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IMPLEMENTATION OF MICROFICHE IMAGE TRANSMISSION SYSTEM

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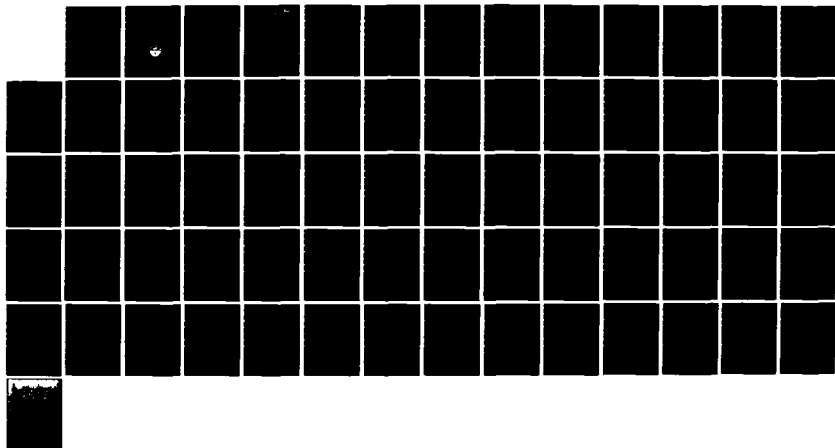
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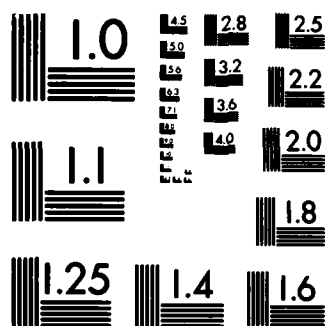
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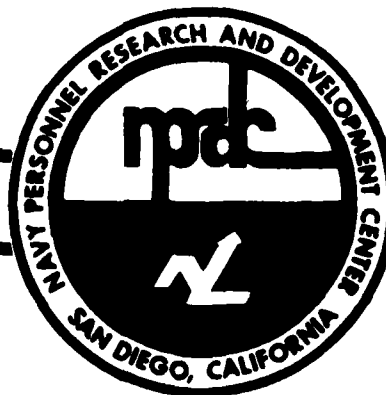
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JUNE 1983

**IMPLEMENTATION OF MICROFICHE IMAGE
TRANSMISSION SYSTEM (MITS): A MULTIFACETED
ASSESSMENT OF DEMONSTRATION INSTALLATION**

ADA 130562

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A multifaceted approach was employed to evaluate the introduction and implementation of a technological system--the microfiche image transmission system (MITS). Four different aspects of the demonstration installation were investigated: (1) operators' perception of MITS, (2) the requesters' acceptance of the services provided, (3) image quality, and (4) management's evaluation of the MITS implementation. The results revealed that the operators' perceptions of MITS were positive, the requesters		

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regarded MITS as highly satisfactory, the image quality of the facsimile input fiche was judged superior to the MITS output, and the managers and developers regarded the MITS implementation as a success. Issues concerning widespread application of MITS were seen as premature at this time.

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FOREWORD

This effort was performed in support of work unit N660018P000002 (Microfiche Image Transmission System (MITS)) and is part of a larger effort investigating the management of technological change in organizations. Results are directed primarily at persons who research and manage the implementation of technological change in organizations.

JAMES F. KELLY, JR.
Commanding Officer

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Technical Director

SUMMARY

Problem

The general decline of office productivity has not been limited to civilian offices. Increasing costs and administrative workloads have affected military offices as well. In response to this situation, the Naval Military Personnel Command (NMPC) developed and tested the microfiche image transmission system (MITS), which has the capability of providing a faster and more reliable means of transmitting personnel data from the central records storage to various remote sites.

Objective

The general objective of this investigation was to evaluate the implementation of MITS by employing a multifaceted approach that would address some of the problems inherent in the evaluation of a system that does not allow an ideal controlled-experiment approach. Specifically, the objectives of the investigation were to:

1. Evaluate the implementation of MITS as perceived by the operators of the system.
2. Determine the individual requester's acceptance of the service provided by MITS.
3. Evaluate the microfiche facsimile image quality.
4. Evaluate the implementation of MITS as perceived by individuals responsible for its development and implementation.

Each of these objectives was met using different subjects and procedures.

Approach

1. Seven MITS operators were interviewed concerning such areas as knowledge of the system, training, receptivity to the system, and operation and failure recovery of the system.
2. Fifty-one personnel record requesters completed a questionnaire dealing with the image quality, length of delivery time, and overall evaluation of the procedure.
3. Thirteen subjects judged, under controlled conditions, the quality of the input and output images to assess the readability of the MITS output.
4. Individuals responsible for MITS development and implementation were interviewed regarding the implementation.

Results

1. The overall reaction of the operators of MITS was positive.
2. Personnel record requesters evaluated MITS as a highly satisfactory delivery system.

3. The quality of the facsimile input fiche was seen as superior to that of the MITS output fiche.

4. Managers and developers of MITS judged it to be a success in the context of a demonstration, while its status in terms of the broader application remains open to question.

Conclusions

1. As a demonstration, the MITS can be regarded as a success.

2. It is not clear whether the present MITS would be suitable for more realistic applications with numerous stations.

3. The multifaceted approach used here provided a more comprehensive, realistic perspective of MITS than a single approach would have yielded.

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INTRODUCTION

Problem and Background

The general decline of office productivity has not been limited to civilian offices. Increasing costs and administrative workloads have affected military offices as well. In response to this situation, the Naval Military Personnel Command (NMPC) developed the military personnel record system (MPRS), which uses microfiche, rather than paper copy, for storage of all Navy military personnel records. These microfiche personnel records from NMPC's central records storage site in Washington, DC are sent to individual requesters by U.S. mail.

Recently, however, the increased volume of requests for personnel information has provided the opportunity to develop and test the microfiche image transmission system (MITS), which has the capability of providing a faster and more reliable means of transmitting the microfiche records from the central records storage to various remote sites. With MITS, original microfiche record images are retrieved and reproduced. These reproductions, or facsimile input fiche, are scanned at the central site and then transmitted electronically to the requester at the remote site in the form of microfiche facsimiles, or MITS output fiche.

During a 6-month demonstration of MITS in the Washington, DC area, personnel records were transmitted from NMPC to the Personnel Support Detachment (PERSUPP-DET), Anacostia, Washington, DC. The overall objective of the demonstration was to evaluate the feasibility of transmitting fiche images in an operational Navy environment, specifically for communication of personnel records.

Evaluation of a demonstration system with respect to its functioning and its impact on organizational output is vital to determine whether to continue, modify, or terminate the operation of the system. An ideal evaluation would involve a controlled experiment in which the system would be assigned randomly to one or more groups or sites, and other groups with similar characteristics would serve as a comparison. Most situations are less than ideal because of the limitations of the organizational settings. For example, time pressures may not allow sufficient time for pre- and postassessment, the numbers of people involved may be limited, or comparison sites may not be available. These limitations work against the ideal controlled-experiment approach. Alternative approaches are problematic. A one-shot assessment, particularly one that focuses on a specific or limited features of the system, has a potential for generating results that may lead to overgeneralizations or to faulty conclusions and recommendations.

The present investigation was handicapped by some of these constraints. Its scope was limited to a relatively small number of people at one site, a relatively short duration, and a lack of comparable comparison groups. Given these constraints, the investigators contended that an approach that incorporated several means of studying the system and that obtained information from persons who were involved with the system in different ways as planners, operators, or users would avoid some of the pitfalls inherent in a one-shot assessment.

Objectives

The general objective of this investigation was to employ a multifaceted approach that would circumvent some of these evaluation problems and provide a broader perspective of MITS. Specifically, the objectives of the investigation were:

1. To evaluate the implementation of MITS as perceived by the operators of the system.
2. To determine the individual requester's acceptance of the service provided by MITS.
3. To evaluate the microfiche facsimile image quality.
4. To evaluate the implementation of MITS as perceived by individuals responsible for its implementation.

Each of these objectives was met using different subjects and procedures and is presented in a separate section of this report.

EVALUATION OF MITS BY OPERATORS

Purpose

The purpose of this study was to evaluate the implementation of MITS as perceived by the operators of the system with emphasis on knowledge of the system, training, receptivity to the system, and operation and failure recovery of the system.

Approach

Subjects

Seven MITS operators, four at the central site and three at the remote site, participated in this study. In addition, the person responsible for maintenance of the system was interviewed when the second wave of interviews was conducted. Two of the remote site operators were civilian Navy employees; the third was a chief warrant officer. All central site operators and the maintenance person were employees of the Planning Research Corporation.

Interview Form

An interview form for the MITS operators was developed (see Appendix A) to assess knowledge of the system, training, receptivity to the system, and operation and failure recovery of the system. The interview items are described below:

1. Background. Items 1 to 3 obtained information on the subjects' job background.
2. General. Items 4 to 20 assessed the subjects' knowledge of the system and the training.
3. Central site operator's manual. Items 21 to 41 asked the central site operators to assess the operation, maintenance, and failure recovery of the operator console and image acquisition unit at the central site.

4. Remote site operator's manual. Items 42 to 62 asked the remote site operators to assess the operation, maintenance, and failure recovery of the terminal and recorder at the remote site.

5. MITS vs. MPRS. In items 63 to 71, the subjects compared the MITS operating procedure with the existing standard MPRS operating procedure.

6. Present vs. prior job. In items 72 to 86, subjects compared their job since operating MITS with their job prior to the introduction of MITS.

7. Consequences. Items 87 to 96 asked the subjects to assess the advantages, disadvantages, and probability of success of MITS, as well as to give their overall reaction to MITS and any additional applications for MITS.

Procedure

The operators were interviewed in December 1981 and again in April 1982. All interviews were conducted individually, recorded on tape, and ranged in length from 30 to 45 minutes.

Results

Interview data bearing on such areas as receptivity to the system, system failure, and operating problems were obtained at two points in time. Response means presented in Table A-1, show that, with a few exceptions, the means obtained from the second assessment differ very little from those obtained from the first. Because of the high degree of similarity of results between the two assessments and because the responses of the second assessment were based on more knowledge about MITS, emphasis will be placed on the data obtained from the second set of interviews.

Knowledge of the System and Training

The first set of responses are concerned with the operators' depth of understanding of the system and their assessment of the training they were offered. The response means for the relevant items are included in Table 1. The interviewees reported that they understood the purpose of MITS to a great extent. They also felt that others in their work unit were very knowledgeable about the system, that information was made available to them, and that they received extensive training. They judged the training to be extremely helpful and rated it very positively. They also felt that the training tended to focus on the practical problems that arise when using MITS.

Receptivity to MITS

Table 1 also includes the response means for items associated with receptivity to MITS. As indicated by the first three items, the need for MITS was perceived by the interviewees to be moderate. They saw management as assigning greater importance to MITS than they had. The findings also indicate that the interviewees were supportive of MITS, they estimated slightly more benefits than costs in using the system, their overall reaction towards MITS was positive, and they placed high value on the usefulness of MITS. It is of interest to note that the interviewees were significantly more positive concerning the value of MITS on the second assessment than on the first; 8 vs. 6 on the 10-point scale (see Table A-1).

Table 1
Response Means for Questionnaire Items

Questionnaire Item	Response Mean ^a
Knowledge and Training	
Personal understanding	3.88
Others' knowledge	3.88
Availability of information	3.63
Extent of training	4.14
Practical focus of training	3.88
Helpfulness of training	4.57
Overall evaluation of training	4.43
Receptivity of MITS	
Need for MITS (self)	2.88
Perceived need for MITS (upper management)	3.50
Perceived importance (upper management)	4.14
Personal support of MITS (idea)	3.50
Cost/benefit ratio	3.28
Overall reaction of MITS	4.13
Value of MITS	8.13 ^b

Note. Responses made by eight subjects (the four central site operators, three remote site operators, and the maintenance person).

^a All means, except where noted, are based on responses to a 5-point scale, where 1 = low and 5 = high.

^b This mean is based on responses to a 10-point scale, where 1 = low and 10 = high.

Operation and Failure Recovery of MITS

All respondents agreed that the MITS components at the central and remote sites are easy to operate. They indicated that, since the operating instructions given during training were very clear and complete, they did not use the manual. All of the central site operators reported a tendency to make data entry errors on the operator console, which all agreed were very easy to rectify. It was suggested that having a proper chair and space for data sheets would alleviate this problem. All respondents judged the failure messages to be very clear. A majority suggested that a supplemental audible message be installed.

Table 2 presents the types of failure, frequency of failure, and failure recovery time at the central and remote sites. As shown, the central site operators reported these types of failures: chemical, scanning, disc not ready, and disc errors. The remote site operators reported: film jammed, loose springs, burned out bearings, roller skewed, camera did not readjust, wheels eroded by chemicals, loss of vacuum, and machine locked in one position.

Table 2
Type and Frequency of Failures and Failure Recovery Time

Item	Central Site	Remote Site
Type of failure	Chemical failure Scanning failure Disc not ready Disc errors	Film jammed Loose springs Bearings burned out Roller skewed Camera did not readjust Wheels eroded by chemicals Loss of vacuum Machine locked
Frequency of failure	1-10 per week	2-5 per week
Failure recovery time	Depending on failure, 2-30 minutes	Depending on failure, 5 minutes to 1 day

At the time of the interviews, it was reported that all system failures, which ranged from 1 to 10 per week at the central site and 2 to 5 per week at the remote site, were being handled by maintenance personnel. Interviewees reported that maintenance personnel were very easily contacted and responded within a reasonable amount of time. The failure recovery time ranged from 2 to 30 minutes at the central site and from 5 minutes to 1 day at the remote site. Recovery time was reported to be dependent on the type of failure. In discussing the question of failure recovery and maintenance of the system, the central site operators expressed a desire to handle simple failure recoveries and maintenance themselves.

EVALUATION OF MITS BY PERSONNEL RECORD REQUESTERS

Purpose

The purpose of this study was to determine the acceptance of the service provided with MITS by individuals requesting their personnel records. Of interest were the image quality of the records, the turnaround time, the overall evaluation of the MITS procedure, a comparison of the service provided by MITS and the standard service provided without MITS, and an assessment of packed and unpacked facsimile formats of MITS output. (In the unpacked format, the images on the MITS output fiche are located in the same rows and columns as the corresponding images on the facsimile input fiche. In the packed

format, the images are sequentially placed on the MITS output fiche without reproducing the blank areas.)

Approach

Subjects

Navy military personnel who requested their records from PERSUPPDET Anacostia in May and June 1982 were asked to participate in this study. There were 51 respondents, 14 officers and 37 enlisted personnel. Five of the enlisted personnel were female; all other subjects were male.

Questionnaire

A short 13-item questionnaire (see Appendix B) was developed to assess the microfiche facsimile image quality, length of delivery time, and expected turnaround time, as well as to evaluate the overall procedure. Items were multiple-choice and open-ended. If the respondents had previously requested their microfiche records, they were asked to compare the present service with the previous service. Also, packed and unpacked facsimiles were assessed.

Procedures

Subjects were given the questionnaire by the system operators when they picked up their microfiche records from PERSUPPDET Anacostia. They were asked to mail the completed questionnaires to the investigators. The questionnaire took about 5 minutes to complete.

Results

Of major interest were the requester's responses to four questions concerning the microfacsimile records produced by MITS: overall image quality, length of response time, expected turnaround time, and overall evaluation of the MITS procedure. Table 3 presents the frequency and percentage of responses for each category. As can be seen, 47 percent of the requesters judged the image quality to be good or excellent, and 22 percent judged them to be less than satisfactory. With respect to the waiting period, 73 percent reported that they were required to wait 30 minutes or more. Only 8 percent stated that the turnaround time was longer than they expected, while 57 percent reported that it was faster than expected. The responses to the final question indicated that, in general, the requesters were very positive about the MITS procedure; 76 percent evaluated the procedure as either good or excellent. Overall, MITS was seen as a highly satisfactory delivery system.

All of the item response frequencies and percentages for the various subsets (e.g., packed, unpacked, officers, enlisted) as well as for the total set are presented in Table B-1. Overall, the response patterns for the subsets did not differ significantly.

There were also several items specifically for requesters who had previously requested their microfiche records. Sixty-six percent of the respondents indicated that the present service (MITS) was much faster; 83 percent found it easier to request a record with the present service, and 75 percent prefer the present service.

Table 3

Responses to Image Quality, Length of Response Time, Expected Turnaround Time, and Evaluation Items

Item	Responses	
	Number	Percent
Overall image quality:		
Excellent	11	22
Good	13	25
OK	15	29
Poor	9	18
Unreadable	2	4
No response	1	2
Total	51	100
Length of response time:		
Less than 15 minutes	1	2
15 to 30 minutes	9	18
30 to 60 minutes	12	24
More than 60 minutes	25	49
No response	4	8
Total	51	101
Expected turnaround time:		
Much faster	18	35
Faster	11	22
As expected	13	25
Slower	2	4
Much slower	2	4
No response	5	10
Total	51	100
Overall evaluation of MITS procedure:		
Excellent	24	47
Good	15	29
OK	9	18
Not good	0	0
Poor	3	6
Total	51	100

IMAGE QUALITY EVALUATION

Purpose

The purposes of this study were (1) to compare the image quality of facsimile input with the companion output from MITS, and (2) to assess the readability of the MITS output.

Approach

Subjects

Thirteen personnel (five enlisted, one officer, and seven civilian) volunteered to participate in this study. Four of the participants were female; and nine, male. All subjects worked at the Navy Personnel Research and Development Center, San Diego.

Test Design

Subjects were assigned to one of two conditions:

1. In Condition 1, subjects (N = 8) compared the image quality of samples of the facsimile input with the companion MITS output.
2. In Condition 2, subjects (N = 5) assessed the readability of samples of the MITS output.

Materials

The materials consisted of a microfiche reader, response sheets, and 80 viewing cards.

Eighty facsimile fiche and their respective MITS output were randomly selected. For Condition 1, each pair of fiche was mounted on a 3- by 5-inch viewing card; for Condition 2, the facsimile input fiche was covered so that only the MITS output fiche was visible. Two response sheets were developed to assess the image quality and readability of the microfiche.

Procedure

Subjects were tested individually. The experimenter read the instructions to the subject (see Appendix C) and demonstrated the task. The subject was shown four practice viewing cards and encouraged to ask questions. Once the subject demonstrated that he or she understood the test procedure, the test began.

The experimenter inserted the viewing cards into the microfiche reader. The subject was allowed to view each image for 5 to 10 seconds. Any subject who found a judgment difficult to make was allowed to scan each image twice.

In Condition 1, the subjects compared the two images on 80 viewing cards and indicated the fiche with the better quality image on the response sheet. In Condition 2, the subjects viewed only the MITS output fiche from the same 80 viewing cards and rated the readability of each image on a 3-point readability scale (i.e., readable, somewhat readable, or not at all readable) on the response sheet. The experimenter then inserted

the next viewing card. The process continued until all 80 viewing cards were evaluated and took 20 to 30 minutes.

Results

Condition 1. Image Quality

Table 4 presents the image quality judgment data for each subject. The data give the number and percentage of times that the facsimile input was selected. As can be seen, all eight subjects selected the originals more often. The overall percentage was 88 percent. A chi square analysis across subject preferences was highly significant ($p < .0001$).

Table 4
Results of Image Quality Paired-Comparison Study

Subject	Original Selected	
	Frequency	Percentage
1	54	65.7
2	70	87.5
3	80	100.0
4	76	95.0
5	69	86.2
6	68	85.0
7	72	90.0
8	74	92.5
Overall mean	70.4	88.0

Note. N = 80 paired comparisons.

Condition 2. Readability

The five subjects in this condition judged the readability of each MITS output fiche. Table 5 shows the degree of readability data for each subject. The subjects judged that 35 percent were readable, 40 percent were somewhat readable, and 26 percent were unreadable.

Table 5
Results of Readability Study

Subject	Responses					
	Readable		Somewhat Readable		Not Readable	
	No.	%	No.	%	No.	%
1	34	42.5	29	36.2	17	21.2
2	22	27.5	33	41.2	25	31.2
3	21	26.2	26	32.5	33	41.2
4	35	43.8	35	43.8	10	12.5
5	27	33.8	35	43.8	18	22.5
Overall mean	27.8	34.8	31.6	39.5	20.6	25.7

Note. N = 80 output fiche.

IMPLEMENTATION ISSUES IDENTIFIED BY MANAGERS AND DEVELOPERS OF MITS

Purpose

The purpose of this study was to evaluate how the individuals responsible for the implementation of MITS--the managers and developers of the system--perceive its implementation. There were three major areas of concern: staffing, implementation problems, and the significance of MITS.

Approach

Subjects

Eight individuals in charge of the implementation of MITS--four managerial and four technical personnel--participated in this study. The technical personnel were involved in the design and development of the system. One technical person and two managers were civilian Navy employees; the third manager was a Navy captain. All others were employed by the Planning Research Corporation.

Interview Form

The interview form developed for the personnel in charge of the implementation of MITS (see Appendix D) focused on the implementation of MITS, staffing, and consequences of MITS. The interview items are described below:

1. Background personnel. Items 1 to 3 obtained information on the subjects' job background.
2. Background system. Items 4 to 11 assessed the subjects' knowledge and support of the system.

3. Implementation. Items 12 to 22 were concerned with the implementation of the system--the subjects' role in the implementation, actions affecting the implementation, and obstacles encountered.

4. Staffing. Items 23 to 29 asked managers and technical personnel and the system developer to assess the skills and knowledge needed to operate MITS.

5. Consequences. Items 30 to 37 asked the subjects to assess the advantages, disadvantages, and probability of success of MITS, as well as to give their overall reaction to MITS and other applications for MITS.

Procedure

All interviews were conducted individually in April 1982, were tape recorded, and ranged in length from 30 to 45 minutes.

Results

The three areas concerning the implementation of MITS covered in the interviews with individuals responsible for its implementation were staffing, problems associated with implementation, and the significance of MITS. Some of the responses are quoted in Appendix E.

OVERVIEW OF RESULTS

Study 1. Evaluation of MITS by Operators

1. The overall reaction of the operators to MITS was positive.
2. The operators reported having the knowledge necessary to operate the system due to the information available and the extensive training.
3. With respect to the value of MITS, the operators were more positive on the second assessment than on the first.
4. All agreed that the MITS components at the central and remote sites were easy to operate.
5. System failures were handled within a reasonable response time in a satisfactory manner.
6. The operators did not become frustrated or disenchanted with the system because of the fairly frequent system failures.

Study 2. Evaluation of MITS by Personnel Record Requesters

1. Overall, MITS was evaluated as a highly satisfactory delivery system.
2. The majority of personnel record requesters assessed the quality of the output image as adequate or better than adequate.
3. The majority of the requesters gave MITS an overall evaluation of good or excellent.

4. Overall, the response patterns for the various subsets (e.g., unpacked, packed, officer, enlisted) did not differ significantly.

5. Respondents who had previously requested their records rated the MITS service as faster and found requesting a record easier than the previous service and preferred the present service to the previous service.

Study 3. Image Quality Evaluation

1. The image quality of the facsimile input fiche was assessed to be superior to that of the MITS output fiche.

2. An independent panel of judges considered 26 percent of the randomly selected MITS output fiche images to be "unreadable."

Study 4. Implementation Issues Identified by Managers and Developers of MITS

1. High skill levels are not necessary for successful operation of the equipment.

2. Somewhat higher skill levels or ratings are required for maintenance personnel than for operators.

3. Shortfalls in equipment performance and funding were cited as the primary obstacles to successful implementation.

4. The skills as well as the level of effort and commitment of all persons directly involved with MITS were cited as the primary reasons for success.

5. The implementation of MITS was considered to be difficult.

6. MITS was judged to be a success when viewed in the context that it was a demonstration installation, while its status in terms of broader application in the fleet remains open to question.

DISCUSSION

Considered in its entirety, the four studies provide information that prompts the conclusion that the MITS project was a success. It must be underscored that this success refers to MITS as a demonstration project. Support for this contention stems from the receptivity of the operators, the favorable overall reactions of Navy personnel who had requested records, and the conclusions of the project staff that MITS was demonstrated to be a reliable and speedy system for sending information.

It should be pointed out that these studies in toto provide stronger conclusions than do the separate studies. For example, the managers' observations and conclusions of the success of the implementation in Study 4 (Implementation Issues Identified by Managers and Developers of MITS) are bolstered by the independent observations of the operators in Study 1 (Evaluation of MITS by Operators). Results from any of the studies taken individually would most likely have led to different conclusions. Results from Study 3 (Image Quality Evaluation) would have suggested that MITS had very little value. However, from Study 2 (Evaluation of MITS by Personnel Record Requesters), one might have drawn an opposing conclusion. The combined results of the two studies provide a

more realistic assessment. In fact, the availability of these different data inputs allow for an easier assimilation of negative results in the assessment of MITS. These shortcomings can be acknowledged without resulting in an overall rejection of MITS. Use of multiple approaches provides a more comprehensive and realistic perspective of MITS.

With respect to the shortcomings of MITS, the reports of chronic breakdowns indicate some flaws in the design, equipment, and the process employed. However, most of the problems were quickly corrected, as reported by the operators. A more serious problem associated with microfacsimile is image degradation. Clearly, Study 3 indicated the image quality of the facsimile input was superior to that of the MITS output. It should be noted, however, that these results (Study 3) are not incongruous with those from Study 2, which showed the majority of requesters satisfied with this procedure. For their purposes, the requesters found the display of their records in MITS output satisfactory. Under controlled conditions where comparisons were required, however, the microfacsimiles did not measure up to the originals. Another shortcoming cited was the need to automate the overall MITS or some variant.

Aside from the design and equipment problems, most implementation efforts fail because of problems that are termed "people problems." These appear to have successfully dealt with here, as shown by the observations of the operators. The fact that the system did not entail a major skill level adjustment should not be seen as the primary reason for the enthusiasm and positive attitudes of the operators. MITS did require some changes in their work and the operators and maintenance personnel experienced new problems as a result of the introduction of MITS. It is to the credit of the project staff and the operators that resistance to the new procedure was for all purposes nonexistent. This was brought about by providing operators with the requisite training, establishing procedures for the rapid response to problems when they occurred, and cultivating commitment in the operators by including them as a real part of the demonstration team. The approach taken by those managing the implementation contributed significantly to an atmosphere that permitted a fair and thorough test of MITS to determine its viability.

In summary, this report provides an approach that can be used when circumstances are less than ideal. As with the MITS demonstration project, where a test system is limited to one site for a relatively short time, particular attention should be given to evaluating a variety of features of the system that appear to be significant for its operation and potential success. The multifaceted approach of this investigation provided a more comprehensive perspective of MITS than a singular approach would have yielded, and both advantages and shortcomings were more easily assimilated in the overall composite. More importantly, conclusions can be drawn regarding the shortcomings of the MITS demonstration project at this time, while suggesting the potential impact of MITS in the future.

CONCLUSIONS

1. As a demonstration, the MITS can be regarded as a success.
2. It is not clear whether the present MITS would be suitable for more realistic applications with numerous stations.
3. The multifaceted approach used here provided a more comprehensive, realistic perspective of MITS than a single approach would have yielded.

APPENDIX A
MICROFICHE IMAGE TRANSMISSION SYSTEM (MITS)
INTERVIEW (FORM A) AND RESPONSES

MICROFICHE IMAGE TRANSMISSION SYSTEM (MITS) INTERVIEW (FORM A)

Purpose

The following interview has been prepared to help the Navy determine the effectiveness of the Microfiche Image Transmission System. We would like to know your point of view.

Thank you for your help.

Confidentiality

Everything you say in this interview will be kept confidential. Your name will not be associated with your responses and with final analyzed results.

With your permission, I would like to tape record this interview to help me with my notetaking.

A. Background

1. What is your job title?
2. How long have you had this position?
3. How long have you worked here?

B. General

4. To what extent do you understand what MITS is supposed to accomplish in this unit?
 - a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.
5. To what extent has information on MITS been made available?
 - a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.
6. What do you feel is the objective of the Microfiche Image Transmission System?
7. Do you feel that there is a need for MITS in this unit?
 - a. Very great need.
 - b. Great need.
 - c. Some need.
 - d. Little need.
 - e. No need.
8. To what extent do you support the idea of having MITS in this unit?
 - a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.
9. To what extent are you involved in using MITS?
 - a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.

10. Have you received training in the use of MITS? Please elaborate.
- Received very extensive training.
 - Received extensive training.
 - Received some training.
 - Received a little training.
 - Received no training.
11. Considering the training, information, advice, and assistance you have received regarding MITS, how much has this training, etc. focused on the practical problems you have to deal with in using MITS? Please elaborate.
- Very great deal of focus.
 - Great deal of focus.
 - Some focus.
 - Little focus.
 - Very little focus.
12. Are there any practical problems associated with using MITS? What are they?
13. Do you at this time feel that you have the appropriate skills and knowledge necessary to use the new equipment?
- Central site:

(1) Operator console	Yes	No	Please elaborate.
(2) Image acquisition unit	Yes	No	Please elaborate.
 - Remote site:

(1) Request terminal	Yes	No	Please elaborate.
(2) Recorder	Yes	No	Please elaborate.
14. Please rate the training on the following scales?
- | | | | | |
|-------------------------------|---|------------------|---|--------------------|
| a. Extremely helpful | | Somewhat helpful | | Not at all helpful |
| 5 | 4 | 3 | 2 | 1 |
| b. Excellent | | Average | | Poor |
| 5 | 4 | 3 | 2 | 1 |
| c. Comments, recommendations: | | | | |

15. How much effort does it take to learn to effectively operate MITS?
- a. Great deal of effort.
 - b. Good deal of effort.
 - c. Some effort.
 - d. Little effort.
 - e. Very little effort.
16. Do you feel that others in your work unit (i.e., those involved with MITS) are knowledgeable about what MITS is all about?
- a. Completely knowledgeable.
 - b. Very knowledgeable.
 - c. Somewhat knowledgeable.
 - d. Not very knowledgeable.
 - e. Not at all knowledgeable.
17. Does upper management feel that there is a need for MITS in this unit?
- a. Very great need.
 - b. Great need.
 - c. Some need.
 - d. Little need.
 - e. No need.
18. Does upper management regard MITS as being important?
- a. They see it as being very important.
 - b. They see it as being important.
 - c. They see it as being somewhat important.
 - d. They see it as being unimportant.
 - e. They see it as being very unimportant.
19. Have you been given the necessary time needed to do the things that must be done in order to implement MITS?
- a. Given all the time necessary.
 - b. Given most of the time necessary.
 - c. Given some of the time necessary.
 - d. Given very little of the time necessary.
20. How difficult is and will the implementation of MITS be in your unit?
- a. Very difficult.
 - b. Difficult.
 - c. Somewhat difficult.
 - d. Easy.
 - e. Very easy.

C. Central Site Operator's Manual

The questions in this section are concerned with the operation, maintenance, and failure recovery of the operator console and image acquisition unit at the central site. The following questions pertain to the operation of the operator console.

21a. Do you use the manual at all? ¹

21. How clear are the instructions?

- a. Very clear and understandable.
- b. Clear and understandable.
- c. Adequate.
- d. A bit difficult to understand.
- e. Not clear at all.

(1) Problems, comments:

22. Has anything been left out of the instructions?

- a. No.
- b. Yes.

(1) If Yes, what has been left out?

23. Do you feel that there might be a better procedure?

- a. No.
- b. Yes.

(1) If Yes, what do you suggest?

24. Is there a tendency to make data entry errors?

- a. No.
- b. Yes.

(1) If Yes, why? What kind of errors?

25. How difficult is it to correct data entry errors?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

¹Skip numbers 21, 22, and 23 if they do not use the manual.

26. In general, how difficult is it to operate the operator console?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

The following questions pertain to the operation of the image acquisition unit.

Do you use the manual at all?²

27. How clear are the instructions?

- a. Very clear and understandable.
 - b. Clear and understandable.
 - c. Adequate.
 - d. A bit difficult to understand.
 - e. Not clear at all.
- (1) Problems, comments:

28. Has anything been left out of the instructions?

- a. No.
 - b. Yes.
- (1) If Yes, what has been left out?

29. Do you feel that there might be a better procedure?

- a. No.
 - b. Yes.
- (1) If Yes, what do you suggest?

30. In general, how difficult is it to operate the image acquisition unit?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

²Skip numbers 27, 28, and 29 if they do not use the manual.

The following questions pertain to the routine maintenance activities at the central site (change paper, ribbons).

31a. Do you use the manual at all?*

31. How clear are the instructions?

- a. Very clear and understandable.
 - b. Clear and understandable.
 - c. Adequate.
 - d. A bit difficult to understand.
 - e. Not clear at all.
- (1) Problems, comments:

32. Has anything been left out of the instructions?

- a. No.
 - b. Yes.
- (1) If Yes, what has been left out?

33. Do you feel that there might be a better procedure?

- a. No.
 - b. Yes.
- (1) If Yes, what do you suggest?

34. In general, how difficult are the routine maintenance activities at the central site?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

The following questions pertain to the failure recovery procedures at the central site.

35a. Do you use the manual at all?

*Skip numbers 31, 32, and 33 if they do not use the manual.

35. How clear are the failure messages?

- a. Very clear.
- b. Clear.
- c. Adequate.
- d. A bit unclear.
- e. Not clear at all.

36. Have there been failures that did not result in a failure message?

- a. No.
- b. Yes.
(1) If Yes, what failures?

37. How frequent are the failures?

- a. Very frequent.
- b. Frequent.
- c. Occasional.
- d. Few.
- e. Rare.
(1) About how many per week?

38. How difficult is it to contact maintenance?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

39. How long does it usually take maintenance to respond?

39a. What kinds of failures have occurred?

40. How long does it usually take to recover from the different kinds of failures?

40a. How frequent are the different types of failures?

41. In general, how difficult is it to recover failures at the central site?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

D. Remote Site Operator's Manual

The questions in this section are concerned with the operation, maintenance, and failure recovery of the request terminal and recorder at the remote site.

The following questions pertain to the operation of the request terminal.

42a. Do you use the manual at all?^{*}

42. How clear are the instructions?

- a. Very clear and understandable.
 - b. Clear and understandable.
 - c. Adequate.
 - d. A bit difficult to understand.
 - e. Not clear at all.
- (1) Problems, comments:

43. Has anything been left out of the instructions?

- a. No.
 - b. Yes.
- (1) If Yes, what has been left out?

44. Do you feel that there might be a better procedure?

- a. No.
 - b. Yes.
- (1) If Yes, why? What do you suggest?

45. Is there a tendency to make data entry errors?

- a. No.
 - b. Yes.
- (1) If Yes, why? What kind of errors?

^{*}Skip numbers 42, 43, and 44 if they do not use the manual.

46. How difficult is it to correct data entry errors?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

47. In general, how difficult is it to operate the request terminal?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

The following questions pertain to the operation of the recorder.

48a. Do you use the manual at all?⁵

48. How clear are the instructions?

- a. Very clear and understandable.
- b. Clear and understandable.
- c. Adequate.
- d. A bit difficult to understand.
- e. Not clear at all.

(1) Problems, comments:

49. Has anything been left out of the instructions?

- a. No.
- b. Yes.
(1) If Yes, what has been left out?

50. Do you feel that there might be a better procedure?

- a. No.
- b. Yes.
(1) If Yes, what do you suggest?

⁵Skip numbers 48, 49, and 50 if they do not use the manual.

51. In general, how difficult is it to operate the recorder?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

The following questions pertain to the routine maintenance of the recorder (change film, chemicals).

52a. Do you use the manual at all? ⁶

52. How clear are the instructions?

- a. Very clear and understandable.
 - b. Clear and understandable.
 - c. Adequate.
 - d. A bit difficult to understand.
 - e. Not clear at all.
- (1) Problems, comments:

53. Has anything been left out of the instructions?

- a. No.
 - b. Yes.
- (1) If Yes, what has been left out?

54. Do you feel that there might be a better procedure?

- a. No.
 - b. Yes.
- (1) If Yes, what do you suggest?

55. In general, how difficult is the routine maintenance of the recorder?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

⁶Skip numbers 52, 53, and 54 if they do not use the manual.

The following questions pertain to the failure recovery procedures at the remote site.

56a. Do you use the manual at all?

56. How clear are the failure messages?

- a. Very clear.
- b. Clear.
- c. Adequate.
- d. A bit unclear.
- e. Not clear at all.

57. Have there been failures that did not result in a failure message?

- a. No.
- b. Yes.
(1) If Yes, what failures?

58. How frequent are the failures?

- a. Very frequent.
- b. Frequent.
- c. Occasional.
- d. Few.
- e. Rare.
(1) About how many per week?

59. How difficult is it to contact maintenance?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

60. How long does it usually take maintenance to respond?

60a. What kinds of failures have occurred?

61. How long does it usually take to recover from the different kinds of failures?

61a. How frequent are the different types of failures?

62. In general, how difficult is it to recover failures at the remote site?

- a. Very difficult.
- b. Difficult.
- c. Not difficult at all.
- d. Easy.
- e. Very easy.

E. MITS vs. SOP

In this section, we would like you to compare the Microfiche Image Transmission System operating procedure with the existing standard MPRS operating procedures. (Scale B)

63. MITS is much easier to operate than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

64. MITS is more reliable than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

65. MITS is much faster than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

66. MITS has more problems than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

67. MITS has more downtime than the standard MPRS operating procedures.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

68. MITS is more accurate than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

69. MITS demands greater operator accuracy than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

70. MITS demands more operator skills than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

71. MITS satisfies more of the client's needs than the standard MPRS operating procedure.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

F. Present vs. Prior Job

In this section, we would like you to tell us about your job since you began using MITS as compared with your job prior to the introduction of MITS. (Scale B)

72. Since MITS, my job is much easier.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

73. Since MITS, I have a greater variety of tasks.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

74. Since MITS, I have much more responsibility.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

75. Since MITS, my job requires more skills.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

76. Since MITS, I have more job autonomy.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

77. Since MITS, I have more busy work.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

78. Since MITS, I have become more efficient.

Strongly agree		Neutral		Strongly disagree
5	4	3	2	1

79. Since MITS, the work unit has become more efficient.

Strongly agree			Neutral		Strongly disagree
5	4	3	2	1	

80. Since MITS, my job has become more interesting.

Strongly agree			Neutral		Strongly disagree
5	4	3	2	1	

81. Since MITS, I am more satisfied with my job.

Strongly agree			Neutral		Strongly disagree
5	4	3	2	1	

82. In general, to what extent has MITS affected your work life thus far?

Very positive		No difference		Very negative
5	4	3	2	1

83. In what significant ways has your job changed?

a. Have your responsibilities/duties changed?

(1) No.

(2) Yes.

(a) If Yes, in what ways?

b. Are new skills required?

(1) No.

(2) Yes.

(a) If Yes, what new skills?

84. To what extent do you feel that MITS has changed the work procedures of your unit?

a. Very great extent.

b. Great extent.

c. Some extent.

d. Little extent.

e. Very little extent.

85. Do you feel that the use of MITS will require changes in the formal organization of your unit?

a. Will require very great changes.

b. Will require great changes.

c. Will require some changes.

d. Will require few changes.

e. Will require no changes.

86. To what extent do you feel the formal management structure will change because of MITS?

- a. Very great extent.
- b. Great extent.
- c. Some extent.
- d. Little extent.
- e. Very little extent.

G. Consequences

87. When new systems are introduced they may sometimes have positive consequences, sometimes negative consequences, sometimes both.

a. Do you see any positive consequences for yourself?

- (1) No.
- (2) Yes.
 - (a) If Yes, what?

b. Do you see any negative consequences for yourself?

- (1) No.
- (2) Yes.
 - (a) If Yes, what?

88. What are the advantages of MITS?

89. What are the disadvantages of MITS?

90. How do you feel the benefits compare with the costs of having MITS?

- a. Benefits outweigh the costs to a great extent.
- b. Benefits outweigh the costs.
- c. About the same.
- d. Costs outweigh the benefits.
- e. Costs outweigh the benefits to a great extent.

91. At this time, what is your overall reaction to MITS? (Scale E)

Very positive		No difference		Very negative
5	4	3	2	1

- 91a. Has your reaction changed from the last time?
92. What do you feel is the probability that MITS will be a success? (Scale C)
- | | | | | | | | | |
|------------|----|----|----|----|----|----|----|------------|
| Not at all | | | | | | | | Completely |
| probable | | | | | | | | probable |
| 0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 .9 1.0 |
93. What is your evaluation of the value or worth of MITS? (Scale D)
- | | | | | | | | | |
|------------|---|---|---|------------|---|---|---|-----------|
| Not useful | | | | Moderately | | | | Excellent |
| at all | | | | useful | | | | |
| 0 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 10 |
94. Do you have any recommendations for improving MITS?
95. In conclusion, what other uses do you see for MITS besides this application?
96. Have we left out anything in talking about MITS?

Again, I'd like to tell you that everything you said in the interview is confidential. I appreciate your assistance. Thank you.

Table A-1
Response Means for Operator Interview Items

Item (Section B)	Response Mean	
	Time 1	Time 2
Understanding of MITS	3.71	3.71
Availability of information	3.43	3.25
Need for MITS	3.50	3.15
Support idea of having MITS	3.71	3.29
Practical focus of training	3.33	3.71
Helpfulness of training	3.57	4.57
Evaluation of training	3.50	4.43
Effort to learn	1.85	2.14
Others' knowledge	4.14	4.00
Perceived need (upper management)	4.50	3.50
Perceived importance (upper management)	4.14	4.00
Given the time to implement	3.85	4.28
Difficulty of implementation	4.42	4.56
Easier	2.28	2.28
Greater variety of tasks	3.71	3.86
More responsibility	3.28	3.42
Requires more skills	3.28	3.00
More job autonomy	3.14	3.00
More busy work	2.71	3.57
More efficient (self)	2.67	3.18
More efficient (work unit)	2.82	2.58
More interesting	3.58	3.58
More satisfied	3.18	3.00
Extent work life affected	3.28	2.78
Change in duties	1.14	1.69
Change in work procedures	1.33	1.50
Change in formal organization	2.71	2.42
Change in management structure	1.85	3.00
Positive consequences ^a	1.28	1.40
Negative consequences ^b	1.14	1.16
Cost/benefit ratio	2.50	3.10
Overall reaction	3.57	4.14
Probability of success ^b	0.72	0.72
Value of MITS ^c	6.00	7.85

Notes.

1. Means are based on N = 7 subjects (the four central site operators and three remote site operators).
 2. All responses, except where noted, are based on a 5-point scale, where 1 = low and 5 = high.
- ^a1 = yes; 2 = no.
- ^bThe response to this item is a probability.
- ^cThis item is based on a 10-point scale, where 1 = low and 10 = high.

APPENDIX B
PERSONNEL RECORD QUESTIONNAIRE (FORM B) AND RESPONSES

PERSONNEL RECORD QUESTIONNAIRE (FORM B)

We would like to know your opinion of the service provided to you. We are interested in whether the format, image quality, and turnaround time satisfy your needs. Your response will help the Navy determine the benefits of remotely distributing personnel jackets to active duty personnel.

Please return the questionnaire to the Navy Personnel Research and Development Center in the attached self-addressed, stamped envelope.

Name _____
SSN _____ Rank/Rate _____
Date of Request _____ Time of Request _____

Please answer the following questions by filling in the blanks and circling the appropriate responses.

1. How did you find out that you could request a record from PSD?
 - a. I saw the posted announcement.
 - b. I heard by word of mouth.
 - c. Other _____.
2. Why did you want a copy?
 - a. General reference.
 - b. To make sure the record is complete, accurate, and up-to-date.
 - c. To review a particular document(s).
 - d. Other _____.
3. Where did you review your record?
 - a. At the PSD facility.
 - b. At my office.
 - c. At home.
 - d. Other _____.
4. How did you read the microfiche?
 - a. A desktop reader.
 - b. A handheld reader.
 - c. Other _____.
5. Approximately how many documents did you attempt to read?
 - a. Less than five.
 - b. Between five and ten.
 - c. More than ten.

6. How well were you able to locate the specific documents that interested you? Circle the appropriate number.

Experienced
great difficulty

5

4

Experienced
some difficulty

3

2

Experienced
no difficulty

1

a. Could not locate the following documents _____

b. Comments _____

7. How would you rate the overall image quality of the record? Circle the appropriate number.

Excellent

5

4

Okay

3

2

Unreadable

1

a. Could not read the following documents _____

b. Comments _____

8. How long after your request did you receive your record?

- a. Less than 15 minutes.
- b. Between 15 and 30 minutes.
- c. Between 30 and 60 minutes.
- d. More than 60 minutes.

9. The turnaround time was:

- a. Much faster than you expected.
- b. Faster than you expected.
- c. About what you expected.
- d. Slower than you expected.
- e. Much slower than you expected.
- f. Did not know what to expect.

10. What is your overall evaluation of this procedure for obtaining your record?
Circle the appropriate number.

Excellent		Okay		Unreadable
5	4	3	2	1

a. Comments _____

11. Had you viewed microfiche of any kind before this request?

- a. Frequently.
- b. Occasionally.
- c. Once or twice.
- d. Never.

12. Had you previously requested your microfiche record?

- a. No.
- b. yes.

If Yes, when? _____

13. If your answer to question 12 is Yes, how would you compare the present and previous service on the following factors? Circle the appropriate number.

- a. The present service is much faster than the previous service.

Strongly agree				Strongly disagree
5	4	3	2	1

- b. It is much more difficult to locate documents with the present service than with the previous service.

Strongly agree				Strongly disagree
5	4	3	2	1

- c. The image quality of the present service is much better than the image quality of the previous service.

Strongly agree				Strongly disagree
5	4	3	2	1

d. It is much more difficult to request my record with the present service than with the previous service.

Strongly agree
5

4

3

2

Strongly disagree
1

e. I prefer the present service to the previous service.

Strongly agree
5

4

3

2

Strongly disagree
1

THANK YOU FOR YOUR ASSISTANCE.

Table B-1

Response Frequencies and Percentages for Personnel
Record Questionnaire Items

Item	Total	Response Frequency and Percentage				
		First Request	Previous Request	Packed	Unpacked	Officers
1. How did you find out that you could request a record from PSD?						
a. I saw the posted announcement.	2 (4)	2 (5)	0	1 (4)	1 (6)	1 (7)
b. I heard by word of mouth.	35 (69)	26 (67)	9 (75)	21 (78)	10 (56)	6 (43)
c. Other.	14 (27)	11 (28)	3 (25)	5 (19)	7 (39)	7 (50)
2. Why did you want a copy? ^a						
a. General reference.	18 (31)	16 (36)	2 (14)	8 (29)	8 (35)	1 (7)
b. To make sure the record is complete, accurate, up-to-date.	28 (48)	21 (48)	7 (50)	13 (46)	11 (48)	10 (67)
c. To review a particular document.	9 (16)	6 (14)	3 (21)	5 (18)	3 (13)	2 (13)
d. Other.	3 (5)	1 (2)	2 (14)	2 (7)	1 (4)	1 (2)
3. Where did you review your record? ^a						
a. At the PSD facility.	40 (77)	32 (80)	8 (67)	24 (89)	13 (68)	6 (43)
b. At my office.	12 (23)	8 (10)	4 (33)	3 (11)	6 (32)	8 (57)
c. At home.	0	0	0	0	0	0
d. Other.	0	0	0	0	0	0
4. How did you read the microfiche?						
a. A desktop reader.	47 (92)	37 (95)	10 (83)	25 (93)	16 (89)	14 (100)
b. A handheld reader.	1 (2)	1 (3)	0	0	1 (6)	1 (3)
c. Other.	3 (6)	1 (3)	2 (17)	2 (7)	1 (6)	0
5. Approximately how many documents did you attempt to read?						
a. Less than five.	9 (18)	6 (15)	3 (25)	8 (30)	1 (6)	3 (21)
b. Between five and ten.	13 (25)	12 (31)	1 (8)	5 (19)	8 (44)	11 (79)
c. More than ten.	29 (57)	21 (54)	8 (67)	14 (52)	9 (50)	0
6. How well were you able to locate the specific documents that interested you?						
a. 5 (Experienced great difficulty).	3 (6)	0	3 (25)	2 (7)	1 (6)	0
b. 4.	2 (4)	2 (5)	0	0	1 (6)	1 (7)
c. 3 (Experienced some difficulty).	11 (22)	8 (21)	3 (25)	6 (22)	4 (22)	2 (14)
d. 2.	9 (18)	7 (18)	2 (17)	5 (19)	3 (17)	4 (29)
e. 1 (Experienced no difficulty).	26 (51)	22 (56)	4 (33)	14 (52)	9 (50)	7 (50)

Note. Numbers in parentheses are response percentages.

^aMultiple responses.

Table B-1 (Continued)

Item	Total	Response Frequency and Percentage				
		First Request	Previous Request	Packed	Unpacked	Officers
7. How would you rate the overall image quality of the record?						Enlisted
a. 5 (Excellent).	11 (22)	8 (21)	3 (25)	6 (22)	3 (17)	5 (36)
b. 4.	13 (25)	10 (26)	3 (25)	8 (30)	3 (17)	5 (36)
c. 3 Okay.	15 (29)	13 (33)	2 (17)	6 (22)	7 (39)	1 (7)
d. 2.	9 (18)	7 (18)	2 (17)	5 (19)	4 (22)	3 (21)
e. 1 (Unreadable).	2 (4)	0	2 (17)	1 (4)	1 (6)	0
f. No response.	1 (2)	1 (3)	0	1 (4)	0	0
8. How long after your request did you receive your record?						
a. Less than 15 minutes.	1 (2)	0	1 (8)	0	1 (6)	1 (7)
b. Between 15 and 30 minutes.	9 (18)	8 (21)	1 (8)	5 (19)	3 (17)	0
c. Between 30 and 60 minutes.	12 (24)	10 (26)	2 (17)	6 (22)	3 (17)	2 (14)
d. More than 60 minutes.	25 (49)	18 (46)	7 (58)	15 (56)	8 (44)	9 (64)
e. Other.	4 (8)	3 (8)	1 (8)	1 (4)	3 (17)	2 (14)
9. The turnaround time was:						
a. Much faster than you expected.	18 (35)	12 (31)	6 (50)	9 (33)	6 (33)	4 (29)
b. Faster than you expected.	11 (22)	10 (26)	1 (8)	5 (19)	4 (22)	5 (36)
c. About what you expected.	13 (25)	11 (28)	2 (17)	10 (37)	3 (17)	3 (21)
d. Slower than you expected.	2 (4)	0	2 (17)	1 (4)	1 (6)	0
e. Much slower than you expected.	2 (4)	1 (3)	1 (8)	1 (4)	1 (6)	2 (14)
f. Did not know what to expect.	5 (10)	5 (13)	0	1 (4)	3 (17)	0
10. What is your overall evaluation of this procedure for obtaining your record?						
a. 5 (Excellent).	24 (47)	18 (46)	6 (50)	10 (37)	10 (56)	9 (64)
b. 4.	15 (29)	14 (36)	1 (8)	9 (33)	4 (22)	2 (14)
c. 3 (Okay).	9 (18)	7 (18)	2 (17)	7 (26)	2 (11)	2 (14)
d. 2.	0	0	0	0	0	0
e. 1 (Poor).	3 (6)	0	3 (25)	1 (4)	2 (11)	1 (7)
11. Had you viewed microfiche of any kind before this request?						
a. Frequently.	25 (49)	21 (54)	4 (33)	13 (48)	7 (39)	8 (57)
b. Occasionally.	9 (18)	6 (15)	3 (25)	6 (22)	3 (17)	2 (14)
c. Once or twice.	11 (22)	6 (15)	5 (42)	4 (15)	6 (33)	7 (19)
e. Never.	6 (12)	6 (15)	0	4 (15)	2 (11)	4 (29)
12. Had you previously requested your microfiche record?						
a. No.	39 (76)	39 (100)	0	21 (78)	13 (72)	18 (57)
b. Yes.	12 (24)	0	12 (100)	6 (22)	5 (28)	6 (43)
						31 (84)
						6 (16)

Note. Numbers in parentheses are response percentages.

Table B-1 (Continued)

Item	Response Frequency and Percentage					
	Total	First Request	Previous Request	Packed	Unpacked	Officers
13. If your answer to question 12 is Yes, how would you compare the present and previous service on the following factors?						
13a. The present service is much faster than the previous service.						
a. 5 (Strongly agree).			7 (38)	4 (67)	2 (40)	4 (67)
b. 4.			1 (8)	0	1 (20)	0
c. 3 (Neutral).			1 (8)	0	1 (20)	1 (17)
d. 2.			1 (8)	1 (17)	0	1 (17)
e. 1 (Strongly disagree).			2 (17)	1 (17)	1 (20)	0
13b. It is much more difficult to locate documents with the present service than with the previous service.						
a. 5 (Strongly agree).			0	0	0	0
b. 4.			1 (8)	1 (17)	0	1 (17)
c. 3 (Neutral).			1 (8)	1 (17)	0	0
d. 2.			1 (8)	1 (17)	0	1 (17)
e. 1 (Strongly disagree).			8 (67)	3 (50)	4 (80)	4 (67)
f. No response			1 (8)	0	1 (20)	1 (17)
13c. The image quality of the present service is much better than the image quality of the previous service.						
a. 5 (Strongly agree).			3 (25)	1 (17)	2 (40)	1 (17)
b. 4.			1 (8)	1 (17)	0	1 (17)
c. 3 (Neutral).			4 (33)	1 (17)	2 (40)	2 (33)
d. 2.			2 (17)	2 (33)	0	1 (17)
e. 1 (Strongly disagree).			2 (17)	1 (17)	1 (20)	1 (17)
13d. It is much more difficult to request my record with the present service than with the previous service.						
a. 5 (Strongly agree).			2 (17)	1 (17)	1 (20)	1 (17)
b. 4.			0	0	0	0
c. 3 (Neutral).			0	0	0	0
d. 2.			4 (33)	3 (50)	1 (20)	2 (33)
e. 1 (Strongly disagree).			6 (50)	2 (33)	3 (60)	3 (50)
13e. I prefer the present service to the previous service.						
a. 5 (Strongly agree).			6 (50)	2 (33)	3 (60)	3 (50)
b. 4.			3 (25)	2 (33)	1 (20)	1 (17)
c. 3 (Neutral).			0	0	0	0
d. 2.			1 (8)	1 (17)	0	1 (17)
e. 1 (Strongly disagree).			2 (17)	1 (17)	1 (20)	1 (17)

Note. The numbers in parentheses are response percentages.

APPENDIX C
IMAGE QUALITY EVALUATION STUDY INSTRUCTIONS

INSTRUCTIONS

IMAGE QUALITY

This study is concerned with the image quality of the microfiche personnel records of Navy military personnel.

I will be presenting a sample of microfiche records. They will be presented in pairs. In each display, two identical samples of individual personnel records will be presented.

Your task is to judge which of the two records has better image quality as compared to the other. By image quality, I mean easier to read, clearer, etc. In some of the comparisons, there may be no detectable differences; therefore, "No difference" would be your response. Also, in some of the comparisons both images may be impossible to read; therefore, "Unable to read" would be an acceptable answer.

In the event that it is difficult to make a judgment, I will allow you to scan each comparison twice. These personnel files were randomly chosen for these judgments. Therefore, we are only interested in image quality and readability, rather than your knowledge or skill in understanding these records.

I will run through a couple of examples in order to correct for any difficulty or misunderstandings.

Any questions?

INSTRUCTIONS

READABILITY

This study is concerned with the readability of microfiche personnel records of Navy military personnel. I will be presenting a sample of microfiche records.

Your task is to rate the readability of the individual records. The categories are readable, somewhat readable, and not readable.

These personnel files were randomly chosen for these ratings. Therefore, we are only interested in their readability, rather than your knowledge or skill in understanding these records.

I will run through a couple of examples in order to correct for any difficulty or misunderstandings.

Any questions?

APPENDIX D

MICROFICHE IMAGE TRANSMISSION SYSTEM (MITS) INTERVIEW: MANAGERS

**MICROFICHE IMAGE TRANSMISSION SYSTEM (MITS) INTERVIEW:
MANAGERS (FORM C)**

Purpose

The following interview has been prepared to help the Navy determine the effectiveness of the Microfiche Image Transmission System. We would like to know your point of view.

Thank you for your help.

Confidentiality

Everything you say in this interview will be kept confidential. Your name will not be associated with your responses and with the final analyzed results.

With your permission, I would like to tape record this interview to help me with my notetaking.

A. Background--Personal

1. What is your job title?
2. How long have you had this position?
3. How long have you worked here?

B. Background--System

4. What is the objective of the Microfiche Image Transmission System?
5. What is the reason for having MITS here?
6. Briefly, describe the system as you see it.

What does it do?

Who will be most affected by it?
(Probe for scope, breadth, level)

7. What are the advantages of MITS?
8. What are the disadvantages of MITS?
9. Do you feel that there is a need for MITS in this unit? In the Navy?
 - a. Very great need.
 - b. Great need.
 - c. Some need.
 - d. Little need.
 - e. No need.

10. Do you regard MITS as being important?

- a. Very important.
- b. Important.
- c. Somewhat important.
- d. Unimportant.
- e. Very unimportant.

11. To what extent do you support the idea of having MITS in this unit?

- a. Very great extent.
- b. Great extent.
- c. Some extent.
- d. Little extent.
- e. Very little extent.

C. Implementation

12. What is your role in managing the implementation of MITS?

- a. What are your responsibilities?
- b. Who has primary responsibility?
- c. How much effort have you exerted? (considerable little)

13. Describe actions in effecting the implementation. Please be specific.

(If necessary ask about the following.)

- a. Gathering data for work force needs.
- b. Training employees.
- c. Work on aspects of the work context.

14. Have you encountered any serious problems in carrying out the implementation of MITS? Yes No

If Yes, what? (Obtain concrete examples.)

- a. Lack of documentation.
- b. Lack of training materials.
- c. Insufficient support from management.
- d. Resistance from subordinates.
- e. Inadequate involvement of all level of employees.
- f. Lack of a game plan.
- g. Poor fit with existing organizational arrangement.

15. What would you say is the major problem or obstacle for the system not working here as smoothly or as well as you think it could?

16. On the positive side, what is the major reason for the system working here as smoothly or as well as it could be?
17. How difficult is and will the implementation of MITS be in your unit?
- a. Very difficult.
 - b. Difficult.
 - c. Somewht difficult.
 - d. Easy.
 - e. Very easy.
18. With the introduction of MITS, are you aware of any changes you have made or will have to make in the way you conduct your work?
- If yes, what?
19. To what extent do you feel that MITS has changed or will change the work procedures of your unit?
- a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.
20. To what extent do you feel the formal management structure has changed or will change because of MITS?
- a. Very great extent.
 - b. Great extent.
 - c. Some extent.
 - d. Little extent.
 - e. Very little extent.
21. Do you feel that the use of MITS has changed or will require changes in the formal organization of your unit?
- a. Very great changes.
 - b. Great changes.
 - c. Some changes.
 - d. Few changes.
 - e. No changes.

22. How much effort does it take to learn to effectively operate MITS?

- a. Great deal of effort.
- b. Good deal of effort.
- c. Some effort.
- d. Little effort.
- e. Very little effort.

D. Staffing

Questions 23-29 for first-line supervisors, technical/developer only.

23. What skills and knowledge are needed to operate MITS?

24. How are these skills and knowledge used in doing the work?

25. What are the operator's duties/tasks?

26. How is the work assigned?

27. What is the operator's responsibility for carrying out the work?

28. What guidelines are used in doing the work?

29. What is the level of difficulty and originality involved in performing the work?

E. Consequences

30. When new systems are introduced they may sometimes have positive consequences, sometimes negative ones, sometimes both.

- a. Do you see any positive consequences?
If Yes, what?
- b. Do you see any negative consequences?
If Yes, what?
- c. What about consequences for subordinates?
- d. What do you think their overall reaction to MITS is?

31. How do you feel the benefits compare with the costs of having MITS?

- a. Benefits outweigh the costs to a great extent.
- b. Benefits outweigh the costs.
- c. About the same.
- d. Costs outweigh the benefits.
- e. Costs outweigh the benefits to a great extent.

32. In conclusion, what is your overall reaction to the new system at this time?

- a. Very positive.
- b. Positive.
- c. Neutral.
- d. Negative.
- e. Very negative.

Can you tell me the reason(s) for your reaction?

33. What do you feel is the probability that MITS will be a success?

(Not at all probable	Completely probable)
(0	1.0)

34. What is your evaluation of the value or worth of MITS?

(Not useful at all	Excellent)
(1	10)

35. Do you have any recommendations for improving MITS?

36. What other uses do you see for MITS besides this application?

37. Have we left out anything in talking about MITS?

Again, I'd like to tell you that everything you said in the interview is confidential. Thank you.

APPENDIX E

**RESPONSES CONCERNING MITS STAFFING, IMPLEMENTATION
PROBLEMS, AND SIGNIFICANCE**

RESPONSES CONCERNING MITS STAFFING, IMPLEMENTATION PROBLEMS, AND SIGNIFICANCE

Staffing

Skills and Knowledge Needed to Operate MITS

1. The main thing is a person who is flexible enough to try new technology. Some people will become quite frustrated and any attempt to learn something--you're breaking my routine and I'm going to resist it. However, I think a person who is flexible enough, who is curious about new technology and astute enough to realize that it's really an opportunity for them, because now they're improving their job skills. I think that type of individual will approach that job with a very positive attitude and consequently it's easier to train them, rather than someone who says I'd rather stay in my corner here and not be disturbed.
2. We require a high school education, and the reason being is so much instruction is written instructions. So a person who at least has mastered reading at a high school level, a fair amount of manual dexterity, and not being afraid of machinery.
3. Familiarity with the keyboard and with the MITS dialog which is very easily learned. Ability to QC the duplicate which is learned over a period of time. Keyboarding is helpful. No particular education is required.
4. Clerical, mechanical, some typing maybe. Maybe a GS-3.
5. Data entry clerks should be more than sufficient to handle the user end of MITS. The skills would be data entry, keyboarding.
6. I think it's the type of thing where in a couple of days most people could pick it up.

Skills and Knowledge Needed by MITS Maintenance Personnel

1. You need a good technician who can understand the basic scanner and the electronics, and who can understand the COM unit. That's basically the only maintenance personnel that the system should require.
2. We need a person with a good electronics background. A person who is familiar with the use of all test equipment, with logical testing procedures,, and electronics. Also, individuals with a basic knowledge of microprocessors seem to do better.
3. I don't have direct knowledge. My understanding would be fairly complex, fairly high. Probably GS-9.
4. He should be familiar with electronics. It would be advantageous for him to have exposure to microcomputers. He should have some knowledge of optics. . . training at a technical school.
5. They need to have a good background in electromechanical as well as electronic equipment. The scanner in particular is a kind of beast and, unless the technician has been around that type of equipment, it might give him problems.

The general consensus of the interviewees was that the work with MITS for both operators and maintenance personnel was not very difficult.

Implementation Problems

Estimates of Difficulty in Implementing MITS

1. I don't know what the work implementation means. If we talk about that it took 5 years to get money, it's been very difficult. If we're talking about it in terms of people operating equipment, very simple. So implementation has many different connotations. Either a very difficult or a very easy.

2. Very difficult, from length of time only. It's twice as long as what we thought it was going to be.

3. Difficult.

4. That's kind of a loaded question. How difficult is any development effort? They're extremely difficult and they're fun. The people work very hard and they're having a good time doing it. So what is "difficult?" It's hard to say something is difficult that is interesting, rewarding, and something you just work at.

5. Difficult. I think it was a nominally difficult implementation. We had a lot of the system already developed when we started it. However, all the customizing to specific MITS related things we had to program in. We came out of a demo system. It was not in any way a system that was, had been installed before. MITS was the first installation.

MITS Implementation Impediments

1. Money. I think any time you have enough money you can overlook some technical problems. There are a lot of technical problems and inadequacies in the system. If there had been more money, we would not have gone to the system that we have today. We had to go with the system that was within our resources on the hopes that the system would be successful enough to get enough money to do it properly.

2. We had tremendous problems getting GSA and Navy services people at the Anacostia site to put up the antennas. Then we began our frustrations of CRT development. Trying to move everything, trying to get the requests to the right individuals, trying to get money over to the PASS office from NMPC to do this. Then the contractor's design of certain things that I thought more important, such as the CRT interface... Of course, the system itself took a good 6 months. We went through several iterations of the acceptance test. From August to December, we were trying to get the system up.

3. The major problem has been equipment--equipment failures. The larger problems were overcome before the Navy accepted it. After that the minor problems that were aggravated because of the lack of knowledge of the people, and just a lot of breakdowns, nuisance breakdowns.

4. One problem I did run into was when the Navy switched films on me, and we went from...to... It took me a while to adapt from one to the other. They scan quite differently. In terms of MITS, they're very different systems. I think we've gotten most of the bugs out of the system by now. We still for some reason have problems with disc, the buffer disc, and I'm not really sure why. They work very well for us here in the lab.

When we take it out to MITS, they don't last very long. We just seem to have trouble with the COM unit more than anything else. It just seems to be the type of thing that requires a lot of hand holding. Chemicals have to be changed very frequently. It seems to me that's where the problems have been.

5. I think it's gone rather smoothly. If you've ever been involved with an R&D type of thing, failure is success. We're delving into a lot of unknowns here. We had some headaches with the original production. The scanner would maybe pick up three quarters of a row, thereby making it useless. You've got to expect that kind of thing in any development. We've licked that now. It's slower than what we thought it was going to be. We'll take care of that, too. That's all part of any kind of development work. I'd say that compared to other things that I've done in my career, this has gone quite smoothly.

6. I guess I'll have to categorize that. As far as design goes, no, we have not had any problems that we could not overcome. As far as the problems in implementing the system, we ran into some procurement problems, which are difficult in advanced technology projects. You're always waiting for somebody to deliver the product and you're dependent on a lot more supplies. We had more than our share of delays. Some of the equipment we have to get from others, not all of them. For example, the microfiche recorder, a subcontractor did it. They slipped by at least 8 to 10 weeks. Then we ran into installation at the Navy Annex. We still haven't figured out why everything went completely kaput. We had our share of problems. I would like to believe it was the first project we were implementing of this nature, so we didn't know what to expect. We didn't experience even a fraction of the problems on the second project. . . (also) you have to remember that a lot of the equipment that has been put together has been put together for the first time. In fact, some of them are the first of their kind. [The atmosphere] in the Navy Annex is not conducive to the more advanced technology. For example, a typical computer room when you walk into it, it's nice and cool, under very controlled climatic conditions. I think even the present equipment with the BUPERS project has a very large failure rate. That whole area needs to be looked into. Is it all the equipment or is it put in a very hostile environment?

7. Reliability.

a. The reliability of the COM unit. It is better (now than it was). It has a lot to do with the training of the maintenance personnel taking care of it now, but that has been one of the things that has been a major problem.

b. The reliability of the COM unit. It has had too many failures.

c. Initially the first couple of months of the demonstration, it was the reliability of the scanner. Those had been pretty much solved.

d. The reliability of the communications link and I think that is directly contributable to cost-saving measures and no one willing to invest in and run a frequency counter so that the communication link is not monitored in optimal condition.

Reasons for Success of the MITS

1. To the extent that it works at all is due to the people. . . some people on the PRC staff and all of the people on the Navy staff.

2. I think the people involved is certainly a big point. The people like. . .who have this deep interest and enthusiasm, the thinkers, the innovators. That's all people I think, and much more than equipment. They don't ever seem to be discouraged. They say, "This didn't work," and immediately they start thinking of alternatives. I'm really proud of them. Not just. . ., but. . ., and the PRC people have cooperated, and everybody's been in on the act.

3. Our hard work. Late nights. We've been kind of hand holding it for the last 4 or 5 months. You really have to do that on any new system to get the bugs out. Once you get them out, then they seem to work pretty well. And this is no exception to that rule.

4. Navy persistence in the initial test period and not accepting a system that didn't work as well as we felt it could work. And then the cooperation of the individuals who actually had to run it.

5. I think we had our initial share of problems with the system in implementation, but I think we really put out a lot of work and did a good job, because from a division point of view we had to prove ourself. That we can do a good job. People here have given 200 percent. We put in a lot of time making sure it's going to work within the time limit of the contract.

6. I think the major system advantage we have is the architecture that it is based on and the ability to have the different microprocessor modules take care of their own problems. We have the modularity of the system that allows us to debug and maintain it very easily. It is evident where the problem is and easy to correct.

7. The commitment of the project personnel.

a. We wanted it to really work, so we put in a lot of hours and suffering, and were willing to fight tooth and nail to get it to work the way we wanted it to work. I think there is a lot of energy there. That made a lot of difference.

b. I think we cultivated the operators carefully and professionally as integral parts of the demonstration. We tried to ensure they got good training and it just dropped those things in their laps and it paid off. We had good operator support all along.

c. I think it has been probably the commitment. . .of PRC to make sure it works and he also put in all sorts of hours and energy to make it work the way it was agreed it would work.

d. The conscientiousness and skills of the maintenance person. He also wants to make it work. He's had to learn a lot on the fly and he is not always given the best direction, but I think he has come a long, long ways and he is in it and a maintenance person who is really committed to keep it up. That spells success. When you have the people who designed it really working together because of personal interest. I really think it is a successful project.

Significance of MITS

Positive Consequences

1. It's given the operators an opportunity to interact with new things, learn something new, which they enjoy. And, it's given them a little more opportunity to learn

what the NMPC and PASS offices are about. And it's certainly given the maintenance individual more exposure. It's given me a lot more experience in knowing what to look for in digitizing micro-imaging things that I would not have realized before.

2. If the system worked, there would be a great many positive consequences, in terms of morale, in terms of perception of NMPC by the fleet, in terms of the ability to do the job that we're here to do better and more efficiently, in terms of the public relations for the organization, in terms of impact on technology. I think it certainly will have an impact in terms of the perception of records organization as no longer a little-old-lady-in-tennis-shoes function or operation.

3. I think it shows the technology of the scanning images, scanning, fiche, and duplicating them. That ought to have positive consequences on people at NMPC by exposing them to new systems.

4. I think we've learned a lot on how to scan images. I think the Navy has learned a lot of things that it can and can't do with MITS. Whether it will be an operational system, I'm really not sure, but I think the experience has been valuable for everybody.

5. I think it helps the MPRS to keep pace with developing technology as far as image transmission is concerned. It will also result in more timely access for users for information that is currently contained in MPRS.

6. There's quite a bit of positive factors with the fleet. The sailor would be able to get his or her record much more quickly.

7. The Navy can make personnel records readily available for the review boards, for the individual personnel, and the level of frustration can be cut down and, therefore, increase the access to the personnel records, which is the original objective of the personnel record. The use of the MPRS system should increase or improve substantially.

Negative Consequences

1. Not if it worked, other than cost. It is expensive, but I don't think it's a negative consequence. I think these other things are worth the money if it were to be an efficient operation.

2. I'm not aware of any negative consequences of the system.

3. The usual I guess. Trying to do too much in too short a time, which I think we did with MITS. The schedule was just too tight. As a result the overall process got lengthened rather than shortened. And I think that's generally true when you try to do too much in too short a time.

4. One may question the cost effectiveness of a MITS-type project in the sense that it is only a demonstration project. To make it more beneficial or cost effective, you'll have to have a much larger user base.

5. I can't think of any to be quite honest with you.

MITS Benefits vs. Cost

1. If you bear in mind that MITS was a prototype, a demonstration, it wasn't meant to serve 300,000 personnel--the whole objective of MITS was to demonstrate, can they put together a set of peripheral devices that will expedite access and retrieval of personnel records. From that point of view, I think MITS has proven to be cost effective, and probably more than Navy might have anticipated.

2. Right now you could not justify MITS with a cost benefit analysis. But it's like anything else, the long-range benefit I'm sure is going to pay off.

3. I have no idea what MITS costs. I can only guess that, as with all evolving technology, it's probably pretty expensive. I say the long-range benefits, particularly if it gets satellite transmission, will be well worth the cost.

4. If you take MITS as a stand-alone system as it is presently installed, it is a very costly thing. If you put it in a context that it is a pilot system for something that might later result in the acquisition by the Navy of an overall records and image distribution system that would service many facilities and many different needs, I don't think it was overly costly at all. It depends on what the Navy decides to do with it. I think it was well worth the money to investigate the technology.

5. With the present system, costs outweigh the benefits to a great extent; with a future system, maybe the benefits will outweigh the costs.

6. Costs outweigh the benefits to a great extent. There are a lot of projects that have not done nearly as well for \$150,000. [The actual contract cost was \$650,000.] That was the size of the contract and the scope of what we did was incredible for what we did for that kind of money, in comparison to other efforts I know. So why has it been terminated before its time? It has fulfilled its usefulness as a demonstration and that is all it is really capable of doing.

7. We could in fact do a cross-country demonstration that would tell us a little bit about the hassles of being cross-country if a communication link was readily available. One is not. It's not the knowledge we would gain by demonstrating that. It is not worth the expense doing it and we could anticipate the answer just with the cases of long-distance correspondence that you do now. It is not a production piece of gear. It wouldn't handle high volumes. . . . It is a super tool for showing what you really can do in scanning and transmitting fiche, instead of listening to a lot of marketing gibberish about companies' capabilities. We have done it and it is a yardstick to measure anybody else against.

8. It is fast, primarily in turnaround. If you make a request for a record, you are going to have the whole record back in 45 minutes and that is a time that can be made less. It is also a reliable method. In other words, you are not subject to the whims of the postal service. Fiche don't get lost in the airwaves. So it is reliable in that sense, although I am the first to admit the equipment unreliabilities. So, I say it is fast and reliable. Disadvantages? I guess I alluded to one that it is unreliable. On the equipment side, it is very costly. The initial capital investment, and there is a bit of overhead there on the operators both at the transmitting site and the receiving site. At the transmitting site, it is another task for the people to do. So, I am not sure how much more expensive that is. I'm not sure you can come up with a personnel equivalence. At the receiving site, you have to have technical capability instead of people just opening envelopes. Then you have the chemistry and the film and those sorts of things. The unreliability and

costliness. The major factor on cost though is not the equipment itself but the communications. Right now the state of the art of the availability of wide-band communications is such that they are not available. Our little radio was a \$30,000 unit so that we can control the communications and we own it, but it is a very short haul, 5 or 6 miles, and it was for the demonstration. If we had to pay for a wide-band line with the telephone company to the PASS office, I think it was \$5,000 or \$6,000 per month. You had to guarantee to use it for 2 years, or something like that. So, that should improve with the new satellite net defense communications, but it is still much more than 20 cents an envelope.

Improving MITS

1. Right now I just could make an example of a recommendation. I think MITS is fairly on track. It's ahead of the rest of the ball game. We don't want to lie down and go to sleep because of that. We may just have to shelve it for a while till the rest of it catches up, but that's okay. That's all right for me. Certainly we're not going to implement MITS just for MITS.

2. There are quite a few recommendations. I think the scanner could be changed to improve the quality. I think we could do better than what we are using. There's obvious advantages to going to a gray scale system. I think the major thing that needs to be done is to be able to automate the input more than is done now. Right now we have a ten fiche buffer and that's not many. Plus the whole Navy system needs to be automated. But that is talking big bucks. Keep working on the COM unit and get it working better. There are also some little problems like disc problems that need to be solved.

3. The reliability of the equipment, the use of gray levels to enhance the imagery, and overall a thorough study of the new uses for it in the fleet. New uses for a truly batch mode enhance the MITS system in the fleet, which takes work which we have not done on it. In other words, the distribution of NMPC functions I just feel should come with time. I really don't know enough about all the operations of NMPC to say how extensive that would have to be and how many people can be affected. I only have a feeling. From what I've heard it takes a tremendously long time to get information from one place to another.

4. Several. There's a lot of details that can be done. The requesting of the images can be done over the radio link. What I would really like to do, if that is of great interest, is prepare some type of proposal that would document those. I don't think when we're tape recording we could go into great detail. I would rather not do it in this type of format.

5. There are lots of recommendations. It was not designed to process lots of records. At MPRS, we distribute 40,000 to 50,000 records a year. We're currently distributing 10 records a day which times 365 days is 3,000 to 4,000 records. We have to get that up to a factor of 10. So speed is certainly an issue. There has to be much greater integration with the computer. There has to be the ability to read labels, label identification information by computer so we can stack these and identify each new record as it comes along. The ability to transmit to multiple sites, as opposed to a single site. There are major communications problems to overcome. The original plan was to go by satellite. At present, it is not feasible either technically or economically. Economically, we certainly can't afford telephone lines that are dedicated to this. That's a big hindrance. We need a much less expensive receiving unit, and a much less complex receiving unit. There are things coming down the pike that appear to be acceptable. I guess those are the basic issues, areas of improvement.

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