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ABSTRACT

Preliminary inquiries into the feasibility of placing the union catalog of the University of California libraries on microfiche are reported. Recent developments in the use of microform catalogs are reviewed and an extensive table is given which summarizes the characteristics of existing microform catalogs. Another section describes the potential applications of the Image Systems CARD (Compact Automatic Retrieval and Display) reader, a random access microfiche retrieval and display device with a capacity of 780 fiche. The discussion emphasizes the ability of the CARD to be integrated with a computer terminal to provide interactive access to microfiche. The advantages and disadvantages of a microform catalog for the University of California at Santa Cruz library are discussed as an illustrative example. A topically-organized bibliography of over 50 items and tables of cost data are given. Appendices explain the cost formulas used. (PF)

THE USE OF A MICROFICHE CATALOG FOR PUBLIC SERVICE AND ON-LINE RETRIEVAL OF BIBLIOGRAPHIC DATA

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I. INTRODUCTION

OBJECTIVES

There has been a significant increase in recent years in the use of microform catalogs in libraries. This development has been occasioned in large part by the low costs and ease of distribution associated with producing a catalog on microform. Concurrently, there have been important technical improvements in the equipment available to select and display microforms, from inexpensive briefcase sized portable views to interactive T.V. display systems. However, since these developments in the use of microform based catalogs have occurred primarily in an operational context, relatively few systematic evaluations have been reported.

This report will review these developments. Of special interest is the use of a random access microfiche retrieval and display device that can be integrated with an on-line computer terminal to provide interactive access to a microfiche catalog.

The primary objective is to evaluate the feasibility of microfiche as a medium for the University of California Union Catalog in the UC libraries. Because of the low costs and ease of distribution of microfiche, this medium is an economically attractive means of providing access to union catalog information. In addition, microfiche catalogs offer two other benefits that could be especially significant for the UC union catalog.

(1) Microfiche catalogs can be produced from direct photographic procedures, thus providing an inexpensive alternative to retrospective machine readable conversion for producing and distributing a union catalog of records directly from their printed form. Georgia Tech, for instance, has successfully integrated a catalog that was filmed

from the card file using a rotary camera with a supplement that is produced via COM. Both catalogs are on fiche at 42X. Estimated cost of filming the base catalog was less than 1¢ per record for direct labor.

(2) Microfiche catalogs can contain non-keyable scripts, such as non-roman alphabets or graphic information, thus accommodating more types of bibliographic records than is possible when records must be computer processed. This could be a significant advantage for a catalog potentially as rich and diverse as a UC union catalog.

SUMMARY OF THE REPORT

The remainder of this report is organized as follows: Section II will review recent developments in the use of microform catalogs. Section III will describe the possible application of an on-line fiche retrieval device in a library. Section IV will consider the advantages and disadvantage of a microform catalog using UCSC as the illustrative example. Section V is a bibliography of relevant material, arranged topically.

II. BACKGROUND

REVIEW OF DEVELOPMENTS IN THE USE OF MICROFORM CATALOGS

In a review of the literature completed in 1973, Robert Greene[1] was able to locate information on only 8 microform catalogs. By the end of 1975, however, there were published reports on the use or development of more than 40 microform catalogs, including 5 national union catalogs, 5 state catalogs, and 4 university wide or inter-university union catalogs. Table 1 summarizes the reported use of microform catalogs by library type. Undoubtedly, there are many other microform catalogs in use in libraries that have not been reported in the literature surveyed for this proposal. In particular, there are two commercially available microform catalogs -- Information Dynamics Corporation's MCRS and Information Design's CARDSET both of which could qualify as national union catalogs which are in use in the processing departments of over 60 libraries.

The primary reasons for using microform catalogs are reported to be lower cost and ease of distribution. The advantages of microform catalogs have been stated succintly by A. J. Crowe of the Shropshire, England, County Libraries.

> "Our view is quite simple. Our branch libraries did not have a catalogue of any type; the area libraries had only an alphabetical author catalogue of the area stock. Now they are all getting author and classified union catalogues of the whole of the County stock continually updated with locations. Compared with that, the fact that they must use a machine that's up to now not been in habitual use by library users is totally irrelevant."[2]

The experiences at several of the libraries where microform catalogs have been employed are directly relevant to the UC union catalog. Table 2 summarizes the following information, where

available, for each reported microform catalog:

1. System in which it is used.
2. Size of the catalog.
3. Record contents.
4. Nature of the microform output.
5. Update procedures.
6. Production process.
7. Equipment used.
8. Costs.
9. User reactions.
10. Comments by authors.

SOME UNANSWERED QUESTIONS

Despite the fairly widespread use of microform catalogs, several important issues remain unresolved.

1. User reactions. In general, the literature has focused on the advantages of microforms, particularly the low costs, ease of update, and the potential for wider distribution. Reports of user reactions have consisted primarily of the subjective perceptions of administrators and/or system designers that the microform catalog is acceptable to, or favorably received by the patrons. Although there were only two negative reports of user reaction to a microform catalog[3], one must ask how many failures or serious problems remain unreported.

In 1974, John Spencer, research officer for the National Reprographic Center for Documentation in England, suggested that user acceptance of microform catalogs is an area requiring a great deal more research. However, except for Greene's[4] evaluation of Georgia Tech's microfiche catalog, and the work at NYPL[5], there has been almost no systematic analysis of user reactions to microform catalogs. There have been some extensive investigations of user reactions to microform texts[6], but several investigators[7] have suggested that the nature, purpose and use of microform catalogs are likely to evoke a different response from patrons.

Complicating this issue is the fact that what user studies there are usually have focussed on comparisons between microforms and some

other version of the catalog (book or card). When the choice is couched in such terms, users react as might be expected -- they prefer a printed version.[8]

The issue underlying the research proposed here, therefore, is to identify the design requirements for a microform catalog that is acceptable to users on its own terms, not in comparison with other media.

2. Fiche vs. Film. There is debate over which kind of output -- film or fiche -- is best for library catalogs. Fiche files tend to be slightly less expensive to maintain because the required readers are less costly and no cassette or cartridge is needed. Fiche are also more flexible and provide faster access than film. Those who have argued against fiche[9] have cited their concern over the problems of maintaining file integrity when large numbers of fiche are involved.

Georgia Tech, on the other hand, has an 800+ fiche file and reports that none of the expected difficulties has materialized.

> "Extensive comparison and testing of the self-indexing microfiche approach with mechanized systems and external indexes leaves us convinced that the microfiche system has greater reliability, is simpler to understand and use, and provides as fast or faster access, as well as requiring less expensive readers. The only real advantage for this application which we can see in mechanized cartridge readers is file integrity. So far, however, we have no reported problems from the loss or misfiling of fiche.[10]"

It must be noted, however, that Georgia Tech library patrons are technically oriented and often have extensive experience with fiche documents.

Resolution of this issue in itself requires further research, so this study will limit its focus to the evaluation of microfiche rather than trying to compare the various microform technologies.

REVIEW OF DEVELOPMENTS IN MICROFORM RETRIEVAL TECHNOLOGY

There is a range of equipment available for microform retrieval, from hand cranked viewers using printed indexes to computer linked direct access storage and display devices using disc stored indexes. Measured times for locating specific items on microforms range from 2 minutes to 3 seconds.[11] Normally, costs and speed of retrieval are inversely related within a given form of output (fiche or film). This is an evolving field of technology, however, and it is unwise to make definitive statements about the very latest techniques available. Certain patterns and techniques have been with us for some time though, and it is useful to review these.

1. Serial vs. Direct Access. Microfiche, like computer disc packs, have the advantage of permitting direct access storage. Microfilm, like computer tapes, must be searched serially. This means that microfiche will inherently be a faster, more flexible medium to search, other elements of the retrieval process being equal. The tests conducted at the NYPL[12] indicated that the time required to search microfilm can be a problem to a researcher making extensive use of the catalog. This problem is further exacerbated in a technical processing context in which time required to locate items is an integral part of production rate.

2. Indexing. A variety of techniques for indexing microforms have been developed. For microfilm the basic options are:

a. Large characters placed at the bottom of each page or between pages to enable rapid scanning of the film.

b. Odometers which indicate by some measuring device the specific point in the film being viewed. These must be used in conjunction with separate indexes.

c. Page counters which count each page as it passes the screen. These also must be used in conjunction with separate indexes.

d. MIRACODE, the most complex film indexing technique. Coding bars inserted between pages on the film contain data on several variables that describe the information on each page. This system allows multivariable searches of records, but the file must be examined serially.

For microfiche, the basic options are:

a. Eye readable characters at the top of each fiche and/or bottom of each column.

b. Column and row indexes which indicate the location of specific pages in a given fiche.

c. Edge notched coding.

3. Retrieval equipment. Equipment designed to provide high speed retrieval of microforms has become more sophisticated in recent years. Beginning with the Rapid Selector, developed by Ralph Shaw for the National Bureau of Standards in the '40's, microform retrieval and display devices have grown continually in number and complexity. The Kodac Recordak, which uses MIRACODE, is one such example. Others include such items as the Bruning Model 95 that can select and display within 1-4 seconds a particular page image stored in a cartridge that holds 30 fiche, and the Sanders-Diebold system that transmit a T.V. image of a record stored in a file of 49,000 microforms in a variety of formats. Each of these advanced microform retrieval devices has its own special operating capabilities, thus making direct comparisons difficult.

In the proposal research we shall focus on one particular unit -- the Image Systems CARD reader. Its capabilities, including its

relatively large file capacity and its ability to be integrated with computer controlled file searching, making it especially attractive for use in the library. We shall consider specifically some of the possibilities posed by the ability of the CARD reader to provide on-line access to bibliographic data, including the library's own catalog and union catalogs of a system, in microfiche form.

III. ON-LINE SEARCH AND RETRIEVAL OF MICROFORMS

DESCRIPTION OF THE CARD READER

CARD (Compact Automatic Retrieval and Display) is a random access microfiche retrieval and display device that can be used in conjunction with an on-line computer terminal. CARD can hold 780 microfiche in a carousel located inside the machine. Display of a specific page on a specific fiche takes a maximum of 3 seconds and can be accomplished either manually, by pushing appropriate buttons located on the front of the viewer, or through on-line interaction. In the latter mode, a search term or terms (e.g., author's name) entered at an on-line terminal is searched by the computer against a centrally stored index. Entries for those terms include the fiche frame locations for bibliographic data associated with each term. A "hit" causes the appropriate fiche frame to be displayed on the CARD device. The process is analogous to on-line retrieval of bibliographic data except that the display is of a microfiche frame -- perhaps an entire page of catalog records. The fiche location code requires 8 bytes of storage. The CARD device thus would supplement on-line storage of catalog data while still permitting on-line interaction and retrieval speeds.

At 48X reduction the CARD could hold approximately 200,000 frames -- the potential of 4,000,000 full catalog entries at 20 entries per page.

High speed retrieval is possible only for the 780 fiche located inside the CARD. One can, however, replace manually 3 of the cartridges that make up the carousel, thereby providing immediate access to .5 - .8 million new entries and permitting effective access to a virtually unlimited file.

A 42X CARD reader with a computer interface costs $8,000.00 plus $60.00 a month maintenance. A printer module for producing hard copy

can be attached to the CARD for an additional $2,310.00 and $15.00 a month maintenance. A replaceable cartridge carousel is an additional $400.00 plus $3.00 a month maintenance. A cost comparison with on-line storage devices will vary depending upon the number of cost sharing users who require access to the data base stored in the CARD. (See below "Cost Considerations.")

Manual CARD readers are available at various reductions, including 42X and 48X. A computer driven CARD reader is currently available at 42X; one is being developed at 48X.

POTENTIAL APPLICATIONS OF CARD

1. Substitute for on-line storage.

Cost Considerations. The CARD reader could serve as an economical supplemental storage device in systems providing on-line access to bibliographic data. Presently, the costs of on-line storage of a 300 character bibliographic record average about $.10/entry/year, when all costs involved are considered. (Although recent developments by IBM in disc pack technology have lowered the potential cost of on-line storage of a 300 character record to $.012/year, they are available only for system 370 installations.) Usually these charges are shared by a number of users, so the cost per user is a function of the number of users.

For the CARD reader the cost per entry per year varies with the number of entries stored in the device. Assuming purchase and 50 months amortization, the cost of a 48X reader is as follows:

-- Full capacity (4,000,000 records) = $.00066/entry
-- 1/2 capacity (2,000,000 records) = $.0013/entry

Figure 1 compares the cost per entry per year for the CARD reader (at full capacity and at half capacity) against the comparable costs, per user, for the IBM 3350 and 3330 Mod 11 units, the two largest and most cost effective disc storage devices currently available commercially,

Figure 2 compares the CARD against typical mini-computer storage costs. An assumption in both Figures 1 and 2 is that each cost sharing user would require his own CARD unit, in contrast to the operation of disc storage in which cost sharing users all access the same hardware from remote locations. As these tables demonstrate, when there are few cost sharing users, the CARD reader can compete favorably with the most cost effective disc storage equipment.

Comparisons with mini-computer storage devices currently available indicate that the CARD reader would be an especially economical component in many such equipment configurations. Taking a typical mini-computer storage cost of approximately $.22 per year for a 300 character record, we can see from Figure 2 that the CARD at full capacity is a less expensive storage device for any reasonable number of cost sharing users. Of course we cannot predict when storage costs for minis might approach those of the IBM 370 and 360 systems, a development that would alter the results of Figure 2.

The most important conclusion from the above analysis and discussion is that the CARD reader could be used to provide a considerably less expensive supplement to on-line storage in systems that require rapid access to data bases of primary value to just a few paying users. Thus a library's reference desk or technical processing department could have on-line access to its own catalog at fairly low operating costs through the combination of a mini-computer for index storage and search and a CARD reader for record storage.

2. Improving access to multi-media files. The development of machine readable records has created a problem of mixed files for many library catalogs. Some records may be accessible only on cards, some only on microform, some via on-line terminals, etc. This situation invariably complicates searching, making it less efficient and less convenient. However, retrospective conversion is too expensive to make the totally integrated, machine readable file economically realistic.

The CARD reader with computer interface offers an alternative solution to this problem. Printed bibliographic records can be microphotographed inexpensively by a rotary or planetary camera. Indexes to these records could be generated fairly cheaply by keying only the access points for the first records on each fiche frame. A search of these indexes would result in the display on the CARD screen of the frame which would have the required record -- if that record were present in the file. The user would then scan the displayed frame to determine whether he had a hit. Those indexed in machine readable form could be stored on disc packs and accessed directly and displayed on the CRT screen. In addition, these indexes could also be COM'd and stored in the CARD reader, thus providing means for manual access as well.

For public access this would be an expensive means of achieving file integrity because of the large number of CARD readers that would be required to accommodate all public users. It might prove highly cost effective, however, in operating situations at the reference desk or in the processing department, where speed of retrieval and integrated files are very important.

3. Editing, updating, correcting. Records stored in the CARD reader can be updated in the following manner. Any change required in a particular record can be keyed at a terminal, stored on-line, then retrieved and displayed at the terminal each time that record is called up. If the original record is in machine readable form, it can periodically be re-COM'd with the changes included. With the rapid turnaround and inexpensive processing costs possible with COM, such a procedure for record editing is worth exploring. Some applications might include:

a. Accessing shared catalog data. MARC records could be COM'd and stored in the CARD reader. The user could enter changes to a record at the terminal, and records for local use could be generated at specified intervals by merging these changes with the original record. Correction of specific data within a record would not be as convenient as is now possible with a CRT. However, it may be worthwhile exploring

this alternative for specific situations in which the cost of on-line storage or processing delays caused by many users make COM access an attractive alternative.

b. Management files. Accounting files, such as book fund records, might be conveniently accessed in an on-line mode with base data stored on fiche and updates stored on-line. Regeneration of the base files could occur at administratively appropriate intervals.

c. Serial files. Local files for which additions rather than corrections are the major form of change might be conveniently maintained with a CARD reader. A serials list of current holdings is a possible candidate for this type of application. It might be very useful, for example, to be able to access on-line the most up-to-date holdings data on currently received serials. Or it might be helpful for the processing staff to be able to enter current holdings data in this manner.

4. Text Retrieval. On-line information retrieval is an additional use of the CARD reader. One reported application[13] involves on-line search and retrieval of pictures collected during U.S. space explorations. The pictures are microfilmed and stored in the CARD reader. Another researcher[14] has experimented with the retrieval of text abstracts stored in an ultrafiche retrieval device. With its replaceable cartridge option, the CARD reader might be used for storing a great variety of data banks and information sources that might be of value in information retrieval. Texts of encyclopedias, abstracts, book reviews, map and picture files might all be accessed using this technology.

EXPLORING THE VALUE OF ON-LINE ACCESS TO MICROFORM FILES

The major advantage of the CARD reader over other random access fiche retrieval units is that it provides for on-line interactive searching of microform files. With a properly constructed index and retrieval program the CARD reader offers the possibility of low cost on-line access to a library's entire catalog.

One of the important questions to be considered when evaluating this capability revolves around the purpose and required complexity of on-line searches of library catalogs. Our investigations into needed access capabilities of printed catalogs have been bound by retrieval strategies that are limited to one-term-at-a-time and one-form-of-the-term-at-a-time searches. Research and development of on-line access to catalogs has, with a few exceptions such as the INTREX experiments, focussed primarily on access to bibliographic data for processing purposes. Beyond that important functional area, however, the question remains whether interactive searching of local catalogs offers significant enough advantages to argue for its development and implementation in many libraries. It would be valuable to explore, for example, some of the potential access requirements that can be facilitated by the computer yet that fall somewhere between single term searches for processing (e.g., via L.C. card number) and highly complex boolean searches for subject related questions. For example, would there be a significant improvement in catalog accessibility if searches for complex corporate authors could be located using any portion of the entered hierarchy, or if serial title changes and abbreviations could be linked via computer stored indexes? Would these improvements be cost effective?

An additional issue involves the nature of file organization and display. One of the great strengths of current theory and practice in cataloging is that most of the rules and conventions attempt to provide for the collocation of the various editions, translations, versions, etc. of a given work by a particular author, along with those works about that author or about that work. This arrangement can be extremely valuable in many search strategies. Although existing on-line bibliographic retrieval systems, such as the ORBIT access of the LIBCON data base, can replicate this arrangement to a degree, doing so requires either increased processing costs if the search results are being viewed on-line, or time delays and added costs if the results are to be printed off-line. In this context, the use of microform technology to display catalog data can be a great asset to systems with on-line capabilities. Whenever a "hit" is displayed via a microfiche stored catalog that reflects current rules of entry and collocation, the user would im-

mediately be able to survey other related works displayed on the screen.

This capability for collocation would not require, however, that the microform catalog be an exact replica of the card or book catalog. There would be no reason, for instance, to print a separate title entry for every work, because a title search would be satisfied by display of the main entry. This approach to retrieval would allow a significant reduction in the number of entries per record required to be stored in the CARD reader, perhaps by as much as one-half. The result would be an equally significant increase in the number of records, within the number of entries, that the CARD reader could contain.

IV. A MICROFICHE CATALOG AT UCSC: CONSIDERATIONS

CURRENT SIZE AND FORMAT

The UCSC catalog of approximately 250,000 plus titles exists in machine readable form. Public access is provided via 8 copies of a multi-volume, 40,000 page book catalog. The catalog contains approximately 1,000,000 entries. Table 3 outlines the major components of the catalog.

CURRENT COSTS

Illustrative of the costs of catalog production is the subject supplement printed in October 1975. It was produced with a one-week turn-around time (including delivery) by the O'Neil Company of Los Angeles. 20 sets of the 1,000 page supplement cost $1,700.00. The product is attractively printed and is efficient in its use of space on the printed page. (30% more characters per page than previous book catalogs at UCSC.)

ADVANTAGES OF A MICROFORM CATALOG

A microform catalog at UCSC would offer those advantages that are already well documented for this medium; lower costs, rapid production turn-around, and ease of distribution.

1. Cost. A formula for estimating the cost of a microfiche catalog is presented in APPENDIX A. APPENDIX B presents the cost estimating formula to project costs of the UCSC book catalog using the currently contracted service bureau, These formulas are used in computing the cost comparisons given below. A basic assumption of these comparisons is that the costs prior to the print stage -- i.e., the editing and keying of new records, exploding of records for multiple entries, sorting, formatting of records and of pages into a print image -- would

be the same for either the fiche or the book catalog.

The potential cost savings that would result from a fiche catalog are considerable. For example, the 1,000 pages of the UCSC quarterly supplement, described above as costing $1,700.00, could be comfortably recorded on fewer than 10 fiche at 42X or 48X reduction. Based upon the current costs to UCLA for its CATALOG SUPPLEMENT and SERIALS CURRENTLY RECEIVED, which are printed on fiche by the Zytron Corporation of Los Angeles, the cost of producing 20 copies of a 10 fiche supplement would be under $60.00. (See Table 4 for a summary and comparison.)

Table 5 compares the cost of printing and providing access to the entire UCSC catalog for one year with quarterly supplements. Projecting costs in the absence of competitive bids from service bureaus is difficult, and Table 5 is of value primarily as an estimate of the order of magnitude of the difference in costs. For example, the assumptions used in Table 5 lead to an estimate for the first year of $7,500.00 for a fiche catalog and $44,000 for a book catalog. This means the fiche catalog would be 1/6 the cost of the book catalog and would save $36,500.00 for that year.

Alternative assumptions, of course, would lead to different comparisons. For instance, if fiche readers and readerprinters were amortized over 12 months rather than 24 months, the cost of the fiche catalog would rise to nearly $13,000 per year and the difference between the two production methods would drop to $31,000 for that year. If, in addition, the cost per book page quoted by the service bureau were to drop to $1.00, the difference between the two processes would drop to approximately $22,500.00. Alternative assumptions should be explored for every variable in Table 5. For example, $1,000.00 is allocated to provide hard copy pages of the catalog for those patrons who are unable to use microforms. This figure may be very high or very low. In the absence of research that could provide an accurate estimate, these cost projections must remain a matter of conjecture.

On the whole, however, even accepting some of the most favorable assumptions for the book catalog, it seems likely that in its first year of operation a fiche catalog would be somewhere between $20,000.00 and $35,000.00 less expensive. By the fifth year of operation, with an additional 100,000 titles in the base catalog, the net difference would be somewhere between $35,000.00 and $50,000.00. The cumulative savings over the five years would be somewhere between $100,000.00 and $160,000.00.

2. Production Turn-around. Less than one week turn-around should be realizable for the production of supplements.

3. Ease of Distribution. Microforms are easily and cheaply mailed. Their low costs makes them easily affordable by patrons or by other libraries. The use of fiche would also allow convenient duplication of portions of the UCSC catalog for individual users. A scholar, a department, or another library may wish to have a copy of the holdings of work in a particular field or by a particular author.

POTENTIAL PROBLEMS

1. Space. Microform readers do require more space in order to accommodate the same number of users who can access a multi-volume catalog at one time. Resolution of this difficulty would require an analysis of available space and space requirements at UCSC.

2. Print Program Changes. Programs to process records for a book catalog are already operational at UCSC. Some modification of these programs would be required in order to produce a COM catalog. These changes should not be extensive, however, because the basic record format need not be changed.

3. Quality of Microforms. Many microform producers do not yet have a good record for quality control. Output from several vendors would have to be evaluated in advance and monitored during operations to insure the product is satisfactory.

4. User Reactions. As noted before, user reactions to microforms are difficult to predict. Many are intrigued and like them, others have a strong dislike for them and will avoid if at all possible. Also, there is some indication in the literature that some users find them physically difficult to use for long periods (eye strain, nausea, etc.). It would be essential, therefore, to insure:

a. Satisfactory procedures are developed for the introduction and explanation of the microforms.

b. Provision is made for satisfactory space, light, etc.

c. Provision is made for accommodation of those who are unable to use microforms. No one has yet reported instances of patrons who have stopped using, or use less frequently, a catalog because it was produced on microform. As noted earlier, no studies have as yet researched this possibility in detail. Because of the critical nature of the catalog to all patrons, it is prudent to examine this problem closely.

5. File Size. The assumptions employed in Table 5 suggested that the entire UCSC catalog would require 200-plus fiche. Determining whether a fiche file this size would be a problem is a part of the proposed evaluation.

6. Name Authority File at UCSC. The Name Authority File at UCSC for the Author/Title/Series catalog is currently under revision and update. This process, which is so critical to the quality of a catalog, is a lengthy one. At issue is whether a cumulation of that catalog should be undertaken before authority file editing has been completed.

7. Development Delays. New procedures involving emerging technology often contain unforeseen development problems that play havoc with project schedules. It would be essential for this test:

a. To insure that the quality of existing services is not degraded by any proposal to test a new means of catalog

production.

b. To allow adequate development time to accommodate unforeseen delays.

APPLICATIONS OF THE CARD READER AT UCSC

If the UCSC catalog can be produced on microfiche, it would offer a convenient opportunity to test the CARD reader in a library environment. Of the potential uses of the reader, it is necessary to explore only one or two of the simplest applications first in order to de-bug operational problems and to minimize development costs. A CARD reader with a microfiche copy of the UCSC catalog could be placed at the reference desk for catalog assistance, checking, searching, etc., and in the technical processing department for the pre-order/pre-catalog search.

V. BIBLIOGRAPHY

The references cited here are organized topically. Works that are of general interest to this research proposal are listed first. Next come references to specific microform catalogs, arranged by the categories employed in Table 2, e.g., National Union Catalogs, State Wide Catalogs, etc.

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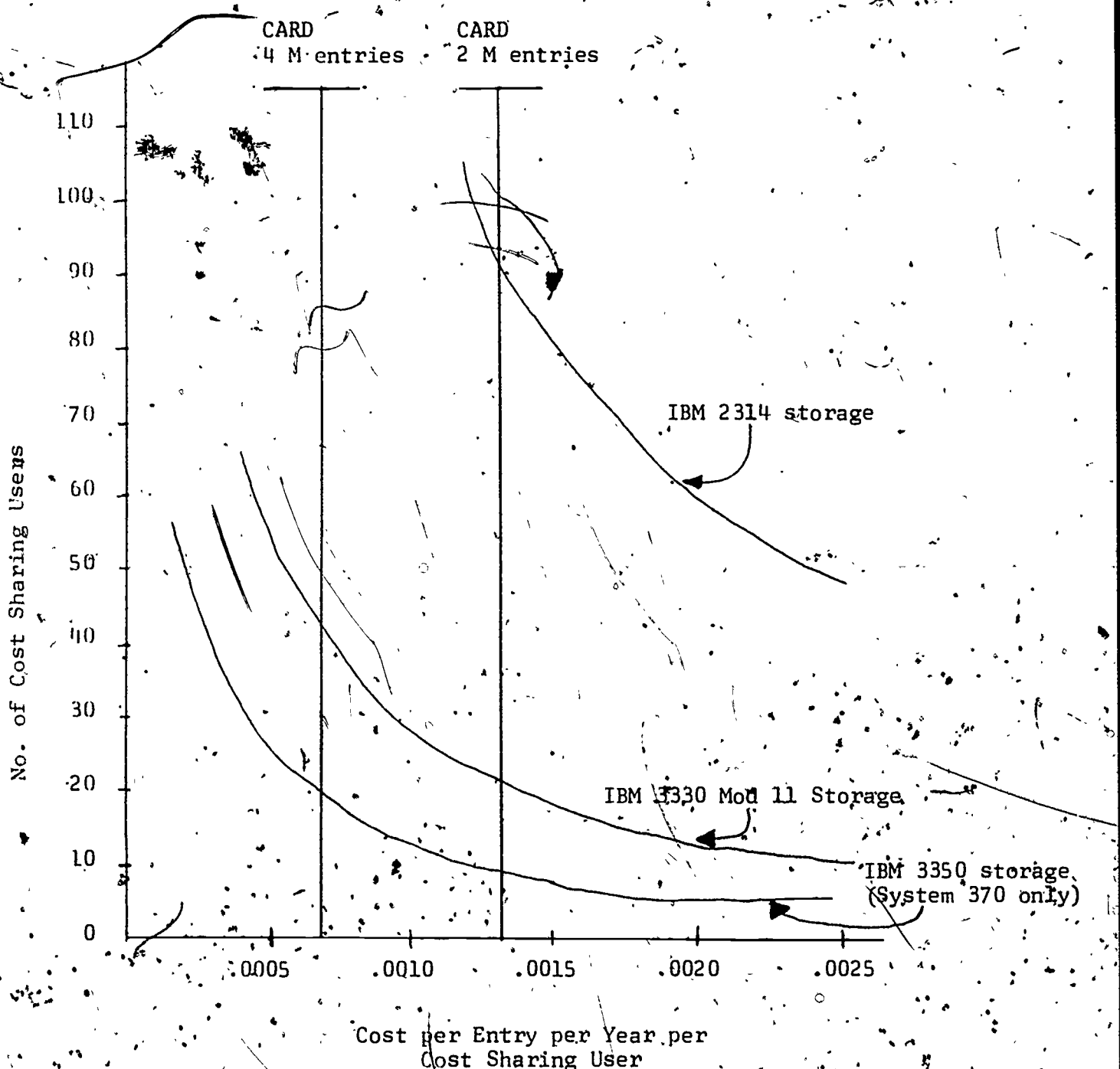
FIGURE 1

Cost Comparison of Storage Units: CARD READER vs. IBM 3350, 3330 Mod 11, and 2314 Disk Storage



NOTES FOR FIGURE 1

Values Used to Calculate and Plot Figure 1

1. CARD READER

$8,000 = Cost of CARD reader with computer interface
3,000 = Maintenance costs for 50 mos. @ $60/mo.

4.17 = Amortization period in years; 50/12 = 4.17

4,000,000 = Full capacity of CARD at 48X, assuming 20 catalog entries per page and 250 pages per fiche

2,000,000 = 1/2 capacity of CARD, as above

Full Capacity:

$$\left(\frac{\$8,000 + \$3,000}{4,000,000 \text{ entries}}\right) \div 4.17 = \$.00066/\text{entry/user/year}$$

1/2 Capacity:

$$\left(\frac{\$8,000 + \$3,000}{2,000,000 \text{ entries}}\right) \div 4.17 \text{ yrs.} = \$.0013/\text{entry/user/year}$$

2. IBM 3350

$8,000 = Monthly rental of 3350 unit. (Includes 8 disc packs, 8 spindles, control unit, 4 drive units)

7,600,000 = Estimated capacity of 3350 storage configuration for 8 spindles. We shall use the most cost effective configuration per entry for this calculation. (For 4 million entries, the monthly rental costs would be $6647 and the annual per entry cost would be 2¢.) Capacity is computed as follows:

$$\frac{317 \text{ megabytes/spindle} \times 8 \text{ spindles}}{333 \text{ Bytes/entry}} = 7.6 \text{ M entries}$$

Full Capacity:

$$\frac{\$8,000/\text{month}}{7,600,000 \text{ entries}} \times 12 \text{ months} = \$.012/\text{entry/year}$$

3. IBM 3330 Mod 11

$10,835 = Monthly rental of 3330 Mod 11 unit. (Includes 8 disc packs, 8 spindles, control unit, 4 drive units)

4,800,000 entries = Estimated capacity of 3330 Mod 11 configuration for 8 spindles. Capacity is computed as follows:

$$\frac{200 \text{ megabytes/spindle} \times 8 \text{ spindles}}{333 \text{ Bytes/entry}} = 4.8 \text{ M entries}$$

Full Capacity:

$$\frac{\$10,835/\text{month}}{4,800,000 \text{ entries}} \times 12 \text{ months} = \$.027/\text{entry/year}$$

4. IBM 2314

$7,135.00 = Monthly rental of 2314 Storage (includes 8 disk packs, 8 spindles, control unit, 4 drive units)

700,000 = Estimated capacity of 2314 unit for 8 spindles.

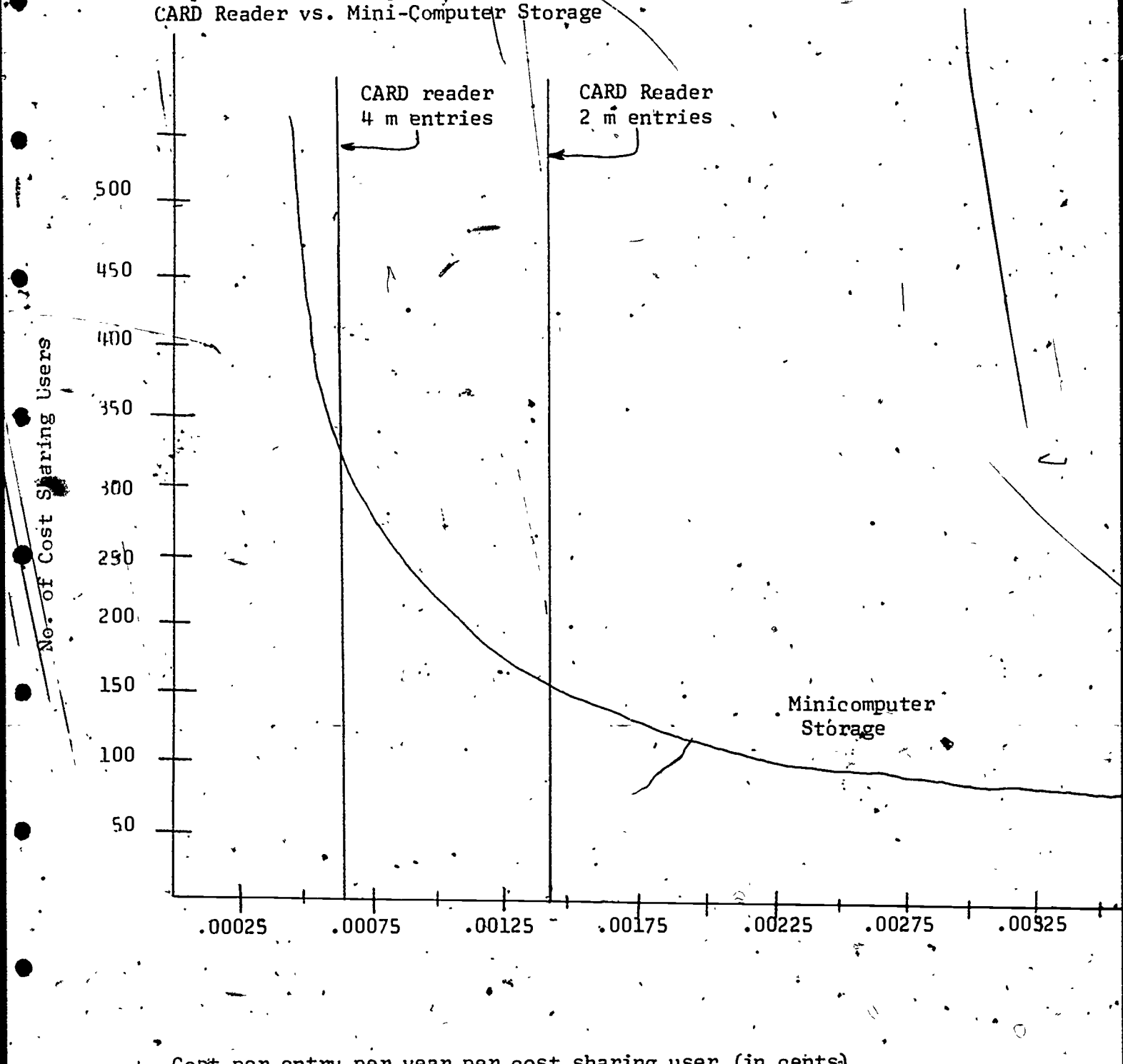
$$\frac{29 \text{ megabytes/spindle} \times 8 \text{ spindles}}{333 \text{ Bytes/entry}} = .7\text{m entries}$$

Full Capacity:

$$\frac{\$7,135.00/\text{month}}{700,000 \text{ entries}} \times 12 \text{ months} = \$.12/\text{entry/year}$$

FIGURE 2

Cost Comparison of Storage Units
CARD Reader vs. Mini-Computer Storage



Cost per entry per year per cost sharing user (in cents)

NOTES FOR FIGURE 2

Values Used to Calculate and Plot Figure 2.

1. CARD READER

   Same as Table 4 B.

2. MINICOMPUTER: Example used is PDP 11/40

   $4,500 = Purchase price of 2.4 million character disc storage unit when purchased as part of full 11/40 system.

   $2,000 = Maintenance cost for 50 mos.

   7,200 = Estimated capacity of disc unit calculated as follows:

$$\frac{2,400,000 \text{ bytes}}{333 \text{ bytes/entry}} = 7,200 \text{ entries}$$

   Full Capacity:

$$\left(\frac{\$4,500 + 2,000}{7,200 \text{ entries}}\right) \div 4.17 \text{ yrs.} = \$.22/\text{entry/year}$$

TABLE 1

SUMMARY OF LIBRARIES OR LIBRARY SYSTEMS REPORTED TO BE EMPLOYING MICROFORM CATALOGS, 1970-1975

System	Number of Reported MF Catalogs
1. National Union Catalogs or Collections of Major Catalogs for National Coverage	5
2. State Wide Union or Collections of Major Catalogs for State Wide Coverage	5
3. University Wide or Inter-university Union	4
4. College, Research, University Library	11
5. Union Catalog for Units Smaller than State	10
6. Special Library	5
Total:	40

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
NATIONAL				
National Library of Australia	National Union Catalog of Monographs	Monographs only	Film; indexed	Maintain card file for filming adds Annual
Scottish Union Cat. (mix. of univ., res., & public)	9000 added vols/month Have .5 million unfiled entries	ISBN & location only	COM. - film	2 months
South African Union Catalog. 151 participating libraries	Begun 1942, closed 1972 with 2.5 M entries. Since 1972, all entries on fiche 2600 adds/month	ISBN & location only	42 X fiche 1100 titles/fiche	Quarterly; If fiche get too awkward, will film base and start fiche again
British Lending Library	Catalogs of 46 individual libraries		Film, 24 X, Code line and flash card indexing	
Rhodesian Libraries	Periodical holdings of Rhodesian Libraries		COM - fiche	Frequent updates intended

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(Australia)	Output will be suitable for range of equipment			Future updates likely to be COM from Australian MARC
(Scotland)		Borneby British Library and participating libraries		Should improve ILL efficiency
(South Africa)				Might publish alphabetical cat. from L.C. MARC if S.A.'s holdings are represented in sufficient quantity
(BLL) Rotary and planetary on and off site				Argue that fiche unsuitable for large files or public access Faster retrieval of fiche not as significant for BLL which searches sorted batches Uses 24X because of greater legibility
(Rhodesia)				

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
STATE				
Illinois State Lib.	600,000 vols. 280,000 titles 1 M cards		30 sets of catalog 16 MM cartridge 18000 cards/cartridge 57 cartridges for retro catalog 7 cartridges for current catalog Odometer indexing Location of item in 30 secs. max. 6 sec to get hard copy at 5¢	Quarterly Cumulative for all supps.
New Jersey State Library	600,000 A/T/S cards 200,000 titles		Film	Quarterly by filming separate card file
South Carolina State Library + 32 county & reg. libraries			Film	
West Virginia - 49 libraries	Individual library catalogs. 3 major catalogs contain locations		16 mm film 20 cards/frame Film can be stripped to make fiche	
Union Library Catalog of Pennsylvania (Eastern Pa. inter-type library system	10 M + cards		Film	

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(Illinois) 50,000 cards processed/day (2.5 reels) Dup., inspec., loading in cartridge for 30 sets took 54 worker days	Film 2.5 ml thick Cartridge holds 215 feet Motor driven readers	Reader printers: $1900 Cart. carousel: $100 30 sets of cat.: $633 (lab:10075 mat: 760 tran: 155		Goal was expedite ILL Claims reduction in ILL costs Bene's cited immediate access to state collection ref tool catalog data tool
(New Jersey)		Masters: $1000 Dupes: $5103 Cartr: $1795		Speeds ILL Claims cuts labor for ILL
(South Carolina)		LSCA funded		
(W. Va.) Rotary and planetary cameras				Used primarily for ILL
(ULC of Pa.)				Will provide M/film copies to decentralized locations to ease burden of ILL on ULC

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
UNIVERSITY WIDE & INTERUNIVERSITY UNION				
Univ. of Missouri 4 campuses	4 M cards		16 MM cartridge Location & printout takes 90 secs.	3 campuses maintain separate card files & film periodically 1 campus uses COM (excludes non roman type)
Louisiana Numerical Register. Holdings of 21 libraries	1.1 M vols 560,000 LC card #'s Complete for 11 libs Current only for 10 libs	L.C. card # and holding code	42X fiche 600 entries/page Requires 5 fiche App. 120,000 entries/fiche	Annual
Birmingham Libraries Cooperative Mechanisation Project (Univ. of Birmingham; Univ. of Aston; Birmingham City Library (England))	Machine readable since '72 Name catalog - 70,000 entries		Union and local catalogs on tape Birmingham has COM output, microfilm	Monthly
Kentuckian Metroversity (6 university libraries, 1 public, 1 community college lib, all in Louisville/S.E. Kentucky area	4 M + cards			

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
UNIVERSITY WIDE & INTERUNIVERSITY UNION				
(U. of Missouri)	Film 2.5 ml thick Cartridge holds 215 feet Motor driven readers	$25,000 estimated total		Goal was more efficient bib access to campus holdings
(LNR)		5.6 cents/entry 2.8 cents/title Update costs $3-4.00/copy		Used for overlap studies Intend to use other numeric ID's (e.g. ISBN) Could match numeric ID with machine readable data base to produce full record catalog
(BLCMP)				See also report on U. of Birmingham, in following section.
(Kentucky)		Funded via LSCA Title III		Film stored at Louisville Information Referral Center Goal is better, faster ILL. If successful will expand operations to other major lib. collections in Kty. to be held by Dept. of Libraries which will serve as bib control center

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
COLLEGE, UNIVERSITY, RESEARCH LIBRARY				
Georgia Tech	750,000 vols 600,000 microtexts Heavy concentration of serials Machine readable since '66 Base catalog thru '72 Supplement since '72	MARC format since '66	Base cat.: 717 fiche 42X 1000 entries/fiche A/T/S & serials (color coded) Supplement: 6000 monos or 12000 serials/fiche 42X Arrangement is column of entries that extends length of fiche	2 months
Mankato State Coll.	Serials holding list		4 fiche 42X	
Yale			Microfilms card catalog for distribution to other libs.	
Yale	In process list Sent to 12 locations within lib system 80,000+ entries, required 2000 pages		Film	
El Centro Community College, Texas	35000 books 1500 phonodisks	A/T/Call #	21 fiche total 7 author, 6 title, 8 sub.	2 months

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (Continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(Georgia Tech) Base catalog produced by rotary camera allowing high density and file integrity, + minimum disruption of service. 6-7000 cards/day filmed by crew of 3 non-tech people super. by cataloger. 16 mm film shot at half width slit into 5 mm strips, mounted on 4 x 6 acetate Supplement via COM	Viewer: REALIST VANGUARD 3333 (50X), has 2 fiche bins, sturdy, easy to use, image slightly larger than original Chose fiche over film because easier to use, more reliable readers. No problems to date with misfiling of fiche.	Base catalog less than 1¢ per card not counting time of library staff super. Supp.: Original + 50 copies of 11 fiche: $260	Intro by letters, brochures, demos. Instructions mounted between bins. Interviews with faculty led to conclusion "...that use of microform catalogs by libraries may not encounter the user resistance that has been experienced in use of other microforms in libraries."	"Faculty seems well pleased and compliments are frequent" "Real savings in man hours in technical processing."
(Mankato) COM			Patrons have no trouble with four fiche file.	
(Yale)				Sold to other libs. More current, cheaper. More access pts. to Yale collection than in NUC.
(Yale)				Evaluated speed of search film vs. paper Average search time in min., film vs. paper 1.01 vs. .783
(El Centro) COM				

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
Ohio State Univ. (test situation)	Selected areas of shelf list (classics)		Arranged via LCSH on fiche	
Wayne State Univ.	Serials holdings 1400 pages		16 MM film, 24X, cassettes	
University of Birmingham (Eng.)	Machine readable 90,000 entries Also film card catalog - 1.2 M. cards		Card catalog 52 cassettes for name catalog 30 cassettes for class. catalog	Monthly for COM 18 mos. for card catalog on film
New York Public Library, Research Library	Experiment with 4 card trays for public access Staff experimented with authority file and book catalog on MF		16 MM film	
Rand Afrikaans University (South Africa) Claremont	Machine readable 140,000 vols. Science Library Collection		13 fiche replace 3000 pages 52 fiche	

TABLE 2 SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(OSU)			Negative reaction to fiche	Sample too small expt. uncontrolled
(Wayne State) COM	Memorex 1644 auto-viewer 11x14 screen			
(U. of Birmingham) COM plus filmed old catalog	CIL 600 Have been inexpensive to maintain, hardy & compact	#90 for reader	Much initial staff resistance: Very little user resistance No queuing problems so far Had seminars for staff and users	
(NYPL)	1642 manual Memorex for public 1644 motorized Memorex for staff		Took longer to find entries on film than on card "Quite a few readers complain of dizziness or headaches." One reader with thick glasses was "unable to use microfilm machines at all." Staff found MF acceptable sub for authority file but preferred book catalog.	Goal was evaluation of MF catalog for public and staff

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(RAND)			"...Students and lecturers are making full use of the new form and no user resistance whatsoever has been encountered."	
(Claremont) COM from OCLC archivetape				

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
OTHER UNION SYSTEMS				
Westminster City Libraries. Many branches, 1 lg. ref. lib., 1 med. library	750,000 vols 75% non-fiction Since '70 all non-fict. incl. IP and On order are output via COM (over 70,000 titles) Pre '70 still in card file. A/Class. cat. on COM Subj. cat. is printed	Fixed format Upper case only Contains ISBN, DDC, A/T/Imprint, Proc. & control info., loc., & shelving info.	2 cassettes Film chosen over fiche because of feeling that eventual 20,000 fiched pages would become too cumbersome; and because of fear of vandalism. Memorex cassettes 3000 frames, 60,000 entries per cassette Negative image	Monthly
Baltimore county, Maryland	20,000 titles added/year		500 foot reel locked in cabinet of ROM II viewer Reel holds 30,000 pages Decided against fiche because "...we couldn't see a library patron handling a bunch of fiche and getting them all back in order..."	
Cheshire County (Eng.) 30 branches	Adult non-fiction 40,000 + titles added annually		16 MM film cassettes Each cassette holds 2000 frames, 20 entries/frame	Monthly

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
OTHER UNION SYSTEMS				
(Westminster)	CAPS Mercury motorized reader "... clearly preferred by public..." to manual reader. Very few maintenance problems Machines at standing height with simple instructions Began with Memorex 1642 reader (non-motorized)	#135/reader #1 cassette Maintenance at 5% of equip	No reported problems in changing cassettes acceptance "...has been exceptionally good...all types of users have adapted quickly to new format, and some consider it an improvement over card catalog." Eyestrain reported "... only for some" who used it continuously over long periods "On present experience we no longer have reservations about a catalog on microfilm or about the use that will be made of it"	Experience with COM so successful that planning COM for children's and music collection Have concerns over whether readers will hold up
(Baltimore County)	ROM II reader	$25,000-$40,000 cheaper per yr. than book catalog $750/reader		
(Cheshire) COM				Used for ILL, ordering

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
Shropshire County (England)	Adult and juvenile non-fiction 40,000 + titles over 3 years		42X fiche Entries run across page L to R. 208 pages/fiche; 20 entries/page Choose fiche, more portable, slightly cheaper 18 fiche altogether	
Cornwall County (England) 6 regional libs., 18 service points	30,000 records Author, classed catalog 4 years of additions		16 MM film 3 cassettes	
LASER (London area Southest Region, Union Catalog)	Monographs part of Recon Project		Tape & microform	
RAMAPO-Catskill Library System, N.Y. (45 libs.)	60,000 subject entries for books throughout system		178 microfiche 50 sets Fiche marked 1 of 178, 2 of 178, etc. When fiche file reaches 15", will color code	

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(Shropshire) COM				Chose COM because catalog updated weekly Long term plan is for all branches trailers, mobiles to have MF copies COM made it economically possible for first time for all branches to have a catalog (Before only area libs. had catalogs) Now branches have author and classified catalog of whole county continually updated and with locations
(Cornwall) COM	Satellite 2W readers			
(LASER)				
(RAMAPO)	Atlantic FGS Readers	1/4 cost of previous book catalog	File integrity has been no problem	Speeds ILL Fiche are easy to file, find, retrieve, copy, store and regroup.

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
L.A. Public	4 M vols. Over 700,000 titles 50,000 serial titles		Fiche	
B[illegible]ton, Eng.	Acquisitions since 1971 12,000/year A/T/Precis subj. index	Printed BNB	16 MM film	Monthly
Winnipeg	150,000 titles 225,000 vols		61 cartridges Code book identifies proper cartridge	Annual and weekly checklists

TABLE 2 SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
(LA Public)			"...preponderately favorable" Used by librarians only. Wider distribution "appreciated..."	
(Brighton) COM				
(Winnipeg)				

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS

SYSTEM	CATALOG	RECORD	OUTPUT	UPDATE
SPECIAL LIBRARIES				
Cornell-Museum Pusat			Film	
National Portrait Gallery	Catalog of American Portraits		Fiche	
Hughes Co. (Union list of 3 major libraries)	40,000 cards		16 MM film on 33 cartridges	3 times year
Lockheed	1 M+ entries		16 MM film 40 cartridges, 100' each, 1800-2 col. pages. 14 entries page. This replaces 720 catalog drawers. Cartridges stored in rack and color-coded	Quarterly
United Aircraft Research Labs.	53,000 tech. rpts.		2 100' rolls of 16 MM film	

TABLE 2: SUMMARY OF REPORTED INFORMATION ON MICROFORM CATALOGS (continued)

PRODUCTION	EQUIPMENT	COSTS	USER REACTION	COMMENT
SPECIAL LIBRARIES				
(Cornell-Pusat)				Cornell films Indonesian museum's card catalog & provides museum with copy
(NPG)				Allows dissemination of massive data base
(Hughes)	Lodestar Reader	Estimated savings of over $20,000 over 10 years	Takes longer to locate items (estimate 40 secs. vs. 20 secs. for card catalog. "The ease with which the system was inaugurated at the branch has been quite gratifying."	Branch is small so one reader per branch is no problem
(Lockheed)	Bell & Howell Model 531 with zoom lens 2:1 readers:patrons 1:1 readers:staff	Operates at net savings of $13,000 annually because of no card filing, no catalog card cases, 200% space savings		Catalog at work space allows staff to be more efficient
(UARL)				Advantages: 95% reduction/bulk Low cost of film dup. Ease of handling

TABLE 3

SUMMARY OF UCSC CATALOG

1. Author/Title/Series Base Catalog
   a. Last cumulation in 1973
   b. 25 vols.
   c. 18,600+ pages; 2 columns/page
   d. each bibliographic record generates 2.4 entries
      1) main entry and series entry are full records
      2) title, author added entries are partial
2. Author/Title/Series Supplement
   a. 1974 to date.
   b. 12 vols.
   c. 4000 pages; 2 columns/page
   d. produced every 2-3 months.
3. Subject Base Catalog
   a. Last cumulation in 1974.
   b. 20 vols.
   c. 16,500+ pages; 2 columns/page.
   d. each record generates 1.4 full entries.
   e. contains no syndetics.
4. Subject Supplement
   a. 1975 to date.
   b. 2 vols.
   c. 1000 pages; 3 columns/page
   d. produced every 2-3 months.

TABLE 3 (Continued)

5. Serials Holding List

   a. lists 1200 serials and holdings.

   b. 1400+ pages.

   c. produced 3 times/year.

In addition, there is an In Process file consisting of a card catalog of all in-process items arranged by main entry. This file contains approximately 10,000+ items.

TABLE 4

COMPARISON OF THE COSTS OF PRINTING 20 COPIES OF 1000 PAGE QUARTERLY SUBJECT SUPPLEMENT VIA COM FICHE VS. BOOK FORMAT

1. Fiche Costs

Using the formula for computing total costs of the fiche (variable TCF, APPENDIX A), assume the following:

NF - number of fiche	=	10
PT - process print tape for COM	=	$2.50
PM - fiche master	=	$1.50
PC - fiche copies	=	$ .09
NC - number of copies of each fiche	=	20
CF - total cost of 20 copies of one fiche	=	$5.80
TCF - total cost of all fiche	=	$58.00

2. Book Costs

Using the actual charges to UCSC for printing 20 copies of the subject catalog supplement in the fall 1975, including collating, binding, and lettering, compute as follows:

1,000 page @ $1.70 per page = $1,700.00

TABLE 5

COSTS TO PRODUCE AND USE ENTIRE UCSC CATALOG
VIA COM VS. BOOK FORMAT FOR ONE YEAR

1. FICHE CATALOG: ASSUMPTIONS RE VARIABLES

NB - number of records in base catalog = 250,000

AA - annual acquisitions = 20,000

NU - number of supplements = 3

PA - % of AA added to each supplement = .25

PC - years in print cycle = 1

NR - number of records printed per year during PC

$$NR = \frac{250{,}000 + \frac{(3)(4)}{2} \times .25 \times 20{,}000}{1} = 280{,}000$$

EF - entry factor = 3.8

EP - entries per page = 20

PF - pages per fiche = 250

NF - number of fiche (to nearest 5)

$$NF = \left(\frac{280{,}000 \times 3.8}{20}\right) \div 250 = 215$$

PT - process print tape for COM = $2.50

PM - fiche master = $1.50

PC - fiche copies = $ .09

NC - number of copies of each fiche = 20

CF - cost of all copies of one fiche

$$CF = \$2.50 + \$1.50 + (\$.09 \times 20) = \$5.80$$

TCF - total cost of all fiche (to nearest 5)

$$TCF = 215 \times \$5.80 = \$1{,}250.00$$

TABLE 5 (Continued)

FR - cost of fiche readers = $150.00

MR - fiche reader maintenance - 10% of FR = 15.00

TR - number of readers = 50

RP - cost of reader printer = $2,000.00

PM - cost of RP maintenance - 10% of RP = 200.00

TP - total number of reader printers = 1

AP - amortization period in years = 2

TCE - total cost of equipment

$$TCE = 50 \left(\frac{\$150 + \$15}{2}\right) + 1 \left(\frac{\$2000 + \$200}{2}\right) = \$5,225.00$$

NP - patrons unable to use fiche = 100

CP - copies per patron = 200

CC - cost per copy = $ .05

TCS - total cost of added service

$$TCS = 100 \times 200 \times \$.05 = \$1,000.00$$

2. FICHE CATALOG: SUMMARY OF COSTS

TCMC - total cost of microfiche catalog

$$TCMC = \$1,250.00 + \$5,225.00 + \$1,000.00 = \$7,475.00$$

TABLE 5 (Continued)

3. BOOK CATALOG: ASSUMPTIONS RE VARIABLES

NB, AA, NU, PA, PC, NR, EF, EP ARE THE SAME AS THEY ARE FOR THE MICROFICHE CATALOG

EP - entries per page = 30

NP - number of pages

$$NP = \frac{280,000 \times 3.8}{30} = 35,500$$

NC - number of copies of a page 20

CP - cost per page

(in the absence of a competitive bid situation, the cost per page is estimated at $1.25. This is taken as a favorable assumption for the book catalog) = $ 1.25

4. BOOK CATALOG: SUMMARY OF COSTS

TCBC - total cost of book catalog

TCBC = 35,500 x $1.25 = $44,375.00

APPENDIX A

ESTIMATING THE ANNUAL COST OF A MICROFICHE CATALOG

Cost of Fiche

NB - number of individual titles in the base catalog

AA - annual acquisitions; titles added per year

NU - number of supplementary updates printed before base catalog is recumulated and reprinted

PA - per cent of annual acquisitions (AA) added to each update

PC - number of years in a print cycle; i.e., elapsed time between reprintings of base catalog

NR - number of records printed per year during print cycle

$$NR = \frac{NB + \frac{(NU)(NU+1)}{2} \times PA \times AA}{PC}$$

EF - entry factor constant; i.e., the constant by which the number of records must be multiplied to derive the number of entries in the catalog. The most precise estimate would require several EF_i's, one for each type and size of entry, which would then be used to compute the number of entries per page. For the calculations made here, however, the variations in entry size will be averaged by using an estimated number of entries per page (EP).

EP - entries per page

PF - page images per fiche

NF - number of fiche required for catalog

$$NF = \left(\frac{NR \times EF}{EP}\right) \div PF$$

PT - cost per fiche to process print tape in preparation for COM run. Preparation includes such things as insertion of eye readable characters, compilation of an index page on the fiche, etc. The costs of this preparation can be reduced if the design requirements for the fiche are changed, e.g., no index page required.

PM - cost to produce a microfiche master

PC - cost to produce each copy of a master

NC - number of copies of each fiche required

CF - total cost of all copies of one fiche

$$CF = PT + PM + (NC \times PC)$$

TCF - total cost of all copies of catalog on microfiche

$$TCF = NF \times CF$$

Cost of Equipment

FR - cost of fiche reader

MR - cost of reader maintenance

TR - total number of readers required

AP - amortization period in years

RP - cost of fiche reader printer

MP - cost of printer maintenance

TP - total number of reader printers required

TCE - total cost of all required equipment

$$TCE = TR \left(\frac{FR + MR}{AP}\right) + TP \left(\frac{RP + MP}{AP}\right)$$

Cost of Additional Services

NP -- number of patrons who cannot use microfiche and who require paper copies of the appropriate pages of the catalog.

CP - number of copies of catalog pages supplied per NP

CC - cost per copy of fiche page

TCS - total cost of additional services

$$TCS = NP \times CP \times CC$$

Summary of All Costs

TCMC = total cost of microfiche catalog

$$TCMC = TCF + TCS + TCS$$

Where

$$TCF = \left(\left(\frac{NR \times EF}{EP}\right) \div PF\right) \left(PT + PM + (NC \times PC)\right)$$

$$TCE = TR\left(\frac{FR + MR}{AP}\right) + TP\left(\frac{RP + MP}{AP}\right)$$

$$TCS = NP \times CP \times CC$$

APPENDIX B

ESTIMATING ANNUAL COST OF UCSB BOOK CATALOG USING CURRENTLY CONTRACTED SERVICE BUREAU

Number of Pages in Book Catalog

For NB, AA, NU, PA, PC, NR, EF, EP see APPENDIX A

NP - number of pages

$$NP = \frac{NR \times EF}{EP}$$

Cost per Page for X Copies

NC - number of copies of catalog required

CP - cost per page for NC copies of catalog as quoted by service bureau

Total Cost of Book Catalog

TCBC - total cost of book catalog

$$TCBC = NP \times CP$$