

--Location probability: The location probability for such a device is average. An expanded directory was tested in this study, and when the creator of the directory (a student assistant with a science degree) used it, the location probability was 41.4%. When an interlibrary loan clerk without a science degree and without former familiarity with the directory used it, the location probability was 30.0%. (Hypothesis 3)

--Coverage: Coverage of the collections of a number of libraries would be easy to attain, but reflection of actual titles would depend on accuracy and specificity of collection assessment and on the extent to which titles

analyzed by ILL librarians suggest the true subjects of those monographs.

--Currency: Below average because the directory would probably not be sensitive to changes in collection development.

--Speed of delivery: Unknown.

--Cost: The cost would vary with the number of libraries included. However, if the location device were an expansion of an already existing directory, published for other purposes, the marginal cost may not be much.

--Enhancement of cooperative efforts: The effect of this tool on cooperative efforts would be minimal. The tool both enhances ILL efforts and identifies collections, and can thus be used for coordinated collection development, but it is not sufficiently narrow and specific for extensive use in this area.

--Network interface: Minimal. Again, it is not sufficiently specific to allow other networks to use the tool with confidence.

--Survival: Below average. The marginal benefits (benefits beyond those achieved through educated guessing) are slight. The biggest problem is that the expanded directory does not afford referral certainty, since even if a user located a subject, he would not be certain of locating a requested title. Consequently there is also time spent in repeated searching for titles at various institutions. However, this tool could have applications, for example, in a consortia of a small number of libraries with limited money to spend on union lists and a potential for very specific collection description.

CENTRAL UNION CATALOG:

In this configuration there is one central union file that users communicate with by mail, teletype, or telephone in order to refer items. The Midwest Medical Union Catalog is of this type. Main entry cards are sent to the Midwest Medical Union Catalog and are filed in a central catalog.

--Location probability: Average. 40.2% of the ILL requests searched against this file are located as being held by a library in the network. These are requests that have already been searched but not located in the John Crerar Library.

--Coverage: Above average. The coverage of such a central file is above average if the larger health science libraries and libraries with special collections contribute to it. The file is then an approximation of the monographs in the region during the existence of the file. In the case of MMUC, 35 libraries contribute to the catalog, and care was taken when the file was created to include large and special collections.

--Currency: Average. The catalog is fairly current, with cards being added to it one to two months after they are sent to the catalog.

--Speed of delivery: Below average. Items must be transmitted to the catalog for referral. In the case of MMUC, 49.1% of the total time necessary to process a referred request within the region is spent transmitting the request to the central catalog, processing it there, and transmitting it to the holding library (Hypothesis 6). However, this delivery speed can be improved by using other means of communication with the central catalog.

Recently, several libraries have begun telephoning to have their requests searched in MMUC. This practice will be encouraged in the future.

--Cost: The total cost of the maintenance of the union catalog is low. The yearly cost for MMUC is $4559 ($2358 for local card production by contributing libraries and $2201 for combining and filing 34,000 cards at the management office--Hypothesis 5.) However, when the cost is expressed in unit cost terms--the cost of maintaining the catalog and searching it divided by the total number of searches made against the catalog--the cost seems higher. Calculated in this way, the unit cost is about $1.90 per request searched against the catalog (Hypothesis 5). This unit cost results from the low volume of searches against the catalog.

--Enhancement of cooperative efforts: Below average. Because the catalog is not physically present at the individual libraries, or easily accessed, it does not contribute to other cooperative efforts such as cooperative collection development.

--Network interface: Below average. This type of catalog contributes only slightly to network interface, with few libraries outside of the region utilizing it.

--Survival: Above average. The maintenance costs are low ($2201 for combining and filing) and libraries are willing to continue to bear the cost of contributing cards to it.

DISTRIBUTED CATALOG:

This catalog is essentially the same catalog as the central one except that multiple copies are made for distribution to libraries in the region. Distributed catalogs can take many forms. They can be microform versions of the central catalog, or book catalogs, or, in order to reduce printing costs, registers of numbers listing some identifying number such as ISBN number, NLM citation number, or LC card number, and then the holding libraries.

--Location probability: Average. The same as for the central catalog.

--Coverage: Average. The same as for the central catalog.

--Currency: Below average. These types of catalogs require frequent supplements, and the literature study of union catalogs indicates that, while it is often possible to obtain the funds to publish an original distributed catalog, it is often difficult to maintain a level of funding sufficient to publish regular supplements.

--Speed of delivery: Average. This is the main advantage of such a catalog. With the current central catalog, 49.1% of the time is spent referring a request to the catalog, searching it there, and referring it on to the holding library. With a distributed catalog, this time would be eliminated.

--Cost: More than average. A rough estimate of the cost of a register of numbers for the Midwest Medical Union Catalog indicates that the cost for the original volumes would be $16,000. This estimate includes locating

a unique identifying number for each title, converting data, programming, photocomposing and printing 500 copies of the register. At any rate, any distributed catalog would cost more than the present central card catalog.

--Enhancement of cooperative efforts: Average. Libraries could easily check the file for other holding libraries in the region before purchasing expensive or low priority items, but such a usage would depend on the currency of the tool.

--Network interface: Average. Such a distributed catalog would facilitate network interface, since it would be available to other networks.

--Survival: Below average. The cost of keeping such a file current would be high and this would diminish its chance of survival.

The options for location of monographs discussed above (except for no catalog at all) have some characteristics in common. They require the maintenance of a data base by the network, and their main function is a union catalog function: the location of titles. Further, these files represent only the holdings of libraries in the region.

The following options do not require maintenance of a data base by the network, and their union catalog function is a byproduct rather than a primary activity. In other words, the union catalog file is generated through shared cataloging activity. Finally, they are mostly larger data bases reflecting the holdings of libraries other than those in the network. Generally, these data bases better fit the theoretical model of a large Basic Set whose records generally include the titles held by the individual libraries.

NATIONAL UNION CATALOG:

--Location probability: Average. While 66.6% of the requests may be located in NUC (Hypothesis 1), the probability of locating a requested title in NUC and within the region is 34.3% when using the Register of Additional Locations. However, the Register has recently been improved and, partly due to automation, a backlog of reports has been removed. Location probability using the Register should improve in the future.

--Coverage: Below average. The coverage of this file is partly a function of the number of libraries that contribute to it. Currently, six of the libraries that contribute to MMUC also contribute to NUC.

--Currency: Below average. This is the biggest problem. While the original cataloging will appear in the monthly volumes, the holdings information for libraries in the region may not appear until the annual or quinquennial editions because of the timing of the cumulations.

--Speed of delivery: Average. The NUC acts as a distributed catalog with resource libraries doing their own searching without sending the request to a central location.

--Cost: The cost to the network is minimal since the network does not have to maintain a central catalog. The cost to a library of obtaining the monthly, annual, quinquennial and Mansell volumes as they come out is about $2500 a year. Clearly the libraries in the region would not purchase NUC for its locational information alone. Furthermore, the search time using NUC is over twice as long as that using MMUC (Hypothesis 4).

--Enhancement of cooperative efforts: Below average. The holdings information is not sufficiently current to facilitate cooperative acquisitions.

--Network interface: Average. Network interface is facilitated because one location device lists the holdings of libraries both in and out of the network.

--Survival: Above average.

THE NATIONAL LIBRARY OF MEDICINE'S CATLINE:

In this option it is assumed that NLM is willing to add location symbols of the major libraries in the region to CATLINE in a way similar to the way they are added to the serials record in SERLINE. The file structure of CATLINE is such that location symbols for up to 100 libraries could be added to the CATLINE record.

--Location probability: Average. 61% of the requests for monographs in the network can be located at NLM. Furthermore, only 9.6% of the requested items can be located in MMUC but not at NLM.

--Coverage: Below average. This system does not allow libraries (other than the three libraries cooperating in cataloging for it) to add titles that are not already on the file. Hence the file would be a partial reflection of the titles in the network.

--Currency: The currency of the file would vary, depending on how location symbols were added to the file. If they were added on-line by the holding library, currency would be above average. If they were batched and added periodically, currency would be average.

--Speed of delivery: Average. Because of the availability of terminals in the health science libraries in the network, and the ability to refer a request directly without sending it to a central catalog, speed of delivery would increase.

--Cost: The cost of this tool to the Management Office of the Network would be small, though there would be a cost to the National Library of

Medicine and to the health science libraries supplying holdings information to it.

--Enhancement of cooperative efforts: This option would enhance some other cooperative efforts, especially coordinated collection development, and would also make possible better coordination between the network libraries and the backup library. However, the system does not allow cooperative cataloging to the extent afforded in the systems described below, nor does it result in production of catalog cards for libraries in the network.

--Network interface: Above average. This option would increase opportunities for network interface; however, this interface would be primarily with other regions in the Biomedical Communication Network and with NLM.

--Survival: Unknown, since the tool does not currently exist in the format described.

UNIVERSITY OF MINNESOTA BIO-MEDICAL LIBRARY'S MINICOMPUTER SYSTEM:

This stand-alone, on-line, mini-computer system is designed to handle data management for all library operations and to be an in-house system for a medium-sized library. Three other health science libraries in the network have plans for replicating the system in their own libraries, and such replication would make possible the linking together of these minicomputers so that each mini could rapidly search the files of other libraries if it could not locate an item in its own files. If the number of files became too large for such searching, then a central abbreviated index to all the files could be developed.

In this option, there would be no complete and separate union catalog file as such, but the union catalog function would be accomplished by rapid switching and searching of various data basis, or, if that system became overloaded, an index to the various files. In any case, the union catalog function would be a byproduct of the system, rather than a primary objective.

--Location probability: Unknown. It would be a function of the number of libraries participating.

--Currency: Above average. Records would become searchable as soon as created, and in-process files would be available for searching.

--Speed of delivery: Above average. Since the mini-computer system is designed for handling all library operations, it would be possible not only to query the catalog file, but also the circulation file of a library,

and to leave a message that the book has been requested on interlibrary loan. This switching of interlibrary loan requests would improve speed of delivery.

--Cost: There is no cost to the Management Office of the network. There would be substantial cost to libraries wishing to replicate the system, and the system would not be chosen by a participating library for its locational function. How much of the system cost would be ascribed to the locational function is unknown at this time.

--Enhancement of cooperative efforts: Other cooperative efforts would be much enhanced, including cooperative acquisitions (from the sharing of in-process and cataloging files), cataloging, and collection development.

--Network interface: This is below average, since the system is not designed to utilize a larger data base with location symbols reflecting the holdings of more than one network.

--Survival: Unknown at this time because the system is in developmental and early implementation stages.

THE OHIO COLLEGE LIBRARY CENTER (OCLC):

OCLC is an on-line cooperative cataloging project utilizing MARC records and input from member libraries. When a library instructs the system to produce library cards for it, OCLC also enters that library's symbol as a holding library, thus creating a union catalog as a byproduct. OCLC is becoming more attractive to medical libraries because several other medical libraries are now using it for cataloging, because Washington University Medical School Library could enter its 18,000 record, 10 year file of MARC-format records into OCLC, and because NLM may develop a conversion program to convert its records to MARC format such that they can be put into the OCLC file. Six health science libraries in MHSLN are currently making plans to obtain services of OCLC, with several other libraries seriously considering using the system.

--Location probability: Unknown. This depends on the number of libraries in the network which utilize OCLC.

--Coverage: Unknown. This also depends on the number of libraries using the system.

--Currency: Above average. Records are in the union file as soon as catalog cards are requested.

--Speed of delivery: Above average. There is no need to send requests to a central catalog to be searched.

--Cost: As with the mini-computer system, there is no cost to the network but there is a cost to the individual library based on the number of OCLC

records used for cataloging. Recently, OCLC instituted search costs for terminals in public service areas, and some of these searches would be for interlibrary loans. For those terminals in cataloging areas, however, the cost that is attributable to the location function is unknown at this time.

--Enhancement of cooperative efforts: Above average. Because of the currency of the file, it is well-suited for such projects as cooperative acquisitions. And of course, the OCLC system itself is based on cooperative cataloging.

--Network interface: Above average. An advantage of a large file such as OCLC, which is used by many libraries in a number of networks, is that network interfacing becomes much easier because there is a large, shared data base.

--Survival: Above average. This system has been operational for several years and continues steady growth.

These, then, are the results of the hypothesis testing, the theoretical model of library cooperation, and the analysis of options on the basis of evaluation criteria. All of these, together with the information from the review of the literature, are now brought together in the recommendations for the Midwest Medical Union Catalog.

TABLE 2
SUMMARY OF OPTIONS FOR LOCATIONAL CONTROL

Options	Location Probability	Coverage	Currency	Speed of Delivery	Cost	Enhancement of Cooperative Efforts	Network Interface	Survival
	Criteria							
No Catalog	Unknown	Not Applicable	Not Applicable	Unknown	None	None	Below Average	Not Applicable
Expanded Directory	Average	Above Average	Below Average	Unknown	Less than Average	Below Average	Below Average	Below Average
Central Catalog	Average	Above Average	Average	Below Average	Less than Average	Below Average	Below Average	Above Average
Distributed Catalog	Average	Average	Below Average	Average	More than Average	Average	Average	Below Average
NUC	Average	Below Average	Below Average	Average	Average	Below Average	Average	Above Average
NLM	Average	Below Average	Average-Above Average	Average	Less than Average	Average	Above Average	Unknown
Minnesota Minicomputer	Unknown	Unknown	Above Average	Above Average	Unknown	Above Average	Below Average	Unknown
OCLC	Unknown	Unknown	Above Average	Above Average	Unknown	Above Average	Above Average	Above Average

Cost evaluation on this table reflects the cost to the Management Office of the network only, not the cost to individual libraries. For a discussion of these costs, see the text. The term "Average" as used in the table has no precise definition. To get an approximation of the meaning of the term within each criterion, compare the use of the term for different options within the same criterion.

RECOMMENDATIONS:

Recommendations Specific to MHSLN:

Recommendation #1:

That location of monographs for interlibrary loan in the Midwest Health Science Library Network be achieved by utilizing existing or developing computerized data bases of monograph titles instead of the Midwest Medical Union Catalog.

This recommendation recognizes that there are changes and developments in the methods of locating materials that are becoming more attractive to the network. In a sense, the recommendation is a recognition of development already taking place in the Midwest Health Science Library Network, and a recognition of the implications of these developments. Specifically, six health science libraries in the network are already preparing to utilize OCLC, and several other libraries are giving this option some consideration. Futhermore, several libraries are making plans to replicate the University of Minnesota Bio-Medical Library's Minicomputer system.

These developments make it possible to anticipate a time in which the locational function for purposes of interlibrary loan is a byproduct of cooperative cataloging rather than a separate function. And this kind of system is one that more closely resembles the theoretical model in which there is a large basic set that encompasses the smaller sets and makes both locational control and other cooperative actions possible.

While the overall costs of maintaining the present catalog are not high, the unit cost per request seems high because of the low volume of

requests against the catalog. Expansion or increased sophistication of the present catalog into some form of distributed catalog should not be an option chosen; such an option would further increase the unit costs of the catalog.

Finally, while the present catalog does provide good probability of location of materials within the network, it does not provide for other benefits such as cooperative acquisitions or increased network interface. And the literature search indicates that there is precedence for generating the location function as a byproduct of cooperative cataloging. In 1974 the Union Library Catalogue of Pennsylvania urged its contributing libraries to join OCLC and to send to the Catalogue only those foreign language titles not included in OCLC or those titles not cataloged on OCLC. (Campion)

Recommendation #2:

That the Midwest Health Science Library Network continue to study the various existing and developing systems, continue to encourage the participation of the network libraries in these systems, and continue to encourage the compatibility and interface between the various systems used by the libraries of the network.

This recommendation recognizes recent changes and developments in the area of bibliographic and locational control of monographs and the need for libraries in the network to stay abreast of these developments. It was in this vein that the Management Office of the Network initiated discussions with OCLC to enable interested network resource libraries to participate in that system. Similarly, the network should study other systems such as the Minicomputer system in Minnesota, INCOLSA in Indiana, the BIBNET system from Information Dynamics Corporation, the Midwest Library Network (MIDLINET), the Illinois State Library Network's usage of the OCLC system, and other systems to determine their implications for the network.

The Midwest Health Science Library Network will, in several years, be in a unique position of being able to examine the effectiveness of several different computerized systems to see how well they fulfill the union catalog function. Results of such examination can then be compared with the results of the present study.

Recommendation #3:

That the network maintain the present Midwest Medical Union Catalog, if only at a minimal level, until such time as these other computerized data bases provide the locational probability currently possible with the Midwest Medical Union Catalog.

This recommendation recognizes that the present catalog does an adequate job of locating materials in the network (the primary function of a union catalog), that the catalog's cost to the network is low, that the other alternatives mentioned cannot provide adequate locational control at this time, that locational control is necessary until they do provide such control.

The recommendation is based on the state of the art in locational control of monographs in the network area. OCLC is just beginning to extend its services to the states of MHSLN, and medical libraries are increasingly participating in OCLC. The University of Minnesota Bio-Medical Library's minicomputer project is entering implementation stages. BIBNET has only recently been offered to libraries. The NLM file of monographs may soon be convertible into MARC format. The INCOLSA project in Indiana is beginning. The Illinois State Library Network's participation in OCLC will soon go beyond the pilot project stage. The Midwest Library Network is in formation stages, and the National Commission is studying the feasibility of a national network.

How rapidly these systems attain full development in the network is uncertain at this time, and since the locational function is the primary one for a union catalog, the current centralized catalog should be maintained until these developing systems satisfy this criterion at a success rate equal to that currently possible with MMUC.

Maintenance of MMUC is already at a minimal level, as can be seen in the discussion of the Central Catalog option (p. 30). The cost for combining and filing the cards sent to MMUC is kept at a minimum by not doing any verification of contributed cards to resolve differences in main entry choice on the part of contributing libraries. A study of a sample of titles in the catalog to determine the effect of this minimal maintenance indicated that 5% of the titles in the catalog are duplicate cards filed in different locations because of different main-entry choice.

This is a tolerable level of duplication, especially since the catalog is not used for such functions as locating all the books written by one author. With any index or catalog, the cost is either spent creating and maintaining the catalog or searching the catalog, and the two costs are usually inversely related. In the case of MMUC, the volume against the catalog is low. It is thus preferable that the unit cost of maintenance of the catalog be low and that the cost of searching be allowed to rise.

Finally, the number of libraries contributing to the catalog should be reduced. Eight of the 43 libraries that formerly contributed to the catalog no longer contribute. In addition, libraries that can currently fill less than 5% of requests and less than 2% of unique requests should be asked to discontinue their contribution. This would involve 14 libraries and about 5,000 cards per year. If these 14 libraries no longer contributed to the catalog, the number of uniquely-held, requested items in the catalog would be reduced by less than 4%. Many of these libraries have received few, if any, referrals from the catalog, and the titles that they could fill are held by larger libraries in the network.

General Recommendations:

Recommendation #1:

That in a network in which interlibrary loan requests are referred in a hierarchical manner to the larger libraries, and in which the union catalog is used only for locational purposes, only the 15 or 20 larger libraries, or libraries with special, unique collections be included in a centralized catalog.

There is some controversy about which libraries should be included in any union catalog. Merritt studied the overlap of library collections in six union catalogs and suggested that, because of duplication patterns, only the 10-15 largest libraries be included in a union catalog (Merritt, p. 92). On the other hand, Arms found that the percentage of unique items in a library collection is related to age and type of library rather than to size (Arms, pp. 378-379).

From the data collected in Hypothesis 10 of the present study, it would appear that Merritt's suggestion is more appropriate in cooperative situations where requests are referred in a hierarchical fashion to larger libraries, and where the union catalog is used for locational purposes only. In MMUC, the correlation between number of cards contributed to th atalog and ability to fill requests searched in the catalog is a positive .89.

The difference between the findings in the Arms' study and those in the present study might be accounted for by the fact that Arms examined catalogs of potential contributing libraries, while the present study examined a union catalog in the context of requested items. It is possible for a library with a highly unique collection to contribute to a union catalog

but rarely have any items requested by other than its own primary users. Arms provides valuable data for planning union catalogs, but such planning should also take into account the requests to be searched in the catalog.

In terms of the theoretical model, when the locational function alone is considered, only those libraries should be included in the union catalog that significantly increase the union of sets when those sets are also defined in terms of requested item.

This recommendation, on the other hand, does not intend to suggest that smaller libraries not contribute to any location tools at all, or that they rely entirely on the larger libraries of a network. If these libraries intend to cooperate in loaning materials to each other before requesting those materials from the larger libraries, and if there were no distributed union catalog, then it would be to their advantage to have a locational tool at that local level to facilitate such cooperation.

Recommendation #2:

That the problem of locational control (traditionally the primary function of a union catalog) not be treated as separate and distinct from the problems of cooperative acquisitions, cooperative cataloging, and bibliographic control.

This recommendation looks toward the future. In the past, cooperation in a union catalog activity has been the easiest first step toward any kind of cooperative activity. This effort should not be discounted or discontinued in lieu of other forms of cooperative activity. However, the technology now being utilized by library systems is such that it is becoming possible for different types of libraries to cooperate in different ways without one kind of cooperative effort detracting from another kind.

Specifically, when the model of cooperation is a large basic set, with the possibility of quick access by a number of libraries, then it is no long necessary to limit cooperative cataloging to certain types of libraries, or resource sharing to other types of libraries. A basic file becomes the means of bringing different kinds of cooperation together by many different kinds of libraries without the need to maintain separate data bases for each of these cooperative activities.

BIBLIOGRAPHY

Arms, W. Y. "Duplication in Union Catalogs," Journal of Documentation 29(4): 373-379 (Dec., 1973).

Campion, E. S. Director, Union Library Catalogue of Pennsylvania, Correspondence, April 30, 1975.

Crawford, H. Study of Interlibrary Loan Activity Conducted by the State Networks Coordination Committee of the Council of the Midwest Regional Medical Library, March - April, 1971. Chicago: Midwest Regional Medical Library, 1973.

Gleaves, E. S.; Martin, I. M. An Investigation of More Effective Means of Organization and Utilization of the Nashville Union Catalog. Final Report. Nashville: George Peabody College for Teachers, 1970.

Goldstein, S.; et al. Development of a Machine Form Union Catalog for the New England Library Information Network (NELINET). Final Report. Wellesly, Mass.: New England Board of Higher Education, 1970.

Keller, C. D. Union Catalogs and Lists: Aspects of National and California Coverage. Occasional Papers No. 114, Urbana, Ill.; University of Illinois Graduate School of Library Science, 1974.

McGrath, W. E.; Dyson, S. "Regional Interlibrary Loan: An Old Idea; A New Tool and a New Dimension," RQ 13 (4):293-298 (Summer, 1974).

Markuson, B. E. The Cooperative Library Services Authority -- A Plan for the Future; Final Project Report of the Cooperative Bibliographical Center for Indiana Libraries (COBICIL) Feasibility Study. Indianapolis: The Indiana State Library, 1974.

Merritt, L. C. "The Administrative, Fiscal and Quantitative Aspects of the Regional Union Catalogues," in Downs, R. B. ed., Union Catalogs in the United States. Chicago: American Library Association, 1942, pp. 3-128.

Olson, P. E.; Pletzke, C. J. Analysis of the Midwest Medical Union Catalog, Progress Report #1. Chicago: Midwest Health Science Library Network, The John Crerar Library, May, 1974.

O'Neill, E. T. "Distribution of Library System Resources," 36th Annual Meeting of the Am. Soc. Inf. Sci., Los Angeles: October, 1973, pp. 175-176.

Palmour, V. et al. Resources and Bibliographic Support for a Nationwide Library Program; Final Report to the National Commission for Libraries and Information Science. Rockville, Maryland: Westat, Inc., 1974.

Stone, J. P. "Regional Union Catalogs: A Study of Services Actual and Potential," in Downs, R. B. ed., Union Catalogs in the United States. Chicago: American Library Association, 1942, pp. 129-228.

APPENDIX I

LIBRARIES CONTRIBUTING TO MMUC

APPENDIX I

Contributing Libraries

Midwest Medical Union Catalog

ILLINOIS

American Dental Association	ICADA
American Hospital Association	ICAH
American Veterinary Medical Association	ICAVS
Children's Memorial Hospital, Chicago	ICChH
Cook County, Illinois, Hospital	ICCH
Chicago Medical School	ICCM
Cook County, Illinois, School of Nursing	ICCN
Chicago College of Osteopathic Medicine	ICCO
Illinois College of Optometry	ICICO
The John Crerar Library	ICJ
Loyola University of Chicago Medical Center	ICL
Illinois Masonic Medical Center	ICMM
Michael Reese Hospital and Medical Center	ICRH
Rush Presbyterian St. Luke's Medical Center	ICRM
University of Chicago, Bio-Medical	ICU-M
Northwestern University Dental School	IEN-D
Northwestern University Medical School	IEN-M

National College of Chiropractic	ILoC
Illinois State University at Normal	INS
University of Illinois at Urbana, Biology	IU-B
University of Illinois at the Medical Center	IU-M
University of Illinois at Urbana, Veterinary Medicine	IU-V

INDIANA

Butler University College of Pharmacy	InIB-P
Purdue University, Life Science	InLP-L
Purdue University, Pharmacy	InLP-P
Purdue University, Psychology	InLP-Ps
Purdue University, Veterinary-Medical	InLP-V
University of Notre Dame, Life Sciences	InND
Indiana University, Anatomy-Physiology	InU-A
Indiana University, Biology	InU-B
Indiana University, School of Dentistry	InU-D
Indiana University, School of Medicine	InU-M
Indiana University, Optometry Library	InU-O

IOWA

Iowa State Medical Library	Ia-M
U.S. Dept. of Agriculture, Agricultural Research Service National Animal Disease Laboratory	IaAAR
College of Osteopathic Medicine and Surgery, Des Moines	IaDmS

MINNESOTA	
Mayo Clinic	MnRM
University of Minnesota School of Agriculture	MnU-A
University of Minnesota Bio-Medical	MnU-B
NORTH DAKOTA	
University of North Dakota Medical School	NdU-M
WISCONSIN	
Medical College of Wisconsin, Medical-Dental	WMM-M
University of Wisconsin Medical School	WU-M
University of Wisconsin School of Pharmacy	WU-P

APPENDIX II

Statistical Analysis of Hypotheses

Research Hypothesis 1: A greater number of interlibrary loan requests for monographs can be located in the Midwest Medical Union Catalog (MMUC) than in the National Union Catalog (NUC).

$$\left.\begin{array}{l} H_o: \ P_{mmuc} = P_{nuc} \\ H_a: \ P_{mmuc} > P_{nuc} \end{array}\right\} \quad \alpha = .05$$

Pre-1956 imprints in the alphabetical range from Ko--Z are not included in the tabulation for this hypothesis.

$n_{mmuc} = 555$ $\quad \hat{p}_{mmuc} = \dfrac{\text{requests located in mmuc}}{555} = .402$

$n_{nuc} = 504$ $\quad \hat{p}_{nuc} = \dfrac{\text{requests located in nuc}}{504} = .667$

D.R.: Reject H_o if $Z > 1.64$.

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_o\hat{q}_o/n_1 + \hat{p}_o\hat{q}_o/n_2}} = -8.63$$

where $\hat{p}_o = \dfrac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2} = .528$

- 8.63 is less than 1.64 therefore H_o cannot be rejected. H_o is accepted.

Research Hypothesis 2: Of the requests located in NUC, more than 50% either have no location given or are located outside the geographic area included in the Midwest Health Science Library Network.

$$\left.\begin{array}{l} H_o: P_{-loc} = .50 \\ H_a: P_{-loc} > .50 \end{array}\right\} \alpha = .05$$

where P_{-loc} is the probability that a request located in NUC has no location given in the geographic area included in the Midwest Health Science Library Network.

A. Without *Register of Additional Locations*:

$n = 336 \qquad \hat{p} = \dfrac{\text{Requests outside region}}{336} = .688 \qquad p_o = .50$

D.R.: Reject H_o if $Z > 1.64$.

$$Z = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}} = 6.9$$

6.9 is greater than 1.64; therefore, reject H_o.

B. With *Register of Additional Locations*:

$n = 336 \qquad \hat{p} = \dfrac{\text{Requests outside region}}{336} = .485 \qquad p_o = .50$

D.R.: Reject H_o if $Z > 1.64$

$$Z = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}} = -.549$$

$-.549$ is less than 1.64; therefore, H_o cannot be rejected.

H_o is accepted.

Research Hypothesis 3: A greater number of titles requested can be located in MMUC than can be located by using an expanded directory to select the probable holding library without checking any union catalog.

$$\left.\begin{array}{l} H_o: P_{mmuc} = P_{dir} \\ H_a: P_{mmuc} > P_{dir} \end{array}\right\} \alpha = .05$$

A. Library Clerk:

$$n_{mmuc} = 555 \qquad \hat{p}_{mmuc} = \frac{\text{Requests located by MMUC}}{555} = .402$$

$$n_{dir} = 240 \qquad \hat{p}_{dir} = \frac{\text{Requests located expanded directory}}{240} = .30$$

D.R.: Reject H_o if $Z > 1.64$.

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_o \hat{q}_o / n_1 + \hat{p}_o \hat{q}_o / n_2}} = 2.73$$

$$\text{where } \hat{p}_o = \frac{n_1 \hat{p}_1 + n_2 \hat{p}_2}{n_1 + n_2} = .371$$

2.73 is greater than 1.64; therefore, reject H_o.

B. Student Assistant:

$n_{mmuc} = 555$ $\quad \hat{p}_{mmuc} = \frac{\text{Requests located by MMUC}}{555} = .402$

$n_{dir} = 302$ $\quad \hat{p}_{dir} = \frac{\text{Requests located expanded directory}}{302} = .414$

D.R.: Reject H_o if $Z > 1.64$.

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_o\hat{q}_o/n_1 + \hat{p}_o\hat{q}_o/n_2}} = -0.342$$

$$\text{where } \hat{p}_o = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2} = .406$$

- .343 is less than 1.64.

Therefore H_o cannot be rejected. H_o is accepted.

Note: The significance of the test was not limited by the percentage of questionnaire return because the return on both parts of the test was 100%.

Research Hypothesis #4: It costs less to search MMUC for titles requested than to search NUC.

$$\left.\begin{aligned} H_o&: \mu_x = \mu_y \\ H_a&: \mu_x < \mu_y \end{aligned}\right\} \alpha = .05$$

where x is time to search MMUC and y is time to search NUC.

$n_x = 76$ | $\bar{x} = 113.6$ $S_x^2 = 3504.6$

$n_y = 142$ $\bar{y} = 270.6$ $S_y^2 = 26114.6$

Test for equal variances:

$$\left.\begin{array}{l} H_o: \sigma_1 = \sigma_2 \\ H_a: \sigma_1 = \sigma_2 \end{array}\right\} \alpha = .05$$

$$F = \frac{S_y^2}{S_x^2} = \frac{26114.6}{3504.6} = 7.45$$

D.R.: Reject H_o if $F > 1.47$ (the table value of F at 141 and 75 degrees of freedom).

7.45 is greater than 1.47.

Therefore reject H_o.

Since the variances are not equal, the t' test for populations with unknown and unequal variances is used.

D.R.: Reject H_o if $t' > t_{\alpha;v}$

$$t' = \frac{\bar{y} - \bar{x}}{\sqrt{S_x^2/n_x + S_y^2/n_y}} = 10.4$$

$$v = \frac{(S_x^2/n_x + S_y^2/n_y)^2}{\left[(S_x^2/n_x)^2/(n_x + 1)\right] + \left[(S_y^2/n_y)^2/(n_y + 1)\right]} - 2 \cong 198$$

$$t_{\alpha;v} = t_{.95;198} = 1.64$$

10.3 is greater than 1.64. Therefore reject H_o.

Research Hypothesis #5: It costs less to maintain MMUC than to maintain NUC.

No statistical analysis was made to verify this research hypothesis. The cost for NUC was obtained from past expenditures. Cost for MMUC was obtained using a combination of systems analysis techniques with repeated observations, and of dividing the cost of combining and filing cards in the catalog by the total number of cards filed.

Research Hypothesis #6: In the case of a request located in MMUC and referred to another library in the region, of the total time, from origination of a request to receipt of the monograph or the status report indicating nonavailability of the monograph, over 20% of that time is spent transmitting the request to MMUC, processing it there, and sending it to a holding library.

$$\left.\begin{aligned} H_o &: \mu_{\frac{x}{y}} = .20 \\ H_a &: \mu_{\frac{x}{y}} > .20 \end{aligned}\right\} \alpha = .05$$

where y is the total time for a request to be filled and x is the time for receiving the same request at MMUC, processing it there, and sending it to another library.

$n = 238$ $\quad \overline{x/y} = .491$ $\quad S_{\overline{x}} = .183$ $\quad \mu_o = .2$
$\qquad\qquad\qquad\qquad\qquad\quad\ \ y$

D.R.: Reject H_o if $t > 1.64$.

$$t = \frac{\overline{x/y} - \mu_o}{S_{\overline{x}} / \sqrt{n}} = 24.5$$
$\qquad\qquad\quad\ \ y$

24.5 is greater than 1.64.

Therefore H_o is rejected.

Note: Inferences made from this test should be limited because the sample was drawn from a questionnaire return of 70.6% and because mail service and library procedures at participating libraries vary from time to time.

Research Hypothesis #7: Of the requests located in MMUC, the percentage of items which could not be located in the *Index-Catalogue of the Surgeon General's Office*, the *National Library of Medicine; Current Catalog* or CATLINE is greater than 30%.

$$\left.\begin{array}{l} H_o: P_{-nlm} = .30 \\ H_a: P_{-nlm} > .30 \end{array}\right\} \alpha = .05$$

where p_{-nlm} is the probability of not locating the item in NLM's bibliographic tools.

$n = 313$ $\quad \hat{p} = \dfrac{\text{Requests not at NLM}}{313} = .230$ $\quad p_o = .30$

D.R.: Reject H_o if $Z > 1.64$.

$$Z = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}} = -2.7$$

- 2.7 is not greater than 1.64.

Therefore H_o cannot be rejected. H_o is accepted.

Research Hypothesis #8: The percentage of titles requested and located in MMUC which are held by only one library is greater than 30%.

$$\left.\begin{array}{l} H_o: \ P_{\text{one lib}} = .30 \\ H_a: \ P_{\text{one lib}} > .30 \end{array}\right\} \alpha = .05$$

where $P_{\text{one lib}}$ is the probability of an item being held by only one library.

$n = 635$ $\quad \hat{p} = \dfrac{\text{Requests held by one library}}{635} = .302$ $\quad p_o = .30$

D.R.: Reject H_o if $Z > 1.64$

$$Z = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}} = .11$$

.11 is not greater than 1.64; therefore, H_o cannot be rejected.

H_o is accepted.

Research Hypothesis #9: Of the above titles held by one library, the percentage which could not be located in the *Index-Catalogue of the Surgeon General's Office*, in *Current Catalog*, or on CATLINE is greater than 30%.

$$\left.\begin{array}{l} H_o: P_{-nlm} = .30 \\ H_a: P_{-nlm} > .30 \end{array}\right\} \alpha = .05$$

where p_{-nlm} is the probability that an item which is unique in MMUC will not be located in NLM's bibliographic tools.

$$n = 189 \qquad p = \frac{\text{Requests not located at NLM}}{189} = .339 \qquad p_o = .30$$

D.R.: Reject H_o if $Z > 1.64$

$$Z = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}} = 1.17$$

1.17 is not greater than 1.64. Therefore, H_o cannot be rejected.

H_o is accepted.

Research Hypothesis #10: There is a positive linear correlation between size (in terms of number of cards contributed to the union catalog) of contributing library and the ability to satisfy requests referred to the Midwest Medical Union Catalog.

$$\left.\begin{array}{l} H_o: \rho = 0 \\ H_a: \rho > 0 \end{array}\right\} = .05$$

where ρ is the Pearson product-moment correlation coefficient.

D.R.: Reject H_o if Z is greater than 1.64.

$n = 43$ $r = .89$

$$z = \frac{\sqrt{n-3}}{2} \log_e \left(\frac{1+r}{1-r}\right) = 8.99$$

8.99 is greater than 1.64.

Therefore reject H_o.

Research Hypothesis #11: There are libraries contributing to the Midwest Medical Union Catalog whose collections can satisfy less than 1% of the interlibrary loan requests referred to the catalog.

340 requests for titles with 1969-1974 imprints (the only years all libraries contributed to the catalog) were searched in MMUC. There are no currently contributing libraries whose collections in MMUC satisfy less than 1% of the requests.

APPENDIX III

QUESTIONNAIRES UTILIZED

AND

RESULTS OF CARD PRODUCTION SURVEY

COST OF CARD PRODUCTION FOR MMUC CONTRIBUTING LIBRARIES*

Production Method	Average Unit Cost	Range	Number of Libraries	Number of Cards		Total Cost of Cards	
Multilith	$.0446	$.0278-$.0773	5	5976	18%	$327.02	14%
Photoduplication	$.0360	$.0255-$.0510	13	11890	35%	$397.23	17%
Typing	$.2067	$.1216-$.2616	10	1843	5%	$352.21	15%
LC Cards	$.1032 (79% ordered by number)	$.0580-$.1555 (26%-100% ordered by number)	12	5926	18%	$645.28	27%
Commercial Printing	$.0943	$.0592-$.1215 (Printing cost of .045-.08 cards)	7	7483	22%	$620.25	26%
Computer Output	$.0216	---	1	755	2%	$16.31	1%
Totals	---	---	---	33873	100%	$2358.30	100%

*Excludes preparation of masters or typing subject headings but includes cost of card stock, machine rental, postage, fringe benefits (13% of direct salaries where none reported), an adjustment of 16.3% for unproductive time, and an overhead rate of 40% of direct salaries where light equipment (such as typewriters) is involved, and where heavy equipment (such as an offset press) is involved. Cost information obtained from 22 contribution libraries, and card production information obtained from the other 13 currently contributing libraries were combined to project a total cost for cards contributed to MMUC

LIBRARY:

RESPONDENT: Please print the name and job title of the person responding:

_____ (Name) _____ (title) _____ (date)

Phone number of respondent:

_____ (area code) _____ (number) _____ (extension)

A. GENERAL INFORMATION:

Set of cards: A group of catalog cards, including main-entry and heading cards and cards to be sent to union catalogs, pertaining to one title. Identical sets produced for two libraries are considered two sets.

Prepared: Brought into existence, whether by local reproduction or through purchasing or both.

1. Did your library prepare card sets for libraries or branches other than your own in 1973?

_____ (Yes) _____ (No)

If YES, please indicate the total number of sets of cards prepared in 1973, including card sets prepared for your library and for other libraries or branches, even if these libraries or branches did not contribute to the Midwest Medical Union Catalog. THEN GO ON TO QUESTION 2.

_____ (total number of sets)

If NO, please indicate the number of sets prepared for your library in 1973 and the average number of cards per set. THEN GO ON TO SECTION B.

_____ (number of card sets) _____ (number of cards per set)

PLEASE RETURN THIS QUESTIONNAIRE IN THE ENCLOSED ENVELOPE BY OCTOBER 16, 1974

2. For each of the libraries or branches for which you prepared cards in 1973 and which contributed to the Midwest Medical Union Catalog, please indicate the number of card sets prepared in 1973 and the average number of cards per set. If your own library contributed to the Midwest Medical Union Catalog, please list it first.

(Name of library or branch)	(Number of sets)	(Cards per set)
(Name of library or branch)	(Number of sets)	(Cards per set)
(Name of library or branch)	(Number of sets)	(Cards per set)
(Name of library or branch)	(Number of sets)	(Cards per set)

B. METHOD OF CARD PREPARATION:

1. Purchased cards: (Printed cards obtained for a price from a source external to the library. Cards for which a master is prepared by the library, but which are then sent to a commercial firm for printing should be reported in answer C of this question.)

Please indicate the percentage of card sets purchased from each source (percentage of card sets out of the total number of card sets prepared by the library).

a. _____ (%) Library of Congress

Out of the cards ordered from Library of Congress, what percentage are ordered by using the LC Card Number?

_____

b. _____ (%) Washington University School of Medicine Library

c. _____ (%) Cards sent to a commercial firm for printing.

What is the cost to you for the extra card ordered for the Midwest Medical Union Catalog?

_____
(Cost per extra card)

d. _____ (%) Other (Please Specify)_____

_____

What is the cost per extra card ordered?

_____
(Cost per extra card)

2. Local Card Reproduction: (Cards are created in the library through printing, typing, photocopying, or some other duplicating process, rather than through purchase.)

What percentage of the total number of cards sets prepared are locally reproduced?

_____
(%)

THE PERCENTAGES IN QUESTION B.1. a-d AND B. 2 SHOULD TOTAL 100%

3. Preparation Steps:

Please describe briefly how each step is done (if at all) in your library.

a. Stencil, photoduplication master, microfilm master preparation: (type of stencil, number of cards on a stencil, etc.)

_____

_____

b. Typing, Printing, or photoreproducing cards:

_____

_____

c. Finishing the set (Finishing the set here means adding any information, such as call number, to the cards which the reproduced or purchased unit cards do not contain):

_____

_____

C. ORDER OF STEPS IN CARD REPRODUCTION:

Please indicate the order in which these steps occur in your card production system by placing the numbers of the activities in their appropriate order on the line below. (For example, the order in your library might be: 1, 2, 3, 6, 7, 5, 8, 4, 9, 10) You may wish to use a number more than once and may leave out numbers that do not apply. When card sets are separated, please follow the flow of activity which pertains to the cards sent to the Midwest Medical Union Catalog. Activities 12 and 13 are blank and may be used to include any activities not anticipated in this questionnaire.

_____
(order of steps)

1. Stencil or master preparation
2. Printing, typing or photocopying of cards
3. Proofing cards or sets of cards for errors
4. Cutting or separating card sheets into sets of cards
5. Drilling holes in cards
6. Interfiling purchased cards and locally reproduced cards
7. Alphabetizing cards or sets of cards
8. Finishing the card sets
9. Splitting up a set into subsets or individual cards
10. Separating cards appropriate to the Midwest Medical Union Catalog
11. Stamping cards for the Midwest Medical Union Catalog with the identifying stamp of the library
12. _____
13. _____

D. EQUIPMENT: (Any tool or machine or device used in the card production process which costs more than $100. For purposes of this study; desks, tables, and chairs are excluded from consideration.)

Please list any equipment used in the production of catalog cards:

_____

_____

E. SUPPLIES:

1. How many cards do you print on each sheet of card stock?

_____

2. What does it cost you to purchase card stock (please give the cost per hundred sheets of card stock.):

_____

3. What percentage of the card stock purchased is wasted during the card reproduction process?

_____

F. PACKAGING AND SHIPPING:

Since packaging cards for shipment is a function which happens infrequently at most contributing libraries, the researcher will calculate costs of this function for all libraries based on observations done by the researcher at the John Crerar Library.

1. Do you send your cards to the Midwest Medical Union Catalog via the United States Postal Service?

_____ (Yes) _____ (No)

2. If YES, please go on to section H; the researcher will calculate your postage costs based on records he has kept at the John Crerar Library for the past year.

   If NO, how do you send your cards to the Midwest Health Science Library Network?

_____

   The approximate cost to you per package of cards sent.

_____

G. FRINGE BENEFITS:

Section H involves an analysis of your direct labor times only. Fringe benefits will be calculated by the researcher based on the fringe benefit percentage that you report in Section G. Fringe benefits are such advantages paid indirectly to the employee as social security, retirement and in some institutions, health insurance.

Please give the fringe benefit rate for your employees (Over and above regular salary and as a percentage of direct labor costs):

Professional: _____

Nonprofessional: _____

Part-time: _____

H. DIRECT LABOR TIMES:

Please record your results on the DIRECT LABOR OBSERVATION FORM which is attached. A sample form is included showing how the form would be used by a library which purchases 20% of its card sets from the Library of Congress and produces the rest using a Gestetner duplicating machine with six cards to a stencil.

1. Name: use the names of functions similar to those used in Section C of this questionnaire (Order of Steps in Card Production). It is not necessary to record the time that it takes to prepare a master or stencil, since marginal costs of preparing an extra card are unaffected by this function (the function would continue just the same even if no card were contributed to the union catalog). However, do not leave out any other function listed by you in Section C unless it does not pertain to cards produced for the union catalog.

Beginning: Please describe the action in the function at which your timing will begin. Please be specific. See the sample form if necessary

Ending: Please describe the action in the function at which your timing will end. Please be specific. See the sample form if necessary.

2. Time: Please indicate in minutes and seconds the amount of time which the function in part 1 was observed. This should be productive time only, not including time for rests, coffee breaks or lunch. These unproductive times will be added by the researcher based on a percentage of productive time.

   It is not necessary to time each repetition of a function. For example, on the sample form, instead of timing the additional revolution of the Gestetner machine needed to print an extra sheet of cards for the union catalog, the time needed to print 20 stencils is recorded. The researcher can determine the time it takes to produce extra cards for the union catalog from this information and other information in the questionnaire.

3. Type and Number of Units: Please record the number of units and describe the kind of units observed during the time period listed in part 2. Please observe at least 50 repetitions of a function where possible.

4. Hourly pay of employee: Please indicate the hourly wage of the employee observed, not including any fringe benefits.

5. Type of employee: Please indicate whether the employee observed is professional, nonprofessional, or part-time.

6. Relative speed: This is an optional item. You may wish to indicate that the employee observed was faster, slower or of the same speed as the average employee doing the same job. If you don't know, please leave the item blank.

7. Comments: Please use this space to indicate any unusual events which may have affected the observed times.

PLEASE RETURN THIS QUESTIONNAIRE IN THE ENCLOSED ENVELOPE BY OCTOBER 16, 1975

THANK YOU VERY MUCH FOR YOUR HELP!

DIRECT LABOR OBSERVATION FORM

1. Function	2. Time (in minutes & sec.	3. Type and no. of units	4. Hourly pay of emp.	5. Type of employe	6. Relative speed	7. Comments
Name: Beginning: Ending: 						
Name: Beginning: Ending: 						
Name: Beginning: Ending: 						

CARD QUESTIONNAIRES FOR HYPOTHESIS 6

ILL FORM #_____ DATE _____

Dear Librarian:
You are listed in the Midwest Medical Union Catalog as holding this item. Please loan the item if possible and direct all replies to the requestor. Do not return this ILL form to the John Crerar Library.

We ask your help in gathering data for our union catalog study. Please fill in the information requested below on the day you receive this referral and mail this card to us.

Thank you very much for your help.

DATE REFERRAL RECEIVED: _____

ILL FORM #_____ AUTHOR _____

TITLE: _____

Dear Librarian:
The monograph which you requested on the attached ILL form has been located through the Midwest Medical Union Catalog and referred to _____ for processing. Please contact the above library directly if you have not received the item shortly.

We ask your help in gathering data for our union catalog study. Please fill in the information requested below on the day you receive either the status report or the requested monograph from the lending library, and send the card to us. Thank you very much for your help.

DATE OF RECEIPT OF STATUS REPORT OR OF MONOGRAPH _____
DISPOSITION OF REQUEST: _____ Request filled
(check one) _____ Request unfilled