AUER-2325/2326-100-TR-1

AD-A022 300

DDC 10 YEAR REQUIREMENTS AND PLANNING STUDY

Survey Plan

AUERBACH ASSOCIATES INC.
121 North Broad St.
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15 August 1975

Progress Report

Approved for Public Release; Distribution Unlimited

Prepared for

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Dr. Charles T. Kenny, Consulting Psychologist

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A plan is presented to survey a representative sample of DDC's user population to provide significant input to the contractor's recommendations for facilitating the transfer of DoD S&TI for the 1978-1988 period. The survey will determine the use of, needs for, and views regarding the adequacy of both current and future DDC information products and services.

The survey utilized telephone interview techniques to a randomly selected

sample of approximately 700 support, management, and bench level individuals engaged in Defense research, development, test, and evaluation (RDT&E) activities. Twenty five organizations from each of four DDC user organization categories were drawn randomly from the DoD Dissemination Authority List (DAL). The four categories are: DoD Key Users, DoD Non-Key Users, Contractor Key Users, Contractor Non-Key Users.

The survey strategy combined the advantages and economy of mailing and the insurability of response was provided by telephone contact. The mailed package included a set of cards which listed acceptable responses for questions. In this way questions asked over the telephone could be answered as multiple choice. The cards containing the choices were not identifiable in terms of the questions prior to the telephone interview to preclude discussion with colleagues or research for answers.

R&D CONTRACT STATUS REPORT:

SURVEY PLAN

AUER-2325/2326-100-TR-1

August 15, 1975

Prepared by
Dr. Charles T. Kenny and Jerome T. Maddock

Submitted to:

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ATTN: DDC-D (John W. Saunders)
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Sequence No. A001

AUERBACH Associates, Inc.
121 North Broad Street
Philadelphia, Pennsylvania
19107

2. DESCRIPTION OF THE SURVEY PLAN

(1) Prospective user survey participants will be selected randomly by a sampling from each of the categories (strata) shown in Figures 1 and 2. In each user category, a specified number of members -- the sample size for the stratum -- will be selected at random by the following method. AUERBACH and CDA have devised a unique methodology for drawing the sample. It had been anticipated that it would be possible to select individual users randomly from DDC records. These records, however, were not adequate for this purpose, because in all too many cases a librarian signs for the services instead of the real user. Hence, an alternative methodology was developed, consisting of the following steps:

(a) Twenty-five user organizations from each of the four user organization categories were drawn randomly from the Department of Defense Dissemination Authority List (DAL). The four categories are: DoD key users, DoD non-key users, contractor key users and contractor non-key users.

(b) The following criteria were utilized to determine a code number representing a user organization that would be included in the sample:

A. The organization must be engaged in some form of R,D,T, or E.

B. The interview must be carried out in a RDT&E environment or in an environment of RDT&E management.

C. A contractor organization must be a DoD contractor in order to be included. (NASA and ERDA contractors also appear in the DAL).

(d) Formulate a definitive set of time phased development efforts to satisfy user population S&TI/RDT&E management information requirements during 1978-1988 and to rectify problem areas identified.

(e) Describe DDC's role in the 1978-1988 S&TI and RDT&E management information community.

Definition of the information needs and problems of technical and management members of the DoD RDT&E community is indispensable to the accomplishment of these objectives. Accordingly, a significant phase of this study is the design and conduct of a survey of users and potential users of DDC supplied information to determine their use of, needs for, and views regarding the adequacy of both current and future DDC information products and services.

(2) Data from this survey will be analyzed by AUERBACH Associates to ascertain representative current and projected information needs and problems of DoD RDT&E Personnel. The results will provide significant input to the contractor's recommendations for facilitating the transfer of S&TI and RDT&E management information for the 1978-1988 period.

(3) Data of the kind to be obtained from this survey are not presently available.

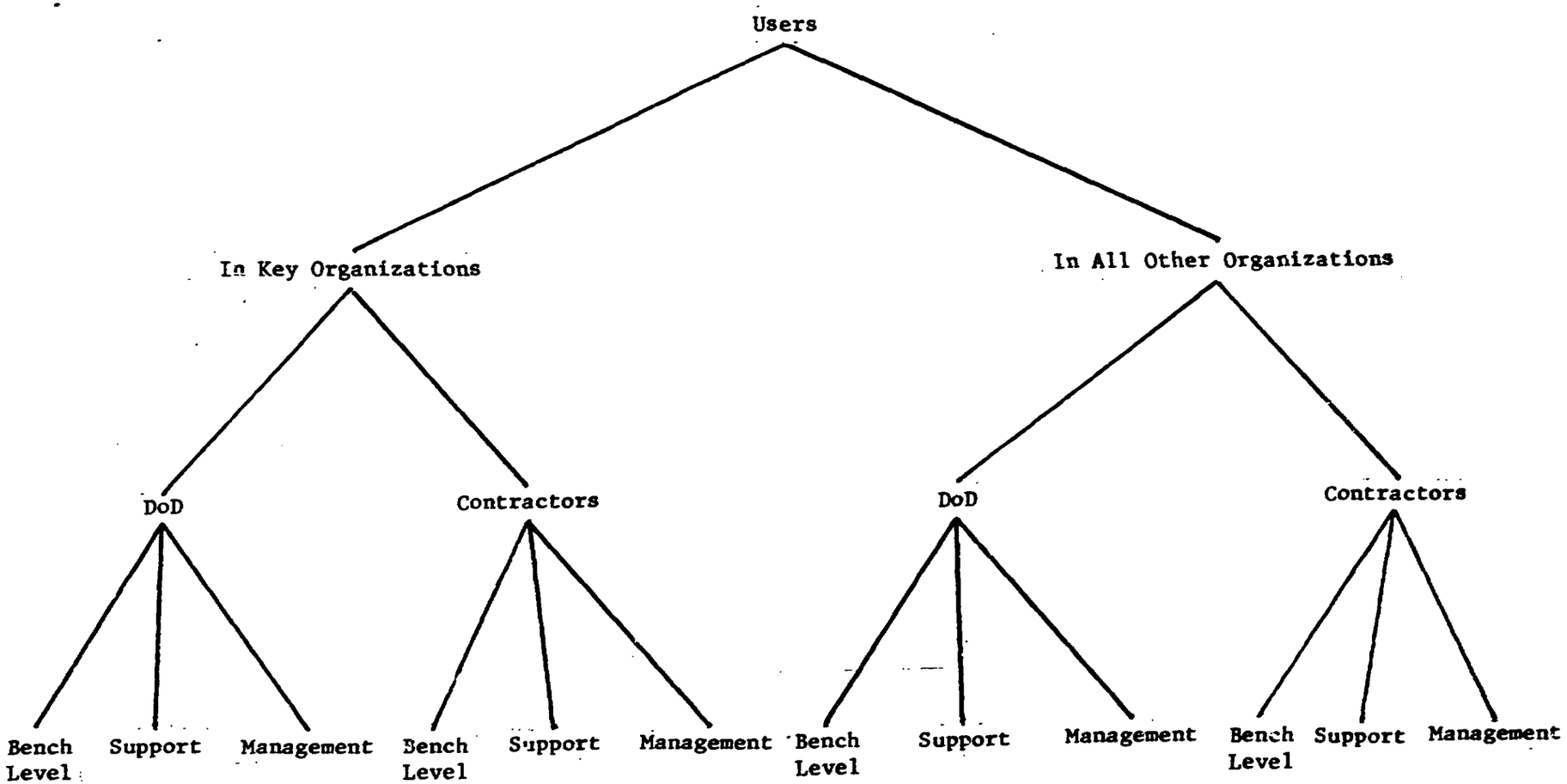

Figure 1. Sampling Stratification in the User Universe

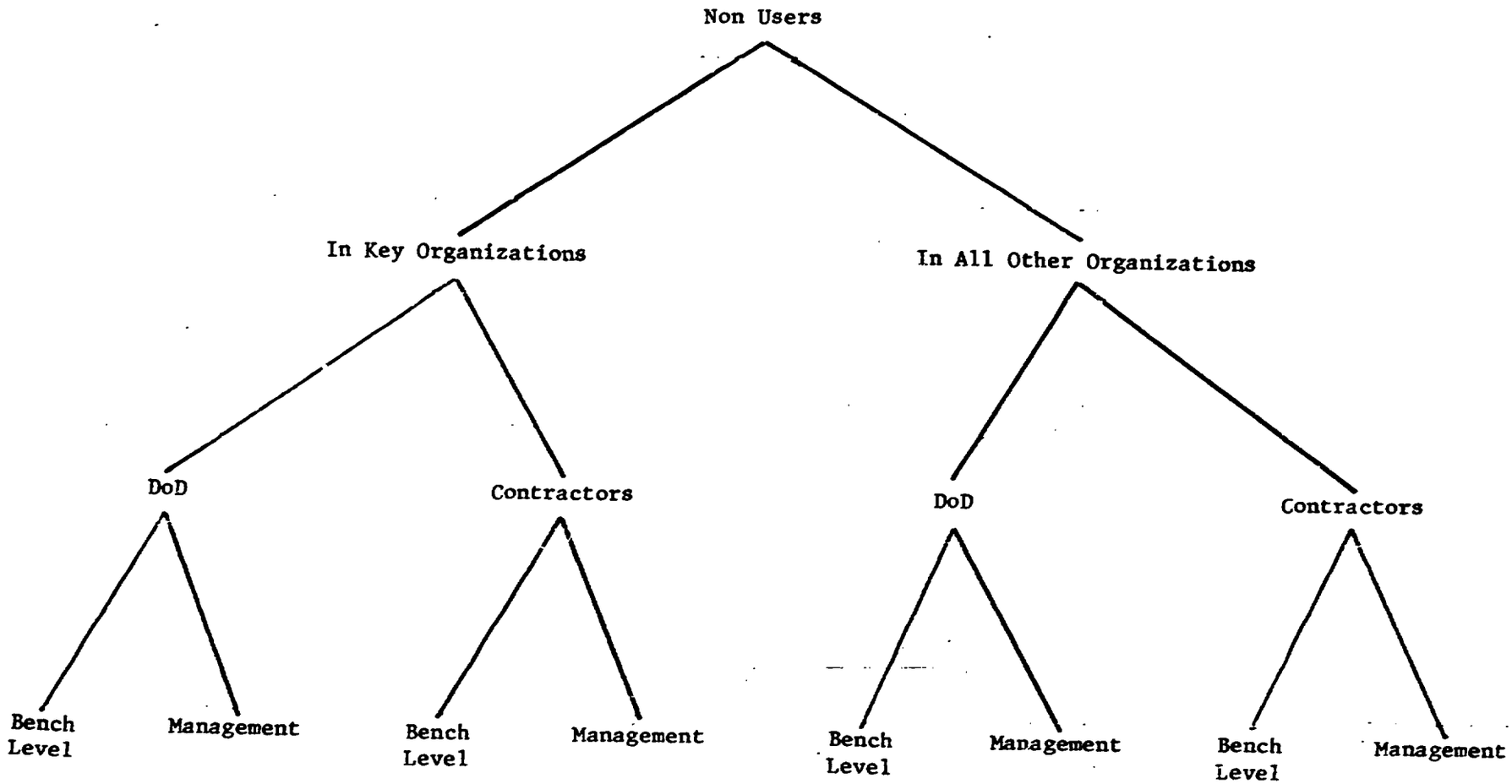

Figure 2. Sampling Stratification in the Non User Universe

D. The contractor must have a current DoD contract at the time of the survey.

E. The organization must be in the continental U.S.

F. The organization must be in DoD or be a Defense contractor. Other government agencies (e.g., NASA, Coast Guard, etc.) are excluded from the survey.

(c) Interviewers will then contact the focal point in each organization. This "focal point" is the person listed in the DAL. After determining if this "focal point" is the support person in charge of the library and/or scientific information, the interviewer asks this support person if he has a file, list or directory of persons in his organization. From this point names are drawn randomly from a randomized alphabetic list based on a combination of random numbers and codified list of name stems.[1] Interviewers have been trained in sampling methodology and several pilot phone calls were made to work out the "bugs" in this procedure.

(2) The proposed study requirements can best be met by a survey strategy which includes both mail and telephone surveys. This strategy will combine the advantages and the economy of mailing and the insurability of response provided by telephone contact. First, potential respondents will be contacted by telephone and solicited for their participation in the study. Should they agree, a date for the telephone interview will be established, along with one alternative date. Following this contact, a pre-packaged set of materials will be sent to the respondent, including a set of cards (see Appendix C) which detail the acceptable responses for the designated questions. In this way, questions that are asked over the telephone may be answered in a multiple choice format, because the respondent will have the various response alternatives before him at the time of the phone call. The cards which contain the response alternatives will not be identifiable in terms of the questions prior to the telephone interview, so that respondents will not be able to discuss the questions with their colleagues, nor will they be able to devise answers prior to the time of the interview.

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[1] C. A. Cutter's Cutter-Sanborn Three-Figure Author Table, distributed by the H. R. Huntting Company

In addition to the response cards, each interviewee will receive a descriptive cover letter, confirming the respondent's intent to participate, and a Privacy Act Statement informing each individual of his response alternatives under the Federal Privacy Act of 1974. The letter will include a reaffirmation of the dates and times (primary and alternate) established for his telephone interview. A copy of the cover letter appears in Appendix D.

In order to provide insights about the various categories of users and potential users, we propose to stratify the population and sample sufficient numbers in each category to make the results obtained in each category reliable. Since the use of the telephone guarantees response, the stratified sample need not be larger that that which would be used for personal interviews.

Pretesting began in July during the first month of the study, so that the results could be submitted to the OMB clearance process at the earliest possible date. The interview schedule that will be used (see Appendices A & B) is structured so that coded and quantifiable responses will result. There is also enough latitude to permit the writing in of responses and amplificiation via comments. Our goal is to use only the minimum number of questions needed to elicit the required information, and generally to make the interview as easy as possible to quantify in order to (a) minimize the interviewer training effort; (b) adapt it to the telephone medium; and (c) facilitate statistical analysis. The objective will be to maximize the response rate without sacrificing interview effectiveness.

The interview schedule for bench level scientists and managers of RDT&E activities (Appendix A) covers the following basic areas:

Identification of information requirements

Identification of the current S&TI and RDT&E management information environment

Identification of current problems associated with information use

Identification of respondent search strategies

Futuristic projections of requirements

Aside from bench level and managerial personnel, "support personnel" will be included in the sample to be surveyed. These support personnel consist of on-line terminal operators, technical librarians, and individuals who provide information support within DoD and Defense contractor organizations. They have been included in the sample to be surveyed as a source of valuable insight into present and projected technical information exchange within the Defense community. A separate, but analogous interview schedule has been prepared for administration to this stratum of the survey sample (see Appendix B).

The interview schedule will focus on the response time, quantity, quality, medium, format and degree to which information received is up to date. Questions will concentrate on the user's viewpoint toward information provided by DDC and other major information sources and reasons for his dissatisfaction and/or satisfaction. The interview will elicit future needs as well as a description of current problems.

Prior to the interview, but following the initial telephone contact, a letter will be mailed to the subject in which his cooperation on the project is explained. This letter, which is shown in Appendix D will also insure the respondent of the confidentiality of the information that is being gathered. The letter will also reaffirm the dates for the telephone interview.

The interview is designed to elicit information on the sources that are currently used to meet information requirements. In addition, it will also solicit responses concerning how well these needs are met by the sources that have been or are being used. Responses to questions are structured in terms of choice such as: poor, fair, good, excellent, outstanding, in order to make quantitative analysis of these responses possible. In addition, the questionnaire provides for amplifying remarks to supplement the structured responses.

Another area of inquiry will involve questions about improvement to DDC information resources. Respondents will be asked to indicate how these resources might be made more useful to them. The interview also solicits respondents' perceptions about feedback mechanisms for DDC information -- that is, do they transmit any feedback to DDC and do they feel there are adequate means for making their needs and suggestions for improvement known to DDC?

The preliminary interview schedule was submitted to the DDC Project Officer for review and discussion before pretesting was attempted. Necessary changes have been incorporated in the attached interview schedule.

After the Project Officer approved the interview schedules, and after modifications were made, a small sample of two users was pretested. The pretest sample was selected with Project Officer approval. Preliminary contacts were made with members of this group and the preliminary package was mailed to the respondents. This pretest allowed us to detect and correct problems in the interview. Problems occurring with any aspect of the interview schedule and/or the associated instructions were noted, then reviewed by the survey team. In addition, the revised interview schedules were reviewed by a task force at DDC and selected key support personnel. Based on the pilot interviews and this additional review process, proposed revisions in the interview schedules were reviewed with the DDC Project Officer. Approved revisions were incorporated into the final version of the interview schedules presented in Appendices A & B.

The sampling plan has been developed in close coordination with the Project Officer, to ensure that it is consistent with DDC objectives. The plan discussed below has been modified based on comments provided by the Project Officer and from insights obtained during the pretesting. The sampling plan requires: (a) identification and categorization of the population; and (b) selection of respondents.

Four populations will be considered for sampling purposes in this study: (1) the key* DoD organizations; (2) all the remaining DoD organizations; (3) key contractor organizations; and (4) all the remaining contractor organizations. Random sampling will be conducted within each of these populations. Bench level users, support personnel and management personnel will be selected from each population. A larger number of personnel within some facilities will necessitate the use of a sampling fraction; that fraction

* "Key" organizations have been defined by DDC as the top 200 requesters of DDC documents, by volume of requests.

to be decided upon by the number of personnel within each relevant population. This information will be gathered from the focal point in the initial telephone contact.

Proportionate sampling will take place within each of the two DoD populations and within the two contractor populations, where groups of bench level users and management personnel will be randomly sampled from within each population. In addition, AUERBACH has added the sub stratum of support personnel, which includes technical librarians, search and retrieval specialists, etc. Again, these sub populations will be subjected to proportionate random sampling; the sampling fraction to be determined on the basis of the total number of persons within each category. At this point, without knowledge of the numbers of persons within each defined category it is not possible to determine the N within each relevant dimension.

We are prepared to conduct a maximum of 800 and a minimum of 650 interviews, based upon the numbers that fall within each category. The estimated accuracy of the results for percentages are $\pm$ 5 percentage points, with a confidence level of 95%.[2] This means that if the project were repeated 100 times, the results would fall within 5 percentage points at least 95 times out of 100. Since this project will be at least partially concerned with differences between sub categories of respondents, the accuracy for differences may increase the estimate of error approximately 2 percentage points. Nevertheless, since both cost and time are relevant considerations, AUERBACH feels that this small percentage of error can be tolerated in the interest of feasibility and practicality.

Prior to tabulating the data from survey responses, we will screen and edit completed interviews for completeness, internal consistency and other factors that would affect data quality. Write-in answers to unstructured and semi-structured questions will be coded by our survey project team to assure

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[2] Yates, Frank. Sampling Methods for Census and Surveys. London: Charles Griffin and Company, Ltd., 1949

reliability and to facilitate analysis and summarization of these kinds of responses. In order to assure complete accuracy and reliability of interview data, 4% of the interviews in each major category will be randomly selected for telephone monitoring. For each of these selected interviews, a senior project team member will monitor the interview while in progress and record all of the respondent's answers. Systematic comparisons will be coordinated with the interviewer, and interjudge reliability coefficients will be determined. This procedure will serve as a check on our interviewers and on the reliability of the respondent's answers.

Interview data will be tabulated initially by groups of users and non-users to determine what kinds of DDC produced/disseminated information each group is aware of, how accessible it is, how useful it is, and how it could be improved.

Results for individual groups will then be compared to look for similarities and differences in their responses to these questions, with regard to the kinds of information they use, and how useful they find it, etc. Where apparent differences are detected, these will be tested for significance to determine whether such differences are attributable to sampling error, or are a function of statistically reliable differences between groups. All analyses performed and the results will be documented in the final study report.

It is anticipated that the statistical analysis of survey results will allow for the determination of the accessibility, quality, quantity, response time and degree to which DDC and comparable services from other agencies are up-to-date, as well as the reasons for satisfaction or dissatisfaction by them. Reasons for information non-use by potential users will also be determined along with an assessment of current feedback mechanisms. Reasons given by non-users for their failure to utilize DDC facilities will also be determined.

The major purpose of the survey, however, will be to draw inferences from the above data and extrapolate in order to predict the total demand of the user population on DDC's capability during the 1978-1988 period.

As a function of the user survey, the adequacy of current feedback mechanisms to various user categories will be determined. Based on this evaluation, alternative user feedback mechanisms will be defined and reviewed with selected users to test their efficacy. As appropriate, these feedback mechanisms may actually be implemented between users and particular DDC programs to judge their adequacy further in a real-world environment.

Those feedback mechanisms showing greatest promise will be defined and reported upon in the final report. The discussion will address how the feedback mechanism(s) will interface with current and projected DDC information production and dissemination functions.

(3) Agency statistician who reviewed and approved the statistical aspects of this design is _____.

(4) Contractor: AUERBACH Associates, Inc.
121 North Broad Street
Philadelphia, PA 19107

Role: Design and pre-test survey questionnaire, conduct user interviews, tabulate and analyze data and interpret results in terms of study purpose and objectives.

Data: Completed interview forms will be used only to tabulate survey results. Individual interviews will not be cited in study reports, or otherwise disclosed. DDC will instruct AUERBACH regarding disposition of completed interview forms at contract termination.

3. TABULATION AND PUBLICATION PLANS

(1) There are no plans at present to publish the data. Results of the analysis of completed interviews will be cited in project reports to establish a basis for various findings and recommendations made therein. These reports, or excerpts from them, may eventually be published.

(2) Survey results will be analyzed and tabulated by AUERBACH's subcontractor, Criterion Development Associates, Inc. via standard statistical analysis software packages available at the Memphis State University (MSU) Computing Center, where all computing will be accomplished.

AUERBACH will select the most efficient and appropriate program packages from SPSS, the Statistical Package for the Social Sciences, and BMD, the Biomedical Computer Programs.

SPSS, developed at the University of Chicago, is a comprehensive, general-purpose statistical program package, designed to perform a wide range of analyses. It computes many types of statistical analyses and provides a capability which offers the user a vast saving in time and effort. SPSS provides several attractive features for data base maintenance, such as extensive variable labeling capabilities, selective processing of data items, user specified data transformation, and data file generation in both BCD and binary formats. Its statistical procedures include descriptive statistics and one-way frequencies, table displays of relationships between two or more variables, correlation analyses, multivariate analyses, and scalogram analysis. The SPSS documentation is exceptionally complete.

The BMD's, a well-known extensively used complement of more than sixty FORTRAN programs, was developed by the Health Sciences Computing Facility of the University of California (Los Angeles) and has proven useful in research projects in themedical and social sciences. BMD programs on the MSU system are in the areas of description and tabulation, multivariate analysis, regression analysis, analysis of variance, and time series analysis. A number of special programs and the BMD-X Series of programs are also included.

This software will be used in the following statistical analyses:

(a) Multiple regression analyses and analyses of variance.

(b) Analysis of variance factional design.

(c) Continuing trend analyses of interview data.

4. TIME SCHEDULE

(1) The contract under which this survey is being performed began on June 19, 1975 and will terminate on February 17, 1976. The project work plan provides for beginning the user interviews in September, 1975, and completing this field work by the end of October, 1975. A draft report presenting results of this survey is scheduled for the end of November 1975.

(2) Although there are no plans to publish the survey data, formally, it is planned to have these results available to the Government within one month after completion of the user interviews.

5. CONSULTANTS OUTSIDE THE AGENCY

(1) (To be supplied by DDC.)

(2) N/A

(3) N/A

6. RESPONDENT BURDEN

(1) The estimated average number of man-hours per interview is one hour.

(2) Respondent will not be required to gather and compile data. Information requested of the interviewee will be readily available to him based upon his experiences in obtaining and using scientific and technical information. Interview form will be completed by contractor's interviewer; hence, no respondent clerical time will be required.

(3) Time required to complete an interview will depend on factors such as: extent to which interviewee uses DDC information; facility with which he responds to questions; and, his interest in discussing information issues and problems.

7. SENSITIVE QUESTIONS

None.

8. ESTIMATED COSTS OF SURVEY

$15,136	-	Design and Pre-test
31,842	-	Interviewing
1,420	-	Travel and Living
44,180	-	Analysis
$92,578	-	TOTAL ESTIMATED SURVEY COST

Note: Above cost estimates include overhead and other loading factors.

APPENDICES

A. Interivew Schedule To Be Used For Bench Level Scientists & Managers Of RDT&E Activities

B. Interview Schedule to Be Used For Technical Support Personnel

C. Pre-Mailed Response Cards

D. Covering Letter

E. Justification of Survey Plan

APPENDIX A.

Interview Schedule to be Used for Bench Level Scientists & Managers of RDT&E Activities

FACE SHEET
DSA 900-75-C-5161

A. Information not to be keypunched

1. Date of interview_____
2. Time interview began_____
3. Time interview ended_____
4. Interviewer's name_____
5. Name of respondent_____
6. Respondent's organization_____

B. Information to be keypunched

1. MIL/GS rating_____
2. What is your job title?_____
3. Sex_____
4. Year of birth_____
5. Highest degree (s)_____
6. Year (s) obtained_____
7. Academic/Professional area of degree_____
8. Number of personnel supervised_____
9. Years of experience in R&D_____
10. Check one: confidential____secret____top secret_____
11. In a few words please tell me what you do on your job. _____

_____

_____

12. Job level (CHECK ONE)
    1. Bench level ( )
    2. Support ( )
    3. Management ( )

13. Please turn to Card #12. Pick your major category and choose one subfield.
14. Organization's User Code #_____
15. _____Contractor or_____DOD Organization
16. _____Key user organization or _____all the rest.
17. State:_____
18. Area Code:_____
19. Interviewer's Code#:_____

INTERVIEW SCHEDULE DSA900-75-C-5161
FOR BENCH LEVEL AND MANAGEMENT USERS AND NON USERS
DOD INSTALLATIONS AND DOD CONTRACTOR PERSONNEL (Pending OMB approval)

(1) I would like to ask you about any research in which you have been involved during the past six months. Can you tell me about the research that you've worked on during this time?

(IF RESPONDENT IS HESITANT BECAUSE OF SECURITY SAY, "We're going to conduct this at an unclassified level.")

(1a) If R describes research	(1b) If R is not involved in any research
_____	(Determine other needs for information)
_____	What are the major tasks involved in your job?
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
ASK R TO IDENTIFY THE MAJOR RESEARCH PROJECTS OR PROJECT AREAS THAT HE HAS WORKED ON SOMETIME DURING THE PAST 6 MONTHS	ASK R TO IDENTIFY A MAJOR ACTIVITY THAT HAS REQUIRED INFORMATION SEARCH

(Many of the questions that follow are highly structured. Please answer them in terms of the Cards we've sent. As the interview progresses I'll be asking questions that will encourage you to tell me all about how you search for information.)

(2) On the average, how many hours per week do you spend in research and research related activities? _____

(3) Please turn to Card #1. Generally speaking, how much need do you have for scientific and technical information?

_____

(4) Again looking at Card #1, in general, how much need do you have for scientific and technical information from sources outside your own office or laboratory?

RE-INSERT CARD #1 _____

Later on you'll stay with the same card for several questions in a row like we just did. To avoid boring you I won't tell you to keep looking at the same card each time; so if you're not sure at any point just tell me.

(5) Now I would like to ask you about the information that you search for in connection with your research projects. Do you conduct your own information searches, or do you have someone else do it for you?

____Conduct it personally

____Have someone else do it

____Both: (If both) (5a) What percentage of the searching do you conduct personally?

_____%

(IF R ANSWERS "HAVE SOMEONE ELSE DO IT," DETERMINE WHO THIS PERSON IS, AND PROBE TO DETERMINE WHETHER OR NOT R CAN ANSWER AS IF HE DOES THE INFORMATION SEARCH HIMSELF.)

(6) Where do you generally go first to search for the information that you need?

____Consultant

____Friend, Peer of Associate

____Departmental Collection

____In house library

____Seminar/Meeting/Conference

____Publisher, Bookstore

____Supervisor

____Personal Collection

____Distant library

____Mechanized Information Service

____Other (specify)_____

_____

INTERVIEW SCHEDULE DSA900-75-C-5161
FOR BENCH LEVEL AND MANAGEMENT USERS AND NON USERS
DOD INSTALLATIONS AND DOD CONTRACTOR PERSONNEL (Pending OMB approval)

(1) I would like to ask you about any research in which you have been involved during the past six months. Can you tell me about the research that you've worked on during this time?

(IF RESPONDENT IS HESITANT BECAUSE OF SECURITY SAY, "We're going to conduct this at an unclassified level.")

(1a) If R describes research

_____

_____

_____

_____

_____

_____

_____

_____

ASK R TO IDENTIFY THE MAJOR RESEARCH PROJECTS OR PROJECT AREAS THAT HE HAS WORKED ON SOMETIME DURING THE PAST 6 MONTHS

(1b) If R is not involved in any research

(Determine other needs for information)

What are the major tasks involved in your job?

_____

_____

_____

_____

_____

_____

ASK R TO IDENTIFY A MAJOR ACTIVITY THAT HAS REQUIRED INFORMATION SEARCH

(Many of the questions that follow are highly structured. Please answer them in terms of the Cards we've sent. As the interview progresses I'll be asking questions that will encourage you to tell me all about how you search for information.)

(2) On the average, how many hours per week do you spend in research and research related activities?_____

(7) Is (_____) generally the most useful single
INSERT FIRST PLACE R GOES Q#6
source for helping you locate the information that you need?

____Yes ____No

GO TO Q#8 (7b) What is generally the most useful single source?

____Personal Collection
____Friend, Peer or Associate
____Departmental Collection
____Seminars/Conferences/Meetings
____Supervisor
____Publisher/Bookstore
____Distant Library
____Mechanized Information Service
____Consultant
____In House Library
____Other (specify)_____
_____

(7c) Why is (_____)
INSERT FIRST PLACE R GOES Q#6
inadequate for your needs?

_____

_____

(8) Please turn to Card #2. Why do you go to (_____)? _____
INSERT #1 SOURCE

_____

(9) Please turn to Card #3. When you go to (_____)
INSERT MOST IMPORTANT SOURCE
what format is the information in that you generally find most useful?

(PLACE A 1 NEXT TO THE APPROPRIATE CATEGORY ON CARD #3 BELOW)

CARD #3 FORMATS

____Computer Generated Bibliographies

____Technical Reports

____Personal Conversation

____Abstract Journals

____Published Bibliographies (Lists)

____Books

____Handbooks, Manuals

____Management Reports: i.e., manpower, funding, project status, resource allocation and status

____Journals

____Reviews/ State of the Art papers

____Current Awareness or Automatic Announcement Services

____Numeric Data Compilations

____Commercial Brochures

____Other_____ _____

(10) Why do you find (_____) so useful?_____
SOURCE #1 FORMAT #1

_____

_____

(11) Are there any disadvantages?_____

_____

_____

_____

(WHEREVER QUESTIONS ARE NOT ANSWERED INDICATE SAME WITH A STRAIGHT 45° LINE FROM RIGHT TO LEFT DRAWN THROUGH THE UNANSWERED QUESTIONS)

(12) What percentage of the information you need typically comes from (_____) in the form of (_____)?
SOURCE #1 FORMAT #1 _____%

---

(13) Do you find any other useful information that is in a different format?

____Yes ____No

GO TO Q#18

(PLACE A 2 NEXT TO THE APPROPRIATE CATEGORY ON CARD #3)

(14) Why do you find (_____) so useful?_____
FORMAT #2

_____

_____

(15) Are there any disadvantages?_____

_____

_____

(16) What percentage of the information you need typically comes from (_____) in the form of (_____)?
SOURCE #1) FORMAT #2 _____%

(17) Please turn again to Card #3. What other useful formats of information do you rely on?

_____

_____

_____

_____

---

(18) Generally speaking what is the second most useful source for helping you locate the information you need?

(IF NO SECOND SOURCE) ↓ GO TO Q #31

_____Consultant

_____Friend, Peer, Associate

_____Departmental Collection

_____In house library

_____Publisher, Bookstore

_____Supervisor

_____Seminars/Meetings/ Conferences

_____Distant Library

_____Personal Collection

_____Mechanized Information Service

_____Other (specify)_____

(19) Please refer to Card #2. Why did you go to (_____) next?
INSERT #2 SOURCE

(20) Please refer to Card #3. When you went to (_____)
INSERT SOURCE #2 Q #18
what format was the information in that you found most useful?

(21) Why did you find it useful?_____

(22) Are there any disadvantages?_____

(23) What percentage of the information you need typically comes from (_____)?
INSERT FORMAT #1 FROM SOURCE #2 _____%

---

(24) Refer again to Card #3. Did you find any other useful information that is in a different format?_____

(25) Why did you find it useful?_____

_____

_____

(26) Are there any disadvantages?_____

_____

_____

(27) What percentage of the information you need typically comes from (_____)?
INSERT FORMAT #2 FROM SOURCE #2 _____%

(28a) Are there any other sources where you find information that is important for your purposes?

____No → GO TO Q#31

____Yes ↓

(28b) What are they?

____Friend, Peer, Associate

____Consultant

____In House Library

____Departmental Collection

____Publisher/Bookstore

____Supervisor

____Seminar/Meeting/Conference

____Personal Collection

____Distant Library

____Mechanized Information Service

____Other (specify)_____

_____

(29) Refer to Card #3. When you went there what format was the information in that you found to be most useful?

_____

(30a) Did you find any other useful information that was in a different format?

____Yes ____No (GO TO Q #31)

(30b) Specify_____

_____

(IF R HAS MENTIONED FORMAL SOURCES) I want to ask you about informal sources of information. (GO TO Q #31) (IF R HAS NOT MENTIONED ANY INFORMAL SOURCES YET, SAY:) You've mentioned formal sources such as (_____) and (_____). Now I want to ask you about informal
INSERT SOURCE #1 #2 SOURCE
sources of information.

(31) Do you know what I mean by informal sources of information?

____Yes ____No

(ELICIT AN EXAMPLE FROM R)

(32a) Do you rely on any informal sources?

____Yes

(32b) How are they useful?_____

_____

(32c) What do they provide that formal sources don't?

_____

_____

____No

(32d) Why not?_____

_____

_____

(IF R HAS NOT MENTIONED A PERSONAL COLLECTION OR FILE YET ASK Q#33a. IF HE HAS GO TO Q #34)

(33a) Do you maintain a personal collection or file?

(33b) ____Yes

GO TO Q#34

(33c) ____No

Why not?_____

_____

_____

GO TO Q#37

(34) You've told me about your personal collection. Why do you maintain a personal collection?

_____

_____

(35) How is it organized?_____

_____

(36a) Does it include microfiche?

____Yes ____No

(36b) Could you use assistance in organizing your collection?

____Yes ____No

(36c) What kind of assistance?	(36d) Why not?_____
_____	_____
_____	_____
_____	_____

(IF R HAS MENTIONED USING A MECHANIZED INFORMATION SERVICE, ASK Q #37 THRU #46. IF NOT, ASK IF HE HAS EVER USED ONE. IF SO, IDENTIFY THE SERVICE AND ASK QUESTIONS 37-46 IF NOT, PROCEED WITH QUESTION #47.)

Name of service not previously identified:_____

_____

(37) Now I'd like to ask you about (_____
_____). INSERT MECHANIZED INFORMATION SERVICE MENTIONED ABOVE

Who initiated the search, yourself or someone else?

____Yourself ____Someone else

(38) Please turn to Card #4. How was the search initiated?_____

_____

_____

_____

(39) What percentage of the titles delivered were of real use to you?_____%

(40) Generally speaking do you screen the titles or does someone else?

____You ____Someone else

(41) Generally speaking, how long does it take?

____Hours ____Minutes

(42) Is it generally necessary to go to other sources to complete your search?

____Yes ____No

(43) Why is it necessary?_____

_____

_____

_____

_____

_____

(44) Please refer to Card #5. In your opinion, how satisfactory has the performance of the mechanized information service (s) been?

INSERT CARD #5

Explain:_____

_____

_____

(45) How much time is typically involved from the initiation of the request until the information is received?

_____Days _____Hours

(46a) Did the information arrive in time to be of use to you?

____Yes ____No

(46b) How much faster would it have to arrive?

_____

(46c) Do you know why it took so long?_____

_____

_____

---

(47) Please refer to Card #6. During the past six months have you had any problems locating information?

_____

(48) For research projects like the ones we've been talking about, what would be the most ideal way to locate the information you need?

_____

_____

_____

(49) Please turn to Card #7. Please rank the media you have relied on most during the past year?

	Medium	%
1st	_____	_____
2nd	_____	_____
3rd	_____	_____
4th	_____	_____

(DO NOT BE CONCERNED IF R CANNOT IDENTIFY A 3rd OR 4th CHOICE)

(50) Now, what percentage of the information you needed came to you as (_____), (_____), etc.
INSERT FIRST CHOICE SECOND CHOICE

1st____%
2nd____%
3rd____%
4th____%

(51) Please turn to Card #5 for the next series of questions. Now please think about all of the information you needed and searched for during the past year. To what extent did the amount of information you received meet your needs?

RE-INSERT CARD #5 _____

(52) To what extent did the quality of information you received meet your needs?

RE-INSERT CARD #5 _____

(53) To what extent did the time between your initial request and the delivery of the information meet your needs?

RE-INSERT CARD # 5 _____

(54) Now please turn to Card #8. To what extent was the information received up-to-date?

RE-INSERT CARD #8 _____

(55) Now please go back to Card #5. To what extent did the media in which you received the information meet your needs?

RE-INSERT CARD #5 _____

(56) To what extent did the formats meet your needs?

RE-INSERT CARD #5

---

(57) How much did the information services you received from (_____) cost you (or your organization)?
#1 & #2 SOURCES

(57a) (_____) 1st SOURCE

(57b) (_____) 2nd SOURCE

(58a) Would you be willing to pay more to improve the (_____ _____) of the information?
INSERT LOWEST RATED ASPECT Q#51-56

____Yes ____No

(58b) How much more?

In absolute terms:_____

Percentagewise:_____

(58c) Why not?

_____

_____

(59a) (If appropriate) Would you be willing to wait longer to improve the (_____) of the information?
INSERT LOWEST RATED ASPECT Q#51-56

____Yes ____No

(59b) How much longer?

In absolute terms:_____

Percentagewise:_____

(59c) Why not?_____

_____

_____

(60) Now I would like you to project yourself backward in time to 1970. I would like to get an idea of how the information you obtained then and the way that you went about finding it compares to the information you obtained this year and the way you found it. First, were you engaged in information search five years ago?

____Yes ____No (GO TO Q#70)

(61) As much as possible I would like you to think about the major research projects you were working on during 1970. Can you tell me what they were? (USE WHATEVER MEMORY JOGGERS MAY BE NECESSARY.)

_____

_____

_____

_____

(62) Please turn to Card #5. In terms of your needs back in 1970, to what extent did the amount of information you received meet your needs?

RE-INSERT CARD #5 _____

(63) In terms or your needs back in 1970, to what extent did the quality of information you received meet your needs?

RE-INSERT CARD #5 _____

(64) In terms of your needs back in 1970, to what extent did the time between your initial request and delivery of the information meet your needs?

RE-INSERT CARD #5

(65) Now, please turn to Card #8. In terms of your needs back in 1970, to what extent was the information that you obtained up-to-date?

RE-INSERT CARD #8

(66) Turn to Card #7. What was the predominant medium that the information you received in?

RE-INSERT CARD #7 _____

(67) Turn to Card #3. What was the predominant format that the information you received in?

RE-INSERT CARD #3 _____

(68) Turn to Card #5. To what extent did the medium meet your needs?

RE-INSERT CARD #5 _____

(69) To what extent did the format meet your needs?

RE-INSERT CARD #5 _____

(READ THE FOLLOWING SLOWLY TO R)

(70) We've covered a lot of questions so far. You have given me a lot of very useful information. Now, I'd like to shift gears for a moment. Are you comfortable? Okay, take a breather, flex your muscles and sit back in your chair. I'm going to ask you to stretch your mind a bit, think about the future and imagine what it might be like, Do you remember the book Future Shock? Do you remember the major points the author was making? (INTERVIEWER EXPLAINS AS NECESSARY) Now please try to anticipate your needs for information as they will be five years from now. In doing so, please try to compare what you have experienced this year in receiving information from your most useful source to what you think your needs will be in 1980. Do you think that you understand what I want you to do?

____Yes ____No

IF "NO", INTERVIEWER MUST EXPLAIN PROCESS IN MORE DETAIL

(71) Okay, I'd like you to project yourself into the future to 1980. How do you think your field will have changed by then?

_____

_____

(72) What do you think you will be doing then?

_____

_____

(73) How do you think these changes you've mentioned will affect your need for information?

_____

_____

(DETERMINE IF R FEELS COMFORTABLE WITH THIS LINE OF QUESTIONIN

(IF "NO", INTERVIEWER MUST EXPLAIN PROCESS IN MORE DETAIL)

(74) Please turn to Card #9. Would the amount of information you have received this year meet your needs in 1980?

RE-INSERT CARD #9 _____

(75) Would the quality of information you recieved this year meet your needs in 1980?

RE-INSERT CARD #9 _____

(76) Would the time between your initial request and delivery of the information this year meet your needs in 1980?

RE-INSERT CARD #9 _____

(77) Would the extent to which the information you received this year was up-to-date meet your needs in 1980?

RE-INSERT CARD #9 _____

(78) Would the predominant format of the information you received this year meet your needs in 1980?

RE-INSERT CARD #9 _____

(79) Would the predominant medium of the information you received this year meet your needs in 1980?

RE-INSERT CARD #9 _____

(80) Would you like to see any changes in the amount of information you receive by 1980?

_____Yes (Be specific) _____No

_____

_____

_____

_____

(81) Would you like to see any changes in the quality of information you receive by 1980?

_____Yes (be specific) _____No

_____

_____

_____

(82) Would you like to see any changes in the time between request and delivery by 1980?

_____Yes (be specific) _____No

_____

_____

_____

(83) By 1980, would you like to see any changes in the degree to which the information you receive is up-to-date?

_____Yes (be specific) _____No

_____

_____

_____

(84) Would you like to see any changes in the medium in which you receive information by 1980?

_____Yes (be specific) _____No

_____

_____

_____

_____

(85) Would you like to see any changes in the format of the information you receive by 1980?

_____Yes (be specific) _____No

_____

_____

(86) Which of the changes you'd like to see would be most useful to you?

(Explain)_____

_____

_____

(87a) Would you be willing to pay more for this change?

(87b) _____Yes (87c) _____No

How much more?_____ Why Not?_____

(88a) (If Appropriate) Would you be willing to wait longer from initial request to time of delivery for this change?

(88b) _____Yes (88c) _____No

How much longer?_____ Why not?_____

(89) Now please turn to Card #10. In the future what do you think will happen to your need for services you subscribe to versus those that you receive on request (or demand)?

_____

(90a) There are a number of services which automatically provide information according to previously registered categories. Do you subscribe to any such services now?

_____Yes

(90b) What are they?_____

_____

_____

_____No

(90c) Why not?_____

_____

_____

(90d) Do you pay for them?

GO TO #91

_____Yes

(90e) How much does it cost?

_____

_____

_____No

(90f) How do you get them?

_____

_____

(91) Please turn to Card 11. If a service was available that could match your information needs and specialty area very closely, how valuable would it be to you in your work?

_____

(92a) Would you be willing to pay for it?

_____Yes

(92b) How much?_____

_____No

(92c) Why not?_____

_____

_____

(93a) Which would you prefer? A free service covering broad areas, or a service you pay for covering your precise needs and specialty?

____Service you pay for

(93b) How much would it be worth to you?_____

_____

_____

____Free service

(93c) Why would you prefer this type of service?_____

_____

_____

(94) Do you know what the letters DDC stand for?

____Yes ____No

(95) Have you ever seen a report, summary or bibliography produced by DDC?

____Yes ____No

(96) If yes, have you had occasion to request any information from DDC?

____Yes ____No

THE BALANCE OF THIS INTERVIEW IS FOR ESTABLISHED USERS OF DDC ONL

PART II
For DDC Users Only

(97) Have you used this information in any work that you have undertaken in the last 6 months?

____Yes ____No

(98) How much time did it take for you to prepare a request for DDC?

____H ____D ____W ____M

(99) When you initiate a search for information from DDC how do you usually do it?

____Telephone ____Mail ____Thru Intermediary ____Other

(100) When you initiate a search for information from other sources, how do you usually do it?

____Telephone ____Mail ____Thru Intermediary ____Other

(101) Approximately how many references are usually delivered?

(101a) From DDC_____ (101b) From other sources _____

(102) How many of these references (approximately) are useful to you?

From DDC_____

(103) From other_____

(104) On Card #12 you will find a list of subject areas within the DDC collection. Could you take a few minutes, look this over, and tell me which areas are most useful to you in your own research?

_____

_____

_____

(105) On Card #13, you will find a listing of the request services provided by DDC. Please scan the list and tell me which ones you are aware of. (INTERVIEWER WILL LIST)

_____Technical Report Program
_____R&D Program Planning Information System
_____R&T Work Unit Info. System
_____Independent Research & Development Data Bank (IR&D)
_____Scheduled Bibliographies
_____RDT&E On-Line Retrieval System
_____Report Bibliographies on Magnetic Tape (RBMT)
_____Current Awareness
_____Defense R&D of the '60's and 1970
_____Defense Retrieval Indexing Terminology (DRIT)
_____Defense Retrieval Indexing Terminology Hierarchy (DRIT-H)
_____DDC Referral Services
_____Report Bibliographies

(106) Now will you please rank these request systems in terms of those that you find to be most useful?

(1) _____

(2) _____

(3) _____

(107) Will you rank those that you find least useful? Include only those you are aware of (RANK LEAST USEFUL 1st, etc.)

(1) _____

(2) _____

(3) _____

(108) On Card #14 you will find a list of the subscription services provided by DDC. Please scan the list and tell me which ones you're aware of.

_____(1) Automatic Distribution of Documents (ADD)
_____(2) Selective Dissemination of Information Software Packages
_____(3) Technical Abstract Bulletin (TAB) & Indexes
_____(4) Automatic Magnetic Tape Distribution (TAB on Tape)
_____(5) DDC Digest
_____(6) Recurring Reports (WUIS)
_____(7) Recurring Reports (Program Planning)
_____(8) Current Awareness Bibliographies
_____(9) Recurring Reports (IR&D) (DOD USERS ONLY)

(109) Now will you please rank these subscription services in terms of those that you find most useful?

(1) _____

(2) _____

(3) _____

(110) Out of those subscription services that you are familiar with, please rank those that are least useful to you.

(1) _____ (Least useful)

(2) _____ (next to least useful)

(3) _____

(111) Now, remember those questions I asked about the future, I want you to relax again and stretch your mind. What services do you think DDC should provide in the future that are not being provided now? First, tell me about the near future, then about the distant future.

(NEAR FUTURE EQUALS "WITHIN THE YEAR")

NEAR FUTURE	DISTANT FUTURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(112) Please turn to Card #15. How were you first made aware of

(_____)?
INSERT REQUEST SERVICE RANKED #1 in Q #106

(113) How were you first made aware of (_____
INSERT SUBSCRIPTION SERVICE

_____)?
RANKED #1 in Q #109

(114) Could you suggest any better ways to make people aware of these services?

_____

_____

_____

(115) Would training, such as seminars, cassette tapes or programmed texts on DDC services be of help to you?

____Yes ____No

(116) What would help most then? _____

_____

(117) Would you make use of (_____) if (it) (they) (was) (were) available? INSERT ANSWER TO #116

____Yes. ____No

(118) At the present time what do you think is the most efficient way of getting information from DDC?

_____

---

(119) Which one of all the DDC services do you find most useful?

_____

(120) Now I'd like to ask you some questions about (_____).
INSERT ANSWER TO Q #119

(121) Now, turning to Card #5, what about the quality of information from DDC?

RE-INSERT CARD #5 _____

(122) What about the quantity of information from DDC?

RE-INSERT CARD #5 _____

(123) What about the time between request and delivery?

Re-INSERT CARD #5 _____

(124) What about the degree to which the information was up-to-date?

RE-INSERT CARD #5 _____

(125) Please turn to Card #3. What format does most of the information come in when you receive (_____)?
INSERT MOST USEFUL SERVICE Q #119

RE-INSERT CARD #3 _____

(126) Turn back to Card #5. To what degree does this format meet your needs?

RE-INSERT CARD #5 _____

(127) Please turn to Card #7. What medium does most of the information come in when you receive (_____)?
INSERT MOST USEFUL SERVICE Q #119

RE-INSERT CARD #7

(128) Please turn back to Card #5. To what degree does this medium meet your needs?

RE-INSERT CARD #5

T THIS POINT THE INTERVIEWER MUST HELP R SELECT ANOTHER INFORMATION SOURCE THAT IS OMPARABLE TO DDC IN SERVICES USED BY R. R MAY HAVE IDENTIFIED SUCH A SOURCE IN ART I. IF SO, FINE. MERELY PROCEED. IF NOT ASK R IF HE GOES ELSEWHERE FOR SERVICES IMILAR TO THE DDC SERVICES HE'S JUST DESCRIBED.)

(THEN, INTERVIEWER GOES BACK AND REPEATS ALL QUESTIONS 121 THRU 128 FOR THE COMPARABLE SOURCE THAT THE RESPONDENT RELIED ON OTHER THAN DDC, SUCH AS NTIS, NASA, etc. CONTINUE TO USE SAME CARDS.)

(129) _____

(130) _____

(131) _____

(132) _____

(133) _____

(135) _____

(136) _____

(137a) Do you use the Research and Technology Work Unit Information System (WUIS)? (BASED ON DD #1498)

____Yes ____No

(137b) Why not?_____

_____

_____ (GO TO #146a)

(138) How often do you use WUIS? _____

(139) What do you use WUIS for?_____

(140) Turn to Card #5 again. I want to ask you about WUIS now. To what extent did the amount of the information meet your needs?

RE-INSERT CARD #5 _____

(141) To what extent did the quality of the information you received meet your needs?

RE-INSERT CARD #5 _____

(142) To what extent did the time between your initial request and delivery meet your needs?

RE-INSERT CARD #5 _____

(143) Please turn to Card #8.
To what extent has the information you received been up-to-date?

Re-INSERT CARD #8 _____

(144) As far as you can tell what percentage of the work units you would be interested in was covered by what you received?

_____%

(145a) List advantages of WUIS

_____

_____

_____

_____

(145b) List disadvantages

_____

_____

_____

_____

(146a) Do you use Program Planning Reports? (ASK ONLY DOD PERSONNEL)

_____Yes

_____No

(146b) Why not?_____

_____

_____

(GO TO #155a)

(147) How often do you use Program Planning Reports?_____

(148) What do you use Program Planning Reports for?_____

(149) Please return to Card #5. I want to ask you about Program Planning Reports now
To what extent did the amount of information meet your needs?

RE-INSERT CARD #5 _____

(150) To what extent did the quality of the information you received meet your needs?

RE-INSERT CARD #5 _____

(151) To what extent did the time between your initial request and delivery meet your needs?

RE-INSERT CARD #5 _____

(152) Please turn to Card #8. To what extent has the information been up-to-date?

RE-INSERT CARD #8 _____

(153) As far as you can tell what percentage of the information you would be interested in was covered by what you received?

_____%

(154a) List advantages of Program Planning Reports

_____

_____

_____

_____

(154b) List disadvantages

_____

_____

_____

_____

(155a) Do you use the Independent Research and Development Data Bank (IR&D)? (ASK ONLY DOD PERSONNEL)

____Yes

____No

(155b) Why not?_____

_____

(GO TO Q #164)

(156) How often do you use IR&D?_____

(157) What do you use IR&D for?_____ _____

(158) Please turn to Card #5. I want to ask you about IR&D. To what extent did the amount of information meet your needs?

RE-INSERT CARD #5 _____

(159) To what extent did the quality of the information meet your needs?

RE-INSERT CARD #5 _____

(160) To what extent did the time between your initial request and delivery meet your needs?

RE-INSERT CARD #5 _____

(161) Please turn to Card #8. To what extent has the information been up-to-date?

RE-INSERT CARD #8 _____

(162) As far as you can tell what percentage of the information you would be interested in was covered by what you received?
(R MAY ELABORATE) _____%

(163a) List advantages of IR&D

_____

_____

_____

(163b) List disadvantages

_____

_____

_____

---

(164) Please turn to Card #16. Here's a list of Information Analysis Centers. Have you ever used the services of an IAC.

____Yes ____No

(165a) Do you use the services of any of these Information Analysis Centers (IAC's)

INSERT CARD #16

____Yes →

(165b) Which one (s)?
(LIST NUMBERS)

____ ____

____ ____

____ ____

____ ____

____No →

(165c) Why not?

(a) Never heard of them

(b) Too expensive

(c) No need

(d) Not in area of interest

(e) Other_____

(166) How do you use these services?

_____

_____

(167) Are more IAC's needed?

____yes ____No

(168) What modifications, if any, are needed in the service IAC's provide?

_____

(169) Do you ever see references to your own work in IAC reports?

_____

_____

(170) Can you see the IAC's as useful sources of information for you in the future?

____Yes ___No Please explain____

_____

_____

(171a) What services is DDC now providing that should be changed or modified?

(171b) Services:	(171c) Changes or Modifications:
_____	_____
_____	_____
_____	_____
_____	_____

(172) Do you have access to a microfiche reader?

____Yes ____No → (GO TO Q #177)

(173) Please turn to Card #17. How available is this reader?_____

_____

(174) How often do you use this reader?_____

_____

(175) How often did you use it 5 years ago? _____

_____

(176) How often do you anticipate using it in the future, by 1980? _____

_____

(177) Do you prefer to receive information on microfiche or in printed copy?

____Microfiche ____Printed Copy

(178) If you could substantially reduce the time lag between your initial request and delivery by receiving output as microfiche instead of paper would you be interested?

____Yes ____No (GO TO Q #180)

(179) (If appropriate) How many days earlier would you have to receive the information in order for you to accept it on microfiche?

____Days

(180) Please turn again to Card #12. In what content areas do you input information to DDC?

_____ _____

_____ _____

_____ _____

(181) In the output you get from DDC do you see references to your own work where you expect them to be?

____Yes ____No

(182) Have you ever failed to get needed information from DDC?

____Yes ____No (GO TO #185)

(183) Were you referred?
____Yes ____No

(184) Was referral appropriate?
____Yes ____No

(185) Are you aware of information services that can bring output directly to the user where he is almost immediately?

____Yes ____No → (Explain) GO TO #188a

(186) What kind of services are you aware of?

_____

(187) Have you ever used this (these) service (s)?

_____

(188a) (If appropriate) Are you familiar with the DDC Defense RDT&E On-Line System?

____Yes ____No (GO TO Q #190)

(188b) Have you ever used it?

____Yes ____No

(189a) For your purposes, does this service have any special advantages?

____Yes ____No

(189b) What are they?_____

_____

_____

(190) If such a service could be precisely keyed to your interests and be complete what would you be willing to pay for it (or your organization)?

_____

(191) Do you know that services like these can be connected to other data bases or libraries switching automatically as needed?

____Yes ____No

(192) Have you ever used such an information system?

____Yes ____No

(193) Which one?

_____

(194a) For your purposes does this type of service have any special advantages?

____Yes ____No

(194b) What kind of advantages? HAVE R EXPLAIN IN DETAIL

(194c) Why not?_____

TERMINATE

APPENDIX B.

Interview Schedule to be Used for
Technical Support Personnel

INTERVIEW SCHEDULE DSA900-75-C-5161
FOR SUPPORT PERSONNEL
DOD INSTALLATIONS AND DOD CONTRACTOR PERSONNEL

---

(1) Please turn to Card 1A. Here are some of the kinds of information that are typically available to libraries. Which of these have your users relied on most often? (RECORD RANKINGS BELOW)

1. _____

2. _____

3. _____

(2) Why do you think they find (_____) so useful? _____
FORMAT #1

_____

_____

(3) Are there any disadvantages? _____

_____

_____

_____

(WHEREVER QUESTIONS ARE NOT ANSWERED INDICATE SAME WITH A STRAIGHT 45° LINE FROM RIGHT TO LEFT DRAWN THROUGH THE UNANSWERED QUESTIONS.)

(4) What percentage of the information they need typically comes in the form of (_____)?
FORMAT #1 _____%

---

(5) Why do you think they find (_____) so useful? _____
FORMAT #2

_____

_____

OMB Approval No. 22-575004

FACE SHEET

DSA 900-75-C-5161

A. Information not to be keypunched

1. Date of interview _____
2. Time interview began _____
3. Time interview ended _____
4. Interviewer's name _____
5. Name of respondent _____
6. Respondent's organization _____

B. Information to be keypunched

1. MIL/GS rating _____
2. What is your job title? _____
3. Sex _____
4. Year of birth _____
5. Highest degree (s) _____
6. Year (s) obtained _____
7. Academic/Professional _____
8. Number of personnel supervised _____
9. Years of experience in R&D _____
10. Check one: confidential _____ secret _____ top secret _____
11. In a few words please tell me what you do on your job. _____

_____

_____

12. Organization's User Code # _____
13. _____Contractor or _____ Dod Organization
14. _____Key user organization or _____ all the rest.
15. State: _____
16. Area Code: _____
17. Interviewer's Code #: _____

(6) Are there any disadvantages? _____

_____

_____

(7) What percentage of the information the typical user needs comes in the form of (_____)?
FORMAT #2

_____%

(8a) Do your users maintain personal collections or files?

(8b) _____Yes

What percentage of them maintain such files?

_____%

GO TO Q#9

(8c) _____No

Why not? _____

_____

_____

GO TO Q#13

(9) Why do they maintain personal collections or files?

_____

_____

(10) How are they typically organized? _____

_____

(11) Do they include microfiche?

_____Yes _____No

(12a) Do you think they could use assistance in organizing their collections?

_____Yes _____No

(12b) What kind of assistance?

_____

_____

_____

(12c) Why not? _____

_____

_____

_____

(IF R HAS MENTIONED USING A MECHANIZED INFORMATION SERVICE, ASK Q#13 THRU #21c. IF NOT, ASK IF HE HAS EVER USED ONE. IF SO, IDENTIFY THE SERVICE AND ASK QUESTIONS #13-#21c. IF NOT, PROCEED WITH QUESTION #22.)

Name of service not previously identified: _____

_____

(13) Now I'd like to ask you about (_____).
INSERT MECHANIZED INFORMATION SERVICE
MENTIONED ABOVE

Who initiated the search, yourself or someone else?

_____Yourself _____Someone else

(14) Please turn to Card 2A. How was the search initiated? _____

_____

_____

_____

(15) What percentage of the titles delivered are typically of real use to your users? _____%

(16) Generally speaking, how long does it take for them to screen the titles?

_____Hours _____Minutes

(17) Is it generally necessary to go to other sources to complete their search?

_____Yes _____No

(18) Why is it necessary? _____

_____

_____

_____

_____

_____

(19) Please refer to Card #3A. In your opinion, how satisfactory has the performance of the mechanized information service (s) been?

INSERT CARD #3A

Explain: _____

_____

(20) How much time is typically involved from the initiation of the request until the information is received?

_____Days _____Hours

(21a) Does the information typically arrive in time to be of use to your users?

_____Yes _____No

(21b) How much faster would it have to arrive?

_____

(21c) Do you know why it takes so long? _____

_____

_____

---

(22) Please turn to Card #4A. Please rank the media your users have relied on most during the past year?

	Medium	%
1st	_____	_____
2nd	_____	_____
3rd	_____	_____
4th	_____	_____

(DO NOT BE CONCERNED IF R CANNOT IDENTIFY A 3rd OR 4th CHOICE)

(23) Now, what percentage of the information your users needed came to them as (_____), (_____), etc.
INSERT FIRST CHOICE,Q#22 SECOND CHOICE, Q#22

1st_____%
2nd_____%
3rd_____%
4th_____%

(24) Please turn to Card #3A for the next series of questions. Now please think about all of the information your users needed and searched for during the past year. To what extent did the amount of information they received meet their needs?

RE-INSERT CARD #3A _____

(25) To what extent did the quality of information they received meet their needs?

RE-INSERT CARD #3A _____

(26) To what extent did the time between their initial request and the delivery of the information meet their needs?

Re-INSERT CARD #3A _____

(27) Now please turn to Card #5A. To what extent was the information they received up-to-date?

RE-INSERT CARD #5A _____

(28) Now please go back to Card #3A. To what extent did the media in which they received information meet their needs?

RE-INSERT CARD #3A _____

(29) To what extent did the formats meet their needs?

RE-INSERT CARD #3A

---

(30) How much did the mechanized information services you received from (_____) cost you (or your organization)?
INSERT SOURCE (S)

(30a) (_____) (30b) (_____)
1 st SOURCE 2 nd SOURCE

(31a) Would your users be willing to pay more to improve the (_____ INSERT LOWEST
_____) of the information?
RATED ASPECT Q#24-29

(31b) How much more? (31c) Why not?

In absolute terms:_____ _____

Percentagewise:_____ _____

(32a) (If appropriate) Would your users be willing to wait longer to improve the (_____) of the information?
INSERT LOWEST RATED ASPECT Q#24-29)

_____Yes _____No

(32b) How much longer? (32c) Why not? _____

In absolute terms: _____ _____

Percentagewise: _____ _____

(33) Now I would like you to project yourself backward in time to 1970. I would like to get an idea of how the information your users obtained then and the way that they went about finding it compares to the information they obtained this year and the way they found it. First, were you engaged in providing information support service five years ago?

_____Yes _____No (GO TO Q#43)

(34) As much as possible I would like you to think about the major research projects you were helping your users find information for during 1970. Can you tell me what they were? (USE WHATEVER MEMORY JOGGERS MAY BE NECESSARY.)

_____

_____

_____

_____

(35) Please turn to Card #3A. In terms of their needs back in 1970, to what extent did the amount of information received meet their needs?

RE-INSERT CARD #3A _____

(36) In terms of their needs back in 1970, to what extent did the quality of information received meet their needs?

RE-INSERT CARD #3A _____

(37) In terms of their needs back in 1970, to what extent did the time between initial request and delivery of the information meet their needs?

RE-INSERT CARD #3A

(38) Now, please turn to Card #5A. In terms of their needs back in 1970, to what extent was the information they obtained up-to-date?

RE-INSERT CARD #5A

(39) Turn to Card #4A. What was the predominant medium of the information they received?

RE-INSERT CARD #4A _____

(40) Turn to Card #1A. What was the predominant format of the information they received?

RE-INSERT CARD #1A _____

(41) Turn to Card #3A. To what extent did the medium meet their needs?

RE-INSERT CARD #3A _____

(42) To what extent did the format meet their needs?

RE-INSERT CARD #3A _____

(READ THE FOLLOWING SLOWLY TO R)

(43) We've covered a lot of questions so far. You have given me a lot of very useful information. Now, I'd like to shift gears for a moment. Are you comfortable? Okay, take a breather, flex your muscles and sit back in your chair. I'm going to ask you to stretch your mind a bit, think about the future and imagine what it might be like. Do you remember the book Future Shock? Do you remember the major points the author was making? (INTERVIEWER EXPLAINS AS NECESSARY) Now please try to anticipate your users needs for information as they will be five years from now. In doing so, please try to compare what you and your users have experienced this year in receiving information to what you think their needs will be in 1980. Do you think that you understand what I want you to do?

_____Yes _____No

"NO", INTERVIEWER MUST EXPLAIN PROCESS IN MORE DETAIL

(44) Okay, I'd like you to project yourself into the future to 1980. How do you think information services will have changed by then?

_____

_____

(45) What do you think you will be doing then?

_____

_____

ETERMINE IF R FEELS COMFORTABLE WITH THIS LINE OF QUESTIONING)

F NO, INTERVIEWER MUST EXPLAIN PROCESS IN MORE DETAIL?

(46) Please turn to Card #6A. Would the amount of information your users have received this year meet your needs in 1980?

RE-INSERT CARD #6A _____

(47) Would the quality of information they received this year meet their needs in 1980?

RE-INSERT CARD #6A _____

(48) Would the time between their initial request and delivery of the information this year meet their needs in 1980?

RE-INSERT CARD #6A _____

(49) Would the extent to which the information received this year was up-to-date meet their needs in 1980?

RE-INSERT CARD #6A _____

(50) Would the predominant format of the information received this year meet their needs in 1980?

RE-INSERT CARD #6A _____

(51) Would the predominant medium of the information received this year meet their needs in 1980?

RE-INSERT CARD #6A _____

(52) Would you like to see any changes in the amount of information received by 1980?

_____Yes (Be specific) _____No

_____

_____

_____

_____

(53) Would you like to see any changes in the quality of information received by 1980?

_____Yes (Be specific) _____No

_____

_____

_____

(54) Would you like to see any changes in the time between request and delivery by 1980?

_____Yes (Be specific) _____No

_____

_____

(55) By 1980, would you like to see any changes in the degree to which the information received is up-to-date?

_____Yes (Be specific) _____No

_____

_____

_____

(56) Would you like to see any changes in the medium in which you receive information by 1980?

_____Yes (Be specific) _____No

_____

_____

_____

_____

(57) Would you like to see any changes in the format of the information you receive by 1980?

_____Yes (Be specific) _____No

_____

_____

(58) Which of the changes you'd like to see would be most useful to your users?

(Explain) _____

_____

_____

(59a) Would your users be willing to pay more for this change?

(59b) _____ Yes (59c) _____ No

How much more? _____ Why not? _____

(60a) (If appropriate) Would your users be willing to wait longer from initial request to time of delivery for this change?

(60b) _____ Yes (60c) _____ No

How much longer? _____ Why not? _____

(61) Now please turn to Card #7A. In the future what do you think will happen to your users' need for subscription services versus those that they receive on request (or demand)?

_____

(62a) There are a number of services which automatically provide information according to previously registered categories. Do your users subscribe to any such services now?

_____ Yes _____ No

(62b) What are they? _____ (62c) Why not? _____

_____ _____

_____ _____

(62d) Do they pay for them?

_____ Yes _____ No

(62e) How much does it cost? (62f) How do they get them?

_____ _____

_____ _____

(63) Do you know what the letters DDC stand for?

_____ Yes _____ No

(64) Have you ever seen a report, summary or bibliography produced by DDC?

_____ Yes _____ No

(65) If yes, have you had occasion to request any information from DDC?

_____ Yes _____ No

THE BALANCE OF THIS INTERVIEW IS FOR ESTABLISHED USERS OF DDC ONLY

PART II
For DDC Users Only

(66) Have your users used this information in any work that you have undertaken in the last 6 months?

___Yes ___No

(67) How much time did it take for you to prepare a request for DDC?

___H ___D ___W ___M

(68) When you initiate a search for information from DDC, how do you usually do it?

___Telephone ___Mail ___Thru Intermediary ___Other

(69) When you initiate a search for information from other sources, how do you usually do it?

___Telephone ___Mail ___Thru Intermediary ___Other

(70) Approximately how many references are usually delivered?

(70a) From DDC_____ (70b) From other sources_____

(71) How many of these references (approximately) are useful to you?

From DDC _____

(72) From other_____

(73) On Card #8A you will find a list of subject areas within the DDC collection. Could you take a few minutes, look this over, and tell me which areas are most useful to your users in their research?

_____

_____

_____

(74) On Card #9A, you will find a listing of the request services provided by DDC. Please scan the list and tell me which ones you are aware of. (INTERVIEWER WILL LIST)

___Technical Report Program
___R&D Program Planning Information System
___R & T Work Unit Info. System
___Independent Research & Development Data Bank (IR & D)
___Scheduled Bibliographies
___RDT & E On-Line Retrieval System
___Report Bibliographies on Magnetic Tape (RBMT)
___Current Awareness
___Defense R & D of the '60's and 1970
___Defense Retrieval Indexing Terminology (DRIT)
___Defense Retrieval Indexing Terminology Hierarchy (DRIT-H)
___DDC Referral Services
___Report Bibliographies

(75) Now will you please rank these request systems in terms of those that your users find to be most useful?

(1) _____

(2) _____

(3) _____

(76) Will you rank those that they find least useful? Include only those you are aware of (RANK LEAST USEFUL 1st, etc.)

(1) _____

(2) _____

(3) _____

(77) On Card #10A, you will find a list of the subscription services provided by DDC. Please scan the list and tell me which ones you're aware of.

___(1) Automatic Distribution of Documents (ADD)
___(2) Selective Dissemination of Information Software Packages
___(3) Technical Abstract Bulletin (TAB) & Indexes
___(4) Automatic Magnetic Tape Distribution (TAB on Tape)
___(5) DDC Digest
___(6) Recurring Reports (WUIS)
___(7) Recurring Reports (Program Planning)
___(8) Current Awareness Bibliographies
___(9) Recurring Reports (IR & D) (DOD USERS ONLY)

(78) Now will you please rank these subscription services in terms of those that your users find most useful?

(1) _____

(2) _____

(3) _____

(79) Out of those subscription services that you are familiar with, please rank those that are least useful to you.

(1) _____ (Least useful)

(2) _____ (next to least useful)

(3) _____

(80) Now, remember those questions I asked about the future, I want you to relax again and stretch your mind. What services do you think DDC should provide in the future that are not being provided now? First, tell me about the near future, then about the distant future.

(NEAR FUTURE EQUALS "WITHIN THE YEAR")

NEAR FUTURE	DISTANT FUTURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(81) Please turn to Card #11A. How were you first made aware of (_____)?
INSERT REQUEST SERVICE RANKED #1 in Q #75

(82) How were you first made aware of (_____)?
INSERT SUBSCRIPTION SERVICE
RANKED #1 in Q #78

(83) Could you suggest any better ways to make people aware of those services?

_____

_____

_____

(84) Would training, such as seminars, cassette tapes or programmed texts on DDC services be of help to you?

___Yes ___No

(85) What would help most then? _____

_____

(86) Would you make use of (_____) if (it) (they) (was) (were) available?
INSERT ANSWER TO #85

___Yes ___No

(87) At the present time what do you think is the most efficient way of getting information from DDC?

_____

---

(88) Which one of all the DDC services do your users find most useful?

_____

(89) Now I'd like to ask you some questions about (_____).
INSERT ANSWER TC Q #88

(90) Now, turning to Card #3A, what about the quality of information from DDC?

RE-INSERT CARD #3A _____

(91) What about the quantity of information from DDC?

RE-INSERT CARD #3A _____

(92) What about the time between request and delivery?

RE-INSERT CARD #3A _____

(93) What about the degree to which the information was up-to-date?

RE-INSERT CARD #3A _____

(94) Please turn to Card #1A. What format does most of the information come in when you receive (_____)?
INSERT MOST USEFUL SERVICE Q #88

RE-INSERT CARD #1A _____

(95) Turn back to Card #3A. To what degree does this format meet your users needs?

RE-INSERT CARD #3A _____

(96) Please turn to Card #4A. What medium does most of the information come in when you receive (_____)?
INSERT MOST USEFUL SERVICE Q #88

RE-INSERT CARD #4A

(97) Please turn back to Card #3A. To what degree does this medium meet your users needs?

RE-INSERT CARD #3A _____

(AT THIS POINT THE INTERVIEWER MUST HELP R SELECT ANOTHER INFORMATION SOURCE THAT IS COMPARABLE TO DDC IN SERVICES USED BY R. R MAY HAVE IDENTIFIED SUCH A SOURCE IN PART 1. IF SO, FINE. MERELY PROCEED. IF NOT ASK R IF HE GOES ELSEWHERE FOR SERVICES SIMILAR TO THE DDC SERVICES HE'S JUST DESCRIBED.)

(EN, INTERVIEWER GOES BACK AND REPEATS ALL QUESTIONS 90 THRU 97 FOR THE COMPARA-
SOURCE THAT THE RESPONDENT RELIED ON OTHER THAN DDC, SUCH AS NTIS, NASA, etc.
(TINUE TO USE SAME CARDS.)

(98) _____

(99) _____

(100) _____

(101) _____

(102) _____

(103) _____

(104) _____

(105a) Do your users use the Research and Technology Work Unit Information System (WUIS)? (BASED ON DD #1498)

___Yes ___No

(105b) Why not?_____

_____

_____ (GO TO #114a)

(106) How often do they use WUIS? _____

(107) What do they use WUIS for? _____

(108) Turn to Card #3A again. I want to ask you about WUIS now. To what extent did the amount of the information received meet their needs?

RE-INSERT CARD #3A _____

(109) To what extent did the quality of the information they received meet their needs?

RE-INSERT CARD #3A _____

(110) To what extent did the time between initial request and delivery meet their needs?

RE-INSERT CARD #3A _____

(111) Please turn to Card #5A. To what extent has the information you received been up-to-date?

RE-INSERT CARD #5A _____

(112) As far as you can tell what percentage of the work units your users would be interested in were covered by what they received?

_____%

(113a) List advantages of WUIS

_____

_____

_____

_____

(113b) List disadvantages

_____

_____

_____

_____

(114a) Do your users use Program Planning Reports? (ASK ONLY DOD PERSONNEL)

___Yes ___No

(114b) Why not? _____

_____

_____ (GO TO #123a)

(115) How often do they use Program Planning Reports? _____

(116) What do they use Program Planning Reports for? _____

(117) Please return to Card #3A. I want to ask you about Program Planning Reports now. To what extent did the amount of information received meet their needs?

RE-INSERT CARD #3A _____

(118) To what extent did the quality of the information received meet their needs?

RE-INSERT CARD #3A _____

(119) To what extent did the time between initial request and delivery meet their needs?

RE-INSERT CARD #3A _____

(120) Please turn to Card #5A. To what extent has the information been up-to-date?

RE-INSERT CARD #5A _____

(121) As far as you can tell what percentage of the information your users would be interested in was covered by what they received?

_____%

(122a) List advantages of Program Planning Reports

_____

_____

_____

_____

(122b) List disadvantages

_____

_____

_____

_____

(123a) Do your users use the Independent Research and Development Data Bank (IR & D)?
(ASK ONLY DOD PERSONNEL)

___Yes ___No

(123b) Why not?_____

(GO TO Q #132)

(124) How often do they use IR & D? _____

(125) What do they use IR & D for? _____

(126) Please turn to Card #3A. I want to ask you about IR & D. To what extent did the amount of information received meet their needs?

RE-INSERT CARD #3A _____

(127) To what extent did the quality of the information meet their needs?

RE-INSERT CARD #3A _____

(128) To what extent did the time between your initial request and delivery meet their needs?

RE-INSERT CARD #3A _____

(129) Please turn to Card #5A. To what extent has the information been up-to-date?

RE-INSERT CARD #5A _____

(130) As far as you can tell what percentage of the information your users would be interested in was covered by what they received?

_____%

(131a) List advantages of IR & D

_____

_____

_____

_____

(131b) List disadvantages

_____

_____

_____

_____

---

(132) Please turn to Card #12A. Here's a list of Information Analysis Centers (IAC's) Have you, or your users ever used the services of an IAC?

___Yes ___No

(133a) Do you or your users use the the services of any of these Information Analysis Centers (IAC's)?

INSERT CARD #12A

_____Yes _____No

(133b) Which one (s)? (LIST NUMBERS)

_____ _____

_____ _____

_____ _____

_____ _____

(133c) Why not?

(a) Never heard of them

(b) Too expensive

(c) No need

(d) Not in area of interest

(e) Other _____

(134) How do you (they) use these services?

_____

_____

(135) Are more IAC's needed?

___Yes ___No

(136) What modifications, if any, are needed in the service IAC's provide?

_____

(137) Do your users tell you if they ever see references to their own work in IAC reports?

_____

_____

(138) Can you see the IAC's as useful sources of information for you and your users in the future?

___Yes ___No Please explain___

_____

_____

(139a) What services is DDC now providing that should be changed or modified?

(139b) Services:	(139c) Changes or Modifications:
_____	_____
_____	_____
_____	_____
_____	_____

(140) Do your users have access to a microfiche reader?

___Yes ___No (GO TO Q #145)

(141) Please turn to Card #13A. How available is this reader? _____

_____

(142) How often do they use this reader? _____

_____

(143) How often did they use it 5 years ago? _____

_____

(144) How often do you anticipate them using it in the future, by 1980?

_____

(145) Do your users prefer to receive information on microfiche or in printed copy?

___Microfiche ___Printed Copy

(146) If you and your users could substantially reduce the time lag between your initial request and delivery by receiving output as microfiche instead of paper, would they be interested?

___Yes ___No (GO TO Q #148)

(147) (If appropriate) How many days earlier would you have to receive the information in order for them to accept it on microfiche?

___Days

(148a) Have you or your users ever failed to get needed information from DDC?

___Yes ___No (GO TO Q #150)

(148b) Were you referred?

___Yes ___No

(149) Was referral appropriate?

___Yes ___No

(150) Are you aware of information services that can bring output directly to the user where he is almost immediately?

___Yes ___No

(EXPLAIN TO RESPONDENT) GO TO Q #153

(151) What kind of services are you aware of?

_____

(152) Have you or your users ever used this (these) service (s)?

_____

(153a) (If appropriate) Are you familiar with the DDC Defense RDT & E On-Line System?

___Yes ___No (GO TO Q #155)

(153b) Have you or your users ever used it?

___Yes ___No

(154a) For your users, does this service have any special advantages?

___Yes ___No

(154b) What are they? _____

_____

_____

(155) If such a service could be precisely keyed to the interests of your users and be complete, what would they be willing to pay for it (or your organization)?

_____

(156) Do you know that services like these can be connected to other data bases or libraries switching automatically as needed?

___Yes ___No

(157) Have you or your users ever used such an information system?

___Yes ___No

(158) Which one?

_____

(159a) For your users, does this type of service have any special advantages?

___Yes ___No

(159b) What kind of advantages? HAVE R EXPLAIN IN DETAIL

(159c) Why not?_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

TERMINATE

APPENDIX C.

Pre-Mailed Response Cards

APPENDIX C.1

Response Cards for Bench Level & Management Personnel

CARD #1

Very large	Moderate	Some	No need at all

CARD #2

_____Part of the task assignment

_____Most readily available

_____Had found other info. there previously

_____Most authoritative

_____Remembered that the info. was there

_____Other (specify)_____

_____

_____

CARD #3 FORMATS

____Computer Generated Bibliographies

____Technical Reports

____Personal Conversation

____Abstract Journals

____Published Bibliographies (Lists)

____Books

____Handbooks, Manuals

____Management Reports: i.e., manpower, funding, project status, resource allocation and status

____Journals

____Reviews/State of the Art papers

____Current Awareness or Automatic Announcement Services

____Numeric Data Compilations

____Commercial Brochures

____Other_____

CARD #4

_____CRT

_____Telephone

_____Written Request

_____Through Intermediary

_____Other (specify) _____

_____

_____

CARD #5

Always met my needs	Met my needs more than half the time	Met my needs half the time	Met my needs less than half the time	Never met my needs

CARD #6

_____A lot of problems

_____More problems than expected

_____No more or less than expected

_____Less problems than expected

_____No problems at all

CARD #7 Information Media

____Printed Documents

____Microfilm

____Microfiche

____Charts

____Verbal Communication

____Computer Printout

____Punched Cards

____Magnetic Tape

____CRT Display

____Videotape

____Audiotape

____Other

CARD #8

Up to date all the time	Up to date more than half the time	Up to date half the time	Up to date less than half the time	Never up to date

CARD #9

Will meet my needs all the time	Will meet my needs more than half the time	Will meet my needs half of the time	Will meet my needs less than half the time	Will never meet my needs

CARD #10

Much greater need for subscription services	Somewhat greater need for subscription services	No change	Somewhat greater need for demand services	Much greater need for demand services

CARD #11

Extremely valuable	Valuable	Somewhat valuable	Not at all valuable

01 Aeronautics

- 01 Aerodynamics
- 02 Aeronautics
- 03 Aircraft
- 04 Aircraft flight instrumentation
- 05 Air facilities

02 Agriculture

- 01 Agricultural chemistry
- 02 Agricultural economics
- 03 Agricultural engineering
- 04 Agronomy and horticulture
- 05 Animal husbandry
- 06 Forestry

03 Astronomy and Astrophysics

- 01 Astronomy
- 02 Astrophysics
- 03 Celestial mechanics

04 Atmospheric Sciences

- 01 Atmospheric physics
- 02 Meteorology

05 Behavioral and Social Sciences

- 01 Administration and management
- 02 Documentation and information technology
- 03 Economics
- 04 History, law and political science
- 05 Human factors engineering
- 06 Humanities
- 07 Linguistics
- 08 Man-machine relations
- 09 Personnel selection, training and evaluation
- 10 Psychology *(Individual and group behavior)*
- 11 Sociology

06 Biological and Medical Sciences

- 01 Biochemistry
- 02 Bioengineering
- 03 Biology
- 04 Bionics
- 05 Clinical medicine
- 06 Environmental biology
- 07 Escape, rescue and survival
- 08 Food
- 09 Hygiene and sanitation
- 10 Industrial *(Occupational)* medicine
- 11 Life support
- 12 Medical and hospital equipment and supplies
- 13 Microbiology
- 14 Personnel selection and maintenance *(Medical)*
- 15 Pharmacology
- 16 Physiology
- 17 Protective equipment
- 18 Radiobiology
- 19 Stress physiology
- 20 Toxicology
- 21 Weapon effects

07 Chemistry

- 01 Chemical engineering
- 02 Inorganic chemistry
- 03 Organic chemistry
- 04 Physical chemistry
- 05 Radio and radiation chemistry

08 Earth Sciences and Oceanography

- 01 Biological oceanography
- 02 Cartography
- 03 Dynamic oceanography
- 04 Geochemistry
- 05 Geodesy
- 06 Geography
- 07 Geology and mineralogy
- 08 Hydrology and limnology
- 09 Mining engineering
- 10 Physical oceanography
- 11 Seismology
- 12 Snow, ice and permafrost
- 13 Soil mechanics
- 14 Terrestrial magnetism

09 Electronics and Electrical Engineering

- 01 Components
- 02 Computers
- 03 Electronic and electrical engineering
- 04 Information theory
- 05 Subsystems
- 06 Telemetry

10 Energy Conversion *(Non-propulsive)*

- 01 Conversion techniques
- 02 Power sources
- 03 Energy storage

11 Materials

- 01 Adhesives and seals
- 02 Ceramics, refractories and glasses
- 03 Coatings, colorants and finishes
- 04 Composite materials
- 05 Fibers and textiles
- 06 Metallurgy and metallography
- 07 Miscellaneous materials
- 08 Oils, lubricants, and hydraulic fluids
- 09 Plastics
- 10 Rubbers
- 11 Solvents, cleaners and abrasives
- 12 Wood and paper products

12 Mathematical Sciences

- 01 Mathematics and statistics
- 02 Operations research

13 Mechanical, Industrial, Civil and Marine Engineering

- 01 Air conditioning, heating, lighting and ventilating
- 02 Civil engineering
- 03 Construction equipment, materials and supplies
- 04 Containers and packaging
- 05 Couplings, fasteners and joints
- 06 Ground transportation equipment
- 07 Hydraulic and pneumatic equipment
- 08 Industrial processes
- 09 Machinery and tools
- 10 Marine engineering
- 10 1 Submarine engineering
- 11 Pumps, filters, pipes, tubing and valves
- 12 Safety engineering
- 13 Structural engineering

14 Methods and Equipment

- 01 Cost effectiveness
- 02 Laboratories, test facilities, and test equipment
- 03 Recording devices
- 04 Reliability
- 05 Reprography

15 Military Sciences

- 01 Antisubmarine warfare
- 02 Chemical, biological, and radiological warfare
- 03 Defense
- 03 1 Antimissile defense
- 04 Intelligence
- 05 Logistics
- 06 Nuclear warfare
- 07 Operations, strategy, and tactics

16 Missile Technology

- 01 Missile launching and ground support
- 02 Missile trajectories
- 03 Missile warheads and fuses
- 04 Missiles
- 04 1 Air and space launched missiles
- 04 2 Surface launched missiles
- 04 3 Underwater launched missiles

17 Navigation, Communications, Detection and Countermeasures

- 01 Acoustic detection
- 02 Communications
- 02 1 Radio communications
- 03 Direction finding
- 04 Electromagnetic and acoustic countermeasures
- 05 Infrared and ultraviolet detection
- 06 Magnetic detection
- 07 Navigation and guidance
- 08 Optical detection
- 09 Radar detection
- 10 Seismic detection

18 Nuclear Science and Technology

- 01 Fusion devices (Thermonuclear)
- 02 Isotopes
- 03 Nuclear explosions
- 04 Nuclear instrumentation
- 05 Nuclear power plants
- 06 Radiation shielding and protection
- 07 Radioactive wastes and fission products
- 08 Radioactivity
- 09 Reactor engineering and operation
- 10 Reactor materials
- 11 Reactor physics
- 12 Reactor theory
- 13 Reactors (Nuclear power)
- 14 SNAP technology

19 Ordnance

- 01 Ammunition, explosives and pyrotechnics
- 02 Bombs
- 03 Combat vehicles
- 04 Explosions, ballistics and armor
- 05 Fire control and bombing systems
- 06 Guns
- 07 Rockets
- 08 Underwater ordnance

20 Physics

- 01 Acoustics
- 02 Crystallography
- 03 Electricity and magnetism
- 04 Fluid mechanics
- 05 Masers and lasers
- 06 Optics
- 07 Particle accelerators
- 08 Particle physics
- 09 Plasma physics
- 10 Quantum theory
- 11 Solid mechanics
- 12 Solid state physics
- 13 Thermodynamics
- 14 Wave propagation

21 Propulsion and Fuels

- 01 Air breathing engines
- 02 Combustion and ignition
- 03 Electric propulsion
- 04 Fuels
- 05 Jet and gas turbine engines
- 06 Nuclear propulsion
- 07 Reciprocating engines
- 08 Rocket motors and engines
- 08 1 Liquid rocket motors
- 08 2 Solid rocket motors
- 09 Rocket propellants
- 09 1 Liquid rocket propellants
- 09 2 Solid rocket propellants

22 Space Technology

- 01 Astronautics
- 02 Spacecraft
- 03 Spacecraft trajectories and reentry
- 04 Spacecraft launch vehicles and ground support

CARD #13 DDC Services - Available on Request

____Technical Report Program

____R&D Program Planning Information System (DD Form 1634)

____Research and Technology Work Unit Information System (DD Form 1498)

____Independent Research and Development Data Bank (IR&D)

____Scheduled Bibliographies

____Report Bibliographies

____Defense R&D of the 60's and 1970

____DDC Referral Services

____RDT&E On-Line Retrieval System

____Defense Retrieval and Indexing Terminology (DRIT)

____Defense Retrieval and Indexing Terminology Hierarchy (DRIT-H)

CARD #14 DDC SUBSCRIPTION SERVICES

____(1) Automatic Distribution of Documents (ADD)
____(2) Selective Dissemination of Information Software Packages
____(3) Technical Abstract Bulletin (TAB) and Indexes
____(4) Automatic Magnetic Tape Distribution (TAB on Tape)
____(5) DDC Digest
____(6) Recurring Reports (WUIS)
____(7) Recurring Reports (Program Planning)
____(8) Current Awareness Bibliographies
____(9) Recurring Reports (IR&D) (DOD USERS ONLY)

CARD #15

____Mailing list I'm on

____Telephone

____Intermediary (librarian, Information Officer, etc.

____Other (specify)_____

CARD #16 **Information Analysis Centers**

(1) ____Machinability Data Center (MDC)

(2) ____ Mechanical Properties Data Center (MPDC)

(3) ____Metals and Ceramics Information Center (MCIC)

(4) ____Nondestructive Testing Data Support Center (NTDSC)

(5) ____Thermophysical and Electronic Properties Information Analysis Center (TEPIAC)

(6) ____Chemical Propulsion Information Agency (CPIA)

(7) ____Infrared Information and Analysis Center (IRIA)

(8) ____Reliability Analysis Center (RAC)

(9) ____Coastal Engineering Information Analysis Center

(10) ____Concrete Technology Information Center

(11) ____DOD Nuclear Information & Analysis Center (DASIAC)

(12) ____Electronic Properties Information Center

(13) ____Hydraulic Engineering Information Analysis Center

(14) ____Pavements & Soil Trafficability Information Analysis Center

(15) ____Plastics Technical Evaluation Center

(16) ____Shock and Vibration Information Center

(17) ____Soil Mechanics Information Analysis Center

(18) ____Strategic Technology Office Data Base

(19) ____Tactical Technology Center (TACTEC)

(20) ____Environmental Information Division (Air Force)

(21) ____USAF Environmental Technical Applications Center

(22) ____Institute of Polar Studies

(23) ____Physical Data Group, Lawrence Livermore Laboratory

(24) ____Radiation Shielding Information Center

(25) ____X-Ray Attenuation Coefficient Information Center

(26) ____Bathythermograph Data Processing and Analysis Facility

(27) ____Chemical Kinetics Information Center

(28) ____Data Collection and Processing Group, Scripps Institution of Oceanography

CARD #17

Readily Available	Available Sometimes	Seldom Available	Not Available at All

APPENDIX C.2

Response Cards for Technical Support Personnel

CARD #1A FORMATS

____Computer Generated Bibliographies

____Technical Reports

____Personal Conversation

____Abstract Journals

____Published Bibliographies (Lists)

____Books

____Handbooks, Manuals

____Management Reports: i.e., manpower, funding, project status, resource allocation and status

____Journals

____Reviews/State of the Art papers

____Current Awareness or Automatic Announcement Services

____Numeric Data Compilations

____Commercial Brochures

____Other_____

CARD #2A

_____CRT

_____Telephone

_____Written Request

_____Through Intermediary

_____Other (specify) _____

_____

_____

CARD #3A

Always met my needs	Met my needs more than half the time	Met my needs half the time	Met my needs less than half the time	Never met my needs

CARD #4A

Information Media

____Printed Documents

____Microfilm

____Microfiche

____Charts

____Verbal Communication

____Computer Printout

____Punched Cards

____Magnetic Tape

____CRT Display

____Videotape

____Audiotape

____Other

CARD #5A

Up to date all the time	Up to date more than half the time	Up to date half the time	Up to date less than half the time	Never up to date

CARD #6A

Will meet my needs all the time	Will meet my needs more than half the time	Will meet my needs half of the time	Will meet my needs less than half the time	Will never meet my needs

CARD #7A

Much greater need for subscription services	Somewhat greater need for subscription services	No change	Somewhat greater need for demand services	Much greater need for demand services

CARD #8A

01 Aeronautics
- 01 Aerodynamics
- 02 Aeronautics
- 03 Aircraft
- 04 Aircraft flight instrumentation
- 05 Air facilities

02 Agriculture
- 01 Agricultural chemistry
- 02 Agricultural economics
- 03 Agricultural engineering
- 04 Agronomy and horticulture
- 05 Animal husbandry
- 06 Forestry

03 Astronomy and Astrophysics
- 01 Astronomy
- 02 Astrophysics
- 03 Celestial mechanics

04 Atmospheric Sciences
- 01 Atmospheric physics
- 02 Meteorology

05 Behavioral and Social Sciences
- 01 Administration and management
- 02 Documentation and information technology
- 03 Economics
- 04 History, law and political science
- 05 Human factors engineering
- 06 Humanities
- 07 Linguistics
- 08 Man-machine relations
- 09 Personnel selection, training and evaluation
- 10 Psychology *(Individual and group behavior)*
- 11 Sociology

06 Biological and Medical Sciences
- 01 Biochemistry
- 02 Bioengineering
- 03 Biology
- 04 Bionics
- 05 Clinical medicine
- 06 Environmental biology
- 07 Escape, rescue and survival
- 08 Food
- 09 Hygiene and sanitation
- 10 Industrial *(Occupational)* medicine
- 11 Life support
- 12 Medical and hospital equipment and supplies
- 13 Microbiology
- 14 Personnel selection and maintenance *(Medical)*
- 15 Pharmacology
- 16 Physiology
- 17 Protective equipment
- 18 Radiobiology
- 19 Stress physiology
- 20 Toxicology
- 21 Weapon effects

07 Chemistry
- 01 Chemical engineering
- 02 Inorganic chemistry
- 03 Organic chemistry
- 04 Physical chemistry
- 05 Radio and radiation chemistry

08 Earth Sciences and Oceanography
- 01 Biological oceanography
- 02 Cartography
- 03 Dynamic oceanography
- 04 Geochemistry
- 05 Geodesy
- 06 Geography
- 07 Geology and mineralogy
- 08 Hydrology and limnology
- 09 Mining engineering
- 10 Physical oceanography
- 11 Seismology
- 12 Snow, ice and permafrost
- 13 Soil mechanics
- 14 Terrestrial magnetism

09 Electronics and Electrical Engineering
- 01 Components
- 02 Computers
- 03 Electronic and electrical engineering
- 04 Information theory
- 05 Subsystems
- 06 Telemetry

10 Energy Conversion *(Non-propulsive)*
- 01 Conversion techniques
- 02 Power sources
- 03 Energy storage

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- 07 Hydraulic and pneumatic equipment
- 08 Industrial processes
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- 10 Marine engineering
- 10.1 Submarine engineering
- 11 Pumps, filters, pipes, tubing and valves
- 12 Safety engineering
- 13 Structural engineering

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- 04 Reliability
- 05 Reprography

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- 03.1 Antimissile defense
- 04 Intelligence
- 05 Logistics
- 06 Nuclear warfare
- 07 Operations, strategy, and tactics

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- 03 Missile warheads and fuzes
- 04 Missiles
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- 04.2 Surface launched missiles
- 04.3 Underwater launched missiles

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- 02.1 Radio communications
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- 08 Optical detection
- 09 Radar detection
- 10 Seismic detection

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- 05 Nuclear power plants
- 06 Radiation shielding and protection
- 07 Radioactive wastes and fission products
- 08 Radioactivity
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- 10 Reactor materials
- 11 Reactor physics
- 12 Reactors *(Power)*
- 13 Reactors *(Non-power)*
- 14 SNAP technology

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- 04 Explosions, ballistics and armor
- 05 Fire control and bombing systems
- 06 Guns
- 07 Rockets
- 08 Underwater ordnance

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- 04 Fluid mechanics
- 05 Masers and lasers
- 06 Optics
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- 08 Particle physics
- 09 Plasma physics
- 10 Quantum theory
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- 12 Solid state physics
- 13 Thermodynamics
- 14 Wave propagation

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- 02 Combustion and ignition
- 03 Electric propulsion
- 04 Fuels
- 05 Jet and gas turbine engines
- 06 Nuclear propulsion
- 07 Reciprocating engines
- 08 Rocket motors and engines
- 08.1 Liquid rocket motors
- 08.2 Solid rocket motors
- 09 Rocket propellants
- 09.1 Liquid rocket propellants
- 09.2 Solid rocket propellants

22 Space Technology
- 01 Astronautics
- 02 Spacecraft
- 03 Spacecraft trajectories and reentry
- 04 Spacecraft launch vehicles and ground support

CARD #9A

DDC Services - Available on Request

____Technical Report Program

____R&D Program Planning Information System (DD Form 1634)

____Research and Technology Work Unit Information System (DD Form 1498)

____Independent Research and Development Data Bank (IR&D)

____Scheduled Bibliographies

____Report Bibliographies

____Defense R&D of the 60's and 1970

____DDC Referral Services

____RDT&E On-Line Retrieval System

____Defense Retrieval and Indexing Terminology (DRIT)

____Defense Retrieval and Indexing Terminology Hierarchy (DRIT-H)

CARD #10A

DDC SUBSCRIPTION SERVICES

_____(1) Automatic Distribution of Documents (ADD)
_____(2) Selective Dissemination of Information Software Packages
_____(3) Technical Abstract Bulletin (TAB) and Indexes
_____(4) Automatic Magnetic Tape Distribution (TAB on Tape)
_____(5) DDC Digest
_____(6) Recurring Reports (WUIS)
_____(7) Recurring Reports (Program Planning)
_____(8) Current Awareness Bibliographies
_____(9) Recurring Reports (IR&D) (DOD USERS ONLY)

CARD #11A

____Mailing list I'm on

____Telephone

____Intermediary (librarian, Information Officer, etc.

____Other (specify)_____

CARD #12A Information Analysis Centers

(1) ____Machinability Data Center (MDC)
(2) ____ Mechanical Properties Data Center (MPDC)
(3) ____Metals and Ceramics Information Center (MCIC)
(4) ____Nondestructive Testing Data Support Center (NTDSC)
(5) ____Thermophysical and Electronic Properties Information Analysis Center (TEPIAC)
(6) ____Chemical Propulsion Information Agency (CPIA)
(7) ____Infrared Information and Analysis Center (IRIA)
(8) ____Reliability Analysis Center (RAC)
(9) ____Coastal Engineering Information Analysis Center
(10) ____Concrete Technology Information Center
(11) ____DOD Nuclear Information & Analysis Center (DASIAC)
(12) ____Electronic Properties Information Center
(13) ____Hydraulic Engineering Information Analysis Center
(14) ____Pavements & Soil Trafficability Information Analysis Center
(15) ____Plastics Technical Evaluation Center
(16) ____Shock and Vibration Information Center
(17) ____Soil Mechanics Information Analysis Center
(18) ____Strategic Technology Office Data Base
(19) ____Tactical Technology Center (TACTEC)
(20) ____Environmental Information Division (Air Force)
(21) ____USAF Environmental Technical Applications Center
(22) ____Institute of Polar Studies
(23) ____Physical Data Group, Lawrence Livermore Laboratory
(24) ____Radiation Shielding Information Center
(25) ____X-Ray Attenuation Coefficient Information Center
(26) ____Bathythermograph Data Processing and Analysis Facility
(27) ____Chemical Kinetics Information Center
(28) ____Data Collection and Processing Group, Scripps Institution of Oceanography

CARD #13A

Readily Available	Available Sometimes	Seldom Available	Not Available at All

APPENDIX D.

Covering Letter

information and management sciences

AUERBACH
121 n. broad st.
philadelphia
penna. 19107
215-491-8200
cable: auerinfo

Dear _____:

Recently we began a series of studies to assist the Department of Defense planning for future technical information needs. We selected your name randomly and then called to ask your participation in one of a series of interviews which will be a major part of the planning studies. Enclosed with this letter you will find a package of cards that we would like you to keep at your desk, so they will be available when we call you. The interview will be conducted by phone, but the cards will make it easier for you to give your answers.

One of the project interviewers at AUERBACH will try to call you on _____. If we don't reach you then we'll call you _____. We'll be asking you questions about the information needs that you need in your work.

AUERBACH is pleased to have you as a participant in this project. When the results and tabulations are reported to DoD only group frequencies and results will be included. Our professional ethics and the contract we have with DoD protects the integrity of your responses, and guarantees complete confidentiality.

We shall look forward to talking with you.

Sincerely,

AUERBACH Associates, Inc.

Jerome T. Maddock
Consultant
Research and Development Division

JTM:lls

philadelphia
washington
new york
london

APPENDIX E.

Justification of Survey Plan

Appendix E.

JUSTIFICATION OF SURVEY PLAN

1. Justification for the Sampling Methodology

AUERBACH chose a stratified sampling plan with provisions for random selection within each group in order to ensure that a number of categories of interest to DoD would be included in the final sample. These categories comprise the strata within the overall sampling plan. The plan calls for the following strata: users vs. non-users; those in key user organizations vs. those in all other organizations; DoD vs. contractors; and bench level vs. management level vs. support personnel. This sampling plan strikes a balance between the need to include a number of important categories and the problems that arise when too many categories are included in the plan.

Specifically, there are potentially dozens of variables that could be included in a sampling plan for this project. Since there is a practical limit to the number of interviews that can be conducted, it is not possible to include more than about four of the many variables that could be of interest to DoD. To include more than four variables would also reduce the size of each group within the sample and thereby drastically reduce the reliability of the results to a point that is below acceptable guidelines.

While it is clear that some of the groups in the sampling plan are much larger in the universe from which we are sampling, it is not known at this time how much larger one group is than another. AUERBACH will allow for these differences by utilizing a sampling fraction to be determined once the ratio between the two groups is established. For example, there may be seven times as many bench level personnel as managers in the population. If so, we would want to interview more bench level personnel than managers. Interviewing seven times as many bench level personnel as managers, however would introduce another problem. Specifically, each group of managers could be so small that estimates of error for their results would be too high. Therefore, we shall select a sampling fraction which minimizes estimated error for both groups without requiring us to interview the same number of managers and bench level personnel. Then, in order to obtain an aggregate sample for overall results, the responses of each group will be weighted in order to reflect their proportion in the population. This procedure will maximize the accuracy of our results, and, in turn, maximize the accuracy of predictions and extrapolations that are based upon the results.

Although it is not possible to include all variables in the sampling plan, this does not mean that we cannot analyze the effects of these variables. In the section that describes our statistical analysis and presents the justification for the same, it will be shown that it is possible to analyze the effects of all of the variables that are of interest to DDC.

In conclusion, AUERBACH has designed a sampling plan which is scientifically rigorous, yet meets the needs of the proposed project. The plan balances the advantages of very large samples against the advantages of including major variables of interest as strata in the sampling design.

2. Justification of the Combined Telephone-Mail Survey Questionnaire And Interview

The survey methodology for this project will combine the advantages of a mailed questionnaire and telephone survey and, at the same time, eliminate the disadvantages of each. In addition, the combined method that we will employ is designed to reduce the considerable expense that would be involved in conducting face-to-face or personal interviews with each subject.

Specifically, the number of parameters associated with the population that is of interest in this study is so broad that the choice of a representative

sample is imperative. This means that the individuals who will eventually be selected for interviewing will be spread over a wide geographic area, and the expense of sending interviewers to all locations would be prohibitive. Furthermore, the advantages of a face-to-face interview, such as personal contact, behavioral observation, etc. are not justified in terms of the desired outcomes and objectives of this project. Therefore, respondents could be contacted either by telephone or by mail. These two methods have the obvious advantage of reducing cost, but either method by itself contains some rather decided disadvantages.

The major disadvantage of the use of mailed questionnaires is the limited response, which may range from 5% to 50%. Even at the upper limits of responding, one is forced to raise questions regarding the unknown differences between those who respond and those who do not. On the other hand, telephone interviews, while assuring cooperation in terms of response, have the decided disadvantage of being unable to impose a set of response categories on the respondent. Such a categorization is often necessary in order to derive answers that may be quantified and entered into an overall statistical analysis. For example, a telephone respondent is asked if he plans to purchase a new car, and is given the following response categories:

Within three to six months
Within six months to one year
Within one to two years
Within two to three years
Three years or more

Research has demonstrated that more than half of all respondents will answer "three years or more" when they are contacted by telephone, simply of the "recency" effect; i.e., they answer in terms of the most recent category that was presented, having forgotten all of the rest. In other words, memory accounts for a considerable portion of the variance in the results of such a study. The telephone interview, then, has a decided disadvantage since the questions cannot be answered in terms of a useful survey format.

For this project, we are proposing that the combined use of mailed questionnaire responses and telephone interviews will eliminate the disadvantages of either approach by itself and at the same time eliminate the expense of personal interviews. In addition, this methodology allows us to draw a sample from a full range of respondents without costly restrictions.

The mailed questionnaire-telephone sequence proceeds as follows:

(1) Respondents are contacted by telephone and asked to participate in the survey. Upon agreement, a telephone interview date and alternate date are established.

(2) Respondents receive in the mail a packet, containing the following items:

   (a) A letter explaining the purpose of the survey. A sample of this letter is enclosed for examination in Appendix D.

   (b) A number of cards, upon which response categories are found. (Appendix C)

   (c) A confirmation of the telephone interview date, and its alternate.

   (d) An explanation of the respondent's rights under the Privacy Act.

In the methodology, the respondent is not required to mail completed questionnaires, thereby eliminating the bias that would occur as a function of cooperation. Furthermore, the response categories that are sent out do not suggest the nature of the content of the questions, so that the respondent cannot "prepare" his answers before the interview.

At the time of the interview, the interviewer will ask three types of questions: (1) questions that may be answered in a straightforward "yes-no" format; (2) questions that require some elaboration; and (3) questions that may be answered in terms of the predetermined response categories. Since the respondent will, at the time of the interview, have access to the predetermined response categories, it will not be necessary to rely upon his memory, or for the interviewer to repeat the categories over and over. Instead, he is simply instructed to respond in terms of the designated card, choosing the response category that he feels is most appropriate. The methodology that AUERBACH has developed is designed to save both money and time as well as to eliminate a considerably large source of variance which results from a reliance upon the respondent's memory in order to gather objective responses.

3. Justification for Statistical Analysis

AUERBACH has developed a strategy for data analysis that will (1) minimize the number of necessary computations; (2) reduce the computer time to a minimum and (3) provide all of the information that is needed without missing any of the critical variables.

The strategy consists of these steps: (1) analysis of the dependent variables defined in terms of interview questions; (2) analysis of trends across time for selected variables; and (3) extrapolation from linear and curvilinear trends to make projections for future user needs.

First, the respondents' answers to each question on the interview will be analyzed using multivariate techniques. All variables of potential interest to DDC will be included as predictors in a multiple regression analysis in order to determine the degree to which each variable can predict or account for the differences among respondents in the way they answered the questions. This procedure has the advantage of including all of the categories in the sampling plan as well as all other variables of interest. Once this has been done, the four most powerful predictors will be selected as factors in an analysis of variance design. Responses to each interview question will again serve as the dependent variables. This second step will allow us to examine the interaction among the most significant variables influencing answers to each question in the interview. Examining these interactions could not be done efficiently using multivariate techniques. In addition, this procedure will add explanatory power beyond that provided by the predictors identified by regression analysis.

The second step in our analysis will be to determine trends over time for user/non-user satisfaction (i.e., satisfaction with quantity, quality, response time, medium format, etc.). Trend analysis will be performed on each dependent variable in order to determine the linearity and/or curvilinearity of the trends. In addition, variables identified in the first step of our strategy, will be included as factors in the design of the trend analysis. The trend analysis will allow us to determine whether the demands for various aspects of information service are stable, whether they are increasing in a linear fashion or whether they are increasing in a curvilinear, ever rising fashion. Determining the trends for these services will allow us to move to the third step of our strategy, which is the relatively precise prediction of user needs in 1988.

The third step in the analysis is the prediction of future needs of users and non-users. These predictions will be based on extrapolation from the trend lines that are established in the second step. Extrapolations will be made utilizing a least squares solution, which will find the best fit curve line, given the existing data points. Therefore, a precise extrapolation beyond the 1980 points toward 1988 can be made. Based on the extrapolated line or curve, predictions can then be made.

The advantage of this technique is that the predictions that will be made will be based on a reliable and empirically developed data bank of past, present and future users/non-users needs. No predictions will be made on the basis of subjective impressions, hunches or speculation.

In conclusion, AUERBACH has developed a methodology which will come as close as the scientist can to predicting the future.

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A022 303 / 3 RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* DDC 10 Year Requirements and Planning Study EXPERT PANEL REVIEW REPORT	5. TYPE OF REPORT & PERIOD COVERED
	6. PERFORMING ORG. REPORT NUMBER AUER-2325/2326-TN-5
7. AUTHOR(s) Thomas J. McGeehan, Martha Cornog, Jerome T. Maddock	8. CONTRACT OR GRANT NUMBER(s) DSA 900-75-C-5161
9. PERFORMING ORGANIZATION NAME AND ADDRESS Auerbach Associates Inc. 121 North Broad Street Philadelphia, Pennsylvania 19107	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DSA-658-01S
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14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* Same	15. SECURITY CLASS. *(of this report)* Unclassified / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

N/A

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Surveys
Technical Information
Information Transfer
Information Retrieval Systems
Forecasting
Information Systems
Requirements
Projection
Technology
Documents
Research Management

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

An evaluation by expert panels was performed as a phase of an overall study to develop technical objectives for DDC planning in the 1978-1988 time period. The approach taken was a modified composite of two approaches: (a) The SEER (System for Event Evaluation and Review) approach used by the Naval Supply Systems Command, and (b) the Probe II methodology of the TRW Corporation. This composite methodology consists of four steps: (a) development of an events list derived from a literature survey and an

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

interagency survey, (b) evaluation of the events list by experts involved in information transfer at the systems level, (c) modification of the events list based on the first evaluation, and reevaluation of the list by a second panel of experts in information technology at the agency level concerned with long range planning and development, and (d) analysis of results, definition of the state of the art and probable time phasing of the events evaluated as desirable and feasible.

Illustrations are presented summarizing the concensus of the evaluation and probable timing by importance of the event, and goals for accomplishment.

TECHNICAL NOTE
AUER-2325/2326-TN-5

EXPERT PANEL REVIEW REPORT

December 31, 1975

Prepared by
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Submitted to;

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SECTION I. INTRODUCTION

The Expert Panel Review Report is an interim document. It presents the results of one major task in AUERBACH's long range planning study for the Defense Documentation Center under Contract No. DSA900-75-C-5161. The conclusions and recommendations discussed in this volume are directed toward predicting the likely course of advancement of information processing technology.

1.1 PURPOSE AND USE OF THE TECHNICAL NOTE

This document is intended to be used primarily by DDC and the project team to formulate a set of reasonable time-phased assumptions about future information technology, information organizations, and economic factors. As a project document, the Expert Panel Review Report serves as an outline of future developments, which will influence the final recommendations of the comprehensive study now underway for the target period 1978-1988. For this review, the results of a literature survey, an interagency survey and an internal review of DDC plans and operations have been converted to a select list of future events that are expected to be especially relevant to the DoD RDT&E information processing and using community. However, some of the conclusions have a generality about them that could have implications beyond DoD. Thus, agencies other than DoD agencies may find these results of interest.

1.2 EXPERT PANEL REVIEW SUMMARY

Highlights of the Expert Panel Review and AUERBACH's conclusions and interpretation are:

- Important Trends
  - Scientific bibliographic information systems are following a trend that will eventually result in a comprehensive, international, cross disciplinary and integrated data resource that will be accessible to individuals through single access points
  - The highest payoff area for increased scientific and technical information service is factual data services that are non-bibliographic
  - Information analysis services will be an increasingly important component of total technical information systems
  - The application of electronic devices to the control and manipulation of information data is a dominant trend. The particular devices themselves are basically of incidental importance. It is the applications techniques for information handling that facilitate total electronic control of technical information processes that are among the most important matters to be resolved.
- Technology
  - Large computers designed specifically for textural information processing are unlikely. Peripheral and decentralized special purpose units are desirable and feasible
  - Complete electronic control over information processing operations is desirable. A number of approaches are feasible depending on various system requirements
  - Electronic storage and dissemination media will virtually supplant microform media
- Organizational Structures and Affiliations
  - Interorganizational cooperation and standardization is fundamental to the advancement of information processing technology

- Economics
  - Cost alone is not a barrier to the advancement of information processing technology
- Services
  - New concepts in service are seen as highly desirable and feasible but a perplexing pessimism is expressed concerning the ability of the information community to develop them
  - Widespread accessibility to many data bases is a highly desirable objective
  - Fact services are a conspicuous gap in current information services
- Time-Phased Goals
  - Quantum advancement of information processing technology is not seen before 1985. Interim progress may be characterized by standardization and expanded bibliographic information services involving multiple data base access and interactive search capability

1.3 METHODOLOGY

The method used by AUERBACH to conduct the Expert Panel Review is a modified composite of two Delphi-like approaches: (a) the SEER (System for Event Evaluation and Review) approach developed and employed for technology assessment by Bernstein, et al[1] of the Naval Supply Systems Command, and (b) the Probe II methodology of the TRW Corporation employed by North and Pyke.[2] AUERBACH's composite methodology consists basically of four steps:

(a) Development of a compendium of factual data and potential events, and distillation of this data into an original Events List. (Discussed in Section 1.3.1 below).

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[1] Bernstein, G. B. et al. A Fifteen-Year Forecast of Information Processing Technology, Washington, D.C., Naval Supply Systems Command, 1969. (AD 681752).

[2] North, H. Q. and Pyke, D. L. "Probes of the Technological Future." Harvard Business Review, 47(3):68-82, May-June 1969.

(b) (Round I) Evaluation of this original Events List by experts involved in information transfer at the R&D, operations and product planning levels. (Discussed in Section 1.3.2 below).

(c) (Round II) Modification of the Events List based on the results of Round I, and re-evaluation of this new Events List by a second round panel of specialists in information technology and individuals in influential information science positions who are concerned with long range planning and administration (Discussed in Section 1.3.3 below)

(d) Analysis of results, definition of the state-of-the-art and definition of potential alternative short, mid- and long-range goals and identification of events necessary or desirable to support these goals.

1.3.1 Development of the Events List

A Literature Survey generated a list of about 70 "raw" events covering technological trends and future predictions for the information community. These "raw" generalized events were then distilled into 41 events, which were seen as the most relevant and specific to DDC's plans and interests. This was done through the following steps:

- Close inspection of all available DDC descriptive and planning documents to isolate areas of high interest for DDC
- Review of the documentation of the Interagency Survey (a related task under the present contract), to point out developments in allied organizations which would be most likely to impact on DDC.
- Formulation of a series of questions in connection with the areas of interest (uncovered as described above) representing planning options for DDC (Shown in Appendix D)
- Translation of the questions into a list of carefully worded events, designed to elicit maxium feedback relevant to the DDC plans.

1.3.2 Round I

Round I procedures were as follows:

(a) Selection of Round I Participants

The Round I participants were selected to provide expertise at the operation or system design level, such as practitioners and researchers in various phases or aspects of information science (e.g., program managers of significant information systems and academic researchers). Effort was made to achieve a broad

coverage of many organizations. Of the 10 Round I participants, five represented government agencies, three represented private "for profit" companies, and two represented academic institutions.

(b) Solicitation of Responses

The Round I Events List was mailed to all participants. Approximately five days later, an AUERBACH representative visited each participant to physically collect the List and to answer any questions the participant might have. The visit also acted as a deadline so that the participant could not put off responding to the Events List.

(c) Analysis of Round I Responses

The collected Round I Events Lists were cut apart so that each question was on a separate piece of paper. Then all the "event number 1's" were clipped together, etc. The number of responses for each category and subcategory was tallied, and the percentages calculated. If, for example, 9 participants responded to the USER DESIRABILITY section of a particular event, and of these, 3 checked "desirable" then the percentage of "desirable" responses for that event was 33%. Years given in the PROBABLE TIMING section were averaged for each of the three probabilities of each event. The comments for each event were read carefully and analyzed to uncover event ambiguity, redundancy, and low probability of occurrences. Results and comments were used as a guide to the modification of the events for Round II. (See Section 1.3.3 below).

1.3.3 Round II

Round II was the second iteration of the two part Expert Panel Review. The refined events list of Round I was reviewed as follows:

(a) Modification of the Round I Events List

Based on the responses of the Round I participants, three types of modifications were made in the events: reduction of "abstracts" (changing "all" to "most," for example); narrowing of scope (rewriting one event as two); and the elimination of six events which were seen by a majority of Round I participants as both undesirable and unfeasible.

(b) Division Into Two Events Lists

Round II was to be conducted with two separate sets of participants: a panel of experts in information technology, and a panel of individuals in influential information science positions. This division of Round II was designed to achieve a high level of precision in the Round II responses. Each panel represented a specific segment of expertise and the events were divided to eliminate extraneous opinions from panelists in areas outside their area of expertise. Accordingly, the revised events were

converted to two lists: Round IA, events concerning information technologies, and Round IIB, events concerning information issues. Since a large number of events had implications for both technology and issues, they were included on both lists. The Round IIA and IIB Events Lists with the aggregate data are included as Appendices B and C, respectively.

(c) Selection of Round II Participants

The Round II participants were chosen to represent two areas of expertise - technology (panel A) and planning and administration (panel B). Round II structure was weighted to favor the input from the planners and administrators by selecting 17 members for panel B versus 10 for panel A (In the analysis the aggregate data were averaged, thus the 17 panel B responses tended to have greater influence on the mean).

It was expected that the points of view expressed by the two homogeneous panels would be divergent when examined separately. This assumption proved to be valid. The results were blended to moderate any extreme opinions (especially negative opinions) since the experience with forecasting studies of this type show that technological progress is often realized sooner than the experts predict. Thus, we hope these results will accurately represent the future path of information technology advancement. This part of the methodology was applied only to those events which had implications in technology as well as in organizational, economic and service aspects of information science.

Events that were purely related to technology or purely related to planning and administration issues were submitted only to the respective experts in these areas. This was done to avoid collecting spurious data provided by panelists beyond their area of expertise. (Appendices A, B, and C indicate the events submitted to each panel.)

The ten Round IIA participants (technology experts) were selected from the staff of the AUERBACH Corporation (excluding the DDC study project team). All are senior personnel with special expertise in the fields of computers, micrographics, teleprocessing, or information systems design. Panel IIB consisted of 17 individuals in influential information science positions who are concerned with long range planning and administration. They represent a cross section of the information community. Three were affiliated with government agencies, seven with for-profit organizations, and seven with not-for-profit institutions.

(d) Solicitation of Responses from the Round IIA Participants

The Round IIA Events Lists were distributed in person by a member of the project team to panelists who previously had been asked to participate. The purpose, scope and procedures of the task were reviewed at the outset and each panelist was permitted one week to respond. (The list required about 1½ hours to complete). The events were collected at the end of the week and panelists were debriefed on their experience with Round IIA review instrument.

(e) Solicitation of Responses from the Round IIB Participants

The Round IIB panelists (who had been invited to participate by telephone with follow-up letters of invitation) received their copies of the Events Lists at an initial group meeting. At that meeting, the project was reviewed and the purpose scope and procedures for the review were outlined. There was no group discussion of the events. The review was estimated to be approximately a 1½ hour effort. Completed events lists were to be returned by mail. All results were received within two weeks.

(f) Analysis of Round II Responses

Each panelist's responses were first examined to see if there were inter-event inferences reflected in the responses - especially the comment responses. If so, they were noted on each involved event. Then the events were physically separated and recombined so that all responses to a given event were merged. The aggregate data were collected and the totals were used to calculate the values for each event. Importance was measured as the percentage of panelists who indicated an event as "important." "Desirability" and feasibility ratings (assigned on a scale of 1 to 10) were averaged for each event. The "probable timing" dates (i.e., forecasted dates) were averaged, as well. The data were analyzed within specific areas of interest, generally categorized under four main areas - technology, organizational structures, economics and marketing and services. They were also analyzed for trends reflected in the comments and by implication of the relative scores of interrelated events. Appendix A consists of several tables compiled to aid the analysis with cross comparisons between and among the events. Appendices B and C report the aggregate data from Round IIA and Round IIB respectively.

1.4 RELATIONSHIP OF THE EXPERT PANEL REVIEW TO THE STUDY AS A WHOLE

The Expert Panel Review is but one of four major facets of AUERBACH's long range planning study for DDC. The other three consist of: a User Survey,

an Interagency Survey, and an Internal Review of DDC Plans and Operations. The findings of all four facets of the study will be assessed and evaluated separately and together as a final report intended to be a DDC planning document appropriate for the user needs, technological capability and interorganization information structure forecast for the decade 1978 to 1988.

1.5 ORGANIZATION OF THE REPORT

The remainder of this report is divided into the following sections:

- Section II: Discussion of Findings
- Section III: Conclusions and Interpretations
- Appendix A: Data Tabulation
- Appendix B: Round IIA Aggregate Data with Comments
- Appendix C: Round IIB Aggregate Data with Comments
- Appendix D: Questions and Issues Related to the Events
- Appendix E: Events Classified by Desirability/Feasibility

SECTION II. DISCUSSION OF FINDINGS

This section discusses the data of the Expert Panel Review task. It consists of:

- A summary of the Round II results, which is the second iteration of the two part Expert Panel Review task.
- A comparison of the results from panel IIA (Technology experts) and panel IIB (Information system planners and administrators)
- A comparison of Round II results with the Round I panel (information system practitioners and researchers)

For the purposes of this report, the following definitions apply:

A. Panel Composition

1. Round I Panel: 10 individuals with expertise at the systems level, such as practitioners and researchers with expertise in various phases or aspects of information science (e.g., program managers of significant information systems).

2. Round II

   a. Panel A: 10 technology experts in the fields of computers, micrographics, teleprocessing and information systems design.

b. Panel B: 17 individuals in influential information science positions who are concerned with long range planning and administration.

B. Events List Data Elements

1. Events: significant future occurrences relevant to the information community

2. Importance: whether or not the panel regarded an event as potentially a major occurrence in the information science field

3. Desirability: a relative assessment of the need for a given event within the information community

4. Feasibility: a relative assessment of the practicality of a given event occuring

5. Probability: a relative assessment of when an event is likely to occur

2.1 ROUND II FINDINGS

The Round II findings represent the second iteration of the two-part Expert Panel Review. The data are compiled in detailed tables in Appendices A, B, and C. The main features of the findings are presented in this section.

Section III discusses the time phased implications of the findings, which take into account the combined factors of importance, desirability, feasibility, and probable timing.

Round II data were collected for thirty-eight events representing four areas:

- Technology
- Organizational Structures
- Economics and Marketing
- Services

Each event was considered for importance, desirability, feasibility, and probable timing. The data for each event were averaged to give a composite rating that was used for the overall analysis in comparing events against each other.

2.1.1 Importance

Participants were asked to designate events that they believed to be "major events." This was done to impart an order of significance to the various events. Results were tabulated as straight percentages of respondents who designated an event as "major." Events accorded the highest ratings (top 20%) were (in order of scores, high to low):

- Interactive access to full text data bases replacing abstracts and indexes as searching tools
- Researchers have access to data bases of factual verified data
- Acceptable machine generated indexes
- Paper will be replaced as the primary numeric storage medium by digital media
- Paper replaced as numeric dissemination medium by digital media
- Accessibility of many data bases through a single terminal
- Standardized citation formats
- Interactive access to citation data bases replacing abstracts and indexes as searching tools
- Information synthesis and analysis available to all researchers
- Optical character recognition (OCR) able to convert any document to machine readable form
- Machine readable storage media competitive with paper

Events accorded the lowest ratings (lowest 20%) were (in order of scores, high to low):

- Two tiers of information providers will emerge and be clearly definable: "wholesalers" and "retailers"
- Minicomputers coupled with perpherals will generally take over many functions currently performed by large centralized computers
- Major IS&R systems will permit a choice of output format

- Input of information to large IS&R systems (e.g., DDC, NTIS, NASA, etc.) will be decentralized, with standardized abstracting, indexing and data conversion provided at the local source level

- Federal technical information services becoming self-supporting

- Dissemination of full text of documents precluding the need for abstracts as announcement devices

- Automatic monitoring built into retrieval systems

- Paper replaced as document dissemination medium by microform

- Computers designed specifically for bibliographic storage and retrieval

These results indicate a select set of "important" trends and/or technological events:

- Scientific bibliographic information systems are following a trend that will eventually (some undetermined date beyond 1988) result in a comprehensive, international, cross disciplinary and integrated data resource that will be accessible to individuals through single access points

- The highest payoff area for increased scientific and technical information service is factual data services that are non-bibliographic

- Information analysis services will be an increasingly important component of total technical information systems

- The application of electronic devices to the control and manipulation of information and data is a dominant trend. The particular devices themselves are basically of incidental importance. It is the applications techniques for information handling that facilitate total electronic control of technical information processes that are among the most important matters to be resolved.

2.1.2 Desirability and Feasibility

Respondents were asked to rate the desirability and feasibility for each event on a scale of 1 to 10. The aggregrate scores of panel A and panel B were averaged for each event. Desirability and feasibility averages were used to group events by class ("most" $>$ 7.5, "moderate" 5-7.5, "least" $<$ 5).

The results have been tabulated in Appendix E which lists eight groups from the "Most Desirable, Most Feasible" events to the "Least Desirable, Least Feasible" events. Each group is subdivided by Technology, Organizational Affiliations, Economics and Services. Some events appear on the tables more than once, as they impact on more than one area.

2.1.3 Probable Timing of Round II Events

Participants were asked to project three dates for each event: a date of 20% probability of occurrence, a date of 50% probability, and a date of 90% probability. As a relative indicator, the 50% probability averages give a fairly consistent picture, and as such they are used here as an index of probable timing. Actual forecast dates are provided in Appendix A.

The events considered likely to occur soonest (by 1985) by the Round II Panel (Technology Experts) were the following (average 50% probability dates in parentheses):

- Two tiers of information providers: "wholesalers" and "retailers" (1980)
- Automatic retrieval systems with built-in monitoring features (1981)
- Standardized citation formats for report literature (1982)
- Standardized abstract formats for report literature (1982)
- Duplication in acquisition among data bases will be eliminated (1983)
- Minicomputers coupled with peripherals will take over many functions (1983)
- Personal interactive terminals will be available for less than $500 (1983)

The events judged to take place in the most remote future (beyond 1995) were:

- Paper will be replaced as document storage medium by full text digital media (1997)
- Access to full text data bases will replace abstracting and indexing as searching tools (1997)

- Standardization will allow data bases to be merged into a single file (2000+)
- Paper will be replaced as document dissemination medium by full text digital media (2000+)

The remaining events were all judged to have a 50% possibility of occurring between the mid 1980's and the 1990's.

Actual estimated dates for events are shown in Appendix A and Appendix B together with the completed results of the "A" Event List and the "B" Event List.

2.2 COMPARISON BETWEEN ROUND IIA AND ROUND IIB

Of the 38 events considered in Round II, 20 events (representing 26 possibilities) were submitted to both the "A" panel (information technology experts) and the "B" panel (planners and administrators).[1] Seven events appear only on the "A" list and eleven appeared only on the "B" list. Appendix A indicates the events submitted to each group.

2.2.1 Importance

The Round IIB panel (administrators and planners) tended to ascribe "importance" to more events than the Round IIA panel (technologists). Specifically, of the 26 events, analyzed for both lists, 16 rated higher in importance in Round IIB than in Round IIA, eight rated higher in Round IIA and two were rated equal in importance in both groups.

These data are not surprising. It was anticipated that the "importance" of the events would be assessed in terms of the benefits that would be inferred from their coming to be. Of the two panels in Round II, the planners and administrators of large information systems (the Round IIB panel) are apt to be more comfortable with anticipating the potential benefits of new technological developments. Therefore, they saw more events as "important."

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[1] Two of the events common to both lists had four parts each. For purposes of analysis, the parts were treated as separate events, bringing the number of common events to 26.

The technology itself appears to lack importance in the judgement of the Round II panels without the inference of useful applications.

Despite the fact that the importance ratings of the B panel were higher than the A panel, both groups ascribed a fairly consistent ordinal ranking to the events, which produced the composite results discussed in Section 2.1.1.

Events on which the importance assessments of the two panels contrasted strikingly were few.

Only one event was highlighted by the Round IIA panel alone:

- Paper replaced as a document dissemination medium by microform

Events highlighted by the Round IIB panel alone included:

- Machine readable storage media competitive with paper
- Machine readable files transferred electronically, competitive with postal service
- Majority of remote retrieval done via dial-up lines
- Facsimile transmission competitive with postal service in cost

2.2.2 Desirability

Opinions varied widely among all participants of both groups as to the desirability of individual events. However, a similar pattern was exhibited as that seen for the "importance" designation. Of 26 events analyzed, 15 rated higher in desirability in Round IIB than in Round IIA, seven rated higher in desirability in Round IIA than in Round IIB, and four were judged about equal.

The events considered more desirable in panel A than by panel B were:

- Paper replaced as numeric dissemination medium by microform
- Paper replaced as document dissemination medium by microform

- Use of commercially available software replacing all original software development

The events seen as considerably more desirable by panel B than by panel A were:

- Numeric data processing will equal bibliographic data processing
- Many data bases accessible through a single on-line terminal
- Automatic retrieval systems with built-in monitoring features
- Personal interactive terminals as common as automatic typewriters

2.2.3 Feasibility

In feasibility, panel B again tended to rank events higher than panel B. Of the twenty six events, thirteen were rated higher in feasibility by panel B than the panel A, eight were rated higher in feasibility in the panel A than panel B, and five were rated about equal in feasibility by both groups.

Events seen as considerably more feasible by Group A than by Group B were:

- Machine readable storage media for text competitive with microfilm
- Machine generated index data virtually eliminating manual indexing
- Commercially available software virtually replacing original software development
- Standardized user protocols adopted by all technical information services
- Conversational and tutorial on-line capabilities will make intermediaries unnecessary

Events seen as considerably more feasible by panel B than panel A were:

- Machine readable records electronically transferred between locations at low cost
- Personal interactive terminals common
- Paper virtually replaced as document dissemination medium by microform

- Information systems allowing user to specify output format

- Researchers having access to data bases of validated numeric data

2.2.4 Probable Timing

The Round IIA panel and the Round IIB panel were relatively consistent in their forecasts of timing. The average forecast ranges of each panel, for each event, tended to overlap with the average data points for 20% probability, 50% probability and 90% probability falling within 5 years of each other. The Round IIB panel (planners and administrators) tended to be somewhat more optimistic than the Round IIA panel (technology experts). Ten of the 26 comparable events were forecast to occur sooner by panel B. Only four events were forecast to have a more proximate probability of occurance by panel A than by panel B. Twelve were forecast approximately even by both groups.

Notable differences (more than 10 years) in the 50% probability forecasts of the two panels are these:

- Events judged to be more proximate by panel A were:
  - Machine readable storage competitive with paper (panel A - 1985; panel B - 1996)
  - Standardization allowing data bases to be merged into a single file by user organizations (panel A - 1993; panel B - 2080)
- Events judged to be more proximate by panel B were:
  - Personal interactive terminals common (panel A - 2002; panel B - 1985)
  - Paper replaced as a document dissemination medium by microform (panel A - 1996; panel B - 1984)
  - Researchers having access to data bases of validated numeric data (panel A - 2003; panel B - 1989)

2.3 COMPARISON BETWEEN ROUND I AND ROUND II

Since many events were rewritten following Round I, and some were eliminated, exact comparisons of results between Round I and Round II are not

possible. However, a rough comparison could be made between similar events. The "importance" parameter was not measured in Round I, thus comparison was made in terms of desirability, feasibility, and probable timing.

2.3.1 Desirability and Feasibility

Of the thirty-six separate events were similar enough between Round I and II to be compared, 12 were judged equally desirable and feasible by Round I and II, 18 were judged generally more desirable and feasible by Round I than Round II, and six were judged more generally desirable and feasible by Round II than Round I. However, the divergence was not extreme except in the cases of the following events:

- User organizations able to merge data bases into a single file
- Researchers having option of data analyses services through an information analysis center

Both events were judged most desirable and feasible by Round I, but only moderately desirable and least feasible by Round II.

2.3.2 Probable Timing

In estimates of probably timing, Round I and Round II panels were in high agreement. For 26 of the 36 comparable events the 50% probability forecast of Round I and Round II were within 5 years of each other. Of the 10 events where the results differed by more than 5 years, 6 were judged to be more proximate by Round II. However, the different estimates were considered significant (more than 10 years) for only four events:

- User organizations able to merge data bases into a single file
  (Round I: 1983; Round II = 2000+)
- Researchers having option of data analysis services through an information analysis center
  (Round I: 2000+; Round II: 1991)
- Processing of numeric data equalling bibliographic data
  (Round I: 2000+; Round II: 1984)
- Researchers having access to data bases of verified numeric data
  (Round I; 1996; Round II: 1986)

SECTION III. CONCLUSIONS AND INTERPRETATIONS

The Expert Panel Review Task was prestructured to highlight gaps in information services and products resulting from inadequacies and unresolved problems in information technology, organizational structures and economic and marketing factors. This section summarizes the probable effects that the forecasted state-of-the-art will have on major information processing operations and plans. Specific DDC implications are pointed out as appropriate.

The interrelationships among events are presented first as a summary by area - technology, organizational structures, economics and marketing, and services; and second, as time-phased goals implied by supporting events.

These conclusions and goals are structured to provide a graphic representation of realistic expectations of technological advances that will serve to guide DDC's time phased planning to achieve new and expanded user services in the decade 1978 to 1988 (and beyond). Three time phases are referred to in the text: short range - before 1985, mid range - 1985 to 1995, long range - beyond 1995.

To sum up the results of the Expert Panel Review Task succinctly, the gaps in information services and products are not in hardware technology but in the application of technology to user needs. For example, non-bibliographic, fact retrieval services are identified as an important service gap. The forecast

indicates that advances in input techniques, communications (in the broadest sense) and standardized (or common) procedures that reduce needless duplication and errors of logic or syntax will contribute to improving information services. However, advances are not likely to be dramatic.

3.1 TECHNOLOGY

3.1.1 Computer Hardware

Large scale, general purpose computers will continue to be utilized for bibliographic as well as other types of storage and retrieval in the next decade. It appears quite unlikely as well as basically unnecessary, that computer systems will be designed specifically for bibliographic applications.

Patterns are evident that indicate complete electronic control over information processing operations is desirable. The feasibility of complete control is questioned, but partial control over sub-functions is increasingly going to involve automation. The probability that technological growth will be piecemeal implies that systems will soon enter a development phase favoring decentralization and distributed processing.

Already emerging are new applications in peripherals which may be especially adapted for bibliographic and full text processing, notably optical character recognition input devices (OCR) and word processing equipment. Word processing is seen as a development particularly worth watching, since the product is then put into machine readable form at its source. OCR, by contrast, is an after-the-fact procedure of converting text to machine-readable forms. It is unlikely, however, that either process will be really widespread before the late 1980's, due to human engineering problems, incompatible equipment produced by different manufacturers, lack of standardization, unwillingness of potential buyers to commit funds, and general unsureness of how exactly to use such equipment most effectively were it to be acquired. Automatic text input devices are seen as potentially desirable and only slightly ahead of the current state-of-the-art.

Another potential and quite controversial development in peripherals is the inexpensive "personal" interactive computer terminal. Many experts see this as unnecessary and a burden on any researcher who must so cope without an intermediary to do his information searches for him. Other information pro-

fessionals foresee favorable effects including possibilities for teleconferencing. Whether or not the "personal" terminal becomes a reality, however, interactive terminals will proliferate and be more available to all researchers in the next decade. Interactive terminals and other types of peripherals may also be coupled with minicomputers (and eventually, micro computers) for applications such as data manipulation, intermediate data processing, and local data control.

A number of new computer memory technologies are being developed (holographic, "bubble," etc.) but are unlikely to affect standard data processing techniques for quite some time. Associative memories, however, (a very fast parallel-processing type of memory) are likely to be of some auxiliary use in information processing by the early 1990's. These memories, too expensive to consider for bulk storage, have a useful potential as hardware support for software "macro" instructions and for index table processing in information retrieval procedures.

3.1.2 Computer Software

In software, machine independence is seen as a useful trend. However, it is regarded as a mid-range achievement, delayed into the 1990's by inherent inefficiencies of machine independent software.

Purchasing software packages is seen as a desirable alternative to de novo programming. Packages with monitoring and tutorial features for on-line interactive systems can be available in the short range. The development of useful, commercial packages is regarded as feasible if DDC or similar influential agencies could define the requirements in their area and thus offer an incentive to potential vendors to develop such packages. The importance of on-line tutorial assistance is linked to the growth of personal interactive search services.

3.1.3 Communications

Total electronic point-to-point communication is seen as highly desirable. For example, the highest ranked event in importance was "interactive access to full text data bases replacing abstracts and indexes as searching tools." Supporting

events leading toward that all encompassing, long-range event show a set of short and mid range achievements including widespread availability of personal terminals, dial-up communication systems, electronic file transfer at reasonable cost and facsimile transmission of supporting material. In all cases, microform communication and paper were seen as limited use, interim communication media. It is probable that in the long-range, microforms will be virtually replaced by digital media with paper fulfilling a basic function unsuited to any medium other than paper. (For example, work in progress records)

3.1.4 Information Storage and Dissemination Media

Microform will be the prime storage medium for large bibliographic files for at least the next decade. Beginning in the 1980's, machine readable digital storage will begin to be competitive on a cost basis with paper and microform. Gradually, digital, machine readable file storage will replace present day file techniques. The probable sequence will be numeric data files first, then bibliographic surrogate files (indexes before abstracts) and ultimately full text files. However, the opinion of the members of the panel is that no media will ever completely replace or be more acceptable than paper. Therefore, DDC should always consider ways that permit individuals to select or regenerate paper copy from bibliographic system output files.

3.2 ORGANIZATIONAL STRUCTURES AND AFFILIATIONS

The Expert Panel Review task emphasized technology and services. Thus, only two organizational issues were submitted to panel reviews - standardization, and whether DDC should be acting as a "wholesaler" of information or a "retailer" (dealing directly with users).

Standardization events are regarded among the most important. Standardization is regarded as most desirable and feasible with standardization of citation data somewhat more feasible than standardization of abstracts. However, there is a counter-influence indicated in several events that indicate a preference for independent operations. For example, standardized vocabularies and merged data bases are regarded as relatively unimportant and only moderately desirable.

Consequently, standardization should not be viewed as part of a move toward coalescence and some form of a consolidated national system but rather as a matter of common interest to facilitate interagency communication and information exchange.

Similarly, information processing organizations acting exclusively as "wholesalers" or "retailers" is an unlikely and undesirable event. Technological and applications gaps will prevent adequate direct service to users being provided exclusively from remote, central information resources. Thus, for the foreseeable future, large processors, such as DDC, must function with a structure that permits and encourages smaller or more specialized information agencies to deal directly with users even if the central agency elects to provide some "retail" services directly to users.

Frequent and intensified cooperative efforts are forecast as desirable and feasible, particularly among agencies with complementary capabilities. For example, DDC's cooperative efforts with NASA and its plans to utilize the ARPANET to broaden its service range were cited as favorable developments.

On the questions involving interaction of data bases, the character of "independence with cooperation" was seen. Feasible events point toward developing algorithms and methodologies for translating between different data formats, thus ensuring a workable measure of compatibility without rigid interagency standardization.

3.3 ECONOMICS

3.3.1 Costs

Cost factors are not inherent barriers to advancing information technology. Notably, no event directed at cost issues was rated among the top 20% in importance regardless of the level of desirability and/or feasibility. Naturally, downward cost trends were regarded as desirable. In fact, downward costs are forecasted because of increased production and more widespread use of digital technologies which will result in lower costs per unit for hardware and software (in terms of current dollars). Communications costs will also drop, although not indefinitely.

Beyond the data of the Expert Panel Review, conjecture suggests that lower costs and more efficient hardware are insufficient and possibly inappropriate objectives as such for the information community. Despite success after success in hardware, and to a lesser extent software (much of which is a direct result of Government underwriting of development costs), the essential problems of intellectual information transfer are identified as the "important" gaps in information technology. System design problems involving machine-machine interface, man-machine interface and interorganizational interaction are consistently highlighted in the Expert Panel Review rounds.

From past experience, represented in the opinions of the panel members, quantum improvements in information processing technology will not result from more automation alone. More sophisticated, total, and human-sensitive design concepts are required than have been employed to date.

Given these conjectural circumstances, priorities for R & D funding ought to emphasize projects directed toward more effective utilization of state-of-the-art technology over developing new capabilities of hardware and software. Particularly, funding should be directed toward research, design and testing of new and more effective interactive technologies involving machine-machine interface, man-machine interface and organization-organization interface.

3.3.2 Source of Funding for Information Services

That federal technical information services become self-supporting is regarded as undesirable and unfeasible. Both R & D funding and operating costs are likely to require at least partial subsidy. The perception of a relationship between information services and accrued benefits is at best tenuous. Thus, efforts to achieve total cost recovery are likely to retard experimentation with new concepts and services at a time when such experimentation is seen as essential to real progress in information processing technology.

3.4 SERVICES

Events directed toward identifying conceptual gaps in the nature of information services received the highest ratings in importance (first and second). However, it is disappointing (as well as enlightening) that the panels

were very pessimistic about the prospects for bridging the gaps before 1995.

Three conclusions stand out:

- Access to complete information is needed (surrogates are only useful intermediate tools)
- Services have to be interactive
- Researchers need access to factual, verified data

3.4.1 Accessibility to Information Resources

Panelists in each of the Rounds stressed the need for users to have access to comprehensive information. It is desirable and feasible that the logical strategy to accessing comprehensive information stores appear direct and "simple" to the user. While many events imply that in the long range, total electronic control and manipulation of information processes will provide the means for accomplishing widespread comprehensive accessibility, it is forecast that to maintain the appearance of simplicity, human intermediaries will be most desirable for the short and mid range periods. The human intermediary is seen as essential . He may be an information specialist or an R & D user sophisticated in information processes who will be able to translate man-machine communication and act as a logical connecting node in an accessible, but complicated technical information community which will persist into the 1990's.

The ability to address the complete technical information record (i.e., all possible technical information files) was regarded as only one aspect of ensuring accessibility to information resources. Equally important is the ability to pursue an interactive search strategy. Broad accessibility is implied by comprehensive addressibility. Precise accessibility is provided by iteration. Thus, an interactive type of information system is the most preferred mode of operation. Interaction can exist at several levels. It usually is taken to refer to the ability of a terminal user to address and define succeeding subsets of a master file in a dialog type of interaction. More sophisticated interaction can involve machine-to-machine interaction and inter-file interaction (e.g., use of multiple files accessed in a number of independent locations) on an *ad hoc* basis.

In the long term, both broad and deep accessibility should be provided in order to provide the full scope of services required by technical information users.

3.4.2 Fact Services

The most conspicuous gap in information services, according to the Expert Panel Review, is fact information. Fact information includes numeric values and also pieces of discrete data capable of satisfying inquiries without further reference. The technology is estimated to be capable of supporting such a service and it is rated most desirable and extremely important. Yet, the probable timing places this as a mid to long range event.

This event must be regarded as a high-payoff area for DDC to pursue. There appears to be no explanation for the lack of progress in fact services other than neglect on the part of the information planners and designers.

3.4.3 Information Analysis

Information analysis, like fact retrieval, is an extension of information services that goes beyond citations and document retrieval. This, too, is an event that was regarded by the panels to be "important". However, it is interesting that it was considered to be only "moderately desirable" and "least feasible" as a service for "all researchers." It appears that information analysis is a service to be offered judiciously.

Alternative interpretations inferred from these results suggest two DDC options. DDC can build on its present referral service and become a centralized referral center for information analysis. This option requires that DDC be able to provide expert consultation on the various capabilities of information analysis centers. Computerized listings of selected names of centers meeting search parameters is not sufficient. Users need interactive dialog to be able to assess the appropriateness of various information centers for their needs of a given moment.

A second alternative is for DDC to sponsor or establish and maintain an information analysis center covering subjects of general interest or multidisciplinary fields not adequately provided for by the specialized information analysis centers currently sponsored by DoD.

3.5 TIME-PHASED GOALS AND SUPPORTING EVENTS

A key objective of the Expert Panel Review was to develop a time phased structure to the forecasted technological advancement of information processing. This section takes the findings and conclusions previously discussed and adds a sense of prioritization.

The two parts of this section present the events of the Expert Panel Review in terms of prioritization by relative importance and prioritization by time phased goals.

3.5.1 Prioritization by Order of Importance

The Expert Panel Review task resulted in a well distributed order of importance to the events submitted for review. Figure 3-1 illustrates the distribution of events according to the "importance" rating ascribed by the Round II panel. 15 events were judged "important" by 60% of the panel, 9 events by 70% of the panel and one event each by 80% and 90% of the panel, respectively.

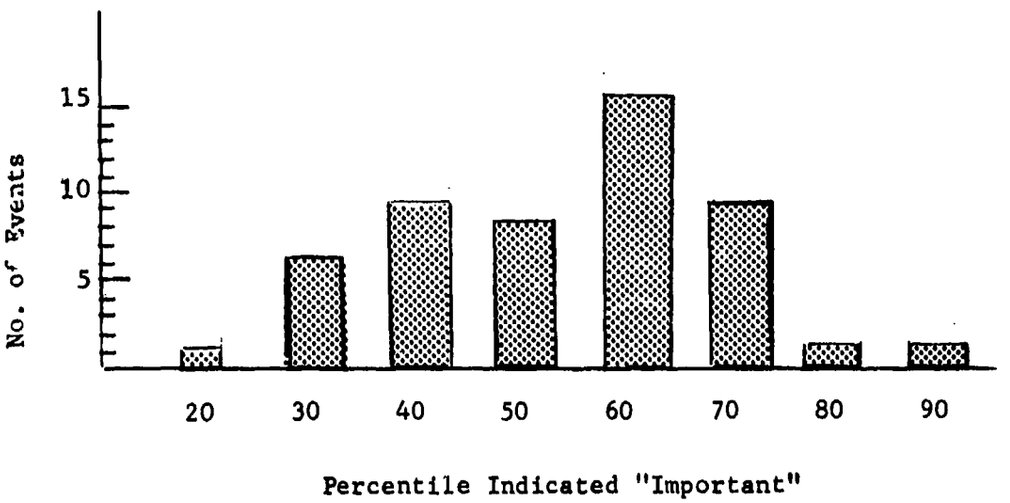

Figure 3-1. Distribution of Events by Importance

Eleven events in the 70 to 90 percentile made up the top 20% of events by importance. They also represented the down slope on the distribution curve (i.e., the above average "important" events). Thus, these 11 events, shown in Figure 3-2, were chosen as a select set, which were interpreted to be

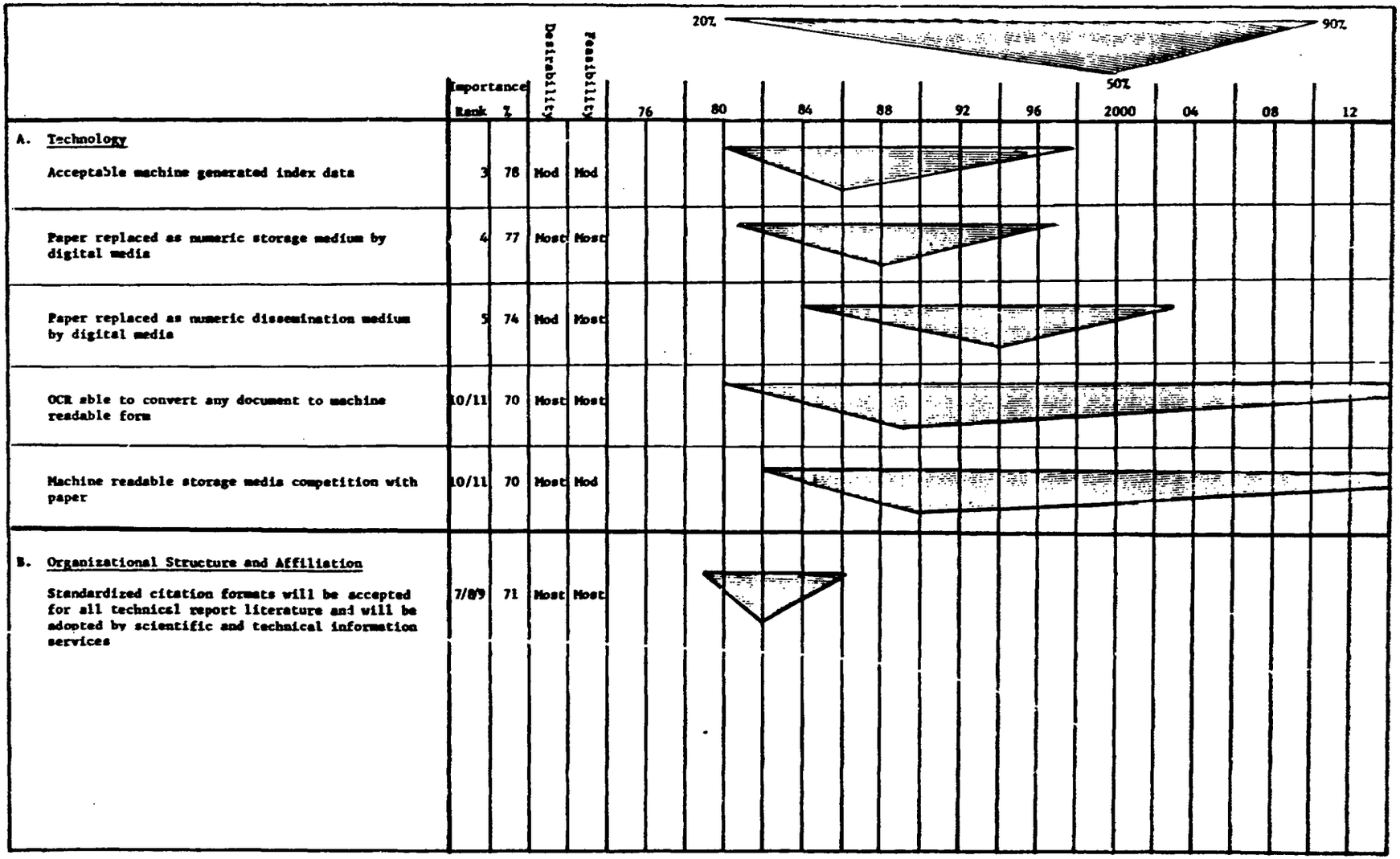

Figure 3-2. Most Important Events

	Importance Rank	Importance %	Desirability	Feasibility
C. Services				
Interactive access to full text data bases will replace abstracts and indexes as searching tools	1	94	Mod	Mod
Researchers have access to data bases of factual verified data	2	81	Most	Mod
Accessibility of many data bases through a single terminal	6	73	Most	Most
Interactive access to citation data bases replacing abstracts and indexes as searching tools	7/8/9	71	Mod	Most
Information synthesis and analysis available to all researchers through an established service	7/8/9	71	Mod	Least

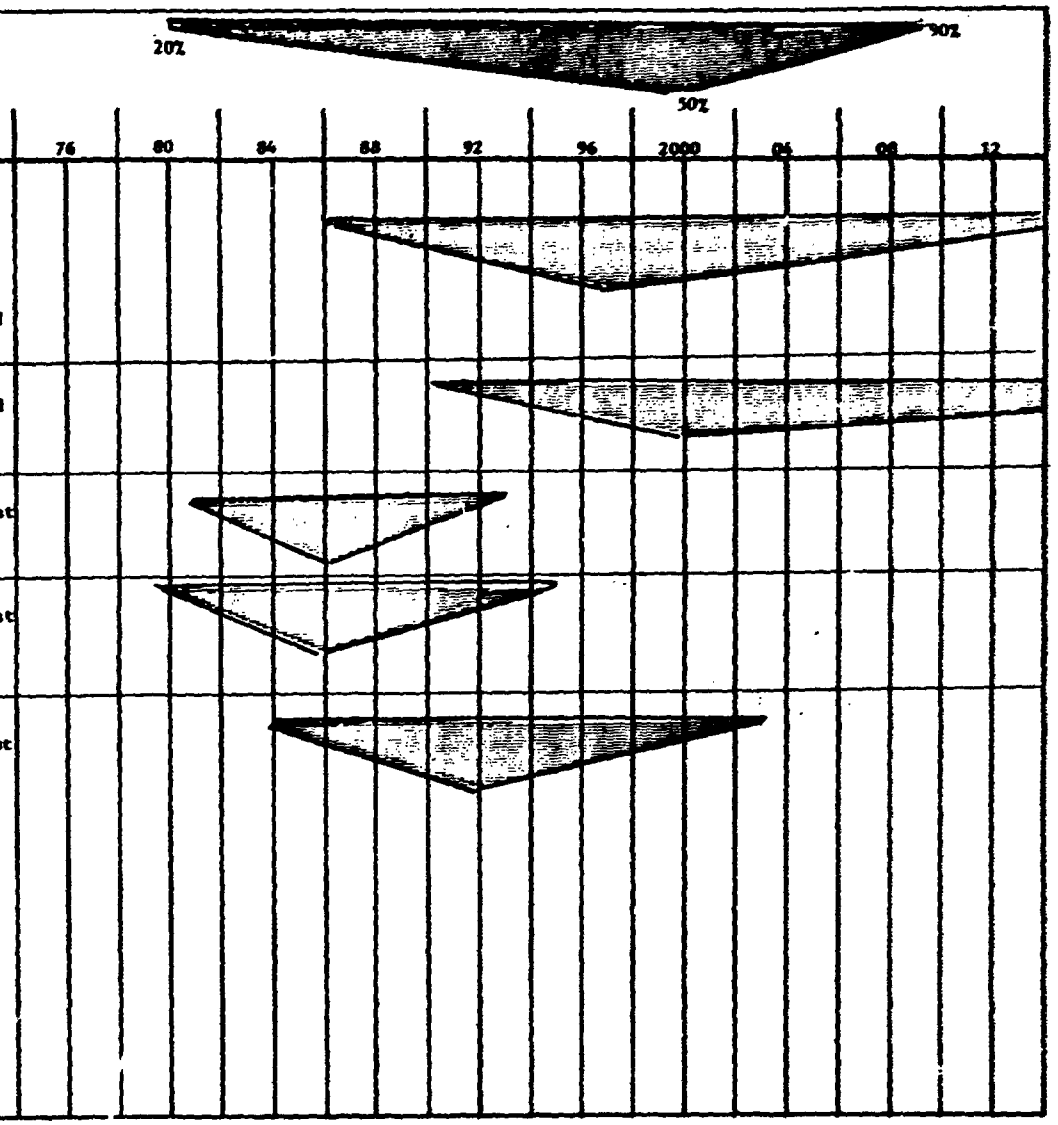

Figure 3-2. (Continued)

the appropriate events to govern the direction of information technology that would be most likely to result in quantum improvements in information processing technology.

The events are evenly distributed between technology and services with standardization achievement acting as a sort of bridge. Achievements of cost related events are notably lacking in the list of "important" events.

3.5.2 Time-Phased Goals and Supporting Events

Using the most important events (top 20%), four principal time phased goals are recommended that should characterize DDC's long range planning.

- Achieve complete electronic control over information processes
- Provide a comprehensive international cross disciplinary and integrated data resource that will be accessible to individuals through single access points
- Provide non-bibliographic services
- Provide information analysis services

These goals and their supporting events are shown in Figure 3-3. The order shown is by probable timing. As can be seen in the graphic representation, there is a wide range forecasted for some events. But the 50% probable timing estimated is used as a guide to planning.

As with all forecasts and most goals, unforeseen developments can alter the predicted course of events. However, until such time, the outline depicted in Figure 3-3 represents the most reasonable forecast of the course that information processing technology will take through the next several decades.

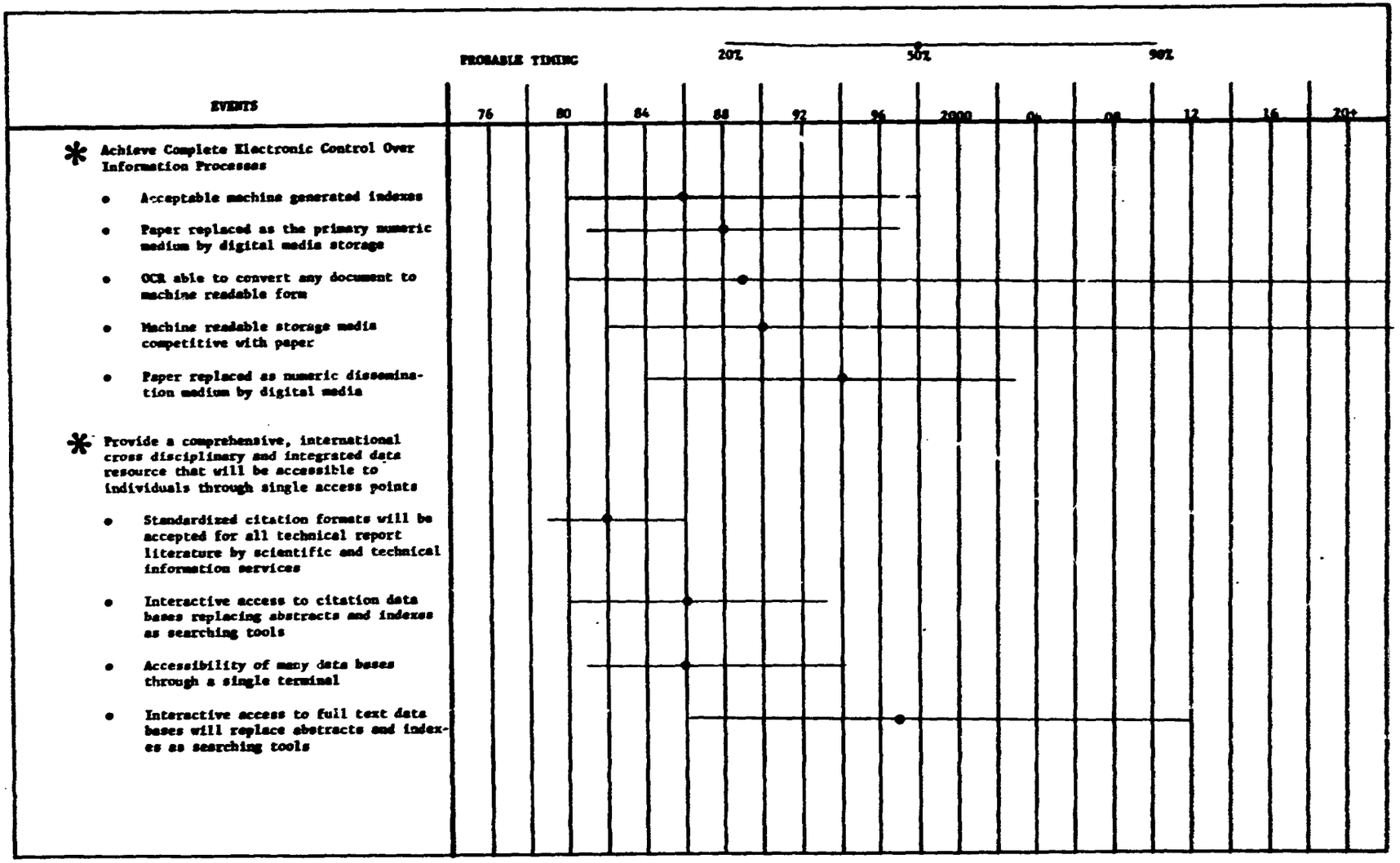

Figure 3-3. Time-Phased Goals and Supporting Events

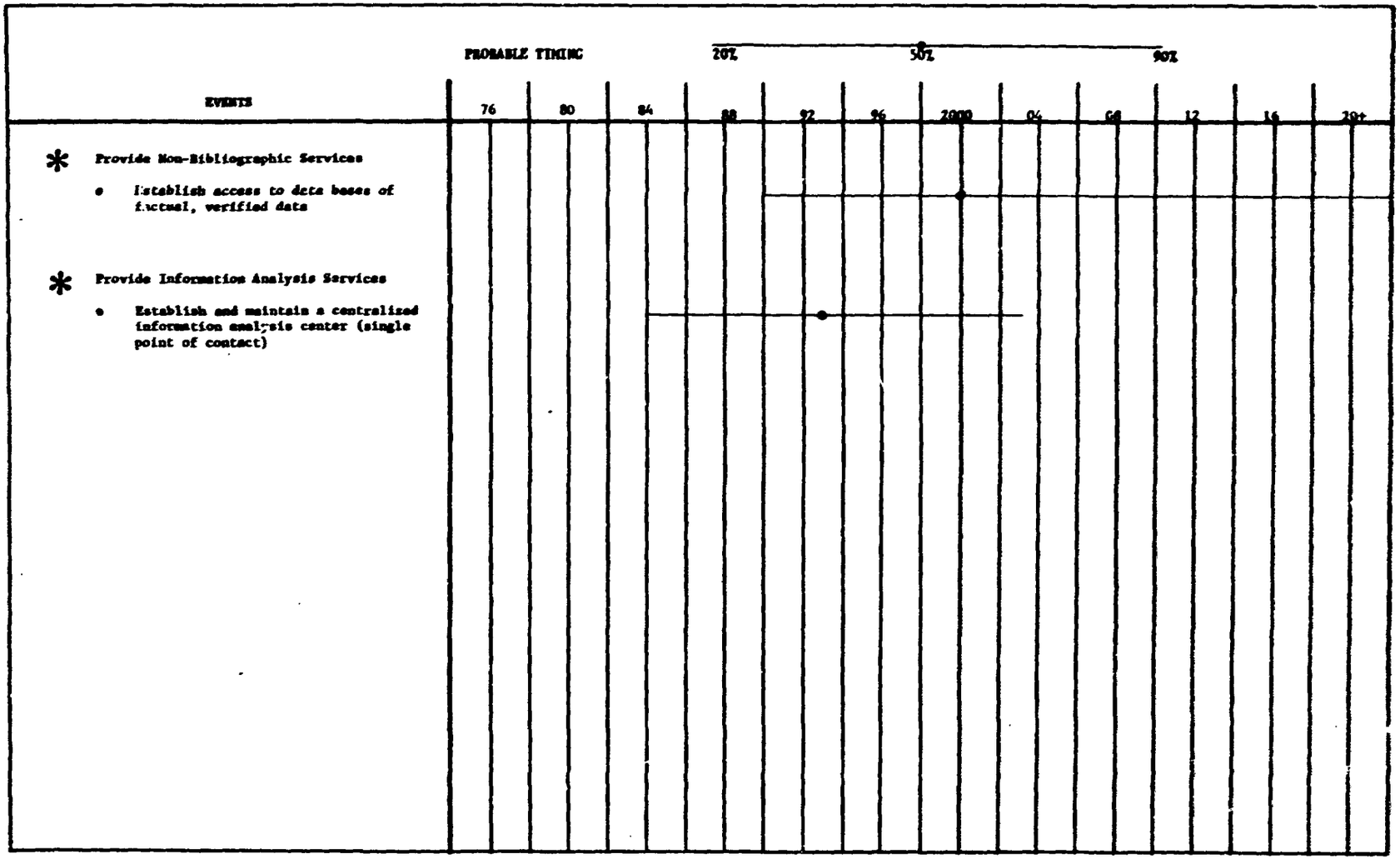

Figure 3-3. (Continued)

APPENDIX A. DATA TABULATION

TABLE A-1 . TECHNOLOGY

EVENT	A#	B#	Importance	Timing	
Most Desirable and Most Feasible					
1. Most technical information retrieval by dial-up communication lines	6	5	59%	1983 1986 1990	M
2. Facsimile transmission competitive with postal service in cost	13	10	50%	1981 1987 1995	M
3. Paper will be replaced as primary numeric storage medium by digital media	17c	14c	77%	1981 1988 1995	M
4. OCR able to convert any document to machine readable form	19	NA	70%	1980 1989 2050	M
5. Word processing equipment making available machine readable full text	20	19	68%	1981 1985 1994	M
Most Desirable and Moderately Feasible					
6. Machine readable storage media competitive with paper	2	3	70%	1982 1990 2071	M
7. Files electronically transferred between different locations at low cost	7	6	68%	1982 1989 1996	M
8. Commercial software packages replacing most original software development	21	20	46%	1983 1987 1994	M
9. Most packaged software machine independent	22	NA	66%	1983 1990 2008	M
Moderately Desirable and Most Feasible					
10. Machine readable storage competitive with microfilm	3	4	66%	1982 1991 2003	M

S = < 1985

M = 1985-1995

L = > 1995

TABLE A-1. TECHNOLOGY (Continued)

EVENT	A#	B#	Importance	Timing	
11. Peripherals with minis will take over many automated functions	8	NA	40%	1979 1983 1987	S
12. Interactive computer terminals available for $500.	10	8	60%	1980 1983 1986	S
13. High quality, low cost microfilm reader-printer available	12		55%	1979 1984 1988	M
14. Paper replaced as document storage medium by microforms	14a	11a	44%	1980 1988 1994	M
15. Automatic monitoring built into retrieval systems	16	13	34%	1976 1981 1984	S
16. Paper replaced as numeric dissemination medium by digital media	17d	14d	74%	1984 1994 2003	M
Least Desirable and Most Feasible					
17. Paper virtually replaced as a numeric dissemination medium by microform	176	146	46%	1982 1988 1994	M
Moderately Desirable And Moderately Feasible					
18. Associative memories commonly used for machine-aided fact retrieval	5	NA	55%	1982 1992 2000+	M
19. "Personal" interactive terminals very common	11	9	67%	1983 1993 2013	M
20. Paper replaced as document storage medium by full text digital media	14c	11c	44%	1985 1997 2014	L

TABLE A-1. TECHNOLOGY (Continued)

EVENT	A#	B#	Importance	Timing	
21. Acceptable machine generated index data	18	18	78%	1980 1986 1998	M
22. Tutorial features of on-line systems making intermediaries unnecessary	24	22	58%	1981 1988 1996	M
Moderately Desirable and Least Feasible					
23. Associative memories will be commonly used in machine aided retrieval	4	NA	44%	1984 1995 2000+	M
Least Desirable and Moderately Feasible					
24. Paper replaced as document dissemination medium by microform	14b	11b	34%	1981 1990 1998	M
25. Paper replaced as numeric storage medium by microform	17a	14b	46%	1981 1988 1992	M
Least Desirable and Least Feasible					
26. Computers designed specifically for bibliographic storage and retrieval	1	NA	20%	1980 1984 1988	L
27. Paper replaced as document dissemination medium by full text digital media	14d	11d	65%	1989 2003 2028	L

TABLE A-2. ORGANIZATIONAL AFFILIATION

EVENT	A#	B#	Importance	Timing
Most Desirable and Most Feasible				
28. Standardized citation formats		16	71%	1979 1982 S 1986
29. Standardized abstracts formats		17	64%	1980 1982 S 1986
Most Desirable and Moderately Feasible				
30. Standardized user protocols for on-line retrieval system	23	21	68%	1983 1989 M 2000+
Moderately Desirable and Most Feasible				
31. Two levels of information providers - wholesalers/ retailers		27	43%	1977 1980 S 1985
Moderately Desirable and Moderately Feasible				
32. Unnecessary data base duplication eliminated		1	64%	1979 1983 S 1993
Moderately Desirable and Least Feasible				
33. Standardization allowing user organizations to merge data bases into a single file	9	7	61%	1987 2000+ L 2000+
Least Desirable and Moderately Feasible				
34. Decentralized input processing for large IS&R systems		2	36%	1981 1988 M 2000

S = < 1985

M = 1985-1995

L = > 1995

TABLE A-2. ORGANIZATIONAL AFFILIATIONS (Continued)

EVENT	A#	B#	Importance	Timing
Least Desirable and Least Feasible				
35. One interdisciplinary subject vocabulary		15	57%	1983 1993 M 2000

TABLE A-3. ECONOMICS AND MARKETING

EVENT	A#	B#	Importance	Timing
Most Desirable and Most Feasible				
36. Facsimile transmission competitive with postal service in cost	13	10	60%	1981 1987 M 1995
Moderately Desirable and Most Feasible				
37. Interactive computer terminals available for less than $500	10	8	60%	1980 1983 S 1986
38. High quality, low cost microfilm reader-printer available	12		55%	1979 1984 M 1988
Least Desirable and Least Feasible				
39. Federal technical information services to become self-supporting		31	36%	1982 1987 M 1992

S = < 1985

M = 1985-1995

L = > 1995

TABLE A-4. SERVICES

EVENT	A#	B#	Importance	Timing	
Most Desirable and Most Feasible					
40. Accessibility of many data bases through a single terminal	15	12	73%	1980 1986 1994	M
Most Desirable and Moderately Feasible					
41. Major IS&R systems allowing choice of output	25	26	38%	1982 1988 1997	M
42. Researchers have access to data bases of factual, verified data	27	30	81%	1990 2000 2000+	L
Moderately Desirable and Most Feasible					
43. Interactive access to citation data bases replacing abstracts and indexes as searching tools		23	71%	1980 1986 1993	M
Moderately Desirable and Moderately Feasible					
44. Personal interactive terminals very common	11	9	67%	1983 1993 2013	M
45. Tutorial features of on-line systems making intermediaries unnecessary	24	22	58%	1981 1988 1996	M
46. Interactive access to full text data bases replacing abstracts and indexes as searching tools		24	94%	1986 1997 2013	L
Moderately Desirable and Least Feasible					
47. Information synthesis and analysis available to all researchers		28	71%	1984 1991 2003	M

S = < 1985

M = 1985-1995

L = > 1995

TABLE A-4. SERVICES (Continued)

EVENT	A#	B#	Importance	Timing
Least Desirable and Moderately Feasible				
48. Processing of numeric data at least equal to the processing of bibliographic information	26	29	44%	1980 1985 M 1989
Least Desirable and Least Feasible				
49. Dissemination of full text of documents precluding need for abstracts as announcement devices		25a	36%	1986 1993 M 2004
50. Dissemination of full text of documents precluding need for abstracts as retrieval devices		25b	50%	1985 1991 M 1998

TABLE A-5. RANKED ORDER OF IMPORTANCE

RANKING BY EVENT NUMBER

Event	% Indicating Importance	Event	% Indicating Importance
1	59%	26	20%
2	60	27	65
3	77	28	71
4	70	29	64
5	68	30	68
6	70	31	43
7	68	32	64
8	46	33	61
9	66	34	36
10	66	35	57
11	40	36	60
12	60	37	60
13	55	38	55
14	44	39	36
15	34	40	73
16	74	41	38
17	46	42	81
18	55	43	71
19	67	44	67
20	44	45	58
21	78	46	94
22	58	47	71
23	44	48	44
24	34	49	36
25	46	50	50

EVENTS BY RANK OF IMPORTANCE

Rank	Event	Rank	Event
1st	46	26th	
2nd	42	27th	1
3rd	21	28th	22, 45
4th	3	29th	
5th	16	30th	35
6th	40	31st	
7th		32nd	13, 18, 38
8th	28, 43, 47	33rd	
9th		34th	50
10th		35th	
11th	4, 6	36th	8, 17, 25
12th		37th	
13th	5, 7, 30	38th	
14th		39th	
15th		40th	14, 20, 23, 48
16th	19, 44	41st	
17th		42nd	31
18th	9, 10	43rd	11
19th	27	44th	41
20th		45th	
21st	29, 32	46th	34, 39, 49
22nd	33	47th	
23rd		48th	
24th		49th	15, 24
25th	2, 12, 36, 37	50th	26

TABLE A-6. DISTRIBUTION OF EVENTS BY ORDER OF IMPORTANCE

Percentile	Number of Events
90	1
80	1
70	9
60	15
50	8
40	9
30	6
20	1

APPENDIX B. ROUND IIA AGGREGATE DATA WITH COMMENTS

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
1. Computers designed specifically for bibliographic storage and retrieval applications will be available.	20%	3.8	5.9	1980	1984	1988

Comments:

General purpose computers can do this well enough. A specialized computer system for this is unlikely. (Specialized storage peripherals, however, may be developed for this application.) Image retrieval, on the other hand (half-tone and color) will have value for bibliographic systems when this new technology expands into the future.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
2. Machine-readable storage media for text will be competitive from cost, capability and access time standpoints with paper.	55%	7.4	6.7	1981 1 "now response"	1986	2135

Comments:

Paper will always have immense value, and some users will always prefer it. In any event, it is the display media (connected to the storage) which has the task of competing with paper. MRS based on photographic principles may be the type most competitive with paper eventually.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
3. Machine-readable storage media for text will be competitive from cost, capability and access time standpoints with microfilm.	55%	6.6	8.7	1979 1 "now"	1984 response	1991

Comments:

Electronic systems are more versatile than purely optical systems, and will replace them. To support this, microfilm will be machine readable.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
4. Associative memories will be commonly available at reasonable cost for use in machine-aided document retrieval.	44%	6.6	5.5	1984	1995	2009

Comments:

May be possible, with semiconductor memory technology developing rapidly, but will always be costly and will not be competitive for bulk storage. Small specialized associative memories, however, will be used to support computer macro instructions. (i.e., software support).

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
5. Associative memories will be commonly available at reasonable cost for use in machine-aided fact retrieval.	55%	6.8	6.3	1982	1992	2003

Comments:

Different Comments: 1) Same comments as 4. 2) Conventional memories are adequate in speed and competitive in cost. 3) "Modest size" (less than 100K bytes) associative memories will be used in this way. 4) Associative memories will be used heavily for index table processing in fact retrieval question and answer systems.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
6. A large majority of remote technical information retrieval will be accomplished via dial-up communication lines. The remainder will be accomplished through dedicated lines.	40%	7.1	8.3	1988	1992	1993

Comments:

Different comments: (Several respondents factored in in mail service and library service as part of "remote technical information retrieval") 1) This capability has existed since 1973. 2) Cost of communications and wide band facilities will prevent this from being economically feasible. 3) Depends on whether number of subscribers or volume of traffic is meant.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
7. Machine readable records will be electronically transferred directly from one location to another at a transmission cost per record which is competitive with currently mailing a reel of tape.	50%	7.4	6.6	1983	1992	2001

Comments:

1) Cost of mailing is too low, and costs of electronic transmission will always be higher. However, if speed is the issue, cost does not matter. 2) The technology exists. Communication costs are still dropping, and CPU handling costs are still in flux. 3) Physically transporting magnetic tape or a hologram will always be cheaper than electromagnetic propagation. The answer depends on distance.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
8. Minicomputers coupled with peripherals will generally take over many functions currently performed by large centralized computers in large scientific information systems.	40%	7.1	7.7	1979	1983	1987

Comments:

Different comments: 1) Large scientific programs are growing in processing requirements - minis are for local control - not computation. 2) Big computers will be transformed into mini-computer networks by 1985. 3) By 1990 it will be microcomputers.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred		
				x = 0.2	x = 0.5	x = 0.9
9. Major obstacles to standardization will be overcome, allowing scientific and technical bibliographic data bases to be merged into a single file.	67%	6.3	6.2	1985 1 "now" technol	1993 response ogy asp	2008 (for ects)

Comments:

1) People and groups are the "obstacles" - standardization would have to be forced. 2) Standardization is not required if data bases are used by different groups. 3) The reverse will take place: data of more complex structure will evolve. 4) Storing data in standard formats is done now.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
10. Each R&D professional will be able to purchase an interactive computer terminal for less than $500.	50%	6.9	8.5	1979 1 "now" response	1982	1985

Comments:

1) What about the administrative overhead, link-in, and communications costs? 2) Programmable microcomputers will be more important. By 1985, individuals will have their own data bases on cheap disc packs. 3) This terminal will have processing and logic capabilities and storage. 4) Such terminals are now available.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
11. Increased computer capacities and reduced processing costs will make personal interactive terminals as common as electric typewriters.	70%	5.9	5.8	1985	2002	2036

Comments:

1) Terminal users may not be as common as typists! 2) Will further depersonalize work. 3) Little need. Users can use calculators. Re record keeping, most individual's records aren't that complex 4) The communication costs are the bottleneck.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
12. A high-quality, low cost (i.e., under $100) microfilm reader-printer will be commercially available. (High-quality: High resolution, small size, light weight, user convenience.)	55%	6.4	7.8	1979	1984	1988

Comments:

The demand factor is the problem - high volume productions needed for lower price may not come. Also inflation will raise prices, so the cost of such equipment would not be 100 1975 dollars, but the equivalent.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
13. In terms of cost, facsimile transmission will be competitive with postal service for full text document delivery.	43%	7.4	7.4	1981	1989	1998

Comments:

1) Assuming brief documents. Don't think fax will ever compete for lengthy documents. 2) Privacy could be a problem. 3) Not clear who needs such a capability.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
14. Paper will be virtually replaced as the primary document dissemination and/or storage medium by microform and/or full text digital media.						
(a) Microform: storage	55%	6.6	6.7	1982	1992	2004
(b) Microform: dissemination	44%	6.4	6.2	1984	1996	2008
(c) Full text digital: storage	67%	5.7	7.0	1987	2001	2018
(d) Full text digital: dissemination	55%	4.4	5.7	1990	2006	2018
(Please respond to all four parts)						1 "never" for .9

Comments:

Microforms more difficult to manipulate physically, but easier to publish. Paper has too many advantages to be "virtually replaced." Non-paper will increase markedly, but statement is too strong.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
15. Machine-readable R&D data bases will be electronically linked so that a user of any one of these data bases can, with proper authorization, directly access almost any other data base through a single on-line terminal.	60%	6.9	8.5	1981	1988	1988

Comments:

Done now with ARPANET. Need and economics must justify costs. "Private enterprise" factors and the number of data bases involved will slow down this development, however.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
16. Automatic retrieval systems will have built in monitoring features, thus providing instant analysis of system use and user needs.	33%	5.0	7.5	1975	1980	1984

Comments:

Different comments: 1) ...and automatic reporting to the authorities of stupid or dangerous requests! 2) This exists now. 3) This one isn't too big a problem.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
17. Paper will be virtually replaced as the primary numeric data storage and/or dissemination medium by microform and/or digital media.	37%	5.8	7.1	1980	1987	1994
	50%	6.2	7.5	1981	1988	1995
	62%	7.2	8.6	1982	1989	1998
	62%	6.7	8.0	1987	1988	2005
(a) Microform: storage						
(b) Microform: dissemination						
(c) Digital media: storage						
(d) Digital media: dissemination						
(Please respond to all four parts of the question)						

Comments:

1) Hand-held calculator/numeric stores will completely replace paper for computation as soon as available. 2) "Same comments as 14"

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
18. For scientific and technical report literature, the machine-generation of use-acceptable index data from machine readable text will virtually eliminate the need for manual indexing.	50%	7.5	7.3	1980	1987	2005

Comments:

1) Only if author or editor provide key words/phrases or abstract. 2) Just as in language translation, a lot of human oversight (sic) will be needed to provide the context. 3) Problems: defining the structure into which the index is to fit; analysis of contextual connotations.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
19. Optical character recognition devices will readily convert virtually any document to machine-readable form, regardless of format or type font, with accuracy of 95% or better.	70%	8.5	7.8	1980	1989	2050

Comments:

1) How could a machine read mathematical diagrams and formulas? These could, of course be treated as pictoral data. 2) Not handwritten material. 3) Not sure such versatility of formats and typefonts may not be necessary in most applications. 4) Including pictoral art? Graphic OCR has a later set of probability dates.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
20. Increased use of word processing equipment will make machine-readable versions of full text documents readily available.	67%	8.2	7.7	1981	1986	1996

Comments:

1) The coming office revolution. 2) Implies cooperative effort to index, store, maintain, etc. which I am not sure will ever take place except by decr e

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
21. Use of commercially available software packages for virtually all but the most specialized document storage and retrieval applications will replace almost all original software development.	50%	7.5	8.3	1985	1990	1999

Comments:

1) Political question. Can technically be done today. 2) Would require and encourage standardization, which is probably the only hope for ever achieving widespread existence of "electronic libraries." 3) The "NIH" effect will slow this down. ("Not Invented Here")

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
22. Almost all packaged software will be machine independent.	60%	8.1	6.7	1983	1990	2008

Comments:

1) May be technically feasible now, but not very attractive economically (to the computer industry)
2) Certain classes of software (high level languages) - now. Differences in system architecture will preclude complete machine independence of all software in the near future.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
23. Standardized user protocols for on-line interactive retrieval systems will be adopted by all technical information services.	67%	8.6	7.2	1984	1992	2012

Comments:

1) Whose standards? Such standards might limit future advances. 2) Political pressure would have to effect this.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
24. Conversational and tutorial on-line retrieval systems will evolve to the point where human intermediaries between the system and the requestor will usually become unnecessary.	60%	6.6	7.3	1980	1987	1999

Comments:

1) The capability to do this is essentially available, as in certain medical diagnostic instruction programs. Someone must pay for the development. 2) While intermediaries may not be strictly "necessary" they often will exist to allay frustration on the part of users without the necessary patience.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
25. Almost all major R&D information systems will permit the user to specify his own format, with few limitations on data order or structure.	40%	8.0	6.8	1983	1991	2004

Comments:

1) Standards will force user to conform to system requirements. 2) Data base techniques are available now. It may not be economically feasible to implement such freedom, however. 3) May be more expensive than it is worth. May also require more user specifications than worthwhile.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
26. In the R&D environment, the collection, storage, and retrieval of numeric data will at least equal, if not surpass, in volume and importance, the processing of bibliographic information.	28%	4.4	6.4	1979 2 "now" responses 1 "never" response	1983	1987

Comments:

1) Numeric data is subset of text, or descriptive, data - we cannot interpret numerics unless we know what they describe. 2) Importance, but not volume. 3) Depends on end use. Engineering may need only numeric data. 4) I haven't the foggiest idea how to assess the relative importance of numeric and bibliographic information. 5) Can't imagine why. Numeric data is only really useful in formulating and verifying hypotheses. 6) Seems to me we are already these.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
27. Most R&D scientists will have access to discipline-oriented data bases of highly select, certified and validated numerical data, largely supplanting bibliographic references to reported results and collections of unverified data.	70%	7.4	5.6	2003 1 "now" response 1 "never" response	2033	2172 for .9

Comments:

1) Masses of numeric data: OK for validating theory, etc. but would seem to me to deemphasize new theories or techniques for which there is no mass of supporting data. Who will define what data is to be collected, etc.? 2) What's to stop "GI-GO,"* just because it's computerized? 3) Can have it now, if they can convince management. 4) "Most" researchers do not trust data gathered by others. How "validated?" 5) All scientific data is subject to further investigation. If you label it as "certified and validated," there is no further need for science.

* Garbage in, garbage out

APPENDIX C. ROUND IIB AGGREGATE DATA WITH COMMENTS

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
1. Unnecessary duplication in acquisitions among major bibliographic data bases will be virtually eliminated through inter-organizational agreements.	64%	7.2	7.1	1979	1983	1993
				1 "neve	r" response for .9	

Comments:

1) May be of short range economy, as publishers raise prices to offset decreased revenue from fewer subscriptions 2) Some duplication necessary and desirable. Will be monitoring from here on to reduce most unnecessary overlap. 3) Contention: what is "unnecessary" 4) Need different indexing (e.g. for different audiences.) 5) Some duplication necessary because the slant of the discipline must be interpreted and analyzed by a subject specialist. 6) Means less tailored indexing and abstracting: help control cost (but) may act to freeze out newcomers and restrict innovations. 7) Some duplications will be desirable, but not necessary.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
2. Input of information to large IS&R systems (e.g., DDC, NTIS, NASA, etc.) will be decentralized, with standardized abstracting, indexing, and data conversion provided at the local source level.	36%	4.8	6.3	1981 1 "never" response for .9 1 "infinity" response	1988	2000

Comments:

1) It may prove very desirable to input online to central location via telecommunications. 2) Authors and institutions will probably never be good "document processors." 3) The event here is the achievement of compatible or standardized data elements formats and contents. 4) Only if centralized quality control. 5) Data conversion always partially centralized. 6) Problems: training costs, standardization. 7) Lowest common denominator of quality. 8) If decentralized, it will go all the way to the user. 9) Managerial problems are substantial. 10) Will be an interactive process involving both central and local people.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
3. Machine-readable storage media for text will be competitive from cost, capability and access time standpoints with paper.	86%	8.3	6.9	1983	1994	2008

Comments:

1) Determined on an individual document basis. Costs and materials priorities are unknown factors. The technology is here now. 2) Journals,not reprints. 3) Only a matter of time. True now in some areas.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROLABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
4. Machine-readable storage media for text will be competitive from cost, capability and access time standpoints with microform.	77%	7.5	6,8	1985	1996	2016
	13	responses				

Comments:

1) Not the technology, but feasibility. Experiments and new developments may make a change here. Individual document and archive files are matters of differing aspects. 2) Not possible to consider "cost, capability and access time" in the same breath. 3) Journals, not reports. 4) Feasibility depends on relative emphasis given to (a) cost, (b) system capabilities and (c) accessibility 5) In terms of actual access, on the average, paper better than microform.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
5. A large majority of remote technical information retrieval will be accomplished via dial-up communication lines. The remainder will be accomplished through dedicated lines.	78%	8.3	8.8	1978	1981	1987
	14 responses			2 "now" responses		

Comments:

1) The first sentence is true now. However, there will always be some local batch work. 2) Dial up to record concentrators, then dedicated lines. 3) Hesitancy may be result of security problem. 4) Most remote IR is now dial-up. 4) NOT dial-up. Through local networks connected to global networks.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
6. Machine readable records will be electronically transferred directly from one location to another at a transmission cost per record which is competitive with currently mailing a reel of tape.	86%	8.8	8.3	1980	1985	1990
	14 responses			1 "now"	response	

Comments:

1) Does "competitive" attach a $ value to time? Makes a big difference. 2) Highly desirable when speed is important. More important for numeric; less important for bibliographic. 3) For many purposes, this would be a major event unless mail service deteriorates to the pony express level! 4) But for shorter records, more feasible and sooner!

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
7. Major obstacles to standardization will be overcome, allowing scientific and technical bibliographic data bases to be merged into a single file.	57%	5.7	5.6	1989	2080	*
				* Only 5 dates given 1 "now" response 1 "infinity" response 1 "never" response		

Comments:

1) Major problem is intellectual analysis involved in the indexing of the literature from the different data bases. 2) No need for this. Value enough of different processing viewpoints and multiple separate data bases. 3) Costs attendent with maintaining and searching a huge data base: too high. Segmented files more economical. 4) Not useful because mission-oriented emphasis would be lost; vocabularies would not be compatible. 5) Assume you mean merger of those parts an agency would need. 6) Policy, politics, ownership are slow to evolve. 7) Organizational/political problems present chief barrier. 8) Assume "most" enough to make global system very useful.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
8. Each R&D professional will be able to purchase an interactive computer terminal for less than $500.	71%	7.8	8.2	1980	1984	1987
	14 responses					

Comments:

1) Almost here. 2) Don't believe this is a real requirement. 3) Not that I can see a lot of professionals doing this very soon. 4) Depends on characteristics of the terminal. Probably can get something for that amount. 5) For searching: intermediaries will play an important role, so terminal not necessary. For teleconferencing, its a different matter. Even here access to a terminal may be sufficient. 6) But why purchase? Most R&D people will have access to the employer-supplied terminal selling for less than $500 (or the equivalent in rental). 7) Cost to manufacturer is a cinch. Price another matter.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
9. Increased computer capacities and reduced processing costs will make personal interactive terminals as common as electric typewriters.	64% 14 responses	7.8	8.3	1980	1985	1991

Comments:

1) Don't believe this is a real requirement. 2) "Will" should be "could". Few professionals use electric typewriters themselves. 3) More important that they be much more widespread!

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
10. In terms of cost, facsimile transmission will be competitive with postal service for full text document delivery.	78%	8.6	7.9	1980	1985	1991
	14 responses					

Comments:

1) Given the problems of the Postal Service, this may come sooner than I think it will. 2) May be more practical to use high-speed transmission/receiving "mini's" with local printing. Personal messengers may soon be competitive with postal service! 3) Very desirable; state-of-the-art just not available. 4) Sending from large centers will be easier, but the (low load) users will need low cost equipment. Yet since users are large in number, mass-market economies may make this possible. 5) Fundamentally inefficient. A blind alley.

		Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred. x = 0.2	x = 0.5	x = 0.9
11. Paper will be virtually replaced as the primary document dissemination and/or storage medium by microforms and/or full text digital media.	(a)	33%	6.0	8.5	1978	1983	1985
					1 "never" for .9		
(a) Microforms: storage (b) Microforms: dissemination (c) Full text: storage (d) Full text: dissemination	(b)	25%	5.2	8.5	1978	1984	1988
					1 "never" for .9		
	(c)	92%	6.9	7.0	1984	1994	2010
	(d)	75%	5.5	6.0	1987	2000	2040
(Please respond to all four parts of the question)		12 responses					

Comments:

1) In the R&D environment and for non-book literature. The book will always be with us. It is very efficient. 2) Data capture: i.e., data entry of full text may be too costly and difficult to standardize. For material generated by computer processing, full text will be available. 3) For (d): only on demand basis and not for current awareness purposes. 4) I do not see "virtual replacement" of paper before the year 2000. 5) The technology is here. Psychology, feasibility is in question. Massive resistance will delay microforms until digital tables over. 6) Full text storage will give microforms only in short span of viability. 7) I doubt that print or paper will be completely replaced in any form. 8) Assume document = technical report, not journal articles. 9) Paper good for local dissemination if "more use" is reading.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
12. Machine-readable R&D data bases will be electronically linked so that a user of any one of these data bases can with proper authorization, directly access almost any other data base through a single on-line terminal.	86% 14 responses	9.4	8.9	1981 2 "now"	1985 responses	1990

Comments:

1) We have this now, essentially. 2) Essentially here except for a few major data bases such as OCLC which require special terminals or communications links. 3) Not economically feasible for the manufacturer. 4) Now possible through Tymshare. 5) Not clear whether one-terminal access is what we are rating or "electronically linked" is what question is asking about.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
13. Automatic retrieval systems will have built-in monitoring features, thus providing instant analysis of system use and user needs.	36% 14 responses	8.0	8.6	1977	1981	1984

Comments:

1) Correlation of user needs and use of systems has not been established. 2) Privacy must be considered: the technology is here. 3) Now available in many cases. 3) Analysis of system use and user needs incurs different levels of difficulty to implement. 4) Privacy for users will prevent much of this as regards "subjects" but not as regards other use factors. 5) Monitoring should only be done when privacy can be guaranteed and when specific objectives for monitoring have been clearly thought out. 6) "Big brother" is the danger here. 7) Now, in R&D systems

		Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
					x = 0.2	x = 0.5	x = 0.9
14. Paper will be virtually replaced as the primary numeric data storage and/or dissemination medium by microform and/or digital media.	(a)	36%	5.4	7.8	1980 1 "never"	1985 response	1990 for .9
	(b)	43%	4.5	8.0	1982 1 "never"	1988 response	1993 for .9
(a) Microforms: storage (b) Microforms: dissemination (c) Digital media: storage	(c)	93%	7.9	7.9	1979	1987	1996
(d) Digital media: dissemination	(d)	86%	7.0	7.2	1981	1990	1998
(Please respond to all four parts of the question)		13 responses					

Comments:

1) For (d): only on demand basis; not for current awareness. 2) I assume that (d) makes sense when combined with ability to simultaneously operate on such data. 3) In the U.S. this may come sooner than worldwide.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
15. A single standard, interdisciplinary subject indexing vocabulary adopted for use by all the major information services.	57%	3.6	3.1	1983	1993	2000
	14 responses			1 "infinity" response 1 "never" response for .9		

Comments:

1) Language does not permit. Also no need to search across broad disciplines on all searches as would be implied in this proposition. 2) Highly doubtful that this will occur. I think it more likely that "translations" will automatically be made from one indexing vocabulary to another on-line. 3) Never happen. 4) Hard to contemplate - doubt it will occur. 4) Not even desirable. 5) A disservice to users. At least a number of vocabularies would be preferable, with switching to be signalled where needed. 6) Requires organization. Like stopping a war.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
16. Common, standardized citation formats for all technical report literature will be adopted by all scientific and technical information services.	71% 14 responses	7.8	8.1	1979	1982	1986

Comments:

1) In U.S., seems very probable. 2) Whether you mean data elements captured or their announcement in announced records (sic), there will probably always be differences. No need for conformance to one mold. 3) Government and standards groups should work toward this kind of standardization. 4) ANSI has such a format in draft. 5) "All" not good in such a survey.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
17. Common, standardized formats for abstracts for all technical report literature will be adopted by virtually all scientific and technical information services.	64%	7.9	7.6	1980	1982	1986
	14 responses			1 "infinity" response		

Comments:

1) Never happen. Why should it? 2) ANSI has a standard which, if used, makes this feasible.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
18. For scientific and technical report literature, the machine generation of user acceptable index data from machine readable text will virtually eliminate the need for manual indexing.	78%	6.7	6.3	1980	1985	1993
	14 responses			1 "infinity" response		

Comments:

1) Manual editing will still be needed. 2) Probably always be some need for human "enhancement" of the available text, for indexing purposes. 3) Machine indexing is still not totally satisfactory or cost effective. Techniques have been around for the last 10 years and we still have not been able to replace the manual indexes. 4) Acceptable is the big "if". But economies may lower standards. 5) Like machine translation, will only be done as aid to indexing. Could get up to 80-90% efficiency, but will need to use human intellectual analysis for many years. 6) Feasible earlier, but perhaps not very high priority.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
19. Increased use of word processing equipment will make machine readable versions of full text documents readily available.	71% (14 responses)	8.1	7.9	1980	1984	1992

Comments:

1) Only for local text editing purposes. Not for use by information centers. 2) To reproduce multiple copies of full text will still involve present costs. 3) Much available now, but will be a long time before economical to search from full text. 4) "Readable" not "understandable"

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
20. Use of commercially available software packages for virtually all but the most specialized document storage and retrieval applications will replace almost all original software development.	43% 14 responses	6.0	6.6	1981 1 "infinity" response 1 "never" for .9	1983	1989

Comments:

1) Question not very clear; I don't see the need or likelihood for, say, MEDLINE to be replaced by commercial software. 2) What a big job that would be. 3) Needed for very long time.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
21. Standardized user protocols for on-line interactive retrieval systems will be adopted by all technical information services.	71% (14 responses)	7.8	6.2	1981	1986	1994

Comments:

1) There will be a standardized subset of commands with additional system-specific commands. Much as with standardized indexing systems today. 2) Due to human nature, "translation" from one protocol to another will probably be used instead. This seems to be a particularly difficult area to gain acceptance of any standard. 3) Very desirable: would eliminate redundant training of searchers and would promote a wider use of the retrieval system. 4) Assume retrieval of bibliographic information only, other retrieval protocols will have to vary according to user kind and need. 5) Standardization should not prevent optional procedures. 6) May be more than one standard, permitting user to choose.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred. x = 0.2	x = 0.5	x = 0.9
22. Conversational and tutorial on-line retrieval systems will evolve to the point where human intermediaries between the system and the requestor will usually become unnecessary.	57%	7.4	5.3	1987	1989	1993
	14 responses			1 "infinity" response 2 "never" responses for .9		

Comments: 1) Probable that experienced intermediary will always do a better job than the requestor, given the ability of the requestor to define his needs. If requestor doesn't know what he wants, he will do a better job. 2) Essentially true now. But other factors: access time/costs, terminal sophistication level of standardization, frequency of search needs, desire of users to do it themselves. 3) Don't expect it soon. 4) More cost effective to have searchers handle all routine SDI queries and searches involving a number of data bases. 5) Don't think user will ever want to bother learning protocols and structure of data bases other than his own specialty. 6) Systems will become easier to use, but for more complex questions there will always be a role for the skilled intermediary. 7) Traffic load will result in an increasing market for intermediaries and also a smaller proportion of searches involving intermediaries. 8) Would take lots of education in the school system to prepare the population for such use.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
23. In an R&D environment, interactive on-line access to data bases of bibliographic citations will virtually (i.e., 90%) replace the abstracting and indexing journal in paper form as literature searching tools.	71% 14 responses	7.3	7.9	1980	1986	1993

Comments:

1) Assume searching of current literature. Doubt that large back files will ever be put on-line. 2) Factors other than technical feasibility make this unlikely. 3) On-line access usually limited to last few years; as storage becomes cheaper, more data may be maintained on-line. It may, however, be more cost-effective to do some searches batch for some time. 4) In a few years 50%, but the 90% point is a sticker. 5) Costs would have to drop drastically. 6) In this U.S. only. 7) Abstract in digital form also necessary.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
24. In an R&D environment, interactive on-line access to full text data bases will virtually (i.e., 90%) replace the traditional abstracting and indexing journal in paper form and literature searching tools.	93% 14 responses	6.2	6.3	1986	1997	2013

Comments:

1) Doubt full text will be needed. I think the trend will be toward synoptic literature: citation plus abstract plus some data, for example. 2) If you mean total document text, never happen. 3) Full text data bases not cost effective for most situations. Unlikely.

		Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
					x = 0.2	x = 0.5	x = 0.9
25. *Low cost, rapid dissemination of full text of documents will preclude the need for abstracts as document:*	(a)	36%	3.0	5.4	1986	1993	2004
					2 "never" responses		
(a) announcement device (b retrieval device	(b)	50%	4.7	5.8	1985	1991	1998
		14 responses					

Comments:

1) The abstract is necessary and desirable in "screening" for relevancy, irrespective of availability of full text. 2) Will always be a need for pre-digested forms of a document. 3) We could drown in the information overload. 4) Unlikely because of resultant mountain of material. 5) Abstracts will continue to serve as effective announcement device. 6) Don't think full text can be an "announcement device" 7) May come about because of ignorance.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
26. Almost all major R&D information systems will permit the user to specify his own output format, with few limitations on data order or structure.	36%	7.9	7.8	1981	1984	1990
	13 responses					

Comments:

1) Greater flexibility in report generation is already being noted. 2) Faster in R&D centers.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
27. Two tiers of information providers will emerge and be clearly definable: those large information services which wholesale their products to local libraries and service centers; and local activities which 'retail' their products directly to end users.	43%	7.0	7.8	1977	1980	1985
	13 responses			1 "infinity" response		

Comments:

1) Already common in the regional medical library system - makes sense for bibliographic information services. Does not seem as relevant to numeric data base services. 2) As yet not known if NASIC-like groups will remain as third tier. 3) I don't think this is exactly the way things will go. 4) In U.S. only. 5) There is much evidence of this now. Am I missing something here?

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
28. Most (more than 80%) R&D personnel will have the option of requesting detailed analysis and synthesis of the literature of their discipline through an established service, such as an information analysis center.	71%	7.4	5.3	1984	1991	2003
	14 responses					

Comments:

1) Economic barriers. 2) Cost problems because of heavy human effort. 3) These services are very expensive, so not likely IAC's will continue to grow. They are important, but unless the value of information services is recognized, these services will continue to be slighted. 4) Unlikely and unnecessary. 5) Expensive! 6) Would eliminate "browsing" fullout and serendipity; both are important benefits. 7) The "more than 80%" shoots the feasibility way down. There won't be enough IAC's unless more funding available from convinced users. 8) Much being done now in partial analysis. Synthesis to what degree or level?

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
29. In the R&D environment, the collection, storage and retrieval of numerical data will at least equal, if not surpass, in volume and importance, the processing of bibliographic information.	58%	6.3	7.2	1980	1986	1990
	13 responses			1 "never" response for .9		

Comments:

1) The comparison is meaningless unless there is a comparison. 2) Just not likely: importance, perhaps. Volume, no. 3) Unlikely. 4) Limited by technology as yet (large memories) 4) Seems to be an "in" trend. Personally, I think it will overshoot its mark. There will be lots of numbers available without adequate context, once the "bibliographic" tie-ins get ignored. 5) Bibliographic (textual) information is an essential component of numeric data. For numeric data to be understood have to have textual elaboration. However, would be desirable for balance between text and numeric information in documents to shift more toward the numeric. 6) Concepts and subjects will always be more important than data. 7) Alphanumeric, but non-bibliographic

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING		
				Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
30. Most R&D scientists will have access to discipline oriented data bases of highly select, certified and validated numerical data, largely supplanting bibliographic references to reported results and collections of unverified data.	93%	8.5	6.9	1982	1989	1995
	14 responses					

Comments:

1) Problems: validation of the data. Must be done by recognized experts in the field, and these people are not always available. 2) Exists in part now. 3) Expensive. 4) I believe bibliographic references will not be largely supplanted. Also there'll have to be a lot more work on certifying and validity. 5) "Access" may be highly desirable, while "supplanting" may not be. 6) Confused by limitation to numeric data. On-line numeric data can never supplant most bibliographic references.

	Major Event? (x or o)	Desirability (on scale 1-10)	Feasibility (on scale 1-10)	PROBABLE TIMING: Year by which the probability is x that the event will have occurred.		
				x = 0.2	x = 0.5	x = 0.9
31. Federal technical information processing and dissemination activities will become virtually self-supporting.	36%	5.8	4.9	1982	1987	1992
	14 responses			1 "never" response		

Comments: 1) Self support, in lieu of specific enacting legislation is highly undesirable for government agencies in that it encourages competition at high cost with alternative services and a spirit of entrepreneurship in agency heads in place of a more desirable fiduciary motivation. Government can always do it "cheaper" because of the way costs are derived. 2) Government, like industry, must cut back on non-justifiable expense on information. The best way to accomplish this goal is to require self-support. Hopefully this would encourage agencies to limit acquisitions to those for which there is a market and for definite need. 3) Don't think it could be done if optimum service. 4) May never happen and not necessarily desirable. 5) How can the government become self-supporting? Even if the services charge their users, the users' resources are still those of the government. 6) Never happen. 7) Information has been provided free of charge, it has been the American Way. We have not learned of the value or the ability to evaluate and put a price on information. It would be desirable to make these activities self-supporting - that way valuable services will be supported and useless ones will not. 8) Can the Library of Congress ever expect to become self-supporting? 9) Most people think it's desirable.

APPENDIX D. QUESTIONS AND ISSUES RELATED TO THE EVENTS

I. TECHNOLOGY

Question:	Can DDC obtain a computer system which is specially designed for IS&R?
Event:	Computers designed specially for bibliographic storage and retrieval applications will be available.
Question:	Will the digital storage medium become competitive with paper and microforms?
Event:	Machine-readable storage media will be competitive from cost, capacity, and access time standpoints, with: (a) paper (b) microform
Question:	Can associative memories be used for machine-aided information analysis and/or retrieval?
Event:	Associative memories will be commonly available for use in machine-aided (a) retrieval (b) information analysis
Question:	Is DDC's decision to pursue dial-up access to unclassified information sound?
Event:	85% of remote technical information retrieval will be accomplished via dial-up (public switched) communications lines. The remainder will be accomplished through dedicated lines.
Question:	Can entire data files be electronically transferred between DDC, NTIS, IAC's, users, etc?
Event:	Files, (of the size equivalent to a reel of magnetic tape) will be electronically transferred directly from one data base to another at a transmission cost which is competitive with mailing a reel of tape.
Question:	Will the trend be away from large, centralized processing systems and toward distributed processing with minicomputers?
Event:	Processing in large scientific information systems will be performed by a network of decentralized minicomputers rather than by large, centralized computers.

AUERBACH

Question:	Will computers be able to support a sufficient number of terminals to provide a CRT to each user who wants one?
Event:	Increased computer capac'ties and reduced processing costs will allow each R&D professional to have his own on-line interactive terminal.

Question:	What factors will influence the acceptability of microforms?
Event:	A high-quality, low cost (i.e., under $100) microfilm reader-printer will be commercially available.
Event:	Microforms will become equal to paper in acceptability by information users.

Question:	What are the alternatives to the postal service for document delivery?
Event:	Facsimile transmission will be competitive with postal service for full text document delivery in terms of cost and speed.

Question:	Will paper cease to be the primary document storage and dissemination medium?
Event:	Paper will be replaced as the primary document dissemination and storage medium by: (a) Microforms (b) Full text digital media (c) Sound recordings (d) Other (specify)

Question:	How can DDC get user feedback without reinitiating user surveys every year?
Event:	Automatic retrieval systems will have built in monitoring features, thus providing instant analysis of system use and user needs.

Question:	Will paper cease to be the primary document storage and dissemination medium for numeric data?
Event:	Paper will be replaced as the primary numeric data storage and dissemination medium by: (a) Microforms (b) Digital media (c) Sound Recordings (d) Other (specify)

Question:	Should DDC continue to support machine-aided indexing activities?
Event:	For scientific and technical report literature, the generation of acceptable index data from machine readable text will virtually eliminate the need for manual indexing.
Question:	Can DDC eliminate duplicate input keyboarding?
Event:	Optical character recognition devices will readily convert any document to machine-readable form, regardless of format or type font.
Event:	Increased use of word processing equipment will make machine readable versions of full text documents readily available.
Question:	Can DDC minimize original software development?
Event:	Use of commercially available software packages for document storage and retrieval applications will virtually replace original software development.
Question:	Can DDC approach a reasonable degree of computer manufacturer independence?
Event:	All packaged software will be machine independent.
Question:	Can the Defense on-line Retrieval System provide full conversational capability?
Event:	Conversational and tutorial on-line retrieval systems will evolve to the point where human intermediaries between the system and the requester become unnecessary.

II. ORGANIZATIONAL STRUCTURES AND AFFILIATIONS

Question:	Can DDC minimize overlap and duplication between its data base and others?
Event:	Duplication among major bibliographic data bases will be virtually eliminated through interorganizational agreements.
Question:	Is the distributed input processing concept preferrable to central input and processing at DDC?
Event:	Input of information to large IS&R systems (e.g., DDC, NTIS, NASA, etc.) will be decentralized, with abstracting, indexing, and data conversion provided at the local source level.

Question:	Will it be possible to merge DDC and other relevant data bases?
Event:	It will be possible for a user organization to readily merge available scientific and technical bibliographic data bases into a single file.
Question:	Should DDC adopt a more centralized approach?
Event:	Through ready access to a central information storage and dissemination facilities, users can bypass local information or library facilities and these can be eliminated.
Question:	What should be the relationship between DDC and its peers?
Event:	Machine-readable R&D data bases will be electronically linked so that a user of any one of these data bases can, with proper authorization, directly access any other data base through an on-line terminal.
Question:	Is a universally-adopted indexing vocabulary feasible?
Event:	A single standard, interdisciplinary subject indexing vocabulary adopted for use by all the major science information services.
Question:	Is a common, standardized citation format feasible for all technical literature, thus allowing free exchange of document surrogates among information-handling agencies?
Event:	Common, standardized citation formats for all technical report literature will be adopted by all scientific and technical information services.
Question:	Is a common, standardized abstract format feasible for all technical literature thus allowing free exchange of document surrogates among information handling agencies?
Event:	Common, standardized abstract formats for all technical report literature will be adopted by all scientific and technical information services.
Question:	Will DDC have to adopt a standardized protocol for DROLS?
Event:	Standardized user protocols for on-line interactive retrieval systems will be adopted by all technical information services.

Question:	Will Federal STINFO services be consolidated under one or more umbrella organizations, causing DDC to be merged with others?
Event:	Virtually all Federal technical information services will be merged into a central organization.

Question:	What is the trade-off between DDC performing information processing with government personnel and delegating these activities to contractor staff?
Event:	Federal agencies will employ contractor staff to perform virtually all of their information processing activities.

III. ECONOMICS AND MARKETING

Question:	At what cost will DDC be able to supply each potential user with an economical interactive terminal?
Event:	Each R&D professional will be able to purchase an interactive computer terminal for less than $500.

Question:	To what extent will DDC need to become self supporting?
Event:	Federal technical information processing and semination activities will become virtually self-supporting.

IV. SCOPE OF SERVICES

Question:	Can DDC and/or its users electronically tap into other relevant data bases?
Event:	Using a single terminal, each R&D professional will be able to query any bibliographic or numeric data base of his choice.

Question:	Should DDC continue to publish its abstract journal (TAB) in paper form?
Event:	In an R&D environment, interactive on-line access to bibliographic data bases will virtually (i.e., 90%+) replace the traditional abstracting and indexing journal in paper form as literature searching tools.

Question:	Will cheap and rapid document dissemination techniques preclude the need for dissemination of abstracts?
Event:	Low cost, rapid dissemination of full text of documents will preclude the need for abstracts as document announcement and retrieval devices.

Question:	Should DDC direct its efforts toward subscription and away from demand services?
Event:	Automatic delivery (as opposed to delivery upon demand) of information products such as documents and citations will become the rule; request services will become the exception.
Question:	How far should DDC go in providing tailored services to its users?
Event:	All major R&D information systems will permit the user to specify his own output format, with virtually no limitations on data order or structure.
Question:	Should DDC be wholesaling services to local libraries retailing services to individual users, or both?
Event:	Two tiers of information providers will emerge and be clearly definable: those large information services which wholesale their products to local libraries and service centers; and local activities which "retail" their products directly to end users.
Question:	Is the IAC concept viable?
Event:	All R&D personnel will have the option of requesting detailed analysis and synthesis of the literature of their discipline through an established service, such as an information analysis center.
Question:	Will numeric data collection, storage and retrieval become a major DDC service?
Event:	In the R&D environment, the collection, storage, and retrieval of numeric data will at least equal, if not surpass, in volume and importance, the processing of bibliographic information.
Question:	Should DDC provide highly select data bases of verified and reproducible research results?
Event:	R&D scientists will have access to discipline oriented data bases of highly select, certified and validated numerical data as opposed to bibliographic references to reported results and data bases of unverified data.

APPENDIX E. EVENTS CLASSIFIED BY DESIRABILITY/FEASIBILITY

TABLE E-1. MOST DESIRABLE AND MOST FEASIBLE EVENTS

EVENT

A. TECHNOLOGY

- Most technical information retrieval will be accomplished by dial-up communications lines
- Facsimile transmission will be competitive with postal service in cost
- Paper will be replaced as primary numeric storage medium by digital media
- OCR will be able to convert any document to machine-readable form
- Word processing equipment making available machine-readable full text

B. ORGANIZATIONAL AFFILIATIONS

- Standardized citation formats
- Standardized abstract formats

C. ECONOMICS

- Facsimile transmission competitive with postal service in cost

D. SERVICES

- Many data bases accessible through a single terminal

TABLE E-2. MOST DESIRABLE AND MODERATELY FEASIBLE EVENTS

EVENT

A. TECHNOLOGY

- Machine readable storage media competitive with paper
- Files electronically transferred between different locations at low cost
- Commercial software packages replacing most original software development
- Most packaged software machine independent

B. ORGANIZATIONAL STRUCTURES AND AFFILITATIONS

- Standardized user protocols for on-line retrieval systems

C. SERVICES

- Major IS&R systems allowing choice of output
- Researchers have access to data bases of "actual" verified numeric data

TABLE F-3. MOST FEASIBLE AND MODERATELY DESIRABLE EVENTS

EVENT

A. TECHNOLOGY

- Machine-readable storage competitive with microform
- Peripherals with mini's will take over many automated functions
- Interactive computer terminals available for less than $500
- High quality, low cost microfilm reader-printer available
- Paper replaced as document storage medium by microforms
- Automatic monitoring built into retrieval systems
- Paper replaced as numeric dissemination medium by full-text digital media

B. ORGANIZATIONAL AFFILIATIONS

- Two levels of information providers: "wholesalers" and "retailers"

C. ECONOMICS

- Interactive computer terminals available for less than $500
- High quality, low cost microfilm reader-printer available

D. SERVICES

- Interactive access to citation data bases replacing abstracting and indexing tools

TABLE E-4. MOST FEASIBLE AND LEAST DESIRABLE EVENTS

EVENT

A. TECHNOLOGY

- Paper virtually replaced as a dissemination medium by microform

TABLE E-5. MO' RATELY DESIRABLE, MODERATELY ASIBLE EVENTS

EVENT

A. TECHNOLOGY

- Associative memories commonly used for machine-aided fact retrieval
- "Personal" interactive terminals very common
- Paper replaced as document storage medium by full text digital media
- Acceptable machine-generated index data
- Tutorial features of on-line systems making intermediaries unnecessary

B. ORGANIZATIONAL AFFILIATIONS

- Unnecessary data base duplication eliminated

C. SERVICES

- "Personal" interactive terminals very common
- Tutorial features of on-line systems making intermediaries unnecessary
- Interactive access to full text data bases replacing abstracting and indexing as searching tools

TABLE E-6. MODERATELY DESIRABLE AND LEAST FEASIBLE EVENTS

EVENT

A. TECHNOLOGY

- Associative memories will be commonly used in machine-aided retrieval

B. ORGANIZATIONAL AFFILIATIONS

- Standardization allowing user organizations to merge data bases onto a single file

C. SERVICES

- Information synthesis and analysis available to all researchers

TABLE E-7. MODERATELY FEASIBLE AND LEAST DESIRABLE EVENTS

EVENT

A. TECHNOLOGY

- Paper replaced as document dissemination medium by full-text microform media
- Paper replaced as numeric storage medium by microforms

B. ORGANIZATIONAL AFFILIATIONS

- Decentralized input processing for large IS&R systems

C. SERVICES

- Processing of numeric data at least equalling the processing of bibliographic information

TABLE E-8. LEAST DESIRABLE AND LEAST FEASIBLE EVENTS

EVENT

A. TECHNOLOGY

- Computers designed specifically for bibliographic storage and retrieval
- Paper replaced as document dissemination medium by full-text digital media

B. ORGANIZATIONAL AFFILIATIONS

- One interdisciplinary subject vocabulary

C. ECONOMICS

- Federal technical information services self-supporting

D. SERVICES

- Dissemination of full text of documents precluding need for abstracts as announcement devices
- Dissemination of full text of documents precluding need for abstracts as retrieval devices