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## Cost Comparison of Manual and Automated Files in a School Library

Phyllis Sargent

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## Cost Comparison of Manual and Automated Files in a School Library

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COST COMPARISON OF  
MANUAL AND AUTOMATED FILES  
IN A SCHOOL LIBRARY

A Research Paper  
Presented to the  
Faculty of the Library Science Department

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In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

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## ABSTRACT

The purpose of this study was to determine if it was more cost effective to create and maintain selected school library files by a manual method or by a microcomputer method.

The hypotheses were tested by choosing three library files - circulation file, vertical subject heading file, and a materials on-order file - found in a high school library and going through the processes of gathering the data, creating the file, adding to and changing the information and changing the format of the file. Each one of the processes for each file was timed and the amount of materials used to create and maintain the file was recorded. The materials and times were converted into a dollar cost for comparison of the manual and microcomputer methods.

The study shows that of the three files tested, two were more cost efficient to create and maintain on a microcomputer, while the third, the circulation file, was not. A cost study of longer duration, one conducted during the school year, or one using different files might result in different findings. Each file was created only for the purpose of this study and while each file is used in many school libraries, the manner in which they were created and maintained was not a real-life situation.

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## Chapter 1

### INTRODUCTION

School libraries have been faced with a serious problem in the past few years - less money in the budget. An obvious result of smaller budgets is that fewer materials are being purchased. In Camden City, New Jersey, six librarians were relieved of their duties and were forced to "bump" other teachers with lower seniority in order to retain a job. This action left five full-time librarians to staff approximately 20 elementary school libraries.<sup>1</sup>

Lower enrollments and subsequent school closings, local tax cuts and reductions in federal funding are all contributing factors to smaller school budgets.<sup>2</sup> School administrators have been forced to reduce personnel positions. In the school library field these reductions have meant that some librarians were let go or their working hours were cut. Some aides were dismissed; the remaining aides were "shared" between the administrators and librarians. In a recent conference held at the University of Northern Iowa, the "no aides" problem was discussed during an informal gathering of librarians. One told about losing her aide and how she was unable to continue services she had offered in the past such as book talks, reading to the students, teaching library skills, creating bibliographies for teachers, or aid

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<sup>1</sup>"New Jersey and Massachusetts Librarians Jobs Abolished due to Budget Crunches," School Library Journal, 27:9, February, 1981.

<sup>2</sup>Notowitz, Carol, "A New Way to Work: Job Sharing for Librarians," School Library Journal, 27:112, March, 1981.

in any reference work. A majority of her time was spent on circulation tasks, ordering or processing materials, and filing. Other librarians added comments about their situations with no aides. No real answers were ventured, only the common problem of little time for all the professional tasks when no aides were available.

Because of the lack of good clerical help, the librarian often must take time to type cards and lists, shelve materials, check out and check in materials, mend books, and perhaps, supervise study halls held in the library. Care and maintenance of the materials collection and the physical facilities of the library become the primary job. Little time is left for other library services such as selection of materials, dissemination of information to teachers and students, teaching library media skills or answering questions.

The school librarian with no other adult staff is forced to become a real master of time management. Little has been published concerning staff cuts and how they affect the school library. The literature does reveal that public libraries are experiencing reduced budgets and reduced staff, too. The Oakridge Public Library in Oregon had a budget of \$12,000.00 and one staff member working 30 hours per week. The librarian discovered that she was spending 75% of her time on circulation-related paperwork as well as the "...never ending tasks of keeping statistical records, department accounts, and records of book orders." She "...saw in a microcomputer system a possible solution to our problem."<sup>3</sup> The library now has its circulation records

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<sup>3</sup>Christian, Debora, "The Microcomputer at Oakridge, Oregon," Library Journal, 105:1470, July, 1980.



automated and when a printer is purchased, the librarian predicts that the process of generating overdue slips will take minutes instead of hours a week.<sup>4</sup>

Few, if any, research studies have been published which deal with little or no staff available to operate a school library. Perhaps the situation is still too new to have been studied in depth. However, in talking with several librarians, the researcher found that many do lack sufficient time and staff to provide desired professional services. Research needs to be undertaken to offer possible and realistic solutions to this problem.

The purpose of this study was to find out if microcomputers can be used in the school library to automate some library files, thereby relieving the librarian of time-consuming clerical duties.

### Problems and Hypotheses

This study was undertaken to find out the cost of developing and maintaining selected library files by the manual method and by the microcomputer method.

To answer this research question, and to determine the feasibility of maintaining selected library files on a microcomputer, the following hypotheses were tested:

1. The "time" cost of developing each selected library file by the manual method will be greater than the "time" cost of developing each selected library file by the microcomputer method.

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<sup>4</sup>Christian, op. cit., pp. 1471.

2. The "materials" cost of developing each selected library file by the manual method will be greater than the "materials" cost of developing each selected library file by the microcomputer method.

3. The "time" cost of maintaining each selected library file by the manual method will be greater than the "time" cost of maintaining each selected library file by the microcomputer method.

4. The "materials" cost of maintaining each selected library file by the manual method will be greater than the "materials" cost of maintaining each selected library file by the microcomputer method.

#### Limitations and Assumptions

Lack of published research dealing specifically with the use of microcomputers as an aid in the school library management of records or files does not allow for a comparison of the findings from this study with those from similar studies. Other limitations of the study are:

1. Selected files of information are those used in a high school library rather than all possible files found in a school system.

2. All possible cost factors are not included. Fringe benefits are not included in personnel time cost nor are overhead costs and original equipment costs included in the materials cost.

3. The librarian/researcher has experience using both manual and microcomputer methods on a near equal experience base so time needed to learn how to use a microcomputer data base management program was not included.

Along with these limitations, the following assumptions are made:

1. Microcomputers are very well suited to the record handling activities of a school library and are well suited to organizing data

into a logical order. School libraries have data that need to be organized easily and logically for ease of use by its staff and patrons. Therefore, librarians can use microcomputers to organize library files into a logical manner.

2. There is a need in high school libraries to keep records in some logical order for easy retrieval by trained staff and untrained patrons.

3. Because of demands on the librarian's time for help in using the library, he/she needs to use efficient and economical methods for doing routine record handling tasks such as overdues, bibliographies, or book lists.

## Chapter 2

### LITERATURE REVIEW

This review includes literature about the use of computers in libraries, specifically in the areas of public services, technical services, and administrative services. Libraries of all types have these main services areas to some degree. Cost studies comparing automated to manual systems are included also. It is difficult to find documented cost studies because of problems that arise when doing a comparative cost study.

Not reviewed will be information concerning types and costs of microcomputer systems and data base programs that are currently available. Each library has specific needs that can be met by several different microcomputers and programs. The purpose of this paper was not to examine the functions and capabilities of microcomputers. There are many other sources that provide that information.

Computerization is becoming an accepted and necessary step for libraries to take in order to keep abreast of the fast changing world. Janet Egeland made the following statement: "Among the many important technological innovations that have come from the information industry to manage and disseminate information in a cost-effective manner in the future will be the microcomputer."<sup>5</sup> Libraries have started to use microcomputers as a management tool. Until recently, there has not been

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<sup>5</sup>Egeland, Janet, "Independence via Microcomputer," Library Journal, 105:1476, July, 1980.

a great amount of good software available to help in this task. More programs are being developed and Hines et. al. gives a good list of possible areas to automate, among them are union lists, word processing, bibliographic listings, inventory, and vertical file headings list.<sup>6</sup>

A librarian in Colorado developed computer catalog programs for a totally computerized card catalog.<sup>7</sup> The program is designed for ease of use and the students can type in simple terms to find the material needed. A response is always given. Another librarian in Illinois uses a commercial software package to catalog his collection of software. He finds that a microcomputer makes it easier for teachers and students to locate desired material.

Larger public, academic, and special libraries have used computer technology in a number of ways for years. "The functioning of the library depends on the speedy and efficient handling of records - their creating, consultation, amending, and their updating which creates an enormous data handling problem and one that is well suited for a computer application."<sup>8</sup>

Exactly how are computers used in libraries? In the public services area, that portion of a library where circulation, reference inquiries, and consultation of the card catalog are carried out, a

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<sup>6</sup>Hines, Theodore, et. al., "Library Applications of Microcomputers," Monitor, August, 1981, pp. 15-16, 23.

<sup>7</sup>Anderson, Eric S., "The Amazing Library Computer," Electronic Learning, 2:68-70, March, 1983.

<sup>8</sup>Young, Micki Jo, Introduction to Minicomputers in the Federal Libraries. (Washington: Superintendent of Documents, 1978), p. 19.

microcomputer can be used in many different ways. The public library in Oakridge, Oregon, uses a microcomputer to charge books out to patrons. Using the microcomputer, the librarian can "...identify holders of overdue material when they try to check out something new."<sup>9</sup> She can also have the computer "...generate a report listing patron's names, address, and overdue material."<sup>10</sup> Using the microcomputer has "...helped us make better use of our staff and made our circulation procedures more efficient."<sup>11</sup>

A high school in Jamesburg, New Jersey, is using a microcomputer for circulation purposes. The program they use was written by persons in the school's business department. Their program incorporates the following functions: produces a list of students and their addresses, produces a student's account and shows the books held by the student, prints overdue notices, prints total number of books circulated, divides circulated books by Dewey classifications, locates books in circulation, and prints letters to parents regarding overdue material.<sup>12</sup> They have not done a cost analysis, but feel "...that the ease with which we get our information is worth the time spent entering it."<sup>13</sup>

In Canada, the National Library of Canada is using computers to aid in answering reference questions from patrons. The staff performs automated searches to answer questions or produce bibliographies. Through the use of a computer terminal and a telecommunication system, they can access several data bases - defined as "...a set of

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<sup>9</sup>Christian, op. cit., pp. 1470.   <sup>10</sup>Ibid.   <sup>11</sup>Ibid.

<sup>12</sup>Lee, Leona, "A Microcomputer Handles Overdues," School Library Journal, 27:42, April, 1981.

<sup>13</sup>Ibid.

bibliographic citations on a magnetic tape so it is machine readable."<sup>14</sup> Through this data base, patrons can "...access on a weekly basis the most recent materials cataloged at the Library of Congress as well as ERIC documents."<sup>15</sup> A national network called CAN/SDI (Canadian Selective Dissemination of Information) enables school libraries to search the LC/MARC tapes for cataloging information as well as using the system for reference work. The use of a computer in the reference area cuts down on time. Curley points out that "...a manual search on the integrated curriculum in the sciences could take you 2 or 3 days to complete before you select materials. An automated search would take 1/2 to 3/4 of an hour."<sup>16</sup> She also states that "...in times when budgets and space are being cut, bibliographic services expand one's collection and one must only pay for the on-line time."<sup>17</sup>

The Chicago Public Library also has a computer-assisted reference center that "...can reduce to mere minutes the time usually required for a thorough query."<sup>18</sup> A trained librarian will interview the patron and devise a search strategy needed to produce the desired information. "The cost - the first 5 minutes of computer time are free; each additional minute costs \$1.50."<sup>19</sup>

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<sup>14</sup>Curley, Elizabeth McDonald, "On-line Reference Services and Teacher/Librarians," Canadian Library Journal, 36:271, October, 1971.

<sup>15</sup>Ibid. pp. 272.    <sup>16</sup>Ibid. pp. 273.    <sup>17</sup>Ibid.

<sup>18</sup>"Computerized Reference at CPL," Library Journal, 104:2510, December 1, 1979.

<sup>19</sup>Ibid.

The technical services area uses automation to a greater extent. Staff in this area order and receive material, and then catalog, classify, and process the material so it is ready for use by the patrons. "It has long been realized that centralized processing can free media specialists from time-consuming clerical tasks."<sup>20</sup> Many schools use central processing to order and catalog books. One system in Shawnee Mission, Kansas, uses an on-line cataloging system in their central processing office. The data base called FASTER (Filing and Source Data Entry Techniques for Easier Retrieval) can do "...24 transactions per minute by four terminals or 12,960 transactions during a 9 hour day..."<sup>21</sup> Shawnee Mission now controls its collections through computer files as well as inventory control, printed catalogs, bibliographies, and union catalogs.

A large book jobber - Baker and Taylor - uses a computer to speed up orders. They send a coded order list to school librarians who check off titles they wish to order. The list is returned to Baker and Taylor and is read by the computer via an optic scanner which is used for speed and accuracy.<sup>22</sup>

OCLC (On-Line Computer Library Center) is another commercial data base service used in the technical services area. This data base can be used for cataloging, acquisitions, and interlibrary loans. This system is beginning to be used in some local libraries. The data base

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<sup>20</sup> Twaddle, Dan R., "School Media Services and Automation," School Media Quarterly, 7:258, Summer, 1979.

<sup>21</sup> Miller, Ellen Wasby, "Shawnee Mission's On-line Cataloging System," Journal of Library Automation, 4:25, March, 1971.

<sup>22</sup> Twaddle, op. cit., pp. 258.



can be accessed via a microcomputer and used to verify cataloging information and also an order can be placed for catalog cards and labels.

According to the literature, computers are not being used for administrative services as much, as for the other two areas of service, to date. The planning and organizing of staff, controlling budget, directing and coordinating the staff and its actions are all part of the administrative function.

The computer system devised by the public school system in Shawnee Mission, Kansas uses the system to provide monthly budget and expenditure records for the whole school as well as for the library.<sup>23</sup> The public library in Oakridge, Oregon, also uses their computer to compile statistics and reports.<sup>24</sup> The most frequently mentioned uses for a microcomputer in the administrative area are fund accounting, reporting and word processing. Word processor packages "...allow editing, formatted printing, automatic page numbering, footnote and index generation, right justified margins, etc."<sup>25</sup> Random sampling techniques can also be employed by the administration to spot check information about their organization. Microcomputers are well suited for this task because they can be programmed to select, in a random manner, a sampling of any information field that is being studied. Random digit tables need not be used and the staff need not deal with the repetitiveness necessary in making a selection. The microcomputer

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<sup>23</sup>Twaddle, op. cit., pp. 259.

<sup>24</sup>Christian, op. cit., pp. 1470.

<sup>25</sup>Lundeen, Gerald, "The Role of Microcomputers in Libraries," Wilson Library Bulletin, 55:182, November, 1980.

can also arrange and print out the information in many different formats.<sup>26</sup> Random sampling can be used to measure accuracy of the shelf list, check user opinion of library services and weed the collection.

The literature does show the many uses of microcomputers in all areas of service. Is it cost efficient? There are some who argue it is not. One author "... depicts library automation as an inefficient, costly monster, giving worse service than its manual predecessor."<sup>27</sup> Based on actual studies done, one may be hard put to deny the above accusation. In a report by Mosley, she states that "A review of the literature reporting automation projects...reveal very few evaluations. Many reports give no indication of costs at all. Those which do often cite unreliable figures, and rarely give any basis for evaluation of automated systems, in comparison with manual ones."<sup>28</sup>

There are problems involved in doing a cost study in the library area. "There is a great lack of consistency in reporting the costs of automated library systems. In a review of the literature about cost analysis done by Mick, several problems are pointed out. He concludes that there are many tools around to use in costing, but the problem is in applying the tools. There is no standardization of cost studies and many are incomplete. He opens his review with a quote from Price - "Unfortunately, the literature of information systems

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<sup>26</sup>Heinritz, Fred J., "Using the Computer for Library Random Sample Selection," College and Research Libraries, 40:261, May, 1979.

<sup>27</sup>Mosley, Isobel, Cost Effective Analysis of the Automation of a Circulation System. Master's Thesis, August, 1974, ED-097 009, pp. 5.

<sup>28</sup>Ibid., pp. 6.

costing has not, to date, been characterized by either nationality or usefulness."<sup>29</sup> Grosch also examines the literature for cost/benefits studies of library automation.<sup>30</sup>

Cost figures given in published reports tend to be misleading and confusing; rather than indicate the true cost of a system, they tend to obscure the issue.<sup>31</sup> "...use of standardized methods can make cross comparisons meaningful and give a basis for estimating the costs of a new system."<sup>32</sup> Several authors speak to the point of having a standardized method for collecting and evaluating data. A first step is to evaluate and determine the cost of the present manual system used in order to compare it with a new system being implemented.<sup>33</sup> The following steps are suggested by Clements to enable library systems to be costed in a uniform and comparative manner:<sup>34</sup>

1. A list of expense and revenue headings under which data must be recorded.
2. Agreed methods of apportionment of costs on an arbitrary basis where exact analysis cannot be made economically, e.g., accommodation costs.

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<sup>29</sup>Mick, Colin K., "Cost Analysis of Information Systems and Services," Annual Review of Information Science and Technology, 14:37-57, 1979.

<sup>30</sup>Grosch, Audrey N., "Library Automation," Annual Review of Information Science and Technology, 11:225-255, 1976.

<sup>31</sup>Jacob, Mary Ellen L., "Standardized Costs for Automated Library Systems," Journal of Library Automation, 3:207, September, 1970.

<sup>32</sup>Ibid., pp. 207.      <sup>33</sup>Ibid., pp. 208.

<sup>34</sup>Clements, D.W., "The Costing of Library Systems," Aslib Proceedings, 27:98, March, 1975.

3. A standard list of library operations so that similar tasks can be compared.

4. An agreed list of units of measure of output or service so that statistics are meaningful and comparable.

As can be seen, there are problems and discrepancies in cost effective reporting. In 1974, Mosley found only "...11 reported cost comparisons between manual and automated circulation systems..."<sup>35</sup> Two other reports gave no breakdown of staff time needed for the manual and automated operations. Still other reports gave operating costs but no breakdown of other costs.

A study undertaken by Nash and Hession of Bell-Northern Research Ltd. stated that a savings of fourteen man-years and \$371,826 could be realized over a five year period when part of their library operations were automated. They decided to study the areas of acquisitions, cataloging and circulation for possible automation. Work loads were projected over a five year period. An average salary base was used to convert time into money. They then determined how many minutes of labor could be saved if automation were introduced. Besides the projected savings in money and time, the authors listed other benefits: better budget control; circulation records could be used for acquisition and weeding; reduction of errors and duplicated tasks; authority files could be provided and better control over interlibrary loans.<sup>36</sup>

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<sup>35</sup>Mosley, op. cit., pp. 6.

<sup>36</sup>Nash, Mary, and Sandra Hession, "Justifying an Automated Library System - A Case Study," ASIS Proceedings, 17:80, 1978.

Another study was done by Mendenhall to determine the cost of data input methods. She compared the magnetic card selectric typewriter (MCST) and an optical character recognition (OCR) as devices used to input data. She compared labor costs and machine costs and rated the performance of the two methods by cost, efficiency, versatility, and acceptability. In all areas but cost, the two systems were rated equal. In the cost area, the OCR cost was \$22/month and the MCST cost was \$305/month.<sup>37</sup>

Elman compared the cost of a literature search using manual methods and on-line computer methods. He used data derived from forty-eight manual searches done and found that twenty-two hours was the average time needed to search at a cost of \$10.00/hour plus \$30.00/**search** average for support costs (clerical help and reproductive costs). The average cost of each of the forty-eight searches done was \$250.00.

He then compared data from sixty-six computer-aided searches done with the result that forty-five minutes was the average time needed to search at a cost of \$1.00/minute plus \$2.00/<sup>search</sup>average for off-line print costs. The average cost of each of the sixty-six searches done was \$47.00.<sup>38</sup>

Mosley conducted a cost-effective analysis of a circulation system comparing a manual system with a semi-automated system. Her analysis included system development, implementation, equipment,

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<sup>37</sup>Mendenhall, Donna M., "Cost Comparisons of Four Data Input Methods," Journal of Chemical Documentation, 14:2:109-111, 1974.

<sup>38</sup>Elman, Stanley A., "Cost Comparison of Manual and On-line Computerized Literature Searching," Special Libraries, 66:12-18, January, 1975.

system maintenance and supervision. Her analysis showed that the manual system cost was \$0.09635 per card and the semi-automated cost was \$0.19066.<sup>39</sup>

A cost study was undertaken in 1972 to compare the preparation of catalog cards by computer and by manual means. OCLC was the vendor used to obtain cards. The manual cost per card was determined from costs given in the literature. The cost per card, based on a six card set was 10.6¢ for a computer generated set and 23.6¢ for a manually generated set. The cost of manually filing the cards was not figured in nor were there any equipment charges mentioned.<sup>40</sup>

There are many applications for microcomputers in the library field. They are used in circulation, acquisition, cataloging, reference, and interlibrary loan as well as for budgetary control, reports and statistical uses. Microcomputers and larger computers are used, but are they cost effective? Some studies show that they are, but have these studies shown the full costs involved? Cost can be defined by fixed overhead, actual salaries of people involved, equipment cost, and/or material cost. The literature suggests that there is a lack of standardization in the cost comparison method. It seems obvious that in order to determine if automation or use of microcomputers is cost efficient, more cost comparison studies should be undertaken, but these studies should accept a single standardized approach as far as what to include in the study and how to measure time and cost. Without this

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<sup>39</sup>Mosley, op. cit., pp. 16.

<sup>40</sup>Kilgour, Frederick, "Evolving, Computerizing, Personalizing," American Libraries, 3:142-143, February, 1972.

standardization the studies will continue to be misleading and unusable by librarians planning for the automation of library services.

## Chapter 3

### METHODOLOGY

The researcher has drawn from her own experience as a high school librarian in a small Iowa school system of 400 students in grades K-12. Approximately 200 were enrolled at the high school level. The researcher feels that the library is fairly typical of most small school libraries in relation to the functions performed. Most libraries circulate materials, order and process material, compile bibliographies, keep statistics and deal with patrons. Another school librarian in a similar situation was asked to identify and describe types of files developed and maintained by her library.

Each file suggested was analyzed to discover the types of information actually used to make up the file as well as the changes, modifications and uses of the file. A file is defined as any type of information kept in some written form and in some logical manner which is accessed on a regular basis and is updated or changed on a regular basis. A written or hard copy of the file may occasionally be needed. A worksheet<sup>41</sup> was used to record the information necessary for analysis. The worksheet asked about input of information; who gathers the information; what information is gathered; how often; when it is gathered; and where the information is obtained.

The worksheet also contained a second section concerning the output of information; what type of format was used; who requested the

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<sup>41</sup> See Appendix A for examples of the worksheet used.



information; how many copies are requested and how often the information was requested.

A third section of the worksheet noted the equipment and supplies needed for input and output of information.

From these information sheets about library files, three were chosen to use in this study. These files met the following criteria:

1. The files are used by the librarian on a regular, at least once a month, basis.

2. The files require frequent updating. A librarian or an aide has to access the file at least once a month to add or change information.

3. A printed paper copy of the information in the file is required at regular or irregular intervals.

4. File information requested by users may have to be arranged in different ways depending on their needs.

5. Each record in each file does contain all the information relative to that file.

6. The file is large enough to contain at least 50-60 records.

7. The type of file is not unique to one school library.

The microcomputer used was an Apple II+ with monitor, two disc drives, and a printer. This is a common microcomputer system found in many school settings. The microcomputer data base program used was Data Factory (Version 5.0) by Micro Lab. This program is widely available and within a price range which is affordable for most school libraries. Data Factory is a versatile data base management program because:

1. The program allows a user to establish for a file the number of fields (89) per record, the length of each field (1-239 characters) and will accept alpha-numeric characters or both.

2. The program provides an update or change option. A file can be searched by any field, in any order. An entire field or one piece of information can be added, deleted, or changed in some manner.

3. Up to 20 fields in each record in a file can be sorted in ascending or descending order - alpha or numerical order.

4. The program will list complete records or parts of records in a file. A user can select what fields in a record are to be listed.

5. The program includes an option of using a printer with the microcomputer. A user can designate and recall up to ten different formats per file when a printed copy is needed.

This program is "user" friendly in that it has good documentation and requires little training to use.

After three files were selected, the next step was to develop or create each file. This was accomplished by determining the content of the file; deciding the format of the file; and then gathering the information to be included in each record in the file. The following steps were taken to develop and maintain each file (See Appendix A for the worksheets used to record the information needed to develop and create each of the three files):

A. DEVELOPING A FILEBOTH METHODS

1. Decide and gather specific pieces of data per record for 50 records.
2. Record on 3x5 cards.
  - (a) Record time needed to complete task.
  - (b) Record amount of materials used.

CREATING EACH SELECTED FILEManual Method

1. Determine structure of file.
2. Type cards
3. Check and verify data.
4. Sort into desired order.
5. Decide format for printed copy.
6. Select 30 records to type on paper for intended user.
7. Type paper copy.
  - (a) Record time needed to complete task.
  - (b) Record amount of material used.

Microcomputer Method

1. Determine structure of file - fields, length.
2. Input data.
3. Check and verify data.
4. Sort into desired order.
5. Decide format for printed copy.
6. Select and search for 30 records to print on paper for intended user.
7. Print paper copy.
  - (a) Record time needed to complete task.
  - (b) Record amount of material used.

B. MAINTAINING A FILEBOTH METHODS

1. Gather specific data for 10 records.
2. Write data for 10 records on 3x5 cards.
  - (a) Record time needed to complete task.
  - (b) Record amount of material used.

ADDING NEW RECORDS TO EACH SELECTED FILE

<u>Manual Method</u>	<u>Microcomputer Method</u>
1. Type cards.	1. Input data.
2. Check and verify data.	2. Check and verify data.
3. Interfile cards in established file.	3. Sort.
4. Select 30 records from updated file for typing up a paper copy for intended user.	4. Select and search for 30 records from updated file to print for intended user.
5. Type.	5. Print.
(a) Record time needed to complete updating task.	(a) Record time needed to complete updating task.
(b) Record amount of material used to complete updating task.	(b) Record amount of material used to complete updating task.

CHANGING DATA IN EXISTING RECORDS OF EACH SELECTED FILEBoth Methods

1. Gather specific data changes for 10 records.
2. Make changes on existing 3x5 cards.
- (a) Record time needed to complete task.
- (b) Record amount of material used.

<u>Manual Method</u>	<u>Microcomputer Method</u>
1. Retype 3x5 cards.	1. Input data changes.
2. Interfile cards.	2. Sort.
3. Select 30 records from updated file for typing up a paper copy for intended user.	3. Select and search for 30 records from updated file to print for intended user.
4. Retype paper copy containing changed data for intended user.	4. Print copy of data with changes for intended user.
(a) Record time needed to complete task.	(a) Record time needed to complete task.
(b) Record amount of material used.	(b) Record amount of material used.

C. CREATE A NEW FORMAT

<u>Manual Method</u>	<u>Microcomputer Method</u>
1. Decide on new format.	1. Decide on new format.
2. Sort into desired order.	2. Sort into desired order.
3. Select 30 records to type on paper for intended user.	3. Search/select 30 records.
4. Type paper copy.	4. Print paper copy for intended user.
(a) Record time needed to complete format change.	(a) Record time needed to complete format change.
(b) Record amount of material needed to complete format change.	(b) Record amount of material needed to complete format change.

Recording of Data

The data recorded was analyzed according to time cost and materials cost. The time factor was converted into a cost by showing the time needed to create and maintain a file as manhours of work -  $T = \text{hours} \times \text{salary/hour}$  where  $T = \text{time}$ . The cost of materials used for both manual and microcomputer methods was obtained from standard library supply catalogs without discounts.

A form was used for each file to record time costs and materials costs. On each form was recorded the time cost and materials cost for creating the file, for maintaining the file, for updating the file and for reformatting the file by the manual method. For purposes of this study, manual method was defined as not using automated electronic devices to create and maintain files. The work was done "manually" by a librarian or an aide. The microcomputer method was defined as using automated or electronic devices to create and maintain files. Most of the work was done by a machine rather than by a person. The "work" was that of sorting, alphabetizing, and printing out copies of the file requested.

Actual hours needed as well as actual amounts of material used to create and maintain each file were recorded. Each column was sub-totaled at each division and totaled at the end. A final cost was determined by adding time cost and materials cost together for each file and for all files.

## Chapter 4

### ANALYSIS OF DATA

The three files chosen for study were a circulation file, vertical file subject heading list, and an on-order file for print and non-print material. The circulation file contained information about materials checked out of the library. The title, author, date due, call number, and borrower's name were all recorded on the checkout card before file input. All the information in this file except borrower's name and date due was recorded on the checkout cards when materials were added to the collection. The purpose of this file was to keep track of all circulating material.

The vertical file subject headings file contained the general subject headings that are used to index the materials in the vertical file. Cross reference, see and see also headings were included. The file was arranged alphabetically by subject headings. The purpose of the file was to provide an index to all materials in the vertical file.

The on-order file was made up of information about material that had been ordered. Each record included the title, author, price, publisher and address, publication date, ISBN number, call number, date ordered and the name of the person for whom the item was ordered. The file was used to keep track of outstanding orders and their current status.

This study was conducted under atypical conditions in that the files were created and maintained without the interruptions that usually occur during the school year in a typical library setting. Repeating this study with the time pressures on library staff when school is in session would likely change the results.

In order to time the study accurately, a stop watch was used and the time was rounded off to the nearest hundredths of a second. The stop watch was started when the information for the first record in the file was gathered and was not stopped until the information for the last record in the file was gathered. Each process in developing and maintaining all three files were timed in the same manner.

After the total times for all processes were recorded, they were then converted into personnel salary cost. To figure the cost of each timed process, a salary figure of \$17,032.00 per year, the average salary of school librarians in the midwestern United States,<sup>42</sup> was used as the base. The average number of days per school year, 180, was multiplied by the average number of hours per day, eight, to find the average number of hours worked per year by school librarians. Average salary per hour was \$11.83 and the average salary per minute was \$0.1971. The salary was figured by the minute instead of by the hour because the time recorded to complete each process for all three files was never greater than sixty minutes and the results were clearer when shown in minutes. Times given on the tables can be converted to hours by dividing by sixty.

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<sup>42</sup>Bowker Annual of Library and Book Trade Information. (New York: R.R. Bowker, 1983), pp. 292.



The cost of materials was determined by figuring the cost of a single item for each type of material used. For example, one unlined 3x5 index card cost \$0.0036 (\$0.36 per 100); one 8-1/2x11 sheet of typing paper cost \$0.0065 (\$3.26 per 500); and one sheet of micro-computer printer paper cost \$0.02 (\$10.20 per 500). The cost of materials used was a negligible amount and could be reduced by using scratch paper for the gathering of data.

Table 1 shows that the on-order file took almost twice as long to create and maintain using the manual method when compared with the microcomputer method. Creating the file took 56.29 minutes using the manual method while the microcomputer method required 22.29 minutes. Entering data via the microcomputer keyboard was faster than by electric typewriter because each order card had to be put in and taken out of the typewriter in the manual method, whereas the information was keyed into memory and stored on a floppy disk for the microcomputer method. Once the data was entered into the microcomputer, it did not need to be re-entered to obtain a different format. The microcomputer rearranged the information and printed it out in any format requested whereas using a manual method, the data had to be physically typed or retyped each time for the requested formats. Table 1 also shows that the microcomputer method was faster at updating the information than was the manual method, 8.21 minutes versus 26.83 minutes. The information could be corrected, added to or deleted, and rearranged in order without having to manually insert in the typewriter each card that needs changing or updating. Total materials cost was about the same for both methods, \$0.44 and \$0.52.

Table 1  
 Cost of Manual and Microcomputer Methods  
 for Developing and Maintaining an On-Order File

File Processes	Manual Method			Microcomputer Method		
	Time <sup>a</sup>		Materials <sup>b</sup>	Time		Materials
	Minutes	Cost	Cost <sup>c</sup>	Minutes	Cost	Cost
<b>A. <u>Developing</u></b>						
Gather Data	29.16	\$ 5.75	\$.18	29.16	\$ 5.75	\$.18
Create File	56.29	11.09	.19	22.29	4.39	.08
<b>SUBTOTAL</b>	85.45	\$16.84	\$.37	51.45	\$10.14	\$.26
<b>B. <u>Maintaining</u></b>						
Gather Data	5.75	\$ 1.13	\$.04	5.75	\$ 1.13	
Update Data	26.83	5.29	.05	8.21	1.62	\$.06
Change Data	21.88	4.31	.05	7.24	1.43	.06
<b>SUBTOTAL</b>	54.46	\$10.73	\$.14	21.20	\$ 4.18	\$.12
<b>C. <u>New Format</u></b>						
Format Change	21.96	\$ 4.33	\$.01	8.09	\$ 1.59	\$.06
<b>SUBTOTAL</b>	21.96	\$ 4.33	\$.01	8.09	\$ 1.59	\$.06
<b>TOTAL</b>	161.87	\$31.90	\$.52	80.74	\$15.91	\$.44

a. Minutes x salary per minute; cost rounded to nearest cent.

b. Cards, paper.

c. Cost rounded to nearest cent.

The microcomputer method also proved to be faster than the manual method for the vertical file subject heading file as is shown on Table 2. Creating the file took 41.15 minutes for the manual method and 39.33 minutes for the microcomputer method. There was not a great difference in the amount of time required in creating the file, but there was a greater time difference in the maintenance of the file. A total of 14.81 minutes was needed to gather and update the information in the file by the manual method whereas only 6.35 minutes were needed to complete the same processes using the microcomputer method. The majority of time used in the manual method was in alphabetizing and typing the new additions and then filing them into the existing file. The microcomputer method could manipulate and alphabetize data at a fast rate and the additions were keyed into the memory of the microcomputer and did not have to be typed on individual cards as was necessary when using the manual method.

The figures on Table 3 show that the circulation file was created and maintained faster by the manual method than it was by the microcomputer method. The information used to create the manual file was already recorded on circulation cards and these cards had only to be interfiled in alphabetical and numerical order to create the file by the manual method. This process took 5.60 minutes while 16.48 minutes were required to create the file by the microcomputer method. All the information on the circulation cards had to be keyed into the microcomputer to create the file. Maintaining the file was also faster using the manual method. It took 13.28 minutes to gather the data and update the records because when changes needed to be made, the card was pulled and the information was added. When using the microcomputer

Table 2

Cost of Manual and Microcomputer Methods for Developing  
and Maintaining a Vertical File Subject Headings File

File Processes	Manual Method			Microcomputer Method		
	Time <sup>a</sup>		Materials <sup>b</sup>	Time		Materials
	Minutes	Cost	Cost <sup>c</sup>	Minutes	Cost	Cost
<b>A. <u>Developing</u></b>						
Gather Data	23.26	\$ 4.58	\$.18	23.25	\$4.58	\$.18
Create File	17.89	3.53	.19	16.08	3.17	.06
SUBTOTAL	41.15	\$ 8.11	\$.37	39.33	\$7.75	\$.24
<b>B. <u>Maintaining</u></b>						
Gather Data	5.20	\$ 1.02	\$.04	5.20	\$1.02	
Update Data	9.61	1.89	.05	1.15	.23	\$.04
Change Data	18.40	3.63	.05	1.52	.30	.04
SUBTOTAL	33.20	\$ 6.54	\$.14	7.87	\$1.55	\$.08
<b>C. <u>New Format</u></b>						
Format Change						
SUBTOTAL						
<b>TOTAL</b>	74.35	\$14.65	\$.51	47.20	\$9.30	\$.32

a. Minutes x salary per minute; cost rounded to nearest cent.

b. Cards, paper.

c. Cost rounded to nearest cent.

Table 3  
 Cost of Manual and Microcomputer Methods  
 for Developing and Maintaining a Circulation File

File Processes	Manual Method			Microcomputer Method		
	Time <sup>a</sup>		Materials <sup>b</sup>	Time		Materials
	Minutes	Cost	Cost <sup>c</sup>	Minutes	Cost	Cost
<b>A. <u>Developing</u></b>						
Gather Data						
Create File	5.60	\$1.10	\$.01	16.48	\$3.25	\$.08
<b>SUBTOTAL</b>	5.60	\$1.10	\$.01	16.48	\$3.25	\$.08
<b>B. <u>Maintaining</u></b>						
Gather Data						
Update Data	11.20	\$2.21		13.68	\$2.70	\$.02
Change Data	2.08	.41	\$.01	5.45	1.07	.02
<b>SUBTOTAL</b>	13.28	\$2.62	\$.01	19.14	\$3.77	\$.04
<b>C. <u>New Format</u></b>						
Format Change	19.63	\$3.87	\$.01	10.63	\$2.10	\$.02
<b>SUBTOTAL</b>	19.63	\$3.87	\$.01	10.63	\$2.10	\$.02
<b>TOTAL</b>	38.51	\$7.59	\$.02	46.25	\$9.12	\$.14

- a. Minutes x salary per minute; cost rounded to nearest cent.
- b. Cards, paper.
- c. Cost rounded to nearest cent.

method, a record search had to be done and the information displayed on the screen before corrections could be made. This process took 19.14 minutes to make changes. Even though the microcomputer method took longer, there were other advantages to using it over the manual method. Once the data are entered, it could be reformatted easier than by using the manual method. Thus, overdue notices can be printed out as well as a list showing what books were checked out to an individual student. The latter capability could be a real timesaver when a student was transferring to another school or had too many books out. Circulation statistics can also be generated using the search and mathematical manipulations modules of the data base program. The materials cost was minimal for both methods: \$0.2 for the manual method and \$0.12 for the microcomputer method.

Table 4 shows a monetary summary of the total time and materials costs for all three files. It shows that the on-order file and the vertical file subject heading file were less cost efficient to develop and maintain by the manual method than by the microcomputer method. The table shows that the on-order file cost \$28.08 for time and materials to create and maintain by the manual method as opposed to \$14.70 for the same processes done by the microcomputer method. The microcomputer method cost \$13.38 less than the manual method.

The vertical file subject heading file cost \$15.16 to develop and maintain while the microcomputer method cost \$9.62 to create and maintain; a difference of \$5.54. The microcomputer proved to be much faster and more versatile than did the manual method.

The circulation file was less cost efficient to create and maintain by the microcomputer method. The total cost of creating and

Table 4

Summary of Total Time and Materials Costs  
for Three Files by Method

Method	On-Order File		Vertical File Subject Headings File		Circulation File	
	Developing	Maintaining	Developing	Maintaining	Developing	Maintaining
<u>MANUAL</u>						
TIME	\$16.84	\$10.73	\$8.11	\$6.54	\$1.10	\$2.62
MATERIALS	.37	.14	.37	.14	.01	.01
TOTAL	\$17.21	\$10.87	\$8.48	\$6.68	\$1.11	\$2.63
<u>MICROCOMPUTER</u>						
TIME	\$10.14	\$ 4.18	\$7.75	\$1.55	\$3.25	\$3.77
MATERIALS	.26	.12	.24	.08	.08	.04
TOTAL	\$10.40	\$ 4.30	\$7.99	\$1.63	\$3.33	\$3.81

maintaining the file by the microcomputer method was \$7.14 as compared to the total cost of the manual method which was \$3.74. This was due to the extra time necessary to enter the information that was already on the circulation cards into the microcomputer. The cost difference between the two methods was \$3.40.

Hypothesis 1, the "time" cost of developing each selected library file by the manual method will be greater than the "time" cost of developing each selected library file by the microcomputer method, is rejected. For two of the three files, the time cost for the manual method was greater, but the reverse was found for the third file.

Hypothesis 2, the "materials" cost of developing each selected library file by the manual method will be greater than the "materials" cost of developing each selected library file by the microcomputer method, is accepted. The materials cost was less for the microcomputer method than for the manual method for all three files.

Hypothesis 3, the "time" cost of maintaining each selected library file by the manual method will be greater than the "time" cost of maintaining each selected library file by the microcomputer method, is rejected. The time cost for the manual method was greater for two of the three files tested, but was not greater for the third file.

Hypothesis 4, the "materials" cost of maintaining each selected library file by the manual method will be greater than the "materials" cost of maintaining each selected library file by the microcomputer method, is rejected. This was true for two of the three files, but the third file cost more in materials to maintain.



## Chapter 5

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine if it was more cost effective to create and maintain selected school library files by a manual method or by a microcomputer method.

A review of the literature showed that microcomputers were being used in libraries, both public and school, in all phases of operation - administration, technical services, and public services. However, not much was said about the cost factors of microcomputers versus manual methods. The literature revealed that cost studies are difficult to do and are often unreliable because of the inconsistencies in the reporting of the cost data. The general feeling was that microcomputers are useful and should be used even if they are not found to be cost effective because they can be accurate and provide additional flexibility of operation.

The hypotheses were tested by choosing three library files - circulation file, vertical subject heading file, and a materials on-order file - found in a high school library and going through the processes of gathering the data, creating the file, adding to and changing the information and changing the format of the file. Each one of the processes for each file was timed and the amount of materials used to create and maintain the file was recorded. The materials and times were converted into a dollar cost for comparison of the manual and microcomputer methods.

The study shows that of the three files tested, two were more cost efficient to create and maintain on a microcomputer, while the third, the circulation file, was not. A cost study of longer duration, one conducted during the school year, or one using different files might result in different findings. Each file was created only for the purpose of this study and while each file is used in many school libraries, the manner in which they were created and maintained was not a real-life situation.

### Conclusions

This study did show that once data were entered into a microcomputer, the information could be used in many ways. It may take longer, initially, to set up a program and enter the data in a microcomputer, but that time can be made up in other ways. Although microcomputers may not always be shown to be cost efficient, they are more flexible than a manual method and can be more error free.

For files having daily input and changes, deletions and additions, the manual method may be more cost effective than the microcomputer method. Unless the library has a fully automated system, the microcomputer method of updating those files would be too time consuming and not very effective. For example, if the circulation system were automated, materials could be checked out by entering the necessary information into the computer by a light pen. When the materials were returned, the information could then be deleted the same way. If all the information had to be keyed into the computer manually, the materials could very well be returned before the information was added to the existing file. However, over a long period of

time, e.g., one school year, the capability of the microcomputer to manipulate circulation data in a variety of ways might show greater cost efficiency of the microcomputer method over the manual method.

This study also has shown that microcomputers can handle the information contained in various library files provided the data base program used is able to manipulate data in a variety of ways.

### Recommendations

Other school library files should be tested using a microcomputer to see if those files are better suited to automation. A variety of data base programs written for data management could be tested for their capability of handling library files. Perhaps there is a program that is better suited to school library file information than the one used. This study also needs to be repeated in a typical situation during the academic year in a school library. It would also be interesting to see if the time saved by the microcomputer was really significant enough to consider changing all systems to a microcomputer. The comparison studies need to continue, not only a cost comparison study, but also studies to explore other ways that microcomputers can be used in the library system to provide better, faster, more accurate, more complete services and information to the patrons.

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APPENDIX A

FILE WORKSHEET

File - On-Order File

Gathering Data and Data Input

Who gathers data - Librarian

What data is gathered - Titles and ordering information for print and non-print materials.

How often - daily

When is data gathered - When publications are scanned.

Where data is obtained - From trade journals and publications.

Who inputs data - Librarian

Producing Information from the File - Data Output

Formats - List by author, title

Who requests - Librarian or book jobber

No. of copies - 2-4

Frequency - Monthly

When needed - When orders are to be sent out.

Equipment and/or Supplies Used

Equipment - typewriter

Supplies - cards and paper

## APPENDIX A

## FILE WORKSHEET

File - Circulation File

Gathering Data and Data Input

Who gathers data - Librarian or aide

What data is gathered - Circulation cards

How often - daily

When is data gathered - When books are circulated.

Where data is obtained - From circulation cards.

Who inputs data - Librarian or aide

Producing Information from the File - Data Output

Formats - Title, author, date due or student's name

Who requests - Librarian, student, teacher

No. of copies - 1 - \_\_\_\_

Frequency - Weekly

When needed - For overdues, circulation count, student leaving

Equipment and/or Supplies Used

Equipment - card file, typewriter

Supplies - paper

## APPENDIX A

## FILE WORKSHEET

File - Vertical File Subject Heading FileGathering Data and Data Input

Who gathers data - Librarian or aide

What data is gathered - Subjects of vertical file information

How often - Whenever information is received.

When is data gathered - Before information is filed.

Where data is obtained - From pamphlets to be filed.

Who inputs data - Librarian or aide

Producing Information from the File - Data Output

Formats - List by subject

Who requests - Teachers or students

No. of copies - 1 - \_\_\_\_

Frequency - On request

When needed - For bibliographies, reports.

Equipment and/or Supplies Used

Equipment - typewriter, labels

Supplies - cards, paper, labels