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ABSTRACT

          The unprecedented growth of the information sources
concerning science and technology makes it particularly urgent that
the processes of information storage, information retrieval,
information processing according to needs, representation of results
and their storage in preparation for the subsequent processing stages
be mechanized. With this end in view, it is necessary to produce a
central "data base" in a "machine-readable form," which is accessible
to creation, updating, processing and retrieval programs. This
project describes the software system which creates the data base for
the periodical purchasing department of a library and processes it by
mechanizing the yearly cycle of activities. The following subjects
are discussed: description of activities comprised in the yearly
cycle; design of the data base; review of the mechanized processes;
organizational and working routines; the forms of input-output; error
checks at different stages; and system analysis and planning for the
future. The Project lays stress on improving the familiarity of the
librarian with the entirety of the data and activities involved. Its
other purpose is to supply the contact between the librarian and the
computer for the convenience of the librarian, who is not expected to
be a computer expert. (Author)

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AUTOMATED ACQUISITION OF PERIODICALS

L.A.SER.

(Library Automation - Serials)

By

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R E S U M E

The unprecedented growth of the information sources concerning Science and Technology makes it particularly urgent that the processes of information storage, information retrieval, information processing according to needs, representation of results and their storage in preparation for the subsequent processing stages be mechanized. With this end in view, it is necessary to produce a central data base in a machine-readable form, which is accessible to creation, updating, processing and retrieval programes.

This project describes the software system which creates the data base for the periodical purchasing department of a library and processes it by mechanizing the yearly cycle of activities.

The following subjects are discussed:

Description of activities comprised in the yearly cycle.
Design of the data base.
Review of the mechanized processes.
Organizational and working routines.
The forms of input/output.
Error checks at different stages.
System analysis and planning for the future.

The Project lays stress on improving the familiarity of the librarian with the entirety of the data and activities involved. Its other purpose is to supply the contact between the librarian and the computer for the convenience of the librarian, who is not expected to be a computer expert.

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1. LIST OF FIGURES

2. PROGRAMMING CONCEPTS

This chapter is intended for those who are not familiar with the technical terms of computer science. The explanations given below are intended to enable the reader to understand the considerations which follow, and are not the exact definitions of the terms.

In order to make the computer carry out a given task, the latter is presented to it in the form of a program, written in one of the languages recognized by the computer. In general, the program will have the form of a deck of punched computer cards, which is known as a job and is sent for a run through the computer. This card deck comprises three kinds of cards:

* A set of control cards, which indicates to the computer how to use the card deck (the language in which the program is written, the available sources of information other than the card deck, where to send the results, etc.);

* A set of program cards, which comprises the working program for this particular task;

* A set of data cards, which contains all the data required for the execution of the task.

The third kind of cards is the input of the program, but these cards often contain only a part of the input. The remaining input may be stored on a magnetic disk or on magnetic tapes which are generally located in the computer centre. The results of processing each job constitute the output, which may be recorded in a manner which has been predetermined by the program, in one or more of the following ways:

It may be printed on computer paper or punched on cards by the card puncher, or punched on a paper tape or magnetically recorded on disks or tapes.

The information contained in the input (and in the output) is placed in fields of predetermined size and location; in this way the information contained in it can then be located.

A set of fields can be combined to a record, and a set of records may be combined to constitute a file. The central file, which contains the basic

information pertaining to the system, is known as the master file.

Files are always kept on an external medium, such as magnetic disk or magnetic tape; they are then referred to as permanent files. Such files may be of two kinds: in sequential access files the contents of the file must be scanned from the beginning to the location sought, before the information can be retrieved; in direct access files the information can be retrieved directly, provided the file is built as a random file.

An assembly of external memories for repeated use is also known as mass storage.

3. YEARLY CYCLE OF ACTIVITIES INVOLVED IN THE
PURCHASE OF PERIODICALS

A.   Collection of all the relevant information concerning each
       periodical (Title), for the compilation of the periodical master
       file.

B.   Publication of classified list of periodicals (which were ordered
       for the current year). The list is then circulated to individual
       departments who mark the periodicals which they wish to receive
       during the coming year.

C.   Preparation of Synoptic List of orders for each title and dispatch
       of orders to suppliers.

D.   Accounting work: payment of suppliers' invoices and debiting the
       accounts of individual departments in proportion to the quantities
       appearing in the invoice.

E.   Verification of receipt of all copies due, and dispatch of copies to
       their destinations. Issuance of claims to publishers for copies
       which failed to arrive.

F.   Special activities: reviews, statistical surveys.

4. CREATING AND UPDATING THE MASTER FILE (M.F.)

The master file (M.F.) serves as the central data base of the system and services most of the mechanized activities. It acts as input for a large number of programs and also as output in which the results of current activities and updating are recorded. Its structure must accordingly be convenient for generation and updating, and the information contained therein must be easy to retrieve. It must contain all the information relevant to each title, and must be elastic enough to accommodate information of different lengths for different titles (The word "Title" will be denoted as "T", for the sake of brevity).

The following solution was adopted for the structure of the master file:

A M.F. record is created for each T, and contains all the information pertinent to this particular T. The length of the records is variable, and each record contains a special field which acts as meter for the determination of its effective size.

When this record has been placed on the disk, the amount of space it occupies corresponds to its size and not to the size of the largest record on the disk. In this way space is saved in the memory of the permanent file.

To each T is assigned an alphabetic code, which is known as <u>coden</u>. It consists of 6 letters, five of which represent a mnemonic for the T, whereas the sixth is a check letter, which is calculated from the preceding five.

All these records constitute a set, the structure of which is that of a random file, with direct access to each record. The coden of each record is the key through which access is gained to the record. This means that the user who wishes to read the content of a given record from the disk, or to update it, only has to give its coden; when the "read" order from the disk is obeyed, the record which carries the specified coden is transferred from the disk to the working area of the program, and can then be employed as desired.

4.1 Structure of a M.F. record (figure No. 8)

Within each record the various kinds of information are classified in two grades, which will be referred to as "type" and "level". In the figure, "type" is shown in columns 8 and 9, while "level" is shown in columns 10 and 11.

Type 1 contains the T, including former T if any.

Type 2 contains the information on the periodical which remains more or less constant, such as country of origin, number of issues per volume, dates of beginning and end of subscription, frequency of appearance of the periodical, name and address of publisher etc.

The significance of other types will be explained at a later stage.

4.2 Creation and Update Program

In order to create a master file, the information must be submitted in the form of data cards (figure No. 1). The structure of each card is: coden, type, level, information.

The cards need not be sorted. Sorting can be more efficiently and more conveniently carried out by the computer, without introducing human error. The only condition is that each periodical have its type card, in addition to the other cards of this T. This is because each T in the M.F. has its own record, which is inserted alphabetically in the record sequence in the file; for such an arrangement to be possible, the T to which the record refers must be known.

Except for this limitation, the cards may be fed in any sequence whatever. Since each card carries the coden of the T it represents and the type and the level of the information it contains, the sorting of the cards to a properly ordered file can be left to the program.

After some of the cards have been prepared (there is no need to prepare all the cards at once), they are run through the computer together with the M.F. creation and update program.

The input of the program - the above-mentined card deck.

Processing and output -

* creation of M.F. including a record �f ᵒ ⁿ ⁱⁿ the form of a
random file, but arranged in alphabᵢ .eᵤ~ence of T; within
each record, the information is arranged by type and level
(figure No. 8).

* updating the M.F. records in all respects (see below).

* printout of input, for the convenience of the librarian, to ensure
follow-up and elimination of errors.

* printout of corrected or updated records.

* printout of error file, listing the errors discovered by the program
at the input (figure No. 10).

Corrections are introduced in the file in accordance with the printout
and the reported errors. The librarian also feeds additional input cards in at
the same time. Both are then run through, a deck of cards at one time. For
this purpose each card carries a special field for the action code, which
indicates to the program the action to be taken with respect to this particular
card:

* Insert - to insert the content of the card into an existing record, or a
new record to be inserted into the file.

* replace - to replace the content of the card by the content of the
corresponding fields in the same record in the M.F.

* delete - to erase superfluous information erroneously inserted into a
record.

* purge - to erase an entire record from the M.F.

These activities are performed both during the original creation of the
file and during the entire cycle of mechanized activities, for file updating
purposes, in addition to direct updating carried out by other special purpose
programs. The created records are recorded and stored on the disk. Updated
records are also recorded on the disk, the updated record replacing the old
one.

5. RENEWAL OF SUBSCRIPTIONS - PATRONS' LIST

Once the organized file has been created and freed from errors, the mechanized activities can commence.

The subscription period for most periodicals coincides with the calendar year. Orders for these periodicals must be issued to suppliers in September. The subscribers (patrons) are members of different departments, but (in the case of our organization) the Central Library alone handles all subscriptions, and issues purchase orders to suppliers. The program includes the compilation of a Patrons' List which is intended to help the patrons in listing and marking their orders, and to provide the Library with lists of periodicals to be arranged in a systematic manner.

The Patrons' List is essentially an invitation to the patrons to place their orders. It includes a list of all titles in the M.F., ordered in the preceding year. It follows that the master file must be properly arranged and ready for use by the month of June of the current year.

The program of the Patrons' List is now run.

The input is the updated M.F. or the disk.

The output includes:

* a numbered, alphabetical list of all the titles in the file (figure No.2). To the left of each title a space is provided for marking the order, together with other details: coden, the country of origin, and the price per issue, if exceptionally high.

* error file.

Any number of copies of this list can be produced by the progra.. The copies are then sent to departments together with a covering letter explaining the manner in which the order should be marked on the list and indicating the date by which the list should be returned. It is important that all lists be returned by this date, since the data can then be inserted in the master file before actuating the orders-to-suppliers program in September; in this way orders can be sent to suppliers in time.

6. RENEWAL OF SUBSCRIPTIONS - ORDERS TO VENDORS

At this stage - after the lists have been sent out - the information which is missing must be inserted in the master file. This information is of two kinds:

(1) information which was already available at the time of creation of the file, but which had not been prepared for punching and was not relevant to the preceding program (e.g. particulars of the publisher of each title).

This information can now be inserted with the aid of file creation and update program, with action code "insert" or "replace".

It is recommended that this be done before the lists are returned by the subscribers.

(2) information which becomes available only after the patrons' lists have been returned, but which can already be prepared for insertion into the M.F. Such preparations should be carried out as early as possible. The purpose of this is twofold:

a) To avoid rush work during input preparation owing to some of the lists arriving late, computer breakdowns, correcting card-punching errors, etc.

b) Not to make the librarian do anything the computer can do in his stead. There is no point in a man preparing and punching the information which is based on the M.F. and is already known. The computer can do it more efficiently and with fewer errors, while saving the librarian some of his tedious routines.

The appropriate program will bear the entire M.F., retrieve the coden of each T and the code of its vendor, and will punch one card for each title with the following data:

Coden, 0301, vendor code.

The cards are put out arranged in the alphabetical sequence of T, so that when the patrons' lists arrive, the card corresponding to any desired title can be easily located, and marked with the desired number of copies and the code of the subscriber's department. The cards are then sent for insertion

in the master file with the aid of the creation and update program, after which the M.F. can be operated by the next program.

6.1 Program for Orders to Vendors

With the aid of this program a written order is prepared for each vendor for all the periodicals to be supplied by this vendor. The printer of the computer puts out the list in a form ready to be dispatched to the vendor.

The input consists of the updated M.F. with type 3 cards.
The output and processing consist of the following:

* a letter to the vendor, together with the list of periodicals ordered (figure No. 3). The list is arranged in the alphabetic sequence of titles, together with their respective orders number of copies ordered and serial number of item, assigned to it by the program.

* Updating of M.F. records, including the assigned item number (see figure No. 8, type 3).

* Punched item card for each item, with the following particulars: Coden, Vendor Code, Item No.

* Error file.

The item cards which are put out are sorted by vendors and by item number.

The idea which underlies the preparation of these cards is to use the output of a program as the input of a subsequent program; again, the librarian is spared the necessity for doing what a computer can do just as well.

In the letter which accompanies the order, vendors are requested to refer to the item number when submitting invoices. If this is insisted upon, most vendors will meet this request.

7 ACCOUNTING

The Library in our organization has no budget allocation out of which to pay for the periodicals subscribed to by the different departments. Each department is debited for the priodicals it subscribes to out of its own al'ocation, but it can order them only through the Central Library. The departments may act only through the Central Library in everything that concerns orders for periodicals and inquiries and complaints arising therefrom. Thus, it is the Central Library which orders the periodicals from the vendors and charges the sums disbursed in payment of the invoices to the respective departments, in accordance with the data indicated on the invoice and the details of the orders. The Library also checks the actual arrival of periodicals, and issues claims for the periodicals which failed to arrive, if any. The Library must answer inquiries of departments concerning the balance of their library allocation, dates and particulars of debited items, and particulars of periodicals which have already arrived and those yet due to arrive.

The following have been created for this purpose:

debit file;
accounting program;
(control and claims program).

7.1 Debit file

This file (figure No. 9) is also a random access file. Each record refers to a particular department, and can be directly accessed to. Each such record contains all the items charged to the department from the different invoices which have arrived during the current year, each item so charged comprising:

1. The charges for library copies, i.e., for periodicals which the requesting department is willing to leave in the Central Library for general use.

2. The charge for extra copies, i.e. for periodicals which are intended for the exclusive use of the patron and which are sent to him as soon as they have arrived in the Central Library.

In this file all charges are expressed in IL. This is because the different invoices are made out in different currencies, and the total of the items taken from the different invoices will only be meaningful if expressed in a standard currency.

Owing to the particular structure of the record and the file, it is possible:

* to debit the department concerned by random access;
* to keep a statistical record of the ratio between the outlay on library copies and additional copies;
* to keep an up-to-date record of the account of every department at all times.

7.2 Accounting Program

When the vendor's invoice arrives, the item cards (section 6.1, output) for the titles appearing in the invoice are taken out. If the item number appears in the invoice, the card is found by its item number. If it does not (which usually does not happen in more than 15% of the cases),the item number is found in the following manner:

The T is indicated in the invoice. The record of that T is found in the printout of the M.F.; it contains the item number, recorded under type 3.

The card is located and the price indicated in the vendor's invoice for this item is punched on the card. If a sum has been credited by the vendor a negative number is punched. If there is a discrepancy between the number of copies ordered and the number of copies indicated in the invoice, the number of copies given by the invoice is punched in as well.

A leader card containing the particulars of the invoice is placed in front of the card deck (identification of invoice, date of invoice, total price, currency, vendor's code, percent commission, if any). If more than one invoice is run through the computer at the same time, the decks are stacked one behind the other, the last card being left blank (sentinel card indicating the end of data cards).

The input of the program comprises:

* the cards as above;
* the M.F. with information about the departments subscribing to each item.

The processing and the output comprise:

* display of input cards in the sequence of their appearance, to facilitate location of·errors (figure No. 4);

* The parts of the price of the item charged to each subscriber department. If the copy was ordered for the Library only, each department pays its proportional part. If the item was especially ordered for the department, the department has to pay the full price, in addition to its share in the price of the copy in the Library. The printout is arranged by departments, and in the alphabetical order of T within each department (figure No.· 5);

* insertion of invoice details in the appropriate M.F. record (type 3, figure No. 8);

* total sums charged to each department, to be charged against their respective budget allocations (figure No. 6);

* the following charges are recorded in the debit file for each department for each invoice (figure No. 9):

  sum debited for library copies;
  sum debited for extra copies;   } in IL.

  identification and date of invoice.

7.3 Prevention of Erroneous Records in Mass Storage

What are we to do about errors in debit accounting? (or about errors in any other process which results in a record being placed in mass storage?)

Errors can originate from erroneous card punching, from the presence of a wrong card in the deck, etc. These will be located on the printouts put out by the program, but in the meantime the various records in the M.F. and in the debit file on the disk will have been updated. After the errors have been identified, it is necessary to locate all the sites

in the disk which carry the erroneous information and to correct it.
This is in no way a trivial task.

Rather than deal with the problem directly, we chose to prevent its
occurrence by making a blank run prior to each operational run.

There is no difference between a blank run and an operational run which
would affect the accounting program; in other words, the accounting
program "does not know" if the run is blank or operational. It
accordingly obeys all orders, prints the results and notifications of
error and "places" records in the M.F. and in the debit file, except
that the updatings made on the disk during a blank run are purged from
it at the end of the run and the condition of the disk reverts to what
it was prior to the blank run. Changes are not permanent, but are
recorded for the duration of the run only.

After the results have been received, the errors are corrected in the
data, and the run is repeated. This operation can be repeated time and
time again, until the last error has been expunged. The next run is
operational (one control card is added), when the error-free data are
recorded on the disk in a permanent manner.

This sequence of blank runs and operational runs is carried out whenever
the processes, the results of which are to be recorded on the disk or on
the tape, are liable to contain errors (e.g. orders-to-vendors program,
which provides for the insertion of item numbers in the M.F.).

8. ROUTING AND CONTROL OF ARRIVALS

The number of items arriving in the Library from different sources is very large; they are addressed to different individuals, some of the items being identical while the others differ from one another in one respect or a few respects only. The result is that large libraries can no longer control the routing of the material to its different destinations and, in particular, no longer know if all the items have arrived and are unable to ensure that they all arrive in time.

This problem is dealt with in two steps described in sections 8.1 and 8.2.

8.1. Preliminary Processing and Means of Control

During the period between the dispatch of the orders to vendors and the arrival of the first copies, it is necessary to collect information on the patrons, i.e. on the individuals who have ordered extra copies, in addition to the copy ordered for library use. This information in its original (unprocessed) form is found on the Patrons' List, with the patrons' original order on it. The librarian uses these forms to prepare type 4 cards (figure No. 1).

The input of the program comprises:

* type 4 cards
* the M.F.

Processing and output comprise:

* for each copy and each patron, the program creates two fields in the M.R. (Master Record, i.e. a record in the M.F.) coresponding to a given title.

The expected date of arrival is placed in the first of the two fields. The second field remains blank to be filled in by the fullfilment and claims program (see section 8.3).

The structure of the posted M.F. is seen in figure No. 11 (the posting is effected in type 5, which is created by the program for this purpose).

For explanation of figure see section 8.3, processing and output.

* The program creates a punched control card to correspond to each field in the M.F.; this card serves as "identity card" for the particular copy.   In this way each copy which has arrived during the year has an "identity card" containing its coden, number of issue, date of issue and the patron (including the library copy) for whom the copy is intended (see figure No. 12   from which the names of the patrons have been removed).   In this way a one-to-one correspondence is produced between the cards in the deck and the collection of periodical copies passing through the Library.

  At this stage these cards are not punched, but are stored on a magnetic tape as card images until needed.

* A printout, which includes the input, the updated M.F. and error diagnostics - (figure No. 13).

The type 4 cards which form the input of this program are run through the computer by groups, so as to assist the elimination of errors. These runs are blank, until the last error has been eliminated, after which the deck is sent to the operational run during which the records are inserted in the files.

Each operational run results in the creation of new control cards which are recorded on the magnetic tape. Before they are taken off the tape, they are sorted by the expected dates of arrival of the copies they represent, after which they are taken off the tape in the form of cards and are placed in boxes.

All cards representing the copies expected to arrive by a given date (at 14 day intervals) are placed in a special box with the initial and the terminal dates of the interval marked on it.

8.2   Operation of Routing and Control Process

The procedures to be followed with respect to copies which arrived and those which failed to arrive are outlined below:

On receipt of a copy, the librarian looks for the corresponding card in the box corresponding to the date of arrival.

These cards are sorted within each box by the date and the number of the issue. If there is more than one identical copy (ordered by different patrons), the cards, including their coden, will be identical in all these particulars and are placed together. The librarian now takes out the first card in the group. He reads the name of the patron and the department on the card, sends the copy to its destination and punches a "+" sign in the appropriate field to signify that the copy has now arrived. He then puts the card in the deck to be sent to the computer.

If, at the end of the period, there are any cards left in the box, this means that the copies represented by these cards failed to arrive. The next step is up to the librarian. If, in his view, the delay in the arrival of the copy is reasonable under the prevailing circumstances (postal strike, port stevedores' strike etc.), he will place the card in the box provided for the following 14 days' period. If he thinks the delay is unjustified, he punches a "-" (minus) sign in the appropriate field to say that the copy failed to arrive and must be claimed from the publisher. These cards, too, are put in the card deck to be sent to the computer.

This deck acts as the input of the program to be described in the following section (see section 8.3).

8.3 Insertion, Fullfilment and Claims Program

This program, in conjunction with the program described in section 8.1, is a check on the timely arrival of copies.

The input of the program comprises:

* Check cards ("identity cards") with punched "+" or "-" sign

* The "filled-in" M.F.

Processing and output includes:
* for copies which have arrived - the date of arrival is inserted in the appropriate field of the respective M.R. (figure No. 14).

* for copies which have not arrived - the issue of claim to the publisher and the date of the claim for this particular copy is marked in the appropriate field of the respective M.R. (figure No. 14).

Fields which were shown empty in figure No 11 carry the date of arrival of the copy or of issuance of claim in figure No. 14. The letters (N,E etc.) which appear in the fields, indicate that the numbers may be positive or negative. The absolute value of the number indicates the target date (day of the year), while the sign indicates that the copy has arrived (positive) by this date, or that a claim has been issued (negative).

* a display of the input cards and the updated Master Records.
* error diagnostics.
* claim letters to the publisher (for copies which failed to arrive) ready to be sent out (figure No. 15.)
* a new punched control card for each copy which failed to arrive.

  This card carries the date of dispatch of the latest claim, in addition to the information included in the corresponding original (input) card, but not the "minus" sign of the original card.

  On being ejected from the computer, these cards are placed in the box corresponding to the actual (current) 14-day period (i.e. the period which is contemporaneous with the date of card ejection) where it is ready for the delayed copies as soon as they arrive.

  The process described in sections 8.2 and 8.3 is repeated until the delayed copy has arrived.

9. RETRIEVAL, STATISTICS, QUERIES

Examples which illustrate the advantage of the particular structure of the data base of the system in everything that concerns file interrogation will be found in reference No. 6.

The programs at the disposal of the user enable him to retrieve any records from the files as printout or as punched card deck. To do this, he must identify the records desired and indicate the appropriate action code.

If an organized M.F. which contains all the relevant data is available, this system is very convenient to use in carrying out statistical studies.

The following are examples of such investigations:

a) what is the delay between the date of printing of a periodical and the date of its arrival in the library, which may be expected on statistical grounds?

b) what is the relationship between the original budget allocation for the purchase of library copies for general use and the original budget allocation for the purchase of extra copies for private use?

c) what is the distribution of prices per copy as a function of the number of copies of a given title which have been ordered?
(see figures Nos 16 and 17 for the example of an investigation which failed to yield meaningful results).

10. SUMMARY AND CONCLUSIONS

10.1 Results of Practical Experience

From the practical point of view, the most striking achievement of the
system has been the increase in control, reliability and accuracy which
is always the more indispensable, the more numerous the data to be
processed. Even though, as a result of mechanization which has been
introduced in our organization, the manpower employed was not reduced,
the mechanization will make it possible to handle a much greater volume
of data without losing control of the system.

The fact that the operation of the mechanized system has been extended
into its second year, emphasizes the convenience of such mechanization
to the librarian. The M.F. for the coming year was compiled from the
old M.F.; it contained all the data which could be retrieved from the
old M.F. and the only new material which had to be added were the data
which change from one year to another (e.g. patrons subscribing to a
given periodical during that year).

The operational programs provided by the system not only relieve the
librarian from routine duties, but carry out these duties more rapidly
and more efficiently than they could ever be carried out by hand. In
addition, the librarian is provided with facilities for carrying out
non-routine research on his working procedures with the purpose of
improving service and reducing the expenses; were it not for the
mechanization, he would hardly find any free time for work of this
kind.

10.2 Future work

a) Lending

The next obvious step is to extend the mechanized system to include
the lending of material out of the Library. In addition to periodicals
the Library also contains some 30,000 books and reports, most of
which are now out on loan, without ar control over the
duration of the loan or dates by which they are to be returned to
the Library.

b) **Mechanized Catalogue**

We now have at our disposal punched paper tapes produced by the
catalogue workers during the past year with the aid of a flexowriter
during the printing of the catalogue cards. These tapes can be
read by the computer and the files required for the compilation of a
mechanized catalogue, can be prepared.

c) **Interactive Search with Guidance**

We already have an extensive thesaurus in machine-readable form,
which was itself created by a computer program (figure No. 18).
Its purpose is to serve both the cataloguer and the library user
in finding the keywords which will help him in locating the book he
needs.

The combination of the mechanized cataloguing system with the
thesaurus will make it possible to operate an answers-to-queries
guided search program. In order to render the search interactive,
the Library will acquire a display terminal which will be connected
on-line to the computer; the user will thus have access to the
mechanized catalogue and will be able to operate the interactive
query program, i.e. modify his query with the aid of the thesaurus,
master file and auxiliary files, and thus to arrive at the
bibliographic material he requires.

10.3 **Manpower and Computer Investment**

Experience has shown that the manual system in the Library can be
mechanized with the aid of the professional manpower now employed in
the Library, if assisted by a computer specialist. In the first stage
of these activities the employed personnel have proved themselves
capable both of operating the still existing manual system and the
mechanical system under construction (except for the aid of key-punchers
not belonging to the Library). This seems to be true, irrespective
of the size of the Library.

As regards the money investment required, the operation of the systems
takes up about one hour of computer time for the yearly cycle of

operations (for a C.D.C. 6500 computer). Additional budget allocations are needed for card punching, printing costs and upkeep of magnetic tapes (as back-up for the files on the disk).

10.4 Other Potential Applications

The applications of the system to various other fields (see reference No. 6) are possible owing to the basic conception of the data base, which can be easily updated, and to the structure of the files which shorten the reaction time to the queries. Moreover should it ever be desired to introduce any changes in the operational structure and the relevant data, this can be done, by and large, by introducing additions and changes in the mechanized operational programs, but no drastic changes will be needed in the structure of the data base or in the operational program system as a whole.

8. REFERENCES

1. Hayes International Corporation. Automated Literature Processing Handling and Analysis System - First Generation. Huntsville, Alabama, 1967. (AD 658 081).

2. Dodd, G. Generalized Data Management Systems: Data Structures. Iltam, 1971 International Seminar on Information Storage & Retrieval, Proceedings, chapter 3.

3. Hsiao, D., and Harary, F. A Formal System For Information Retrieval From Files.
    Comm. ACM 13,2 (Feb. 1970), 67 - 73.

4. Lefkovitz, D. File Structures For On-Line Systems.
    Spartan Books, New York, 1969.

5. Random Files   קדמון, ג.. מחבונת העבודה עם
    Permanent Files   השמורים כ-
    53-50 (דצמבר 71) ,7 ׳ירעון רומ"ח מס

6. קדמון, ג. מערכת אוטומציה של מחלקת כחבי העח כספו־ה,
    דו"ח ביניים מס׳ 1.

7. קרמון, ג. אוטומציה של מחלקת כחבי עח כספריה,
    דו"ח מסכם.

Figure 1: Structure of Master File Cards

-------------	141	CYBERNE·ICA		BELGIUM	CYBEAD
-------------	142	CYBERNETICS		USA	CYBNAO
-------------	143	DA-MA	130.00 DOLLAR	ISRAEL	DAMACH
-------------	144	DAPEI TOCHEN-HASHMAL VEELECTRONICA		ISRAEL	DTHECP
-------------	145	DAPEI TOCHEN-ZAVA VEHIMUSH		ISRAEL	DTZHCH
-------------	146	DATA PROCESSING		ENGLAND	DPROARX
-------------	147	DATA PRODUCT NEW		USA	DAPNCJ
-------------	148	DATAMATION		USA	DTHNAD
-------------	149	DEFEKTOSKOPIYA		RUSSIA	DEFKAG
-------------	150	DESIGN NEWS		USA	DIGNAS
-------------	151	DIFFERENTIAL EQUATIONS		USA	DIEQAD
-------------	152	DIN MITTEILUNGEN	155.00 DOLLAR	USA	DIEQAD
-------------	153	DIRECTORY OF PUBLISHED PROCEEDINGS (INTERDOK)		W-GERMANY	DINICJ
-------------	154	DISCUSSIONS OF THE FARADAY SOCIETY		USA	DPPRAI
-------------	155	DISSERTATION ABSTRACTS B-ENGINEERING AND TECHNOLOGY		ENGLAND	DFSOAV
-------------	156	DMS-AN EQUIPMENT		USA	DABSAE
-------------	157	DMS-ELECTRONIC SYSTEMS	350.00 DOLLAR	USA	DMSACV
-------------	158	DMS-MILITARY AIRCRAFT	350.00 DOLLAR	USA	DMSECX
-------------	159	DMS-MISSILES SPACECRAFT	350.00 DOLLAR	USA	DKSNCB
-------------	160	DOKUMENTATION REGELUNGSTECHNIK (VDI)	350.00 DOLLAR	USA	DMSSCR
-------------	161	E.D.N. ELECTRICAL DESIGN NEWS	480.00 MARK	W GERMANY	DORECY
-------------	162	E.E.E. MAGAZINE OF CIRCUIT DESIGN ENGINEERING		USA	EDNEAC
-------------	163	EICHUT		USA	EEECAV
-------------	164	ELECTRICAL COMMUNICATIONS		ISRAEL	EICHCF
-------------	165	ELECTRO-OPTICS		USA	ELCNAB
-------------	166	ELECTRO TECHNOLOGY NEWSLETTER		ENGLAND	ELOPCA
-------------	167	ELECTROMECHANICAL DESIGN		USA	ETECAR

.gure 2:   Patrons' List

ITEM NC.	CODE	NO. OF COFIES	T I T L E
01029	JPLFAG	01	JCURNAL CF FCLYMER SCIENCE,PART A-2,PCLYMER PHYSICS
01030	JPYEAZ	01	JOURNAL OF FCLYMER SCIENCE,PART 9,PCLYMER LETTERS
01031	JPYCAG	01	JCURNAL CF FCLYMER SCIENCE,PART C,PCLYMER SYMFOSIA
01032	JALSAI	J2	JOURNAL CF THE ASTRONAUTICAL SCIENCES
01033	JFINAZ	01	JCURNAL CF THE FRANKLIN INSTITUTE
01034	JSMTAM	01	JCURNAL CF THE S.M.P.T.E.
01035	JVSTAJ	02	JOURNAL OF VACUUM SCIENCE AND TECHNOLCGY
01036	LUEKAA	01	LUBRICATION ENGINEERING
01037	MACYAI	03	MACHINERY
01038	MAREAV	01	MATHEMATICAL REVIEWS
01039	PCMFAE	01	MATHEMATICS CF CCMPUTATION
01040	PEFCAP	01	METAL PRCGPESS
01041	TMSAAP	01	METALLURGICAL TRANSACTIONS
01042	XGMRAM	03	MILITARY REVIEW
01043	MSSCZD	01	MILITARY SPECIFICATIONS AND SOURCES
01044	PCCAEX	01	MODERN CASTING
01045	PFHCAI	01	MCDERN PHOTCGRAFHY
01046	PCFLAY	02	MODERN PLASTICS INTERNATIONAL
01047	NSANAC	01	NATIONAL SAFETY NEWS
01048	FASCAR	01	RADIO SCIENCE
01049	SPIEA9	01	S.P.I.E. JOURNAL
01050	STNVEH	02	SCIENCE AND TECHNCLOGY
01051	SFRMAY	01	SCREEN PRINTING MAGAZINE
01052	SPPLAH	01	SPACE PROPULSICN
01053	LUAMAI	01	STUDIES IN APPLIED MATHEMATICS
01054	TEJCZH	03	TELEMETRY JCURNAL
01055	TAGLAH	01	TRANSACTIONS CF THE AMERICAN GECPHYSICAL UNICN
01056	TSRMAZ	01	TRANSACTICNS CF THE SOCTETY OF RHEOLOGY

Figure 3: Orders to Suppliers

```
ADHAAS  S0100200231<
AHHAAS  S0100301102E
APNYAS  S0100401911<
ATINZV  S0100500210<
CHERAV  S0100600262E
CHWKAV  S0100900262E
CMPCAX  S0101000262E
CMPOAD  S0101100787E
CPAUAF  S0101200218H
CNCNZB  S0101300050<
DTMNAO  S0101400903<
EEEEAH  S0101500415H
ELECAT  S0101604209<
FLQUZN  S0101701097B
FOUNAE  S0101800210<
GPYSAL  S0101900162G
HYDPAR  S0102001059<
IBMJAE  S0102100052E
IAEAAC  S0102201443G
JAPNAT  S0102301630<
JCISAZ  S0102401058D
JCSSBI  S0102500333I
JDEQAU  S0102600579F
JOMTAK  S0102700378<
JPLCAT  S0102803579<
JALSAI  S0103200240<
JFINAZ  S0103300210<
JSMTAW  S0103400283E
JVSTAJ  S0103500577D
LUENAA  S0103600168<
MAREAV  S0103803360<
MCHPAB  S0103900210<
MACYAI  S0103700300<
MEPOAP  S0104000111C
TMSAAP  S0104100409E
XGMRAM  S0104200160E
MSSCZO  S0104300577E
MOCABX  S0104400157E
MPHOAI  S0104500105<
MOPLAY  S0104600240<
NSANAC  S0104700112<
AICEAK  S0100102992E
RASCAR  S0104800346E
SPIEAB  S0104900190<
STNYBM  S0105000302D
SPRMAY  S0105100072D
SPPLAH  S0105201045B
UUAHAI  S0105300138F
TEJOZH  S0105401260<
TAGUAM  S0105500063<
TSRHAZ  S0105600336<
  Q53936   12.10.71  02   00131400042000
```

Figure 4:   Accounting - Representation of Printout of Data Cards

```
        INVOICE NO.-AO 3192        DATE  24.09.71     VENCCR  C     DEPART-ENT
MAZTEM T I T L E                                                      LIB-CCP        EX-CCP
01015  COMPUTER CECISIONS                                            +36025.08     +65600.83
01320  INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING    +CJU16.U0     +C560C.5J
01034  JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS             +00036.25     +CC.00.C3
01081  SIMULATION                                                    +00J38.8'     +0566U.60
01082  SOFTWARE PRACTICE AND EXPERIENCE                              +06013.24     +0600..53
#1096  TRANSACTIONS OF THE AMERICAN MATHEMATICAL SOCIETY             +06060.08     +66300.63


        INVOICE NO. AO 3192        DATE  24.09.71      VENDOR  C     CEPARTMENT  E
MAZTEM T I T L E                                                      . LIB-CCP      EX-COF
01010  ELECTRONIC DESIGN                                             +00002.92     +00035.60
01010  ELECTRONIC DESIGN                                             +03002.92     +00035.00
01067  PRODUCT ENGINEERING                                           +06082.50     +00028.10


        INVOICE NO. AO 3192        DATE  24.09.71      VENOCR  C     DEPARTMENT  F
MAZTEM I I T L E                                                      LIB-CCP        EX-COF
01095  APPLIED OPTICS                                                +00000.60     +00342.00
01086  APPLIED PHYSICS LETTERS                                       +00005.50     +00325.50
u1010  ELECTRONIC DESIGN                                             +06J02.52     +06J35.00
01023  FUSION                                                        +00002.00     +00004.00
01023  FUSION                                                        +00002.08     +00008.60
01029  JOURNAL OF APPLIED PHYSICS                                    +00205.07     +00J00.60
01039  JOURNAL OF THE OPTICAL SOCIETY OF AMERICA                     +00007.67     +00800.08
01040  LASER FOCUS                                                   +00u06.00     +00038.00
01041  LASERSPHERE                                                   +06606.50     +00005.00
01041  LASERSPHERE                                                   +00034.50     +00038.60


        INVOICE NO. AO 3192        DATE  24.09.71      VENDOR  C     DEPARTMENT  H
MAZTEM T I T L E                                                      LIB-COP        EX-COP
01017  ELECTROMECHANICAL DESIGN                                      +00604.17     +00080.08
01010  ELECTRONIC DESIGN                                             +06J02.92     +00035.00
01049  NUCLEAR SCIENCE AND ENGINEERING                               +G0027.63     +00000.08
01055  PHYSICAL REVIEW LETTERS                                       +00012.60     +00000.08
01058  PHYSICAL REVIEW,C-NUCLEAR PHYSICS                             +0u012.60     +00000.00
01073  REVIEW OF SCIENTIFIC INSTRUMENTS                              +00306.75     +00020.50
01091  TRANSACTIONS OF THE A.S.M.E.-C:JOURNAL OF HEAT TRANSFER       +u0015.30     +00000.00


        INVOICE NO. AO 3192        DATE  24.09.71      VENDOR  C     DEPARTMENT  I
MAZTEM T I T L E                                                      LIB-COP        EX-COF
01025  INDUSTRIAL ENGINEERING                                        +00005.50     +06022.00
01046  MECHANICAL ENGINEERING                                        +00u02.00     +06000.00
01054  POPULAR MECHANICS                                             +06002.33     +02807.00
01067  PRODUCT ENGINEERING                                           +00002.50     +00020.00
01069  QUALITY PROGRESS                                              +00004.67     +00014.00
01080  TOOLING AND PRODUCTION                                        +00020.00     +00020.00
01094  TRANSACTIONS OF THE A.S.M.E.-F:JOURNAL OF LUBRICATION TECHNOLOGY +00010.25  +00000.08


        INVOICE NO. AO 3192        DATE  24.09.71      VENDOR  C     DEPARTMENT  K
MAZTEM T I T L E                                                      LIB-CUP        EX-COP
01053  AMERICAN JOURNAL OF PHYSICS                                   +u0007.67     +00000.00
01016  ELECTRO TECHNOLOGY NEWSLETTER                                 +00009.33     +00000.00
01010  ELECTRONIC DESIGN                                             +00002.92     +00035.00
01010  ELECTRONIC DESIGN                                             +02002.92     +00035.00
01029  JOURNAL OF APPLIED PHYSICS                                    +00005.07     +00000.00
01034  JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS             +00036.30     +00000.00
01035  JOURNAL OF MATHEMATICAL PHYSICS                               +00012.75     +00000.00
01038  JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA                  +00005.60     +00006.00
01039  JOURNAL OF THE OPTICAL SOCIETY OF AMERICA                     +00007.67     +00006.00
01040  LASER FOCUS                                                   +00006.80     +00000.00
```

Figure 5: Accounting - Debit Itemization per Department and per Item

DEPARTMENT T HAS BIGGEST EXTRA SUM: +00381.40   FOR LIB-SLBS: +00071.32   TCTAL ADEC: +5.00

INVOICE NO. AD 3192   DATE 24.09.71   FOR LIB-SLBS: VENDOR C   DEPARTMENT

CHARGE DEPARTMENT T FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00129.50   +000.00   +000129.50
CHARGE DEPARTMENT A FOR LIP-COP, EX-CUF, TOTAL, AS FCLLOWING-   +0032E.55   +00140.75   +004467.74
CHARGE DEPARTMENT B FOR LIU-COP, TOTAL, AS FCLLOWING-   +00030.00   +00150.00   +000180.00
CHARGE DEPARTMENT C FOR LIU-COP, EX-COP, TOTAL, AS FCLLOWING-   +00190.49   +000.00   +000190.49
CHARGE DEPARTMENT D FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00157.50   +000.00   +000157.50
CHARGE DEPARTMENT E FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00008.34   +00090.00   +000098.34
CHARGE DEPARTMENT F FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00150.50   +00053.16   +000203.66
CHARGE DEPARTMENT H FOR LIB-COP, EX-COF, TOTAL, AS FCLLOWING-   +00063.05   +00076.50   +001139.55
CHARGE DEPARTMENT I FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00083.00   +00048.13   +001131.13
CHARGE DEPARTMENT K FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00424.61   +00196.00   +000620.61
CHARGE DEPARTMENT L FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00047.00   +00010.00   +000057.00
CHARGE DEPARTMENT M FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00027.20   +00065.00   +000092.20
CHARGE DEPARTMENT O FOR LIU-COP, EX-COP, TOTAL, AS FCLLOWING-   +00237.00   +00174.50   +000411.50
CHARGE DEPARTMENT P FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00174.50   +00032.11   +000206.61
CHARGE DEPARTMENT S FOR LIB-COP, EX-COF, TOTAL, AS FCLLOWING-   +00070.50   +00075.00   +001145.50
CHARGE DEPARTMENT T FOR LIR-COP, EX-COP, TOTAL, AS FCLLOWING-   +00070.50   +00304.34   +000597.83
CHARGE DEPARTMENT U FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00074.26   +00491.33   +000597.83
CHARGE DEPARTMENT W FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00070.87   +00106.50   +000121.47
CHARGE DEPARTMENT X FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00073.05   +00050.00   +000627.55
CHARGE DEPARTMENT 3 FOR LIU-COP, TOTAL, AS FOLLOWING-   +00007.67   +00154.50   +000021.67
CHARGE DEPARTMENT 5 FOR LIB-COP, EX-COP, TOTAL, AS FCLLOWING-   +00223.57   +00014.00   +000589.92

IEMIZU 002U01J02005<
ISMISISU00113.10.7105   U054644104200F

Figure 6: Accounting - Debit Totals

ERRCR FILF OUTPUT.

```
NO TYP 03 FOUND       IN INVOICE PP-317/72  IN CODEN NFSAAO IN HAZTEM 02001
INVALID CODEN         IN INVOICE  16.038    IN CODEN AFSPBV IN HAZTEM C2001
NON NUMERIC IN TYP 3  IN INVOICE  16.038    IN CODEN ELOCZG IN HAZTEM 02002
INVALID CODEN         IN INVOICE  16.038    IN CODEN ELWACN IN HAZTEM 02003
INVALID CODEN         IN INVOICE  16.038    IN CODEN POELAN IN HAZTEM 02005
INVALID CODEN         IN INVOICE 35/10922/4 IN CODEN HAWEAR IN HAZTEM 01001
NO TYP 03 FOUND       IN INVOICE  15052     IN CODEN SOVIAN IN HAZTEM 02002
INVALID CODEN         IN INVOICE  15052     IN CODEN MADEAS IN HAZTEM 02001
NO TYP 03 FOUND       IN INVOICE  Q53936    IN CODEN CPELAO IN HAZTEM 01002
NO TYP 03 FOUND       IN INVOICE  053936    IN CODEN CPCOBK IN HAZTEM 01001
NO TYP 03 FOUND       IN INVOICE  Q53936    IN CODEN IEJQAV IN HAZTEM 01003
INVALID CODEN         IN INVOICE  Q53976    IN CODEN IJSCBU IN HAZTEM 01006
INVALID CODEN         IN INVOICE  053936    IN CODEN IJSCBU IN HAZTEM 01005
NO TYP 03 FOUND       IN INVOICE  Q53976    IN CODEN IEARAJ IN HAZTEM 01010
NON NUMERIC IN TYP 3  IN INVOICE  053936    IN CODEN IETPAM IN HAZTEM C1012
NO TYP 03 FOUND       IN INVOICE  05 1976   IN CODEN ITADAI IN HAZTEM 03014
NO TYP 03 FOUND       IN INVOICE  Q53936    IN CODEN IEMCAQ IN HAZTEM 01028
NON NUMERIC IN CARD   IN INVOICE  053936    IN CODEN IETOAG IN HAZTEM 01030
NON NUMERIC IN CARD   IN INVOICE  Q53976    IN CODEN IICIAU IN HAZTEM 01035
NON NUMERIC IN CARD   IN INVOICE  Q53936    IN CODEN IEIMAO IN HAZTEM C1039
NON NUMERIC IN CARD   IN INVOICE  Q53936    IN CODEN IEIMAO IN HAZTEM 01040
NON NUMERIC IN CARD   IN INVOICE  Q53936    IN CODEN IETHAR IN HAZTEM 01044
NON NUMERIC IN CARD   IN INVOICE  Q53936    IN CODEN IETNAY IN HAZTEM 0. ,46
INVALID CODEN         IN INVOICE  053936    IN CODEN IEPMAX IN HAZTEM 01047
********  END OF ERROR-FILE ********
```

Figure 7: Accounting - Error Diagnostics

```
001
EAC SAM
AJP IAC
EAC SAM 0101AMERICAN CERAMIC SCCIEV BULLETIN


005
AJP IAC
AMM AAS
AJP IAC 0101AMERICAN JOURNAL OF PHYSICS
AJP IAC 0201U01212C902299012122          AMERICAN INSTITLTE GF PHYSICS
AJP IAC 0202                             335 EAST 45 STREET
AJP IAC 0203                             NEW YORK N.Y. 10017  USA
AJP IAC 0301CC1103AXK                    01093AO 3192   24.09.71  C90239901


005
AMM AAS
AMS CAK
AMM AAS 0101AMERICAN MACHINIST
AMM AAS 0201U02626D0035000121 22          AMERICAN MACHINIST
AMM AAS 0202                             330 WEST 42ND ST
AMM AAS 0203                             NEW YORK N.Y 10036  USA
AMM AAS 0301S03 04FIMO                   01003


005
AMS CAK
ASI NZS
AMS CAK 0101AMERICAN SCIENTIST
AMS CAK 0201U00606D0009500121 22          SOCIETY CF SIGMA XI
AMS CAK 0202                             155 WHITNEY AVE
AMS CAK 0203                             NEW HAVEN CONN.06510  USA
AMS CAK 0301F02 84FCUK                   01001


001
ASI NZS
ANA LAM
ASI NZS 0101AMERICAN SOCIETY FCR INFORMATION SCIENCE NEWSLETTER


002
ANA LAM
AA9 SAB
ANA LAM 0101ANALYST
ANA LAM 0301801 01C                      01082


002
AA8 SAB
ANC HAU
AA8 SAB 0101ANALYTICAL ABSTRACTS
AA8 SAB 0301801 01C                      01003


005
ANC HAU
ACI EAW
ANC HAU 0101ANALYTICAL CHEMISTRY
ANC HAU 0201 01313      012122    AMERICAN CI EMICAL SCCIETY
ANC HAU 0202                             1155 SIXTEENTH STREET N.W.
ANC HAU 0203                             WASHINGTCN D.C. 20036  USA
ANC HAU 0301D01 01C                      01001
```

Figure 8: Printout of Master File Records

```
        T-KEY= 001
 006    DEBI-1    A
 000210<001260< A05041    23.09.71
 01373JF005911EA0 3192    24.09.71
 011412001653 7EISHAISISG000113.10.71
 000157E001260<02-3094    19.10.71
 000126<000000<CE29MPHAF07.09.71
 001012<000000<  67632    25.10.71

        T-KEY= 002
 000    DEBI-1    E
 000210<001260< A05041    23.09.71
 000350000378U<AD 3192    24.09.71
 001267A0067E2DISHAISISG00113.10.71
 000126<000630<CE29MPHAF07.09.71

        T-KEY= 003
 003    DEBI-1    H
 000213<081260<-A05041    23.09.71
 003194A002667<AD 3192    24.09.71
 000447C0028E6EISHAISISG00113.10.71

        T-KEY= 004
 005    DEBI-1    K
 000210<001260< A05041    23.09.71
 017833F008232<AD 3192    24.09.71
 003927E002066EISHAISISG00113.10.71
 000157E001260<02-3094    19.10.71
 000000<001108<   2339    14.11.71

        T-KEY= 005
 005    DEBI-1    T
 000213<001260< A05041    23.09.71
 003118I016142CAD 3192    24.09.71
 001585E005468UISHAISISG00113.10.71
 000157E00126U<02-3094    19.10.71
 001334<000000<  67632    25.10.71

        T-KEY= 006
 005    DEBI-1    5
 000210<001260< A05041    23.09.71
 00938JI015386GA0 3192    24.09.71
 015251E020103GISHAISISG00113.10.71
 000315<002520<02-3094    19.10.71
 000126<000000<CE29MPHAF07.09.71

        T-KEY= 007
 002    DEBI-1    
 005439<006000<AD 3192    24.09.71
 00167+E0032630ISHAISISG00113.10.71
```

Figure 9:   Printout of Records in Debit File

ERROR   FILE   OUTPUT.

```
ERRONEOUS TYP-LEV OR ACT-COD,      IN CODEv  OSBUZU   TYPE 03   LEVEL 01

ERRONEOUS TYP-LEV OR ACT-COD,      IN CODEv  BJOSZF   TYPE 03   LEVEL 01

ERRONEOUS CHECK-LETTER.   PUT V  IN CODEN  CMERA    TYPE 01   LEVEL G1

ERRONEOUS DECK. MISSING TYPE 01
CMERA  u301D01 01C

ERRONEOUS CHECK-LETTER.   PUT F  IN CODEv  PQIMA    TYPE 01   LEVEL 01

ERRONEOUS DECK. MISSING TYPE 01
PQIMA  u301M01 01X

EPRONEOUS TYP-LEV OR ACT-COD,      IN CODEv  ADEGBE   TYPE 03   LEVEL 01

••••••••  END  OF  ERROR-FILE  ••••••••
```

Figure 10:   Updating - Error Diagnostics

```
AJ4FAT 0J3723"   ?!?   2A7   ?,?   24"   ?A?   297   ?37   ?.7   ?4?   .?.
AJ4.3? ?534??.   2.   29.   2..   29.   2?.   23.   ?3.   2?.   ?3.   ?2.
AV4FA? ?53923.   ?9.   ?31   771   3?1   301   3J1   ?J1   7?1   3?1   771
AVHF3? 0?3??11   3?1   33?   3.1   5?2   3?.   303   70?   7??   13.   7?.
AJ4?3? ?5.131J   ?.3   3?9   713   70.   30.   70?   ??0   315   315   315
AVHE3T 0?42315   ?13   31?   31?   715   ?15   315   715   715   ?15   ?15
AV4FA? 0543322   322   322   72?   722   322   322   722   322   ?22   ?22
A?4FA? ?544322   32?   ?22   323   72?   329   329   ?2?   329   329   ?2?
AVHF3? ?545?2?   32?   32?   72.   32?   329   336   ??6   335   336   ?2?
AV4EAT 0?43335   33?   335   336   33?   736   736   73?   336   3.?   2.?
AV4EAT C?.73.?   3.3   3.?   3.3   3.3   3.3   7.3   7.?   3.3   ?.3   3.?
AVHF3T ?54A3.?   35?   35?   3?3   35?   2?0   350   3?(   35?   359   ?5?
AVHF3? 054935?   350   35?   3??   35?   357   357   ?57   357   35?   ?5?
AV4EA? 0?50?5?   35?   35?   35?   35?   357   357   35.   36.   35.   36.
AV4EAT ?5513?.   36.   36.   36.   35.   36.   364   ?6.   ?6.   35.   3?1
AVHF3? ?552771   371   371   371   371   371   371   271   371   371   771
AVHE3? 0?53371   371   37?   37?   37?   378   378   37?   37?   173   77.
AV4? ? ?3543?8   37?   37?   37?   37?   385   395   ?9?   385   395   7.?
AV4EAT 0555335   38?   3?9   33?   335   385   295   7?5   392   33?   30?
AV4EAT ?556332   392   392   39?   33?   392   332   39?   392   19?   33?
AVHE3? ?357399   39?   339   799   339   359   399   395   399   333   799
AVHEAT ?5583??   3??   3??   .06   .?5   .06   .?5   .?6   .06   -35   .?5
AVHEAT ?559.?6   .05   405   .05   .36   .36   .13   .13   .13   .1?   .1?
AV4EAT 0?60413   .13   .13   .13   .13   413   .13   .1?   .13   .20   .2?
AVHF3T ?561.2?   .2?   420   42?   420   420   .?0   42C   .?0   .29   .??
AV4EAT 0?62.2?   .2?   .2?   .27   427   427   .27   .27   .27   .27   .2?
AVHE3T ?56?.27   427   .27   .27   .3.   .3.   .3.   .3.   .3.   .3.   .3.
AV4F3T 0?6.43.   .3.   .3.   .3.   .3.   .3.   .3.   ..?   ..1   ..1   ..1
AVHEAT ?565441   ..1   .41   .41   .41   .41   441   ..?   .41   ?.1   ..?
AVHEAT ?566.4?   ..?   ..A   .4?   ..3   ..3   ..?   ..?   ..?   .?8   ..?
AVHE3T 0567.48   ..9
```

```
BAJVZ? 01019ASA0.. UVAHIFAL
BAUVZ? 0?01I??F06      01?123?60   ?1313
BAUVZ? 04010173
BAJVZ? ?501121   121   121   121   19?   18?   18?   19?   2.3   2.3   2.?   02.
BAUVZ? 0502243   ?0.   304   304   304   3?5   355   ?65   365   .26   .25
BAUVZ? 0503.25   .25
```

```
BHIA2? 01019ITO. .EIL .AAVI?
BHIA7Z ?201I??C3I000A00013123035   05252
BHIAZZ 0401C10?
BHIAZZ 0?01071   071   07?.   971   193   193   193   193   315   315   315   912
BHIAZZ 0?u2?15
```

```
BJNTAS 010?9?ITIS. JOURNAL OF NON ?ESTRU?TIVE TESTIN?
BJNTAS 0201E?0F?6L0?0450013123?6?   01313
BJ?TAS 030189210.JXIH            00022
BJNTAS 04010173
BJNTAS 0?0117?   192   243   -30.   ?65   .26
```

Figure 11: Routing and Control - Recording in the Master File

```
1939+IAZZ00020606          ...  ---  -  ,    J75
1939+IAZZ00020606                              007
1939+IAZZ00020606          ..                  J78
3159+IAZZ0J03J610  L  I  3  R  A  P  Y         J39
3159+IAZZ0LJ3J617                              J10
3159+IAZZC003J617                              311
3159+IAZZ003J3617                              712
05JCHAMZSU001301  L  I  3  R  A  R  Y          071
J5JCHAMZSGJJ13JC1                              J02
05JCHAMZSOJJ13001                              603
J5JCHAMZSLJ013001                              J74
J9UCHAMZSCCJ229L2  L  I  3  R  A  P  Y         J05
J9OCHAMZSJJ02290a                              J76
J9OCHAMZS00J2290d                              J07
J9JCHAMZSJJ0229Jd                              J08
120CHAMZS09033003  L  I  3  R  A  P  Y         009
12JCHAMZS0JG33J03                              J1C
120CHAMZS0J033003                              J11
12GCHAMZS0JG33C03                              712
150CHAMZS000J2904  L  I  3  R  A  P  Y         J13
15JCHAMZSGG0429J4                              714
15JCHAMZSG0G4290J                              J15
15JCHAMZSJCC4290J                              716
18JCHAMZSCJJ52905  L  I  3  R  A  P  Y         J17
18GCHAMZS00JJ290J                              J18
180CHAMZSJCC5290J                              719
180CHAMZS0JJ52305                              J20
21JCHAMZS0J062806  L  I  3  P  A  P  Y         J21
210CHAMZSJJ062806                              J22
21JCJAMZSUJ06283J                              723
21JCJAMZS0JJ62306                              J24
240CHAMZSJCJ728J7  L  I  3  R  A  P  Y         J25
24JCHAMZS0GJ728J7                              J26
24JCJJMZSJJCC2807                              J27
24JCHAMZS0J07286J                              J28
27JCHAMZSJJJ8271J  L  I  3  R  A  P  Y         J29
270CHAMZSJJJ82708                              J30
27JCJJAMZSJJJ8271J                             J31
27JCHAMZSJJJ82706                              J32
30JCHAMZS00J92609  L  I  3  R  A  P  Y         J35
3JJCHAMZSJJJ92uJ9                              J54
30JCHAMZS0JJ92609                              J35
3JJCHAMZSJC092609                              J3J
33JCHAMZS00102610  L  I  3  R  A  R  Y         J37
33JCHAMZSJJ102613                              J38
33JCHAMZSJJ102617                              J39
33JCHAMZSJJ102610                              J40
35JCHAMZSJJ112531  L  I  3  R  A  R  Y         J41
36JCHAMZSJJ112511                              J42
36JCJJJZSJJ112531                              J43
36JCHAMZSJJ1125J1                              J44
39JCHAMZSJJ122512  L  I  3  R  A  P  Y         J45
39JCHAMZS00122512                              J46
33JCHAMZSJJ122512                              J47
34JCHAMZSJJ122512                              J48
```

Figure 12: Routing and Control - Control Cards

```
                           ERROR  FILE  OUTPUT.


    ERRONEOUS DECK. MISSING TYPE 01
    A4MAAS 0401  02

    ERRONEOUS DECK. MISSING TYPE 01
    AMSCAK 0401  01

    ERRONEOUS DECK. MISSING TYPE 01
    AMPEAT 0401  02

    ERRONEOUS DECK. MISSING TYPE 01
    APOPAM 0401  01

    ERRONEOUS DECK. MISSING TYPE 01
    A24PAW 0401  02

    INVALID DATA IN TYPE 02 OF MODIFIED MF.
    AR4YAT 0101134Y
    AR4YAT 0201JJ1312000C0510013123J40.
    ARMYAT 0301FJJ103X20                    00239
    AR4YAT 04010101

    INVALID DATA IN TYPE 02 OF MODIFIED MF.
    ARMAF 0101ARMY RESEARCH AND DEVELOPMENT
    AROVAF 0201J0060600003J013123                        SUPERINTENDEN
    AROVAF 02024ENTS              GOVERNMENT PRINTING OFFICE          WA
    AROVAF 0232J.C. 20412  USA
    AROVAF 04010102

    ERRONEOUS DECK. MISSING TYPE 01
    APPLAP 0401  01

    NO TYPE 02 FOUND IN MODIFIED MF
    BSTJAF 01013FEL SYSTEM TECHNICAL JOURNAL
    BSTJAF 0301FJ3109TKJC0A                 00213
    BSTJAF 04010101

    ERRONEOUS DECK. MISSING TYPE 01
    BRPLAW 0401  01

    NO TYPE 02 FOUND IN MODIFIED MF
    CSPJAM 0101C4 INDIAN AERONAUTICS AND SPACE JOURNAL
    CSPJA1 2301HJ110025A                    00304
    CSPJA1 04010101

    ******** END OF ERROR-FILE ********
```


Figure 13:   Routing and Control - Error Diagnostics

```
CHABAE 0101CHEMICAL ABSTRACTS
CHABAF 0201U15925003040001312304 5   152                    CHEMICAL ABSTRACTS SER
CHABAE 0202VICE                    P.O.BOX 3012                        UNIVERSITY
CHABAE 0203POST OFFICE                      COLUMBUS, OHIO 43210  USA
CHABAER0301X04103CFX                         00575
CHABAE 04010109
CHABAE 0501001126509126509175E09126E09126509126E09126E09126N09126N09126N09826509J~6545A
CHABAE 0502001326:09326C0932AE09326509A26N09926N0982EN10F26E10525E10526E10526E
CHABAE 0503105267E10526E10526E10526E10526N11226E11226E11226E11226E11226E1122EE
CHABAE 050411226E112    11226E119    119     119     119     119     119     119     119
CHABAE 0505119   126    126     126     126     126     126     126     126     126     133
CHABAE 0506133   133    133     133     133     133     133     140     140     140
CHABAE 0507140   140    140     140     140     140     147     147     147     147     147
CHABAE 050814?   147    147     147     154     154     154     154     154     154
CHABAE 0509154   154    161     161     161     161     161     161     161     161     161
CHABAE 0510168   168    168     168     168     168     168     168     175     175
CHABAE 0511175   175    175     175     175     175     175     182     182     182
CHABAE 0512182   182    182     182     182     189     189     189     189     189     199
CHABAE 0513189   189    189     196     196     196     196     196     196     196     196
CHABAE 0514196   203    203     203     203     203     203     203     203     203     210
CHABAE 0515210   210    210     210     210     210     210     210     217     217     217
CHABAE 0516217   217    217     217     217     217     224     224     224     224     224
CHABAE 051722+   224    224     224     231     231     231     231     231     231     231
CHABAE 05182T1   231    238     238     238     238     238     238     238     238     238
CHABAE 0519245   245    245     245     245     245     245     245     245     252     252
CHABAE 0520252   252    252     252     252     252     252     259     259     259     259
CHABAE 0521259   253    259     259     259     266     266     266     266     266     266
CHABAE 0522266   266    266     273     273     273     273     273     273     273     273
CHABAE 0523273   280    280     280     280     280     280     280     280     280     287
CHABAE 0524287   287    287     287     287     287     287     287     294     294     294
CHABAE 0525294   294    294     294     294     294     301     301     301     301     301
CHABAE 0526301   301    301     301     308     308     308     308     308     308     308
CHABAE 0527308   308    315     315     315     315     315     315     315     315     315
CHABAE 0528322   322    322     322     322     322     322     322     322     329     329
CHABAE 0529329   323    329     329     329     329     329     329     336     336     336     336
CHABAE 0530336   336    336     336     336     343     343     343     343     343     343
CHABAE 0531343   343    343     350     350     350     350     350     350     350     350
CHABAE 0532350   357    357     357     357     357     357     357     357     357     364
CHABAE 0533364   364    364     364     364     364     364     364     371     371     371
CHABAE 0534371   371    371     371     371     371     378     378     378     378     378
CHABAE 0535378   379    378     378     385     385     385     385     385     385     385
CHABAE 0536385   385    392     392     392     392     392     392     392     392     392
CHABAE 0537399   399    399     399     399     399     399     399     399     406     406
CHABAE 0538406   406    406     406     406     406     406     413     413     413     413
CHABAE 0539413   413    413     413     413     420     420     420     420     420     420
CHABAE 0540420   420    420     427     427     427     427     427     427     427     427
CHABAE 0541427   434    434     434     434     434     434     434     434     434     441
CHABAE 0542441   441    441     441     441     441     441     441     448     448     449
CHABAE 0543448   448    448     448     448     448
```

Figure 14: Routing and Control - the Updated Master File

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THANK YOU FOR YOUR CO-OPERATION.

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C. ROESLER

ACQUISITIONS DEPARTMENT

Figure 15:   Routing and Control - Claim to the Publisher

```
*********  END OF PERIODICALS LIST  *********
SUBS = 01  TOTAL = 397  TOT-PRICE= r971f5c2  MEAN PRICE= c244.7f
SUBS = 02  TOTAL = 773  TOT-PRICE= 5r970579  MEAN PRICE= r132.95
SUBS = 03  TOTAL = 727  TOT-PRICE= 9024467?1  MEAN PRICE= 3c.9204
SUBS = 04  TOTAL = 807  TOT-PRICE= 00942267  MEAN PRICE= 23F038
SUBS = 05  TOTAL = 807?  TOT-PRICE= C043726  MEAN PRICE= 0137.77
SUBS = 06  TOTAL = 663  TOT-PRICE= 0221ff8  MEAN PRICE= 5r35.36
SUBS = 07  TOTAL = 551  TOT-PRICE= 0012f07  MEAN PRICE= 012E03
SUBS = 08  TOTAL = 704  TOT-PRICE= 0094822n  MEAN PRICE= 0115.5?
SUBS = 11  TOTAL = 801  TOT-PRICE= 0016800  MEAN PRICE= 016800
SUBS = 12  TOTAL = 801  TOT-PRICE= 0003465'  MEAN PRICE= 011560
SUBS = 13  TOTAL = 801  TOT-PRICE= 0c25P30  MEAN PRICE= 012915
SUBS = 14  TOTAL = 001  TOT-PRICE= 0r012800  MEAN PRICE= 012800
SUBS = 15  TOTAL = 001  TOT-PRICE= 0091109n  MEAN PRICE= 011925
SUBS = 16  TOTAL = 001  TOT-PRICE= 3:01470u  MEAN PRICE= 0147.u3
```

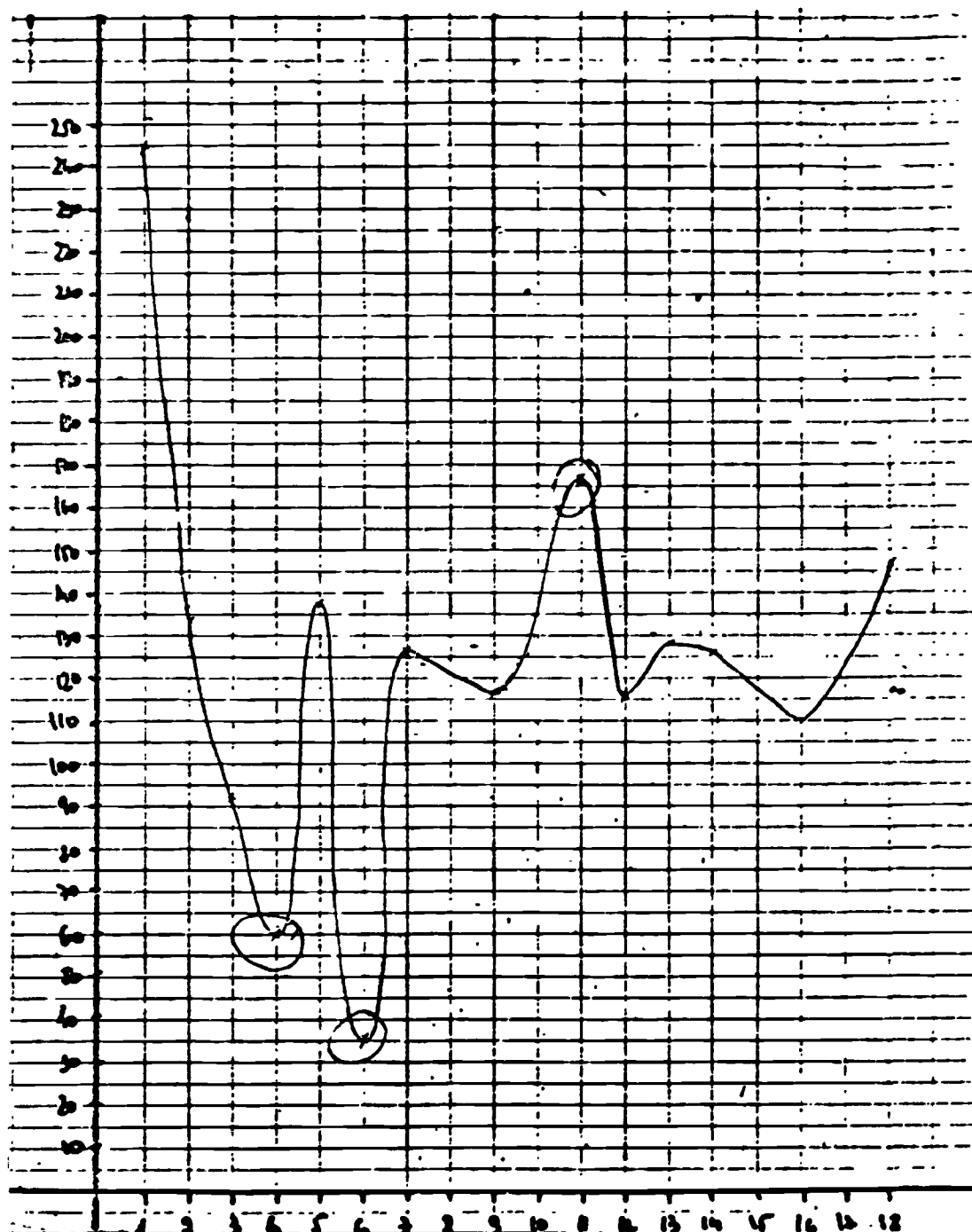Figure 16:   Distribution of Prices per Copy - Summary Table

Figure 17: Distribution of Prices per Copy - Diagram

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BT MANAGEMENT PRINCIPLES;AUTOMATION
BT MANAGEMENT THEORY,METHOD,SYSTEM

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US PRODUCTION MANAGEMENT AND CONTROL

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65.015.001.5
BT RESEARCH
NT SUPERVISION OF SCIENTISTS + ENGINEERS
RT ECONOMIC ASPECTS,SCIENCE AND TECHNOLOGY
RT MANAGEMENT

MANAGEMENT PERSONNEL
658.3
NT MANAGEMENT PERSONNEL SELECTION
NT SUPERVISION OF SCIENTISTS + ENGINEERS
NT WORK STUDY AND MEASUREMENTS
RT INCOMPETENCE; FAILURE
RT INDUSTRIAL RELATIONS
RT MANPOWER
RT PERFORMANCE EVALUATION
RT PERSONNEL, HUMAN RELATIONS
RT PROFESSIONAL PERSONNEL
RT WAGES. SALARIES. PAY
SF PERSONNEL

MANAGEMENT PERSONNEL SELECTION
658.311
BT MANAGEMENT PERSONNEL
RT PERSONNEL, HUMAN RELATIONS
BT SELECTION (GENERAL)
RT INTERVIEWING
SF PERSONNEL

Figure 18:   Thesaurus produced by the Computer