To the Graduate Council:

I am submitting herewith a dissertation written by Lucy Clough Robinson entitled "The Application of Micrographics in Records Management." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Curriculum and Instruction.

George A. Wagoner, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

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THE APPLICATION OF MICROGRAPHICS IN RECORDS MANAGEMENT

A Dissertation

Presented for the

Doctor of Education

Degree

The University of Tennessee, Knoxville

Lucy Clough Robinson

December 1976

1303302

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ABSTRACT

The purpose of this study was to determine the application of micrographics in records management in business and government for information storage and retrieval.

The population consisted of nine vendors of micrographics systems in Chicago and ten users of micrographics systems in records management in Atlanta. Two interview guides were used to collect data during interviews with top management executives in companies that market micrographics systems and with executives responsible for records management in selected companies and government agencies. Two checklists were used to determine the consistency of data collected during the interviews.

Case reports were written for the vendor and user interviews. The checklists were analyzed to determine the extent of consistency with which vendors could match the marketing advantages and disadvantages of micrographics systems and the advantages and disadvantages of the systems to users they identified during the interviews, and to determine the extent of consistency with which users could match the advantages and disadvantages of the systems claimed by vendors they identified during the interviews.

The items claimed as advantages and disadvantages by vendors were compared for extent of congruence with items claimed as advantages and disadvantages by users.

Other items contained in the interview guides, i.e., general information about vendors and users, components of the systems, problems

with the systems, contributions to management, and new and developing product lines were tabulated.

The major findings of this study were:

1. The kinds of storage for information on the market range from simple manual techniques to discrete computer-based communication networks, including a new data storage and processing system--micrographics.

2. The users of micrographics systems identified by vendors are in the categories of government, manufacturing, education, banking, insurance, utility, retailing, diversified-financial, transportation, engineering, and services.

3. The marketing advantages of micrographics systems identified consistently by vendors were product reliability, file integrity, alternative configurations, records security, systems versatility, cost reduction, and space savings.

The marketing disadvantages identified were high equipment costs, product vulnerability, equipment downtime, service costs, and educating the market to different ways.

4. The advantages of micrographics systems identified consistently by users were file integrity, cost effectiveness, data terminal, space reduction, speed of information turnaround, data accessibility, operating ease, and better utilization of personnel.

The disadvantages identified by users were camera sluggishness, records security, computer downtime, high equipment costs, use acceptance, quality control of film, updating capability, limited blowback and printback, rear image viewing, film loading and rewinding, and servicing.

5. The relationship of vendors' claims to users' experience was congruent on five items identified as advantages--file integrity, cost reduction, space savings, ease of operation, all operations in room light, and on two items identified as disadvantages--high equipment costs and film loading and rewinding.

6. The users were experiencing few problems with micrographics systems. Problems that were identified related to slow processing, keeping the system operative, scheduling operations with an off-line computer, limitations imposed by standards, and training and retraining necessitated by personnel turnover.

7. The contributions of the micrographics industry to management perceived by vendors and users were space reduction, more effective management planning, turnaround, file integrity, security, and better utilization of personnel.

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CHAPTER I

INTRODUCTION TO THE STUDY

Competitive survival in business is dependent generally upon the ability of administrative management to scientifically organize and analyze all available information as a basis for making decisions. Traditionally, the office has been the place in a business organization where information is accumulated and processed by office workers as a support service. But an increasing demand for management information services and a preponderance of paper flow has caused officials in government and business to take a more indepth look at procedures, personnel, and equipment in the office in terms of savings and efficiencies.

Whereas the computer has increased productivity and efficiency in *data* processing operations including accounting, the rate of productivity and efficiency in *word* processing operations in the office remains about the same. The basic support services--telephone and mail handling, dictation and transcription, typewriting, filing, and duplicating--*are* the same. But there exists the need to combine these services into cohesive units for better management, scheduling, measurement, and control.

New systems and procedures are available now which transform the office into an automated and integrated administrative support center designed to meet the needs of administrative management. There are

telecommunications systems which transmit imagery and reproduce it, if necessary, completely bypassing the mail system. Machine dictation recorded on magnetic cassette tape is printed out by the computer on continuous fold letterhead. There are automatic text-editing typewriters which print out 115,000 characters an hour. COM (computer output microfilm) and ASRS (automated storage and retrieval systems) are active in records management to store and retrieve information sixteen times more rapidly than can traditional systems.

The micropublishing field has a computer typesetting system in addition to COM which automatically transfers images on negatives to offset plates and prints out copy at high speeds. In prototype is a copier which uses laser to produce up to 500 copies of single imagery in seven seconds. The image is burned into the flat stack of sheets simultaneously rather than imprinted one sheet at a time.

The technologies which increase the flow of information likewise create problems in its management. The recognition of the costs of processing and, particularly, the storing of the great volume of records has made the problem more evident to management. This fact was substantiated in interviews with the Head Librarians at the Oak Ridge National Laboratory, Oak Ridge, Tennessee, and the Tennessee Valley Authority, Knoxville, Tennessee. The rising cost of paper and the prospects of an impending paper shortage coupled with the cost of present storage and retrieval operations has caused these organizations to look to other systems for savings and efficiencies. ORNL is

changing to a COM system effective in January 1976.[1]

Management is not only concerned with the increasing volume of records that are accumulated and the increasing number of office workers needed to handle them; but also is concerned with the retrieval of information at the time it is needed. *Records management* is the application of systematic and scientific control to recorded information which is required in the operation of an organization's business (Maedke et al., 1974, p. 5). Records serve as the vehicle of management in planning, organizing, and controlling.

Records are created in the form of magnetic tapes, disks, cores, punched cards/tapes, computer printouts, specifications, catalogs, pamphlets, brochures, ads, proofs, books, briefs, reports, and case reports in addition to the various microforms. However, the operational, cost, and quality controls afforded in the application of micrographics to records management adds a new dimension to administrative management.

Micrographics is a relatively new industry which reduces any form of information to a microform medium. Since World War II, it has been possible to commit information to microfilm, yet it is but one microform in use currently. Most of the micrographics systems conform to continuous roll film or cartridge, microfiche (negative and positive), aperture, jacket, and ultrafiche produced by the computer or laser for storing information. Retrieval is by means of a reader or reader-printer, microfilm projector, CRT (cathode ray tube screen and computer

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[1]Ray Dickison, Head Librarian, Oak Ridge National Laboratory, Oak Ridge, Tennessee, in an interview conducted November 10, 1975.

terminal), COM (computer output microfilm), and ASRS (automatic storage and retrieval systems).

Security and file integrity are easy to maintain with compact records stored, coded, and retrieved by a micrographics system. One 4 x 6 inch ultrafiche can accommodate over 3,000 original documents, 8-1/2 x 11 inches in size, at a reduction ratio of 150:1. This is roughly equivalent to eight average size textbooks, sixty 50-page reports, or 3,000 sales orders or checks (Ross, 1975, p. 5).

The outlook for micrographics is favorable. Compared to less than $100 million in 1958, micrographics revenues exceeded $700 million in 1973 and are projected to grow almost 20 percent per year to $6.4 billion by 1985 (Ross, 1975, p. 2).

I. Statement of the Problem

The study was to determine the application of micrographics in records management in business and government for information storage and retrieval.

II. Analysis of the Problem

Answers to the following questions were required in the study:

1. What kinds of information storage and retrieval systems are being marketed?
2. Who are the users of micrographics systems as identified by vendors of the systems?
3. What are the marketing advantages and disadvantages of micrographics systems identified by selected vendors?

4. What are the advantages and disadvantages of micrographics systems identified by users in records management?
5. What is the relationship of vendors' claims to users' experience in the application of micrographics systems?
6. What problems are users in business and government finding with micrographics systems in records management?
7. What are the contributions of the micrographics industry to management as perceived by vendors and users?
8. What are the implications for business education?

III. Limitations of the Study

The study was limited in the following ways:

1. Vendors of micrographics systems in one of three geographic marketing areas were included.
2. The use of microforms for only the information storage and retrieval function of records management was considered.
3. The time period between interviews and the followup checklist limited the use of this procedure.
4. Vendors selected in the greater Chicago area and users selected in the greater Atlanta area and one in Jacksonville, Florida, participated.

IV. Importance of the Study

In 1972, the Third Research Committee (Hopkins, 1972, p. 9) of Delta Pi Epsilon, honorary graduate business education fraternity, reiterated the need for a study which earlier was identified by the

organization's first Research Committee (Hillestad, 1961, p. 8): a study to compare records management systems used in business and to determine the implications for business courses.

No study in the area of records management was found since 1961 as substantiated in A Review and Synthesis of Research in Business and Office Education, first edition, 1966 (Lanham and Trytten, 1966) and the second edition in 1970 (Price and Hopkins, 1970). There have been studies on other topics which address certain areas of records management. These are included in Chapter II.

A cursory examination of instructional materials available to teachers of courses in records management, administrative management, office systems, secretarial procedures, and related courses revealed very little about new technologies in records and information management. Most of the textbooks in records management approached the topic from the standpoint of filing, even two with "records management" included in the title. Filing is but one element of a records management system.

Little attention was given to automated systems of processing information and the application of microforms, other than microfilm, microfiche, and aperture, in the textbooks. Even less attention was given to storage and retrieval systems, particularly those that are computer based. One book did give some treatment to records and information management from the standpoint of providing management information for planning and decision making.

Texts in the area of administrative management published in the past three years addressed records management from its usefulness as a

management information system in industries operating in a *management by objective* mode. Attention was given to the effect of the computer on the planning and controlling functions of management but little on the organizing and evaluation functions. The effect of other technologies, for example electrostatic impulses, fiberoptics, three dimensional microphotography, telecommunications, and laser on a system of information processing were not easily discernible.

The findings of this study should be useful to teachers of records management, administrative management, office systems, secretarial procedures, and related courses through the identification of information storage and retrieval systems on the market and the users of micrographics systems for records management. It is difficult for teachers to be held accountable for the improvement of instruction in areas where technologies are developing more rapidly than time and staff development procedures permit the updating of their own competencies.

V. Definition of Terms

Because of the technical nature of the terms used in this study, they are defined in a separate Glossary shown in Appendix A.

VI. Procedures

The purposes of this section are to describe: (1) the use of the 1974-1975 Microfilm Source Book in compiling a list of micrographics systems; (2) the procedures for selecting the sample of vendors and users of micrographics systems; (3) the collection of data; and (4) the techniques used from which to make comparisons and draw implications.

Geographic Classification

The 1974-1975 Microfilm Source Book (1975, pp. 175-197) contained 265 vendors of micrographics systems. The name, address, and telephone number of their top management were listed as were the components of micrographics systems they manufacture.

In order to group the components and products, the following classifications were used:

1. microphotography equipment
2. microforms and related equipment
3. viewing equipment
4. reading equipment
5. retrieval systems
6. storage equipment
7. COM equipment
8. visual control boards
9. facsimile equipment
10. miscellaneous equipment.

Among the 265 vendors, 58 had to be removed from the list for a variety of reasons: 2 had names listed but no products; 3 were international solely; 2 were no longer in business according to the literature; and 51 manufactured items which could not be grouped under the ten classifications. Two hundred and seven vendors remained and each was assigned an identifying number.

The states with vendors of micrographics systems are located primarily in three marketing areas: (1) California, (2) Illinois (greater Chicago), and (3) New York. A geographic distribution was made

to determine the states in each marketing area, the number of vendors in each state, and the total number of vendors by marketing area. Table I.1 shows the geographic distribution of vendors by marketing area.

A matrix was designed to display the components of micrographics systems marketed by each of the 207 vendors.

Selection of the Sample

Nine vendors of micrographics systems and ten users of the systems in records management in business and government were selected to participate in interviews and to receive a followup checklist.

Vendors. The states with vendors of micrographics systems were located primarily in three marketing areas: California, Illinois (greater Chicago), and New York. Because of the broad geographical location of the vendors nationally, the study was limited to one of the three, the Illinois (greater Chicago) marketing area.

The state having the greatest concentration of vendors, Illinois with twenty, was selected from which to identify the vendors to participate in the interviews. A second matrix (shown in Appendix B) was developed to delineate the twenty vendors from among the two hundred and seven in the first matrix. The matrix number previously assigned was used for the twenty vendors on the second matrix along with the classifications used to group components. Any component that appeared on the first matrix that was not a product of the twenty vendors in Illinois was not included on the second matrix.

TABLE I.1

GEOGRAPHIC DISTRIBUTION OF VENDORS BY MARKETING AREA
(N = 207)

California Market		Illinois Market (Greater Chicago)		New York Market	
California	48	Illinois	20	Connecticut	4
Colorado	5	Indiana	1	Delaware	1
		Iowa	1	District of Columbia	1
		Minnesota	5	Florida	1
		Missouri	2	Georgia	1
		Louisiana	1	Maryland	3
		Oklahoma	1	Massachusetts	15
		Texas	3	Michigan	3
		Wisconsin	3	New Hampshire	1
				New Jersey	21
				New York	47
				North Carolina	1
				Ohio	9
				Pennsylvania	6
				Virginia	3
Total	53		37		117

Criterion statements were written and applied to the twenty vendors in Illinois to determine the population of vendors to participate in the interviews. They are as follows:

1. The vendor is listed in the Fortune Double 500 Directory, 1975.

2. The vendor markets components and products considered to be part of a micrographics system.

3. The vendor is identified in surveys conducted by trade journals and marketing analysts as being among the top vendors of retrieval systems, the centrality of micrographics systems.

4. The vendor's office products division is in the state represented by the greatest concentration of vendors.

5. The vendor sells direct rather than to third party.

The vendors meeting three or more of the criteria were selected to participate in the interviews. There were eight in the greater Chicago area among the twenty in Illinois. Table I.2 shows the vendors by matrix number and the total number of criteria met by each.

One other company with established product lines, not in the market as a vendor of micrographics systems at the time of the present study, but which will be within a year, was added to the eight in the population. The company has developed a COM system with a data base which gives it better than 95 percent of the market with the present operation. The vendor is one of only three companies marketing the product for which the three are known in the market.

The system consists of two components on the market manufactured by the vendor, and three components manufactured by three other vendors

TABLE I.2

VENDORS IN THE GREATER CHICAGO AREA
MEETING THE CRITERIA

Vendors By Matrix Number	Number of Criteria Met
16	5
21	5
40	5
42	4
47	3
51	5
119	5
131	4

which are also on the market. The company is working on a new algorithmic language model which will be marketed on royalties. Any other company with comparable components would then have the capability to market a micrographics system. The company was added, making a total of nine, but was not assigned a matrix number since it was not listed in the Microfilm Source Book.

To establish a contact among the vendors in the population, the name, address, and telephone number of the Vice President, Micrographics Products, or comparable executive, for each of the eight vendors were obtained from the 1974-1975 Microfilm Source Book. The name, address, and telephone number of an executive in the eight companies were verified by Search Associates, Incorporated, a service marketing company located in Mount Prospect, Illinois. The president of Search Associates, Dr. Robert E. Wiper, was known by the investigator to specialize in market and education consulting with business and government, and no attempt was made to contact any other consulting firm. An executive in the ninth company was known already by the investigator.

A schedule of appointments was predetermined based on two factors: (1) the probability of being able to visit two vendors a day to conduct the interviews and to see their micrographics systems in operation, and (2) the physical proximity of one vendor to another, also verified by Search Associates, Incorporated, to minimize driving time within a 50 mile radius of the greater Chicago area. This schedule indicated that six work days were needed to complete the interviews.

Telephone calls were made by the investigator to the executives in the selected firms in the greater Chicago area setting up appointments

for the interviews and to see their micrographics systems in operation. With each call, the purpose of the study and the interview was explained and the length of time needed for the interview was indicated. Without exception, the executives voiced a willingness to participate in a study which was a cooperative effort between education and industry, and which sought to establish credibility of the micrographics industry in the marketplace.

Users. The categories of companies listed in The Fortune Directory of Business (1975, pp. 116-127), diversified-financial, banking, retailing, and utility, were used to classify users of micrographics systems.

A publication by DataPro Research Corporation, Office Systems, 1 (1974), p. 105), listed as users the names of several corporations in the categories of manufacturing, transportation, and engineering. These three categories were added to the four indicated previously making a total of seven.

The literature examined for this study in a ten-year period indicated companies and agencies in the categories of insurance, hospitals, and education as users of micrographics systems. The three categories were added to those already identified making a total of ten used in the study. The ten categories are as follows:

1. diversified-financial
2. banking
3. government
4. manufacturing

5. hospitals
6. retailing
7. insurance
8. transportation
9. utility
10. education

During the vendors' interviews, the executive participating was asked to identify the users of his company's micrographics systems among the ten categories. Table I.3 shows these in rank order.

Because of the broad geographical location of users nationally, this part of the study was limited to an area familiar to the investigator in terms of being able to identify companies and agencies among the categories indicated by the vendors. Atlanta, Georgia, was the site selected.

The categories indicated by the greatest number of vendors were chosen for identifying the users in business and government to participate in the interviews. They were the following: government, manufacturing, education, banking, insurance, utility, and retailing.

Although the category of diversified-financial was ranked the same as retailing, the latter was chosen to achieve more diversification. The category of government was divided into state-federal, and the category of utility into two different types. The latter necessitated scheduling an appointment in Jacksonville, Florida, because of the installation and its importance to the study. Ultimately, there were nine businesses/agencies in the greater Atlanta area and one in Jacksonville, Florida, selected to participate in the interviews.

TABLE I.3

USERS OF MICROGRAPHICS SYSTEMS IDENTIFIED BY VENDORS

Categories	Number of Vendors Identifying Each Category
Government	10
Manufacturing	8
Education	8
Banking	6
Insurance	6
Utility	6
Retailing	5
Diversified-Financial	5
Transportation	3
Other: Engineering	4
Services	1

To establish a contact with a records manager, or comparable executive, in the categories of users constituting the population, the name, address, and telephone number of two or more businesses and agencies known by the investigator to be located in the greater Atlanta area were obtained from the Metropolitan Atlanta Area Telephone Directory (1975).

Criteria were developed for determining the companies and agencies to participate in the users' interviews. They are as follows:

1. The business/agency has a records manager, or an executive with comparable title and responsibility.
2. The business/agency has installed a micrographics system for records management.
3. The business/agency is currently using a micrographics system for records and information management.

A schedule of appointments was predetermined based on two factors: (1) the probability of being able to visit two businesses/agencies a day to conduct the interviews and to see the micrographics systems in operation, and (2) the physical proximity of one user to another to minimize driving time within a 50 mile radius of the greater Atlanta area. This schedule indicated that five work days were needed to complete the interviews. The schedule was altered one day to make possible three interviews and allow for driving time to Jacksonville.

Telephone calls were made by the investigator to the user companies/agencies. By applying the criteria through query of a switchboard operator or, if directed, to a secretary or administrative assistant, companies/agencies not meeting all criteria were thereby

eliminated. A call was then placed to the next company/agency in the same category on the list.

Queries indicating that the business/agency met all of the criteria usually resulted in a conversation with the records manager or comparable executive. With each call, the purpose of the study and the interview was explained and the length of time needed for the interview was indicated. In some instances, a second call had to be placed to get confirmation of the appointment. As was the case in the calls to the vendors, the records managers expressed a willingness to participate in a study which was a joint effort between education and industry.

Construction of the Instruments

Three of the purposes of this study were: (1) to determine the kinds of information and retrieval systems being marketed; (2) to determine the end users of micrographics systems as identified by vendors; and (3) to determine the contributions of the micrographics industry to management as perceived by vendors. Two interview guides were constructed to obtain data.

Vendors Interview Guide. An interview guide (shown in Appendix C) was prepared to collect the following data:

1. Background information about the vendor executives.
2. Factors the vendors identified as advantages and disadvantages of micrographics systems.
3. Factors the vendors identified as advantages and disadvantages of micrographics systems to users.

4. Contributions of the micrographics industry to management as perceived by the vendors.
5. Unmet needs identified to the vendors by the users of micrographics systems.
6. The components in varying stages of development by vendors and their relationship to the users' unmet needs.

To validate the instrument, the interview guide was administered in January by the investigator to an executive in a company identified as a distributor of micrographics systems located in Atlanta, Georgia. The company had been noted in the Microfilm Source Book and the name, address, and telephone number of an executive was listed.

An appointment was arranged through a call to the executive, and the investigator traveled to Atlanta for the interview. Approximately two hours were needed to administer the interview guide. Suggestions for change were incorporated subsequently in a rewrite of the guide.

Two other purposes of the study were: (1) to determine the relationship of vendors' claims to users' experience in the application of micrographics systems, and (2) to determine how effective users in business and government are finding micrographics systems to be in records management.

Users Interview Guide. An interview guide (shown in Appendix C) was prepared to collect the data described:

1. Background information about selected users in business and government,
2. Components of the users' micrographics system,

3. Departments that feed into the records management system and documents that are stored,
4. Contributions of the micrographics system to the management of the business/agency,
5. Factors the users identified as advantages and disadvantages of micrographics systems based on their experience,
6. Factors the users identified as advantages and disadvantages of micrographics systems which were asserted by the sales representative prior to installation,
7. The users' problems with the micrographics system following its installation, and
8. Components described by the users to a vendor as needed to make the records management system more effective.

A trial run of the interview guide was made to a records administrator at the Oak Ridge National Laboratory, Oak Ridge, Tennessee, and the Tennessee Valley Authority, Knoxville, Tennessee, by the investigator. Appointments were arranged by the investigator's committee chairman, and the interviews were completed in approximately two hours. Suggestions for change were incorporated subsequently in a rewrite of the guide.

Following the third interview, question 2 in one section of the guide, management attitudes and system change, was eliminated from subsequent interviews because of redundancy.

Checklists. Though the solution of the problem required the answers to questions which were built into the two interview guides, it

became apparent following their administration that some type of procedure was necessary to determine the consistency of data collected in the interviews. Two checklists were developed: one requiring a response from the vendors participating in the interviews and the other requiring a response from the users participating in the interviews.

Vendors. The checklist (shown in Appendix D) was prepared to determine the consistency of the following data collected in the interviews with vendors:

1. Advantages and disadvantages of micrographics systems identified by vendors.
2. Factors identified by vendors considered to be advantages and disadvantages of micrographics systems by users.

Users. The checklist (shown in Appendix D) was prepared to determine the consistency of the following data collected in the interview with users:

1. Advantages and disadvantages of micrographics systems identified by users.
2. Factors identified by users considered to be advantages and disadvantages of micrographics systems asserted by the vendors prior to installation.

Administration of the Instruments

All data were collected in the interviews during a visit by the investigator to each of the vendors in January and each of the users in March. During the interview, the guide was completed by the executive

responding to questions in the interview guide as the investigator wrote the responses using a separate interview guide. All interviews were written as case reports. The vendors' case reports are shown in Appendix E and the users' case reports are shown in Appendix F.

Data were collected through the checklists by mailing the appropriate checklist to each of the vendors and users in July. A stamped reply envelope was provided for return to the investigator. To assure responses to the checklist, a phone call was made to each vendor and user not responding by the deadline.

To assure anonymity in the study, the vendors' guides, case reports, and checklist were coded by capital letters, A through I. For the same purpose, the users' interviews guides, case reports, and checklist were coded by three-digit numbers, 301 through 310.

Collection of the Data

When the vendors' interview guide and the schedule of appointments had been prepared and all vendors had been contacted to set a time for the interview and to see the micrographics system in operation, the investigator traveled to Chicago to visit each of the ten vendors.

Initially, about ten minutes was spent reviewing the purposes of the study and giving the executive time to glance through the interview guide. After that, the executive followed a copy and responded to questions as the investigator wrote the responses on a separate interview guide. In most cases, the written response was verbatim. If a response was shortened, it was read back for authenticity. Due to the technical nature of the data collected in some interviews, the investigator called back to verify certain responses.

The same procedure was followed to administer the users' interview guide. When the users' guide had been prepared, the classification of users had been determined, the schedule of appointments had been prepared, and all of the users had been contacted to set a time for the interview and to see their micrographics system applied to records management, the investigator traveled to Atlanta, and subsequently to Jacksonville to visit each of the users.

One hour was requested to administer the interview guides, but each of the executives gave more than an hour of his time, most up to two hours. To see the systems in operation took approximately two hours. With one exception, the vendors had scheduled the investigator with a marketing or sales representative to describe the systems' operation and unique operating features. Each of the users personally conducted the investigator through his systems' operation. The vendors generously supplied brochures, specification sheets, samples of microfilm or microfiche, cartridges, cassettes, disks, and manuals supplied to sales representatives.

The investigator found all the executives, vendor and user, to be most pleasant and receptive, knowledgeable about the micrographics system, and articulate in describing its operating features. During the interview, each executive reiterated the statement expressed during the initial telephone contact: a willingness to cooperate in a study which represented a joint effort between education and industry. Most of the executives commented that the present study is the first of its kind in which their company was invited to participate. All vendors and users requested a copy of the findings of the study.

Analysis of the Data

Because of the nature of the study in describing the growth of micrographics as an industry, the users of micrographics systems, and the market penetration in records management, as opposed to an historical survey, the data collected in the study were given no statistical treatment. Implications for the improvement of instruction in records management and related business courses were drawn and are included in Chapter VI.

VII. Organization of the Study

Chapter I introduces the problem; presents an analysis of the problem, the limitations of the study, and the importance of the study; and describes the procedures used in the selection of the sample, in the construction of the instruments, and in the collection of the data.

Chapter II presents a review of the related literature.

Chatper III presents the administrative support center concept; describes other storage systems; presents automated storage and retrieval systems; and describes computer information retrieval systems.

Chapter IV presents contemporary micrographics systems; describes the vendors and components of micrographics systems; and presents the findings of the study pertaining to vendors.

Chapter V describes the users and components of micrographics systems in records management; presents the findings of the study pertaining to users; and describes the future market for micrographics in records management.

Chapter VI contains a summary of the study, implications drawn from the study's findings, and recommendations made as a result of the study.

The bibliography contains a list of references cited in the study.

The appendices contain a glossary of terms, a matrix of the twenty vendors of micrographics systems in Illinois and the components marketed by each, the interview guides, the checklists, the vendors' case reports, and the users' case reports.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

The office is the last place in a business organization for management to look for cost savings and operating efficiency. Personnel, procedures, and equipment are being analyzed and measured to transform the office into an administrative support center responsive to the problem-solving and decision-making functions of administrative management.

In the area of business education, several studies have attempted to identify basic office functions which are being affected by new technologies and the changes necessitated in the training of office workers. The studies related to basic office functions are reviewed in this chapter.

Few studies have been conducted in the area of records management; none since 1961 till the present study. Two that were completed prior to that time are reviewed in this chapter.

Several studies have been conducted for the improvement of instruction in business education. Three which have relation to this study are presented in this chapter.

Many studies have been completed using the descriptive survey method, most being historical or status studies. Few have been conducted in which the survey was more future oriented in terms of describing a situation as it is evolving. Three studies related to methodology are reviewed.

I. Basic Office Functions

The studies in this section were included because they describe the abilities needed by office workers which are supportive to the functions of management, and describe the impact of the computer on the functions of management.

The Coonrad study (1955) was a comprehensive study of six common office services in 16 business firms which were chosen by vendors of office equipment as having well-organized office services. The office services were identified as (1) stenographic and typewriting, (2) filing, (3) mechanical communications, (4) mail and messenger, (5) duplicating, and (6) office supplies. The problem involved a study of administration; procedures, personnel selection, training, and utilization practices; equipment procurement and maintenance practices; and cost reduction and control practices. Information regarding the administration and operation of the office services was obtained from the companies through interviews with company personnel and through a study of company publications related to the administration and operation of the common office services.

Among his findings was the fact that a centralized plan for administering office services was used extensively and that production records were kept on clerical-stenographic workers in a stenographic pool.

The NOBELS Project (1972) identified 30 high-priority abilities in sequence proposed for the preparation of office personnel, the first of which was the ability to comprehend and conceptualize the flow of

the information processing system. The second high-priority item was the ability to adjust quickly to new equipment, procedures, and work sequences brought about by rapid technological changes for the purpose of updating skills, increasing individual productive capacity, and raising company output.

Of particular importance to this study were the following high-priority ability items:

1. To communicate via data communication devices.
2. To review information systems output.
3. To utilize contemporary record storage techniques including microfilm, microfiche, aperture, and coding systems.
4. To operate various computer data manipulation devices for input, output, storage, and retrieval.
5. To operate microfilm and microfiche equipment.
6. To summarize output from information systems for management purposes.
7. To formulate plans for the collection, processing, storage, and retrieval of information.

Huffman and Gust (1970) utilized the same 30 high-priority abilities from the NOBELS Project to substantiate their increasing importance in the performance of office workers in the emergent office. Their examination of the literature for the period, 1967 - 1968, indicated much more discussion about microfilm, particularly the analysis of microfilm as an output of the computer and as a means of storing and retrieving information from remote centers.

Van Voorhis (1971) undertook to determine the impact of the computer on the nature and performance of traditional management functions. The functions were in the categories of planning, organizing, staffing, directing, and controlling. Three types of business organizations were examined.

Evidence from the research indicated that, whereas all managers in the three firms recognized some computer effects on the functions, most thought the overall impact to be slight to moderate. Most of the managers indicated that their work would become more complex as the "total system" became involved in decision-making.

II. Records Management

The studies in this section were included because they were the most recent studies in records management, or related, found in the literature.

Johnson's study (1958) was undertaken to analyze filing practice sets as they related to the five basic filing methods: alphabetic (the most important), geographic, subject, numeric, and chronological. Filing sets were analyzed to determine their construction as to rules for alphabetic filing, their comparison to the rules used in business offices, how much practice the student obtained using the set, and the applicability of the set to other methods of filing.

Letters sent to 384 companies and associations located 58 written sets of filing instructions used in offices. Letters sent to the 238 member schools of the National Association of Business Teacher Training Institutions (NABTTI) revealed six practice filing sets in use in

schools. Letters to manufacturers of filing equipment and supplies and consultants located additional sets of alphabetic rules to be analyzed.

Analysis of the filing sets, the written instructions, and the rules for alphabetic filing led to the following conclusions, three of which are important to this study: (1) the alphabetic rules accompanying practice filing sets are those found in offices; however, they should be increased in all instances, (2) because of the difficulty in locating written instructions for filing used in offices, the conclusion is reached that businesses tend not to have written instructions for their filing procedures, and (3) the format and content of any written set of filing instructions used in offices must be dependent upon the needs of the specific office for which it is written.

The Griffin study (1961) to determine the education needed for administrators of records management programs, is the most recent formal study in the area of records management prior to the present study according to a search of the literature using the following descriptors: records management; records--business; records and information management; filing; information processing; instruction--business education; improvement of instruction; management; office management; and administrative management.

The purpose of the study was to gather information concerning the responsibilities, duties, and organizational relationship of administrators of records management programs; to determine the status of records management instruction in member schools of the American Association of Collegiate Schools of Business; to compare the topics now

being included in instruction and the duties considered important by records management administrators; to gather opinions from prominent business educators concerning the content of records management instruction; and to develop an outline of the content of records management instruction if such is justified.

The normative-survey method of research was used to obtain data concerning responsibilities, duties, spans of control, and organizational relationships of records administrators and executives. Questionnaires were sent to records administrators and executives who were members of the American Records Management Association and the Association of Records Executives and Administrators. The information obtained through library research, interviews with records administrators, and correspondence with educators and records administrators was used as a basis for constructing a questionnaire to be used in obtaining these data.

Questionnaires were sent to the 97 member business schools and colleges that are members of the American Association of Collegiate Schools of Business for the purpose of obtaining the status of records management instruction. Questionnaires were sent to the collegiate schools of business which indicated that a records management course was offered to determine the activities that were included in the course which were considered by the records administrators as major portions of responsibility. Questionnaires were sent to teachers of records management and office management for the purpose of obtaining opinions concerning the content of a college course in records management.

Griffin's findings pertinent to this study are the following:

1. Records management, as a part of operations management, is considered to be a function of office management.
2. Records administrators should be able to combine planning techniques and machines in their performance of duties related to the management of records retention, filing, microfilming, and support activities to personnel and general management.
3. Organized instruction in records management is limited in the member schools of the American Association of Collegiate Schools of Business (AASCB) and is offered in courses other than records management in the largest number of schools.
4. Courses in records management now being offered include instruction in filing practices predominantly.

III. Improvement of Instruction

The studies in this section were selected because they reflect a transition in the business office and the involvement of the business community which presupposes a re-examining and possible restructuring of the instructional programs which train business teachers and office workers.

Wise (1973) conducted an informal study in the Denver area to observe selected offices in operation for the purpose of making recommendations to improve instruction in business education courses taught in the Denver schools.

In the area of records management, she found that the majority of correspondence filing was decentralized and that lateral files were seen in most offices, with motorized files being rather common. Drawer-type

files were practically non-existent. Microfilm and microfiche were used to retain items. Numeric coding was predominant in the retrieval systems. The records were reviewed by means of cathode ray terminals, with hard copy prepared upon request.

In her recommendations for the improvement of instruction, Wise recommended the teaching of the principles of microfilming in addition to numeric coding with emphasis on terminal digit. She further recommended teaching about the different kinds of equipment and supplies used in records systems.

Hershey (1972) pointed out in the Balance Sheet that the increased specialization in office jobs suggests that secondary and postsecondary programs in such areas as records and information management, microforms processing, communications transmissions, and report preparation from information systems should be added to the curriculum. However, Reiff (1975, p. 331) suggested that teachers are painfully unaware of developing technologies, and that their knowledge of these new technologies is not sufficient to enable them to decide how to modify their instruction in order to accommodate its basic principles within the curricula.

Reiff (1974) conducted a study to determine the requirements for entry-level employment in word processing centers* in New York City; to determine the attitudes of word processors toward their jobs, and to make recommendations for secondary school business education curricula in the New York Metropolitan Area.

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*Found in the literature as administrative support centers, administrative support/word processing, and administrative processing.

The data were obtained by investigating the word processing centers of 30 business organizations in New York City and administering three validated instruments within those firms. One guide was administered to management personnel, one to correspondence and administrative secretaries, and the third to secondary business teachers who taught the skills and/or concepts of word processing.

From the data, the minimum qualifications for employment in the word processing centers of each of the 30 companies and the minimum qualifications of in-company training programs were compiled. A range of qualifications for employment in entry-level word processing positions in New York City was established, then these qualifications were compared with the current curricula in the secondary schools of New York and New Jersey.

The conclusions derived from the data and which are pertinent to this study are the following:

1. The overall potential for word processing appears to be favorable.

2. The majority of business educators are not familiar with the concept of word processing. Of the group that is familiar with the concept, most do not teach the skills required of office workers in the word processing installation. A small group of business educators, however, does teach one or more of the environmental concepts inherent in a word processing installation.

3. Most of the curriculum guidelines for secondary business education programs in the New York Metropolitan area do not include instruction in word processing skills specifically. However, some of the

minimum qualifications necessary for employment in entry-level positions in word processing centers may be developed within the current curricula.

4. Training programs within the 30 companies provide instruction on the operation of the magnetic-media (tape and card) typewriter and the operation of a transcribing machine. Instruction in spelling, punctuation, and grammar was also provided by a few firms.

5. There was no specific organization pattern in the word processing installation followed by the firms. Each company had adopted the variations of ergonomics and staffing best suited to its own needs.

6. Although the correspondence secretarial position existed in all the business organizations in the sample, few firms had incorporated the concept of the administrative secretary into their word processing systems.

7. Women filled most of the correspondence and administrative secretarial positions in the organizations that were investigated.

The Stead study (1967) was an analysis of one method for obtaining current feedback from the business community and for using this feedback to update curricula. It was contended that current continuing feedback from the business community is necessary to determine curricula that are relevant to today's business world.

Top management, middle management, and first-line supervisory positions among members of the Administrative Management Society (AMS), American Records Management Association (ARMA), Data Processing Management Association (DPMA), National Secretaries Association (NSA), and Systems and Procedures Association (SPA) were selected in the researcher's county location, and a list of 59 duties was sent to the organizations'

members. Respondents ranked the duties as major or occasional, or NA. A comparison of duties among the five business organizations was made to determine specific curricula for related careers, then the respondents were divided into seven groups according to the SIC (Standard Industrial Classification).

The duties were grouped into five subject matter areas: communication, data processing, administrative management, records management, systems and procedures, and office services. Duties were ranked and given a numerical weight, and a total "importance score" and mean were computed for each duty.

Implications for business teachers among the findings were:

1. Typical decisions and problems faced by administrative management are personnel, finance, equipment selection, records maintenance, and new systems and procedures recommendations.

2. Properly trained records management personnel are needed.

3. Systems and procedures emphasize the best way for personnel to accomplish work.

4. Data processing has emerged to better integrate the entire organization through the release of more information for better management decisions.

5. AMS members appear to have more authority than the other organization members.

6. Curricula can be developed and revised by surveying modern position duties, evaluating them through a questionnaire, and studying them statistically by a system of numerical weights.

7. There are enough significant differences among the five organizations, AMS, ARMA, DPMA, NSA, and SPA to develop a separate curriculum for each of the occupations they represent: administrative manager, records manager, data processing manager, secretary, and systems analyst.

IV. Methodology

The studies in this section were selected because the methodology used by the researchers was appropriate for the present study.

The procedure used in the present study was similar to the procedure used by Cook (1951). The problem was a study to analyze and classify visible filing equipment available from manufacturers and to study the equipment and its applications in selected offices. Letters were sent to manufacturers of visible filing equipment to determine the importance of visible filing in business, and to manufacturers of visible filing equipment to determine firms in the area of Knoxville, Tennessee, using the equipment. Personal interviews were conducted in offices listed by the manufacturers or distributing agents to determine the extent and application of visible filing in the city of Knoxville.

The procedure of the present study was similar also to the procedure used by Maze (1962). His definition of the descriptive survey method and the use in his study is more future oriented and philosophical in nature as opposed to an historical or status study. The parallel for the present study is the discussion of the growth of micrographics as an industry, and its forward projection in records and information management.

The procedure in a study by Cunningham (1961) was most closely approximated in the procedure of the present study. The use of the computer in student personnel records systems brought problems to school administrators never before encountered. The purpose of the Cunningham study was to determine the major difficulties, the degree of concordance among educational administrators as to the relative difficulty of the problems encountered, and to recommend possible solutions or ways to get around the problem. The population consisted of all public schools and school systems using data processing equipment for school business and student personnel records as identified by International Business Machines (IBM) Incorporated.

A two-page instrument was developed and sent to 294 school administrators. Of 181 replies received, 155 were eligible to participate in the study. The respondents were asked to rank eleven identified problems as to the most difficult and the easiest problems encountered. Statistical analyses were drawn to determine agreement within the population as to the difficulty of the problems. Case reports were written of the effective school systems.

CHAPTER III

INFORMATION MANAGEMENT SYSTEMS

The purposes of this chapter are to (1) describe the administrative support center concept, (2) delineate records management as the system in the administrative support center having primary import for the present study, (3) describe the kinds of storage for information, (4) identify automated storage and retrieval systems, and (5) describe computer information retrieval systems.

During the past two decades, men and machines have managed to create more paper documents than were created during the 5,000 years of recorded history preceding them (Moskowitz, 1972, p. 97). The daily addition of 1.5 million documents, produced primarily by computer, inundates a records management program in terms of distilling vital information for management information purposes. As quoted by Ridenour (1952, p. 4):

> They are called computers simply because computation is the only significant job that has so far been given to them. The name has somewhat obscured the fact that they are capable of much greater generality. . . . To describe its potentialities, the computer needs a new name. Perhaps as good a name as any is "information machine."

In order to plan and control business operations, top-level management must have the right information at the right place and at the right time to insure the right decision. Increasingly, management is becoming dependent on computerized data bases from which can be

extracted information that is useful for the fast development of alternative courses of action to achieve an objective.

Place (1973, p. 83) warns that records managers must resist the temptation to glamorize electronic data processing and continue to pursue the fundamental goals of records maintenance and retrieval of information. The basic need is to manage paperwork so that useful information emerges as a high-quality resource from the complex of variables of machines, systems, company structure, production-marketing-accounting needs, and the changing times.

Office management has traditionally been associated with the handling of paperwork--the innumerable details which have had to be taken care of to allow the two primary operational arms of business, production and marketing--to get on with their work of generating profits, states Heyel (1972, p. 3). These functions, as well as personnel, procurement, and the controlling functions of management--finance, accounting, and legal--have also relied upon office management for certain paperwork and service requirements in the areas of supplies, routine equipment and facilities, and secretarial and mail services.

In a supportive sense, these services have been recognized as important to smooth operation, but the *total* office management function has too often been viewed as of secondary importance to the two profit-generating functions. However, with today's growing sophistication and complexity of management decisions, the total of these supportive services is being looked upon as more than mere paperwork formerly thought of in connection with the term "office management." Fetridge and Minor (1975, p. 3) concur with the changing view of the office by

noting the significance of the change in name of the National Office Managers Association (NOMA) to the Administrative Management Society (AMS) only a decade ago.

To the two profit centers of production and marketing, a third is now added--administrative management. Because of the increasingly important role the supportive services play in enabling the first two to achieve their objective and at the lowest possible cost, administrative management is likewise being scrutinized for savings and efficiencies (Terry, 1970, p. 318). Some of the most advanced technology in systems and procedures is being applied to the office as an administrative support center toward the end of achieving cost effectiveness in the performance of five basic operations: telephone and mail handling, dictation and transcription, text editing, records management, and reprographics.

I. The Administrative Support Center

The term "administrative support" is synonymous with office management and administrative management to a degree. Place and Hicks define "office management" as the information handling and memory function of the office (1958, p. 1). Terry (1970, p. 15) defines "administrative management" as the planning, controlling, and organizing of information work, and actuating those performing it so as to achieve predetermined objectives. According to Littlefield, Rachel, and Caruth, "administrative management" is that function within the organization with responsibility for the overall operations of the firm. Administrative management comprises those functions that support line

management--production, marketing, accounting, and finance (Littlefield et al., 1970, p. 83).

The term "word processing" was coined by IBM in 1964. With the development of the Magnetic Tape Selectric Typewriter at IBM-Germany, the company recognized that words could be captured and stored in much the same way the computer stores numbers. As described in Think (1971, p. 9), IBM envisioned using dictation equipment to "feed" the words into a word processing center as well attuned to the equipment's versatility as programmers are to computers. However, the company acknowledged that all of the basic office operations would co-mingle at some point in the processing of information in this kind of setting. Against this backdrop, the term "administrative support" emerged, according to Fetridge and Minor, as the systematizing of logistics, production methods, and environmental control, through the integration of equipment and personnel, to maximize productivity, responsiveness, convenience, job satisfaction, and work quality (1975, p. 675).

In the automated and integrated office, basic operations interface to become a combination of systems. Fetridge and Minor (1975, p. 686) describe these as communications, dictation, composing/typesetting, information storage and retrieval, and reprographics. Ober (1972, pp. 29-32) refers to the major office functions as telephone and mail handling, dictation and transcription, automatic typewriting, records management, and reprographics. Cumpston in Word Processing World (1975, pp. 20-28) refers to the components as telephone/mail handling, dictation/transcription, text editing, records management, and reprographics.

The administrative support center is not just another name for a stenographic pool. Indeed, according to U. S. Department of Labor figures released in September (1975, p. 4), the position of stenographer will decline sharply by 1980. However, as pointed out by Simpson (1973, p. 74), the new concept of the office and the application of new technologies virtually forces the setting up of a hierarchy of office positions in which initial hiring and opportunities for advancement are based on carefully prescribed competencies spelled out in job descriptions. Among other things, this more efficient concept permits women in stereotyped positions to enter the administrative management level.

Formerly, women were named supervisors but there was no place to go from there. Today, women in supervisory positions, and other women knowledgeable in the management of administrative support centers and the tasks performed by office workers, are entering high-level line and staff positions with a chance for advancement based on demonstrated performance.

Business organization and management requires the kind of structure that effectively interrelates the functions of management and the various on-line and off-line services that are supportive to efficient operation. Figure 1 shows a typical organizational chart in which the services can be seen with their line relationships.

The *office* as a place in the business organization is in a state of transition. Changed and changing emphases in line relationships and levels of responsibility, a more prescriptive identification of the tasks office workers perform in a cluster of occupations, and the indepth evaluation of individual performance and productivity emphasize

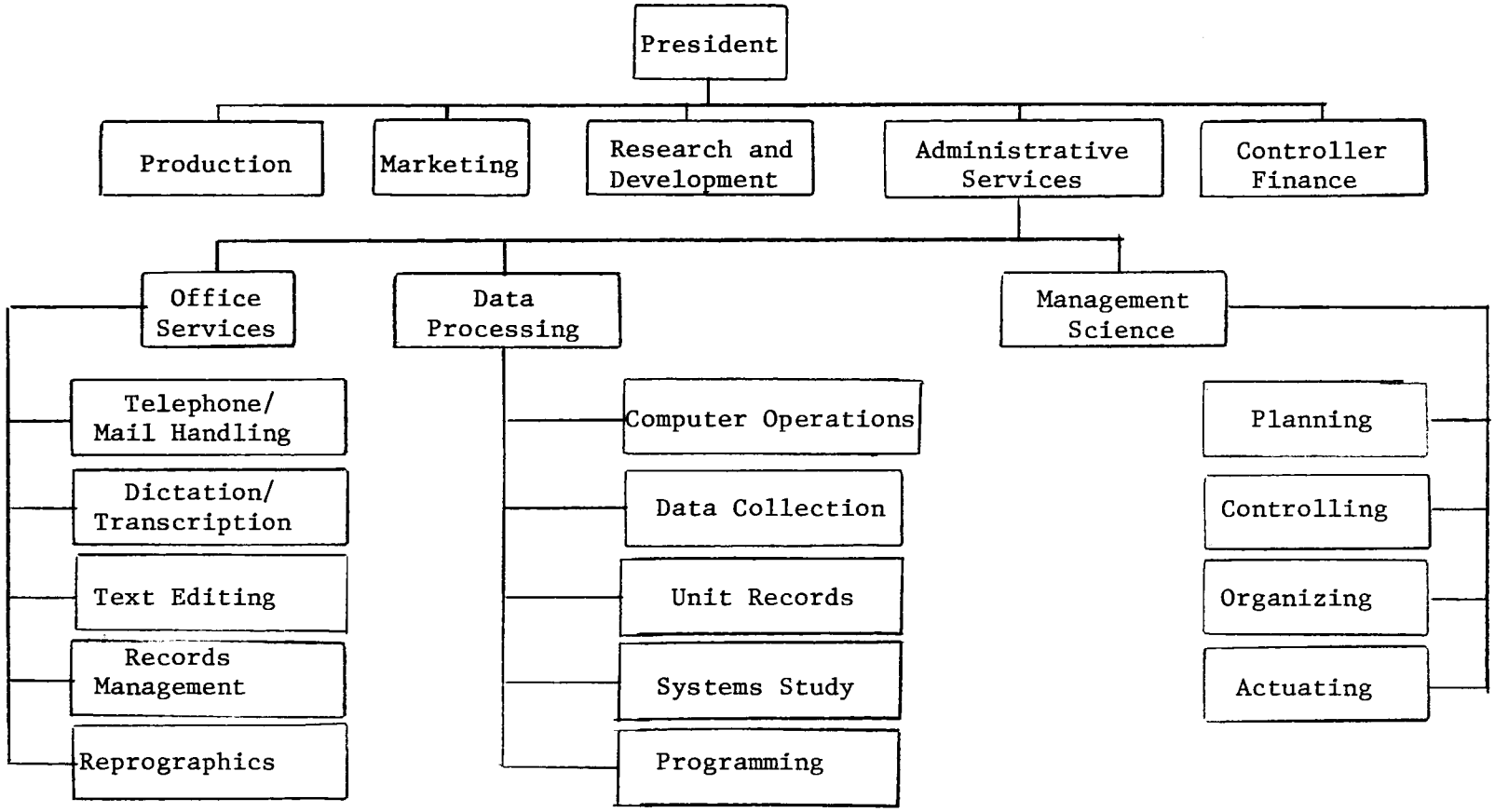


FIGURE 1. Typical organizational structure.

SOURCE: Littlefield, Rachel, and Caruth, Office and Administrative Management, p. 260.

the intent of management to look at the office in terms of cost effectiveness and cost savings. The chart shown as Figure 2 displays the five basic operations, telephone/mail handling, dictation/ transcription, text editing, records management, and reprographics, in the concept of the administrative support center, and some of the positions created by a division of responsibility, new job descriptions, new technologies, and the identification of tasks required for work in the positions.

This concept of the systems comprised within the administrative support center was described by Wiper (1974) in a prepared slide-commentary presentation to the National Association of State Supervisors of Business and Office Education (NASSBOE) at the annual convention of the American Vocational Association.

Telephone/Mail Handling System

The Telephone/Mail Handling System is generally centralized and often is composed of one or more Call Directors. The Call Director monitors the flow of external and internal calls. Communications Receptionists are responsible for answering Call Directors as well as handling incoming mail for distribution, and greeting people coming to the Center.

Vendors of communications systems are increasing rapidly. As of January, 1975, Modern Office Procedures (1975, p. 46) lists 32 vendors in its quick reference section. According to Kloman (1975, p. 60), the most significant event has been the recent announcement by AT & T that automatic answerers equipped with the new Bell System, Authorized

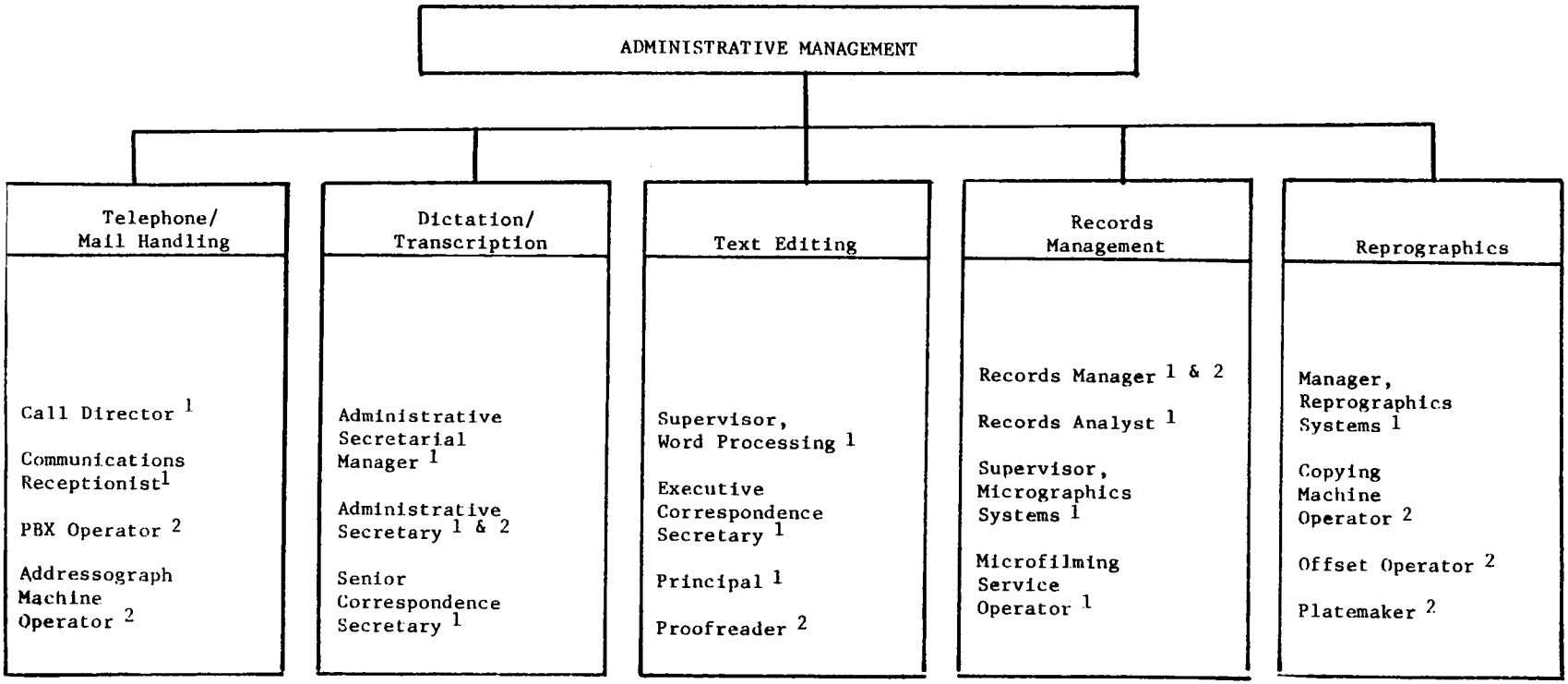


FIGURE 2. The administrative support center concept.

SOURCES: Cumpston, Modern Office Procedures, p. 93; and Dictionary of Occupational Titles.

Protective Coupler Module (APCM) can be plugged into an ordinary four-prong telephone extension jack thus eliminating the present telephone company connection charge and monthly charges for the voice connecting arrangement. The Consumer Communications Reform Act of 1976 (1976) is also significant in that the telecommunications industry is allowed to become more competitive while continuing to hold a monopoly as a utility.

In mail handling operations and in telecommunications, facsimile equipment may be part of a network which transmits hardcopy from one place to another, for example from a main office to branch offices in the same city as well as interstate, and intrastate. Optical Character Recognition (ORC) equipment greatly speeds up the outgoing mail handling process. Modern Office Procedures (1975, p. 49) lists some 29 vendors of mail processing systems.

Dictation/Transcription System

The second system in the Center is the Dictation/Transcription System. This system provides for a faster, more convenient method of information generation. The system may be as simple as a hand-held dictation unit for input or more sophisticated approaches as PBX and Centrex for central location recording. The system chosen to meet specific needs will often require an Administrative Secretarial Manager, Administrative Secretaries, and Senior Correspondence Secretaries to dictate as well as persons in administrative management. Transcription may be a stand-alone system, or it may be part of a centralized system such as a "tank" or computer memory system. It may also be a remote

system incorporated frequently by banks and insurance companies and their branches.

Whereas some systems use cassette magnetic tape as the recording medium, others use a disc for recording and playback. A new innovation described by Duker (1974, p. 5) is voice compression for fast review of dictated material with search features providing for fast voice deletion, inserts, and other changes without re-recording, and voice banks for storage and retrieval of information. According to Word Processing World (1975, pp. 17-21), 28 central dictation systems, 56 discrete media desk-top units, and 18 discrete media portable units were on the market in 1975.

Text Editing System

The third component of the Center is the Text Editing System. The system consists of an automatic typewriter station which makes possible the editing of text material without having to retype the entire copy. Remote recording features enable transmission of information over telephone lines. Proportional spacing permits right-margin justification.

Work in this component of the Center is performed by Senior and Executive Correspondence Secretaries, Principals, and Proofreaders. They are responsible to a Supervisor, Administrative Support Center or a Secretarial Administrative Manager.

Most of the systems are tied to the IBM selectric keyboard for printout. However, several companies are now using the Diablo printout head with speeds twice that of the Selectric. Xerox has released its

text-editing unit which uses the "daisy" Diablo head for printout. A. B. Dick Company has marketed a magnetic card input copier with output speed faster than either of the other two.

A good many of the companies use magnetic cassette tapes as the recording medium; others are beginning to use floppy discs. Another innovation provides for CRT (cathode ray tube) display of information on a page-size screen. Corrections can be made in the visible copy then printed out from magnetic tape storage while simultaneously keyboarding in new copy.

According to Word Processing World (1975, pp. 17-21), 30 stand-alone mechanical text editing devices, 18 stand-alone text editing devices with communicating capabilities, 5 automatic typewriter manufacturers, 3 time-shared text editing systems, 8 stand-alone display editing devices, and 7 shared logic text editing systems were on the market in 1975.

Records Management System

The fourth system is the Records Management System. The system is treated more in detail because of its importance to the present study.

Organized control over the information used in management problem-solving and decision-making activities and the use of a systematic and scientific approach to the management of business records are now recognized as emerging and rapidly growing concepts among top- and middle-management personnel in business and government.

A comprehensive records management program, as described by Maedke, Robek, and Brown (1974, pp. 32-33), exercises control over the

creation, distribution, retention, utilization, storage, retrieval, protection, preservation, and final disposition of all types of records within an organization. Stated a little differently, records management includes the creation, control, use, filing, and disposition of records as viewed by Kahn, Yerian, and Stewart (1971, p. 2). Johnson and Kallaus define records management as the control of the life cycle of a record from its creation through processing, checking, maintenance, and protection to its destruction (1974, p. 4). Similarly, Place, Hicks, and Wilkinson define records management as the planned control of all types of records in a company from their creation (birth) to their final disposition (1975, p. 192).

Whereas definitions may vary, the objectives of a records management program remain the same: (1) to reduce costs in the handling of an organization's records, and (2) to develop efficient systems and procedures for the storage and retrieval of information (1974, p. v). In order to meet these objectives, records managers in large organizations normally have a staff composed of Records Analysts, a Supervisor of Micrographics Systems, Microfilming Service Operators, Coding Clerks, and File Clerks. Persons in these positions may be working with records housed in bins which may be left open, or open- and closed-access systems, or racked and shelved visibly in signal-bearing folders. According to Modern Office Procedures (1976, p. 57), "workers in an administrative support center will be performing at a decentralized location where work is extremely diversified, and local in nature." In a records management system, workers will have computer-based capabilities for information storage and retrieval which include automatic search, selection, and update features.

Within the last decade, the need of large organizations to reduce operating costs has caused them to look to other means for storing material and for quick simplified access. *Micrographics* has emerged as an industry as a result of the demand for and utilization of various microforms for information storage and retrieval.

Reprographics System

The last system to be recognized in the transition of the office to an administrative support center is the Reprographics System. Because of high paper and printing costs, businesses of all kinds are now processing a vast percentage of their duplicated and printed paperwork through in-house facilities (1975, p. 61). Dry-copy systems as well as automated offset systems are now being combined into hybrid copier/duplicator systems. Most of the administrative support centers have one copier for small-quantity duplication and a quick-copy center composed of offset platemakers and duplicators for quick turnaround.

Prior to 1975, the British Columbia Telephone Company, for example, was producing two large parts and materials catalogs using its computer and ordinary printing methods at a cost of $20,000 (1975, p. 62). To reduce costs, management decided to use the computer's COM facilities to produce the catalog output on microfilm. An immediate problem was how to get the microforms into print in catalog form since no single piece of equipment was on the market to do that job. The Reproduction Supervisor designed a system that put the computer back-to-back with a dual-head offset, thus permitting printing on both sides of the page simultaneously. Images were transferred from microfilm directly to

offset plates with over 40 percent savings in time and approximately $3,000 cost savings.

Large organizations with their own in-house facilities normally employ a Manager/Supervisor of Reprographics Systems, Copying Machine Operators, Offset Operators, and Platemakers. Out of computer applications has come a new technology, COMpugraphics, which is a system of computer typesetting. Continued use of a computer-typesetting system may establish additional jobs in the hierarchy for reprographics workers, particularly in the micropublishing field.

Modern Office Procedures (1975, pp. 68-74), in its Source Reference Guide, indicates some 40 vendors of copiers and related products with an array of equipment including copiers, copier/duplicators, diazo or thermal copiers, copier controls for access, audit, and audit/count, automatic feeders, on-line collator/sorters, copier paper, toners and assorted supplies. However, marketing research reports (1975, p. 1) see a slowdown in the copying and duplicating market due to a decline in the percentage of increase in the number of impressions per year.

In summary, the concept of the Administrative Support Center synthesizes the five basic office functions--telephone/mail handling, dictation and transcription, text editing, records management, and reprographics--into an automated and integrated information processing system designed to best utilize the capabilities of personnel, procedures, and equipment with time and cost savings for the purpose of facilitating the planning, decision-making, and problem-solving functions of management.

II. Kinds of Storage for Information

Information gathering is the most time-consuming manual task paid for by business (Moskowitz, 1971, p. 83). Manual methods, slow processes, expensive storage media and equipment, and a tendency to overstaff these operations contribute to inefficiency. Another contributing factor is that old information is retained, stored, and never disposed of. The net result is that document storage, retrieval, and reproduction back to hard copy is often totally out of step with the needs of the organization served. When the cost of purchasing cabinets and shelving that consume expensive floor space is totaled, and manpower needs are considered, the plus factors bottom out in favor of automation and a system which assures consistency of information for varied management uses and decreases the acquisition and processing costs.

Various kinds of storage for information are available, each type having a different application (Stamper, 1971, pp. 179-185).

Fixed storage means that the documents or information itself cannot be easily recopied or reproduced. This type of storage usually consists of historical documents and collections of out-of-print books. Most businesses have very little need for fixed storage because of the need for mobility of information.

Flexible storage requires that the information be in easily copied form. Unbound pages of reports are an example. The fact that copying equipment can be used to reproduce other than originals makes the difference between flexible storage and master image storage. Flexible storage requires manual handling or materials handling

techniques applied to information. It also requires electronic storage of facts by themselves.

Variable storage, format changeable is a very important kind of storage which provides for replacement of documents or information. Punched cards, magnetic tape, and perforated or punched paper tape are prime examples of variable format, changeable storage.

Variable format, fixed storage means certain kinds of storage require that the format be fixed but that data within the format can be erased and changed. Forms, diagrams, and tables are examples of manually variable format, fixed storage. In addition, programs developed for computer systems dictate a fixed format for information. This kind of storage conforms to the core, disk, or drum memory of a computer.

Manual storage refers to all techniques which usually depend upon the human being to place information in or out of storage. Manual filing consists of placing documents within category locations established in filing cabinets. Based on the filing, pulling, and re-filing cycle, a breakdown of filing costs shows space and equipment at about 13 to 14 percent each and personnel 73 percent of the total cost.

Coding is usually alphabetic, numeric, subject, or geographic, or it may be some combination of these. Color coded, alphanumeric systems are frequently used. Terminal digit filing keeps arrangement in the file uniform and the number of documents in each proportionate.

Semi-automatic storage assists the manipulation of information in selecting, printing, or erasing from the media. Examples of semi-automatic storage are punched paper tape, punched cards, and Termatrex

cards. Machinery or equipment is used to punch information into cards, and is also used to sort, collate, and select them. However, a person must handle cards, select portions of the collection, and oversee first-hand manipulation of the subset.

Automatic storage is characterized by complete absence of human direct interference in either writing or erasing information on the media or handling the media during processing. Examples of automatic storage are disk files, core memories, and sophisticated microfilm handling systems.

Master image storage pertains to microfilm prints, reproducible masters, and electronic storage which are capable, when directed or desired, to display or produce an identical copy or multiple copies.

Random access storage describes techniques of placement and selection of information in files which are not serialized in a conventional manner. Random access refers to systems such as disc files which can calculate addresses numerically from characteristics of information or to card selecting techniques which operate on unordered sets of cards and output selected cards without resort to serial scanning. An example of random access storage is the system used in The University of Tennessee Book Store which inventories every book currently available or held in stock for one year.

Bohl (1971, p. 83) adds to the above storage mediums, the data-cell drive, which is a device with ten removable data cells each containing ten strips which are the recording medium. The cells are rotated until the desired location point is positioned under a drum that is in a fixed position. An example of data-cell drive is a programmable

calculator in banks which automatically computes interest on term-payment loans and amortization schedules by means of magnetic card reader/recorders.

III. Automated Storage and Retrieval Systems

Two types of automated storage and retrieval systems are available on the market: (1) nonmotorized units, and (2) mechanized units.

Nonmotorized Storage Units

Terry (1970, p. 324) describes nonmotorized storage units as the pull-drawer, lateral, reciprocating, rotary, card automatic, and visible units.

Pull drawer units are available for various size cards, letters, and legal papers, and in types of one to six drawers. The units are either desk top or desk height, counter height or floor models. A standard four-drawer file holds about 5,000 sheets of paper, 300 file folders, and 26 file guides.

Lateral units provide for easy access to stored material. In storing and retrieval work, they are 25 percent faster in handling stored material than other types of units. In savings on floor space, lateral units return about 50 percent of the available square feet of floor space compared with other types of units. Lateral units can be divided into four groups: (1) drawer, (2) box, (3) shelf type, and (4) suspension. A modification of the shelf and suspension types, or "open shelf" type, is widely used for odd-sized items such as magnetic reels, paper tapes, photographs, and drawings.

Filed strips are another type of nonmotorized storage unit. The strips provide quick reference to records containing small amounts of data but data which undergoes frequent change, e.g., customer lists, price lists, rates, directories, reservations, hospital indexes, routings, telephone and switchboard data. Data are encoded by writing or typing on thin strips which are then separated and placed in a holding frame.

Reciprocating units permit the operator to remain seated with accessories in easy reach, and the file can be moved backward or forward as is necessary. A useful modification is an arrangement whereby the files can be moved along tracks thus utilizing conventional aisle space. Only one "floating" aisle is used, and the units can be moved from side to side. For heavy shelving loads, electrical power can be used by operating a foot pedal.

Rotary units are either mounted on a platform which revolves, or held to the periphery of a wheel which revolves for quick and convenient access. Several employees in work stations around the platform can use the records simultaneously, and in the second type, posting is convenient without removal of the filed material. Capacity varies according to the size of the wheel; a 21-inch diameter wheel, handling 5 x 8 cards, has a capacity of 6,000 cards, for example.

Visible units--cards horizontal provide users retrieval at a glance because the information is visible. The cards are filed horizontally in such a manner that the bottom area of each card is exposed, providing for quick visibility. Capacity per tray averages about 80 cards. Some equipment permits fastening the card directly to the tray;

some have "pockets" which are fastened directly to the tray. Effective signaling by means of colored plastic markers which highlight signals for specific actions is one of the outstanding features of this system.

Visible units--cards vertical store cards in a vertical, overlapping position with notched or cut corners making for easy removal of the filed material.

Mechanized Storage Units

Representative of less automated yet highly effective storing and retrieving means are motorized files (Terry, 1970, p. 52). Operated electrically, the units bring to the seated operator any tray of material in the unit at convenient writing height and eliminate lost-movement factors which are costly. An additional factor is that power storage containers utilize the full space from floor to ceiling, thus in many cases doubling the cubic feet for storage per unit of floor space over that of nonmotorized units.

IV. Computer Information Retrieval Systems

Of all the information systems, the management information system that is computer based is probably the most fundamental. Management planning and control is becoming increasingly dependent on computerized data bases for the fast development of alternative courses of action to achieve an objective. According to Costigan (1975, p. 322), information retrieval may be a system that permits a user to interrogate the computer and communicate via input/output devices such as a teletypewriter or cathode ray tube display. Or, information retrieval may be a

micrographics system that utilizes the special advantages of the computer for microimaging. Whatever the system used to synthesize vast amounts of information for management planning and decision-making, computerization, states Diebold (1964, p. 6), provides new-dimensional capabilities in data and information collection, processing, interpretation, and dissemination. Three computer information retrieval systems are described because of their importance to the present study.

Computer Output Microfilm COM

The converting of computer output information on magnetic tape to microfilm, COM, in readable form and at magnetic tape speeds (300 pages a minute) illustrates an automation breakthrough into the storage and retrieval activities of records management in the view of Gildenberg (1974, p. 14). According to Infosystems (1976, p. 48), however, taking the big step to convert can create some painful changeover problems. One overriding problem is educating the users to a new method of working with computer output. Three other problems have to do with selecting the COM equipment for the system, the development of COM-oriented software for the computer, and training operations personnel. Rather than a complete in-house system, using a COM service bureau might be the way to enjoy the benefits of micrographics.

A COM recorder is used to transcribe information from a computer magnetic tape, or directly from the computer onto microfilm. Three basic techniques are employed in generating information on a COM recorder: cathode ray tube (CRT), electron beam recording (EBR), and fiberoptics. CRT and EBR generate an entire page of information onto

the unprocessed microfilm before the film is incremented. The third technique, fiberoptics, records only a single line of the page on the film before the film is incremented.

Cathode Ray Tube (CRT)

The CRT technique is the oldest and most commonly used method for COM recording. An electron beam generates the desired characters on the face of the CRT. The image of the character passes through a semi-reflective mirror and lens system onto the unexposed film.

Unlike the CRT technique, the electron beam in the EBR technique writes the characters directly on the unexposed film. To properly control the direction of the electron beam in forming the characters, this process must be performed in a vacuum chamber. One of the main advantages of the EBR technique is that a special type of silver film which is electron as well as light sensitive, can be used in the COM recorder. This film can be developed by heat processing, as opposed to the wet chemical processing which is required for both the CRT and fiberoptics COM original film.

The fiberoptics technique of character generation uses a matrix of luminous fibers which is selectively illuminated to form a single line of characters. The film is exposed to this line of characters, and then incremented to permit the next line of characters to be generated. The forms overlay process is accomplished by the use of a second lens system, as used in the EBR process.

Conventional hard-copy microfilm techniques are inadequate to capture the large volume of information that a computer can generate. Also, because of the relatively slow rate at which the computer

high-speed paper printers can generate information, the speed of running computer programs in many cases becomes printer-bound. In other words, the time required to run the computer program is a direct function of how rapidly the printer can print the information on paper. By increasing the speed at which information can leave the computer, states Gildenberg (1974, p. 14), and by using a computer output microfilm approach, the time required to run many computer programs will be greatly reduced. However, Dickison (1975) cautioned that COM can tie up the computer from other required operations, e.g., payroll, and that activities must be scheduled so as to avoid expensive downtime.

Electronic Graphic Transfer

Micrographics facilitates the retrieval of specific information from an extensive storage system. However, consideration should be given to some method of transferring the information to where it is needed by persons who may be geographically remote. There are basically four ways to accomplish the transfer electronically according to Costigan (1975, p. 61): (1) digital data, (2) facsimile, (3) closed-circuit TV, and (4) slow-scan TV. Ultimately, the decision of selecting one way over another will likely be based on use and cost factors.

In 1964, Diebold (1964, p. 84) stated that whereas the computer accounted for 75 to 80 percent of the dollar value of a centralized information system in times past, the situation would reverse itself in the 1970's. He predicted that "75 to 80 percent of a typical business computer installation will be in peripheral equipment--in the traditional input-output equipment, in communications, and in such new areas as *image files.*"

Gildenberg (1974, p. 14) supports Diebold's comments by pointing out that computer-output microfilm files can be used in conjunction with other types of information management systems, such as on-line computer, hard-copy microfilm (micropublishing), and manual paper, to provide the most effective information management system at the lowest cost. By intermixing these systems, many advantages can be achieved.

The probability of "mixing systems" was prophetically described by Diebold (1965, pp. 192-199) ten years ago when he listed among his views on management some changes in information technology resulting from the time-sharing and real-time capabilities of the computer. The changes are as follows:

1. Future information systems will be more versatile and will more nearly parallel the real flow of information within an organization.

2. Information systems will tend increasingly to be "real time"; that is, they will reflect important and routine events as they occur.

3. Systems flexibility for new applications will be vastly increased, and costs greatly reduced, through a broad range of new peripheral equipment developments.

4. Significant cost reductions and vastly expanded use of random-access files and memory will permit the drawing together on an integrated basis of the data needed to manage and operate the company, and provide instantaneous and flexible access to it.

5. A totally new data storage and processing capability--graphic storage and processing--will become economical and commonly available.

6. Information storage and retrieval of technical, management, and general data will become an increasingly important aspect of information management.

7. There will be significant improvements in the means of communicating with the system--the so-called man-machine interface.

New systems are reshaping the office functions to embrace the emerging technology of electronic communications and information systems. A paper-based system, adequate for centuries, has grown to such proportions as to force companies to look for newer and more efficient methods of managing information.

CHAPTER IV

CONTEMPORARY MICROGRAPHICS SYSTEMS

The process of placing records in storage and retrieving information from stored records has been altered greatly by the development of microfilming (Terry, 1970, p. 314). Microfilming is a photographic means of retaining information at a reduced size on film. Government, industry, business, education, law, and medicine is on the alert for the most effective and efficient methods of information and documentation storage and retrieval (Terry, 1970, p. 318), and microfilm is the first realistic item storage device that is feasibly available to all.

One of the strong justifications for microfilm usage is recovery of space. In growing and crowded conditions, space assumes an importance out of proportion to the actual rent or building cost per square foot involved. The rate at which new records are being generated emphasizes that if relief is not found, recorded information will eventually overrun the available space or will require space out of proportion to the value of the records. Consequently, on a long-range basis, microfilm may be evaluated as a means of keeping ahead of the records management problem.

Micrographics is a relatively new industry which reduces any form of information to a microform medium. Whereas the initial installation of a micrographics system may be a high-cost factor, depending on

the system, the immediate and long-term return in cost savings and operating efficiency is incalculable.

I. Vendors

The micrographics industry continues to be dominated by three companies primarily. Table IV.1 shows the industry structure in terms of 1973-74 revenues. The executives in the nine companies selected to participate in the interviews, some of which are shown in the table, are similar in training and experience and the number of years they have been in the micrographics industry.

Six of the nine executives hold Bachelors degrees: three in marketing and one each in the fields of accounting, aeronautical engineering, and liberal arts. One executive holds a two-year certificate in business administration and court reporting. Another executive holds a two-year certificate in business administration and marketing, and one has extensive sales experience interspersed with short period training programs.

At the time of the present study, six of the nine executives had been in the industry seven to nine years, and one executive indicated having been in the industry one to three years.

The nine executives were divided just about evenly in the length of time they had been in the company with which they were working at the time of the present study. Four executives had been in the company ten or more years. One executive had been in the company seven to nine years. Four executives had been in the company four to six years.

TABLE IV.1

MICROGRAPHICS INDUSTRY STRUCTURE, 1973
(MILLION DOLLARS)

Company	Total Revenues	Percent Micro-graphics	Micro-graphics Revenues	Percent of Industry	Cumu-lative Percent
Eastman Kodak	4036	4.0	160	21.7	21.7
Minnesota Mining & Mfg.	2546	4.7	120	16.3	38.0
Bell & Howell	397	15.1	60	8.2	46.2
General Dynamics	1642	1.8	30	4.1	50.3
Xerox	2990	1.0	30	4.1	54.4
GAF	849	2.4	20	2.7	57.1
Sperry Rand	2614	.6	15	2.0	59.1
Addressograph-Multigraph	541*	2.6	14	1.9	61.0
NCR	1816	.6	11	1.5	62.5
Indian Head	551	1.8	10	1.4	63.9
Singer	2528	.4	9	1.3	65.2
Itek	205	4.4	9	1.3	66.5
New York Times	357	2.5	9	1.3	67.8
Keuffel & Esser	68	11.8	8	1.1	68.9
Calif. Computer Products	129*	6.2	8	1.1	70.0
Arcata National	234*	3.4	8	1.1	71.1
Transamerica	2110	3.4	6	.8	71.9
Anken Industries	15	33.3	5	.7	72.6
Memorex	177	2.3	4	.5	73.1
Quantor	4	100.0	4	.5	73.6
Information International	7	57.1	4	.5	74.1
Cubic	67	6.0	4	.5	74.6
U.S. Microfilm Sales	4	100.0	4	.5	75.1
Gould	740*	.5	4	.5	75.6
Washington Scientific	15	26.7	4	.5	76.1
Scott Paper (A.B. Dick Co.)	931	.3	3	.4	76.5
Dietzgen	30	10.0	3	.4	76.9
Kalvar	9*	33.3	3	.4	77.3
Xidex	6*	50.0	3	.4	77.7
Oce Industries	-	-	3	.4	78.1
Other Companies			161.0	21.9	100.0
TOTAL INDUSTRY			736.0	100.0	100.0

*Denotes Fiscal 1974 Revenues.

SOURCE: Ross, 1975, p. 19.

Most of the nine executives had experience in fields other than the micrographics industry with sales, management, and marketing being predominant. More than one field was indicated by each executive. Seven executives have experience in sales. Five executives have been in management. Four executives have been in marketing. Three executives have experience in engineering. One executive each indicated the fields of accounting, manufacturing, data processing, and transportation. One executive had been in graphics, an area which did not appear on the interview guide originally.

Six professional organizations are allied with the micrographics industry. Eight executives are members of the National Micrographics Association (NMA). One each indicated membership in the American Records Management Association (ARMA), the National Court Reporters Association (NCRA), the National Association of Visual Arts (NAVA), and the Association for Representatives of Marketing and Manufacturing.

II. Components

A micrographics system usually consists of a camera, processor, microforms, and retrieval capability. A vendor's retrieval system may be a reader or reader-printer, a COM system, or CRT. Other components in the micrographics system may be an enlarger-printer, contact printer-duplicator, and storage equipment, i.e., bins, cabinets, and tubs. A vendor may have several systems comprised of different configurations which conform to user need. Lens and screens are manufactured by most of the vendors or they use the lens manufactured by another vendor.

A close compatibility exists between the components of micrographics systems listed in the Microfilm Source Book, 1974-1975 and the components identified by each of the executives during the interview as being marketed by his company. Any discrepancy was a matter of semantics. Whereas two separate classifications had been indicated for viewing equipment and reading equipment by the investigator, three companies identified them as being one and the same. One other company manufactures components which comprise a COM system, but the executive described the company as being into retrieval solely and, therefore, classified the components as retrieval systems instead of COM equipment.

The micrographics systems manufactured by the vendors selected to participate in the study are shown in Table IV.2. As can be seen in the table, the vendors are fairly consistent with one another in the micrographics systems that they market.

Microphotography equipment. Six of the vendors market cameras and lenses. Seven vendors market processors, and five market screens. Four vendors market contact printer-duplicators, and three market enlarger-printers.

Viewing equipment. Three vendors market cassettes, and two market cartridges. One vendor manufactures reels. Another vendor manufactures projectors.

Microforms. Eight vendors market a microfiche master system, and six companies each market film, aperture cards, and jackets. Most of the companies have components that conform to two or more microforms.

Storage equipment. Four of the companies market storage devices, not elsewhere classified. Three of the vendors market bins, and one

TABLE IV.2

MICROGRAPHICS SYSTEMS MANUFACTURED BY SELECTED VENDORS

Components	Vendors								
	A	B	C	D	E*	F	G	H	I
Microphotography Equipment									
Cameras	x		x	x			x	x	x
Lenses	x	x	x			x		x	x
Enlarger-Printers	x							x	x
Processors	x	x	x	x			x	x	x
Contact Printer-Duplicators	x						x	x	x
Screens	x	x	x	x					x
Viewing Equipment									
Projectors							x		
Reels	x								
Cartridges	x						x		
Cassettes	x				x		x		
Microforms									
Film	x		x			x	x	x	x
Microfiche Master System	x	x	x	x		x	x	x	x
Aperture Cards	x		x			x	x	x	x
Jackets	x		x			x	x	x	x
Storage Equipment									
Storage devices, NEC	x	x					x	x	
Cabinets	x								
Bins				x			x		x
Retrieval Systems	x	x	x	x	x		x	x	x
Reading Equipment									
Readers	x	x		x	x	x	x	x	
Reader-Printers	x	x				x	x	x	
Reader Turntables/Stands/Carts	x			x			x		
COM Equipment									
COM Recorders	x		x		x		x	x	
COM Printers	x		x				x	x	

*Not in Microform Source Book

NOTE: NEC - Not elsewhere classified.

vendor markets cabinets. Generally, the vendors participating in the present study consider their systems to be for storage and retrieval purposes, and they are not commonly on the market as vendors of storage equipment per se.

Retrieval systems. Eight of the nine vendors market some kind of retrieval system. As was indicated earlier, one vendor described his company as being into retrieval systems solely and the company finds this to be a marketing advantage.

Reading equipment. Seven vendors market readers, and five have reader-printers. Three vendors market reader turntables, stands, and carts.

COM equipment. Five vendors market COM recorders, and four have COM printers. COM (computer output microfilm) came on the market during FY 1969-1970.

Advantages Identified by Vendors

During the interviews, the executives were asked to identify the advantages and disadvantages of the micrographics systems they manufacture. They were also asked to identify the advantages and disadvantages of the systems that they thought users would identify in subsequent interviews. These were grouped under four categories and formed the data base for the checklist sent later to the vendors. Table IV.3 shows the marketing advantages of micrographics systems identified by the vendors.

Advantages related to systems. Four vendors considered product reliability to be an advantage of their system. Three vendors

TABLE IV.3

MARKETING ADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY VENDORS

Advantages	Vendors								
	A	B	C	D	E	F	G	H	I
Advantages Related to Systems									
1. File integrity	x	x							x
2. Records security	x		x						
3. Product reliability		x		x	x			x	
4. Alternative configurations					x		x		x
5. Systems versatility						x		x	
Operating Advantages to Users									
1. Space saving capability	x		x	x					
2. Cost reduction	x	x	x		x		x		x
3. Reduction in mailing costs			x						
4. Low cost master making		x							
5. Low cost distribution				x		x			
6. Time-sharing capabilities					x				
7. Minimal servicing						x			
Advantages Related to Vendors									
1. Systems approach to product development							x		
2. Capability of sales staff							x		
3. Staff concept of systems' dominant features							x		
4. National-international sales and services							x	x	
5. Company policy responsive to user needs			x						
6. Company into retrieval systems solely								x	
7. Company has only product on the market					x				

TABLE IV.3 (continued)

Advantages	Vendors A	B	C	D	E	F	G	H	I
Operational Advantages of Systems									
1. High volume output		x							
2. Image quality		x		x					
3. Ease of operation				x				x	x
4. Quality of master duplication				x					
5. Screen imagery						x			
6. Blowback capability		x							
7. Operates in room light		x							
8. Reduction capability - greater document density							x		
9. Line application processes							x		
10. COM system applications							x		
11. Equipment durability						x			
12. Retrieval system compatibility			x						
13. Film duplicating techniques	x								
14. Lamp life						x			
15. Data base options					x				

identified file integrity and three identified alternative configurations. Two vendors identified records security and two vendors identified systems versatility.

Operating advantages to users. Six vendors mentioned cost reduction to be an advantage to users. Three vendors identified space saving capability. Two vendors identified low-cost distribution. The other operating advantages to users--reduction in mailing costs, low cost master making, time-sharing capabilities, and minimal servicing--were each identified one time.

Advantages related to vendors. Two vendors identified national-international sales as an advantage related to vendors. The other advantages related to vendors--systems approach to product development, capability of sales staff, staff concept of systems' dominant features, company policy responsive to user needs, company into retrieval solely, and company has only product on the market--were each identified one time.

Operational advantages of systems. Three vendors identified ease of operation as an operational advantage of systems. Two vendors identified image quality. The other operational advantages of systems--high volume output, quality of master duplication, screen imagery, blowback capability, operates in room light, reduction capability - greater document density, line application processes, COM system applications, equipment durability, retrieval system compatibility, film duplicating techniques, lamp life, and data base options--were each identified one time.

Disadvantages Identified by Vendors

The vendors did not identify very many disadvantages of micrographics systems. The disadvantages that were identified are shown in Table IV.4.

Disadvantages related to systems. None of the vendors identified a disadvantage related to systems. The word None was written under that section.

Operating disadvantages to users. The operating disadvantages to users--high cost of equipment, cost and vulnerability of product line, service costs, and equipment downtime--were each identified one time.

Disadvantages related to vendors. Two vendors identified educating the market to different ways as a disadvantage related to vendors. The other disadvantages related to vendors--inability to tool up for user needs, no synergistic approach by vendors, inability to service rural areas, establishing identity in a competitive market, irresponsible marketing by some vendors, new technology - shallow market penetration, cost of product development, and Federal standards that inhibit--were each identified one time.

Operational disadvantages of systems. The operational disadvantages of systems--cumbersomeness, simplicity of operation, lack of training and retraining, no updating capabilities, lack of multiple reductions, screen height and slant, lack of portability, and film loading and rewinding--were each identified one time.

Advantages to Users Identified by Vendors

As would have been expected, when the vendors were asked during the interview what advantages and disadvantages the users were

TABLE IV.4

MARKETING DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY VENDORS

Disadvantages	Vendors								
	A	B	B	D	E	F	G	H	I
Disadvantages Related to Systems									
None									
Operating Disadvantages to Users									
1. High cost of equipment		x							
2. Cost and vulnerability of product line			x						
3. Service costs								x	
4. Equipment downtime from mishandling			x						
Disadvantages Related to Vendors									
1. Inability to tool up for user needs	x								
2. Educating the market to different ways				x					x
3. No synergistic approach by vendors							x		
4. Inability to service rural areas								x	
5. Establishing identity in a competitive market								x	
6. Irresponsible marketing by some vendors									x
7. New technology; shallow market penetration					x				
8. Cost of product development							x		
9. Federal standards that inhibit							x		
Operational Disadvantages of Systems									
1. Cumbersomeness	x								
2. Simplicity of operation			x						
3. Lack of training and retraining			x						
4. No updating capabilities				x					
5. Lack of multiple reductions				x					
6. Screen height and slant						x			
7. Lack of portability						x			
8. Film loading and rewinding						x			

experiencing with the systems, the factors identified were similar to the marketing advantages and disadvantages identified by the vendors. Table IV.5 shows the factors considered to be advantages to users.

Advantages related to systems. Four vendors identified product reliability as an advantage to users related to systems. Two vendors identified alternative configurations. Two vendors identified compatibility with other systems. Two vendors identified dependable service.

Operating advantages to users. Four vendors identified cost reduction as an operating advantage to users. Three vendors identified faster information retrieval. Two vendors identified space utilization. Two vendors identified reduction in labor costs. Two vendors identified minimal maintenance, and one vendor identified reduced mailing costs.

Advantages related to vendors. One vendor identified the name status of the vendor as an advantage to users which was related to vendors. None of the other advantages related to vendors were identified.

Operational advantages of systems. The operational advantages of systems to users--ease of operation, wide range of image and copy sizes, all standard reductions, reduction capability - greater document density, line application processes, COM system application, lamp life, and all operations in room light--were identified one time.

Disadvantages to Users Identified by Vendors

Two vendors did not respond to the question during the interview for reasons stated in the case reports. One of the two vendors had a new product line which was just being field tested for which no data

TABLE IV.5

FACTORS IDENTIFIED BY VENDORS CONSIDERED TO BE ADVANTAGES OF MICROGRAPHICS SYSTEMS TO USERS

Advantages	Vendors								
	A	B	C	D	E	F	G	H	I
Advantages Related to Systems									
1. Product reliability			x	x		x		x	
2. Alternative configurations							x		x
3. Compatibility with other systems				x	x				
4. Dependable service	x							x	
Operating Advantages to Users									
1. Cost reduction	x			x			x		x
2. Space utilization	x	x							
3. Reduction in labor costs		x			x				
4. Reduced mailing costs				x					
5. Minimal maintenance						x			x
6. Faster information retrieval		x			x				x
Advantages Related to Vendors									
1. Name status of the vendor									x
Operational Advantages of Systems									
1. Ease of operation									x
2. Wide range of image and copy sizes		x							
3. All standard reductions		x							
4. Reduction capability--greater document density							x		
5. Line application processes							x		
6. COM system application							x		
7. Lamp life						x			
8. All operations in room light		x							

base was yet available. The second vendor responded in a way that could not be classified. Table IV.6 shows the factors considered by vendors to be disadvantages to users.

Disadvantages related to systems. None of the vendors identified factors they would consider to be a disadvantage to users under this classification. The word None was written under this section in the interview guide.

Operating disadvantages to users. Three vendors identified high equipment costs as an operating disadvantage to users. One vendor identified inability to reduce costs.

Disadvantages related to vendors. None of the vendors identified factors they would consider to be a disadvantage related to vendors. The word None was written under this section in the interview guide.

Operational disadvantages of systems. Three vendors identified inability to conform to all standard microforms as an operational disadvantage of systems to users. Two vendors identified film loading and rewinding. The other disadvantages related to vendors--simplicity of operation, cumbersome, no instant imaging, and sluggish copying-processing procedures--were each identified one time.

III. Problems Identified by Vendors

One vendor previously cited could not respond to the question during the interview for reasons that are stated in the case report. The responses given by other vendors were grouped under classifications similar to the identified advantages and disadvantages. Table IV.7 shows the problems with micrographics systems identified by vendors.

TABLE IV.6

FACTORS IDENTIFIED BY VENDORS CONSIDERED TO BE DISADVANTAGES OF MICROGRAPHICS SYSTEMS TO USERS

Disadvantages	Vendors								
	A	B*	C	D	E	F	G	H	I*
Disadvantages Related to Systems									
None									
Operating Disadvantages to Users									
1. High equipment costs			x		x		x		
2. Inability to reduce costs	x								
Disadvantages Related to Vendors									
None									
Operational Disadvantages of Systems									
1. Simplicity of operation			x						
2. Cumbersome								x	
3. No instant imaging							x		
4. Forced retraining					x				
5. Film loading and rewinding			x			x			
6. Inability to conform to all standard microforms	x			x			x		
7. Sluggish copying-processing procedure				x					

*NR - No Responses; reasons cited in Case Reports.

TABLE IV.7

FACTORS IDENTIFIED BY VENDORS CONSIDERED TO BE PROBLEMS WITH MICROGRAPHICS SYSTEMS

Problems	Vendors								
	A	B*	C	D	E	F	G	H	I
Problems Related to Systems									
1. Difficulty with equipment conforming to another vendor's equipment previously installed	x							x	x
2. Updating capability of the system					x				
Operating Problems to Users									
1. Difficulty of users getting needed equipment because the market dictates			x						
2. Equipment capability does not measure up to user expectations				x		x	x		
3. Lack of top management level being committed to the system and making it work							x	x	
4. Users failure to plan for indirect costs							x		
Problems Related to Vendors									
1. A marketing problem having to do with the need of equipment with different ways to do similar things	x								
2. Inability of users to describe needs				x					
Operational Problems of Systems									
1. Insertion--re-insertion of cartridges and cassettes			x						
2. Sluggishness of the camera				x					
3. Improper operation of equipment						x	x		x
4. Film wear in a manual operation						x			
5. Minor problems with illuminating grid kits	x								

*NR - No Response; reasons cited in Case Reports.

Problems related to systems. Three vendors identified the difficulty with equipment conforming to another vendor's equipment previously installed as a problem related to systems. One vendor identified the updating capability of the system.

Operating problems to users. Three vendors identified that equipment capability does not measure up to user expectations as an operating problem to users. Two vendors identified as a problem the lack of top management level being committed to the system and making it work. The other operating problems to users--difficulty of users getting needed equipment because the market dictates, and users' failure to plan for indirect cost--were each identified one time.

Problems related to vendors. The problems related to vendors--a marketing problem having to do with the need of equipment with different ways to do similar things, and inability of users to describe needs--were each identified one time.

Operational problems of systems. Three vendors identified improper operation of equipment as an operational problem of systems. The other operational problems of systems--insertion - reinsertion of cartridges and cassettes, sluggishness of the camera, film wear in a manual operation, and minor problems with illuminating grid kits--were each identified one time.

IV. Contributions to Management

Cost reduction was identified by six vendors as the most significant contribution of the micrographics industry to management. Three vendors identified the efficiency of operation. Three vendors

identified access to a manageable information system. Two vendors identified the management of equipment and personnel. One vendor identified COM, and one other vendor identified records accessibility as a contribution to management.

V. Congruence of Marketing Advantages and Disadvantages

The checklists were analyzed to determine the consistency with which respondents could match items identified seven months previously during the interviews, and to what degree they considered them to be advantages and disadvantages of micrographics systems.

The vendors had a consistency of 81.63 percent in marking the checklist to reinforce the items they identified as marketing advantages. Their consistency in marking the checklist to reinforce the items they identified as disadvantages was 63.16 percent.

The vendors had almost total consistency in marking the checklist to reinforce the factors they considered to be advantages to users. The level of consistency was 96.55 percent. However, when the factors considered to be disadvantages to users were marked, the level of consistency was lower, 27.27 percent. One reason might be that fewer items were identified during the interviews.

The congruence of marketing advantages of micrographics systems identified by vendors is shown in Table IV.8. Consistency is particularly notable in the operating advantages, the advantages related to vendors, the operational advantages, and how strongly the vendors agree that the items are advantages.

TABLE IV.8

CONGRUENCE OF MARKETING ADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY VENDORS

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Advantages
	SA	A	SA	A	
					Advantages Related to Systems
3	3		3	2	1. File integrity
2	2		5	1	2. Records security
5	1		1	2	3. Product reliability
3		1		4	4. Alternative configurations
2		2	3	3	5. Systems versatility
					Operating Advantages to Users
3	3		5		1. Space savings capability
6	5	1	3		2. Cost reduction
1	1		4	3	3. Reduction in mailing costs
1	2		4	3	4. Low cost master making
2	2		3	2	5. Low cost distribution
1				5	6. Time-sharing capabilities
1			2	3	7. Minimal servicing
					Advantages Related to Vendors
1	1		5	2	1. Systems approach to product development
1	1		2	4	2. Capability of sales staff
1	1			3	3. Staff concept of systems' dominant features
2	1	1	3	2	4. National-international sales and services
1		1	7		5. Company policy responsive to user needs

TABLE IV.8 (continued)

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Advantages
	SA	A	SA	A	
					Advantages Related to Vendors (continued)
1	1		1	1	6. Company into retrieval systems solely
1			3	1	7. Company has only product on the market
					Operational Advantages of Systems
			4	2	1. High volume output
2	2		3	2	2. Image quality
3	3		4	1	3. Ease of operation
1	1		5		4. Quality of master duplication
1		1	2	4	5. Screen imagery
1	1		3	2	6. Blowback capability
1	1		3	4	7. Operates in room light
1	1		2	1	8. Reduction capability - greater document density
1	1		1	1	9. Line application processes
1	1		3	3	10. COM system applications
1	1		3	3	11. Equipment durability
1			3	1	12. Retrieval system compatibility
1		1	2	2	13. Film duplicating techniques
1		1	1	3	14. Lamp life
1				2	15. Data base options

*SA - Strongly Agree; A - Agree.

Table IV.9 shows the congruence of disadvantages identified by the vendors. Overall, the vendors did not agree that the items were disadvantages.

The congruence of factors identified by vendors considered to be advantages of micrographics systems to users is shown in Table IV.10. The degree of consistency is particularly apparent in the operational advantages.

The factors considered to be disadvantages of micrographics systems to users in the interviews were not matched with consistency on the checklists as is shown in Table IV.11. Fewer items were identified during the interviews, there being none identified as disadvantages related to systems and disadvantages related to vendors. However, the lack of consistency in matching items earlier identified is most evident in the operational disadvantages of systems. One reason could be that, though the items were written verbatim in the interviews, the vendors had some difficulty in identifying the same items in the four categories. Further, the span of seven months from the time of the interviews would have some bearing.

VI. New and Improved Product Lines

At the time of the interviews, in response to user needs, the vendors had on the drawing board two new products primarily. One product was a small, desk-top, low-cost microfiche reader. The other product was the development of an instant imaging capability to conform to existing product lines for processing.

TABLE IV.9

CONGRUENCE OF MARKETING DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY VENDORS

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Disadvantages
	SA	A	SA	A	
					Disadvantages Related to Systems
					None
					Operating Disadvantages to Users
1	1		1	2	1. High cost of equipment
1			1		2. Cost and vulnerability of product line
1			1	1	3. Service costs
1		1	1	2	4. Equipment downtime from mishandling
					Disadvantages Related to Vendors
1	1			4	1. Inability to tool up for user needs
2	1	2	1	5	2. Educating the market to different ways
1	1			1	3. No synergistic approach by vendors
1		1		2	4. Inability to service rural areas
1		1		2	5. Establishing identity in a competitive market
1	1			3	6. Irresponsible marketing by some vendors
1				3	7. New technology; shallow market penetration
1		1	2	1	8. Cost of product development
1		1		2	9. Federal standards that inhibit

TABLE IV.9 (continued)

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Disadvantages
	SA	A	SA	A	
					Operational Disadvantages of Systems
1				1	1. Cumbersomeness
1			2	4	2. System too simple to operate resulting in user mishandling
1					3. Lack of training and re-training
	1			2	4. No updating capabilities
1		1		2	5. Lack of multiple reductions
1	1			1	6. Screen height and slant
1				4	7. Lack of portability
1				1	8. Film loading and rewinding

TABLE IV.10

CONGRUENCE OF FACTORS IDENTIFIED BY VENDORS CONSIDERED TO BE ADVANTAGES OF MICROGRAPHICS SYSTEMS TO USERS

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Advantages
	SA	A	SA	A	
					Advantages Related to Systems
4	2	1	2	2	1. Product reliability
2		2	1	2	2. Alternative configurations
2	1		2	5	3. Compatibility with other systems
2	1		4	1	4. Dependable service
					Operating Advantages to Users
4	3		2	2	1. Cost reduction
2	3		2	2	2. Space utilization
2		1	4	3	3. Reduction in labor costs
1	1		3	4	4. Reduced mailing costs
2		2	1	4	5. Minimal maintenance
3	2		6		6. Faster information retrieval
					Advantages Related to Vendors
1			4	1	1. Name status of the vendor

TABLE IV.10 (continued)

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Advantages
	SA	A	SA	A	
					Operational Advantages of Systems
1	1		6	1	1. Ease of operation
1	1		2	4	2. Wide range of image and copy sizes
1	1		4	2	3. All standard reductions
1	1		1	4	4. Reduction capability - greater document density
1	1		1	4	5. Line application processes
1	1		3	2	6. COM system application
1		1	1	3	7. Lamp life
1	1		3	3	8. All operations in room light

TABLE IV.11

CONGRUENCE OF FACTORS IDENTIFIED BY VENDORS CONSIDERED TO BE DISADVANTAGES OF MICROGRAPHICS SYSTEMS TO USERS

Frequency of Mention					
	Followup Checklists				
	Same Selection		Other Selection		
In Interviews	SA	A	SA	A	Disadvantages
					Disadvantages Related to Systems
					None
					Operating Disadvantages to Users
3		1	2		1. High equipment costs
1				1	2. Inability to reduce costs
					Disadvantages Related to Vendors
					None
					Operational Disadvantages of Systems
1				2	1. System too simple to operate resulting in user mishandling
1				1	2. Cumbersome
1			1	2	3. No instant imaging
1				3	4. Forced retraining
2		1		2	5. Film loading and rewinding
3	1	2			6. Inability to conform to all standard microforms
1			1	3	7. Sluggish copying-processing procedure

One vendor spoke of his company having a highly automated microfiche duplicator under development. Another vendor stated that his company was developing a high speed fiche and cartridge storage and retrieval system. Two vendors indicated that their companies were refining existing product lines. One vendor declined to respond to this question on the basis of confidentiality explaining that the company is a distributor for over 40 companies in the micrographics industry doing business under their own name.

The design, development, field testing, and production of a product normally takes three to five years, depending on the product. The life span of the product on the market is normally five years, six at the most.

The vendors explained that most companies do not put their research dollars into innovations; they cannot afford to. This is the reason that smaller companies are being taken over by the larger ones. A small company or an individual can develop and market a product that fits the system of a larger company. The larger company then buys them out thus perpetuating the dominance of the micrographics industry by the larger companies.

Competition among manufacturers marketing similar products ultimately reaches a no cost return point. During the interviews, several of the executives talked about the highly competitive market and the need for a synergistic approach among vendors. They stated that it becomes pointless to continue marketing certain products after a time. A change in the product line is made as a matter of survival in the marketplace, or a refinement is made in an existing product line.

Vendors are highly knowledgeable about their competitors' products and highly speculative about a product which one of their competitors may be introducing to the market. They are somewhat dubious but politely inquisitive as to ways in which their product lines may make a further penetration in the education market. The vendors indicated a willingness to assist in the staff development of teachers through seminars, conferences, and short training periods, but they are looking to educators to identify how such services can best be utilized.

CHAPTER V

USERS OF MICROGRAPHICS SYSTEMS IN RECORDS MANAGEMENT

The purposes of this chapter are to (1) describe the users of micrographics systems according to a recent survey; (2) discuss the application of micrographics in records management as to selected users, components, advantages, disadvantages, and problems; (3) relate the contributions of the micrographics system to management; and (4) describe the future market for micrographics in records management.

In 1976, a national survey was completed by Modern Office Procedures (1976, pp. 22-32) to determine micrographics usage and spending among known users on the circulation list. An extensive questionnaire was mailed to a random sample of 1,000 subscribers to which there was a response of over 49 percent.

The survey and the present study were in progress concurrently, unknown to the investigators. The content of the questionnaire and the content of the checklists used in the present study to gather data are so similar as to be worthy of comment. For example, the questionnaire asked users to rate items claimed by them to be benefits of microfilm. The use of the term benefits is synonymous with advantages in the checklists.

The studies are different in that the present study included selected vendors of micrographics systems as well as users. The sample in the present study was considerably smaller than in the questionnaire, but a 100 percent return was obtained on the checklists.

Some of the results of the two studies are similar. Those that have a particular importance for the present study will be noted.

I. Users

During the interviews with vendors, they were asked to identify the users of micrographics systems. As listed in Chapter I, the categories were: diversified-financial, banking, government, manufacturing, hospitals, retailing, insurance, transportation, utility, and education, with government being the prime user.

The executives in records management in the ten companies selected to participate in the interviews are similar in training and experience. A similarity in the number of years in records management was also noted.

Three of the executives hold Bachelors degrees: one in political science, one in government, and one in production management. One executive holds the required certification of a registered medical records librarian. One executive attended college for two years with a major in secondary education. Another executive attended college for two years with a major in business administration. At the time of the interview, one executive was attending college at night with a major in accounting. Three of the executives have extensive experience in diverse positions with their respective companies.

At the time of the present study, one of the executives had been in records management ten or more years. Five executives had been in records management seven to nine years. Three other executives had been in records management four to six years, and one executive indicated

having been in records management one to three years.

The ten executives were reasonably stable in the length of time they had been in the company with which they were working at the time of the present study. Four executives had been in the company ten or more years. Five executives had been in the company seven to nine years. None of the executives indicated the span of four to six years. One executive had been with the company one to three years.

Most of the ten executives have experience in fields other than records management. Two executives have experience in engineering. Two executives have experience in data processing. Two other executives have experience in sales. One executive each indicated experience in management, accounting, manufacturing, government, and transportation. Other fields also indicated were credit, tax examining, personnel, and electromechanical maintenance.

Five of the executives hold membership in the National Micrographics Association (NMA). Two executives hold membership in the Administrative Management Society (AMS). Other membership listed were the American Medical Records Association, the American Institute of Electrical Engineers (AIEE), and COMtec, an association of computer technologists.

II. Components

The micrographics systems utilized usually consisted of a camera, processor, microforms, and retrieval capability. A company may do the camera work in house or contract it out. The same applies for COM recording. As is seen in Table V.1, five users do their own

TABLE V.1

MICROGRAPHICS SYSTEMS UTILIZED BY SELECTED USERS IN RECORDS MANAGEMENT

Components	Users									
	301	302	303	304	305	306	307	308	309	310
Microphotography Equipment										
Cameras		x	x		x	x		x		
Lenses								x		
Enlarger-Printers				x				x		
Processors	x		x		x			x	x	x
Contact Printer-Duplicators			x		x			x		
Screens										
Viewing Equipment										
Projectors										
Reels										
Cartridges										
Cassettes										
Microforms										
Film			x		x	x		x	x	x
Microfiche Master System	x		x	x	x		x	x		x
Aperture Cards								x		
Jackets	x	x	x							
Storage Equipment										
Storage Devices, NEC		x	x		x	x		x		x
Cabinets								x	x	
Bins		x								
Retrieval Systems	x	x	x	x	x	x	x	x	x	x
Reading Equipment										
Readers	x	x		x	x		x	x	x	x
Readers-Printers		x			x	x	x	x		x
Reader Turntables/Stands/Carts										
COM Equipment										
COM Recorders	x		x	x	x		x	x	x	x
COM Printers										

NOTE: NEC - Not Elsewhere Classified.

camera work. Others contract it. Eight of the ten users have their own COM equipment. Two of the users were kind enough to identify a company that does a large portion of the contract work for firms in Atlanta, but the interview schedule did not permit a visit to see the operation.

The micrographics systems utilized by users selected to participate in the study are shown in Table V.1. As pointed out in the study several times, retrieval of information at the time of need is the hallmark of an effective systems of records management. Each of the ten users has a retrieval system, some more sophisticated than others, as described in the case reports.

Microphotography equipment. Five users have cameras and six have processors. Three users have contact printer-duplicators. Two users have enlarger-printers. One user has a lens capability unique in the micrographics industry and which is required for the detailed work. None of the users has screens.

Viewing equipment No components were identified as viewing equipment by the users. The word None was entered under that section of the guide.

Storage equipment. Six users have storage devices, NEC, not elsewhere classified: three users have automated motorized systems, two users have open shelving, and one user has boxes on open shelves. Two users have cabinets, and one user has bins.

Retrieval systems. Each of the ten users has a retrieval system ranging in sophistication from a reader or reader-printer to COM, CRT, or a telecommunications network. Eight of the users have COM.

Eight users have CRT, though it was not an item in the classification of components.

Reading equipment. Eight users have readers and six users have reader-printers. None of the users has reader turntables/stand/carts.

COM equipment. Eight of the users have a COM system, though they did not indicate COM Printers as a separate item. Of the two users not utilizing a COM system at the time of the present study, the executive stated there is a definite need but that difficulty has been encountered in justifying the cost to the administration. Note is made also that one of the companies visited in Knoxville, Tennessee, to validate the interview guide, not utilizing COM, is using one of the first micrographics systems on the market. Moreover, despite the use of a computerized data base and the availability of the ERIC system, an abundance of time was spent by a small staff in a manual operation to hand-cut, code, cross reference, photograph, and store information relative to the industry at the time of the present study.

Advantages of Systems Identified by Users

During the interviews, the executives were asked to identify the advantages and disadvantages of micrographics systems they use in records management. The executives were also asked to identify the advantages and disadvantages claimed by a vendor prior to installation of the system. The advantages and disadvantages were grouped under four classifications and formed the data base for the checklist sent later to the users. Table V.2 shows the advantages of micrographics systems identified by users.

TABLE V.2

ADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

Advantages	Users									
	301	302	303	304	305	306	307	308	309	310
Advantages Related to Systems										
1. Cost effectiveness	x		x							
2. Speed of information turnaround	x			x	x					
3. Storage capabilities	x									
4. File integrity			x		x	x				
5. Retrievability										x
6. Better service					x					
7. Timelessness - stored data can be ten or two billion										x
8. Data terminal				x					x	
Operating Advantages to Users										
1. Space reduction		x	x		x					
2. Accessibility of information		x	x	x					x	
3. Reduction in personnel			x							
4. No paper shuffling							x		x	
5. Information received at time of need				x						
6. Ease of operation					x	x	x	x		
7. Better personnel utilization								x	x	
8. Effective planning and production tool									x	x
Advantages Related to Vendors										
None										
Operational Advantages of Systems										
None										

Advantages related to systems. Three users considered speed of information turnaround to be an advantage. Three users identified file integrity. The identification of these two advantages is consistent with the Modern Office Procedures survey which indicated that two thirds of the respondents are receiving better management data and receiving it faster. Two users identified their data terminal as an advantage. Two users identified cost effectiveness, another similarity with the Modern Office Procedures survey, though not to the degree. The other advantages related to systems--storage capabilities, retrievability, and better services--were each identified one time. Timelessness of stored data was removed from the list because of the similarity to storage capabilities.

Operating advantages to users. Four users identified accessibility of data as an operating advantage to users. Four users identified ease of operation. Respondents to the questionnaire in the Modern Office Procedures survey rated the same two advantages as prime benefits. Three users considered space reduction as an advantage as did respondents in the Modern Office Procedures survey. Two users identified no paper shuffling. Two other users identified better personnel utilization. Two users identified the system to be an effective planning and production tool, and one user identified reduction in personnel.

Advantages related to vendors. None of the users identified items as operating advantages to users. The word None was written under this section.

Operational advantages of systems. None of the users identified items as operational advantages of systems. The word None was written under this section.

Disadvantages Identified by Users

The users did not identify very many disadvantages of micrographics systems. Two executives did not respond to this question for reasons cited in the case reports. The disadvantages that were identified are shown in Table V.3.

Disadvantages related to systems. The disadvantages related to systems--historical data incorrectly recorded in COM system cannot be retrieved, intervening steps to get to data, records security, and computer downtime--were each identified one time.

Operating disadvantages to users. The operating disadvantages to users--user acceptance, cost of equipment, incompatibility of reduction standards, updating capability, and PSC standards that inhibit--were each identified one time.

Disadvantages related to vendors. The disadvantages related to vendors--servicing must be done by the vendor, tied to film produced by vendor, and market dictates user needs--were each identified one time.

Operational disadvantages of systems. Two users identified as an operational disadvantage of systems that the camera is a little sluggish, particularly in hand operation. The other operational disadvantages--quality control of film, rear imagery viewing, difficulty of changing bulb in the reader, limited printback, limited blowback, dual file requirements to back up and finish a job, lamp life, and time loss in hand operated splicing--were each identified one time.

TABLE V.3

DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

Disadvantages	Users									
	301	302*	303	304*	305	306	307	308	309	310
Disadvantages Related to Systems										
1. Historical data incorrectly recorded in COM system cannot be retrieved	x									
2. Intervening steps to get data									x	
3. Records security				x						
4. Computer downtime										x
Operating Disadvantages to Users										
1. User acceptance	x									
2. Cost of equipment				x						
3. Incompatibility of reduction standards								x		
4. Updating capability										x
5. PSC standards that inhibit										x
Disadvantages Related to Vendors										
1. Servicing must be done by vendor				x						
2. Tied to film produced by vendor						x				
3. Market dictates user needs								x		

TABLE V.3 (continued)

Disadvantages	Users									
	301	302*	303	304*	305	306	307	308	309	310
Operational Disadvantages of Systems										
1. Quality control of film	x									
2. Camera is a little sluggish, particularly in hand operation		x							x	
3. Rear imagery viewing							x			
4. Difficulty of changing bulb in reader							x			
5. Limited printback								x		
6. Limited blowback								x		
7. Dual file requirements to back up and finish a job								x		
8. Lamp life										x
9. Time loss in hand operated splicing										x

*NR - No Response; reasons cited in Case Reports.

Advantages Claimed by Vendors

Four of the executives could not respond to this question for reasons cited in the Case Reports. Primarily, they were not with the company at the time the system was installed, or they were instrumental in designing the system. The latter is reflected in the Modern Office Procedures survey in that 78.9 percent of the users indicated that they purchased equipment from several sources rather from a single source. Table V.4 shows the user identified advantages of micrographics systems claimed by vendors.

Advantages related to systems. Two users identified retrievability as an advantage related to systems. The other advantages related to systems--file integrity and stand-alone equipment in the system--were each identified one time.

Operating advantages to users. Two users identified cost reduction as an operating advantage to users. Two users identified space savings. The other operating advantage to users--low cost factors of on-site camera--was identified one time.

Advantages related to vendors. One user identified servicing by the vendor as an advantage related to vendors. No other advantages related to vendors were identified.

Operational advantages of systems. Two users identified ease of operation as an operational advantage of systems. The other operational advantages of systems--storage life of film and fiche, film updating capability, time spent in splicing, no sensitivity to electrostatic impulses, and no environmental restrictions--were each identified one time.

TABLE V.4

USER IDENTIFIED ADVANTAGES OF MICROGRAPHICS SYSTEMS CLAIMED BY VENDORS

Advantages	Users									
	301	302	303*	304*	305	306*	307	308*	309	310
Advantages Related to Systems										
1. File integrity								x		
2. Stand alone equipment in the system										x
3. Retrievability	x					x				
Operating Advantages to Users										
1. Economies of operation (cost reduction)	x							x		
2. Space savings	x		x							
3. Low cost factors of on-site camera		x								
Advantages Related to Vendors										
1. Servicing by vendor		x								

TABLE V.4 (continued)

Advantages	Users									
	301	302	303*	304*	305	306*	307	308*	309	310
Operational Advantages of Systems										
1. Ease of operation						x		x		
2. Storage life of film and fiche	x									
3. Film updating capability										x
4. Time spent in splicing										x
5. No sensitivity to electrostatic impulses										x
6. No environmental restrictions										x

*NR - No Response; reasons cited in Case Reports.

Disadvantages Claimed by Vendors

Four of the users did not respond to this question for reasons cited in the Case Reports. The disadvantages claimed by vendors that were identified are shown in Table V.5.

Disadvantages related to systems. One user identified no replacement equipment during downtime as a disadvantage related to systems, and one user identified that the size of the system will not work.

Operating disadvantages to users. One user identified more expensive equipment compared to other vendors' systems as an operating disadvantage to users. No other operating disadvantages to users were identified.

Disadvantage related to vendors. One user indicated the vendor was not system oriented. Another user indicated the vendor was unable to explain the total system.

Operational disadvantages of systems. Two users identified the quality control of film as an operational disadvantage of systems. The other operational disadvantages--will not perform all operations, difficulty in changing film, decentralized COM filing, and short lamp life - 200-400 hours--were each identified one time.

III. Problems Identified by Users

Three of the users could not respond to this question for reasons cited in the Case Reports. The responses of the other seven users were grouped under classifications similar to the identified advantages and disadvantages. Table V.6 shows the problems with micrographics systems identified by users.

TABLE V.5

USER IDENTIFIED DISADVANTAGES OF MICROGRAPHICS SYSTEMS CLAIMED BY VENDORS

Disadvantages	Users									
	301	302	303	304*	305	306*	307*	308	309*	310
Disadvantages Related to Systems										
1. No replacement equipment during downtime		x								
2. Size of system will not work			x							
Operating Disadvantages to Users										
1. More expensive equipment compared to other vendors' systems								x		
Disadvantages Related to Vendors										
1. Vendor not system oriented					x					
2. Vendor unable to explain total system					x					
Operational Disadvantages of Systems										
1. Will not perform all operations								x		
2. Difficulty in changing film										x
3. Decentralized COM filing										x
4. Short lamp life; 200-400 hours										x
5. Quality control of film	x									x

*NR - No Response; reasons cited in Case Reports.

TABLE V.6

FACTORS IDENTIFIED BY USERS CONSIDERED TO BE
PROBLEMS WITH MICROGRAPHICS SYSTEMS

Problems	Users									
	301*	302	303*	304	305	306	307*	308	309	310
Problems Related to Systems										
1. The difficulty in a jacket system of bringing information together from several sources and keeping it together		x								
2. Slow processing						x				
Operating Problems to Users										
1. Training and re-training necessitated by personnel turnover					x					
2. No assigned responsibility for training and re-training greatly reduces systems' operating effectiveness					x					
3. Limitations imposed by standards										
Problems Related to Vendors										
None										

TABLE V.6 (continued)

Problems	Users									
	301*	302	303*	304	305	306	307*	308	309	310
Operational Problems of Systems										
1. Maintaining confidentiality of patient records										
2. Keeping the system operative				x						
3. Scheduling operations with an offline computer				x						
4. Problems related to the operation of any new system in its infancy										x
5. Limited equipment								x		
6. The end of the film cartridge comes loose at times									x	

*NR - No Response; reasons cited in Case Reports.

Problems Related to Systems

One user identified the difficulty in a jacket system of bringing information together from several sources and keeping it together. One other user identified slow processing as a problem related to systems.

Operating Problems to Users

One user identified the training and retraining necessitated by personnel turnover as an operating problem to users. One user identified as a problem that no assigned responsibility for training and re-training greatly reduces the systems' effectiveness. None of the users identified the limitations imposed by standards as an operating problem.

Problems Related to Vendors

None of the users identified problems related to vendors. The word None was written in this section of the interview guide.

Operational Problems of Systems

The operational problems of systems--maintaining confidentiality of patient records, keeping the system operative, scheduling operations with an off-line computer, problems related to the operation of any new system in its infancy, limited equipment, and the end of the film cartridge coming loose at times--were each identified one time.

IV. Contributions to Management

The contributions identified by the users most closely parallel the part of the Modern Office Procedures survey related to how the users

rate the benefits of microfilm. Space reduction, more effective management planning, speed of information turnaround, retrievability, and file integrity were the items most frequently mentioned by users as contributions of micrographics systems to management. Security and better utilization of personnel were also mentioned.

V. Congruence of Advantages and Disadvantages

The checklists were analyzed to determine the consistency with which respondents could match items identified five months previously during the interviews, and to what degree they considered them to be advantages and disadvantages of micrographics systems in records management.

The users had a consistency of 97.14 percent in marking the checklist to reinforce the items they identified as advantages of micrographics systems. Their consistency in marking the checklist to reinforce the items they identified as disadvantages was 68.16 percent.

The users had a consistency of 88.23 percent in marking the checklist to reinforce the items they identified as advantages claimed by vendors. Their consistency in marking the checklist to reinforce the items they identified as disadvantages claimed by vendors was 80 percent.

The congruence of advantages of micrographics systems identified by users is shown in Table V.7. The consistency is reasonably evident, but note should be taken that other users had strong opinions as to whether the items were advantages. None of the users identified

TABLE V.7

CONGRUENCE OF ADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Advantages
	SA	A	SA	A	
					Advantages Related to Systems
2	2		6	1	1. Cost effectiveness
3	2	1	3	3	2. Speed of information turnaround
1	1	1	8	1	3. Storage capabilities
3	2	1	5	1	4. File integrity
1		2	5	3	5. Retrievability
1	1		3	3	6. Better service
1			3	5	7. Timelessness of stored data
2		1	2	4	8. Data terminal
					Operating Advantages to Users
3	3		5	1	1. Space reduction
4	1	2	7		2. Accessibility of information
1	1		3	4	3. Reduction in personnel
2	1		4	3	4. No paper shuffling
1		1	3	4	5. Information received at time of need
4	1		6	2	6. Ease of operation
2	2	1	4	1	7. Better personnel utilization
2	1		4	2	8. Effective planning and production tool

advantages related to vendors. None of the users identified the operational advantages of systems.

Table V.8 shows the congruence of disadvantages of the systems by users. Other users indicated a stronger agreement or agreement with items identified by users as disadvantages related to systems, operating disadvantages to users, and disadvantages related to vendors. However, a consistency among all users is more evident in the identification of operational disadvantages of systems. The users had little difficulty in matching the disadvantages they identified during the interviews.

The congruence of advantages claimed by vendors as identified by users is shown in Table V.9. The users were quite consistent in reinforcing the advantages related to systems and the operating advantages to users claimed by vendors. The users were less consistent in matching the operational advantages of systems, and they indicated less strong agreement or agreement as to the items being operational advantages of systems than did other users.

Table V.10 shows the congruence of disadvantages claimed by vendors as identified by users. The users had good consistency in marking the checklist to reinforce the disadvantages claimed by vendors as identified by users.

A purpose of the present study was to determine the relationship of vendors' claims to users' experience in the application of micrographics systems. The Modern Office Procedures survey made a similar check on the validity of vendors' claims. Treatment of this part of the data was identical.

TABLE V.8

CONGRUENCE OF DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

Frequency of Mention					
	Followup Checklists				
	Same Selection		Other Selection		
In Interviews	SA	A	SA	A	Disadvantages
					Disadvantages Related to Systems
1			1	3	1. Historical data incorrectly recorded in COM system cannot be retrieved
1			1	3	2. Intervening steps to get data
1				3	3. Records security
1			3	1	4. Computer downtime
					Operating Disadvantages to Users
1			4	3	1. User acceptance
1		1	1	4	2. Cost of equipment
1			1	3	3. Incompatability of reduction standards
1	1	1	1	5	4. Undating capability
1			1	2	5. PSC standards that inhibit
					Disadvantages Related to Vendors
1			3	2	1. Servicing must be done by vendor
1		1		3	2. Having to use film produced by vendor
1	1		1	1	3. Market dictates user needs

TABLE V.8 (continued)

Frequency of Mention					
	Followup Checklists				
In Interviews	Same Selection		Other Selection		Disadvantages
	SA	A	SA	A	
					Operational Disadvantages of Systems
1			1	6	1. Quality control of film
2			1	1	2. Camera is a little sluggish, particularly in a hand operation
1	1			2	3. Rear image viewing
1	1			4	4. Difficulty of changing bulb in reader
1	1		2		5. Limited printback
1	1		1	1	6. Limited blowback
1		1	1	1	7. Dual file requirements to back up and finish a job
1		1	2	4	8. Lamp life
1	1		2	3	9. Time loss in hand operated splicing

TABLE V.9

CONGRUENCE OF ADVANTAGES OF MICROGRAPHICS SYSTEMS CLAIMED BY VENDORS AS IDENTIFIED BY USERS

Frequency of Mention				
	Followup Checklists			
In Interviews	Same Selection		Other Selection	
	SA	A	SA	A
				Advantages Related to Systems
1	1		4	3
1	1		3	2
2	1		4	2
				Operating Advantages to Users
2	2		4	2
2	2		5	1
1			2	3
				Advantages Related to Vendors
1			4	1
				Operational Advantages of Systems
2	2		2	5
1	1		3	3
1			3	4
1			1	2
1			1	2
1			2	1

1. File integrity
2. Stand alone equipment in the system
3. Retrievability

1. Economies of operation (cost reduction)
2. Space savings
3. Low cost factors of on-site camera

1. Servicing by vendor

1. Ease of operation
2. Storage life of film and fiche
3. Film updating capability
4. Time spent in splicing
5. No sensitivity to electrostatic impulses
6. No environmental restrictions

TABLE V.10

CONGRUENCE OF DISADVANTAGES OF MICROGRAPHICS SYSTEMS CLAIMED BY VENDORS AS IDENTIFIED BY USERS

Frequency of Mention					
	Followup Checklists				
	Same Selection		Other Selection		
In Interviews	SA	A	SA	A	Disadvantages
					Disadvantages Related to Systems
1	1		2	1	1. No replacement equipment during downtime
1			1	1	2. Size of system will not work
					Operating Disadvantages to Users
1		1	1	2	1. More expensive equipment compared to other vendors' systems
					Disadvantages Related to Vendors
1	1		1	1	1. Vendor not systems oriented
1	1		1	1	2. Vendor unable to explain total system
					Operational Disadvantages of Systems
1	1			2	1. Will not perform all operations
1		1	1	3	2. Difficulty in changing film
1				2	3. Decentralized COM filing
1		1	1	3	4. Short lamp life; 200-400 hours
2				4	5. Quality control of film

The relationship of vendors' claims to users' experience in the application of micrographics systems was determined. The items identified by the vendors considered to be advantages to users were juxtaposed to the advantages identified by users as claimed by vendors. The advantages having the greatest SA (Strongly Agree) and A (Agree) count were extrapolated. The count was added for those items and the consistency of vendors' claims to users' experience was indicated as a percent. The same procedure was followed with the disadvantages that were identified.

Five items were considered by vendors to be advantages to users and identified by users as being advantages claimed by vendors. The items and the degree of consistency of vendors' claims to users' experience are the following:

	Percent
Product reliability - File integrity	87.0
Cost reduction - Economies of operation	87.0
Space utilization - Space savings	77.0
Ease of operation	88.0
All operations in room light - No environmental restrictions	42.0

Two items were considered by vendors to be disadvantages to users and identified by users as being disadvantages claimed by vendors. The items and the degree of consistency of vendors' claims to users' experience are the following:

	Percent
High equipment costs - More expensive equipment compared to other vendors' systems	75.0
Film loading and rewinding - Difficulty in changing film	60.0

VI. New and Improved Product Lines

The users are looking for faster processing and duplicating systems with the capability to return to original paper optional. Three users mentioned having seen a record-keeping system which has come into being through merger of a well-known company plus one of the vendors participating in this study.

Three users spoke of the need for a good library reader and a better reader-printer. One stated the need for a jacket carrier and loader. The latter is available but will not conform to the user's available system.

Seven of the users stated that the vendors need to get together on standardizing replaceable parts. One of the vendors also spoke about the lack of a synergistic approach.

VII. The Future Market for Micrographics in Records Management

The year 1985 is the target year for the forecasters and the vendors. Market forecasts predict micrographics sales in the billions

and vendors have systems in design and in varying stages of development, all of which support the unlimited growth possibilities for the micrographics industry. Moreover, although business and government are the prime users now, the developments in telecommunications, in three dimensional microphotography, and in micropublishing will have an effect on the everyday lives of people.

The network system of telecommunications already affects that part of everyday living having to do with banking, credit, travel, buying, eating, law and traffic control, medical needs, and communicating. Telephone companies across the country are computerizing the Directory Assistance service; expensive-to-print directories are being converted to microfiche through COMpugraphics. Hard copy is transmitted by facsimile and returned to original paper wherein necessary. Laboratories have in design systems which ultimately will permit transaction of those things necessary to everyday living from the home, the office, the automobile, or wherever one happens to be.

Three dimensional photography is already in use in medicine, dentistry, tool and die precision instruments, and automobile manufacturing. The vendors manufacturing lenses now have a system which permits photographing three angles simultaneously of a tumor, a fracture, a tooth, an eye, telemetry instruments, and automobile and machine parts.

The field of micropublishing is wide open according to market forecasts and the vendors. Whole libraries may be converted to microfiche and, through telecommunications satellite, readers may get information wherever they are at the time of need. Copyright does not appear to be a problem and, in fact, has already been bypassed in many

instances. Though many people like to hold something in hand--a book or a sheet of paper--the economies of scale in the publishing field portend the possibility of best sellers, newspapers, textbooks, public documents and records, and other items in hardcopy form being converted to microform. If nothing else, printing and mailing costs may make the difference.

The market for micrographics in records management is expected to increase 24 percent annually to $3.1 billion in 1985 (or 48 percent of all micrographics revenues in 1985), compared with the historical annual growth of almost 50 percent according to a recent market survey (Ross, 1975, p. 54). That figure is in line with Barron's (1975, p. 5), since they predict the figure of $3 billion by 1980. Less rapid growth will be due to greater maturation of alphanumeric COM markets after 1980 and the slowdown of computer installations throughout the forecast period. This was Diebold's prediction back in 1964 (1964, p. 84). Nevertheless, micrographics revenues per installed computer system in records management are projected to rise from $1843 in 1973 to $7750 in 1985.

Micrographics equipment expenditures are projected to rise from $96.7 million (39 percent of equipment shipments) in 1973 to $1210 million in 1985 (55 percent of equipment shipments). Records systems will be highly mechanized and about 75 percent of expenditures by 1985 will be for computer recording systems and automated storage and retrieval systems. Much of the remainder will be for satellite reader and reader-printer stations, thus holding conventional microfilm camera purchases to minimum (Ross, 1975, p. 55).

From the market forecasts and the people in the business--vendors and users--the records management segment of the micrographics industry is predicted to become the largest segment by 1985. It would appear that micrographics is "active and vital" (Conners and Amundson, 1975).

CHAPTER VI

SUMMARY

I. Problem and Procedures

The purpose of this study was to determine the application of micrographics in records management in business and government for information storage and retrieval. Secondary purposes of the study were to (1) determine the kinds of information storage and retrieval systems on the market, (2) identify the users of micrographics systems as identified by vendors, (3) determine the relationship of vendors' claims to users' experience in the application of micrographics systems, (4) ascertain how effective users in business and government are finding micrographics systems to be in records management, (5) identify the contributions of micrographics systems to management as perceived by vendors and users, and (6) delineate the implications for business education.

Use of the Interview Guides

Two interview guides were used to collect data from selected vendors of micrographics systems and to collect data from selected users of the systems in business and government. The vendors guide was tried out in a company in Atlanta, Georgia, that is a distributor of micrographics systems. The users guide was tried out in two government agencies in the Knoxville, Tennessee area.

After the two guides were revised, they were used for interviews with top management executives in companies that market micrographics systems and with executives responsible for records management in selected companies and government agencies.

Use of the Checklists

Two checklists were used in the study to determine the consistency of data collected during the interviews with vendors and users.

The items identified as advantages and disadvantages of micrographics systems during the interviews with vendors and the items identified by vendors considered to be advantages and disadvantages of the systems to users were grouped under four categories on four separate sheets. These became the data base for the vendors checklist.

The items identified as advantages and disadvantages of micrographics systems during the interviews with users and the items identified by users as advantages and disadvantages of the systems purported by vendors were grouped under four categories on four separate sheets. These became the data base for the users checklist.

Collection of Data

Ten vendors of micrographics systems in the greater Chicago area selected according to criteria from among twenty vendors in Illinois were included in the study. Nine users of the systems in the greater Atlanta area and one in Jacksonville, Florida, selected according to criteria were included in the study. Each of the vendors and users was visited by the investigator, and the executive interviewed in each

company completed the interview guide as the investigator wrote the responses on a separate guide.

The checklists were mailed to each of the vendors and users with a stamped reply envelope provided for return to the investigator. A phone call was made to those vendors and users not responding by the deadline.

Analysis of the Data

The data collected in the interviews were written as case reports and appear in the Appendices. Ultimately, the data from the interview guides were grouped under four categories and entered on summary sheets. Data from the checklists were tallied on duplicate copies of the vendors and users checklists.

The checklists were analyzed to determine the consistency with which respondents could match items identified several months previously during the interviews. The percent of consistency of vendors in matching the marketing advantages and disadvantages they identified during the interviews, and the items they considered as advantages and disadvantages to users was determined. The percent of consistency of users to match the advantages and disadvantages of systems they had experienced and had identified during the interviews and the advantages and disadvantages identified by users as having been claimed by vendors was determined.

The summary sheets of the interview guides and the tallies on the duplicate checklists were reviewed to determine the relationship of vendors' claims to users' experience in the application of micrographics systems. The items identified by vendors considered to be advantages

to users were placed side by side to the advantages identified by users as purported by vendors. The items having the greatest SA (Strongly Agree) and A (Agree) count were extrapolated. The count was added for each of those items and the consistency of vendors' claims to users' experience was indicated as a percentage. The same procedure was followed with the disadvantages.

Other items contained in the interview guides, e.g., general information about vendors and users, components of the systems, problems with the systems, contributions of the micrographics industry to management, and new and developing product lines were summarized.

II. Major Findings

The major findings of this study are as follows:

1. The kinds of storage for information on the market range from simple manual techniques to discrete computer-based communication networks, including a totally new data storage and processing system--micrographics.

2. The users of micrographics systems identified by vendors are in the categories of government, manufacturing, education, banking, insurance, utility, retailing, diversified-financial, transportation, engineering, and services.

3. The marketing advantages related to systems identified by vendors were product reliability, file integrity, alternative configurations, records security, and systems versatility. The operating advantages to users were cost reduction, space saving capability, low-cost distribution, reduction in mailing costs, low cost master making,

time-sharing capabilities, and minimal servicing. The advantages related to vendors were national-international sales, a systems approach to product development, capability of sales staff, company policy responsive to user need, staff concept of systems' dominant features, company into retrieval systems solely, and company has only product on the market. The operational advantages identified by vendors were high volume output, image quality, ease of operation, quality of master duplication, screen imagery, blow-back capability, operates in room light, reduction capability-greater document density, line application processes, COM system applications, equipment durability, retrieval system compatibility, film duplicating techniques, lamp life, and data base options.

The vendors did not identify very many marketing disadvantages of micrographics systems. None of the vendors identified a disadvantage related to systems and the word None was written under that section.

Identified as operating disadvantages to users were high cost of equipment, cost and vulnerability of product line, service costs, and equipment downtime. The disadvantages related to vendors were educating the market to different ways, inability to tool up for user needs, no synergistic approach by vendors, inability to service rural areas, establishing identity in a competitive market, irresponsible marketing by some vendors, new technology--shallow market penetration, cost of product development, and Federal standards that inhibit. The operational disadvantages of systems were cumbersomeness, simplicity of operation, lack of training and retraining, no updating capabilities,

lack of multiple reductions, screen height and slant, lack of portability, and film loading and rewinding.

4. The advantages of micrographics systems identified by users were speed of information turnaround, file integrity, the data terminal, cost effectiveness, storage capabilities, retrievability, and better services. The operating advantages to users were accessibility of data, ease of operation, space reduction, no paper shuffling, better personnel utilization, effective planning and production tool, and reduction in personnel. None of the users identified advantages related to vendors. None of the users identified operational advantages of the systems.

The disadvantages related to systems identified by users were historical data incorrectly recorded in the COM system cannot be retrieved, intervening steps to get to data, records security, and computer downtime. The operating disadvantages to users were use acceptance, cost of equipment, incompatibility of reduction standards, updating capability, and PSC (Public Service Commission) standards that inhibit. The disadvantages related to vendors were the servicing must be done by the vendor, tied to film produced by the vendor, and the market dictates user needs. The operational disadvantages of systems were the camera is a little sluggish, quality control of film, rear imagery viewing, difficulty of changing bulb in the reader, limited printback, limited blowback, dual file requirements to back up and finish a job, lamp life, and time loss in hand operated splicing.

5. The relationship of vendor claims to user experience was congruent on five items identified as advantages and on two items

identified as disadvantages of micrographics systems.

On the five items considered by vendors to be advantages to users and identified by users as having been claimed by vendors, the items and the degree of consistency of vendor claims to user experience were: product reliability - file integrity, 87.0 percent; cost reduction - economies of operation, 87.0 percent; space utilization - space savings, 77.0 percent; ease of operation, 88.0 percent; and all operations in room light - no environmental restrictions, 42.0 percent.

On the two items considered by vendors to be disadvantages to users and identified by users as having been claimed by vendors, the items and the degree of consistency were: high equipment costs--more expensive equipment compared to other vendors' systems, 75.0 percent; and film loading and rewinding--difficulty in changing film, 60.0 percent.

6. The users were experiencing relatively few problems with micrographics systems. The problems related to systems were the difficulty in a jacket system of bringing information together from several sources and keeping it together and slow processing. The operating problems to users were the training and retraining necessitated by personnel turnover, no assigned responsibility for training and retraining greatly reduces the systems' operating effectiveness, and limitations imposed by standards. None of the users identified problems related to vendors. The operational problems of systems were maintaining confidentiality of patient records, keeping the system operative, scheduling operations with an off-line computer, problems

related to the operation of any new system in its infancy, limited equipment, and the end of the film cartridge comes loose periodically.

7. The contributions of the micrographics industry to management as perceived by vendors and users closely paralleled the part of the Modern Office Procedures survey related to how users rate the benefits of microfilm. The contributions identified were space reduction, more effective management planning, turnaround, retrievability, file integrity, security, and better utilization of personnel.

8. Records management was the largest segment of the micrographics industry at the time of the present study.

9. A micrographics system usually consisted of a camera, a processor, microforms, and retrieval capability. Most vendors marketed a COM system. The potential for CRT and electronic graphic transfer appeared yet to be determined.

III. Implications

The following implications for business education can be drawn from the study.

1. The administrative support center concept presupposes different *emphases* in the training of business teachers and office workers, not totally different training altogether. Emphasis is more toward the systematic flow of information and the synthesizing of office tasks into an efficient information management system to facilitate the planning, controlling, and decision-making functions of management. The use of sophisticated, complex communication systems implies that a different emphasis is needed.

2. Business teacher educators and training directors in business can work cooperatively to define teacher competencies which each can develop in a prescriptive training program for potential business teachers and office workers.

3. The high cost of equipment may ultimately outweigh the cost benefit and prohibit the training of students in school laboratories for entry-level office jobs.

IV. Recommendations from the Study

Based on the findings of this study, the following recommendations are made:

1. Business teachers, teacher educators, and training directors in business should work cooperatively to delineate those competencies required for job performance in a cluster of office jobs from among those generic to all office workers.

2. Staff development procedures should include teacher work days and travel reimbursement during the school year and in off periods for business teachers and teacher educators to participate on site in short training programs, institutes, and seminars in business appropriate to their teaching assignments and advanced technologies.

3. Internships should be available to potential business teachers and office workers on a selected basis. Vendors identify education as a classification among its users, but the two segments of education considered to be the areas of use--student records and library services--do not permit students to learn about total micrographics systems and their application in business for records and information management.

V. Recommendations for Further Study

As a result of this study, other studies are needed to solve the problems identified or not resolved by this study:

1. Further study should be made of the application of micrographics in records management to determine the relationship of vendors' claims to on-line users' experience. Interviews with office workers actually using the equipment would give an investigator a different perspective from which to compare vendors' claims for consistency.

2. Because this study was limited to the records management segment of the micrographics industry, the study should be replicated in the area of micropublishing.

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APPENDICES

APPENDIX A

GLOSSARY

The following terms are used in this study and are defined here for clarification:

1. *Administrative management* is that function within a business organization with responsibility for the overall operations of the firm. Administrative management comprises those functions that support line management: production, marketing, accounting, and finance.

2. *Administrative support services* are the auxiliary services--telephone and mail handling, dictation and transcription, text editing, records management, and reprographics--which facilitate the work of administrative management.

3. *Aperture* is a hole in a card in a microreproduction system which is specifically designed to hold a frame of microfilm.

4. *Automated storage and retrieval systems (ASRA)* are mechanized or computer-based storage and retrieval systems.

5. *Binary digital code* is an optical pattern of clear and opaque rectangles machine encoded for random access retrieval used to index one or more images.

6. *Blip* is an optical document mark, usually rectangular, within the recording area, and usually below the image on a roll of microfilm used for counting images or frames automatically.

7. *Blowback* is an enlargement; a reproduction larger than the original. Some readers and reader-printers have automatic adjusting

blowback while others have hand-operated controls or interchangeable lens.

8. *A computer chip* is an integrated circuitry system incorporated within some computers. An entire integrated circuit may be imprinted on one solid block no larger than 3/4 to 1-1/2 inch.

9. *Computer output microfilm (COM)* is microfilm containing data produced by a recorder from computer generated electrical signals.

10. *CRT* is a cathode ray tube, a vacuum tube, in which a gated electron beam impinges upon a surface, usually phosphor coated, resulting in a display which may be read visually or microfilmed or photographed or recorded in some manner. CRT is usually attached to a keyboard to allow communicating with a computer.

11. *"Daisy" Diablo head* is a text-editing typewriter printing element with multiple fonts which produces characters held in memory.

12. *Diazo* film is a slow print film which produces negative imagery, i.e., white on black, when exposed to light in the ultraviolet spectrum.

13. *Ergonomics* is the study of the office environment in relation to the effects of design, lighting, accoustics, and accoutrements on work productivity.

14. *Facsimile* is the process or the result of the process by which fixed graphic images are scanned, transmitted electronically, and reproduced either locally or remotely.

15. *Fiberoptics* is a technique used in a COM system to transcribe a single line of a page onto microfilm before the film is incremented.

16. *Floppy disc* is a multi-channel computer storage medium which stores information in up to ten channels on one disc.

17. *Front imagery* is obtained by a mirror whose reflecting surface is coated on the front rather than the rear of the glass. Front surfaced mirrors are used in optical systems to preclude the formation of double images.

18. *Integrated circuitry* is a network of switching in telecommunications systems by electronic means.

19. *Instant processing* is the treatment of exposed photographic material to produce latent images similar to the film pack in a polaroid camera.

20. *A jacket* is a transparent plastic carrier with a single or multiple sleeve or pocket made to hold microfilm in flat strips.

21. *Key access imagery* is a separate unit attached to a reader or reader printer as part of a retrieval system which automatically searches microfilm, microfiche, jacket, and aperture for viewing. The keyboard is numeric or alphanumeric depending on the coding on the microforms.

22. *Microfiche* is a sheet of microfilm containing microimages in a grid pattern. It usually contains a title which can be read without magnification.

23. *Microfilm* is a fine-grain, high resolution film containing an image greatly reduced in size from the original.

24. *Microform* is a generic term for any form, either film or paper, which contains microimages. The four basic forms are microfilm, microfiche, aperture, and jacket which conform to most micrographics systems in combination of two or all four.

25. *Micrographics* is the industry which systematizes and reduces any form of information to a microform medium.

26. *Micropublishing* is the issuing of new, not previously published material, in multiple copy or reformatted microform for sale or distribution to the public.

27. *A planetary camera* is a flat-bed type of microfilm camera in which the document being photographed and the film remain in a stationary position during the exposure. The document is on a plane surface at the time of filming.

28. *Rear imagery* is the projection of an image onto a translucent screen from the side opposite to that from which the image is viewed.

29. *Records management* is the application of systematic and scientific control to recorded information which is required in the operation of an organization's business.

30. *A rotary camera* is a type of microfilm camera that photographs documents while they are being moved by some form of transport mechanism. The document transport mechanism is connected to a film transport mechanism, and the film also moves during exposure so there is no relative movement between the film and the image of the document.

31. *A step and repeat camera* is a microfilm camera which can expose a series of separate images on an area of film according to a predetermined format, usually in orderly rows and columns.

32. *Telecommunications* is the process of transmitting and reproducing information electronically.

33. *Text editing* is a direct or remote automatic typewriting system.

34. *Time sharing* is a technique or system for supplying computing services to a number of users at geographically scattered terminals, providing rapid responses to each user so that it appears to each that he alone is using the system.

35. *Ultrafiche* is a microfiche with images reduced more than 90X, usually by laser.

36. *Vesicular* film has light sensitive elements suspended in a plastic layer and which upon exposure creates strains within the layer in the form of a latent image. The strains are released and the latent image made visible, i.e., black on white, by heating the plastic layer. The image becomes permanent when the layer cools.

APPENDIX B

DATA OF ILLINOIS VENDORS

TABLE B-1

ILLINOIS VENDORS BY MATRIX NUMBER
(N = 20)

Micrographics Components	14	16	20	21	24	40	42	47	48	83	87	88	115	131	135	164	183	196	202	203
Microphotography Equipment																				
Cameras		x		x			x													
Lenses																x				
Screens															x					
Enlarger-Printers				x										x						
Processors				x		x	x													
Contact Printer-Duplicators		x																		
Developers		x		x																
Exposure Units--Diazo		x		x		x														
Exposure Units--Vesicular		x		x		x														
Viewing Equipment																				
Projectors		x																x		
Cartridges		x																		
Cartridge Loaders									x											
Cassettes		x																		

TABLE B-1 (continued)

Micrographics Components	14	16	20	21	24	40	42	47	48	83	87	88	115	131	135	164	183	196	202	203
Microforms and Related Equipment																				
Film		x		x												x				
Film Dryers										x										
Editing and Splicing									x											
Splicers and Tape									x											
Aperture Cards				x									x							
Jackets		x										x	x							
Storage Equipment																				
Storage Devices	x	x	x		x					x		x								x
Boxes	x																			
Retrieval Systems	x	x		x	x		x												x	x
Reading Equipment																				
Readers		x		x		x	x					x	x	x		x				
Reader-Printers		x		x		x												x		
Reader Turntables/Stands/Carts		x	x	x								x								
COM Equipment																				
COM Recorders		x																		
COM Printers																				

APPENDIX C

INTERVIEW GUIDES

VENDOR GUIDE

THE APPLICATION OF MICROGRAPHICS IN RECORDS MANAGEMENT

This interview is conducted by Lucy C. Robinson, a Doctoral candidate at The University of Tennessee, Knoxville, who is on leave from the Florida Department of Education, Tallahassee. She is collecting a portion of the data for a study to determine "The Application of Micrographics in Records Management." Initial information which resulted in the selection of your company to participate in this interview was verified by Dr. Robert E. Wiper, President, Search Associates, Inc., a management-education consulting firm in Mount Prospect, Illinois.

It is felt that the results of this study will benefit teachers of records management, administrative management, and related business courses as they work toward the improvement of instruction in these areas. Your participation in this interview will provide valuable information relative to the micrographics industry.

Your time and the courtesies extended to Miss Robinson are very much appreciated.

George A. Wagoner, Professor
Office Administration and
Business Education

Do you wish to receive a copy of the results of this study?

_____ Yes

_____ No

SECTION I--GENERAL INFORMATION

Company _____

Interview Executive _____

Title _____

Professional Training _____

Degree(s) Major Field

Professional Experience in Micrographics Industry
___ 1 - 3 years
___ 4 - 6 years
___ 7 - 9 years
___ 10 or more

Length Of time This Company
___ 1 - 3 years
___ 4 - 6 years
___ 7 - 9 years
___ 10 or more

Other Professional Experience
___ Engineering
___ Industrial Management
___ Management
___ Marketing
___ Accounting
___ Other (Please specify)

___ Manufacturing
___ Government
___ Data Processing
___ Transportation
___ Sales

_____

_____

_____

Professional Memberships
___ AMS
___ NMA
___ DPMA
___ ARMA
___ SPA
___ NAM

Other _____

_____

SECTION II--MICROGRAPHICS SYSTEMS

1. What are the components of the micrographics system(s) manufactured?

___ Microphotography Equipment
___ Microforms and Related Equipment
___ Retrieval Systems
___ Storage Equipment
___ Viewing Equipment
___ Reading Equipment
___ COM Equipment
___ Other (Please Specify)

2. How would you classify the prime users of the system(s)?

___ Diversified-Financial
___ Banking
___ Government
___ Manufacturing
___ Hospitals
___ Retailing
___ Insurance
___ Transportation
___ Utility
___ Education

3. What does the company consider the marketing advantages of the system(s) to be?

a.
b.
c.
d.
e.

4. What does the company consider the marketing disadvantages of the system(s) to be?

a.
b.
c.
d.
e.

5. What do users of the system(s) consider the advantages to be?

a.
b.
c.
d.
e.

6. What do users of the system(s) consider the disadvantages to be?

   a.
   b.
   c.
   d.
   e.

7. What are the recurring problems users are finding with the system(s)?

   a.
   b.
   c.

8. What do you consider the most significant contributions of the micrographics industry to management?

   a.
   b.
   c.
   d.
   e.

9. What are the unmet needs of users of micrographics systems on which manufacturers are working?

   a.
   b.

SECTION III--NEW AND DEVELOPING TECHNOLOGIES

SYSTEM, EQUIPMENT, PRODUCT	DEVELOPMENTAL STAGE				New or Improved Design	Anticipated Target Date	Basic Price Range	MARKETING FEATURES
	Projected	In Design	In Prototype	In Production				

SECTION IV--SUMMARY

1. How is the equipment manufactured by the company serviced?

2. Do you have suggestions for other questions to be asked subsequently?

   a.
   b.
   c.

USER GUIDE

THE APPLICATION OF MICROGRAPHICS IN RECORDS MANAGEMENT

This interview is conducted by Lucy C. Robinson, a Doctoral candidate at The University of Tennessee, Knoxville, who is on leave from the Florida Department of Education, Tallahassee. She is collecting a portion of the data for a study to determine "The Application of Micrographics in Records Management." In earlier interviews, manufacturers of micrographics systems and products identified ten business classifications, including government, as the users of their systems. Your company/agency was among these.

It is believed that the results of this study will benefit teachers of records management, administrative management, secretarial administration, and related business courses as they work toward the improvement of instruction in these areas. Your participation in this interview will provide valuable information about the application of micrographics to records management.

Your time and the courtesies extended to Miss Robinson are very much appreciated.

George A. Wagoner, Professor
Office Administration and
Business Education

Do you wish to receive a copy of the results of this study?

___ Yes

___ No

SECTION I--PROFESSIONAL INFORMATION

Company/Agency _____

Interview Executive _____

Title _____

Professional Training _____

Degree(s) Major Field

Professional Experience in Records Management
___ 1 - 3 years
___ 4 - 6 years
___ 7 - 9 years
___ 10 or more

Length of Time This Company/ Agency
___ 1 - 3 years
___ 4 - 6 years
___ 7 - 9 years
___ 10 or more

Other Professional Experience
___ Engineering
___ Industrial Management
___ Management
___ Marketing
___ Accounting
___ Banking and Finance
___ Other (Please Specify)

___ Manufacturing
___ Government
___ Data Processing
___ Transportation
___ Sales

_____

_____

Professional Memberships
___ AMS
___ NMA
___ DPMA
___ ARMA
___ SPA
___ NAM

Other _____

_____

SECTION II--MICROGRAPHICS SYSTEMS

1. What are the micrographics components which comprise your records management system?

___ Microphotography Equipment
___ Microforms and Related Equipment
___ Retrieval Systems
___ Storage Equipment
___ Viewing Equipment
___ Reading Equipment
___ COM Equipment
___ Other (Please Specify)

2. What departments feed into the records management system?

a.
b.
c.
d.
e.
f.
g.
h.
i.
j.

3. What documents are stored and retrieved by the micrographics system?

a.
b.
c.
d.
e.
f.

4. What do you consider the most significant contributions of the micrographics system to the management of the company/agency?

a.
b.
c.
d.
e.

5. What were the advantages of the micrographics system purported by the vendor?

a.
b.
c.
d.
e.

6. What were the disadvantages of the micrographics system purported by the vendor?

   a.
   b.
   c.
   d.
   e.

7. What has the company/agency found the advantages of the micrographics system to be for storing and retrieving information?

   a.
   b.
   c.
   d.
   e.

8. What has the company/agency found the disadvantages of the micrographics system to be for storing and retrieving information?

   a.
   b.
   c.
   d.
   e.

9. What are the problems you are finding with the micrographics system since its installation?

   a.
   b.
   c.
   d.
   e.

SECTION III--MANAGEMENT ATTITUDES AND SYSTEM CHANGE

1. What is the position of management toward a systems change?

2. What is the position toward changing the management structure of any new support system, e.g., records management?

3. What is the position of management toward centralizing the records management system?

4. What is the position of management toward a satellite system of records management?

5. What is the position of management toward cost justification of any office changes?

SECTION IV--GENERAL INFORMATION

1. What component(s) and/or product(s) have you described to a vendor of micrographics systems and products as needed to make the records management system more effective?

   a.
   b.
   c.
   d.
   e.

2. Is the records management system open ended?

   _____ Yes

   _____ No

3. How is the system serviced?

APPENDIX D

CHECKLISTS

4721 Santala Drive
Knoxville, Tn 37919
July 23, 1976

May I have ten more minutes of your valuable time?

To finish my study, The Application of Micrographics to Records Management, I need your reaction to the various advantages and disadvantages of micrographics systems identified by you and other vendors during the interview. I am requesting that you complete the enclosed checklist and return it to me by Monday, August 2, 1976. A stamped, reply envelope is provided for your convenience.

I very much appreciate the interest and cooperation that you have shown in my work. The study has an added dimension for me because of the opportunity to spend time with you and to visit (Company).

Sincerely,

Lucy C. Robinson

Enclosures: 2

VENDOR CHECKLIST

DIRECTIONS: The checklist contains advantages and disadvantages of micrographics systems identified by you and other vendors during the interview conducted as a part of my study. Please consider ALL items listed then place an X in the appropriate column according to the following code:

SA - Strongly Agree that the item is an advantage or a disadvantage

A - Agree that the item is an advantage or a disadvantage

Leave blank any item about which you have no opinion or you do not see the item as an advantage or disadvantage. You need not sign the checklist.

ADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

SA	A	ADVANTAGES
		Advantages Related to Systems
___	___	1. Cost effectiveness
___	___	2. Speed of information turnaround
___	___	3. Storage capabilities
___	___	4. File integrity
___	___	5. Retrievability
___	___	6. Better service
___	___	7. Timelessness of stored data
___	___	8. Data terminal
		Operating Advantages to Users
___	___	1. Space reduction
___	___	2. Accessibility of information
___	___	3. Reduction in personnel
___	___	4. No paper shuffling
___	___	5. Information received at time of need
___	___	6. Ease of operation
___	___	7. Better personnel utilization
___	___	8. Effective planning and production tool
		Advantages Related to Vendors
		NONE
		Operational Advantages of Systems
		NONE

ID:

DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

SA	A	DISADVANTAGES
		Disadvantages Related to Systems
___	___	1. Historical data incorrectly recorded in COM system cannot be retrieved
___	___	2. Intervening steps to get data
___	___	3. Records security
___	___	4. Computer downtime
		Operating Disadvantages to Users
___	___	1. User acceptance
___	___	2. Cost of equipment
___	___	3. Incompatibility of reduction standards
___	___	4. Updating capability
___	___	5. PSC standards that inhibit
		Disadvantages Related to Vendors
___	___	1. Servicing must be done by vendor
___	___	2. Having to use film produced by vendor
___	___	3. Market dictates user needs
		Operational Disadvantages of Systems
___	___	1. Quality control of film
___	___	2. Camera is a little sluggish, particularly in a hand operation
___	___	3. Rear image viewing
___	___	4. Difficulty of changing bulb in reader
___	___	5. Limited printback
___	___	6. Limited blowback
___	___	7. Dual file requirements to back up and finish a job
___	___	8. Lamp life
___	___	9. Time loss in hand operated splicing

USER IDENTIFIED ADVANTAGES OF MICROGRAPHICS SYSTEMS

PURPORTED BY VENDORS

SA	A	ADVANTAGES
		Advantages Related to Systems
___	___	1. File integrity
___	___	2. Stand alone equipment in the system
___	___	3. Retrievability
		Operating Advantages to Users
___	___	1. Economies of operation (cost reduction)
___	___	2. Space savings
___	___	3. Low cost factors of on-site camera
		Advantages Related to Vendors
___	___	1. Servicing by vendor
		Operational Advantages of Systems
___	___	1. Ease of operation
___	___	2. Storage life of film and fiche
___	___	3. Film updating capability
___	___	4. Time spent in splicing
___	___	5. No sensitivity to electrostatic impulses
___	___	6. No environmental restrictions

ID:

USER IDENTIFIED DISADVANTAGES OF MICROGRAPHICS SYSTEMS

PURPORTED BY VENDORS

SA	A	DISADVANTAGES
		Disadvantages Related to Systems
___	___	1. No replacement equipment during downtime
___	___	2. Size of system will not work
		Operating Disadvantages to Users
___	___	1. More expensive equipment compared to other vendors' systems
		Disadvantages Related to Vendors
___	___	1. Vendor not systems oriented
___	___	2. Vendor unable to explain total system
		Operational Disadvantages of Systems
___	___	1. Will not perform all operations
___	___	2. Difficulty in changing film
___	___	3. Decentralized COM filing
___	___	4. Short lamp life; 200 - 400 hours
___	___	5. Quality control of film

4721 Santala Drive
Knoxville, TN 37919
July 23, 1976

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I very much appreciate the interest and cooperation that you have shown in my work. The study has an added dimension for me because of the opportunity to spend time with you and to visit (Company).

Sincerely,

Lucy C. Robinson

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USER CHECKLIST

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SA - Strongly Agree that the item is an advantage or a disadvantage

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Leave blank any item about which you have no opinion or you do not see the item as an advantage or disadvantage. You need not sign the checklist.

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SA	A	ADVANTAGES
		Advantages Related to Systems
___	___	1. Cost effectiveness
___	___	2. Speed of information turnaround
___	___	3. Storage capabilities
___	___	4. File integrity
___	___	5. Retrievability
___	___	6. Better service
___	___	7. Timelessness of stored data
___	___	8. Data terminal
		Operating Advantages to Users
___	___	1. Space reduction
___	___	2. Accessibility of information
___	___	3. Reduction in personnel
___	___	4. No paper shuffling
___	___	5. Information received at time of need
___	___	6. Ease of operation
___	___	7. Better personnel utilization
___	___	8. Effective planning and production tool
		Advantages Related to Vendors
		NONE
		Operational Advantages of Systems
		NONE

ID:

DISADVANTAGES OF MICROGRAPHICS SYSTEMS IDENTIFIED BY USERS

SA	A	DISADVANTAGES
		Disadvantages Related to Systems
___	___	1. Historical data incorrectly recorded in COM system cannot be retrieved
___	___	2. Intervening steps to get data
___	___	3. Records security
___	___	4. Computer downtime
		Operating Disadvantages to Users
___	___	1. User acceptance
___	___	2. Cost of equipment
___	___	3. Incompatibility of reduction standards
___	___	4. Updating capability
___	___	5. PSC standards that inhibit
		Disadvantages Related to Vendors
___	___	1. Servicing must be done by vendor
___	___	2. Having to use film produced by vendor
___	___	3. Market dictates user needs
		Operational Disadvantages of Systems
___	___	1. Quality control of film
___	___	2. Camera is a little sluggish, particularly in a hand operation
___	___	3. Rear image viewing
___	___	4. Difficulty of changing bulb in reader
___	___	5. Limited printback
___	___	6. Limited blowback
___	___	7. Dual file requirements to back up and finish a job
___	___	8. Lamp life
___	___	9. Time loss in hand operated splicing

APPENDIX E

VENDOR CASE REPORTS

COMPANY A CASE REPORT

Company A is organized by divisions according to the products it manufactures and its user markets. The company's products enter the national and international markets through direct sales and distributorships, and are serviced under contract by approximately 90,000 of the company's trained staff.

Like other large companies in the industry, Company A has acquired smaller firms which had products that were compatible with its systems, or it contracts with a firm to purchase an item already in production that configures to an existing system. The executive responding to questions in the interview commented several times on the importance of vendors having open-ended systems so that users would not be locked in as the need arises to change their records systems.

Components

Company A manufactures microphotography equipment which includes camera-processors, lenses, printer-duplicators, and enlargers. The cameras are planetary and rotary and conform to any of the four standard microforms--microfilm, microfiche, jacket, aperture. The lenses are 18X to 50X.

The company manufactures several models of readers and reader-printers which conform to some microform. Some read only aperture, some read microfiche alone, and other models are designed to read ultrafiche.

Like some of its competitors, Company A makes no distinction between viewing and reading equipment. The readers and reader-printers have both front and rear imagery, and are desk top, on stands, and carts. They read both diazo and vesicular film with magnification of 20X to 48X.

The processor uses a 100 ft. roll which can handle 3,000 8-1/2 by 11 documents on continuous roll film. The film is housed either roll-to-reel or to cartridge. The company has a microfiche processor which cuts the image and packs 25 fiche in a cartridge pack.

The company's retrieval system consists of a camera, a processor, microform, and a recorder along with the processor. They conform to multiple configurations depending on the user's identified needs.

Company A manufactures a COM system which converts copy either to microfilm by copying source document material, or converts magnetic tape from the computer either by CRT or laser. The company is the only one in the market at present using laser, and the executive in the interview did not think that the laser conversion COM system was cost prohibitive to any user who was considering changing his records system to COM anyway.

The company has cabinet and tub storage units which house microfilm cartridges and microfiche.

Users

The management of Company A identified the users of its micrographics systems and products as being in the categories of diversified-financial, banking, government, manufacturing, hospitals, retailing, insurance, transportation, utility, education, and added the categories of engineering, humanities, meaning the performing arts, and services. The executive stated that the categories of banking, government, insurance, education, and engineering constitute their largest groups of users.

Marketing Advantages

The executive described the space saving capability of its system to be a decided marketing advantage. Up to 96 percent of file drawer material can be converted to a micrographics system manufactured by Company A in line with the cost of its nearest competitors. The executive sees good retrievability or file integrity as another advantage. Records security, particularly in off-site storage, is an advantage in addition to techniques for duplicating files thus producing satellite systems of files.

Marketing Disadvantages

The executive in Company A indicated that some of the systems were cumbersome and were considered to be a disadvantage, but the company's inability to tool up for user needs was more of a disadvantage. The executive commented that it is extremely difficult for large companies to maintain marketability of products similar to its competitors and expect to make a reasonable profit in what he termed "a boxed environment." He was saying that the market determines user needs and that it is difficult for most large companies to market products specifically designed to meet the needs of a particular user or a group of users, such as banking or insurance.

User Identified Advantages

Company A's management believes the users find the same advantages in using the systems and products that the company considers them to be. The most consistent feedback relates to space utilization, dependable service, meaning performance capability, and cost effectiveness. The executive commented that cost-run figures among some of its users show an appreciable reduction in the cost of managing their records systems.

User Identified Disadvantages

The executive in Company A said that the user of their micrographics systems find it a disadvantage that they do not accept both microfiche and microfilm. Whereas some users identified cost effectiveness as an advantage, others identify as a disadvantage their systems' inability to show a reduction in overall costs.

Problems

Some of the problems users of Company A's systems and products are having relate to machine configurations. The executive said the company was experiencing some minor difficulty with its equipment conforming to another company's system previously installed. This problem is reflected in his comments about open-ended systems.

Company A encountered problems with its illuminated grid kits but has overcome these to apparent user satisfaction.

The executive identified as a marketing problem the companies' need to have equipment with different ways of doing similar things, and this fact is revealed in his comments about unmet user needs.

Contributions to Management

Company A considers a managed system of costs and people as the most significant contribution of the industry to management. The executive believes that "managed" and "system" are the keys to what the industry has been able to do in terms of selling a micrographics approach to top management. His view supports a second contribution relating to records accessibility and the kinds of information available to management for planning, controlling, and making decisions. Finally, the executive in Company A stated that cost savings in managing facilities is a contribution of the industry to management as a whole. As can be seen, these are three closely related statements.

Unmet Needs of Users

The users of the systems and products manufactured by Company A have specified the need for a blip system to read encoded information to search recorded documents. They have indicated a need for programmable devices to re-format imagery from one size to another without changing lenses. Some users have talked about disc storage as a need as opposed to magnetic tape. Others, such as city police departments, have need of rapid search units of police records. The executive mentioned there is a need for a small size reader-printer, and less expensive ways to automatically index and print out at high speed.

New Product Lines

The executive in Company A declined comment about any new products it might have projected or in various stages of development. He did say they were working to refine existing products and would be making some changes in their COM system. The company is working on a microdisc product and low cost duplicators.

COMPANY B CASE REPORT

Company B entered the micrographics market through an existing product line that produced hard copy. Combining reader capability with the existing printer capability gave the company entré into a new line with expansion possibilities, particularly for information retrieval.

Company B has merged within the past year with a firm that was in the micrographics market. With the combination, Company B now has a microfiche retrieval system with update capability unique to the system. The company's executive is of the opinion that this capability is a real breakthrough in the field of records management plus the fact that the system does not necessitate downtime in the changeover.

Components

Company B manufactures a retrieval system with read-out and print-out facility that conforms to microfiche in standard formats from 20X to 48X. A unique feature to this particular system is interchangeable microfiche carriers from 4 x 6 to 4 x 12 size. Normally, carriers are either 4 x 6 or 5 x 8. The system also has rotating imagery, and floating lens which adjust the viewing focus 95 percent automatically. The viewing screen is a neutral tone which reduces glare and is available in two colors, gray and soft green.

The read-out part of the retrieval system is removable and may be used as stand-alone equipment as can the print-out equipment. The microfiche coding field, unique to Company B, can be updated as necessary, and the microfiche itself added to without having to copy the entire fiche over.

Company B's records management system, consisting of a record processor, microfiche, a fiche master file, a reference fiche copy (either diazo or vesicular), and a reader-printer, is compatible with automated file systems, random access files, COM, or satellite computer based index systems. Digital key access is used for both storage and retrieval.

Users

The executive in Company B identified as the prime users of its systems the categories of diversified-financial, banking, government, manufacturing, insurance, utility, and education.

Marketing Advantages

The management of Company B considers product reliability in terms of overall performance as one advantage plus high volume output and image quality. The facility for master making at low copy cost was thought to

be yet another advantage. File integrity was identified as an advantage of the records management system in addition to better management of active records at less cost to companies with large, active file systems.

Marketing Disadvantages

Company B's executive stated that the company sees the higher than average cost of the equipment as a marketing disadvantage. The products are too costly for broad market application. The executive foresees the possibility of a cost reduction as the company makes further penetration in the market.

User Identified Advantages

The executive believes that the users of Company B's micrographics systems will identify image versatility as a first advantage, the wide range of image and copy sizes with better than 85 percent automatic blow-back. Users find that less space is required than with former file cabinet systems. File integrity is maintained because of less likelihood of misfiling, and there is a reduction in labor costs to operate the system. The executive stated that users comment on the fact that all operations take place in room light requiring no darkroom facilities.

User Identified Disadvantages

The retrieval system of Company B is being introduced just now. It has been field tested for over five years, but the top management was slow to move on new product lines because of the longevity of other products that enjoyed proven marketability. A disadvantage of the records management system is that it conforms to microfiche solely. It currently requires duplication of file film before viewing or copy making.

Contribution to Management

Company B's executive declined to comment on this question because his comments would be unfounded in terms of the company's length of time in the industry. He did talk in general terms about cost savings, file integrity, and image access, but only from what Company B envisions its systems' capability to be.

Unmet User Needs

Company B continues to work on equipment reliability as management policy, evidenced, for example, by five years of field testing one product. Their users are also asking for a better means of getting back to

hard copy. Company B is field testing a product for another company which automatically reads, magnifies or reduces, and prints one copy or multiple copies then shuts off automatically. At present, this is the company's answer to the user's need of getting back to hard copy more rapidly with a better copy produced. The company is also working to develop an application of plain paper technology to microfilm printout as an outgrowth of user need. This technique was referred to earlier in Chapter I under Reprographics in discussion of the Administrative Support Center.

New and Developing Product Lines

On a projected basis, Company B anticipates the development of a plain paper reader/printer in a basic price range of $6,000 in addition to a step and repeat plain paper enlarger printer in the range of $10,000. The company is presently field testing a magnetic card input copier and a communicating word processor, the first anticipated for production within five years and the latter within three years. This would be a new line for Company B and is a reflection of the future direction of the company according to the executive participating in the interview.

COMPANY C CASE REPORT

Company C is a vendor in the micrographics industry under its own name and a distributor for over 40 companies marketing products in their names. The Fortune 500 Directory places Company C among the top three vendors in total sales of micrographics systems and products. Much of its microphotography equipment, lens, cameras, and film, is found among the components of other vendors' systems. Because of the vast network of its distributorship and the multiplicity of products under development and to be developed by the more than 40 companies, the executive participating in the interview rightly declined comment about those developing and new technologies. His contention is that the confidentiality of the vendors should be protected in a highly competitive market.

Components

Company C manufactures microphotography equipment which includes rotary, planetary, and step and repeat microfilmers (cameras). These conform to four microforms: roll film, microfiche, jackets, and aperture. Sequential numerical imprinting automatically stamps an identifying number on each document in high-speed microfilming operations from an eleven-digit array. The cameras are both table top and floor stand and perform a variety of operations. Table top models photograph checks, letter-size documents, and tab cards. One floor stand model photographs engineering drawings, and computer printouts are photographed by another.

Company C's systems include a microfilmer, all four microforms, a recorder and a processor. The latest model of its retrieval system is capable of searching up to 350 documents per second with a twelve-digit key access unit.

The company manufactures readers and reader-printers which take all microforms in two or all four combinations. Some are manually operated; others have motor drive. All have eye-ease tinted screens, light controls to cut down glare, and a choice of up to four magnifications. Some models have adjustable viewing angles for improved imagery. One model is specifically designed for viewing COM microfiche and other micropublished information requiring 40X magnification. Lens are interchangeable on most models with magnification of 20X to 40X. The motor-driven units have controls which automatically blow back and reduce imagery being viewed.

The readers and reader-printers are desk-top, floor stand, or on stands and carts. They read both diazo and vesicular film and fiche. In the miscellaneous equipment necessary to process information for viewing, is equipment that allows updating of roll film and jackets, and for loading microfiche and roll film cartridges.

Company C manufactures a COM system and the support software necessary for its operation. Source document material is converted to microfilm then to magnetic tape and stored in a data file. Retrieval is either manual or automatic through several ways of coding: flash card, code lines, sequential numbering array, key access image control, or binary code patterns.

Users

The executive in Company C identified banking as the category primarily using its micrographics systems. The company sees the categories of retailing, insurance, utility, and engineering collectively as the next group of users, and manufacturing would follow as last.

Marketing Advantages

Company C's management sees the security provided through its micrographics system, particularly in banks, as a distinct marketing advantage. The executive stressed that customers have confidence in the system. The company believes its information storage and retrieval system is a marketing advantage because of its versatility in adapting to a variety of situations. Company C considers the cost reduction and space reduction in operations as a strong marketing advantage.

Marketing Disadvantages

Paradoxically, Company C identified simplicity of operation as the first disadvantage. The downtime of its products from improper handling has prompted the company to produce an Operator's Training Manual complete with microfiche in color and cassettes. Its sales staff will even go in to demonstrate the use of the training system if necessary. Retraining, then, becomes the second disadvantage Company C finds. Despite trained sales staff and training manuals, some users install micrographics systems but do not provide the necessary retraining for its employees to operate the system for maximum efficiency.

The executive stated that Company C has the highest prices in the market which often turns out to be a disadvantage. The cost and vulnerability of film production is yet another. Film can be damaged easily.

User Identified Advantages

The executive in Company C cited company policy in response to this question during the interview. Assuming that the market always dictates user needs, Company C's policy is to always work toward those needs. Without a satisfied client, there is no need for marketing a product. Therefore, no product of Company C moves that is not up to the best possible standards of the company.

User Identified Disadvantages

Company C's executive again identified simplicity of operation as a disadvantage considered by users. "It is almost too simple" he stated. The cost of the equipment is a user disadvantage. Lost motion in the insertion-reinsertion of cartridges and cassettes is a third disadvantage.

Problems

The management of Company C finds that users quite frequently cannot get equipment specifically designed for their situation because the market dictates what designs are available. The executive stated that somehow this problem must be overcome in order to achieve a shorter response time to user needs.

Contributions to Management

Company C defines cost reduction as the most significant contribution of the micrographics industry to management. Information dissemination is considered to be a contribution. Getting information at the time of need is crucial to management.

Unmet User Needs

The executive stated that users are asking for a portable microfilm reading unit. Users are also asking for the manufacture of a low-cost reader, possibly desk top. Instant processing was identified as a need frequently mentioned.

New and Developing Product Lines

Explanation was given earlier as to the reason for the executive in Company C not responding to this question during the interview.

General Comments

Company C services its own products but the executive could not respond for the over 40 companies in its distributorship. Two questions to be raised subsequently had to do with "time killers," i.e., ways of doing things or machine operations that kill time, and the need for common reduction standards. The executive sees a need for some kind of standards, perhaps developed through the National Microfilm Association, that do not inhibit production.

Speaking more generally, the executive believes there is growing decentralization of the tripartite--management, market research, sales. He sees the decision-making level moving up because the upper levels of management must base decisions on cash flow. In support of the statement, the executive stated that the main offices of Company C in another city are converting to an administrative support center concept within a short time.

CASE D CASE REPORT

Company D is one of the companies longest into the market with an established line of micrographics systems and products. The company also does contract work with clients for special equipment and products. As opposed to a few of the other large firms, Company D designs and manufactures the components and products it sells, and has not to this time bought out a subsidiary firm with support products.

Components

The company manufactures microphotography equipment which includes a planetary camera with automatic step-and-proceed and step-and-repeat controls. In other words, on a microfiche grid, the camera photographs source document material, automatically advances to the next grid, then reverses itself back to the first grid on the next line of the microfiche. The camera automatically focuses to the copy and adjusts the lighting. If necessary, these controls can be hand operated. An internal buzzer denotes the end of a film roll. The viewing frame is 24 x 24 inches,, and the camera conforms to 105 mm to 148.75 mm microfilm with 20X to 24X reduction capability.

Company D markets viewing (reading) equipment in several different models which are either table-top or on stands and carts. All are microfiche readers with lens ranging from 24X to 48X with 80 percent blowback. The viewing screen is green and varies in size with the size of the model. All readers have rear image projection and hand-operated fiche carriers.

The company's retrieval system includes a camera, a processor, microfiche, and a reader. The system is open-ended and conforms to any COM system manufactured by another company. At present, Company D does not have its own COM system for the reason just stated.

The storage system manufactured is an automated rotary system geared to engineering firms for the storage and retrieval of large, flat drawings or drawings which have been converted to microfiche. The coding is alphanumeric.

Users

Engineering, primarily surveying, is the category identified by the executive as the prime user of its system. Manufacturing was next, in particular parts control, in large manufacturing firms. Governmental agencies are users of Company D's micrographic systems, and education as a category is a strong market for the company. Utilities were likewise identified by the executive, especially for their installation drawings.

Marketing Advantages

The management of Company D sees the high quality of its microfiche production as a first advantage, and tied to this is the reliability of imagery. The executive emphasized that high quality and reliability are achieved through the marketing of a system that is easy to use, easy to handle, and which can be distributed at a lower cost than most of the other vendors. He identified the space saving features of the system also as an advantage.

Marketing Disadvantages

Momentarily, Company D's retrieval system does not have updating capabilities and this is a decided disadvantage when a user changes its operation. Multiple reductions, rather the lack of multiple reductions, was considered another disadvantage to the company. The executive sees as a real disadvantage the difficulty of educating the market to different ways of doing things. As an example, he talked of having discussed with users the possibility of adding a jacket system to its microfiche master system and met no encouragement whatsoever.

User Advantages

Company D is confident that its users will identify the economies of the systems' operation in terms of cost savings as a primary advantage. Next would be the systems' compatibility with other vendor's micrographics systems. Another advantage would be the systems' capability to disseminate information. The executive stated that users will identify the quality and reliability of microfiche imagery as an advantage along with reduction in mailing costs since microfiche is lightweight.

User Disadvantages

The application of only one microform (microfiche) is considered by the company to be the disadvantage most frequently mentioned by users. Generating original paper faster may prove to be a disadvantage to users. What this means is that some users feel the copying-processing procedure is a little sluggish, and to overcome that might mean the purchase of another camera.

Problems

The executive in Company D described the slowness of the camera as a problem with its system. This was earlier described as a disadvantage by the company's users. The company also finds that it has a problem when a prospective user cannot adequately describe his needs, a system is installed, and then it does not totally do all of the operations the user thought it was designed to do. The executive commented that the

investigator would probably find this one problem more consistent than any other among the vendors interviewed.

Contributions to Management

The management of Company D considers the efficiency of operation in terms of cost savings as the most significant contribution of the micrographics industry to management as a whole. The compatibility of systems, i.e., COM systems, is thought to be a supportive factor in management. "Doing things better" is the way the executive summed up his response to this question.

Unmet User Needs

The user of the company's micrographics systems and products are asking for color filming. The executive pointed out that this capability would be particularly advantageous for color coding in parts control among manufacturers.

New and Developing Product Lines

Company D will have in production in five months a microfiche duplicator in the basic price range of $18,000. Within four months, it will go into production with an automatic, alphanumeric image indexing system at a cost of approximately $2,900. The company is also working to gain UL (Underwriters Laboratories) approval of its camera.

General Comments

The executive in Company D is of the opinion that micropublishing is the coming market and that ways will be found to circumvent copyright. He stated that laser, as an imagery process, will also be very big in the coming market, and he did not feel that cost would be a prohibitive factor. NOTE: the executive at Company D was the only one interviewed who believes that laser will make a further penetration into the market except, of course the executive in the company which currently is the only one using the medium.

COMPANY E CASE REPORT

Company E is not presently in the market as a manufacturer of a micrographics system, but it does manufacture two components in an established product line which are part of a COM system being field tested at present. The company has a data base which, with the COM system, gives the company better than 95 percent of the market with its present operation since there are only three companies in the business. The executive in the interview stated that the company anticipates marketing the data base on royalties which would then give any vendor with comparable components a new dimension for a micrographics system.

Components

The components of the system in Company E consist of a magnetic tape input-output unit marketed by the manufacturer from which information is transmitted by telecommunications. The taped material is read by a product also marketed by Company E, then stored on floppy disks by a COM system manufactured by another vendor.

The retrieval system is a CRT screen tied to the computer terminal that utilizes alphanumeric coding for read statements and terminal digit coding to access the data base. A printing unit manufactured by a third vendor which conforms to Company E's system is available but used infrequently. With CRT, the company has less need for converting back to paper.

NOTE: the product marketed by Company E as reading equipment is not the same kind of product marketed by other vendors as reading equipment.

The COM system currently being field tested by Company E, then, consists of a magnetic tape input unit, a reader, disk storage, and CRT for retrieval. The company's executive stated that Company E does not now foresee adding any microform to the system. This is not necessary with the data base stored on floppy disk. When the company decides to market the data base on royalties, then any vendor with the capability can convert to microform so long as the data base is purchased. The executive sees a real marketing advantage for Company E in having the option of either conforming to another system, or marketing the data base on royalties.

Users

Because of the nature of its system, Company E identifies its users as being in the categories of government and education. Government in particular is a prime user.

Marketing Advantages

Company E finds that it has a unique advantage with the options of its data base. The executive adds that the completeness of the data base is an advantage because the package is the only product of its kind. The executive identified the reliability of the hardware systems as being an advantage. Again, because of the unique capability to transmit, store, and retrieve information, the company foresees an increasing need among other users. Increased user interest could turn out to be a marketing advantage since Company E is the only vendor with the system.

The company is experiencing minor restraint on the part of prospective customers because the system is a totally new technology. In the words of the executive during the interview, "That is both good news and bad news!"

User Advantages

The management of Company E finds the users identify frequently the computer compatibility of the system. The savings in time and man hours and the speed of producing information has been noted many times. The time-sharing capabilities of the system are noted as an advantage by the users who prefer to contract with Company E to handle their work as opposed to installing the system.

User Disadvantages

Fear of possible retraining was classified as being a disadvantage to Company E that users identify. The executive pointed out that input training-retraining is affected very little, but a small amount of retraining is required to get maximum efficiency from the retrieval unit.

Company E finds that the users consider the initial cost of some of the editing equipment a disadvantage also.

Problems

The one problem Company E finds with the system is the updating capability. Entries to the data base for updating cannot go into the computer without two intervening steps. This factor proves to be more of a problem for Company E than for its users.

Contributions to Management

The management of Company E considers the combining of technologies to speed communications as the most significant contribution of the micrographics industry to management. Getting information to the point of need at the time of need is crucial.

Unmet Needs

The users of Company E's system are requesting the company to manufacture its own COM system as a cost savings to them. When a user puts together bits and pieces, quite often a tremendous outlay is required.

New and Developing Product Lines

Company E has in design currently computer typesetting equipment as a logical concomitant of the system. The company will go into production in about a year and will market the product in a range of $50,000. Targeted for eighteen months release, is a new data base which gets Company E into the electronic data processing market with further penetration. To these, the company will add an office transcription processor, presently in design, which will go into production within a year at a marketing cost of $50,000.

General Comments

Company E services its own products through trained staff and distributors.

COMPANY F CASE REPORT

Company F is not new to the micrographics industry. Its penetration into the market with microphotography and reading equipment is long established. Whereas the company does not manufacture a total micrographics system, in comparison with other vendors' systems, a move in this direction would not be infeasible in view of other product lines it manufactures. However, literature distributed by the company refers to its components as a system.

Components

The microphotography equipment manufactured by Company F consists of variable intensity lamps, interchangeable lens with magnification from 18X to 27X, roll film, microfiche, jacket, and aperture card attachments. The reading equipment conforms to 16 and 35 mm roll film and cartridge in addition to microfiche, jacket, and aperture card. Rear imagery is projected on a 14 x 14 screen corner to corner. Image rotation is almost fully mechanical. All models are table top and priced in a medium range.

Users

The field of education is the prime user of Company F's micrographics components and products. The company's reading equipment is frequently observed in libraries. The categories of government, manufacturing, and hospitals are consistent users.

Marketing Advantages

Company F considers the marketing advantages of its micrographics equipment to be a large screen, bright and sharp imagery corner to corner, and lamp life of over 1,000 hours. The executive underscored the versatility of the reading equipment in that it conforms to 16 and 35 mm roll film, fiche, and aperture. He emphasized that the combination of durability and accessibility of the equipment is an advantage. It was his contention that a relative middle-of-the-road cost is also a marketing advantage.

Marketing Disadvantages

The executive in Company F talked about screen height and the forward slant of the screen being disadvantageous, particularly for readers wearing bifocals. He cited the loading mechanism for slowing operation as well as the manual advance of frames. The lack of portability is another marketing disadvantage.

User Identified Advantages

The management of Company F lists performance as the advantage most frequently mentioned by the user of its components and products. Its versatility with minimal maintenance is also mentioned. The executive stated that the company gets good feedback on screen clarity and lamp life.

User Identified Disadvantages

The company finds that loading is the biggest disadvantage of the micrographics equipment it manufactures. Rewinding of roll film is another.

Problems

Company F encounters a problem with its equipment and products when users find it has less capability than was expected. Quite often the company finds improper operation of the equipment, and there is considerable wear on film with manual operation.

Contributions to Management

The management of Company F considers COM to be the most significant contribution to management though it does not manufacture a COM system. According to the executive interviewed, microfiche capability is a second contribution to management, particularly for training purposes. As an example, the executive discussed plumbing and automotive mechanics training diagrams available on microfiche in self-instructional programs.

Unmet Needs of Users

Company F finds that its users have need of roll film with 48X capability. Users ask for an inexpensive table-top microfiche reading unit, and they stress the need for equipment with motorized drive. Basically, the management sums up user needs as a general refinement of certain features of the micrographics equipment and products.

New and Developing Product Lines

In prototype, but soon to go into production, Company F will market a motorized drive unit which actually is an adaptor to an existing piece of equipment. It is considered to be a new product design, however. The company anticipates the basic price to be approximately $275.

General Comments

Company F's dealers service the equipment manufactured by the company under a warranty service contract with one year guarantee on parts and labor. The executive stated that a question to be asked in subsequent interviews, of importance to Company F, would be what users might consider their needs to be on a 3- to 5-year time line.

Reflecting generally, the executive commented that microfiche is the current market and probably will be for a good five years or more. In his opinion, the industry has not begun to exhaust its storage-transmittal capabilities. Combined in a COM system, microfiche becomes limitless.

Commenting on laser as an advance, particularly in the micro-publishing field, the executive stated that it is one of those "nice things to have," but it is unlikely that the cost will get down low enough for general application as with other technologies.

COMPANY G CASE REPORT

Company G is organized by divisions which relate to the products it manufactures as well as its user markets. All products enter the national and international markets by direct sales through 192 sales offices. There is no third party source.

A large company, as is Company G, must direct its research dollars toward product lines which will promulgate sales returns in a highly competitive market. Tooling up to market innovative products is not economically feasible. Therefore, the larger vendor frequently buys out a smaller firm whose product is compatible with its systems. Company G then manufactures the product under its own name, or it may contract with that firm to continue manufacturing the product under its own name as a secondary source. Company G may be either field testing or marketing the product in one of its configurations.

Components

Company G manufactures microphotography equipment which includes rotary, planetary, and step and repeat cameras. The cameras conform to four microforms: roll film, cassettes, jackets, and microfiche. Unique to Company G's microimagery system is the sequential numerical imprinter which allows an eleven-digit array for coding. This feature is available on two models, one of which includes blip that reads coding for fast retrieval. "Blip" is used by other vendors for code reading and rapid retrieval under their own trade name.

Company G's micrographics systems consist of a camera, four microforms, and a recorder. The floating lens capability is 18X to 40X, and the dual lense capability is 18X to 33X.

The company manufactures readers and reader-printers which take only one microform, two in combination, or all four. The sales representatives readily admit some reduction in effectiveness when the four microforms combine. Combining four microforms necessitates making hand adjustments on an automated system, thus lowering its operating effectiveness. The operating efficiency is not otherwise affected when two microforms are in combination.

Company G makes no distinction between viewing equipment and reading equipment in the micrographics division. The readers and reader-printers have both rear and front imagery, and are desk-top, on stands and carts, or are part of a tub storage file. They read both diazo and vesicular film and fiche with magnification of 18X to 32X on some models and 24X to 50X on most. The readers and reader-printers normally become the third component of a micrographics system, but Company G manufactures a processor which is an intervening step.

The negative of the imagery from the recorder goes to the processor on a 100 ft. roll of film. The recorder has photographed source document material, and the code for each piece is usually alphanumeric or terminal digit. The processor produces any of the four microforms. If the coding is to be read by blip, the processor notches the film.

Company G manufactures tub and automated rotary files for storage of microfiche. Desk-top and floor-stand cassette racks are also available as are shelves and cabinets for storing microfilm. The company considers these to be optional products and available to users dependent on their needs.

The company markets a COM system and the software necessary for its operation, film and magnetic tape. The computer converts source document material to magnetic tape, material which has been photographed and committed to roll film or microfiche. Most vendors use microfiche as the medium. Through a series of four steps for most vendors manufacturing a COM system, three for Company G, the imagery is converted to magnetic tape and entered into the data file. The company sees a slight marketing disadvantage to the system because it is a one-person operation as opposed to a two-person operation of other vendors.

Users

All of the products in Company G's micrographics systems are available in configurations designed for user needs. The users are in the categories of diversified-financial, banking, government, manufacturing, hospitals, retailing, insurance, transportation, utility, and education. The executive revealed that banking and insurance constitute the company's prime users.

Marketing Advantages

The management of Company G views as a primary advantage the total sales capability of its sales staff. To this is added the ability of the sales staff to conceptualize each of the micrographics systems manufactured and its dominant features. Product development along systems design, backed up by carefully designed national-international sales and services, is seen as a marketing advantage.

Marketing Disadvantages

The executive in Company G maintains that all vendors in the micrographics industry must work harder toward a synergistic approach in the marketing of systems. The economies of operation will become increasingly difficult to curb unless the industry as a whole moves more in that direction. Emphasis must be placed on interchangeable components

while continuing to render the best possible services with product lines which have established the company in the market.

Company G considers the marketing disadvantages to be the cost of product development and service costs. Servicing handled by the sales representatives is an expense to the company. The difficulty of adhering to standards which sometimes inhibit is a disadvantage, particularly for large vendors which have equipment capability for reduction and blowback that the smaller companies do not have.

A third marketing disadvantage to Company G is the difficulty of having to conform to standards of reduction and magnification which tend to protect the smaller vendors. The federal government imposes the standards to maintain some degree of uniformity among vendors marketing like products. Because of the multiplicity of components which comprise its systems, Company G, and its competitors of comparable size, must adhere to more and different sets of standards than do the smaller vendors. The executive stressed that such standards restrict vendor capability.

User Identified Advantages

The management of Company G was certain that users of their systems will identify cost effectiveness of operation as their prime advantage. Their line application processes will also rate high. The executive states favorable feedback on its COM system, particularly its source document application and its alpha-digitized application. Users of Company G's systems consider the possibilities for alternative configurations to be an advantage in making decisions initially. The systems' capacity to condense information on microfilm, and the possibilities for more density on documents are other advantages passed on to the user.

User Identified Disadvantages

The company finds that users are disappointed to find that some of the products will not do all applications, i.e., store, read, and print. Users go for a low-cost item as a judgmental error. Basically, the systems and products of Company G are high-cost items with few low-cost products, and the company recognizes that users term this to be a disadvantage. The company's system does not have instant imaging capability. Users cannot key access the desired material without intervening steps of page/line run through.

Problems

Problems occur when the user finds that not everything is reproducible; they expect the system to do more than it is designed to do. Another problem is that user requirements change, thus causing the

initial system to no longer be functional. Company G finds that user habits are difficult to change resulting in lost effectiveness of the system as designed, or even malfunction. One of the company's biggest problems is a lack on the part of some of the users' top management level being committed to the system as an information system enough to make it work. Last, when users fail to plan for hidden costs involved with a change in systems, they invariably conclude that the company has increased overall costs. Such a conclusion becomes a problem for Company G.

Contributions to Management

Company G considers COM, not just its system, but the concept of COM to be the most significant contribution of the micrographics industry to management. The company is convinced that the economies of operation, i.e., cost reduction, is a plus for management. Another contribution to management is the distribution of cost rise, meaning use amortization for whatever period of time the user may choose to cost out the system.

Company G credits NMA, the National Microfilm Association, with having made a most significant contribution to management through its effectiveness in helping to develop an awareness about rising costs of paper, information management, retrieval time lags, and efficiency of operation, and what this means in dollar loss to management.

Unmet Needs of Users

Users of Company G's systems and products are asking for a high speed, automated microfiche retrieval system. Users specify the need for instant imaging and a better picture, meaning higher imagery in terms of clarity. They are also asking for lower cost products and some way of high speed recording of "junk" material. The executive digressed to comment that voice imagery and visual image communications will make tremendous changes in telecommunications within this decade.

New and Developing Product Lines

Company G has in design a dry instant imagery product which is new to the company and which will go into production in three to five years. A basic price range is not projected this early. Within two to five years, the company will market a high speed storage retrieval system--fiche and cartridge--which is in design and which is also a new product. The cost is projected to be in the $1,000 to $25,000 price range. In design is another new product, a high speed recording device to be available within two to five years, with a basic price range of $2,500 to $25,000.

General Comments

The executive of Company G spoke more generally and stated, in response to question, that in time the terminology "information management" will be more descriptive of the process than is the current term, "records management."

In the area of micropublishing, he stated that copyright can be dealt with and, in fact, has already been circumvented in the copying market. He foresees the possibility of entire libraries being converted to microfiche as well as textbook material. Publishers would be paid royalties in advance for the use of their materials.

The executive was one among several kind enough to remind the investigator about the upcoming national convention of the National Microfilm Association, April 27-30, 1976, in Chicago, in addition to suggesting two NMA publications which would be helpful to this study.

COMPANY H CASE REPORT

Company H is an international-based company which has made formidable penetration into the national market with its micrographics systems and products. The company is rapidly moving into the Middle East area while continuing to manufacture some components under its own name for two vendors considered to be giants in the industry by their competitors.

Components

The company manufactures microphotography equipment including a microfilmer with a triple lens arrangement unique to the company. The uniqueness is the fact that the lenses may be the same magnification, or three different magnifications photographing simultaneously. The lenses are standard magnification, 20X to 48X, and the arrangement is particularly useful for topographic photographing and detailed copying. The microfilmer conforms to 16 mm and 35 mm roll film in addition to microfiche, jacket, aperture, and ultrafiche. The processor also handles the four standard microforms.

The retrieval system marketed by Company H consists of a camera, microform, a processor, an enlarger-printer, a duplicator, reader or reader-printer, and a COM reader-printer.

The enlarger-printer is table top and conforms to both diazo and vesicular microfilm. It prints roll film, 16 mm and 35 mm, microfiche, jackets, and aperture with no fixed magnification, but with the capability of 7.4X to 24X depending on the model.

The automatic production printer (duplicator) reproduces aperture in various sizes and has automatic card feed and print quantity controls. It operates with both diazo and vesicular film, producing copies at a rate of from 600 to 1000 per hour depending on the model. The duplicator has a magnification capability from 6.5X to 26X, variable speed control for positioning in the optics system. Optional to the duplicator are storage trays for roll film and aperture cards.

Company H manufactures several models of readers available in four screen formats with image rotation, ranging in size from 9 x 12 inches to 14 x 11 inches. The readers have a dual lens assembly for handling multiple microforms filmed at different reduction ratios without a lens change. Some of the models read source document material on microfiche, others conform to microfiche, jackets, and aperture, then there are other models for reading ultrafiche. The ultrafiche readers have a variable lens range from 95X to 142X. The microfiche readers have drop-in lens capability of from 10X to 85X. Unique to Company H is a reader primarily used in the field of engineering with zoom lens capability. The built in zoom feature allows blowback to original size

from a format ranging from 11.5X to 50X. Blowback for most readers is only about 90 percent of original size. The screen size is 19 x 13 inches and input is microfiche, jacket, and aperture.

The reader-printers manufactured by Company H are table top and floor models. These, too, have dual lens and zoom lens capability, and conform to microfilm, microfiche, jacket, and aperture. The interchangeable lens system ranges from 18X to 42X as a standard feature, and from 20X to 48X optional.

The company's COM component is the ultrafiche reader-printer with 180° image rotation, 12 x 12 inch screen size, with lens capability of from 16X to 80X as optional equipment in the floating lens design.

Users

Company H identifies its users of micrographics systems and products in the categories of diversified-financial, manufacturing, insurance, banking, government, and hospitals. The executive in the interview added the category of engineering and made note that this category and diversified-financial grouped the majority of its users.

Marketing Advantages

The management considers the versatility of its systems to be a priority advantage. The executive stated that the systems components are technically reliable and convenient to operate. He believes the dependability of their operation is another advantage. The company finds that being in the international market gives it an advantage in that the product lines were field tested and on the market prior to meeting the national competition. In the final analysis, the fact that the company is strictly in retrieval with its systems is thought to be a distinct advantage.

Marketing Disadvantages

Although the company is established in the international market, the management finds that it is disadvantageous from the standpoint of establishing company identity. Pricing in a competitive market for a company that is primarily international is thought to be another disadvantage. The company is experiencing a disadvantage in servicing rural areas because its equipment is serviced by trained branch staff and is somewhat limiting.

User Advantages

Feedback from users relates to the kinds of services performed by the systems manufactured by Company H. User comments deal primarily with the versatility, the reliability, and the ease of operating the systems.

User Disadvantages

As with a few other vendors, the users of Company H's systems and products find the equipment to be slightly cumbersome. Readers and reader-printers on stands and carts are not as accessible as table-top models.

Problems

The executive stated unhesitatingly that the company gets no comments about the operation of the systems. However, he did state that problems arise when all management levels are not involved in the decision to adopt a micrographics system. Interestingly, some executives among the company's users want something to hold in hand, such as a piece of paper on which they may make marginal notations.

The company finds a problem with a bits and pieces operation in which the system consists of more than one vendor's products. Company H stresses the total package approach. When called in to place or replace components, a problem occurs with trying to conform to different products. The executive commented that some components just do not fit.

Contributions to Management

The executive in Company H sees the most significant contribution to management as being a convenient, economical method of records retention, a medium for storing and retrieving information to meet a variety of needs. He believes the wide variety of equipment available, particularly cameras, gives an information conversion capability to a wider range of documents. Then, finally, the company finds as an advantage the ability of the systems with reader-printers to convert back to paper when needed.

Unmet Needs

The users who purchase the micrographics systems and products of Company H have identified a need for a printer that will make prints to scale, particularly users in the field of engineering. The executive commented that lens capability to photograph to scale is extremely difficult to achieve without distortion. The users have also asked for a more universal reader-printer which will accept any microform.

New and Developing Product Lines

Company H has in prototype and will begin to produce within six months on a universal reader-printer that conforms to 8-1/2 by 11 paper. The machine will be in the range of $2,000 to $3,000. The reader-printer is a new piece of equipment for the company as is an automated reader-printer to be used primarily in the field of engineering which the company will soon market for approximately $6,000 to $8,000. A dry copier, considered by Company H to be a part of its micrographics system, will be presented on the market within a short period.

General Information

Company H does not see laser as a photocopying medium making any real impact on the micrographics industry.

COMPANY I CASE REPORT

Company I entered the micrographics industry as a logical concomitant to other product lines. The formation of a micrographics division combined existing products with a new line to place Company I in competition with other manufacturers of equipment and products necessary for two components of an administrative support center to function, mail handling, and records management.

Components

Whereas Company I is not into the manufacture of a COM system, being new to the micrographics industry, it does market fully automated storage and retrieval systems. A key element in its microphotography equipment is a microfiche camera with built-in processor. Another model with this same capability processes fiche with archival quality. The company produces microforms as continuous roll film, microfiche, and jackets. A unique feature of blip, incorporated by Company I as optional on its processor, is the step-and-proceed facility instead of step-and-repeat to read code.

The company manufactures microfiche duplicators which conform to both diazo and vesicular film. One model requires only light and heat for operation and offers an automatic master roll feed as optional. Another model has a fiche collator as a standard feature and automatically produces collated sets of fiche duplicates in quantities to 99 copies per bin. A self contained table-top fiche duplicator is also available. All models conform up to 5 x 8 microfiche and 16, 35, and 105 mm roll film with standard reduction of 24X to 48X.

The retrieval/display system of Company I key accesses information housed on microfiche in specially designed cartridges. Image positioning and focus are simple to control. Table-top storage modules for the fiche are optional, and the system accepts any original fiche 105 x 148 mm size with a choice of magnification from 20X to 48X. Unique to this system is a 14 x 14 inch, non-glare screen as opposed to a 12 x 12 screen used by most companies.

Company I manufactures enlarger-printers in addition to readers and reader-printers. The readers come with either front or rear projection and the reader-printers with rear projection. Both have single or dual lens, or interchangeable lenses in all standard magnifications and three screen tints. All readers accept microfiche, jackets, and aperture cards. The dual intensity halogen lamp allows for adjustment to match image brightness with viewing conditions.

Users

Company I deals with all classifications of users: diversified-financial, banking, government, manufacturing, hospital, retailing, insurance, transportation, utility, education, and added one more, engineering. The executive emphasized that engineering firms are big buyers of Company I's micrographics systems.

Marketing Advantages

The management of Company I considers cost effectiveness in the operation of the system a first advantage. A second advantage was the ease of operation and the accessibility of information. The company views unlimited expansion possibilities from base as another marketing advantage.

Marketing Disadvantages

Company I's executive discussed the reluctance of users to try a new way of storing and retrieving information resulting in a disadvantage to the company. He emphasized that quite often when a system is installed it loses its effectiveness either because users are reluctant to change to a different way of doing things or because they do not understand the system.

The executive was quite positive in stating a second marketing disadvantage. His opinion is that the irresponsible marketing activities of some vendors causes difficulty for other vendors entering the market with a similar product. Users become hard to sell based on previous experience with other vendors.

User Identified Advantages

Company I is confident that the users of its systems will identify as advantages the same ones it does: cost effectiveness of operation, the accessibility of information, and unlimited expansion options from base.

User Identified Disadvantages

The executive interviewed stated that his company's users expect continued performance of the system free of service costs. This becomes a disadvantage to Company I because no vendor can market a system that does not have problems or require upkeep. He underscored the point that Company I is frank to discuss what its system will and will not do.

Problems

The problems Company I gets feedback on point to a lack of training on the part of the user and his refusal to follow instructions in the operation of the equipment. Another is the user who purchases bits and pieces of several different systems exhibiting no loyalty to a proven, established vendor. A bigger problem to Company I is a poorly designed system installed by another vendor which Company I may be asked to replace. Selling the overriding characteristics of its systems becomes more difficult.

Contributions to Management

Company I considers the cost effectiveness of operating a micrographics system to be a significant contribution to management. He is of the opinion that a micrographics system properly managed gives back easy access to information necessary for effective operation.

Unmet User Needs

Company I's users ask for a better quality reader at less cost. The users are looking for an improved retrieval system and also a system with more efficient blowback. Users are also looking for a product with ease and speed of recording with conversion possibilities from film to hard copy.

New and Developing Product Lines

Company I has in prototype a product with more efficient blowback, and this is a new product for it. A second item also in prototype is an automatic retrieval system for greater efficiency at the low end of the cost scale. Large and small users are looking for this kind of product. The company has a third new product in prototype which is a highly automated microfiche duplicator, and production on it will begin in less than a year.

General Comments

In parallel with another executive interviewed, the executive of Company I likewise discussed possibilities in the foreseeable future for converting entire libraries to microfiche with royalties being paid to publishers. He sees this as the best preservation for continued use of archival collections.

APPENDIX F

USER CASE REPORTS

COMPANY 301 CASE REPORT

Company 301 is a service organization for four separate utilities. The company's micrographics system performs a series of functions for the four utilities. The functions are basically the same, but not necessarily according to the same schedule nor in the same order. The executive participating in the interview pointed out that, were the functions performed in the same order and at the same time, they would not necessarily adhere to that regimentation (scheduling) in successive months. The functions performed basically cover three operations which also parallel departmental organization--engineering, data processing, and rating.

Components

Company 301 does its own photographing though not at the site of original information generated for the four companies. Primarily, Company 301 takes the data and converts by means of COM to microfiche positive then mails the fiche back to each of the four companies. The silver master is held by Company 301 for a period of ten days then it, too, is sent to the individual company. When the silver master is forwarded, the service company no longer has retrieval capability on any function, for example, billing, until the function is scheduled again and a new silver master is produced. Each of the four companies then has responsibility for keeping and/or destroying the master.

The COM system consists of one vendor's system for data conversion to magnetic tape, then to disc storage. Normal reduction is 42X to 105 mm and 24X for 16 mm. The processing unit is another manufacturer's component and conforms to 1000-ft. film rolls. There are eight processors in almost constant operation producing vesicular fiche. The microfiche are then placed in protective jackets and mailed to each of the four companies. The company is switching to microfiche negative as turnover time permits, due largely to the difficulty of maintaining quality control with microfiche positive. The company has found that positive film is easily damaged.

Company 301 has readers and CRT for retrieval. The CRT units are located in top management level offices and key access is by alphanumeric coding. Wherein necessary, the company can convert back to paper via printout from magnetic tape or to paper from the reader-printer.

Departments in the System

From each of the four companies serviced by Company 301 through its internal setup, the engineering department, customer accounts, payroll, and the multi-faceted general accounting departments feed into the records management system. The executive pointed out that customer accounts is the largest operation from all four companies.

Documents Stored

The micrographics system utilized by Company 301 stores and retrieves the billing system for each of the four companies on a monthly basis. All billing is handled within the system on a staggered schedule. Budget preparation and monitoring, the payroll register, and various general accounting systems are stored and retrieved as are engineering drawings, specifications, and reports.

Contributions to Management

The executive in Company 301 sees the capability to provide customer account information as the most significant contribution. Budget planning and controlling was a second contribution. A third contribution was the capacity to make corrections in engineering listings, and the reference usages in the payroll register was also given as a contribution.

Vendor Purported Advantages

Company 301's executive indicated the economies of operation as a first advantage pointed out by the vendor and cost savings in storage was second. A micrographics system does not take up expensive square footage. A third advantage pointed out by the vendor was the speed of information turnaround. The management of Company 301 finds this factor to be important in planning and controlling operations. The vendor also pointed out the storage advantages of film.

Vendor Purported Disadvantages

Maintaining quality control was the only disadvantage pointed out by the vendor of Company 301's micrographics system. Microfiche positive is more susceptible to scratching and distortion than is the negative form.

User Advantages

The company executive identified cost effectiveness as a first advantage of the micrographics system to Company 301. Next came the speed of information turnaround, and last was the systems' storage capacity. The executive emphasized the tremendous dollar savings to the company in using the system without specifying the particular amount.

User Disadvantages

Company 301 has encountered the disadvantage of storing "historical" data only to find some of it was incorrect information and, once filmed, was impossible to recoup and correct. The executive explained that historical information is data that are more future informational than are immediately useful. When historical information is COM recorded, if all or any portion is transferred to magnetic tape incorrectly, there is no way to make corrections on the tape because the information is lost in the computer.

A second disadvantage is the quality control of the film for reasons stated previously. Company 301 also finds a third disadvantage to be user acceptance among the four companies serviced by Company 301. The company experiences some difficulty in the four companies with employees not using the system to its full effectiveness.

User Problems

The management of Company 301 could not identify any real problems with the system since its installation.

Management Attitudes

The numbered comments in this section are in response to five questions about the attitude of the company's management toward systems change in the office.

1. The management of Company 301 is favorable toward change for the sake of improvement. The executive cited as an example the fact that middle management did the work on cost justification of changing to another system of micrographics but that top management made the ultimate decision to change.

2. Company 301's management is favorable toward opportunities for upward mobility. In the last system changeover approximately five years prior to the present study, no new hierarchy was established; but there still is room for advancement depending upon one's background and experience.

3. Company 301 has a centralized system because of its COM capability and prefers this to a satellite system. The planetary camera work could be contracted by the four utilities, but the centralized system is preferred at present by the management of Company 301.

4. The management of the company is open to change but such changes must be cost justified in writing.

General Comments

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. Company 301 amortizes its system on a seven-year basis. Within this time span, then, five of the seven years have already passed, and Company 301 has indicated the need to a vendor for a faster processing component. Whereas the company is not changing systems totally, it is updating some of the components of the system because of obsolescence.

2. The micrographics system is open ended in that it is compatible with another vendor's system.

3. The COM system is serviced by the vendor as is the processor, but the duplicator is serviced inhouse, primarily through on-the-job training.

The executive was kind enough to call to the attention of the investigator a service company in the greater Atlanta area that performs the bulk of contracted microphotography work for firms in the area that do not have equipment inhouse. Multiple operations are performed by the service company which the executive in Company 301 thought would be pertinent to the present study.

COMPANY 302 CASE REPORT

Company 302 is a hospital within a twenty-mile radius of Atlanta. The internal organization of the hospital is such that maintaining medical records is the sole function of the records management system. Though relatively simplistic in design and operation for a period of over five years, the security of the system and confidentiality of information proves to be one of the problems identified by the executive during the interview. The problem could become more pronounced because the logistics of the hospital in proximity to similar operations portends the possibility of Company 302 becoming part of a satellite system operating from a common data base, with one exception. A hospital operating primarily as a cardiac center, for example, requires a specialization depending on need at no fixed point schedule. Because of the specializations, one of the other area hospitals might become operative as part of a satellite system before Company 302 or other area hospitals. Other than the need for a specialized area, were the satellite structure to become operational, the system would work off a common data base.

Components

Company 302 has a rotary camera, jacket microform, desk-top readers and reader-printers, and open access storage shelving. Motorized storage units are accessed by alphabetic coding. The coding system for the jackets in open shelving is serial numbered. The company is not on a COM system, but the operation would lend itself to a rather simple conversion. Overtures have been made to determine the feasibility of on-line computer application, but the company's administration has not been able to justify the cost.

Departments in the System

Because of the nature of the company and the organizational structure only one kind of information is available from the system. Twenty staff members are under the supervision of the executive in the interview to facilitate the management of medical records.

Documents Stored and Retrieved

The executive identified in-patient records, emergency medical records, and a daily census report as the documents stored in the system. The daily census report is an in-house count of bed patients on a daily basis.

Contributions to Management

Company 302 considers space reduction as the most significant contribution of the micrographics system. Prior to moving into a new building, the space for processing and housing records was much less.

Vendor Purported Advantages

According to the executive, the vendor pointed out the reduction in cost of overall operations as an advantage. The installation is a one-vendor system and the vendor stated this fact to be an advantage. Vendor servicing of the system was also thought to be an advantage.

Vendor Purported Disadvantages

The vendor made it clear that there was no replacement of any part of the system during any period of downtime. If, for example, the frame on a jacket loader were broken, the loader would not be replaced by the vendor till the original equipment was repaired. The vendor thought this to be a disadvantage. The time limits on the service contract was considered as another disadvantage by the vendor.

User Advantages

The executive in Company 302 identified space reduction as a first advantage of the micrographics system. Conversion to microfiche had eliminated the time-consuming task of pulling several folders of information about one person. However, certain research information still has to be compiled by hand because it is not yet available on microfiche. Cumulative records on one person will in time make information more accessible.

Because of certain state laws, cumulative records must be maintained for a period of four years. For internal purposes, the records may be kept for a longer period, but they must be maintained for at least four years. Paper records are destroyed after about three years. Cumulative records on jackets can be updated whenever necessary.

User Disadvantages

The executive in Company 302 pointed out that the camera is a little sluggish in photographing records. The fact that the information is hand fed is thought to be a slight disadvantage.

User Problems

Company 302 finds file integrity to be an advantage of the micrographics system. However, with a jacket system, there may be more than one jacket on a patient making it difficult to keep the cumulative record together. The executive identified confidentiality of patient records as a problem though not connected to equipment operation.

Management Attitudes

The numbered comments in this section are in response to five questions about the attitude of the company's management toward systems change in the office.

1. The hospital administration is favorable toward a system change as evidenced by the fact that it has changed. The Chief Administrator presents all recommendations to the Hospital Board. Recommendations have been made twice to go on-line with the microphotography work, but cost justification has not been supported.

2. The administration is favorable to changes in the management structure if they become necessary. It was pointed out that a new division level had been added and a new position of Assistant Administrator added.

3. Company 302 has a centralized records management system and is moving more in that direction. Were the hospital to ultimately become part of a multi-county emergency treatment network, Company 302 probably would operate as a decentralized system instead of part of a satellite system.

4. The hospital operates in a Management by Objective mode. Therefore, if changes in overall office operations can be cost justified within the parameters for the year, the administration is favorable toward it. A favorable attitude does not necessarily bring about change. Accountability is required in hospital administration as in other business operations, but the budget is difficult to modify once it gets into the computer.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. The executive in Company 302 stated that requests had been made to a vendor for a more efficient jacket carrier and a jacket loader.

2. The microrecords system is open ended and would be compatible with a more recent system from the same vendor, or comparable components available from another vendor.

3. The system is serviced by the vendor and, whereas it is not set up on an amortization schedule, the entire system will be subject to periodic re-evaluation. The executive stated that on-site filming results in some loss of quality control.

COMPANY 303 CASE REPORT

Company 303 is a bank that formed its own company internally to handle data operations, one of which is the COM micrographics system. The bank maintains three different systems actually, each one self-contained. During the interview, the executive explained that the systems all stand alone for each of the departments and the three together comprise the bank's centralized data operations. The systems are housed in three different locations.

Components

The bank has microphotography equipment consisting of both rotary and planetary camera which conform to diazo microfiche, jackets, and 16 mm roll film. Processing of the film is handled in one location; processing and duplicating of the microfiche and the jackets is handled in another building which the bank is temporarily leasing. The CRT units which feed data into the computer on customer accounts are also the retrieval system for account inquiries. However, in the microfiche and jacket system, viewers are used for retrieval. This system also has a microfiche processor, duplicator, and a jacket loader. The microfiche are stored in motorized rotary files accessed by alpha coding. Approximately 500 microfiche are produced daily.

The COM unit is a large unit which utilized both 100 ft. and 200 ft. film rolls. Film and microfiche are stored according to state regulations in coded cardboard boxes and then disposed of by means of shredding after five years. However, treasury checks are stored for seven years and trust treasury notes for a period of ten years.

The bank does not have blip notching in the microfiche system that utilizes step and repeat photography, but there have been studies about the possibility in the future.

Departments in the System

The executive reiterated that the three stand-alone systems are actually the three departments feeding in--the installment loan department, factoring, and Mastercharge. Factoring is the processing of trust accounts.

Documents Stored

All debit and credit items are stored on disk in the computer. Customer credit files are also in the computer. Financial reports, letters of reference to other banks, letters requesting various kinds of information, agency reports, credit reports, and guaranties represent

the kind of information stored on microfiche. Whereas 500 microfiche is a fairly normal daily output, a check of the monthly output over a period of five years indicates as high as 724 for one day's run.

Contributions to Management

The bank's executive identified cost reduction as the most significant contribution of the micrographics system to the bank's management. The ease and speed of information turnaround was also mentioned. A third contribution was the use of the system as a planning and controlling tool. The executive stated that the system more effectively utilizes personnel and equipment and that its value in planning and controlling operations is inestimable.

Vendor Purported Advantages

Based on the experience of the executive in the interview and others in system management within the bank, two of the three stand-alone systems were designed by internal teams and one by a vendor. After determining specialized needs, employees in the bank's middle management level visited several installations and put together a report for top management recommending one or more vendor's systems that would do the necessary job.

The third stand-alone system was designed by the vendor. Space savings was the one advantage pointed out by the vendor. The executive could not comment on the other two systems because the bank management knew what was needed, designed the system, and chose the products of the vendor that could get the job done.

Vendor Purported Disadvantages

The one disadvantage identified did not relate to the system installed by a vendor; it related to one of the systems designed by the bank. The executive stated that the size of the system would not work because it was not large enough for the job intended.

User Advantages

Company 303's executive pointed to file integrity as a first advantage of the system. Space savings and the economies of operating the system was mentioned as a second advantage. Reallocation of personnel for greater utilization of man hours was given as a third advantage. Cutting down on time and motion loss was identified as the last advantage of the system in that paper shuffling is eliminated.

User Disadvantages

The bank's executive could not identify any disadvantages of the system particularly since executives in the bank designed two of the systems.

User Problems

For the reason given in No. 8, the bank has not encountered problems with any of the systems since they were installed.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. Top management in the bank is favorable toward a systems change if the change is for the better. Normally, personnel at the middle-management level conduct a cost justification study and make recommendations to top management. Primarily, the Comptroller and people in Systems Operation decide what changes, if any, can be initiated.

2. During this third interview, the investigator concluded that question No. 2 was quite similar to No. 1 and should be eliminated to avoid redundancy in subsequent interviews.

3. The bank favors a centralized system of records control and, in fact, each department has a centralized system. The CRT imaging is centralized.

4. Because CRT imaging is centralized, the system does permit inquiry with all branch locations. The bank does not now foresee the necessity for a satellite approach to records management.

5. The executive stated very positively that no change takes place within the bank if it has not been cost justified.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. The executive in Company 303 described the need for a product that will convert microfilm to original paper. This need has been transmitted to a vendor and, in fact, is available on the market. The executive was of the opinion that the product is not yet available in the South among other places.

The bank executive also stated that the need for a good reader-printer had been discussed with vendors.

2. The microrecords system at the bank is open ended as evidenced by the fact that the bank designed two of its operating systems which are composed of more than one vendor's products.

3. The systems in Company 303 are serviced by the vendor.

COMPANY 304 CASE REPORT

Company 304 is the regional office of an insurance company with headquarters out of state. The company underwrites commercial and personal coverage, and the bulk of the policy information is entered by CRT to the computer located out of state. Certain information comes back via CRT terminals and high-speed printers.

The records control system basically rotates around five functions in handling new customer accounts. Workers in the system perform tasks related to one of the five functions, but the company cross-trains for positions to compensate for slowdown as well as a means of promotion. For example, if the company finds a capable person who moves through the five functions, job descriptions will be rewritten to permit that person to move into another department in order to keep moving up.

The five functions relate to checking new accounts for errors, correcting errors that can be corrected by checking against a code manual, routing an application for insurance back to underwriting, synthesizing the log of errors with the daily computer tape update and the printout, and maintaining a daily status of each application. The Supervisor of these operations pointed out the difficulty of keeping up with new customer accounts after errors have been detected and the application is rerouted. However, the investigator noted the smooth operation in Company 304 the day of the interview, and the fact that a changeover in systems and training of new employees was accomplished in three week's time.

Components

The micrographics system in Company 304 consists of microfiche, readers, a printer, CRT, and the COM system which is located out of state. The microphotography work is done by a company in Atlanta under contract with Company 304. The microfiche is diazo and most original copy is photographed at 24X. The CRT units are accessed by alphanumeric coding. All of the readers have reverse screen imagery.

The executive pointed out the risk involved with CRT inquiry so far as confidentiality and security are concerned. For example, the executive and one other person in the regional office know the code to tell the computer out of state to prepare the payroll. Turnaround time for the payroll is only three days, but the important point is that only two people know how to tell the computer to prepare the payroll for that particular office.

Departments in the System

The executive stated that the commercial underwriting department, the personal underwriting department, marketing, personnel, and the accounting departments feed into the records management system.

Documents Stored

The insurance company's micrographics system stores personnel records, accounting records, underwriting information, various kinds of statistics, budget control documents, and rate change results.

Contributions to Management

The management of Company 304 believes that information planning is the most significant contribution of the system to management. Computer analysis capability was considered to be another contribution. A third contribution was the facility for writing and routing premiums on a daily basis.

Vendor Purported Advantages

The executive in Company 304 could not respond to this question. Someone in senior management made the decision about the micrographics system which had been installed, and all regional offices conform to the same system.

Vendor Purported Disadvantages

As in question No. 5, the executive could not respond because of lack of involvement with the decision to install a certain system. He did say that for a time it seemed evident that two computers might have been needed, as viewed by the vendor, but a dual installation did not prove to be necessary.

User Advantages

The executive in Company 304 stated that the company had found the data terminal (CRT) to be of particular advantage in that information was more readily accessible. The retrievability of the system and the capability to access information at the time of need was a second advantage. A third advantage was the systems' speed of retrieval.

User Disadvantages

The executive in Company 304 believes the fact that the system must be serviced by the vendor is one big disadvantage. The company does not experience complete downtime but finds difficulty in getting parts replacement, for example in getting a lamp changed when burned out. Another disadvantage is the high cost of the equipment. Security was identified as a third disadvantage as evidenced by the executive's earlier remarks about CRT direct access to the computer.

Problems

Keeping the system operative has been the biggest problem. Frequently there is a telecommunications foul up which has no direct bearing on the micrographics system per se but which does slow down the communications process. A third problem had to do with the scheduling of operations with an off-line computer terminal.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. The management of Company 304 is favorable to a systems change if the cost is justified. However, the executive reiterated that such decisions usually come down from the top.

2. The company operates from a centralized records management system in that all regional offices operate from the same data base.

3. Company 304 would be favorable to a system that would better disseminate information, though it might not necessarily be a satellite system.

4. The management is favorable to any change to better the operation provided it is cost justified in writing.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. The executive in the interview could not respond to this question for the reason that decisions about the system and its components are outside his realm of responsibility.

2. The microrecords system is not open ended in that it is not compatible with another vendor's system, primarily because of the data base.

3. The system is serviced by the vendor under contract and is not always the most expedient way of maintaining operations.

COMPANY 305 CASE REPORT

Company 305 is an agency in state government in Georgia. All agencies of state government in Georgia have a microrecords system designed to meet their particular needs. The executive in the interview is responsible for helping to design the systems in collaboration with all state agency heads. Each agency assumes the cost and upkeep, and each agency head makes the final decision as to vendor after considering alternatives based on consultation with several vendors and visitations to installations with similar operations. The executive pointed out that equipment is frequently utilized on an intra-agency basis rather than purchasing a new component. On occasion, agencies acquire an updated component and sign the older, but operative, component over to inventory. The executive in the interview makes a particular effort to get this equipment back into the operations mainstream so that it does not collect dust in the warehouse and have to be discarded. Most state agencies amortize the micrographics systems for three to five years.

Whereas the interview related to agencies of state government, the executive in the interview performs similar services for city and county government. As an example, historical and genealogical records are filmed by the state and returned to cities and counties. Tax assessment records and frequently used information are on some microrecords system in each of the 159 counties in Georgia and several cities, having been photographed at the site of original entry by a state-owned mobile unit.

To provide consultative services to these agencies, to institutions in the State University, and to local school agencies, the state has initiated a mobile unit service system. Three units are based in Atlanta and service the counties in one of five geographic areas. A fourth unit is on order and a fifth will be ordered as funds become available. At the time of the present study, the three units are concentrating on the counties in the northern part of the state and will move to the middle or the lower section as the servicing is completed. When the five units are available, it will be more feasible for the state to be divided into five areas with one mobile unit servicing each area. Microphotography equipment and a processor are available with each unit.

Components

Ninety-seven percent of the records control system in all state agencies in Georgia are diazo. Many of the systems have vesicular duplicating, however. The operation for which the executive in the interview has immediate supervision has planetary cameras, processors, and duplicators for photographing and processing onto microfilm and microfiche. The agency has viewing equipment, meaning readers, and reader-printers. The retrieval system is COM and this was the first

time for the investigator to see this particular system. The microfiche are stored in mechanized rotary units and the microfilm in boxes on open shelves. The COM system records the tax assessment records for forty counties in Georgia.

Departments in the System

Whereas the State maintains archival records, no centralized records control system exists because each agency has its own system. The agencies or departments having a records control system are the following: administrative services, the departments of transportation, revenue, labor, human resources, pardon and parole, offender related, natural resources, the State University System of Georgia, the Port Authority, the State Board of Education, Georgia correctional institutions, and counties and local government.

Documents Stored

The executive identified a multiplicity of documents stored and retrieved in individual agency systems. These are: budgetary records, tags and titles, prison inmate records, fingerprint files, tax assessment records, grantee-grantor records, vital records, correctional institution records, teacher certification, certain church records, medicaid and medicare records, examination records, corporation records maintained by the Secretary of State, engineering drawings and surveys for the Department of Transportation, newspapers and journals, and school student records (some of the larger counties).

Contributions to Management

The agency's executive identified space savings as the first contribution of the micrographics system to agency heads, and file integrity was next. Next, was rapid and easy accessibility of information and cost reduction across the board. Equipment expenditures was also identified as a contribution in that costs are kept within budgetary confines depending upon the decisions made by agency heads at the outset.

Vendor Purported Advantages

The agency executive could not respond to this question. He worked formerly as a sales-marketing representative for two vendors of micrographics systems and products. Because of this experience he is well informed about installations throughout the southeast, particularly in the state of Georgia, he is a member of the National Micrographics Association and regularly attends the annual convention and exhibits. When he plans and designs a micrographics system for a particular agency, the alternatives are presented among several vendors' systems based on

the executive's firsthand knowledge. He lines up several on-site visitations where similar installations are in operation. Thereafter, whatever decision the agency head makes about installing a particular system is based on the decision the agency head made to get the job done. In other words, the procedure is such that a vendor only responds in terms of whether he thinks his company has components that will perform in a system designed by the executive participating in the interview during the present study.

Vendor Purported Disadvantages

The executive could not respond to this question for the reason given in question No. 5.

User Advantages

The agency heads have identified space savings as an advantage of the micrographics system followed by faster retrieval. Mentioned third was an improved file system which provides information with faster turn-around. The executive said that ease of operation and better service overall is another advantage.

User Disadvantages

Only one disadvantage of the micrographics system was identified which had nothing to do with the systems operation. The executive stated that several of the vendors are not systems oriented and, therefore, cannot fully explain what their company's system can do in terms of meeting a particular agency's needs as designed by the executive in the interview and the agency head.

Problems

The state agency's executive identified two problems, neither of which are directly related to equipment malfunction. A problem exists with personnel turnover which then involves a good bit of training and retraining. No one person is assigned responsibility for training and retraining among agencies which greatly reduces the effectiveness of the systems' operation.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. As explained previously, alternative planning strategies are presented to agency heads by the executive in the interview. The agency heads decide what vendor's equipment will be installed. If at some future time a change in system is necessitated, the same process is begun again. In other words, if an error in judgment was made initially, the responsibility for making a change in operation must be recommended by the agency head, bearing in mind that support dollars will again come out of his agency's budget.

2. The fact that each agency has a separate micrographics system is evidence of a decentralized system of records control.

3. The executive indicated a favorable position toward a satellite system if the need could be substantiated.

4. Basically, if faster services can be provided and the cost justified on an individual agency basis, most agency heads are favorable toward changes for the sake of improvement.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. The executive identified a faster processor plus a good library reader as a need described to a vendor. He indicated a need for all vendors to standardize like components. (NOTE: A synergistic approach to product development was a point made by two of the vendors.) As had one of the previous users, the executive in state government indicated the need for equipment that would provide return to original paper capability. He, too, mentioned the name of such a system new on the market and identified places in the South and in Atlanta where the system is in operation.

2. The executive pointed out that most of the microrecords systems in state agencies are open ended with about 90 percent compatibility with any vendor's system.

3. Most of the systems are serviced by the vendor. Some minor adjustments can be made in-house; most are handled by the vendor under contract.

COMPANY 306 CASE REPORT

Company 306 is one of the universities in the State University System of Georgia. The micrographics system in the university is used solely to maintain student records. The university is part of an educational complex but is the only agency in the complex utilizing this particular system.

Components

The university has microphotography equipment consisting of a planetary camera which conforms to microfilm. The film is stored on reels in boxes and housed in open shelving. The reading equipment is reader-printers. Whereas the university formerly photographed all information in student folders and dry-copied transcripts, only transcripts are copied, and on occasion a letter of reference, so as to maintain confidentiality. Hard copy is maintained in student folders, however, and the transcript is produced on the reader-printer.

Departments in the System

The executive in the interview could not respond to this question beyond that which is obvious. Since student records are the only items committed to microform, the Registrar's office is the only one using the system.

Documents Stored

As stated earlier, student records are the documents stored and retrieved by the micrographics system.

Contributions to Management

The executive identified accessibility of information as one contribution followed by the ease of retrievability. The security provided by having information on microfilm was a third contribution given.

Vendor Purported Advantages

Retrievability and ease of operation were the two advantages pointed out by the vendor prior to installation of the system according to the executive in Company 306.

Vendor Purported Disadvantages

The executive explained the way in which the micrographics systems are designed for all state agencies, the University System being one of these. The executive stated the present system meets the needs of the Registrar's office, and that no vendor really had the opportunity to talk about any disadvantages.

User Advantages

Company 306 found the ease of operation to be an advantage in working with the system, particularly where several different persons were using it. He also spoke about file integrity and reiterated the earlier point related to the security of records on microfilm.

User Disadvantages

Though not an operational disadvantage, the executive was of the opinion that being tied to having to use the film produced by the vendor is a minor disadvantage. However, he did mention that most state agencies purchase in large quantities and the chance of being out of film was remote.

Problems

The one problem described by the executive was slow processing. The problem does not become one of any magnitude, however, because large number of records are not needed simultaneously.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. The executive is of the opinion that the university administration is favorable to change in systems if it can be cost justified. Such changes requiring budgeting and operational changes are difficult to make if an existing operation appears to be functional.

2. The system is centralized since the Registrar's office is the only office utilizing it.

3. The executive could not respond to this question based on the fact that the university has no need for a satellite system of records.

4. Change is quite often slow to come, but the administration is primarily favorable to better ways of doing things if they are cost justified.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. About the only component mentioned to a vendor as a need is some way to achieve more rapid processing.

2. The microrecords system is open ended. It is an uncomplicated system and would conform to other vendors' systems.

3. The micrographics system is serviced by the vendor.

COMPANY 307 CASE REPORT

Company 307 is a large retailing establishment, and its micrographics system is in two different locations. The microphotography work is handled in downtown Atlanta where credit applications, mail orders, and a number of other transactions are converted to microfilm by the company's COM unit. Some transactions are transformed by the computer to ultrafiche at the same location. The ultrafiche are then sent back to the second installation which is the regional credit center. The interview was conducted at the second installation.

Components

CRT units input credit information to the computer and access information from it through alphanumeric coding. The company has viewing equipment to scan the ultrafiche, but there are reader-printers also should a customer, or anyone inhouse, request a copy of a credit transaction. The ultrafiche are stored in boxes in open shelving.

Departments in the System

Though Company 307 is a regional credit system, other departments feed into the installation located in downtown Atlanta. The executive stated that the micrographics system covers credit applications, credit imaging, records of billing, unit buying, parts control, national stop credit (similar to the Telex system), and has various input systems of checks and balances. While the investigator was conducting the interview and seeing the equipment in operation, simultaneously a Credit Information Clerk queried the computer on a customer record after receiving the request to do so from one of Company 307's stores in the region. The clerk keyed in the coding and the information appeared on the CRT screen and was relayed to another clerk who had called in. As a case in point, though CRT users have expressed concern about security and confidentiality of information, the investigator was more aware of the coding appearing on the screen and trying to understand its interpretation than whether a customer's name appeared. Understandably, this might be different when one is trained to use the CRT and is trained to access specific information to be transmitted by telecommunications.

Documents Stored

The executive indicated that Company 307 maintains a master file (microfilm) on every customer in the southern region. The master file stores catalog items in the micrographics system, and all accounts payments are entered into the system. The company's budgetary items are stored in the system.

Contributions to Management

The management of the company finds space reduction as a significant contribution to the company and the storing of large quantities of credit information. The executive commented that the retrievability of the system, particularly by CRT, was also a significant contribution of the system to management.

Vendor Purported Advantages

The executive could not respond to this question. As was true with other users, top management made the decision about the micrographics system used in all regional offices.

Vendor Purported Disadvantages

The executive could not respond to this question for the same reason as stated in No. 5.

User Advantages

The executive stated that ease of operation is the prime advantage of the micrographics system. Use of the CRT units was a second advantage. Prior to the CRT application, trays had to be brought to work stations and they took up considerable room.

User Disadvantages

One disadvantage identified by the company is the rear image viewing. After several hours of sitting before the microfiche viewer, the operator is fatigued. The executive spoke of the difficulty in changing the lamp in the view. The lamp use is 200 hours and has to be changed frequently because of almost constant use.

Problems

Company 307, as a regional office of a national firm, has had no real problems with the micrographics system. Servicing is done by the vendor and normally the company does not experience downtime.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. Basically, the company is favorable to systems changes if they can be cost justified.

2. Company 307 has a centralized records control system through time-shared computer capability and CRT access.

3. A satellite system is not needed by Company 307 since each regional credit office is already on a centralized system.

4. General procedures in the office can be changed if they are cost justified.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. Because of reasons stated earlier, the executive in Company 307 would not likely be involved in discussion with a vendor about replacement items.

2. The company's micrographics system is compatible with other vendors' systems.

3. The micrographics system in Company 307 is comprised of three vendors' products. Components of the system are serviced by the respective vendors.

COMPANY 308 CASE REPORT

Company 308 is a manufacturer which supplies one of the largest utilities, public and private, in the country. The company performs a series of functions for the utility primarily through seven distribution regions. As with some of the other users, the functions parallel the departments which feed into the microrecords system--accounting, engineering, quality control, warehousing, and service centers control.

Components

Drawing forms and engineering forms are the primary documents stored and retrieved by the micrographics system for dispersing to utility companies in the seven distribution centers serviced by Company 308. Because of the volume of drawings handled, the company maintains a COM-based reprographics system in house. The installation in Company 308 was the first time for the investigator to observe a reprographics system in operation.

The micrographics system has a planetary camera with a three-dimensional lens capability. Creases and tears in engineering and topographic drawings can be eliminated through a repeat photography process. A drawing is photographed then creases and tears noted on the negative are coated over with a fluid that shows up in different colors on the negative. The negative is printed and the copy examined. Whereas the blemish seen originally on the first negative may have been eliminated, others may appear through the dimensional magnification capability of the lens system. Therefore, through the repeat photography process all blemishes on the engineering and topographic drawings are eliminated ultimately.

In addition to the planetary camera, the micrographics system has processors, duplicators, printers, loaders and light sensory splicers. The system conforms to microfilm, microfiche, and aperture. Retrieval is by readers and reader-printers, COM, and CRT. Company 308 also has facsimile.

The COMPUgraphics system consists of a heavy-duty copier, a COMPUwriter which is computerized typesetting equipment, offset at four work stations, collators, and folders. The company also has a graphic arts section to complete the reprographics department.

The company's storage system is motorized, rotary files which house microfiche primarily. Motorized files also house drawing forms and engineering forms.

Departments in the System

According to the executive, the accounting, engineering, quality control, warehousing, and service centers control departments feed into the records management system. During the walk-through of the system in operation with the executive, the investigator saw row after row of flatbed and swingline files in which engineering drawings were housed.

One point should be made clear: whereas Company 308 does commit most of the engineering drawings to microfiche for storing and retrieving, it must also convert drawings to paper for field use. The company does a tremendous amount of photography and reprographics work for the public and privately owned utility it serves.

Documents Stored

As indicated earlier, Company 308 stores drawing forms and engineering drawings primarily. The system also stores engineering job specifications, source documents, and issue forms.

Contributions to Management

The executive in Company 308 sees space reduction, retrievability, and file integrity as the most significant contributions to management on the use of a micrographics system. Better utilization of personnel was identified as a contribution. The executive stated that any advantages gained through new methods and procedures are always significant to management.

Vendor Purported Advantages

In response to this question, the executive in Company 308 readily identified file integrity as a first advantage. The ease of operating the system was second, and cost reduction was the last advantage to be mentioned.

Vendor Purported Disadvantages

The executive stated that the vendor had pointed out that the system was more expensive than some of the other systems on the market. A second disadvantage was that the system will not perform all applications.

User Advantages

The executive in Company 308 identified cost reduction as a first advantage of the system with better personnel utilization mentioned second. Ease of operation and space reduction were identified as advantages. Due to the nature and volume of work performed by Company 308, the executive stated that the company would experience great difficulty in managing the vast repository of information were the micrographics system not available.

User Disadvantages

Limited printback and limited blowback were the first disadvantages identified by the executive. He talked also about the lack of compatibility of reduction standards which was a frequent disadvantage mentioned by several vendors. Company 308 has found to be a disadvantage the fact that the system does not have dual file requirements to back up and finish a job. The executive mentioned a statement also made by one of the vendors that the market dictates and does not necessarily meet user needs.

User Problems

Company 308 has found a few problems with the system which do not necessarily have anything to do with its operation. The executive commented about the limitations imposed by standards which inhibit user operations and the compatibility of programs. Limited equipment was also mentioned as a problem.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. The management of Company 308 is favorable toward change if it can be cost justified and if it means better management of operations. According to the executive, the company maintains a cost-avoidance posture.

2. Company 308's middle management is hesitant to consider change, so stated the executive, because of a somewhat limited viewpoint.

3. Management is favorable toward decentralization and, in fact, some departments are decentralized. The fact that the company operates in a seven-region concept with each region performing a different function points to decentralization.

4. The executive said that the company has found no necessity for a satellite system of records control.

5. Generally speaking, the management of Company 308 is favorable toward office changes so long as they are cost justified.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. Company 308 has a need for the capability of returning to original paper and has mentioned the need to a vendor. The company has indicated the need of a processor which eliminates the use of ammonia.

2. The micrographics system is open ended and, in fact, is made up of components from different vendors.

3. The system is serviced both in house and by the vendors.

COMPANY 309 CASE REPORT

Company 309 is a federal agency of government which, because of its nature, operates a micrographics system that is not totally available to the general public. The likelihood of limited access was anticipated by the investigator when the appointment was made.

There are two reasons for the inaccessibility. First, the section where tax records are retrieved by CRT and are being reviewed by examiners is locked. One sees the operation through a glass panel in the locked door. Viewing at close range is not permitted as it was where other users with CRT units accessed confidential and/or classified information. Second, federal regulations require that two of four document files maintained should be destroyed by shredding. One of the document files is destroyed on a weekly basis. The tapes of the retention register are destroyed and the accounts terminated after eighteen months.

It should be noted here that the appointment was made originally with an executive in Company 309 who was detained in a meeting in downtown Atlanta and could not get back at the appointed time. The assignment had been given to a management trainee in Program Management who handled the interview most capably. He was familiar with the micrographics system and the handling of records, and did quite a thorough job in describing the operating features of the system.

Components

Components of the agency's micrographics system are a processor, cassette film, reading equipment, CRT, wall-cabinet storage equipment, retrieval systems, and COM. Data are stored alphabetically on tape and cross referenced in multiple ways. Photographing is done at another site by COM.

Departments in the System

Sections, not departments, feed all types of tax accounts into the records system from five states which comprise a region. The sections are forms conversion, production management, operations, and personnel.

Documents Stored

The data base in Company 309 is an account register made up of business, individual, and residual accounts, and employee plans. By definition, residual accounts are low-volume accounts. Employee plans are tax exempt organizations. Deposits from businesses are identified by a tax ID number and a master tape is kept to locate misapplied payments.

Contributions to Management

The executive was unable to respond to this question. As was true in other of the user interviews, someone at a higher level made the decision that placed similar micrographics systems in the various regional offices.

Vendor Purported Advantages

The executive was unable to respond to this question for the same reason as stated in No. 4.

Vendor Purported Disadvantages

The executive was unable to respond to this question for the same reason as stated in No. 4.

User Advantages

Two advantages were identified by the executive. The first was the backup capability of the system, and the second was the capacity of the CRT to retain a large volume of data.

User Disadvantages

The executive commented that the microfilm cartridge system is a little slower than is practicable. A second disadvantage was the fact that several intervening steps in the systems' operation slow down records getting to the examiners.

User Problems

Only one minor problem was identified by the executive, this being that the end of the film cartridge comes loose at times.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. The agency management is favorable toward systems change if it can be cost justified, albeit decisions may be made elsewhere.

2. Response to this question was that the management is favorable toward a centralized records system. The question was not really appropriate for this particular agency because the agency operation, as a branch of federal government, is predetermined.

3. No response was given to this question. The very fact that the agency is a regional center of a federal government agency makes its records system on a satellite system in a sense. On the other hand, regulations pertaining to confidentiality require destroying certain parts of the account register as was described earlier. Looking at the operation from this point, there never is a total system for longer than a week at a time.

4. Office changes can be made and management is favorable toward proposed changes provided they are cost justified.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. The executive could not respond to question No. 1 because he would not be involved in making this kind of decision.

2. The microrecords system is not open ended according to the agency executive.

3. The system is serviced in house by trained personnel.

COMPANY 310 CASE REPORT

Company 310 is a utility in Jacksonville, Florida, whose total operation is in three locations. The business office, management, public relations, consumer services, and marketing are at one site. The district office is at another site, and the telecommunications systems is at a third site. Visits to the three sites were arranged by one of the company's school representatives. The interview actually was with an executive at the telecommunications center, and the case report deals primarily with the operation at the third site. Entry to the site was an unusual experience before ever seeing the installation. The school representative walked to a microphone in the wall of the building next to a double glass door and identified herself. There was a slight whirring sound which was the release of the electronic security system, and entry was gained. The same kind of security operated internally in some of the sections.

Components

The telecommunications network is comprised of different but related subsystems: (1) control computer system, (2) directory assistance system, (3) COM system, and (4) the billing and listing system. Acronyms are given to each of the systems, e.g., SUE (System User Engineered) is the control computer system designed for the utility by Lockheed. The directory assistance system for all of north Florida is RADRU III (Rapid Access Data Retrieval Unit). This latter system, the day of the visit, was manned by fifteen operators, but a computer controlled electronics system, INTERCEPT, was to be cut in the middle of the following month. In the operation, the micrographics system is a common base and is, therefore, described more in detail.

Components of this system consist of processors, COM, and the retrieval component is CDT, the company's terminology for CRT. The system conforms to microfilm and microfiche and all microphotography work is done in the company's film laboratory in Atlanta. In the microfilm splicing process, scrap film is shredded, placed in barrels, and destroyed. The ultrasonic film splicing process was the second seen by the investigator. Light sensors seal the film. Readers and reader-printers are also a part of the system.

Departments in the System

The executive at the telecommunications center listed four departments which feed into the system: the service department, the plant department, comptroller, and the traffic department, which is the records system. One function, customer billing and listing, is expanded in the case report to show the inter-relationship among subsystems of the network.

From Jacksonville and through the use of SUE, the programmed data processor, CORDNET (corporate data network) transmits a daily addendum of listings to Atlanta. INTERFILE receives the data which is photocomposed and transmitted on tapes back to RADRU III (rapid access data retrieval unit) in Jacksonville. RADRU III accesses every customer listing in the 904 area code section of north Florida at a rate of 1500 microfilm frames per second for directory assistance. Large cities are keyed individually on the terminal; small towns are grouped alphabetically and keyed by customer listings which are also grouped alphabetically. Twelve RADRU installations are in cities where the utility operates. While viewing the system in operation, the investigator saw computer chips for the first time.

Documents Stored

Company 310 stores microdata transmitted in the network which deals with customer record and billing. The tapes contain customer names, addresses, and numbers. Service orders are handled through the system, and the directory format for directory assistance is in the system.

Contributions to Management

The company's executive identified as a contribution to management the systems' capability as a tool for planning and increasing services to customers.

Vendor Purported Advantages

The fact that the system has stand-alone equipment was a first advantage purported by the vendor. The executive stated that the company was told that no environmental restrictions exist with the system in that it is not sensitive to electrostatic impulses. He stated that film updating was given as an advantage as was film resolution and splicing time.

Vendor Purported Disadvantages

The changing of film, lamp life of 200-400 hours, and decentralized COM filing were identified as disadvantages purported by the vendor to Company 310.

User Advantages

Company 310 finds the systems' retrievability to be an advantage, and the timelessness of the storage capacity. Use of the system as an effective tool for planning and production was also mentioned.

User Disadvantages

The executive in Company 310 identified computer downtime as the first disadvantage. (Note should be made that the executive in the interview to validate the User Interview instrument first mentioned this factor as a disadvantage.) The updating capability of the system was given as a disadvantage in addition to lamp life and the loss of time to change and splice tape as a hand operation. The executive was particularly emphatic about standards imposed by the Public Service Commission on utilities which he thinks inhibit operations and which are upheld by the Federal Communications Commission. The school representative was kind enough to suggest that the investigator obtain a copy of the Consumer Communications Reform Act of 1976, which delineates the respective positions of the Federal Communications Commission and the utility.

User Problems

The executive stated that Company 310 has encountered a few problems with the SUE (System User Engineered) system that would be found in any new operation.

Management Attitudes

The numbered comments in this section are in response to four questions about the attitude of the company's management toward systems change in the office. One of the original five questions was removed after the third interview to avoid redundancy.

1. Questions 1 and 2 were marked NR (no response) because they are inappropriate for Company 310, considering that it is a public utility.

3. Company 310 is favorable toward a satellite system and, in fact, has a small satellite system serving Lake City and Palatka, Florida, and a second system located in Chipley, Florida, serving the Panhandle section of the state.

4. The company is favorable to office systems changes, particularly one that involves a team concept.

General Information

The numbered comments in this section are in response to specific questions related to user need of products not on the market at the time of the present study, to compatibility of systems, and to servicing.

1. Company 310 has described to a vendor the need for a minicomputer similar to SUE to achieve greater cost savings. The company also needs a CDT data base package.

2. The micrographics system is open ended and utilized three different vendors' products.

3. Company 310's system is plant maintained.

VITA

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She was a high school teacher, supervising teacher, business teacher educator, and college admissions counselor in Georgia for 18 years prior to joining the Florida Department of Education, Tallahassee, in 1965. She has worked in business education in Florida as a curriculum specialist, regional consultant, and assistant program administrator.

On leave from the Department of Education in 1970-71, Miss Robinson accepted a teaching assistantship at The University of Tennessee, Knoxville, where she also worked as a research assistant while completing her program of studies. She returned to Florida in September, 1971 and resumed work until October, 1975 when a second leave was granted. She received the Doctor of Education degree with a major in Curriculum and Instruction in December, 1976.

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