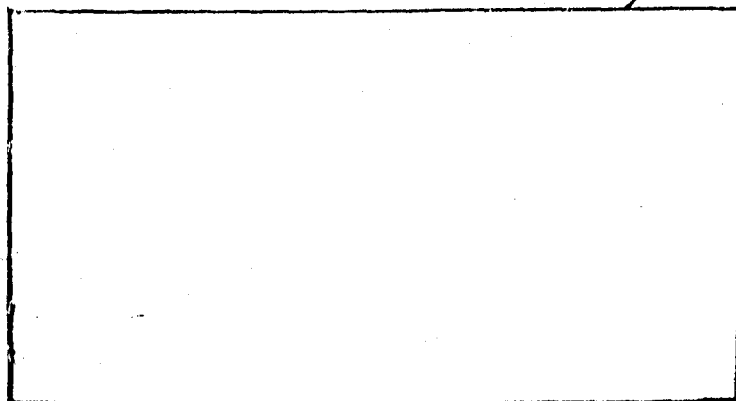AD NUMBER

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AUTHORITY

AFSC ltr, 11 Jan 1967

BOOZ · ALLEN APPLIED RESEARCH INC.

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Technical Report

AD 489 999

6) MECHANIZATION STUDY
OF THE
TECHNICAL INFORMATION
REFERENCE BRANCH OF THE
SYSTEMS ENGINEERING GROUP,
WRIGHT-PATTERSON AFB, OHIO,

10) G. A. Kershaw
D. Crowder
J. E. Davis
E. G. Loges
E. Merendini

Submitted to

Defense Supply Agency
Defense Documentation Center
Cameron Station, Virginia
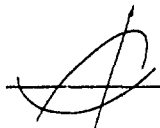
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WASHINGTON
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ABSTRACT

By use of the IBM 7094-7044 computer system, the Technical information Reference Branch of the System Engineering Group produces catalog cards, Selective Dissemination of Information notification cards, and a noncumulative semimonthly accessions list with a KWIC index. The computer program that produces these outputs utilizes information from document unit records entered on EAM punched cards. Since the introduction of mechanized processing, the accessions list with KWIC index has been produced on a regular semimonthly schedule with no increase in effort or manpower on the part of the Branch. Prior to mechanization, the Branch found it impossible to produce a list for distribution even on a monthly basis.

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I. SUMMARY

I. SUMMARY

By computer, the Technical Information Reference Branch is applying mechanized processing to production of a noncumulative semi-monthly accessions list with a keyword-in-context (KWIC) index, and to a Selective Dissemination of Information (SDI) pilot program.

The computer program that produces these outputs utilizes information from document unit records entered on EAM punched cards. Besides a listing of new documents with KWIC index, the computer program produces a table of contents as a part of the accessions list. On the accessions list, documents are grouped alphabetically by COSATI subject categories and are indexed by KWIC permuted index terms. The SDI program machine-produces a notice card and a response card for each document selected, according to a participant's indicated subject interest.

The Branch has functioned since 1954 as the technical reports library for all the research facilities at Wright-Patterson Air Force Base (W-PAFB). In addition, it acts as liaison with the Clearinghouse for Federal Scientific and Technical Information (formerly the Office

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of Technical Services) and DDC for reports originating with W-PAFB and its contractors, as well as with NASA for the 200 participants in the NASA-SDI program at W-PAFB.

The Branch's collection contains only technical reports and a few reprints in full-sized copy. About 20 percent of the collection is W-PAFB-generated, with the remainder being generated by AEC, NASA, RAND Corporation, DoD agencies, and their contractors.

The 160,000 unclassified and 40,000 classified items in the collection increase annually by about 15,000 and 5,000 respectively. The collection is not concentrated in any particular area but reflects the wide interest areas of the scientific community at W-PAFB. Bibliographic searches by specific subjects, corporate authors, report numbers, and contract numbers are performed manually and desired documents are loaned on request. Document references are filed in a card catalog which is divided into three sections: originating agency, specific subject, and contract number. No other cumulative listing of documents is produced at this time. However, such a listing could be made as desired using the cumulative file of EAM document record cards from the accessions list program.

II. MECHANIZATION

II. MECHANIZATION

1. CHRONOLOGY

The Technical Information Reference Branch began considering mechanization as a result of its document collection growth and man-power limitations. Formerly, catalog cards and accession lists were produced manually in separate operations. According to the Branch Chief, manpower limitations and the volume of manual effort required to make up the list made it impossible to produce a list for distribution even on a monthly basis. In the 8 years preceding the advent of the mechanized process, only 56 lists were published. In the period of September-October 1964, the program was developed and the first machine-produced catalog cards and accessions list were completed. The list was published monthly until January 1965 when the present format was adopted and semimonthly publication began.

During 1965, about 200 Systems Engineering Group (SEG) per- nel were selected for the SDI program by their directors and were n .ified of their participation by the Technical Information Reference Branch. The Digital Computation Branch began development of the SDI machine program in the fall of 1965.

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2.   DESCRIPTION OF PROCESSES

For each newly received document, a unit record, called a Technical Information Control Card (worksheet) is prepared by Technical Information Reference Branch staff members. No additional or unusual work in the Branch is required for the mechanized process, since the worksheet preparation is a normal cataloging process. An example of the worksheet is illustrated in Figure 1. This completed form is delivered to the Digital Computation Branch for punched card preparation. The punched cards are assembled semimonthly and applied to the computer which produces individual catalog cards and the accessions list with table of contents and a permuted KWIC index. Figure 2 presents a flow diagram for this system. The following discussion describes the process in detail.

(1)   Input Procedures

1.   Received documents are descriptively cataloged on the worksheet by accession number, corporate author, report number, title, date, contract or grant number, pagination, security classification, and tracings.

2.   Documents and worksheets are given to another cataloger for subject cataloging. Subjects and added

TECHNICAL INFORMATION CONTROL CARD (SEPIR)

WORKSHEET SECURITY CLASSIFICATION

I.D. NO. AND COPY NO. OF REPORT
(If classified)

KEYPUNCH INSTRUCTIONS:

(1) Punch cards for all lines typed within double lines at left.

(2) Punch blanks where this sheet has blanks.

(3) Punch card numbers as shown in card cols. 1-2.

(4) Punch all of card no. 00 as shown, cols. 1-12.

(5) Duplicate card cols. 3-12 from card no. 00 to each following card.

ORIGINAL TITLE

PROCESSED BY

PROOFED BY

TO KEYPUNCH

CATALOG CARDS RECEIVED

AF-WP-O-JUN 65 5M

TI Number

Corporate Author/Originating Agency, Report No.

Title (Indicate substituted title by * as first character of title) Do not break any word at end of a line.

Additional Report Info/ Date Pagination Contract No./ Contractor or Monitor/ Document Security Classification.

Tracings:
1 = Subjects
2 = Secondary Report Nos.
3 = Contract Numbers
4 = Abstract

Subject Code Category

SEG Form 10

FIGURE 1
Technical Information Control Card

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Document Received → **Duplication Check** → **Descriptive, Subject Cataloging, Title Enrichment on Control Card Worksheet** → **Document Filed** / **Keypunch EAM Cards**

EAM Cards → **Computer Program** → **Accessions List**, **KWIC Index**, **Catalog Cards**, **SDI Cards**
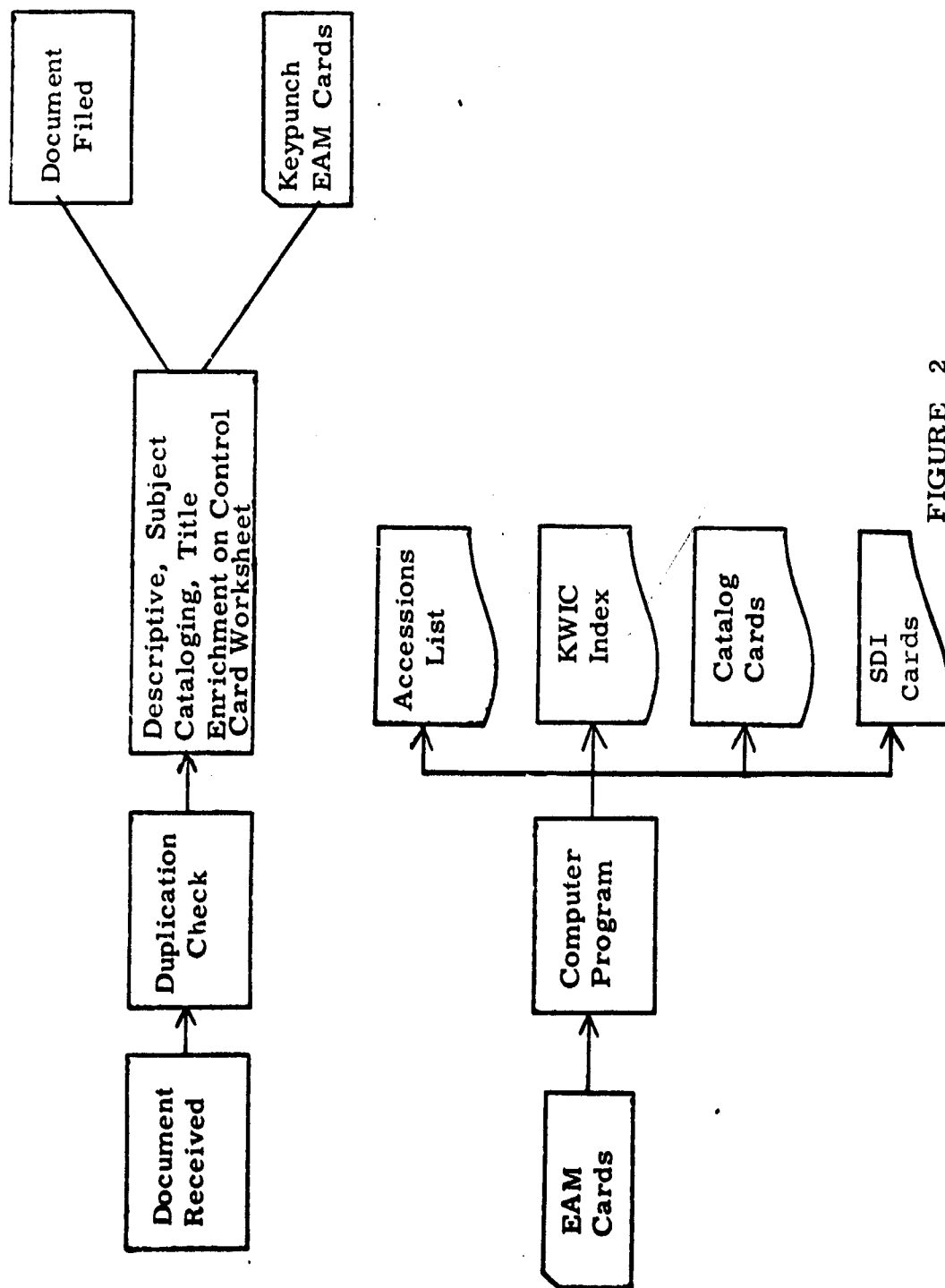
FIGURE 2

Technical Information Branch Document Processing

entries are entered on the worksheet, and the title is examined to determine adequacy of subject expression. If the title is meager, it is "enriched" by adding subjects, synonyms, or keywords to aid in later accessions list KWIC indexing.

3.   The worksheet is sent to the Digital Computation Branch where one EAM card is punched for each line on the worksheet--with a maximum of 19 cards per document. A typical document record requires 14 cards. Because of symbol limitations of the computer print chain, substitutions are made during preparation of the worksheet. (These limitations and substitutions are described in the Technical Information Reference Branch's draft descriptive cataloging manual but are not included in this report at the request of the Branch.)

4.   A proof list of the EAM card file is printed out and sent to the Technical Information Reference Branch for approval.

5.   Following approval, the card file is applied to the computer to produce the accessions list with the KWIC index and the table of contents, catalog cards, and computer cards.

(2)   Outputs

1.   Accessions List

For the accessions list, the computer sorts informa-
tion from the EAM card file and produces an arrangement
by COSATI subject categories, and within a subject, alpha-
betically by corporate author. In addition, it paginates,
produces a table of contents and a KWIC permuted index,
and sequentially generates an arbitrary index reference
number for each arranged document. Examples of these
outputs are not included in this report at the request of
The Technical Information Branch "for reasons of security. "
To produce the KWIC index, the computer detects keywords
in the enriched titles of the documents and arranges these
alphabetically, along with the document reference number.
The computer develops context for each keyword by selecting
a preprogrammed amount of text preceding and following the
word in the title and printing the two text fragments with the
keyword in the center.

2.   Catalog Cards

The computer produces one catalog card for each
descriptor term applied to a document from the Technical

Information Reference Branch's subject authority thesaurus.
one additional card for corporate author, and cards for the
contract number file.

3.   SDI Notice and Response Cards

In the pilot SDI program, the computer prints out a
set of two 3 x 5 cards per selected document for each par-
ticipant.   The participant may return the appropriate card
with his indication of relevance, interest--loan requested,
interest--not wanted, or of no interest--have seen copy.
Space is also provided for comments.   He can retain the
remaining card for his personal file.

To record a participant's interest, EAM punched
cards are prepared in the following format*:

Card Columns	Contents
1-16	Participant's name
17-67	Coded subject interest (3 characters per code)

Figure 3 is a diagram of the proposed SDI system
program.

---

*   Format for SDI program is in accordance with plans that existed
at the time of the survey in early September 1965.

Prepare Interest Profiles of Participants

Index Documents

Compile Profile Term Thesaurus

Numerically Code and Keypunch EAM Cards

Computer Program

Print Coded Thesaurus Index for Use by Document Indexers

Print Accession List
Print File Cards
File Cards

Print SDI Notification Cards
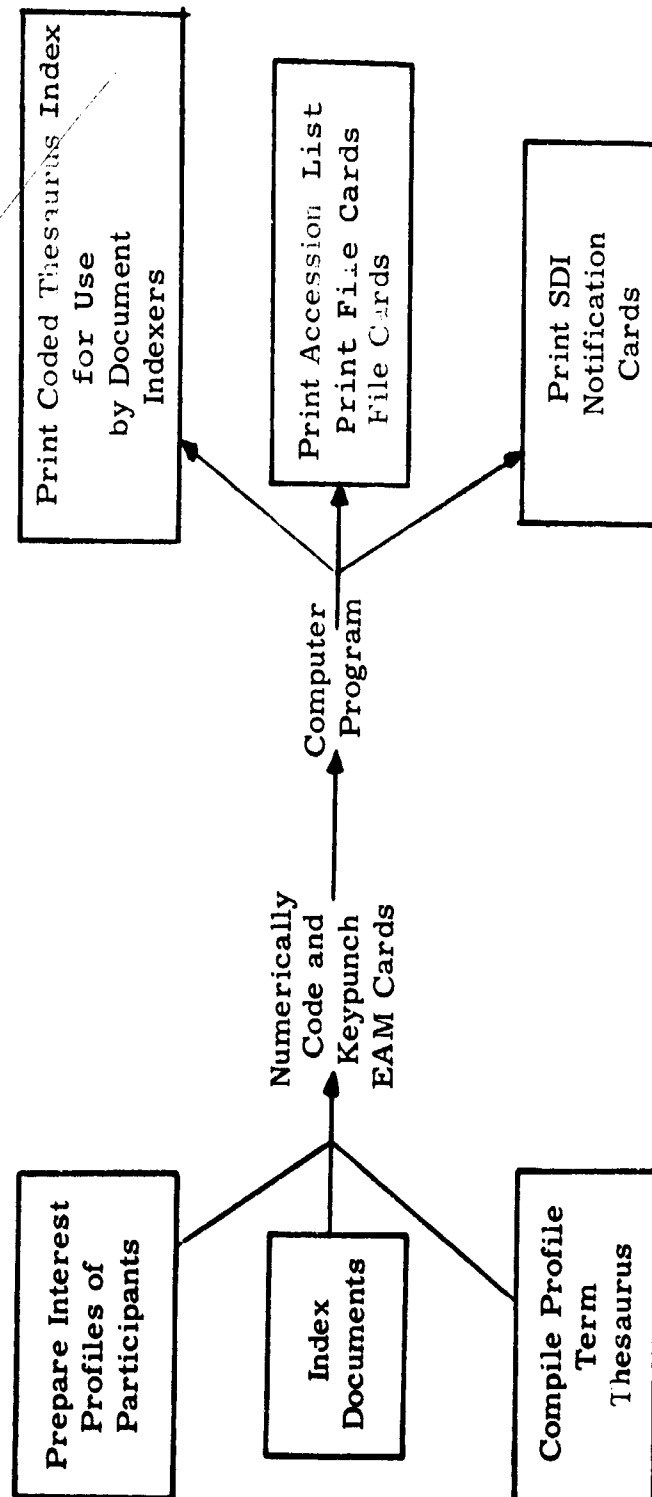
FIGURE 3

Technical Information Branch Proposed SDI Program (as of September 1965)

III.   PROGRAM SYSTEM DATA

III. PROGRAM SYSTEM DATA

In the accessions list runs (Figures 4 through 7), the input program is a standard card-file-to-tape conversion with one record per document, containing all the information from the worksheet in unblocked form. The edit program reformats this and produces an edit listing, error cards, and two temporary tape files. File no. 1, carrying one record per document, is sorted by corporate author with within subject categories. During the sort, each record receives an arbitrary number for later index reference. Sorted tape file no. 1 is then formatted into page-length groups which receive subject categories and paginations. A printout occurs, forming the accessions list. A second printout, the table of contents, also occurs. Sorted tape file no. 1 is also inputed to the KWIC program, resulting in a printout of the KWIC permuted index, based on subjects detected in the enriched titles and compared to a stored subject word list from the document records.

To produce the catalog cards, the records on tape file no. 2 are sorted by subject categories, contract number, and corporate author. Card headings are then generated and a record, with heading, is printed out on a card for each entry in the above three categories.

```
                    ┌─────────────┐
                    │   Control   │
                    │    Card     │
                    │ (Worksheet) │
                    └──────┐  ┌────┘
                           │  │
                           ▼
                    ╭─────────────╮
                    │  Key Punch  │
                    │ And Verify  │
                    ╰─────────────╯
                           │
                           ▼
                    ┌─────────────┐
                   ╱  Card File   │
                  │               │
                  └───────────────┘
                           │
                           │
                           ▼
                  ┌─────────────────┐
                  │ 407  10W Speed  │
                  │  Card Reader/   │
                  │     Printer     │
                  └─────────────────┘
                           │
                           ▼
                  ┌──────────────┐
                  │  Proof       │
                  │   List       │
                  │  (80-80)     │
                  └────────┐  ┌──┘
                           ┊
                           ┊
                           ▼
                 ┌──────────────┐
                ╱   Approved    │
               │   Card File    │
               └────────────────┘
```

FIGURE 4
Keypunch and Create Card File

-12-

```
                    ┌──────────────┐
                    │  Approved    │
                    │  Card File   │
                    └──────┬───────┘
                           │
                           ▼
                    ┌──────────────┐
                    │  Convert     │
                    │ Card File To │
                    │  Tape File   │
                    └──────┬───────┘
                           │
                           ▼
                       ╭────────╮
                       │ Input  │
                       │ Tape   │
                       │ File   │
                       ╰────────╯
                           │
                           ▼
                    ┌──────────────┐
                    │   Edit       │
                    │  Program     │
                    └──────────────┘
```

Edit
Listing

Error
Cards

Tape
File
No. 1

One Record
Each Per
Document

Tape
File
No. 2

One Record Each
Per Subject Term,
Contract Number
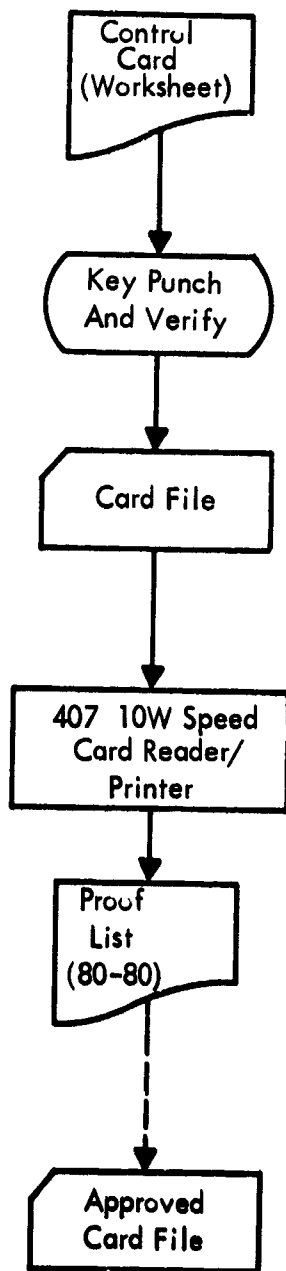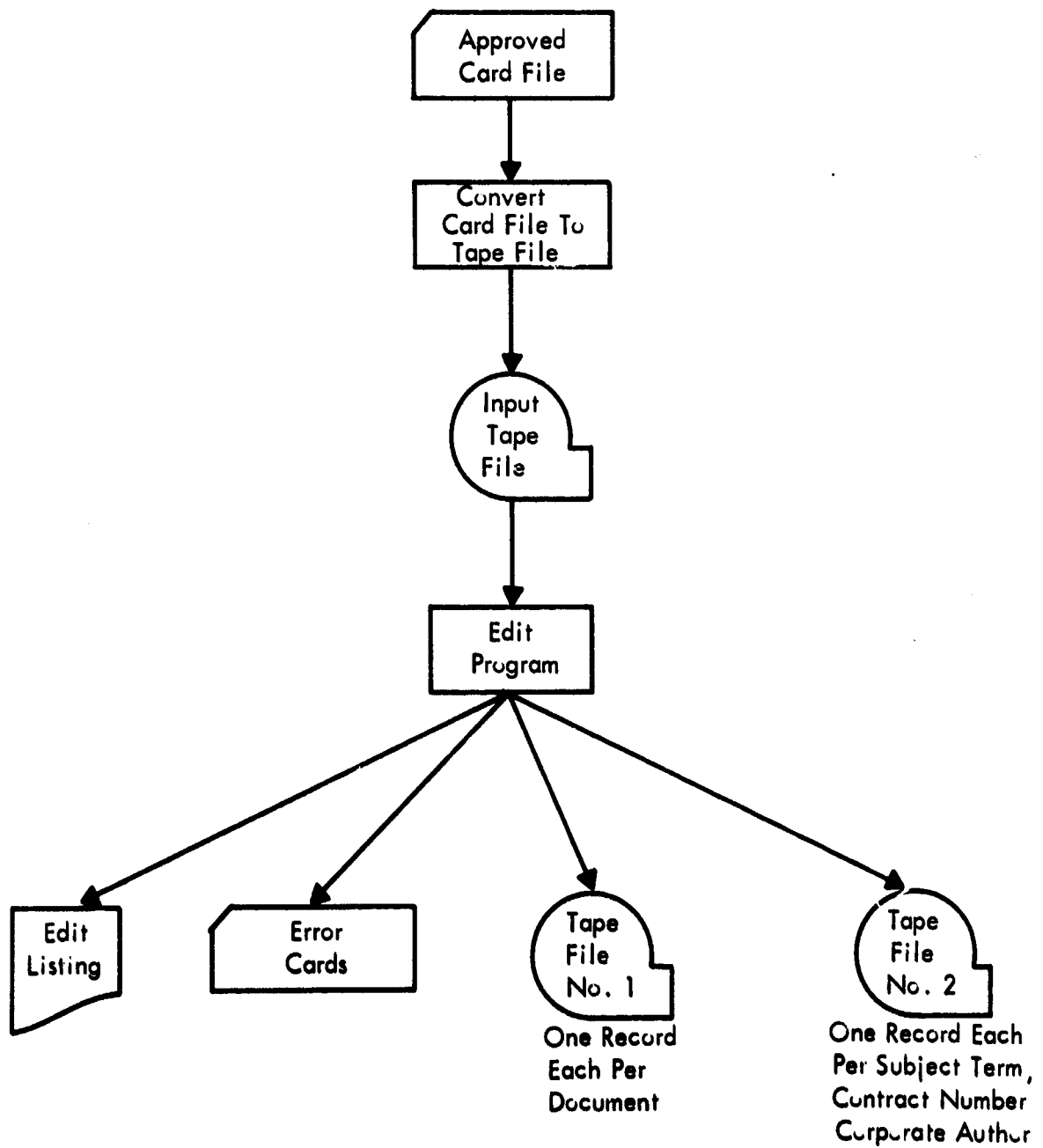Corporate Author

FIGURE 5
Convert Cards to Tape and Reformat for Inputs to Accessions List,
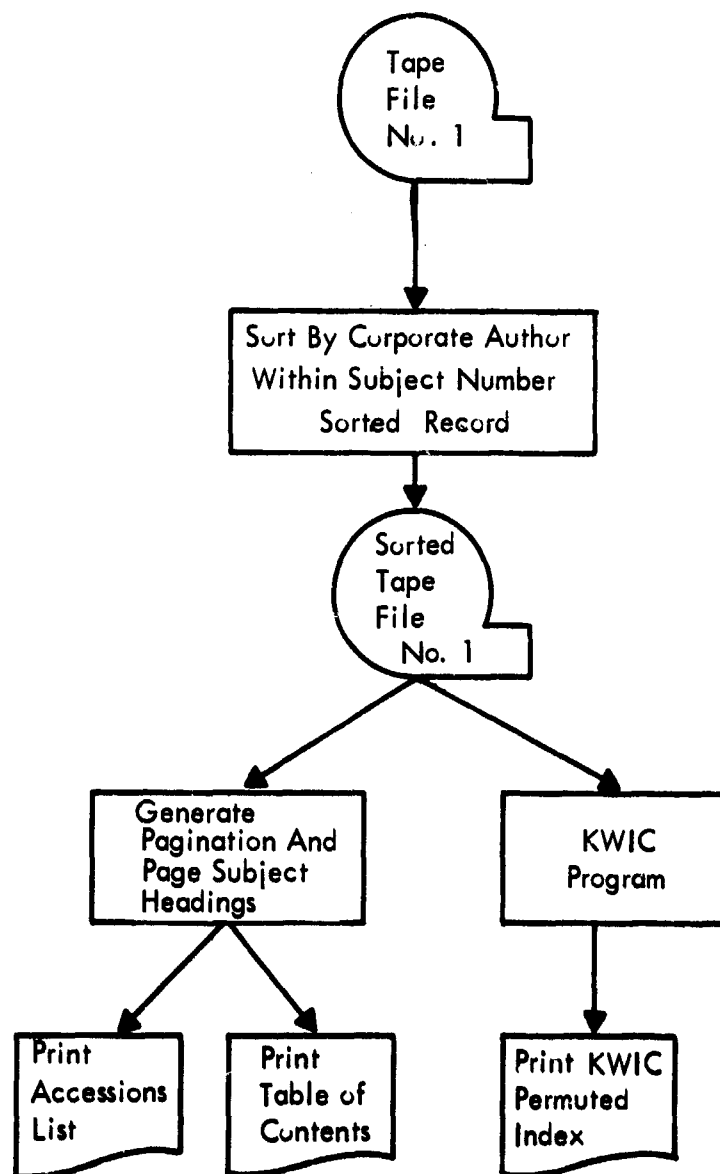Card, and KWIC Index Programs

FIGURE 6
Program to Create Accessions List, Table of Contents,
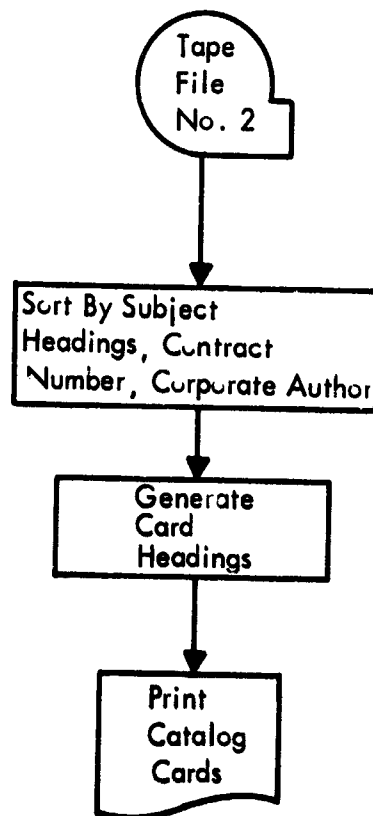and KWIC Permuted Index

FIGURE 7
Production of Catalog Cards

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IV. EQUIPMENT, COSTS, AND EVALUATION

IV. EQUIPMENT, COSTS, AND EVALUATION

1. EQUIPMENT

IBM	7094	direct couple system with 32K memory
8	729	Mod IV tapes
		disk (10 million words)
	7044	input-output computer
	1402	card reader/punch
6	1403	line printers
IBM	407	low-speed printer
	026	card punch
	082	card sorter

2. COSTS AND TIME

System Study	3 man-weeks; librarian
Program Development and Debugging	120 man-hours; programmer

System Operation--From
April 1964 to July 1965

Cumulative Labor	641 man-hours; programmer and keypunch operator
Cumulative Computer Use	18.64 machine-hours
Computer Cost	$7.00 per minute (Not charged to the Technical Information Reference Branch)

The following chart compares costs of the previous manual system and the present mechanized system.

COST COMPARISON*

Annual Cost Under Former System

Accessions list preparation	$ 8,244	
Catalog card preparation	13,947	
Card cost	1,216	
Total		$23,407

Annual Cost Under New System

Computer time	$ 6,814	
Manpower costs in support of computer operation	1,344	
Card stock for computer system	712	
Total		$ 8,870
Total Net Annual Savings		$14,537

3.   FACILITY'S EVALUATION OF SYSTEM

Since the introduction of mechanized processing, the accessions list with a KWIC index has been produced on a regular semimonthly schedule with no increase in effort or manpower on the part of the Technical Information Reference Branch.   In the 8 years preceding

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*   As reported by the Directorate of Engineering Standards and Technical Information in Reference 4.

mechanization, the Branch was able to produce manually only 56 such lists. Besides the accessions list, the computer also produced, in its first run, 4,700 catalog cards in 11 minutes. Normally, 30 days would have been required to type these cards, with additional time required for proofreading, correcting, and arranging them in file order.

The Chief, Technical Information Division, reports that "Successful mechanization (in the Technical Information Reference Branch) is attributed to the excellent cooperation of the Digital Computation Branch, Directorate of Computation (SESCD) who developed the program."

The use of an uppercase print chain is not considered a problem by the Technical Information Reference Branch. In fact, the Branch cites that "typing is simplified by not having to follow a style sheet to determine which words to capitalize," and "lowercase is too expensive, involving about 3 hours for each change to lowercase print chain and back to uppercase print chain, plus computer down time at $7.00 per minute." Furthermore the purchase of a lowercase chain would cost about $1,000, and its use would probably be limited.

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"Library Periodical System and Procedure." 25 June 1965.
    Memorandum by J. W. Richmond.

"Subject Cataloging Instructions." Undated draft instructions by
    Miss M. Koeker.

"Descriptive Cataloging Manual." Undated draft instructions by
    Miss M. Koeker.

"Departmental Operating Expense Savings." April 1965.
    Extraction from W-PAFB, SEP "Cost Reduction Report."

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G. A. Kershaw, D. Crowder, J. E. Davis, E. G. Loges, E. Merendini, S. M. Thomas

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13. ABSTRACT

By use of the IBM 7094-7044 computer system, the Technical Information Reference Branch of the Systems Engineering Group produces catalog cards, Selective Dissemination of Information notification cards, and a noncumulative semimonthly accessions list with a KWIC index. The computer program that produces these outputs utilizes information from document unit records entered on EAM punched cards. Since the introduction of mechanized processing, the accessions list with KWIC index has been produced on a regular semimonthly schedule with no increase in effort or manpower on the part of the Branch. Prior to mechanization, the Branch found it impossible to produce a list for distribution even on a monthly basis.

14	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	Digital Computers Indexes						

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