

A Database Management System for Interlibrary Loan

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In facing the growth of interlibrary loan requests; dealing with different libraries and policies; verifying obscure requests; meeting the individual's demand; and managing massive paper files, invoices, statistics, etc., the interlibrary loan librarian's job is neither simple nor easy to accomplish. However, the database management system of Texas Tech University Libraries has offered a high-speed, easy-to-use computer system in controlling files, maintaining records, generating reports, and streamlining the work flow that enables the staff to be more productive.

As information becomes easier to access through information technology systems such as online databases and compact disc technology, the demand for acquiring information in libraries has grown dramatically. However, libraries cannot purchase, process, or store all materials. Therefore, interlibrary loan has become a pivotal point in meeting the demands of the library users.

In responding to the library user's expectation for faster service in ILL, locations for a book title or serial title can be searched on OCLC and large numbers of requests can be processed electronically throughout the nation using the OCLC Interlibrary Loan Subsystem. With the ILL subsystem, a work form appropriate to the searched bibliographic record can be pulled up on an OCLC terminal. When the work form displays on the screen, the OCLC number and author/title of the book or serial are also read from OCLC. The user needs only to enter the locations, citation of an article, name of the patron, and copyright information on the screen. The user can also enter any special message to the lender (such as rush, fax an article, etc.). As soon as the user completes the work form on the terminal, the request is ready to be sent to the assigned locations electronically.

The recipient has four working days to

process a request. A maximum of five locations can be assigned for one request. If the assigned library cannot supply the material and answers "no" on the ILL system, the request automatically moves to the next location. If the recipient does not give an answer on the system within four days, the request will be transferred to the next location or returned to the sender with an "unfilled" answer. Such items as renewal requests, overdue notices, and shipping notices, can also be sent through the system.

Although the ILL system has shortened the hours or days in finding locations and processing requests, tasks for managing records to meet the demands for information in the ILL unit are still very labor-intensive. In many libraries, records and files are managed manually by cards and papers. For example, according to the Copyright Law, if the requested issue of a serial title has been published within five years of the date of the request (e.g., a serial issue published 1985 and request date of 1988), records must be maintained on the title of that serial with the request date, the issue of the serial, and number of times requested. Many hours can be spent in creating cards and maintaining files for the Copyright File before a request can be processed. Since the paper file can only be

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indexed in a limited way (by author or by title), when the staff needs to retrieve records by name of the patron, ILL number, or an inadequate title entry from the paper file, the retrieving task can be very time-consuming and difficult. Generating reports, such as collection development wish lists from paper files, may not be possible. As files grow larger, staff spends hours in dealing with misfiled cards and duplicate cards. As a result, interlibrary loan has been faced with a massive records management dilemma.

In today's information world, the speed and efficiency of acquiring information are emphasized. The manual method of managing records can no longer satisfy users' demands for timely information. With automation applications having increased dramatically in the library, utilizing the microcomputer and software in managing records can keep all phases of service running at the same level of efficiency.

The system for computerizing ILL records at Texas Tech University Library was proposed by the staff in the spring of 1987. dBase III Plus was chosen for the project. After two years, the system has been enlarged several times. The massive paper files were converted onto a database management system that maintains data, generates reports, and retrieves records. The system has been useful not only in determining storage capacity and organizing and sorting data but also in generating useful reports and managing the daily paper flow (see "An Analysis of the System Performances").

DATABASE MANAGEMENT SYSTEM

The database itself can be regarded as a kind of electronic filing cabinet that collects computerized data files. Actually, a database management system is a computerized record-keeping system. It allows the user to maintain information and make information available. Included among the many tasks it performs are the following:

- adding new files to the database;
- inserting new data into the files;
- retrieving data from the files;
- updating data in the files; and
- generating reports.

There are several essential advantages in using such a system:

- It provides faster access for retrieving

and updating records than tracking down the records from the paper files. Mechanical tasks for managing large files, such as updating files and organizing records, are always handled better by computer.

- Information becomes sharable when the system generates different reports from the database for different uses. This feature offers a different view of the database by user. For example, with the ILL Database the subject specialist can identify reports for collection development, the administrator receives statistics, and ILL staff use the database for retrieving records and managing files.

- The capacity for generating statistics allows users to form different statistical reports. For example, how many requests were received during a certain period of time? How many library users come from specific departments or what is their status? How many materials are borrowed or loaned from specific subject areas? The statistics provide administrators with information for determining how the service has been used.

- There is a large storage capacity for data. The size of storage depends upon the size of the hard disk.

- Structure of the database is flexible. That is, the user can create numbers of fields for the database—title, author, OCLC number, ILL number, patron's name, etc. With such database structure flexibilities, users are able

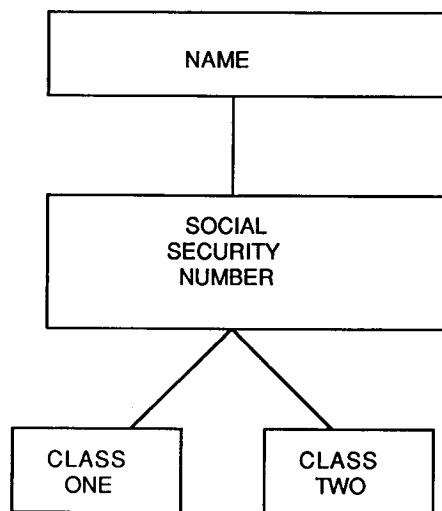


Figure 1. Hierarchical Data Model.

to index the data by any of the field names and organize the file based on the users' needs. There are three types of structures for database systems: the Hierarchical Model, the Network Model, and the Relational Model.

A Hierarchical Model is structured in an ordered set of trees. It consists of a single "root" together with an ordered set of subtrees and actually is a root/parent/child structure (see figure 1). With the parent/child relationship, the data structure diagram must form a tree. The direction of the functional arcs is always toward the tree and away from the root so that the system will automatically delete the entire tree as the parent of the database is deleted. That is the constraint of the hierarchical database structure. The Hierarchical Model is designed for complex data models.

The Network Data Model is an extended form of the hierarchical data structure. In network structure, a child record can have any number of parents. It is structured by the record type and the link. A record type in a data structure represents an entity type in the diagram. Links represent the relationship types and specify the connections between record types (see figure 2).

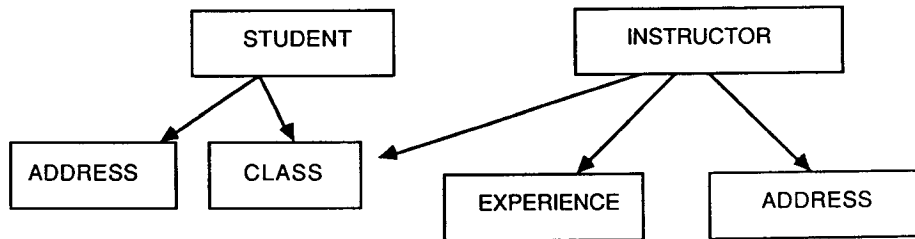


Figure 2. Network Data Model.

NAME	SOCIAL SECURITY NUMBER	CLASS ONE	CLASS TWO
SMITH	002-12-3456	ENGLISH	MATHEMATICS

Figure 3. Relational Data Model.

The Hierarchical and Network Models are structured for databases requiring large amounts of storage space and very fast computing speed. The Relational Data Model is based on relations and is represented as tables. It is laid out in rows and columns. The heading of each column describes the type of information in the column, and each row contains the information itself. The columns form fields and the rows make up records in the database. Such a database structure works well on a microcomputer. As an example, in figure 3, NAME is a field, and so are SOCIAL SECURITY, CLASS ONE, and CLASS TWO. Each row makes up one record, so that all the data for Smith forms one record. dBase is a relational database system.

To structure a database is to name fields, decide the size of each field, and specify whether the fields will be represented by numbers, dates, or characters. Once the structure is defined, fields are stored in the data directory. Then data can be input according to the field structure and stored in a file.

Normally, fields are determined by the kinds of reports needed by the users from the database and the options for retrieving a re-

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Structure for database: C:\arrival.dbf
Number of data records: 715
Date of last update : 02/06/90
Field  Field Name  Type      Width  Dec
  1  PATRON      Character  30
  2  DEPT        Character  25
  3  ADVISOR     Character  20
  4  ADRS1      Character  30
  5  ADRS2      Character  25
  6  BK_TITLE   Character  110
  7  P_TITLE    Character  110
  8  ART_TITLE  Character  110
  9  CITATION   Character  65
 10  ARR_DATE   Date       8
 11  DUE_DATE   Date       8
 12  SUPPLIER   Character  30
 13  OCLC       Character  12
 14  REG_NUM    Character  12
 15  USTAT     Character  10
 16  CHARGE     Character  25
 17  VSOUR      Character  20
 18  CC         Character  10
 19  VERIF      Character  6
 20  REG_DATE   Date       8
 21  REC_DATE   Date       8
 22  RET_DATE   Date       8
 23  CALL       Character  5
** Total **                696

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Figure 4. Structure for Database.

cord. All of these will be based on the data being collected. The structure for the ILL database system has 22 fields (see figure 4). dBase III Plus has a built-in feature called the screen painter, with which the user can create customized format screens for display. Fields can be placed anywhere on the screen (see figure 5).

THE FUNCTIONS OF THE SYSTEM

This Database Management System for ILL is capable of:

- downloading the borrowed material record from OCLC and uploading the record to the database;
- generating the Copyright Clearance Report;

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PATRON NAME :                               REQ_DATA:  /  /
DEPARTMENT :                               ADVISOR  :
NO. & STREE :                               REC_DATE:  /  /
CITY, STATE & ZIP :                         RETURNED:  /  /
BOOK AUTHOR/TITLE :
PERIODICAL TITLE :
ARTICLE AUTHOR/TITLE :
CITATION :
OCLC:                               CALL#:   ILL_NUM:
SUPPLIER:                           VER SOURCE:
DUE DATE :  /  /   CHARGES :                               VERIF:
COPYRIGHT (REQ:ISSUE) :   :   ARRIVAL DATE :  /  /   STATUS :

```

Figure 5. Arrival Record Appending.

- producing the notification letters to patrons; and
- generating Research Reports for patrons. As the user interacts with dBase III Plus, the system is capable of:
 - producing the borrowing report for collection development;
 - retrieving a record by ILL number, OCLC number, title, request date, or keyword of the title;
 - compiling monthly and yearly statistical reports; and
 - generating overdue reports.

With the application program interface capacity of dBase, several functions of the ILL database system were programmed to be "menu driven." The user needs only to press the function key and the computer will start to perform the specified task (see figure 6). Figure 7 shows the functioning of the system.

AN ANALYSIS OF SYSTEM PERFORMANCE

Unloading Data

When the materials are received, the staff can call up the records from the ILL subsystem to a floppy disk. Using the importing data and the downloading capacity of dBase, the staff can upload the data from the floppy disk to the database. The downloading and uploading tasks are quick and accurate.

Maintaining Data

There are three options under Maintain Records on the Main Menu:

Copyright, 1987

Texas Tech Library
Interlibrary Loan

MAIN MENU

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IHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH;
:INTERLIBRARY LOAN DATABASE MANAGEMENT SYSTEM :
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH<
    
```

- 0 > EXIT TO DOS
- 1 > UPLOAD RECORD
- 2 > MAINTAIN RECORDS
- 3 > NOTIFICATION LETTER
- 4 > GENERATE REPORTS/RESTORE
- 5 > BACKUP/RESTORE

Please Enter a Number

Figure 6. Main Menu.

1. Add New Records: allows the user to enter the record that was not processed through OCLC, such as material requested by mail and requests by telefax machine.

2. Modify Records: enables the user to call up the uploaded record by patron's name or the ILL number to make any necessary change to the record.

3. Reindex Records: allows the user to index the records in the database by patron's name, periodical title, or ILL number after the uploading, adding records, or modifying records tasks have been completed.

Notification Letters

As soon as the uploading, modification, or inputting task is completed, the system will be ready to generate the letters that notify patrons of the arrival of their materials. The name of the patron, department or home address, title of the material, and charges can be pulled up from the database once the record is uploaded (see figure 8).

Generating Reports

Three reports can be generated from the

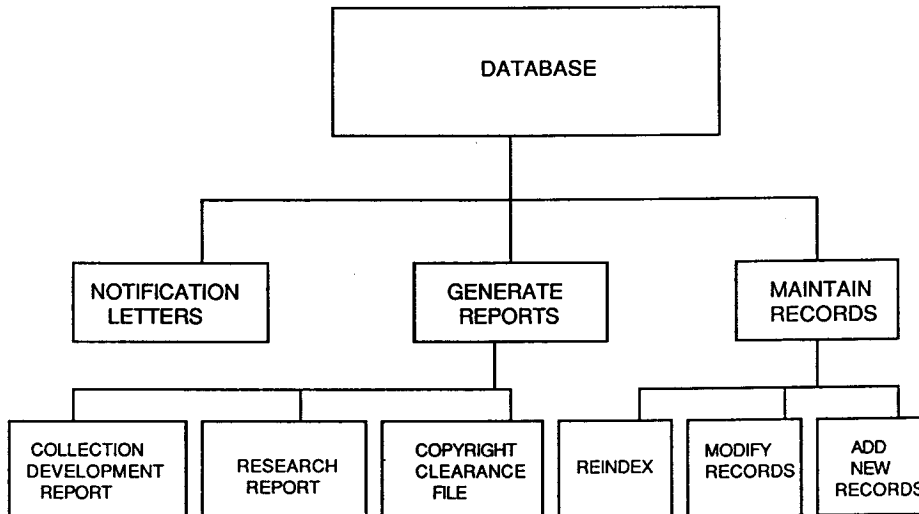


Figure 7. Functioning of the System.

INTERLIBRARY LOAN
TEXAS TECH UNIVERSITY LIBRARY
TEXAS TECH UNIVERSITY
LUBBOCK, TEXAS 79409-0002

BAKER,
SPECIAL EDU.
ON CAMPUS

DATE:02/02/90

The Interlibrary Loan material which you ordered has arrived, and is ready for you to pick up at **CIRCULATION DESK. Please come to the library at your earliest convenience. THANK YOU.

PERIODICAL TITLE : (P) JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION.

ARTICLE AUTHOR/TITLE: KNOFORG, J. "A SEARCH FOR READING DIFFICULTIES AMONG ERRED WORD PROBLEMS"

** PHOTOCOPY IS FOR YOUR RETENTION **

CHARGES : N/C

Figure 8. Notification Letter.

database system; Copyright Clearance Report, Research Report, and Collection Development Reports.

1. Copyright Clearance Report: The system is able to count the serial titles when records have been uploaded or entered in the database, according to their requested dates and the dates of the issues acquired. The report provides the serial title, request date,

date of the issue, and the number of times requested (see figure 9).

2. The Research Report offers a list of materials that have been supplied by ILL to each faculty member and graduate student. This report is sent to patrons at the end of each semester. Title, author, citation, and OCLC number of each item are included (see figure 10). These reports have helped many

PERIODICAL TITLE	COPYRIGHT	COUNT
(P) ACA BULLETIN.	1988:1985	4
(P) ACA BULLETIN.	1988:1984	1
(P) ACA BULLETIN.	1988:1985	3
(P) ACADEMIC THERAPY	1988:1985	1
(P) ACM SIGSMALL SYMPOSIUM ON SMALL SYSTEMS [PROCEEDINGS]	1988:1985	1
(P) ADVANCES : JOURNAL OF THE INSTITUTE FOR ADVANCEMENT	1988:1986	1
(P) ALCOHOLISM: CLINICAL AND EXPERIMENTAL RESEARCH	1988:1986	1
(P) AMERICAN INDIAN ART MAGAZINE	1988:1985	2
(P) AMERICAN SOCIETY OF ANIMAL SCIENCE, WESTERN SECTION MEETING	1988:1986	1
(P) ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL	1988:1984	1
(P) ANTIBIOTICS AND CHEMOTHERAPY	1988:1984	1
(P) APPETITE.	1988:1986	1
(P) ARCHAEOLOGY	1988:1987	4
(P) ARCHIV FUR GESCHICHTE DER PHILOSOPHIE	1988:1986	1
(P) ARCHIVES OF GENERAL PSYCHIATRY.	1988:1985	1
(P) BALLET REVIEW.	1988:1984	1
(P) BEHAVIORAL ASSESSMENT	1988:1988	1
(P) BEHAVIORAL ASSESSMENT	1988:1988	4
(P) BEHAVIORAL ASSESSMENT	1988:1987	1
(P) BRIMLEYANA	1988:1985	1
(P) BRITISH JOURNAL OF ADDICTION	1988:1986	1
(P) BRITISH JOURNAL OF SPORTS MEDICINE	1988:1987	1
(P) BULLETIN (NEW MEXICO STATE UNIVERSITY, AGRICULTURAL EX)	1988:1984	1
(P) BULLETIN OF THE PSYCHONOMIC SOCIETY.	1988:1987	1
(P) CA MAGAZINE.	1988:1987	2
(P) CANADIAN JOURNAL OF PSYCHIATRY, REVUE CANADIENNE DE PSYC	1988:1986	1
(P) CANADIAN JOURNAL ON AGING = LA REVUE CANADIENNE DU VIEIL	1988:1985	1
(P) CANADIAN MINING JOURNAL.	1988:1986	1
(P) CANADIAN SYMPOSIUM ON CATALYSIS (9TH : 1984 : QUEBEC)	1988:1984	1
(P) CANCER LETTERS	1988:1984	1

Figure 9. Copyright Clearance Report.

faculty and students in building their own research profiles, writing a bibliography for research reports, and documenting their research activities. As one faculty member has commented, "it is a quantum leap for the Interlibrary Loan service to generate such a report from the computer."

3. The Collection Development Reports are generated according to the field name of academic departments listed in the database. The report gives a list of titles, with OCLC numbers, and the name of the department. This information reflects needs in the collection. It has helped librarians at the Texas Tech Library to understand the research environment of their institution and make purchase decisions more effectively (see figure 11).

In addition to generating the above reports, the system offers an easy way to retrieve records. For example, a full record can be pulled out of the database with the only infor-

mation supplied being the ILL number, an incomplete title, or the name of the patron. It would not be possible to retrieve such records from the paper file when the record is indexed only by title or by the name of the patron. When a patron needs the citation of an article, the material may have been received months ago and may not have had a complete title entry. Still, this record can be retrieved from the database using a keyword of the title and the embedded searching capability of dBase. Often, Interlibrary Loan receives an invoice from a library that supplies only the ILL request number or the name of the patron and the charge. Using only this abbreviated information, the full record can then be called up from the database.

In managing records, this system offers a systematic method for controlling records, providing an easy way of locating information and organizing records. It has saved time in

TEXAS TECH UNIVERSITY LIBRARIES

INTERLIBRARY LOAN REPORT

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NAME : BHALERAO, M.

PERIODICAL TITLE : (P) PROCEEDINGS /
ARTICLE TITLE : THOMPSON, R. "SUPPRESSION OF MICROSTRUCTURAL INFLUENCES
ON THE ACOUSTIC MEASUREMENT"
CITATION: VOL: NO: DATE: 1983 PAGES: 988-990

PERIODICAL TITLE : (P) THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA.
ARTICLE TITLE : PAO, Y. "ACUSTOELASTIC WAVES IN ORTHOTROPIC MEDIUM"
CITATION: VOL: NO: DATE: 1985 PAGES: 806-812

PERIODICAL TITLE : (P) NONDESTRUCTIVE EVALUATION : APPLICATION TO MATERIAL
S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE : THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUREMENT
OF STRESS"
CITATION: VOL: NO: DATE: 1984 PAGES: 137-146

PERIODICAL TITLE : (P) NONDESTRUCTIVE EVALUATION : APPLICATION TO MATERIAL
S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE : THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUREMENT
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CITATION: VOL: NO: DATE: 1984 PAGES: 137-146

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S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE : THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUREMENT
OF STRESS"
CITATION: VOL: NO: DATE: 1984 PAGES: 137-146

Figure 10. *The Research Report.*Page No. 1
01/05/88

SEMESTER REPORT TO LIAISON FROM INTERLIBRARY LOAN

OCCLC #	TITLE	DEPT
8968609	(P) PROCEEDINGS 6TH INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION, OCTOBER 19-22, 1982, MUNICH, GERMANY	COMPUTER SCI
13861568	(B) NEW COMMUNICATION SERVICES: A CHALLENGE TO COMPUTER TECHNOLOGY	COMPUTER SCI
1445487	(P) IBM SYSTEMS JOURNAL	COMPUTER SCI
1764613	(P) PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON	COMPUTER SCI
12625477	(P) ACM SIGSMALL SYMPOSIUM ON SMALL SYSTEMS: (PROCEEDINGS)	COMPUTER SCI
12418598	(B) THE LOCUS DISTRIBUTED SYSTEM ARCHITECTURE	COMPUTER SCI
1519568	(P) PROCEEDINGS OF THE HUMAN FACTORS SOCIETY ANNUAL MEETING.	COMPUTER SCI
4353174	(P) STALLINGS, W. "COMPUTER ORGANIZATION AND ARCHITECTURE"	COMPUTER SCI

Figure 11. *The Collection Development Report.*

indexing and maintaining records, saving space in storing records, and generating reports quickly and thoroughly.

CONCLUSION

Developing a database system requires some knowledge of microcomputers, data-

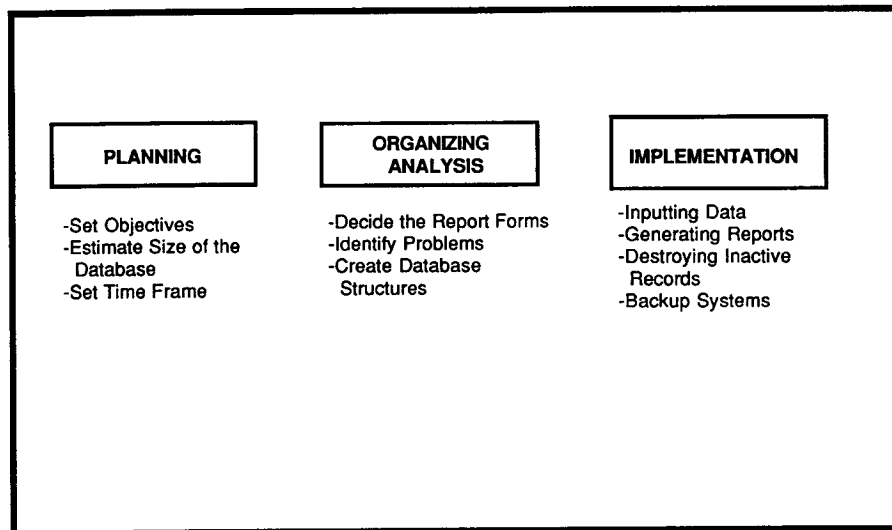


Figure 12. Routine Management of Records.

base structure, and the logic of a program. Since there are many database system packages on the market, one may not need to be involved in the tasks of programming or system design. The knowledge basic to understanding high technology is needed, however, when one is dealing with the problems in developing a database management system and in selecting an appropriate system for the operations. The skill in working with computers will assist the user in analyzing the advantages and disadvantages of a product, utilizing the product to its fullest potential capacities, and understanding the limitations of the system.

In general, a quality software product for a database management system should provide flexibilities that allow users to maintain data, generate reports, retrieve records under various conditions, and offer speed and accuracy in record keeping.

Computerizing a system requires planning, organization, analysis, and implementation. In the planning stage, one needs to set objectives, define the major activities of the system, estimate the size of the database, design a time frame for the project, and choose soft-

ware. In the organizational and analysis stage, one needs to identify the task that originally slowed down the operation and determine the potential for expanding the use of the system in the future and in creating a data structure. It is also important to recognize and identify the users to be served and to decide what kind of information and reports need to be generated from the database. In the implementation stage, emphasis will be on the routine management of records, which includes collecting data, retrieving records, generating reports, and destroying inactive records (see figure 12).

In facing the growth of interlibrary loan requests, dealing with different libraries and policies, verifying obscure requests, meeting user demands, and managing the massive paper files, invoices, and statistics, the interlibrary loan librarian's job is neither simple nor easy to accomplish. However, the database management system developed at Texas Tech University Libraries offers a high-speed, easy-to-use computer system that controls files, maintains records, generates reports, and streamlines the work flow and thus enables the staff to be more productive. ■■