UNIVERSITY LIBRARY MANAGEMENT SYSTEM

BY

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ICS

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DECLARATION

I hereby declare that this work has not been accepted in substance for any Diploma, nor is it being currently submitted in candidature for any Diploma other than Diploma of Computer Science in the Institute of Computer Science , University of Nairobi.

Candidate : _____

Date : _____

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Date : _____

STATEMENT OF ORIGINALITY

I certify that, except where otherwise indicated, the concept, organization and writing of this project is the result of my own independent investigation under the Supervision of Dr. Timothy M. Waema.

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ABSTRACT

The current manual operations of The University of Nairobi Library System are investigated.The shortcomings in the current System are identified and documented. The design of an Automated Integrated Library Management System to correct the deficiencies in the Present Manual System is worked out. A Specifications document for the acquisitions of the proposed System is prepared and presented (**See appendix xix**). Implementation issues for the new System are discussed and proposals made. Any abbreviations and acronyms used in this work are defined in the appendices along with other informative materials.

CHAPTER:1 INTRODUCTION

In this Project Work, emphasis is placed on the analysis of current System and Design of the new System. This emphasis is deliberate because as **Reynolds** (1985) alludes,[1] examination of Library's needs and their critical evaluation is prerequisite for good design. In addition:-

The Library subsystems are so much interrelated and share vast amounts of common data that the study and design of an automated Library System can better be accomplished by a holistic approach. The time available however could not permit the implementation of the system to be accomplished.

Automation of Library procedures nowadays is moving very quickly from the traditional implementation of in-house developed systems to the off-the-shelf packages that are cheap,reliable and provide maintenance service.

The job of systems analysis has been a problem area in many library automation projects, **Veaner(1974)**[2] attributes the problems to:-

* Failure by librarians to understand in full detail the current manual systems and describe them in a manner essential to system design work.

* Inability of the librarians to communicate design specifications and prepare specifications document because of lack of understanding of systems analysis as their education background which until recently has included little or no computer use,mathematics,statistics or technical subjects. Such education does not prepare them to have ability to analyze,evaluate and improve the system.
* Analysts who have no Library experience tend to leave most salient features in the design of the system.
* Finally the automation of the University of Nairobi Library is planned for the near future, so this project will serve dual purpose:- as an academic exercise and as a specifications document for Request For Proposal in the acquisition of the new system.

1.1 The University of Nairobi

The University of Nairobi is the oldest and the largest of the four Public Universities in Kenya in terms of physical size and student enrolment.

1.1.1 Historical Background

In 1951,the Colonial government granted a Royal charter to establish what was then referred to as Royal Technical College.

Later in 1956 the Asian Community in East Africa and the Colonial Government pooled resources to set up what was later to be known as **The Royal Technical College of East Africa** incorporating The Gandhi Memorial Academy.

In 1961 the Royal Technical college became a constituent college of The University of East Africa under the name Royal College Nairobi.

In 1970 by an Act of Parliament The Royal college Nairobi was transformed into a fully fledged University and came to be known as The University of Nairobi.

Today The University of Nairobi is spread over 7 campuses within 6 colleges. The University also has 6 institutes and 2 schools.

The number of students and staff of the university has risen steadily since 1971 from 2,362 to 17,500 in 1993, according to the **University of Nairobi Calendar (1989/90**[3]**)** and the current statistics from University.

1.1.2 Objectives of The University

The concern of developing nations is how to bridge the technological gap between developed and developing countries.A primary agent in this process is the University.The University library which is aptly referred to as the 'heart of the University' **Carter (1966)**[4] obviously has significant contribution to make.

The University of Nairobi is modelled upon the metropolitan Western University. However it subscribes to the objectives of the Accra Conference of 1972 on 'A Truly African University'.Yesuf (1973)[5] lists the objectives of the University from this Conference as:-

Pursuit,promotion and dissemination of knowledge,
Research,
Provision of intellectual leadership,
manpower development,
Promoting social and economic modernization and
Promoting intercontinental unity and international understanding.

According to University of Nairobi Calendar(1989/90)[6],the University is also guided by the objectives set out by the University Act of 1970. According to this Act the objectives of the University of Nairobi are:-

To participate in the discovery,transmission and preservation of knowledge and to stimulate the intellectual life and cultural development of Kenya,
To promote directly or in collaboration with other institutions of higher learning facilities for University education,including technological and professional education for research,
To conduct examinations for and to grant such academic awards as may be provided for in the statutes,

To determine who may teach and what may be taught in the University.

Subject to the University's Act to cooperate with the government in the planned development of University education and in particular to examine and approve proposals for new facilities, new departments,new degree courses or new subjects of study submitted to it by constituent colleges or other post secondary institutions.

1.1.3 The Organization Structure

Information Systems when implemented, become institutionalized and inextricably entwined within the organization context. By studying the organization structure the objectives of the organization,those of the information system and peoples objectives can effectively be aligned to produce a system that is technically and socially acceptable.

Appendix (i) shows the University's Administrative structure and the relationships between departments.**Appendix (ii)** is the Key to Appendix (i).

1.1.4 Existing Management Information Systems

The design of The Library Management System for the University need to be cognizant of the existing automated systems in the entire University establishment for the purpose of future networking to facilitate resource sharing.

According to Moturi (1992[7]) , The Institute of Computer Science has implemented/developing or has earmarked for development the following systems:-

The Payroll,
General Ledger,
Stores,
Pensions,
Admissions,
Transcript,
Examination Registration,
Bursary Scheme,
Undergraduate Nominal Roll,
Fixed Assets,
Room Allocation,
Personnel Records,
Tender,
Postgraduate Nominal Roll.
Library System
Bookshop System

Some of the above systems for instance(Admissions,Room allocation,Nominal Roll) are of direct consequence to library as they reflect the Library requirements at various sites and the University as a whole.

1.2 The University Library

The Library is the core of the University. As a resource, it occupies the central and primary place because it services all the functions of the University of teaching, research, creation of new knowledge and transmission of learning culture of present and past.

1.2.1 Goals & Objectives of The Library

The primary objective of the University of Nairobi Library as set out in the University of Nairobi Act of 1985 section 7(1)[8] is to provide the most relevant and up to date information to support the parent institution in order to achieve its objectives of teaching and promoting research. Accordingly the Library's services are designed to facilitate the achievement of these objectives. Specifically the objectives of the Library are to support :-

Teaching programs,

Research and advanced study,

Learning process

1.2.2 Physical Organization,Structure & Staff Responsibilities

Like The University, the Library is decentralized to 12 sites inclusive of the Main Library which is situated at Main campus.

The Location of the other Libraries from the Main Campus range from 0.5 Km to 21 Km.Each of these Libraries specialize in a given information provision or another depending on the courses offered on site.

Organization Chart

Appendix (iii) is the Organization chart of The Library highlighting components of departments and units which make up the organization. The relationship between departments is described in the Data Flow Diagram **Fig. 1.**

The Main Library of The University houses the offices of The Librarian,The 2 deputies,Centralized technical and reader services of Acquisitions, Card Production, Africana Collection, Computer Services, Archives, Union Catalogue and Bindery. The other services of Cataloguing Circulation Shortloan and Photocopying are replicated in other branch libraries. The Main Library in addition houses Law of the Sea Documentation which is set to become regional centre for Eastern and Southern Africa when fully developed according to **Kimani (1993[9])**

Staff Structure & Responsibilities

The staff structure of the University Library is shown in **Appendix (iv).** The staff responsibilities described below.

The Library is organized on pyramidal hierarchical structure with strong departmental bias.This is an application structure with some operations such as acquisitions and Card Production centralized. Each department specializes in some functions.

The University Librarian

The University Librarian is among other functions responsible for policy, planning, preparation and control of the budget.

The Deputy University Librarians

There are two deputy librarians, one in charge of technical matters and another in charge of personnel. They assist the Librarian in the discharge of her duties. In addition each has his/her own designated responsibilities.

Senior/College Librarians

The senior or College librarians head college libraries or one of the central technical service sections. The college librarians are concerned with the overall management of the college libraries. The senior librarians are concerned with management of services and staff falling under that section and they in addition deputize the college librarians. The senior archivist is responsible for the overall management of the archives.

Librarians

Librarians/Archivist are involved in the day to day running of the sections and assist the senior librarians in their duties.

Senior Library assistants

Senior library assistants perform any general duties as may be assigned by the librarian or senior librarian.

Library Assistants

The library assistants are responsible for answering general enquiries, issue and return of books, file and pull borrowing slips, clearance, overdue notices and many others.

Others

The rest of the staff shown in the structure do not come into direct contact with the users.

1.2.3 Structure and Staffing of Library sections

The Library is divided functionally into a number of sections.

(i) Circulation

The Circulation section chart is shown in Appendix (v).

The current manual Circulation Control System is made up Reference,Photocopying,Reserve,Issue Desk and Security subsystems.

The Circulation section is headed by a senior Librarian who is assisted by a Librarian. There is a team of Library assistants and library attendants. Security personnel are deployed to man the entrance and the Cloakroom.

(ii) Acquisitions

The divisions making up Acquisitions System and the relationship between them is shown in Appendix (vi). The staff structure is similar to that of Circulation.

(iii) Cataloguing

For the purpose of performing its functions the unit is divided into 7 subunits as shown in Appendix (vii) namely:-

Searching,

Shelf-Listing,

Added copies,

Original cataloguing,

Subject heading unit,

Physical processing unit and

Reprographic unit.

The staffing hierarchy is similar to that of Circulation.

(iv) Periodicals

The section structure is similar to the one for Acquisitions and staff hierarchy is as described in Circulation.

(v) Library Accounts

The section structure for Library accounts is shown in Appendix (viii).

The section is headed by an Accountant under whom work an Assistant Accountant, Accounts Assistants and Accounts Clerks.

(vi) Archives Systems

The section organization chart is shown in Appendix (ix).

The section is headed by the Senior Archivist. Under him are:- Archives assistants, a Photographer and an attendant.

1.2.4 Scope and Coverage

This Project Work covers mainly analysis and design of Circulation Control System, Acquisitions System, Cataloguing System and Periodicals Control System. Accounts System and Archives System are covered in the investigation and analysis.

In this Work the word University Library is used to mean The Main Library of the University of Nairobi and the University refers to the University of Nairobi.

1.2.5 Literature Review

Literature has been extensively reviewed.Though a lot of works exist in the area of Library automation ,these works are of general nature and any Library anticipating automation of its procedures needs to perform detailed system survey specific to its own situation. This project takes this view into consideration.

A number of projects have been done on Library Management Systems at The Institute of Computer Science but have the following limitations:-

They tend to focus on the Circulation System and forget to tackle other systems in the Library on which circulations Functions solely depend.

The salient requirements of library are inadequately covered most probably due to lack of familiarity with Library operations.

The systems developed have focussed on very small libraries which in most cases have small stock,limited clientele and deal with specific information sources.

Integration has not been tackled.

1.2.6 Library Users' information needs

The University Library is primarily for staff and students. However the Library extends the services to some members of the public at the discretion of the University Librarian. Such outside users include;members of the professional institutions with whom the library has special arrangements,graduate of various Universities,Secondary School teachers,Government officials and people engaged in research. According to the University Calendar [10] (1990) and the current registration files,the Library caters for about 20,000 borrowers inclusive of Students,Staff and Outside borrowers.

Due to diversity of users ,their information needs are quite broad and varied. The users information demands include:-

Research
Problem solving,
Planning,
Recreation,
Study and Learning
Examinations purposes.

1.2.7 The Library Stock

According to Kimani(1993)[11], the total bookstock for the University library is 352,196 volumes with 150,000 bound periodicals.Current periodical subscriptions stand at 1,200 titles per year.

The Main Library is designed to accommodate 1,000,000 volumes and has a seating capacity of 1,330.

Bound periodicals are unclassified and arranged by title with the Kardex as the key to locating the Library's holdings. All books are catalogued using AACR2 for original cataloguing and the MARC records on Microfiche for other books.

The Library holds different types of materials which include; books,periodicals,microfilm sets of Kenya Parliamentary debates,Newspapers,Magazines,Theses,Dissertations,Reports, Pamphlets,Conference papers, photocopies and other paraphernalia.

The Library also is a designated Legal Deposit for materials published in Kenya as well as UN,FAO,ECA,GATT,UNESCO and UNEP.

Classification of books is accomplished using the Library of Congress Classification Scheme.

1.2.8 Existing Computerized Files

The University Library maintains computerized data bases for searching using CDS/ISIS Information Retrieval Package.

The Databases on computer are:-

Union List of Periodicals: This is a listing of periodicals in Kenyan Libraries.The List shows the titles,volume numbers,year and locations.

Institute for Development Studies(of The University) Research Works.This consist mainly of Working Papers, Occasional Papers and Sessional Papers.

Shortloan Collection:- This consists of list of books,photocopies,examination papers,pamphlets that are on Reserve in the Library.

Law Database:- This is list of selected articles from leading Law Journals.This database is still under development.

Theses Database:- This is list of theses held at the University of Nairobi Library.

Searchable databases on CD-ROM:- These include Science Citation Index,Social Science Citation Index and Engineering databases

1.2.9 Existing Hardware & Software

The University Library is in possession of the following equipments:-

4 stand-alone IBM compatible microcomputer with an Intel based microprocessor, 20Mb hard disk memory each,dual disk drive and a monochrome monitor.

IBM compatible File server with 70Mb hard disk memory linked to 4 workstations in a network.

Super 5 EP-1805 Epson, Epson FX 850 and IBM Proprinter XL24 Printers.

2 Hitachi CD-ROM drives.

ASM 416 False Save UPS.

The Library has installed the following software packages:-

CDS/ISIS,

Novell Netware,

Word Perfect 5.1, Wordstar 4.0,

Dbase iii Plus,

Lotus 1-2-3,

Multimate.

Easy flow

Formtool

1.2.10 Problem Definition

The expansion in student enrolment at the university consequent upon the implementation of the 8-4-4 education system at the university in 1990 and the decision of the Kenya government to provide higher education to as many Kenyans as possible has greatly stretched the manual library facilities beyond their operational capacity.

According to **The university Calendar** (1990)[12], prior to the new system of education the student population stood at about 11,000. Today the student population is about 17,500.

Inspite of the increased numbers at the University,available statistics show that the library budgetary allocation has decreased in real terms during this period. In addition the student book allowance has remained constant against rising cost of books.

The implications of this scenario has been increased pressure on the use of library facilities by students who can barely afford any of the books to support their study. The demands placed on the library can not be adequately fulfilled.The present manual system can not facilitate efficient management of stock to ensure equitable circulation of materials to all.

Library functions by their very nature are repetitive,tedious,labour-intensive and error-prone.

The University of Nairobi Library because of its sheer size in terms of bookstock and the users is experiencing acute problems reminiscent of failing manual systems.These problems include;backlogs,poor file maintenance,long queues at service points,low staff morale,lost borrower records and general inefficiency in operations.

Therefore the present manual systems at the University Library is inadequate in many ways.

1.2.11 Feasibility Study

The recognition for the need to automate the University Library is not absent in the minds of the management of the Library.

However very little or no attempt has been made to establish the feasibility of a computer project at the Library.

The author therefore feels obliged to briefly look at the viability of the organization to support computer systems.

(i) Technical Feasibility

The major concern here is whether the proposed system can be implemented given the existing equipment in the organization or on the market and whether the available equipments if any can cope with extra demands placed on it by the proposed system.

The university Library does not have equipment that can support the automation of procedures envisaged.However, there are quite many off-the-shelf turnkey systems on the market with powerful features that meet many Library automation needs.These include such big names as DEC's Libertas,GEAC's GEAC system,BIBLIOTECH's Bibliolend, MCDONNEL's Urica ,IBM's Dobis Libis and IME's Tinlib.

The Library can therefore technically implement a computerized system using the existing Systems on the market.

(ii) Economic feasibility

The issue here is whether the benefits that accrue from the introduction of a new system will outweigh costs of its introduction.

A survey of many Library projects that have been documented has shown that benefits far outweigh the costs of developing and running the system.

In particular Library automation has shown to facilitate introduction of new services,contain costs and improve on operational efficiency.

(iii) Operational Feasibility

This has to do with whether the system would be used if it were developed and installed. An interview with staff at various levels of organization shows clear dissatisfaction with the current manual system so any improvement in the present system appear quite welcome.

(iv) Motivational Feasibility

This concerns with the desire of the organization to introduce the new system. Library management has taken keen interest in training its staff both overseas and locally in information technology in preparation for the automation of its Library procedures. So quite a good number of staff are conversant with what automation can offer and they are looking forward keenly to the Library's automation.

(v) Schedule Feasibility

This concerns with whether the proposed system development work can be completed within time schedule and with the resources allocated to it.

The University Library has well trained staff at various levels in Library science.

The expertise to see automation through is therefore available. This project work which is given a time limit of three months can not achieve much in terms of implementation but efforts will be made to come up with detailed requirements and design specification for the Library automated system.

1.2.12 Project objectives & Solutions

This project proposes a Computerized Library Management System to address the deficiencies in the existing manual system and in particular to:-

Allow expansion to cope with foreseeable increases in stock, borrower numbers and transaction loads,
Provide statistics for planning,
Increase productivity in the phase of decreased budget,
Be easy to use for both staff and users,
Improve collection circulation through variation in loan period and quide acquisition procedures,
offer improved and new services to the users,
Contain operational costs,
Reduce backlogs in clerical functions,
Improve management information,
Speed up processes of circulation,cataloguing,acquisition and periodical controls,
Commit the library to the use of technology,
Provide solutions to existing problems and any anticipated ones

Maximize use of the Library's resources and ensure an equitable access to the collections by those who need information,by providing multiple access points to library records.

Provide the most relevant and up to date information to its users to support their needs.

Provide accountability resulting from better control over library materials and services through the availability of more current and comprehensive files and faster and more accurate notices and reports than the manual system.

Provide better security of Library files and materials.

1.3 Outline for the rest of Project Work

Having looked at the Parent Organization and the Library environment that support the current System,what follows is an Outline of how the rest of the chapters in this Work are organized.

Chapter two discusses the techniques and tools of system investigation,analysis and design that have been used in this work. The rationale for the choice of these tools and techniques is explained. Chapter three investigates and analyses the current system procedures using the analytical tools and techniques identified in Chapter two. The problems in the current systems are identified. The requirements for the current and future systems are given.

Chapter four discusses the specifications and design of the new system to correct the existing problems in the current systems taking into consideration desirable design criteria. Emphasis is placed on input,process,output and database designs. Chapter five discusses implementation issues for the proposed System. Limitations and the strengths of this project are identified.

Appendices and Bibliography are given at the end of this Project Work.

CHAPTER:2 METHODOLOGY

Notations

The basic symbols that were used in the investigation,analysis and design of this work are depicted in Fig.2

Systems Development Lifecycle

The systems approach to the study of information systems is inter-disciplinary and the methods employed are many and varied. The methodology used in this Work was structured systems analysis and design keyed to the systems life cycle of :-

Problem Definition,

Feasibility study,

Analysis,

Design and

Implementation.

This approach was chosen because it forces stepwise progression in a careful, methodical fashion completing a number of well defined exit criteria for each step.

Tools & Techniques

Fundamental to all methods of analysis and design is the model for effective understanding of the problem so that the solution can become readily apparent.

In analysis and design there are many different aspects and inter-related problems which have to be tackled together.

This diversity necessitates different representation of the same problem area in order to define what the fundamental features are.

This required that the system be modelled using different methods.

2.1 Preliminary Investigation

This is usually the first stage in the Systems Development Life Cycle following recognition of a problem in the existing system.This is followed by gathering facts about how the system works using different fact-finding methods.

In this Project the following methods were used:-

Document review,

Interview

Observation.

2.1.1 Document Review

A number of documents were reviewed at the beginning of the investigation about the existing system to discover departmental organizations and relationships,functions,staff structure and responsibilities,staff qualifications, inputs,processes and outputs from the systems.

The documents reviewed included:-

Organization charts

Annual reports

Procedure manuals

Job description manual

User guide.

This method helped:-

Identify staff who later were important sources of information,

Determine what the system ought to accomplish and what in actual fact was being accomplished,

Determine documents and forms used by the system and discover any redundancies,

Discover history of the organization and the overall organizations and its operations.

2.1.2 Interviews

Interviewing is a method of eliciting information verbally through questioning. In this Work those interviewed included:-

Top management for policy

Middle management for departmental objectives and procedures,

Operational staff and different categories of users.

Both structured and unstructured interviews were used to collect information.

Structured Interview employed standardized questions.

Structured interview was used because:-

There was uniformity in wording to questions for all interviewees,

It was easy to administer and evaluate,

It took me shorter times,

It proved relatively cheaper.

The unstructured interview is a method which allows free flow of ideas. It was used alongside structured interview because:-

It was more flexible in wording of questions,

It facilitated exploration of topics as and when they arose,

It provided information that may have been overlooked,

It took shorter times to set up.

Interviewing was particularly preferred because:-

It helped overcome some resistance,

It was used to understand peoples feelings,attitudes and beliefs,

It yielded much data,

It helped minimize ambiguous response

It verified information gathered by other methods.

2.1.3 Observation

Observation involved watching operations to see exactly what was happening.

In some cases the author was involved in the actual participation of the work. Emphasis was placed on timings,work flow,volumes,bottlenecks and behaviour of staff involved.

Observation was used because:-

It gave an in-depth understanding of what, how and why of the activities,

It helped overcome biases,

It helped verify accuracy of information gathered by other methods,

It enabled the environment under which work takes place to be seen.

It helped determine group behaviour.

2.2 Systems Analysis

During systems analysis and design a great deal of relatively unstructured data was collected.It was necessary that this data be summarized so that it could simplify communication with the user. A number of analytical tools were used in representing this information. They included:-

Data flow diagrams

Data dictionary

Decision Tables.

2.2.1 Data Flow Diagrams

A Data flow diagram (DFD) is a graphic picture of the logical system.

A DFD was particularly useful for analyzing the system.

It showed in a pictorial manner the network of data flows between external bodies and internal storage and its processing.

DFD was particularly preferred in analysis because :-

it simplified communication between Myself and the users. As a result users got involved in describing and designing the system,

it showed visually where data originated,how it was processed and what happened to it,

the absence or presence of a given data source or destination could be verified at a glance,

it provided logical overview of the entire system,

Helped me generate reasonable solutions to a problem,

Helped me organize information about the system, and the very act of creating DFD forced me to summarize information,extract key details and consider relationships between details,

the contents of the data flows and data stores presented me with a base for developing a data dictionary and

DFD was later used in the design work.

2.2.2 Data Dictionary

A Data dictionary is a collection of data about data. A Data Dictionary is a complementary tool to a DFD.It describes in detail all data elements which are referenced in the DFD.

A data Dictionary is a useful tool in analysis because it provides information on the definitions,structure and use of each data element an organization uses.

In this Work data Dictionary was used for the reasons given above and for the fact that:-

It helped establish communication by establishing consistent definitions between broad segments of an organization,

For large programs involving efforts of several programmers, developing data descriptions from a common data dictionary generally ensures that potentially serious module interface problems can be avoided,

In developing new applications, the analyst can check the required data elements against the organization's central data dictionary saving time of development and avoid data redundancy,

Programs using a given element could be cross-referenced in the data dictionary,thus it became easy to assess the impact of a change in the data ,

Data dictionary helped in developing a database,

It helped locate and correct errors and omissions

2.2.3 Decision Tables

A decision Table is matrix of rows and columns made up of conditional statements,conditional entries,action statements and action entries.It lists all the contingencies to be considered in analysis of a system together with the corresponding actions that have been taken.

Decision Tables were used here because:-

They were necessary in describing multiple nested decisions which could be difficult to describe using some other tools.

They gave clear and concise picture of the program logic.

2.2.4 Flow Chart

A Flow Chart is a graphical representation of program logic.

Flow Charts were used here because:-

They have some desirable features as an analysis and design tool. In particular they illustrated logical flow of information at a glance.

They Clarified elements of Structured English and were useful for decision based algorithms where there were more than one alternative.In addition they:-

acted as a memory aid to me,

generally are independent of any specific language,

are generally accurate as a base for cost estimates and

they are good at providing a picture of how the system under study can be implemented.

2.3 System design

System design like analysis has many tools that were used to accomplish activities at this stage of SDLC. These tools were important for communication,system documentation and maintenance.

2.3.1 HIPO Charts

HIPO is an acronym which stands for Hierarchy-Plus-Input-Process-Output.HIPO chart consist of two parts namely;Hierarchy Chart and IPO chart.

The Hierarchy chart identifies system modules by number and in relation to each other,it may have description of each module and it serves as a visual Table of contents.

The IPO chart, for each module or function shows inputs,process logic and outputs.

The HIPO technique was chosen as a design tool because:-

By using it a design could be refined and flaws corrected prior to implementation,
Hierarchy and IPO charts are generally used in writing and maintaining the programs,
IPO charts were used to document the system and served as a communication tool by showing from left to right the inputs,processes and the outputs for the entire system.

2.3.2 Structured Charts

Structured Chart shows logic of a system on hierarchical basis.It partitions the system into modules and shows relation between modules.

Structured Chart has three basic elements:- module,connection and couple.

Structured charts were chosen as one of the design tools because:-

Given Structured Charts one could easily evaluate data coupling,
They are generally useful in grouping related fields,
They were used to verify design,
They were excellent in keeping track of data flows and
Facilitated program modularity.

2.3.3 Structured English

Structured english expresses process logic step by step more clearly and understandably than narrative english. It uses limited vocabulary and precise grammatical form which include active verbs, terms defined in Data dictionary and certain reserved words from programming languages.

Structured English was used in this Work because:-

Since its base is English, users found it easy to follow,
It was useful in describing an algorithm especially when user communication was necessary and
Since it resembles programming language programmers tend to find it easy to understand.

2.3.4 Entity-Relation Modelling (E-R)

E-R model is a graphical tool/method of representing entities, attributes and relationships. E-R is a tool that aids production of a logically consistent database design.

The E-R model was used for the design of the database because:-

It has a graphic orientation so it was easier to understand,
It showed individual entity occurrences and their relationships,
The relations modelled in E-R approach were more explicit,
E-R were used for documentation and
E-R gave a view of the organization reflecting data in the business.

CHAPTER:3 SYSTEMS ANALYSIS

3.1 Description of Current System

The procedures of the current University Library system are manual based. Given the size of the Library,large files are kept.These files consume much time to maintain,are tedious to handle and prone to errors.

3.1.1 Circulation Control System

The Circulation Control System is charged with the overall responsibility of managing loan and loan records as well as stock control.

The Objectives

The prime objective of the current Circulation Control System is to keep materials circulating to as many of the Library's patrons as possible by operating an efficient system of loans and returns.

Other objectives include:-

Maximizing the use of the Library's resources and ensuring an equitable access to all the necessary course and research materials to every one concerned,
Facilitating physical access to Library materials and encourage their fullest use,
Responsibility for physical custody of the books,
Accurate arrangement of books on the shelves after their use.

To meet the above objectives the Circulation System performs the following functions:-

Registration of users and maintenance of the records of the Library Patrons,
Issuing overdue notices,
Operating reservation services,
Computation of statistics,
Calculations of fines,
Determining what is currently in circulation
Charging and discharging Library materials,
Handling interlibrary loans,
Clearance of staff and students,
Answering enquiries.

3.1.1.1 The Processes

Performing Circulation functions requires the processes listed below:-

Issues (refer to Flow Chart Fig.3 for the procedure)
Returns (Refer to Flow Chart Fig.4 and Decision table Fig. 5 for further details)
Reservations
Recalls (For details refer to Decision table Fig. 6)
Renewals
Registration
Enquiries
Clearence

Inter-library loans

Fines (See Fig. 5 for details)

Producing statistics of use

For detailed description of the above processes refer to entries in the Data Dictionary Fig.7

3.1.1.2 Data Description

(a) Input Data

The inputs to the existing manual Circulation System are:-

Borrower Names,

Borrower Id number/Registration number/Staff number,

Author of Book,

Title of Book,

Signature of borrower,

Book number,

Address,

Enquiries,

Names of reservees,

Date due,

Department,

Designation,

Address

Graduate-of,

Authority- by

The other details about inputs are depicted on Registration forms,Borrower forms Data Dictionary entries in Figs 8a ,8b and registration forms and borrower forms Appendices x and xi respectively.

(b) Output Data

The outputs from the Circulation system are:-

Issues,
Discharges,
List of items on loans,
List of reservations,
List of overdue notices and books,
Statistics of use daily,weekly and monthly,
Recall notices,
reservation notices,
Fines payable,
Loan entitlement,
List of borrowers by category
(UG,PG,Academic,OB,Staff,ILL),
List of registered users,
Expiry of user registration,
List of Blacklisted users,
Date of registration,
Year of entry

(c) File Data

The Circulation Control System maintains multiplicity of files to support its functions.

The details of the files are described in the Data Dictionary entry for entities Figs 9 and 9a . Some of the files not adequately covered in the Data Dictionary are described below.

Borrower File

This is an alphabetical file of borrower Names with the Surname first. The Borrower file in actual fact consist of 5 different files namely:-

Postgraduate student file

Undergraduate student, Outside borrower & Interlibrary Loans file

Academic staff file

For the purpose of designing the database the different borrowers are considered as single entity.

Registration file

There are separate files for:-

Undergraduate Students

Postgraduate Students

Academic Staff

Outside Borrowers

Intelibrary loans

Readers only

For the purpose of designing the database, the file is considered as one.

Defaulters File

This file is for those users who have been blacklisted or barred altogether from using the library.

Each record in the file consists:-

Name of user,

Date,

Reasons for blacklisting,

Action taken.

Cleared file

This file stores records of users whose membership with the library has been terminated or expired.

The contents of the records in this file are similar to the contents of registration file.

Revenue Delivery file

This file contains details of any money collected by Circulation staff which is eventually delivered to Accounts section.

Each record in this file consists of:-

Date,

Vote number to credit money,

Subject,

Amount(Kshs),

Payment- for,

Staff name collecting money,

Stamp of the University library.

Statistics File

This file contains statistics of use of the library. Each record contains:-

Date,

Number of readers in library on half-hourly basis,

Number items borrowed by Undergraduates,Postgraduates, OB's, Academic staff,non-academic staff and Interlibrary loan partners daily,weekly monthly and yearly.

3.1.1.3 The Problems with the Current Circulation System

The multiplicity of files kept by circulation system results in enormous duplication of data elements and makes maintenance very difficult.

The problems experienced with the voucher system are:-

Readers spent too much time filling the slips,

Patrons find it difficult to identify correct positions on slips to fill in required information.So many slips are incorrectly filled giving rise to many errors in the entire circulation process.

Dividing and filing slips and subsequently un-filing them by staff is tedious and time consuming,

The resultant records file composed of flimsy pieces of paper with high proportion of them inaccurate or illegible is clumsy and inefficient to use.

The whole process of loaning out items is slow resulting into long queues at the service points leading to frayed tempers on the part of users and consequently loss of morale by staff.

Because of staff inability to keep up with filing of loan slips there are usually large piles of slips waiting to be merged into circulation file.This makes it difficult in answering queries relating to status of items.

insufficient staffing levels to run all but the most basic circulation services.

There is lack of security both for records and library materials with records often destroyed,lost or misplaced.

The manual system is wasteful of stationary.Most documents once used can not be used again.

The manual system provides poor storage facilities that are bulky insecure and uneconomic.

Poor statistics. statistics kept are unreliable as they are usually estimated or very often exaggerated.

Users are often fined wrongly.

It is difficult to perform reservation service effectively as there is limited number of readers that can be queued on the same slip.

3.1.1.4 Requirements for future Circulation System

Issues

Loan period may vary by patron group, item type and library collection within the library.These categories should be easy to change online by staff member with proper authorization.

The system should provide for machine-scannable label for items to be checked out. The system must accept keyed data for both item and patron identification numbers.

The system should be able to calculate date due automatically taking into account holidays,weekends and other days when the library is closed.

Library staff with proper authorization may override the calculated date.

The system should be able to handle different category of users e.g undergraduate,postgraduate,academic etc.

Handle reservations logged or waiting collection.

Handle breaches of library regulations.

The system should produce a date due label for the patron.

The system should allow materials to be checked out to bindery.

Control of borrowing above predetermined limits.

Allow renewals with or without the book.

Creation and maintenance of a blacklist of defaulters.

The facility to set different circulation control parameters for different categories of stock and user.

Returns

Items may be checked at any library in the system assuming a network environment.

The system should automatically calculate fines payable on overdue items and produce overdue notices.

Fines may vary by patron group and item type.

Staff with proper authorization may forgive fines or change their amounts.

All evidence of patron association with any particular item will disappear from the system and from all the records at the time the items returned.

Renewals

Items may be recovered by telephone if the patron supplies his/her name and identification number of items to be renewed.

Renewal policy may vary by patron group,item type,library collection and library.

Library staff with proper authorization may override renewal policy

Reservations

Patrons and library staff may place materials on hold.

Hold policies may vary by patron group,item type,library and library collection.

A library staff member with proper authorization may override the hold queue.

The system will automatically generate recall notices for circulating materials placed on hold.

A separate fine policy may be set for recalled materials that are not returned promptly.

Reservations must be automatically flagged and reserved items trapped on return.

Prevention of renewal of reserved items.

A user must be able to record a reservation at a public access terminal.

The system must be able to handle reservation queues.

Patron information

System will accept machine scannable patron data or patron data may be keyed in by an authorized staff member.

The patron record format may be tailored to meet the individual library needs.

Library staff with proper authorization may review patron information.

System should allow patrons to view listing of materials checked out by keying in their names or identification numbers.

System should be able to produce lists of items on reserve by author,call number,title and user name.

Produce statistics in many formats relating to:-

* Number of registered users.
* Number of issues hourly,daily etc.
* Number of reservations weekly,monthly etc.
* Number of overdues weekly, daily monthly etc.
* Number of renewals daily,weekly,monthly.
* Number of interlibrary-loans weekly,monthly etc.
* Analysis of stock use and non-use.

Other Requirements

The system should be able to block illegible people from borrowing.
The System should allow staff with proper authorization to override patron blocks.
Provide management information on the utilization of the collection.
Allow posting holds on all materials in circulation.
Ability to access patron accounts for current and past fines.

Produce circulation statistics weekly,monthly and yearly on frequently used materials,borrower type and by location.

System should be easy to use by staff.

Records should be accessed online by a variety of access points.

Records for both items and patrons should be bibliographic and numerical.

The system should have capacity to store all loans records and cope with future stock increases,borrower numbers and transaction loads.

The system must handle recording of loans to other libraries and the associated administration e.g overdue notices.

The facility to record the loan to a University Library user of material borrowed from other libraries.

Creation and maintenance of historical records of material requested from other libraries and of the status and location of users.

3.1.2 Acquisitions Control System

Acquisitions involves all tasks related to obtaining all library materials.

Objectives

The main objective is to acquire reading materials for the University through purchases,gifts,exchange,legal deposit and United Nations Deposit.

3.1.2.1 The Processes

The processes that facilitate the acquisitions procedures and functions are :-

Selection

Verifying order

Ordering

Receipting (For procedure refer to DFD fig.10)

Claiming

Fund accounting

Enquiries

Cancelling orders

Reports & accessioning

Weeding

Gifts and exchange processing

Book trickering

Detailed description of the processes are given in the Data Dictionary entry for processes Figs 10a and 10b.

The processes not covered adequately in Data dictionary entry are narrated below.

Selection

Selection is usually done by departments who submit their request for purchases to the Acquisitions section of the Library on prescribed forms similar to order forms.

Verifying the order

The selections from the department are verified using various bibliographic tools such as bibliographies,Publishers catalogues.

3.1.2.2 Data description

(a) Input Data

Inputs data to Acquisitions listed below include:-

Author,

Title,

Edition,

Place of Publication,Publisher,Year of Publication,

Supplier Name,address,order number,ISBN,Invoice number,

Department requesting,University address,Vote number,

New orders,

Queries.

Amending existing orders

Other details of input are depicted in the input order form,claim form and invoice form (**see appendices xii,xiii,xiv**).

More details are shown in the Data Dictionary entry for attributes **Fig.11**

(b) Output Data

The outputs from the Acquisitions systems include:-

Order forms to suppliers,

List of items on order,

Departmental accounts orders,

Claims notices,

Payments,

Error reports,

Statistical reports,

Accession numbers,

Cancelled orders,

List of items received through exchange.

(c) File Data

The files that maintain the Acquisitions functions are listed below:-

Standing order file

On order file

Supplier file

Invoice file

Claims file

Donor file

LPO file

Book-vote

Exchange partner

Publisher-catalog

Payment Voucher

Licence

Kardex-record

The details about these files are described in the Data Dictionary entry for entities **Fig.12** Other files are described in the narrative below.

Standing Order file

This file consists of records of items that have to be supplied to the library whenever they are published.

The file remains permanent until the order is cancelled.

The records in the file consists of:-

Supplier name,

Order no.,

Date of Order,

Publisher,

Title,

Call number,

Location,

Year of publication,

volume,

Issue numbers,

Invoice date,

Invoice no.,

Date received,

Amount,

Frequency.

The records on this file are arranged alphabetically by the Supplier's Name and under each supplier by the author/title of the item.

Requests file

This file consists of requests for purchases from departments. Each record consists of:-

Date,

Department,

List no.,

Call number,

Author,

Title,

Edition,

Year,

Publisher,

Place,

Unit price,

Number of copies,

Source of information,

Recommender,

Order number,

Suppliers,

Date of requests.

Statistics file

This file consists of statistics relating to the number of orders placed and the orders received.

Each record in the file consists of:-

Date,

Number of books ordered,

Number of books received,

Books received through exchange,

Books received through gifts.

3.1.2.3 Problems with the current Acquisitions System

Many of the problems of manual Acquisition system are akin to those in Circulation system resulting from increased number of files that are again heavily duplicated. Because of the multiplicity of files:-

There is increased time to process materials,

There are many errors in processing orders,

Backlogs of materials awaiting processing,

There is continued need for more staff to operate the system,

The system can not generate the necessary statistics and reports needed for management decision making.

There is excessive duplication of data across the many files supported,

There is duplication of efforts,

Files are too large to manage.

In addition the manual Acquisitions system experiences the following problems:-

* The current system can not verify that the cost billed is the current one hence staff simply quote the amount on the invoice.
* information on vendors performance can not be produced by the current system so it makes it difficult to compare vendor performance.
* Records missing when books received.
* Books get to readers long after they are received due to the slow nature of the system.

3.1.2.4 Requirements for the future Acquisitions system

The systems requirements revolve around the ordering and acquisitions of library materials.

Ordering

Provision of search facility to ascertain if the library already holds the book to be ordered.
Provision for multiple search keys for instance author,ISSN ,series and class number.

If record does not exist,bibliographic data entered at the search stage will be retained and carried across to the on-order file.

Allow data to be entered into fields on formatted screen with cursor control.

Provision for rush orders.

System should provide for primary request types for instance regular approval,gift or exchange.

Provides for the frequently used vendor as default.

Provision for adding various notes to the order.

Orders to be printed in supplier order.

Funds be committed once the order has been printed.

For adding fund information, the account number for the fund to be used must be entered.

Allow for on-order items to be reflected in the catalogue or circulation files once updated.

Facility to retrieve records from external databases.

Online creation of order records.

The system must handle standing orders and one-off orders.

The system should provide for possibility of interfacing with system suppliers.

The system must interface with Cataloguing system so that the order record can provide a basic catalogue entry.

Provide for selecting,sorting and output on any field.

Provide for automatic printing of cancellations.

Receipting

The record may be retrieved on a number of keys including order number and vendor.

Orders to be receipted by locations and allow partial orders to be received.

A receive all command automatically distributes received copies amongst locations.

The system should provide for recording the next delivery and action date for partial receipt.

Provision for processing the next processing location for an item received.

Provide for producing barcodes for the books and should reflect on circulation file once updated.

Allow unit prices of items to be changed and invoice numbers and discounts may be entered.

Provides for authorization for payment and automatic updating of fund details from committed to spent.

The system should be able to print cheque requests or print the cheques.

Claiming

Provide for automatic generation of claim notices after library defined grace period.

Allow for the estimated delivery time to differ by orders.

Provides for non-automatic claiming by setting an action date on which orders which generates an exception report when the date has passed.

Provision for cancellation of orders.

Fund Accounting

The system should display online the amount committed and the amount spent and the balance.

Provides for currency exchange rates and automatic currency conversion with readjustments of committed funds if rates change.

Costs for items may be spread across two or more funds.

The system should also report on funds committed and spent by the vendor.

Enquiries

Provision for staff query function to allow staff to set up or view privileges for individual staff.

Allow staff to search the request file and an order file for details of items requested,ordered,received and claimed.

Allow on-order items to be displayed in the catalogue.

Reports & Statistics

Allow variety of reports and statistics to be generated including budget reports, exception reports for claims, vendor performance statistics.

3.1.3 Cataloguing Control System

The Cataloguing System is concerned with preparing Library materials by way of classification so that they can be easily located and retrieved by the user.

Objectives

The main objective of the Cataloguing System is to provide Library users with up to date, clear records of the contents of The University Library.

To achieve this objective the Cataloguing System performs the following functions:-

Making Catalogue cards for every book so that a reader can trace each book in the Library.

Preparing physically the book for the shelves and providing books with the necessary labels for use at the issue desk.

Providing users with the cards in the Public Catalogue (PC) by which they can trace any book by way of authors, titles, subjects and editors.

Sending paperback books for binding in order that they will last longer.

Maintaining authority files.

Producing accession lists.

Training staff in-house on cataloguing procedures.

Coordinating cataloguing procedures for the entire library.

3.1.3.1 The Processes

The processes that facilitate Cataloguing functions are:-

Searching

Shelf-listing

Descriptive Cataloguing

Copy Cataloguing

Physical Processing

Card Production

Catalogue maintenance

Subject Cataloguing

Added Copy Processing

Accessioning

The detailed description of these processes is given in Data Dictionary entry Figs.13 and 13a. Processes not covered in the entry are given in narrative below.

Added copies processing

Added copies refer to materials whose type are already held by the library.

Processing added copies involves simply copying details from existing cards with a few additions as copy number and location.

Subject Cataloguing

Involves the assignment of subject headings and Call numbers using Library of Congress List of Subject Headings(LCSH). This process may involve searching in different volumes an exercise that is time consuming.

Accessioning

This is the production of lists of the Library acquisitions on fortnightly basis.

3.1.3.2 Data Description

(a) Input data

The inputs to the manual cataloguing system include;

Author,

Title,

Imprint,

Collation

Class numbers.

Subject headings.

Further details can be found in catalogue record appendix xv

(b) Output data

The outputs from the system include:-

Accession lists.

Catalogue cards.

Statistical reports.

Shelf-list cards.

Refer to **Appendices xvi and xvii** for further details

(c) **File Data**

The files maintained by the Cataloguing System are described below. Those not covered here are described in Data dictionary entry **Fig.14**

(i) Subject Authority File (SUBJAF)

This file is used to ensure that specific subject is represented by the same terms all the time.The file also establishes authority of all subject headings. The contents of each record in the file include:-

Subject name,

Cross reference,

Location in the PC,

Date of Entry in the PC.

This file is arranged alphabetically by subject headings.

(ii) Geographical Authority File (GAF)

This file provides a comprehensive geographic names to subjects dealing with Africa. The purpose is to have comprehensive record of material on Africa.The contents of records are:-

Geographic name,

Cross reference,

Location in PC,

Date for entry in PC.

This is alphabetical by the region then country.

(iii) Name Authority File (NAF)

This is an official record of names both personal and corporate which have been selected as headings in the Library Catalogue. This file is used whenever there is doubt as to which part of the name is to be used as an entry. The records contain the following data elements:-

Name,

Cross reference,

Location in PC,

Date for entry.

(iv) Series Authority File (SAF)

This file contains authority cards for those series for which there is a book in the library. SAFs are not made for publishers series except for those related to East Africa.

Each record in the file consists of:-

Name of series,

Date of creating record.

(viii) Kenya Name Authority File (KNAF)

This file consists of format of writing names of Kenyan origin that are accepted to be used as entries in the catalogue.

Each record here consist of:-

Author surname and initials.

For the purpose of constructing a database all the above files are combined into one entity of Authoritylist. This merging is desirable since no data is lost but storage space is saved.

(ix) Cataloguing Units File

This file consists of statistics of catalogued materials from cataloguing units across the University libraries.

The record in this file contains:-

Name of cataloguing unit,

Subject on catalogued materials,

Number of titles catalogued,

LC subdivisions,

Number of Added copies,NUc's and CIP's catalogued,

Total books catalogued.

(xv) statistics file

This file contains statistics of work done by staff.

Each record will consist of:-

Queries done,

Pilots verified,

Cards produced,

Cards filed at PC,

Shelf-list cards,GAF cards,SAF cards,SUBJAF cards, NAF cards and KNAF filed.

3.1.3.3 Problems with the current Cataloguing System

The current manual Cataloguing System experiences a number of problems.The most common problems include:-

Cataloguing backlogs.Books may take as long as one year before they are processed due to the many tasks involved.

The cataloguing files are many and large that maintaining them is problematic to staff.

Many records are duplicated across many files.

The cost of maintaining manual catalogue is enormous.

Increasing demand for more staff yet still only basic functions can be done.

There are many inconsistencies in the records with different books having same class number or copies of the same book with different class numbers.

Manual catalogue provide limited access points to a record making access rather difficult.

The manual systems does not provide for effective ways of standardizing and enforcing the procedures.

Double cataloguing is common because inefficient record control.

So many cataloguing tools need to be consulted before a single catalogue records can be produced. This wastes a lot of staff time.

The records for catalogue files are easily pulled out and destroyed by malicious users.

The cataloguing tools are bulky, expensive and out of date making the catalogue produced out of date before it is produced.

There is lack of cataloguing skills.

There is duplication of efforts and records.Some activities done in Acquisitions are repeated here.

3.1.3.4 Requirements for the future Cataloguing System

The requirements for Cataloguing System are:-

Provision for original cataloguing online.

Provision for downloading catalogue records from an external source.

Allow creation of new records. The system should warn if the record already exist in the database.

Provision for authority control giving options for which fields are authority controlled.

Allow editing of authority files directly.

Provides online access to the catalogue.

Provision for multiple access to records through author,title,subject,keywords searches,class numbers and acronyms.

Produce hard copy catalogues for instance COM,printed catalogues and listings.

Provides MARC format for entering records directly and by downloading from other databases.

Provides easy check for duplicate entries.

Allow easy addition for duplicate entries.

provides a link to acquisition records.

Provides for online input using formatted screen.

Facility to distinguish between collections within library and locations outside.

Production of accession lists.

Provision for word and/or text processing software for manipulation of management and operational reports.

The system should be able to produce statistics relating to:-numbers of titles catalogued,current and cumulative,Numbers of titles deleted current and cumulative.

The System should also provide for public access facility with:-

Online access.

Self-teaching menu driven facilities.

Keyword and phrase searching.

Direct display of records if only one match.

Display of copy and status information through minimum number of screens.

Index display if no match.

Provision for browsing backwards and forwards in index or catalogue.

Provision for placing reservations by public display of owner borrower information of items on loan.

Library defined help message and context help.

Provision for Boolean searching.

Truncation of search terms.

Provision of search qualifiers.

Searching on one location or all.

Provides different views of catalogue depending on users.

Provides offsite access to the catalogue.

Provision for variety of sequences.

Provides for library defined layout.

Provide for facilities to gain online access to catalogue of monograph and serials,books on order,books on loan,books and serials at binding,user own records.

Facility to implement time-out parameters.

Facility should be provided for any terminal on the network to connect to the library system.

Facility for connecting to external databases e.g Dialog or Data Star.

3.1.4 Serials Control System

The task of acquisitions of serials is handled by the periodicals section of the University Library.

The serials system features all three subsystems encountered with books namely cataloguing,ordering and circulation.

Objectives

The main objective of periodicals section is to acquire all serial publications through purchases,gifts and exchange for the entire Library system,process them and despatch them to the sublibraries.

To achieve the objective, the Serials system perform the following functions:-

Place subscriptions for new titles and renewals,

Cancel subscriptions,

Follow up on delayed and missing parts,

Prepare lists of newly acquired periodicals,

Maintain a Kardex card catalogue in which all serial publications are recorded,

Circulation of Serials of special interest to academic staff and postgraduate students.

Receiving vendor reports to determine performance,

Accounting deductions to various departmental votes,

Generating management statistics,

Producing accessions.

3.1.4.1 The Processes

Processes required to perform the functions of Serials Control System are similar to those for Acquisitions System. The following addition processes for periodicals are either different from those of books or differ in the way they are performed.

Renewals:- This requires master record to include information about when subscriptions are to be renewed.Renewal notices are to be prepared and sent to the vendors.

Binding:- When all issues of each title of a serial are received they are prepared for binding.

Circulation:- Serials are only circulated to members of academic staff and postgraduate students for a period of a week.

Current awareness:- Copies of some serial titles are photocopied and circulated to departments to bring attention to those who need them.

Cataloguing: This basically involves recording the details of each title in a kardex which include title,volume,issue number,date,location,binding information.

3.1.4.2 Data Description

(a) Input Data

Inputs to the Serials Control system are :-

Title

Volume

Issue number

Date

Supplier name

Address

Borrower name

Date due

Binding information

Shelf-mark

Order date,

Renewal date,

Frequency

Further inputs are shown on **appendix xviii** and Data Dictionary entries in **Fig.15**

(b) Output Data

Outputs from the Serials System include:-

Claim notices,

Overdue notices,

Renewal notices,

Order forms,

Statistics,

Reports,

Payment authorization,

List of serials on loan,

List of serials borrowers,

Binding reminders.

(c) File Data

To perform the various functions associated with serials control a number of files similar to those encountered with acquisitions are used. In addition the following files are unique to periodicals:-

(vii) Binding information file

Information in this file include:-

Title,

Volume,

Date sent to bindery,

Date returned,

Colour,

Style of binding,

Number of issues per binding volume,

Type of binding.

(ix) Kardex file

The Kardex consists of description of journal titles and where they can be located. Kardex acts as a catalogue for journals. Each record here consists of:-

Title,

Volume,

Issue number,

Date,

Date received,

Location,

Publisher,

Binding,

Source.

(x) Subscription file

This consists of items on order. The records here consists of :-

Supplier name & address,

Frequency,

Title,

Volume,

Proforma invoice number,

Invoice date,

Year,

Price,

Amount.

(xviii) Newspaper file

This file consists of records of Newspapers to which the Library subscribes to. Each record in the file contains:-

Date,

Name of paper,

Name of delivering staff,

Signature of delivering staff,

Name of receiving staff,

Signature of receiving staff.

3.1.4.3 Problems with the current Serials System

The current manual serials system experiences a lot of problems. These include:-

The system is labour intensive requiring a lot of staff which makes supervision difficult and result in many clerical mistakes.

The manual storage facilities used are very bulky insecure and uneconomic.

The system takes along time to generate required statistics.

Some of the functions of serials are done by acquisitions thus leading to duplication of records and efforts.

Serials change their titles and frequency very often making it difficult to manage the subscriptions effectively.

Large amount of information must be held for each serial which requires much storage space.

The continuing nature of serials requires that renewal notices must be created and despatched at the appropriate time.This is difficult in manual system.

The manual system can not flag un-authorized borrowing.

In manual system it is difficult to monitor when all issues are received so that binding can be done.

Listings from catalogue are required in many formats. Manual system is slow in producing these lists.

Serials are difficult to start and stop because a lot of information need to be provided.

Agents require orders 10-16 weeks in advance of the date of commencement.

The Library has to ensure that claiming is not done earlier to result in duplication,yet the claim has to be done earlier to get missing issues.

Frequent changes in publisher can not be adequately handled by the manual system.

3.1.4.4 Requirements of the future Serials System

Ordering

The system should provide for preorder searching to establish if the title is on file.

The system should allow creation of orders online using formatted screen.

System generated date of order,order number.

Provision of supplier's data.

Provision for entering frequency,volume,issue number.

System should give warning if fund is about to be exhausted.

Provision for renewal of subscriptions.

Provision for printing cancellation notices

Produce printed orders in supplier order at library defined time.

Provide for immediate updating of fund information.

Provide means to input reports from suppliers.

Transmission of order direct to suppliers online.

Provide for multiple copies to be placed against multiple suppliers.

Check-in

The system must be able to cope with the complexity of serials check-in e.g delayed delivery,non-delivery,returns of damaged issues,partial or extra invoices.

The system should provide for retrieving records on variety of keys.

Provide for display of issues expected.

Allow check-in of multiple copies on a single screen.

Provision of partial receipts.

Provision for viewing of other predicted issues if issue in hand is not the issue expected.

provision for entering issues not predicted.

Production of routing lists.

The potential to interface with the systems of suppliers.

Routing

Creation and maintenance of routing lists for specific copies of serials.

Online access to lists by serial title for list of recipient or by recipient for list of titles routed.

Provision for replacing recipient name with new name on the list.

Provide for priority levels for recipient on the list.

Facility to merge routing lists or change routing lists of partial receipt of copies.

Claiming

System should be able to identify missing or overdue issues based on predicted expected issues with library defined claim period by title or supplier.

Notification of overdue or missing issues for claiming by library or automatic claiming.

Library defined texts and frequency of claim.

Binding

Provide indication for when title is ready for binding.

Picklist of items ready for binding.

Provision of binder details.

Provision of binding details e.g colour lettering.

Binding location should be reflected in the system.

Identification of overdue from binding and provision for claiming.

Fund Accounting

Provision for handling commitments,actual expenditure,budgetary and forecasting information.

Provision for currency conversion.

Invoice processing and payment authorization.

Enquiries

Provide access on variety of keys to all levels of serials information holdings,issues expected,received,missing,overdue and claimed.

Allow searching for details of stock and location.

Reports & Statistics

The system should be able to produce standard reports relating to missing,overdue issues and claiming subscriptions due for renewal,Supplier performance,bindery performance and fund reports.

MARC-Interfacing

The internal file structure should allow data to be transferred into and out of the system in full MARC format.

Accessions maintenance

The system should help establish work targets or to simply measure the length of time it takes for each item to appear on the shelves.

Archiving & Weeding

The system should allow to selectively archive or delete data.

3.1.5 Library Accounts Control System

The Accounts section until January 1993 has been part of the Acquisitions. It was separated from Acquisitions because its functions are not limited to books alone but extend to other library materials.

Objectives

The Library Accounts main objective is to control the book fund of the University library. To meet this objective, the Accounts section advises the University Librarian and the Acquisitions section on the status of the fund.

3.1.5.1 Processes

The processes required to accomplish the functions of Accounts include:-

Keeping details of departments allocation,

Processing Local purchase orders,

Receiving invoices,

Processing the invoices for payment,

Keeping track of each department's allocation and informing the Librarian on the status of the account,

Clearing and forwarding of library consignments,

Stock control,

Purchasing,

Control of income and expenditure,

Correspondences relating to finance,

Maintenance of finance records.

3.1.5.2 Data Description

(a) Input data

The data input to the Accounts System is more similar to the one used in Acquisitions. The data consist of:-

Supplier name,

Item description,

Invoice date,

Invoice number,

Department ,

Vote number,

Licence number,

Date,

Order number,

Amount,

LPO number,

(b) Output Data

The output from the System include:-

payment authorization,

List of items purchased,

Processed invoices,

Department allocation,

Department expenditure,

Revenue,

Expenditure.

(d) File Data

To perform its functions, the Accounts section supports a number of files which are more similar to those supported by Acquisitions.

(i) Proforma invoice file

This file consists of records of invoices which must be paid before the order is delivered. Each record in the file consist of:-

Date,

Invoice number,

Supplier name and address,

Quantity of items,

Order number,

Invoice date,

Unit price,

Total cost,

signature of Librarian,

Signature of Finance officer.

(ii) LPO file

This file contains records of local purchases.

Each record in the file consists of:-

Title,

Author,

Number of copies,

Order form details,

LPO number,

Amount,

Signature

(iii) Delivery file of invoice

This file contains invoices that have been passed for payment. each record consists of an invoice which contains:-

Date,

Supplier name and address,

Invoice date,

Invoice number,

Licence number,

Order number,

Vote number,

Amount,

University librarian signature,

Finance officer signature.

(iv) Vote number file

This file consists of vote numbers . Each record consists of:-

Vote number,

Vote name,

Folio number,

Amount

(v) Payment Voucher file

This file consists of vouchers for payment. Each voucher consists of:-

Date,

Payee,

Invoice number,

Amount,

Advance number,

Order number,

Vote number,

(vi) Advance payment file

This file contains records for advance payment to staff. Each record contain:-

Name of requestor,

Payroll number,

Date,

Department,

Serial number,

Amount,

Reason,

Vote number,

Date accounting,

Applicant's name,

Head department signature,

Finance officer signature.

(vii) Photocopying file

This file contains records of photocopying transactions. Each file contains:-

Machine model,

Opening meter reading,

Closing meter reading,

Copies made,

Official copies,

Bookshop copies,

Department work,

Spoilt copies,

Amount due

(viii) Transaction file

This file consists of records of business that Accounts section has transacted and checked by the Finance officer to reconcile the records. Each record consists of:-

Document number,

Transaction date,

Description,

Debit,

Credit,

Account number,

Vote number

(ix) Surrender analysis file

This file contains records with the following details:-

Supplier name and address,

Date,

Receipt number,

Description,

Amount,

Vote number

(x) Petty cash file

This file consists of records of petty cash transaction in the library. each record contain:-

Date,

Description,

Section,

Signature,

Remarks

(xi) Finance Correspondence File

The file contains records of finance correspondence relating to library's dealings. Each record contain:-

Payment voucher number,

Payee,

Date,

Description,

Invoice number,

Amount.

(xii) Unpassed invoice file

This file contain invoices which are yet to be passed for payment.

(xiii) Passed invoice file

This file contain invoices that have been passed for payment.

Each record contain:-

Date,

Supplier name and address,

Item description,

Quantity of items,

Unit price,

Cost,

Invoice number,

balance.

(xiv Query invoice File

This file contain invoices that have queries pending.

3.1.6 Archives Control System

Objectives

The main objective of Archives System is to preserve records whose primary value has expired but are reckoned to have some future value.

The university Library Archives preserves records for the University and others collected from else where.

These records form a special research collection for the University.

3.1.6.1 Data Description

The data used by the Archives is so diverse because materials preserved are on different and unrelated subjects.

In general materials preserved are on three main areas:-

Administrative records: for The University,

Raw data: for materials collected by researchers but not used,

Private records: Records donated by individuals.

3.1.6.2 Processes

The key processes in archiving involves:-

Sorting,

Indexing,

Serializing,

Microfilming,

Photography,

Preservations,

searching & retrieval

(a) Input data

Input to this System include:-

Photographs,

Serial numbers,

reference numbers,

Location,

Descriptions,

Number of copies,

Names of collections

(b) Output Data

The output from the system consists of:-

special research information,

List of archival material,

Photographs,

List of persons in key University positions,

Administrative records,

Locations of materials

(c) File data

To perform the archiving functions the system supports so many files among them:

Correspondence file,

Diaries file,

Photograph file,

promotion file,

Scholarship file,

Interviews file,

Catalogue file,

Recruitment file,

Personnel administration file

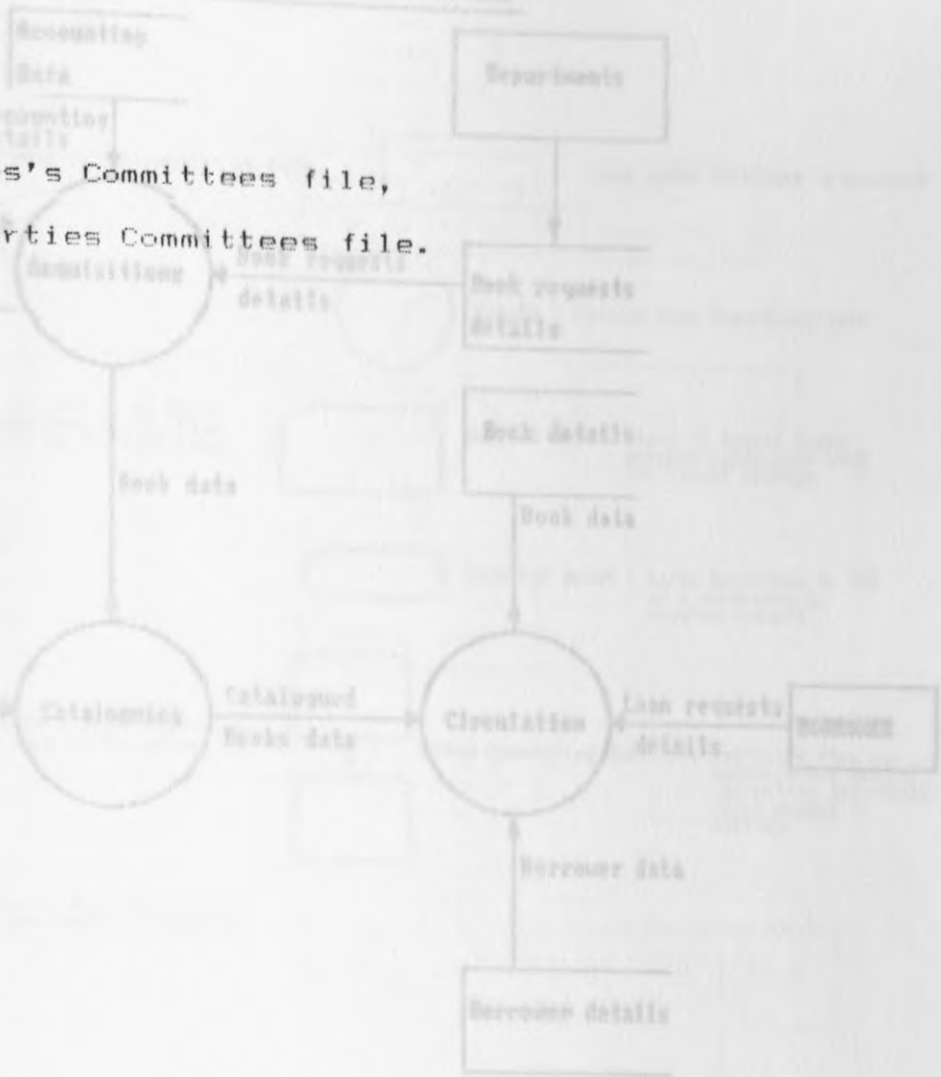
Senate meetings file,

Deans Committee file,

Faculty committees file etc.

Council Committees file,

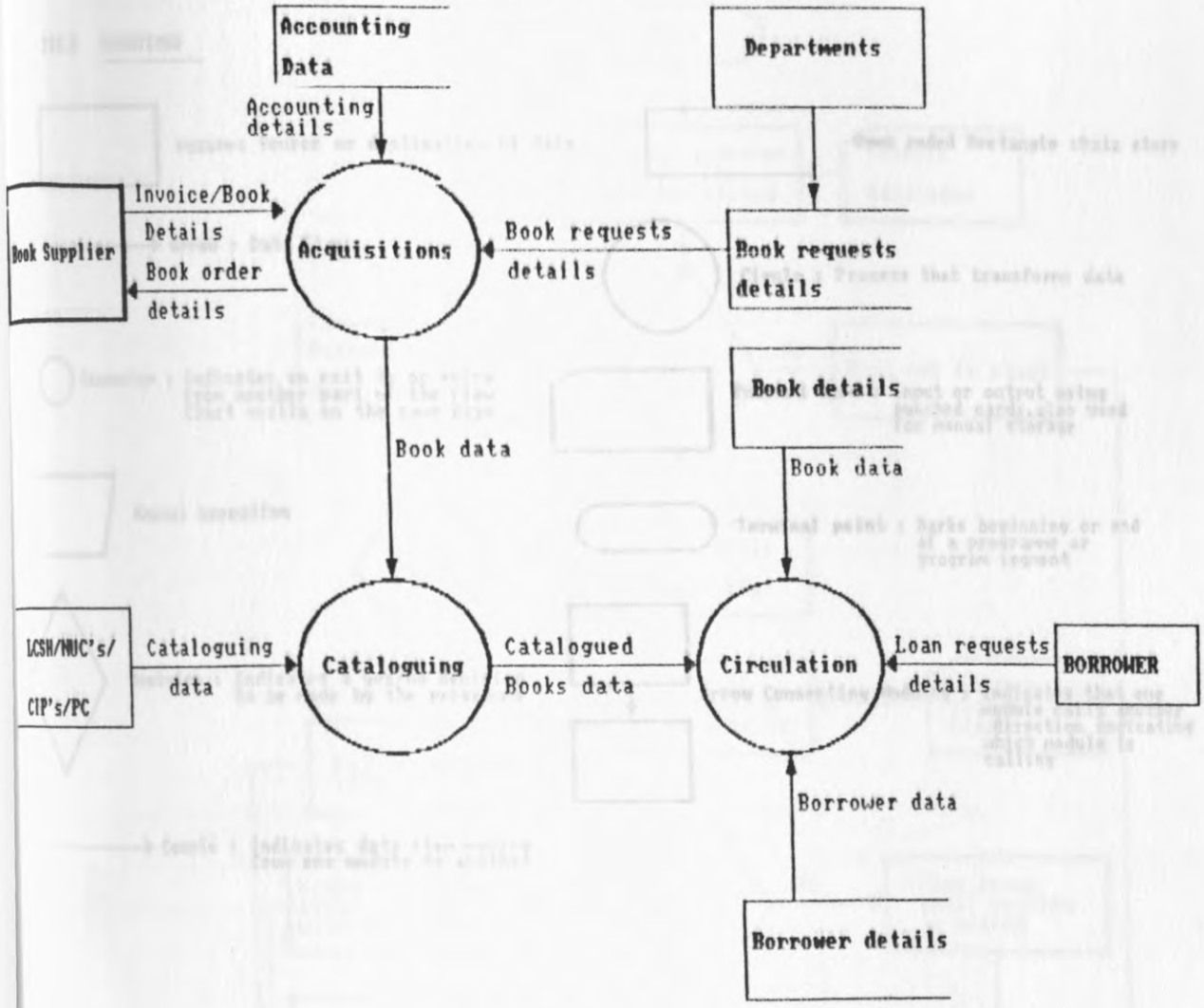
Vc's Committees file,



High Degrees's Committees file,

Working Parties Committees file.

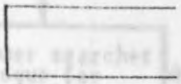
Fig.1 DATA FLOW DIAGRAM FOR OVERVIEW OF LIBRARY SYSTEMS



NB Periodical System activities are similar to Acquisitions. It is therefore not represented on the Data Flow Diagram above.

FIG.2 NOTATIONS

square: Source or destination of data

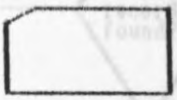


Open ended Rectangle :Data store

Arrow : Data Flow

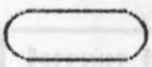
Circle : Process that transforms data

Connector : Indicates an exit to or entry from another part of the flow Chart usally on the same page



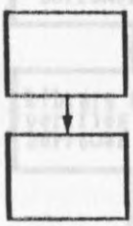
Punched Card : Input or output using punched cards,also used for manual storage

Manual operation



Terminal point : Marks beginning or end of a programme or program segment

Decision : Indicates a yes/no decision to be made by the programme



Arrow Connecting Modules : Indicates that one module calls another ,direction indicating which module is calling

Couple : Indicates data item moving from one module to another

FIG.3 FLOW CHART FOR BORROWING A BOOK FROM THE LIBRARY

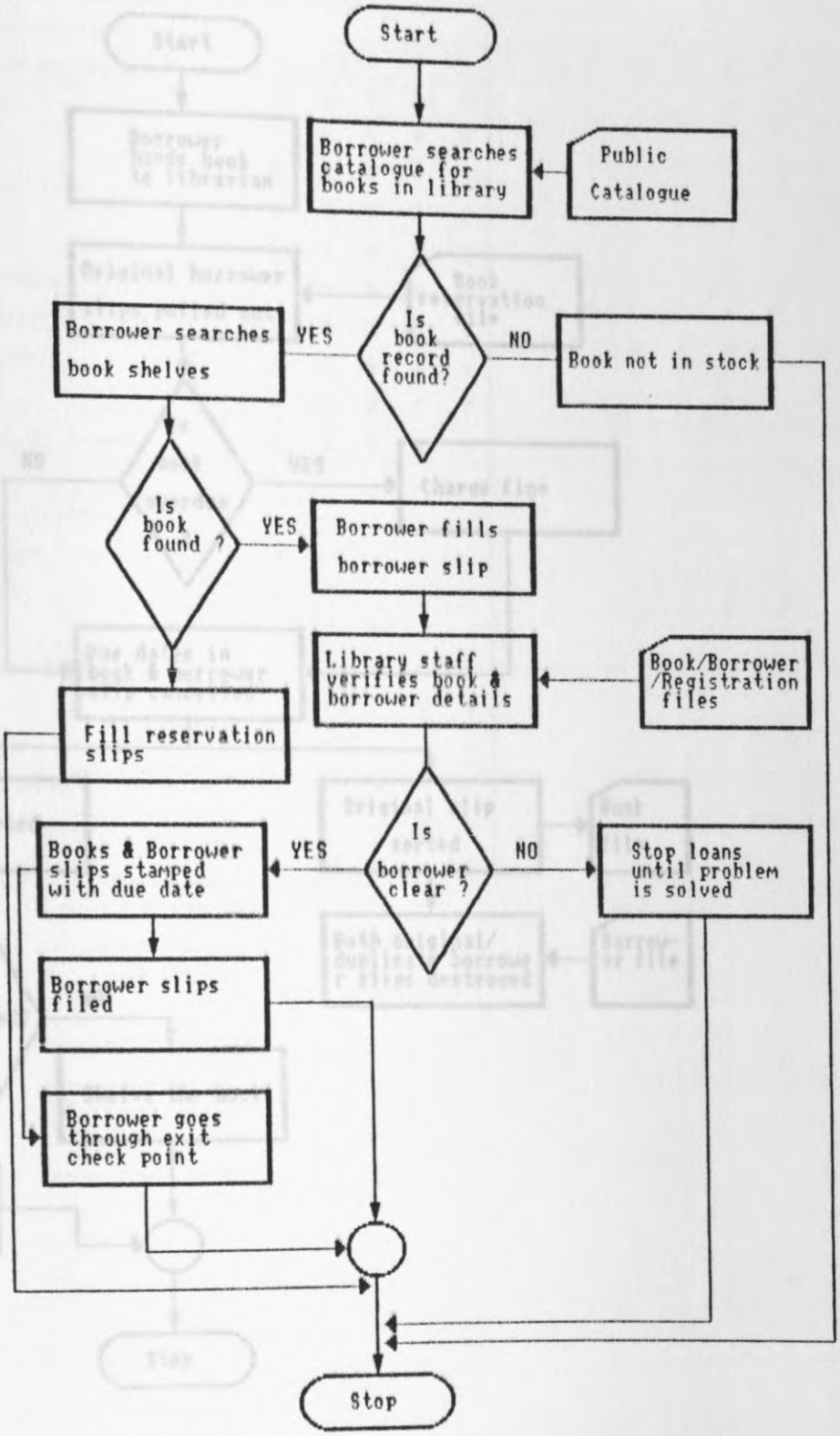
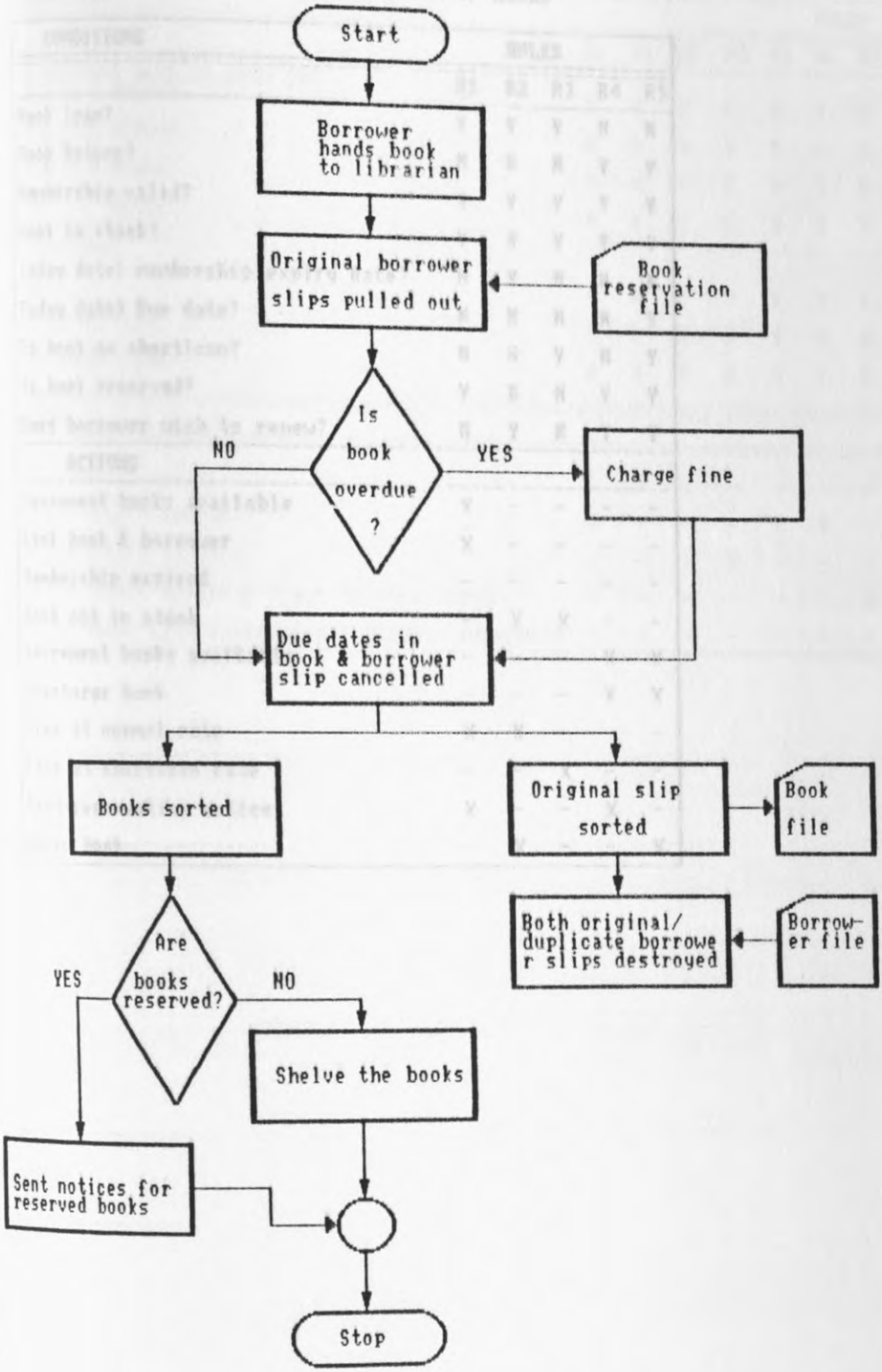


FIG.4 FLOW CHART FOR RETURNING BOOK TO LIBRARY



DECISION TABLE FOR LOAN AND RETURN OF BOOKS

	CONDITIONS	RULES				
		R1	R2	R3	R4	R5
	Book loan?	Y	Y	Y	N	N
	Book Return?	N	N	N	Y	Y
	Membership valid?	Y	Y	Y	Y	Y
	Book in stock?	Y	N	Y	Y	Y
	Today date) membership expiry date?	N	Y	N	N	N
	Today date) Due date?	N	N	N	N	Y
	Is book on shortloan?	N	N	Y	N	Y
	Is book reserved?	Y	N	N	Y	Y
	Does borrower wish to renew?	N	Y	N	Y	Y
	ACTIONS					
1	Decrement books available	X	-	-	-	-
2	Link book & borrower	X	-	-	-	-
3	Membership expired	-	-	-	-	-
4	Book not in stock	-	X	X	-	-
5	Increment books available	-	-	-	X	X
6	Discharge book	-	-	-	X	X
7	Fine at normal rate	X	X	-	-	-
8	Fine at shortloan rate	-	-	X	-	-
9	Send reservation notice	X	-	-	X	-
10	Renew book	-	X	-	-	X

FIG.6 DECISION TABLE FOR RECALLING LIBRARY MATERIALS

CONDITIONS	RULES											
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Has document been on loan for												
> 2 & <= 4 WEEKS?	Y	Y	Y	N	N	N	N	N	N	N	N	N
> 4 & <= 6 WEEKS?	N	N	N	Y	Y	Y	N	N	N	N	N	N
> 6 & <= 8 WEEKS?	N	N	N	Y	Y	N	Y	Y	Y	N	N	N
>= 8 WEEKS?	N	N	N	N	N	N	N	N	N	Y	Y	Y
Is borrower												
UG/OB?	Y	N	N	Y	N	N	Y	N	N	Y	N	N
PG/ACADEMIC/ILL?	N	Y	N	N	Y	N	N	Y	N	N	Y	N
NON-ACADEMIC STAFF?	N	N	Y	N	N	Y	N	N	Y	N	N	Y
ACTIONS												
Send no recall notice	-	X	X	-	-	-	-	-	-	-	-	-
Send 1st recall notice	X	-	-	-	X	X	-	-	-	-	-	-
Send 2nd recall notice	-	-	-	X	-	-	-	X	X	-	-	-
Send 3rd recall notice & block further loans	-	-	-	-	-	-	X	-	-	-	X	X
Debit borrower with value of outstanding documents	-	-	-	-	-	-	-	-	-	X	-	-

FIG.7 DATA DICTIONARY ENTRY FOR CIRCULATION PROCESSES

PROCESS	DESCRIPTION	INPUT	OUTPUT	LOGIC SUMMARY
Issue	Loaning books to borrowers	Book number, ISBN, Borrower-id	Books on loan, Due date, Borrower names	Staff checks for any overdues,outstanding fine & black information before issuing any books
Returns	Processing returned books to the library	Book number, ISBN, Borrower-id	Fine payable if any,Reservations,	Books reserved are filed separately & notices sent to user for their collection
Renewals	Re-borrowing of books on their return	Book number, ISBN,Borrower-id	Due date,Renewals, borrower names	Staff ensure that borrower has no fine,book is not reserved before renewing
Reservations	Putting holds for books on loan so that upon return they are trapped	Book number, ISBN	Due date, author, Title,reservations	On return books are trapped and reservations notices produced by system
Recalls	Written note to borrower asking for the return of books in their possession required by other borrowers	Book number, borrower-id	Due date,Title, Author,Borrower currently with book	Recalls are necessitated by requests from borrowers
Registration	The process of enrolling borrower to library	Registration-date,Registration number, employer, Guarantor, Department, Expirydate, Borrower-code, Borrower-id, Expiry date	Registration records	The records are filed separately according to borrower-code. The records may be checked to verify the borrower
Clearence	The process of terminating library membership through expiry or discontinuation	Borrower-id	The registration record, borrower information	Before clearence staff have to establish that the borrower owes nothing to any of the branch libraries
Enquiries	Finding out the status of books in the library	Book number, ISBN, Borrower-id	Books in the library,Books on loan status information	This may be performed by staff or user at public terminal
Statistics	Figures relating to use of stock & reading facilities in library	Borrower-code, Book-code, Book number,	Usage information hourly,weekly, monthly & yearly	This information must be regularly produced for planning purposes.
Computing fines	calculating fine payable on overdue materials	Book number, ISBN	Amount payable,due dates,book description	This is usually done in the present system when books are returned

ATTRIBUTE	DESCRIPTION	ALIAS	RANGE	LENG
Borrower-names	Surname & Middle name, borrower with valid library membership, Last name	-	2-3	45
Borrower-code	Unique identification for borrower-class		40-60	2
Borrower-id	Unique personal identity-no	Borrower no	1-100000	12
Registration-no	Unique number assigned to student when they register with the University		-	11
Id-no	Unique national identity-no		-	1
Address	Post box address or residence		-	3
Registration-date	Date of enrolment with library		-	8
Expiry-date	Date of expiry of library membership		-	8
Year-of-study	Student year of study year of study		-	1
Department	Department of student or staff		-	
Employer	Employer of the outside borrower		-	
Guarantor	Suriety for outside borrower		-	
Staff-no	Unique payroll-no for staff		-	
Designation	Grade of staff	post		
University-attended	Graduate university of outside borrower		-	
Time	Time staff reported on duty		-	
Occurrence-date	Date of the occurrence		-	
Occurrence-description	The description of the occurrence		-	
Base-library	Department of staff or student		-	
Carrel-no	The identification number of carrel		-	
Surname	The holder of the Carrel		-	
Carrel-date	The date carrel is allocated		-	
Carrel-expiry	Date of expiry of Carrel		-	
Loan-limit	The maximum number of books borrower is permitted to borrow	2-12	-	
Signature	Signature of borrower		-	
Carrel-usage	Regularity of use by user	-		

ATTRIBUTE	DESCRIPTION	ALIAS	RANGE	LENGTH	TYPE	SOURCE	VOLUME	CONTENTS
Borrower-names	Surname & Middle name, borrower with valid library membership, Last name	-	2-3	45	Char	Borrower-id	60,000 names	Surname Middle-name & Lastname
Borrower-code	Unique identification for borrower-class		40-60	2	Numeric	Registr-ation record	20	3 digits
Borrower-id	Unique personal identity-no	Borr-ower no	1-100000	12	Numeric	Borrower card	100000	6 digits
Registration-no	Unique number assigned to student when they register with the University		-	11	Char	Registr-ation record	15,000	code,no, year
Id-no	Unique national identity-no		-	11	Char	National-id	20,000	-
Address	Post box address or residence		-	35	Char	Registr-ation file	20,000	Surname, initials box-no
Registration-date	Date of enrolment with library		-	8	Date	Registr-ation file	20,000	Day, Month, Year
Expiry-date	Date of expiry of library membership		-	8	Date	Registr-ation file	20,000	Day, Month, Year
Year-of-study	Student year of study year of study		-	1	Numeric	Borrower-id	20,000	Digit
Department	Department of student or staff		-	20	Char	Registr-ation file, borrower-id	120	Depart-ment-name
Employer	Employer of the outside borrower		-	30	Char	Registr-ation file	500	Name-of Employer
Guarantor	Suriety for outside borrower		-	30	Char	Registr-ation file, letter of suriety	500	Name of Suriety, and signed-suriety
Staff-no	Unique payroll-no for staff		-	11	Char	Staff-id, Payroll	7000	Staff-code, number
Designation	Grade of staff	post		30	Char	Registr-ation file	7000	Name-of post
University-attended	Graduate university of outside borrower		-	40	Char	Certifi-cate	500	Univer-sity name
Time	Time staff reported on duty		-	10	Char	Time-book	10	Time
Occurrence-date	Date of the occurrence		-	8	Date	Occurren ce book		Day, Month, Year,
Occurrence-descripti-on	The description of the occurrence		-	200	Char	Ocurrence book	5	Descr-iption
Base-library	Department of staff or student		-	20	Char	Library-guide	20	Library names
Carrel-no	The identification number of carrel		-	3	Numeric	Carrel-book	100	number
Surname	The holder of the Carrel		-	10	Char	Carrel-book	5	holder details
Carrel-date	The date carrel is allocate d		-	8	Date	Carrel-book	5	Day, Month, Year
Carrel-expiry	Date of expiry of Carrel		-	8	Date	Carrel-book	5	Day, Month year
Loan-limit	The maximum number of books borrower is permitted to borrow	2-12	-	2	Numeric	borrow-code	3	number
Signature	Signature of borrower		-	15	Char	Borrower-id		signat-ure
Carrel-usage	Regularity of use by user	-		30		Record-bk	5	Signature

FIG.8b DATA DICTIONARY FOR CIRCULATION ATTRIBUTES

ATTRIBUTE	DESCRIPTION	ALIAS	RANGE	LENGTH	TYPE	SOURCE	VOLUME	CONTENT
Book-code	Unique identity-no for type of material	-	01-20	3	Numeric	Book-file	20	Number
Title	Title of book	-	-	50	Char	Book	100000	Title
Author	Author of book	-	-	45	Char	Book	300000	Surnam name, init-ials
Publisher	Publisher of the book	-	-	40	Char	Book	500	Publ-isher detail
Place	Place of publication	-	-	10	Char	Book	500	Name
Year	Year of Publication	Date	-	4	Numeric	Book	-	Year
Price	Price of book	Cost	-	10	Char	Book	-	Price
Pagination	Number of pages	-	-	6	Char	Book	-	-
Bibliography	List of references	-	-	500	Char	Book	-	Book descr-iption
Index	Index in the book	-	-	5	Char	Book	-	Index
Book-no	Class number of book it is unique	Call-number	-	35	Char	Catal-ogue, Book	-	Symbol number
Loan-duration	Duration book can be loaned	-	14-28	8	Char	Book	-	stamp
Loan-date	Date when book is loaned	-	-	8	Date	System	-	Day, Month, Year
Date-due	Date when book is to be returned	-	-	8	Date	System	-	Day, Month, Year
Copy-no	Unique number for partic lar copy of book	--	-	5	Char	Book	-	Copy-no
No.-of-copies	Number of copies of give title	-	-	3	Numeric	shelf-list	-	Number
Overdue-date	Date overdue notice is sent to borrower	-	-	8	Date	Overdue file	-	Day, Month, Year
Recall date	Date recall notice is sent to user	-	-	8	Date	Recall file	-	Day, Month, Year
Reservation-date	Date when reservation is made	-	-	8	Date	Reserv-vation file	-	Day, Month, Year
Overdue-description	Description of items overdue	-	-	200	Char	Borrowe r file	-	Book-detail
Recall-description	Description of items recalled	-	-	200	Char	Recall file	-	Book-detail
ISBN	Unique identifier for each copy of book	-	-	13	Char	Book	-	-

FIG.9 **DATA DICTIONARY ENTRY FOR CIRCULATION ENTITIES**

ENTITY	DESCRIPTION	CONTENT	VOLUME
Book	Reading material that may be borrowed from the library	Book-no,Title,Book-code,Author, Due-date, Place,Publisher, Year,Pagination,ISBN,Edition, Bibliography,Index,Illustration, Publisher-code	800 daily
Borrower	User who is registered to use the Library and has borrowing rigths	Surname,Middle-name,Last-name Department,Designation,Id-no, Signature,Registration-no, Registration-date,Employer, Guarantor,Address,Expiry-date, University-attended,Borrower-code,Borrower-id	20,000
Overdue-Notice	Written reminder send to borrower to ask him to return overdue books in his possession	Surname.initials,address, book descriptions,due-date message	100 per month
Recall-Notice	Written note to borrower asking him to return books yet due because of demand from other borrowers	Surname,initials,address, book-descriptions,message	20 per month
Time-book	Book where staff signs time of arrival on duty	Surname,initials,Time, signature	10 record daily
Carrel	Private study room in the library assigned to post-graduate students in their 2nd year or members of academic staff engaged in research	Carrel-no,Carrel-date, Expiry-date,Holder, Department,Signature, Carrel-usage	100
Occurrence-book	Records of occurrences in the library	Occ-date,Description, Staff-no	5 per week
Fine	Charge levied to borrowers overdue books	Amount,Fine-date,Borrower-id, surname,initials,Fine-descriptio n	100 per day
Bindery-record	List of books sent to bindery for repairs	Book-description,Bind-date, date-received,	30 per day
Reserve-collection	Materials for shortloans	Material-type,Placement-date, loan-duration,Staff-no department,Duration-in-shortloan,	
Address	Place of residence or working place of borrower	Borrower-id,Box-no,Town-code Tel-no	20,000
Department	Department where Staff of the University works	Depart-code,Depart-name, Location,Staff-no	130
LOANS	record of books on loan	Book-no, Loan-date,Due-date, Borrower-id,Loan-duration Borrower-code	800 daily

FIG.9a DATA DICTIONARY ENTRY FOR CIRCULATION ENTITIES

ENTITY	DESCRIPTION	CONTENT	VOLUME
Book	Reading material that may be borrowed from the library	Book-no,Title,Book-code,Author, Due-date, Place,Publisher, Year,Pagination,ISBN,Edition, Bibliography,Index,Illustration, Publisher-code	800 daily
Borrower	User who is registered to use the Library and has borrowing rigthts	Surname,Middle-name,Last-name Department,Designation,Id-no, Signature,Registration-no, Registration-date,Employer, Guarantor,Address,Expiry-date, University-attended,Borrower-code,Borrower-id	20,000
Overdue-Notice	Written reminder send to borrower to ask him to return overdue books in his possession	Surname.initials,address, book descriptions,due-date message	100 per month
Recall-Notice	Written note to borrower asking him to return books yet due because of demand from other borrowers	Surname,initials,address, book-descriptions,message	20 per month
Time-book	Book where staff signs time of arrival on duty	Surname,initials,Time, signature	10 record daily
Carrel	Private study room in the library assigned to post-graduate students in their 2nd year or members of academic staff engaged in research	Carrel-no,Carrel-date, Expiry-date,Holder, Department,Signature, Carrel-usage	100
Occurrence-book	Records of occurrences in the library	Occ-date,Description, Staff-no	5 per week
Fine	Charge levied to borrowers overdue books	Amount,Fine-date,Borrower-id, surname,initials,Fine-descriptio n	100 per day
Bindery-record	List of books sent to bindery for repairs	Book-description,Bind-date, date-received,	30 per day
Reserve-collection	Materials for shortloans	Material-type,Placement-date, loan-duration,Staff-no , department,Duration-in-shortloan	

FIG.10 RECEIVING BOOKS FROM SUPPLIERS

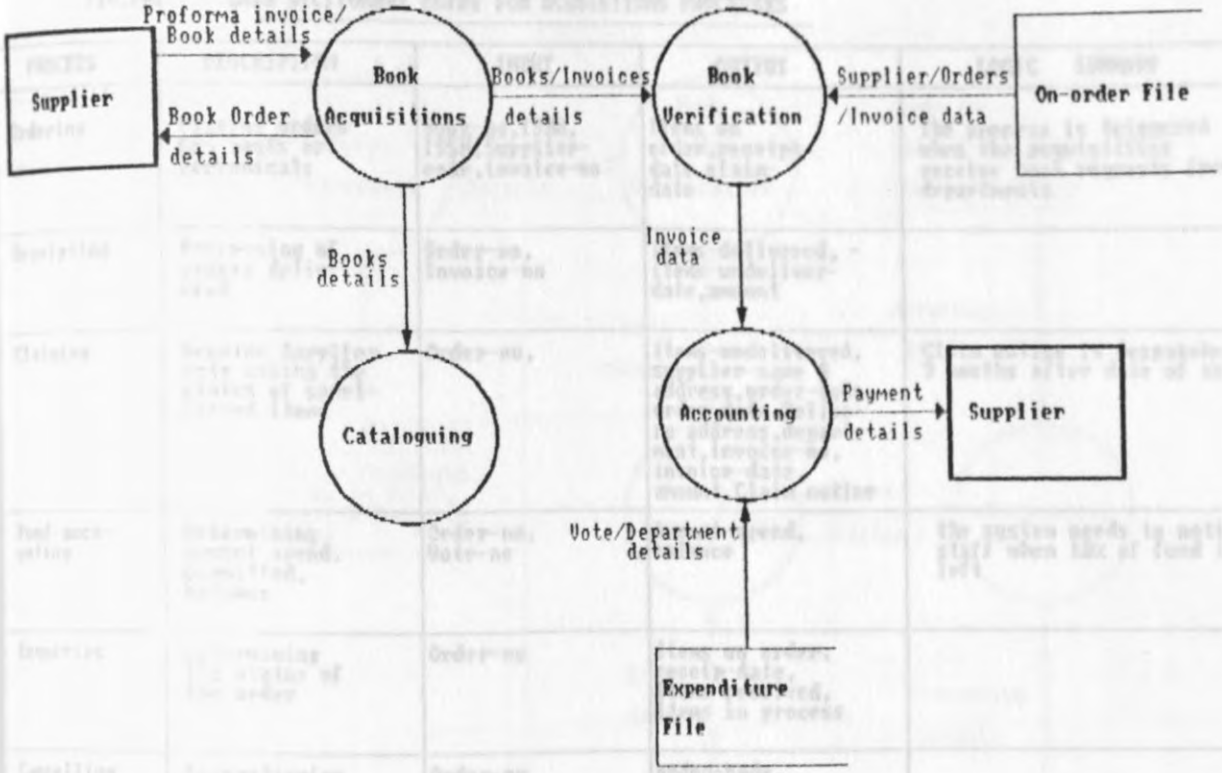


FIG.10a DATA DICTIONARY ENTRY FOR ACQUISITIONS PROCESSES

PROCESS	DESCRIPTION	INPUT	OUTPUT	LOGIC SUMMARY
Ordering	Placing orders for books or periodicals	Book-no,ISBN, ISSN,Supplier-code,invoice-no	Items on order,receipt-date,claim-date	The process is triggered when the acquisitions receive book requests from departments
Receipting	Processing of orders delivered	Order-no, Invoice-no	Items-delivered, -items-undeliver-date,amount	
Claiming	Sending Supplier note asking the status of undelivered items	Order-no,	Items-undelivered, supplier-name & address,order-code, order-date,Delivery address,department,invoice-no, invoice-date, amount,Claim notice	Claim notice is despatched 3 months after date of orde
Fund-accounting	Determining amount spend, committed, balance	Order-no, Vote-no	Amount-spend, balance	the system needs to notify staff when 10% of fund is left
Enquiries	Determining the status of the order	Order-no	Items on order, receip-date, Items received, Items in process	
Cancelling orders	Discontinuing items that have not been received after prescribed time	Order-no	order-code, date-cancelled, reasons	
Reports	reports relating to performance of Supplier	Order-no, Supplier-code	Supplier-statistics	This statistics should be produced at prescribed times
Accessioning	Producing lists of new acquisitions	ISBN,ISSN,	Accession number	
weeding	Removing from stock books that are not utilized & those outdated	ISBN, Book-no	Books weeded from stock	-
Gifts & Exchange processing	Processing books received through donation & exchange	Donor-name, Exchange-partner-name	Items donated, Items exchanged	-
Book trickering	inserting magnetic tape in the book so that it cannot be removed from library without being borrowed	Magnetic tape	Trickered book	-

Fig.10b DATA FLOW DIAGRAM FOR PROCESSING BOOK ORDERS

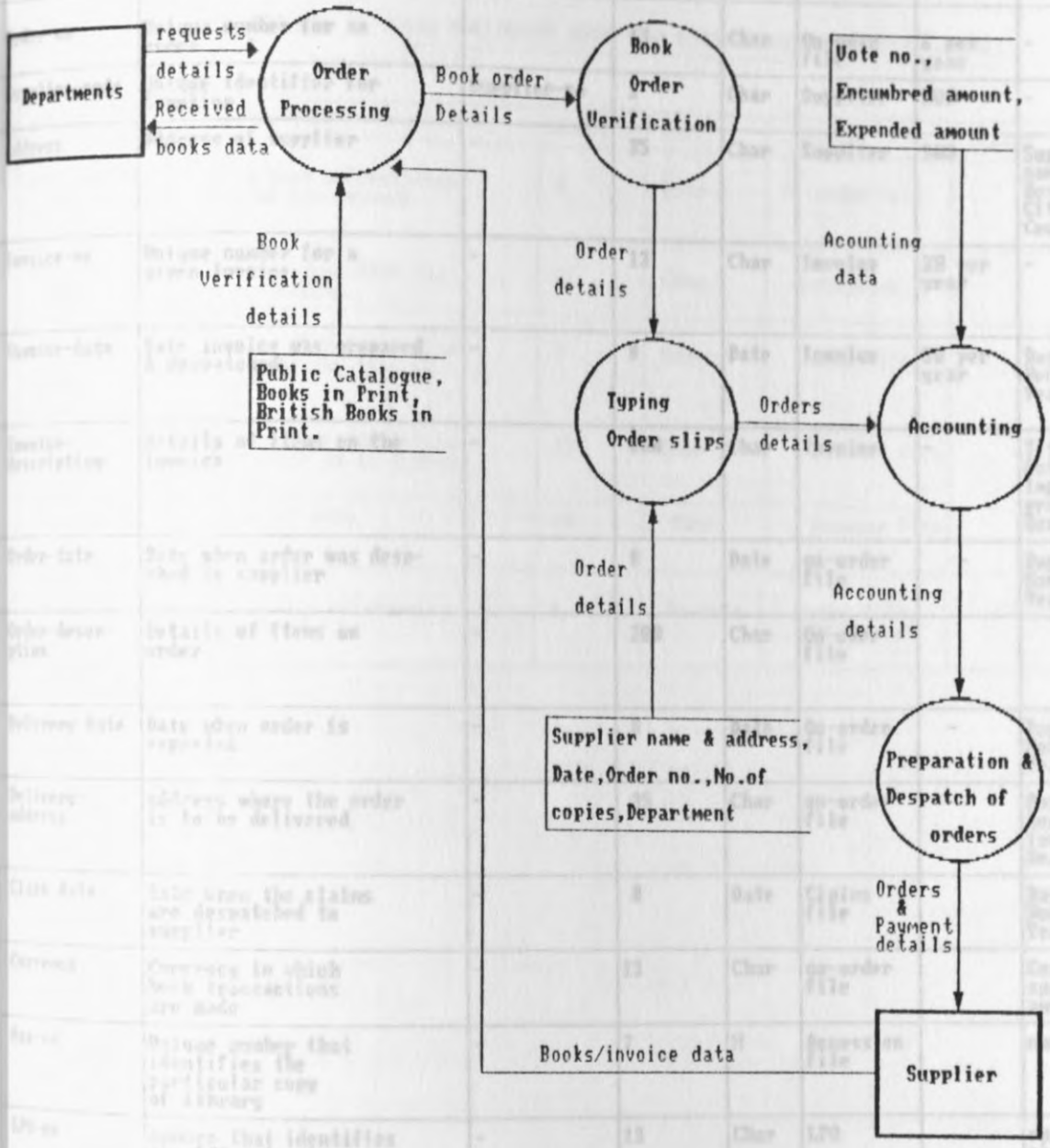


FIG.11a DATA DICTIONARY ENTRY FOR ACQUISITIONS ATTRIBUTES

ATTRIBUTE	DESCRIPTION	ALIAS	LENGTH	TYPE	SOURCE	VOLUME	CONTENT
Order-no	Unique number for an order	-	13	Char	On-oder file	6 per year	-
Supplier-code	Unique identifier for Supplier	Supplier-no	3	Char	Supplier	500	-
Address	Address of supplier	-	35	Char	Supplier	500	Supplier-name, Box number, City, Country
Invoice-no	Unique number for a given invoice	-	13	Char	Invoice	30 per year	-
Invoice-date	Date invoice was prepared & despatched	-	8	Date	Invoice	30 per year	Day, Month, Year
Invoice-description	details of items on the invoice	-	200	Char	Invoice	-	Title, Author, Imprint, price, Quantity
Order-date	Date when order was desp-ched to supplier	-	8	Date	on-order file	-	Day, Month, Year
Order-descr-ption	Details of items on order	-	200	Char	On-oder file		
Delivery-date	Date when order is expected	-	8	Date	On-order file	-	Day, Month, Year
Delivery-address	address where the order is to be delivered	-	35	Char	on-order file		Post box number, Town, Destination
Claim date	Date when the claims are despatched to supplier	-	8	Date	Claims file		Day, Month, Year
Currency	Currency in which book transactions are made	-	15	Char	on-order file		Currency-symbol, amount
Acc-no	Unique number that identifies the particular copy of library	-	7	N	Accession file		number
LPO-no	number that identifies the LPO uniquely	-	13	Char	LPO		number/ char
LPO-date	Date when the LPO is prepared	-	8	Date	LPO		Day, Month, Year
LPO-descr-ption	description of LPO	-	200	Char	LPO		Details of order
Licence-no	Number that identifies licence uniquely	-	13	Char	Licence		number,/char
Licence-date	Date when the licence is granted	-	8	Date	Licence		Day, Month, year
Licence-description	Description of items covered by the licence	-	200	Char	Licence		details of items

FIG.11b DATA DICTIONARY ENTRY FOR ACQUISITIONS ATTRIBUTES(contd)

ATTRIBUTE	DESCRIPTION	LENGTH	TYPE	SOURCE	VOLUME	CONTENT
Renewal-date	Date when subscription is due for renewal	8	Date	On-order file	-	Day, Month, Year
ISSN	Unique identifier for a periodical	11	Char	Periodical	-	-
Order-code	Number that identifies uniquely the type of order	3	Numeric	Order file	-	-
Vote-no	Number that identifies book-vote to be debited	13	Char	Finance file	-	-
Vote name	Name of vote	15	Char	Finance file	-	-
Quantity	Quantity of items ordered	6	Numeric	Order file, LPO, Licence	-	-

FIG.12 DATA DICTIONARY ENTRY FOR ACQUISITIONS ENTITIES

ENTITY	DESCRIPTION	CONTENTS	VOLUME
Order	Details of books to be purchased from supplier	Order-no order-date, Receipt date,Department, Quantity,Total price, Delivery-address, Order description,Supplier details,Order code, order-status	10,000 per year
Supplier	Vendor to supply the library books	Supplier-code, Supplier-name,supplier address, Supplier-info,Faxno	500
Invoice	Bill from Supplier for books supplied /to be supplied	Invoice-date, invoice-no Supplier-details,vote, Invoice description,Invoice amount, Invoice payee	200 per year
Claim Notice	Written reminder to Supplier asking about status of non-delivered order	Order-no, Order-date Department,delivery-address,Invoice-no	10 per year
Delivery book	Book in which books to be ferried to branch libraries are entered	Date,destination, Description,staff-delivering,staff receiving	60 per year
Donor	Individuals or institutions who offer books to library as gifts	Donor-name, Donor-addres donation-description, donation-date,date-receipt	20 per year
LPO	Local purchase order that authorizes purchases locally	LPO-number,LPO-date,LPO-description,LPO-supplier details	20 per year
Book-vote	Book fund	vote-name,Vote-number, amount	-
Exchange-partner	Institutions with whom the library has agreement to exchange certain publications	Partner-name,address, material-description, agreement-date	20 per year
Publisher-catalogue	List of publications from a publisher	Item-description, price,Publisher details	100
Payment Voucher	Authorization for payment	voucher-date,Voucher-no, payee,description,vote-no, staff-authorizing, staff approving,	120 per year
Licence	Authority to import books	Licence-date,Licence-no, Licence-description, Licence-expiry	12 per year
Kardex record	Records of periodicals in the library	Title,date,Volume number issue number,Location, frequency,Publisher, Physical state	150,000

FIG.13 DATA DICTIONARY ENTRY FOR CATALOGUING PROCESSES

PROCESS	DESCRIPTION	INPUT	OUTPUT	LOGIC SUMMARY
Searching	Checking for cataloguing data from CIP,MUC,LCSH	ISBN, Title, Author	Class number, Added copy information, Location, Copy number	ISBN is unique so its input should trigger other details to be displayed
Shelf-listing	Recording book description on Shelf list card	ISBN	Holdings, Location, Copy number	One record represents holding details of same title
Descriptive Cataloguing	Describing details of book on a pilot	ISBN	Title,Author, Imprint, Collation, Added entries, Class number	The source of data is the book itself
Copy Cataloguing	The catalogue data is copied to pilot direct from CIP	ISBN	CIP, Copy number, Class number	-
Card Production	Producing catalogue cards that are filed in public catalogue	Photocopying	catalogue record	The computer would produce cards automatically as well as COM
Physical Processing	preparation of the book for the shelf. This involves spine-marking,typing labels, pasting labels	Class number, Title,Author	Book ready for circulation	-
Catalogue maintenance	Updating catalogue records	Copy-no, Record-no	- updated record	-

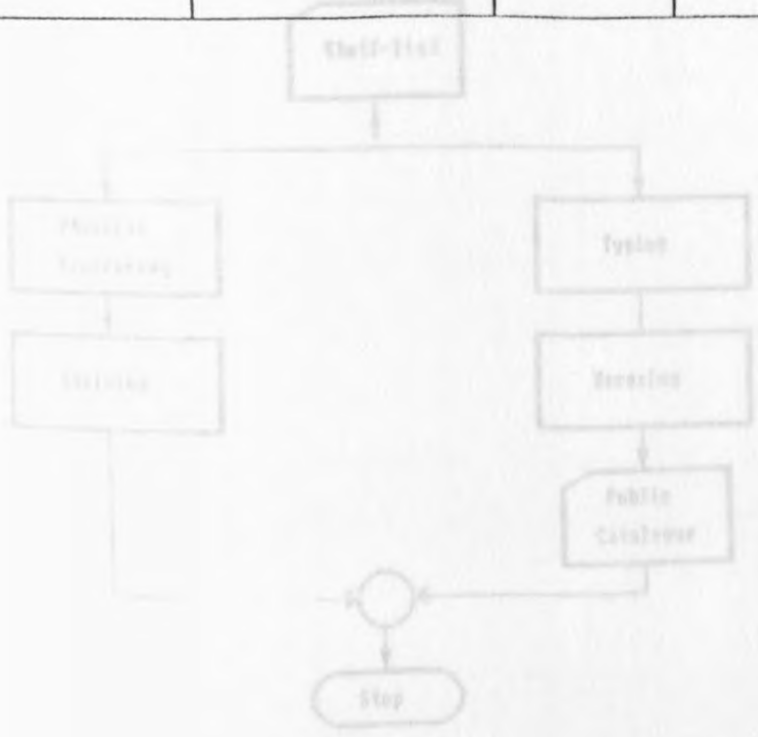


FIG.13a

FLOW CHART FOR THE CATALOGUING PROCESS

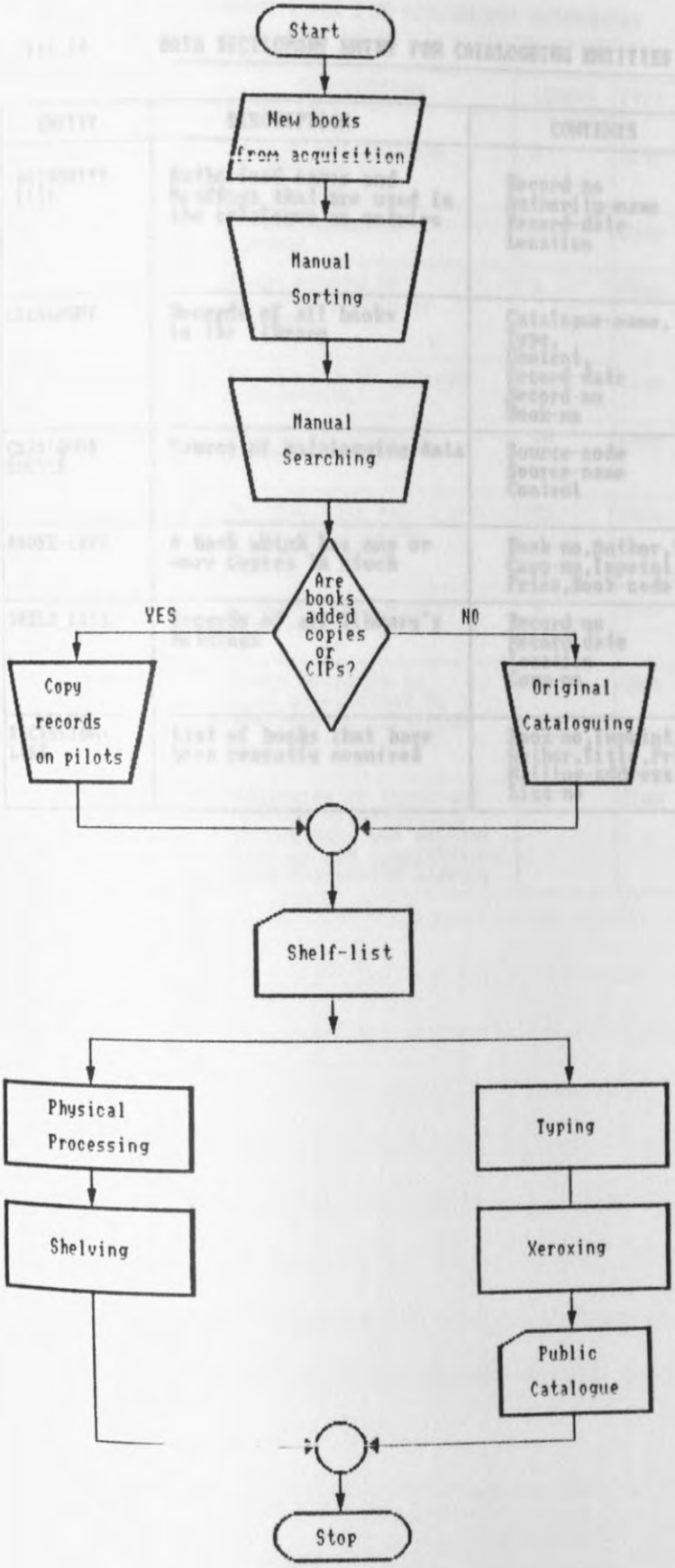


FIG.14 DATA DICTIONARY ENTRY FOR CATALOGUING ENTITIES

ENTITY	DESCRIPTION	CONTENTS	VOLUME
AUTHORITY-LIST	Authorized names and headings that are used in the catalogue as entries	Record-no Authority-name Record-date Location	20,000 records
CATALOGUE	Records of all books in the library	Catalogue-name, Type, Content, Record-date Record-no Book-no	1,200,000 records
CATALOGUE-SOURCE	Source of cataloguing data	Source-code Source-name Content	10 Types
ADDED-COPY	A book which has one or more copies in stock	Book-no,Author,title Copy-no,Imprint, Price,Book-code	-
SHELF_LIST	Records of all library's holdings	Record-no Record-date location Copy-no	100,000 records
ACCESSION-LIST	List of books that have been recently acquired	Book-no,Imprint, Author,title,Price, Mailing-address List-no	-

FIG.15 DATA DICTIONARY ENTRY FOR PERIODICALS ATTRIBUTES

ATTRIBUTE	DESCRIPTION	LENGTH	TYPE	SOURCE	CONTENTS
Date	Date of publication of journal	8	Date	Journal	Day, Month, Year
Vol-no	Volume number of journal	5	Char	Journal	-
Issue-no	Issue number of particular copy of journal	3	Char	Journal	-
Frequency	Regularity of journal publication	15	Char	Journal	-
Status-info	Status of order of journal	70	Char	On-order file	-
Routing data	Routing data for staff who receive certain journal titles	35	Char	Journal Circulation file	
Bind-date	Date due for journal binding	8	Date	Bind file	-
Authority name	Names accepted to used as headings in the Library catalogue	15	Char	Authority file	Geographic names, Subject headings, Series names, Kenya names
Mailing-address	Addresses of local and foreign institutions/ individuals who receive list of new acquisitions from University Library	35	Char	Mailing list	Name, Post box, Town, Country

CHAPTER:4 SYSTEM DESIGN

4.1 Systems Specifications

The new System will have to be configured to the following specifications recommended by Boss (1984)[13]

Response time averaging 2 seconds or less for issue and returns transaction,

Response time of 5 seconds or less for simple enquiries by author or title,

Maximum response time of 8 seconds or less for subject enquiry,

Ability to sort in Book number order and display or print,

Ability to distinguish multiple copies of same book number to permit specific access,

Ability to handle up 20 different types of patrons,

Ability to charge materials to bindery,

Ability to override loan periods,

Ability to set variant length loan,

Identification of restricted or blocked borrowers during issue process,

Immediate updating of the database

Ability to trap reserved books and notify patrons of their availability,

Ability to produce reports on hold queues,

Ability to access patron accounts for current and passed fines,

Easier regular preparations of overdue notices, fine notices, etc,

Ability to post holds against all circulating copies multiple copy item,

ability to produce claim notices of overdue notices,

Immediate updating of database upon receipts of order,

Indicate when book fund is 10% to be exhausted,

Automatic balancing of book fund upon commitment,

Indicate added copies during order or cataloguing.

4.2 Input Design

The inputs will be in form of carefully designed screen. The input screen will facilitate the process of input of data into the computer.

The following input design features desirable for system users will be taken into account wherever possible.

The system must be easy and convenient to use,

Minimize number of times of data input by giving provision for some default values where there is repetitive data,

Provision of help pages which can be called at any stage of data input,

prompt user to input information but allow skilled users to work with less prompts,

Provision for data to be compiled from other sources,

Provide for interrupting the input if irrelevant material has been selected,

Provide for data verification at input stage

4.2.1 Input Considerations

The input of the design include:-

Book number,

Due date,

Membership details,

Book enquiry request,

Borrower enquiry request,

Bookloan request,

Borrower identification,

Supplier details,

Book details,

Periodical details

4.2.2 Input Screens design

Screen design has been done to minimize entry of data and where applicable most of the data is provided by the system.

To facilitate data input, the following screens have been designed:-

Borrowing input screen Fig. 16,

Input screen for Author/Title enquiry Fig. 16b

Acquisitions input screen Fig. 16d

Cataloguing input screen Fig.16f

4.3 Output Design

The output from the system is both in printed form and screen display. The screen display is necessary if data is needed for immediate use. The display takes the form of reports,queries, replies & graphics output.

Printed output are useful for permanent record of information.

The following output design criteria were considered desirable to users:-

Output displays and reports which are consistent with the needs of a particular problem,
The design should provide for checks to ensure that outputs are within acceptable parameters,
Provide facilities to control access to security-classified material,
Provide ability to control the quality and extent of output i.e provide default quality,
Provide use of typographic and graphic means of drawing attention to significant features in the output,
Provision for file security such as 'read only'
provide for backup ,
Provide for alternative output forms i.e VDU and printing only items deemed relevant.

4.3.1 Output Considerations

Some of the output users would like to see will include:-

List of all library loaned out and yet overdue,

List of all library items,

List of library items by author,title etc,

Membership expired,

Book unavailable,

Return date,

Book details,

Copies of book held,

Overdue reminders,

Fine payable on overdue book,

Books on order and expected date,

Supplier who has dealings with library,

Status of ordered items.

4.3.2 Output Screens design

The output screen design incorporates as many design criteria features identified above. The design screens are:-

Screen showing real status of copies Fig.17

Staff Screen showing real time status of copies Fig.17a

Public Query Borrowing Queries menu Fig.16a

Output screen for acquisitions Fig.16e

Cataloguing Output Screen Fig.16g

Output Screen for Author/Title enquiry Fig.16c

4.4 Process Design

The processes involved in Library procedures are designed and key algorithms described using HIPO technique, structured charts and Structured English.

The criteria of process design considered are:-

Set of clear specifications for the programs using HIPO technique,

Well defined inputs to, outputs from and process performed by modules using Structured charts,

Concise algorithm descriptions for the processes

Chosen names for the modules consisted of strong verb followed by a clear subject. The name tells clearly what the module does and so adds to the documentation.

Where applicable more than one tool was used to describe processes explicitly.

Fig.18 shows integrated Library functions for Main Menu and the submenus.

4.4.1 Circulations processes design

The issue process is described using a HIPO Chart Fig.19 and complemented by Structured Chart Fig 19a.

Fig. 19b is HIPO Chart with Structured English description of the returns process of Circulations. The HIPO is supplemented by Structured Chart Fig.19c

Fig.19d is HIPO Chart with structured English description of Enquiries process of Circulations system.

Fig. 19e refers to HIPO Chart with structured english description of Circulations Renewal process.

The Recall procedure is designed using HIPO Chart Fig.19f

Fig.19g is HIPO Chart description of the Clearence process.

The process of producing statistics of use is designed using HIPO Chart technique Fig.19h.

Fig.19i shows the design of Registration process using HIPO Chart technique.

4.4.2 Acquisitions processes design

Fig. 20 Is HIPO Chart with Structured English description of Order process of Acquisitions. the HIPO is supplemented by Structured Chart Fig. 20a

Fig. 20b refers to HIPO Chart technique with Structured English description of Order receipting process of acquisitions. The HIPO is supplemented by Structured Chart Fig. 20c

4.4.3 Cataloguing processes design

Fig. 21 is HIPO Chart with Structured English description of the entire cataloguing process. Where as the design of Online Public Access enquiry process is shown in Fig.21a.

4.4.4 Periodicals processes design

Fig.22 is Structured Chart description of the Periodicals functions.

4.5 File Design

The considerations in file design relate to:-

The information each record must contain to service the objectives,

the structure of the fields,

the content of each field,

the size of each field,

The types of files to be designed will include:-

Borrower files,

Supplier files,

Book files,

Catalogue files,

Registration files,

On-order files,

Clearence files.

4.5.1 Record Size

Various rules of thumb exist to calculate record size. In this Work the number of characters including spaces are counted taking into consideration the longest record e.g the catalogue record. The longest record is found to have 400 characters. But space inclusions requires record size of 500 characters.

4.5.2 File Size

General rule of thumb shows that One megabyte disk storage should be reserved for 1000 records of between 350-400 characters per record. 1000 records of 500 characters per record would require about 1.1 megabytes.

The university library with an estimated 500,000 records would require about 550 megabytes hard disk storage. When the annual growth rate is taken into account disk space of up to 1 gigabyte is required.

This storage, it is expected will accommodate data files,Operating system, Backup copies, management database program, application programs, file copying and editing programs.

4.6 Database Design

In order to design a database for the Library applications,the relevant elements were identified.

The Conceptual model served two main purposes namely;-

describing the data in a form users and computer specialists could discuss and implications for design identified.

As a base for construction of logical model.

4.6.1 Normalization

Normalization is a 3-stage process in which entities are converted in their 3NF by way of Two intermediate stages of 1NF and 2NF.

Normalization regroups attributes of the entities such that the relationships between the resulting entities are clearly shown and any redundancies in the data are removed.

4.6.1.1 Entities & Attributes

(i) BOOK (Book-no, ISBN, Accn-no,
Title, Vol-no, Publisher,
place,Year,Pagination,Bibliography,Index,
Reservation-date,Publisher-code(Author, No.-of-
copies,Price,Book-code))

The Blocked attribute is an identifying attribute for the entity Book.

The inner brackets show two sets of repeating groups i.e for a given book-no, there can be many authors.

(a) 1NF

To transfer entity BOOK into 1NF repeating groups are removed into new entities BOOK1, COPY1. However to maintain link with the outer bracket entity BOOK, the original identifying attribute Book-no becomes attribute of the new entities.

BOOK1 (Book-no., ISBN, Accn-no,
Reservation-date,Title, Vol-no,
Publisher,Place,Year,Pagination,
Bibliography,Index, Publisher-code)

COPY1 (Book-no., Author, No.-of-copies, Book-
code,Price)

(b) 2NF

To generate 2NF norms, only entities which have more than one identifying attribute are involved in the transformation from first to second normal forms. The others are by definition already in 2NF. In this case each of the non-identifying attribute must be fully dependent on the identifying attribute for it to be in 2NF.

BOOK2 (Book-no., ISBN, Accn-no.,Title, Vol-no.,Publisher,Place,Year,Pagination, Bibliography,Index,Publisher-code,Reservation-date).

COPY2 (Book-no., Author, No-of-copies,Price,Book-code,Price)

(c) 3NF

To generate 3NF norms, the entities must already be in 2NF and none of the non-identifying attribute must uniquely define the other.

BOOK3 (Book-no., ISBN, Accn-no.,Title, Vol-no. Publisher-code,Pagination,Year,Place Bibliography,Index,Reservation-date)

COPY3 (Book-no., Author, No-of-copies,Book-code, Price).

(ii) BORROWER (Borrower-id, Borrower-code,
Surname,Middle name,Last name, Loan-limit,
Employer, Guarantor,registration-date,
Expiry-date, Base-library, Depart-code,
University-attended,Designation,Registration-
no,Signature,Id-no, Staff-no)

(a) 1NF

By definition the Borrower entity is already in 1NF since it has no repeating groups.

(b) 2NF

by definition Borrower entity is in 2NF since it is in 1NF and has no repeating groups.

BORROWER3 (Borrower-id, Borrower-code, surname,
Middle name,Last name, Employer,
Guarantor,Registration-date,
Registration-no,Id-
no,Depart-code,Signature,Staff-no,
University-attended,Designation)

LIMITS3 (Borrower-id, Loan-limit, Expiry-date,
Base-library)

(iii) ORDER (Order-no, Order-code, Date, Receipt-date,
Delivery-address,Depart-code,Total-price, Claim-
date,Vote, Currency, Quantity,Order-
description,Supplier-code(Unit Price,Publisher-
code,Order-status,Licence-no,Licence-date,Licence-
expiry,Licence-descr))

ORDER1 (Order-no, Order-code, Date, Receipt-
date, Delivery-address,Depart-code,
Total-price, Claim-date, Vote,
Currency, Quantity,Order-
description,Supplier-code,Licence-no,Licence-
date,Licence-expiry,Licence-descr,Publisher-
code)

PRICE1 (Order-no, Unit price, Order status)

ORDER2 (Order-no., Order-code, Date, Receipt-
date, Delivery-address,Depart-code,Total-
price, Vote, Licence-no,Licence-
date,Licence-descr,Licence-expiry Currency,
Quantity,Order-description,Supplier-
code,Publisher-code)

PRICE2 (Order-no, Unit Price Order Status)

ORDER3 (Order-no, Order-code,Receipt-date,Delivery-address,Depart-code,Total price,Order-description,Currency, Supplier-code,Licence-no,Licence-descr, Vote,Date,Licence-date,Licence-expiry,Publisher-code)

PRICE3 (Order-no, Unit Price, Order Status)

((iv) SUPPLIER (Supplier-code, Supplier-name, faxno, Publisher-code, Supplier-address)

SUPPLIER1 (Supplier-code, Supplier-name, faxno, Publisher-code, Supplier-address)

SUPPLIER2 (Supplier-code, Supplier-name, faxno, Publisher-code, Supplier-address)

SUPPLIER3 (Supplier-code, Supplier-name, faxno, Publisher-code, Supplier-address)

(v) INVOICE (Invoice-no., Invoice-date, Invoice-amount, Supplier-name,Invoice-payee, invoice-vote, Invoice-description)

INVOICE1 (Invoice-no, Invoice-date, Invoice-amount, Invoice-payee,Invoice-vote,Invoice-description,Supplier-name)

INVOICE2 (Invoice-no, invoice-date, Invoice-amount, Invoice-payee,Invoice-vote,Invoice-description,Supplier-name)

INVOICE3 (Invoice-no, Invoice-date, Invoice-amount,
Invoice-payee,Invoice-vote,Invoice-
description,Supplier-name)

(vi) LPO (LPO-no., LPO-date, LPO-description, LPO-amount,
LPO-vote, Supplier-code)

LPO1 (LPO-no., LPO-date, LPO-description, LPO-
amount, LPO-vote, Supplier-code)

LPO2 (LPO-no., LPO-date, LPO-description, LPO-amount,
LPO-vote, LPO-description, Supplier-code)

LPO3 (LPO-no., LPO-date, LPO-description, LPO-vote,
LPO-amount, Supplier-code)

(vii) BOOK-VOTE (Vote-no, Vote-name, Vote-amount,Balance)

BOOK-VOTE1 (Vote-no, vote-name , Vote-amount,Balance)

BOOK-VOTE2 (Vote-no, Vote-name, Vote-amount,Balance)

BOOK-VOTE3 (Vote-no, Amount, Vote-name,Balance)

(viii) PVOUCHER (Voucher-no., Voucher-date, Payee,
Voucher-vote,Description,Authorized-
by,Approved-by, Staff-no)

PVOUCHER1 (Voucher-no, Voucher-date, Payee,
Voucher-vote,Description,Authorized-
by,Approved-by,Staff-no)

PVOUCHER2 (Voucher-no, Voucher-date, Payee,
Voucher-vote,Description,Authorized-
by,Approved-by,Staff-no)

PVOUCHER3 (Voucher-no, Voucher-date, Voucher-payee,
Voucher-vote,Description,Authorized-
by,Approved-by,Staff-no)

(ix) DONATION (Donor-name, Donor-address,Donation-date,Donation-
descr,Date-receipt,Book-code)

DONATION1 (Donor-name, Donation-date,Donation-
descr, Date-receipt,Book-code,Donor-address)

DONATION2 (Donor-name,Donation-date, Donation-
description,Date-receipt,Book-code,Donor-
address)

DONATION3 (Donor-name, Donation-date,Donation-
Descr,Date-receipt,Donor-address)

(x) EXCHANGE (Partner-name, Partner-address,(Exchange-
description, Exchange-date,receipt-date)

EXCHANGE1 (Partner-name, Partner-address Xchange-date,
X-receipt-date,X-description)

EXCHANGE2 (Partner-name, Partner-address)

EXCHANGE2 (Partner-name,Xchange-date,X-receipt-date,
X-description,Partner-address)

EXCHANGE3 (Partner-name, Xchange-date,Partner-address
X-description,X-receipt-date)

(xi) KARDEX-RECORD (ISSN, Title,vol-no,Pen-date,Bind-date
,Imprint, Frequency, Issue-no(Depart-
code,Staff-no,Location)

KARDEX-RECORD1 (ISSN,Title, Vol-no, Ren-date, Bind-
date,Imprint,Issue-no,Frequency)

JOURNAL-ROUTING1 (ISSN,Staff-no ,Location,Depart-code)

KARDEX-RECORD2 (ISSN, Title, Vol-no, Ren-date,
Imprint, Frequency, Bind-date,
Issue-no,)

JOURNAL-ROUTING2 (ISSN,Staff-no,Location,Depart-code)

KARDEX-RECORD3 (ISSN, Title, Vol no., Issue-no,
Ren-date, Bind-date, Frequency,
Imprint,)

JOURNAL-ROUTING3 (ISSN,Staff-no,Depart-code,Location)

(xii)CATALOGUE (Catalogue-name,Record-no,Book-code,
Content,Book-no,Record-date)

CATALOGUE1 (Catalogue-name,Record-no, Book-
code,Content,Book-no,Record-date)

CATALOGUE2 (Catalogue-name,Record-no,Content,Book-
Book-code,no,Record-date)

CATALOGUE3 (Catalogue-name, Record-no,Book-code,
Content,Book-no,Record-date)

(xiii)TIME-BOOK (Staff-no,Surname,Middle name, Last
name,Date,Time,Signature)

TIME-BOOK1 (Staff-no,Surname,Middle name, Last
name,Date, Time,Signature)

TIME-BOOK2 (Staff-no,Surname,Middle name,Last
name,Date,Time,Signature)

TIME-BOOK3 (Staff- no,Surname,Middle name,Last name,Date,Time,Signature)

(xiv) OVERDUE-NOTICE (Borrower-id,Overdue-date Description,Overdue-message, Surname,Middle name,Last name)

OVERDUE-NOTICE1 (Borrower-id,Overdue-date,Overdue-Description,Overdue-message, Surname,Middle name, Last name)

OVERDUE-NOTICE2 (Borrower-id,Ovredue-date,Overdue-description,Overdue-message, Surname,Middle name,Last name)

OVERDUE-NOTICE3 (Borrower-id,Overdue-date,Overdue-description,Overdue-message, Surname,Middle name,Last name)

(xv) RECALL-NOTICE (Borrower-id,Recall-date,Recall-description,Recall-message, Surname,Middle name, Last name)

RECALL-NOTICE1 (Borrower-id,Recall-date, Recall-description,Recall-message, Surname,Middle name,Last name)

RECALL-NOTICE2 (Borrower-id,Recall-date, Recall-description,Recall-message, Surname,Middle name, Last name)

RECALL-NOTICE3 (Borrower-id,Recall-date, Recall-
description, Recall-
message,Surname,Middle name,Last name)

(xvi) CLAIM-NOTICE (Order-no,Order-date,Invoice-no, supplier-
code,Supplier-address, Delivery-
address,)

CLAIM-NOTICE1 (Order-no,Order-date,Invoice-no,Supplier-
code,Supplier-address,Delivery-
address,Delivery-date)

CLAIM-NOTICE2 (Order-no,Order-date,Invoice-
no,Supplier-code,Supplier-
address,Delivery-address,Delivery-date)

CLAIM-NOTICE3 (Order-no,Order-date,Invoice-no,Supplier-
code,Delivery-address,Delivery-date)

CLAIM-DATE3 (Order-no.,Claim-dates,Supplier-address)

(xvii) PUBLISHER-CATALOG (Publisher-code,Catalog-
name,Publisher-name,Publisher-
addr,Content)

PUBLISHER-CATALOG1 (Publisher-code,Catalog-
name,Publisher-
addr,Content,Publisher-name)

PUBLISHER-CATALOG2 (Publisher-code,Catalog-
name,Publisher-name,Publisher-
addr,Content)

PUBLISHER-CATALOG3 (Publisher-code,Catalog-
name,Publisher-name,Publisher-
addr,Content)

(xviii) CARREL (Carrel-no,Carrel-date,Carrel-expiry, Carrel-
usage,Surname,Middle name Last name,Borrower-id
))

CARREL1 (Carrel-no,Carrel-date,Carrel-expiry,Carrel-
usage,Surname,Middle name,Last name,Borrower-id)

CARREL2 (Carrel-no,Carrel-date,carrel-expiry,Carrel-
usage,Surname,Middle name,Last name,Borrower-id)

CARREL3 (Carrel-no, Carrel-date,Carrel-expiry,Carrel-
usage,Surname,Middle name,Last name,borrower-id

(xix) OCCURRENCE-BOOK (Occ-date,Description,Staff-no)

OCCURRENCE-BOOK1 (Occ-date,Description,Staff-no)

OCCURRENCE-BOOK2 (Occ-date,Description,Staff-no)

OCCURRENCE-BOOK3 (Occ-date,Description,Staff-no)

(xx) FINE (Borrower-id, Fine-date,Surname,Middle name,Fine-
description,Amount,Last name)

FINE1 (Borrower-id,Fine-date,Fine-
Description,Surname,Initials,Address,Amount)

FINE2 (Borrower-id,Fine-
date,Surname,Middle name,Last name,Fine-
description,Amount)

FINE3 (Borrower-id,Fine-
date,Surname,Middle name,Last name,Fine-
description,Amount)

(xxi) ACCESSION-LIST(book-no List no,Mailing-address
Acc-date,Author,Title,Imprint,Price)

ACCESSION-LIST1 (Book-no,List-no.Mailing-address,
Acc-date,Author,Title,Imprint,Price)

ACCESSION-LIST2 (Book-no,List-no,Acc-date,Mailing-address
,Author,Title,Imprint,Price)

ACCESSION-LIST3 (Book-no,List-no,Acc-date,Mailing-
address, Author,Title,Imprint,Price)

(xxii) BINDERY-RECORD (Book-no,Bind-date,Date-receipt)

BINDERY-RECORD1 (Book-no, Bind-date, Date-receipt)

BINDERY-RECORD2 (Book-no,Bind-date, Date-receipt)

BINDERY-RECORD3 (Book-no,Bind-date,Date-receipt)

(xxiii) RESERVE-COLLECTION (Book-no, Book-code,Placement-date
Loan-duration,Staff-no)

RESERVE-COLLECTION1 (Book-no, Book-code,Placement-
Date,Loan-duration,Staff-no)

RESERVE-COLLECTION2 (Book-no, Book-code,Placement-
date,Loan-duration,Staff-no)

RESERVE-COLLECTION3 (Book-no,Book-code,Placement-
date,Loan-duration,Staff-no)

(xxiv) AUTHORITYLIST (Record-no,Authority-name,Record-
date,Location)

AUTHORITYLIST1 (Record-no,Authority-name,Record-date,Location)

AUTHORITYLIST2 (Record-no,Authority-name,Record-date,Location)

AUTHORITYLIST3 (Record-no,Authority-name,Record-date,Location)

(xxv) CATALOGUE-SOURCE (Source-name,Content,Source-code,Book-no)

CATALOGUE-SOURCE1 (Source-name,Content,Source-code,Book-no)

CATALOGUE-SOURCE2 (Source-name,Content,Source-code,Book-no)

CATALOGUE-SOURCE3 (Source-name,Content,Source-code,Book-no)

(xxvi) LOANS (Book-no,Loan-date,Borrower-id,Loan-duration,Due-date,borrower-code,Book-code)

LOANS1 (Book-no,Loan-date,Borrower-id,Loan-duration,Due-date,Borrower-code,Book-code)

LOANS2 (Book-no,Loan-date,Borrower-id,Loan-duration,Due-date, Borrower-code,Book-code)

LOANS3 (Book-no,Loan-date,Borrower-id,Loan-duration,Due-date,Borrower-code,Book-code)

(xxvii) ADDRESS (Borrower-id,Box-no,Town-code,Tel-no)

ADDRESS1 (Borrower-id,Box-no,Town-code,Tel-no)

ADDRESS2 (Borrower-id,Box-no,Town-code,Tel-no)

ADDRESS3 (Borrower-id,Box-no,Town-code,Tel-no)

(xxviii) DEPARTMENT (Depart-code,Depart-name,Location,Staff-no)

DEPARTMENT1 (Depart-code,Depart-name,Location,Staff-no)

DEPARTMENT2 (Depart-code,Depart-name,Location,Staff-no)

DEPARTMENT3 (Depart-code,Depart-name,Location,Staff-no)

4.6.1.2 NORMALIZED E-R

The contents of normalized E-R are described below and details given in Figs.23 and 23a

BOOK3 = Book-no + Book-code + ISBN + Acc-no + Title +
+ Publisher-code + Pagination + Year + Place + Bibliogaphy
+ Index + Reservation-date + No-of-copies

COPY3 = Book-no + Author + Price + Book-code

BORROWER3 = Borrower-id + Borrower-code + Surname + Middlename +
Last-name + Employer + Guarantor +
Registration-date + Registration-no + Id-no +
Depart-code + Signature + Staff-no + University-
attended + Designation

LIMITS3 = Borrower-id + Loan-limit + Expiry-date + base-Library

ORDER3 = Order-no + Order-code + Receipt-date + Delivery-address
+ Depart-code + Total-price + Order-description +
Currency + Supplier-code+ Licence-no + Licence-date +
licence-description + Licence-expiry + Quantity + Vote +
Date

PRICE3 = Order-no + Unit-price + Order-status

SUPPLIER3 = Supplier-code + Supplier-name + Faxno +
Publisher-code + Supplier-address

INVOICE3 = Invoice-no + Invoice-date + Invoice-amount + Invoice-payee + Invoice-vote + Invoice-description

LPO3 = LPO-no + LPO-date + LPO-description + LPO-vote + LPO-amount + Supplier-code

BOOK-VOTE3 = Vote-no + Amount + Vote-name + Balance

PVOUCHER3 = Voucher-no + Date + Payee + Vote + Description + Authority-by + Approved-by + Staff-no

DONATION3 = Donor-name + Donor-address + Book-code + donation-description + date-receipt

EXCHANGE3 = Partner-name + Xchange-date + X-description + X-receipt-date

KARDEX-RECORD3 = ISSN + Title + Vol-no + Pen-date + Bind-date + Frequency + Imprint + Issue-no

JOURNAL-ROUTING3 = ISSN + Staff-no + Location + Depart-code

CATALOGUE3 = Catalogue-name +Book-code + Content + Book-no + Record-date + Record-no

TIME-BOOK3 = Staff-no + Surname + Middle name + Last name + Date + Time + Signature

RECALL-NOTICE3 = Borrower-id + Recall-date + Recall-message + Surname + Middle name + last name

CLAIM-NOTICE3 = Order-no + Order-date + Invoice-no + Supplier-code + Delivery-address

PUBLISHER-CATALOG3 = Publisher-code + Catalogue-name +
Publisher-name + Publisher-addr +
Content

CARREL3 = Carrel-no + Carrel-date + Borrower-id + Surname +
Middle name + Last name + Carrel-usage + Carrel-expiry

OCCURRENCE-BOOK3 = Occ-date + Description + Signature
Staff-no

FINE3 = Borrower-id + Fine-date + Fine-description + Amount +
Surname + Middle name + Last name

ADDED-COPY3 = Book-no + Copy-no + Title + Imprint + Author +
Price + Book-code

ACCESSIONLIST3 = Book-no + List-no + Acc-date + Author +
Title + Imprint + Price + Mailing-address

BINDERY-RECORD3 = Book-no + Bind-date + Date-receipt

RESERVE-COLLECTION3 = Book-no + Staff-no + Book-code +
Placement-date + Loan-duration

AUTHORITYLIST3 = Record-no + Authority-name + Record-date +
Location

CATALOGUE-SOURCE3 = Source-name + Source-name + Content + Book-no

SHELFLIST3 - Record-no + Record-date + Copy no + Location

LOANS = Book-no + Loan-date + Borrower-id + Loan-duration +
Due-date + Borrower-code

ADDRESS = Borrower-id + Box-no + Town-code + Tel-no

DEPARTMENT = Depart-code + Depart-name + Location

4.6.2 E-R Modelling

The E-R modelling for a Library Management System is given in FIG.24. The relationships between entities is given in FIG.24a

4.6.3 Database Structure

(i) DATABASE NAME : BOOK3

Fieldname	Length	Type
BOOK_NO	35	CHAR
BOOK_CODE	3	NUMERIC
ISBN	13	CHAR
ACC_NO	7	CHAR
TITLE	50	CHAR
EDITION	4	CHAR
VOL_NO	5	CHAR
PUBLISHER-CODE	3	CHAR
PAGINATION	6	CHAR
YEAR	4	NUMERIC
PLACE	10	CHAR
BIBLIOGRAPHY	5	CHAR
INDEX	5	CHAR
Reservation-date	8	DATE
NO-OF-COPIES	4	CHAR

(ii) DATABASE NAME : COPY3

Fieldname	Length	Type
BOOK_NO	35	CHAR

AUTHOR	45	CHAR
PRICE	8	CHAR
BOOK-CODE	3	NUMERIC

(iii) DATABASE NAME : BORROWER3

Fieldname	Length	Type
BORROWER-ID	12	CHAR
BORROWER-CODE	2	NUMERIC
SURNAME	15	CHAR
MIDDLE-NAME	15	CHAR
LAST-NAME	15	CHAR
GUARANTOR	30	CHAR
REGISTRATION_DATE	8	DATE
REGISTRATION-NO	11	CHAR
ID-NO	11	CHAR
EMPLOYER	30	CHAR
UNIVERSITY-ATTENDED	40	CHAR
DESIGNATION	20	CHAR
DEPART-CODE	4	CHAR
STAFF-NO	11	CHAR
SIGNATURE	15	CHAR

(iv) DATABASE NAME : LIMITS3

Fieldname	Length	Type
BORROWER ID	12	CHAR
LOAN_LIMIT	2	NUMERIC
EXPIRY-DATE	8	DATE

BASE-LIBRARY	20	CHAR

(v) DATABASE NAME : ORDER3

Fieldname	Length	Type
ORDER-NO	13	CHAR
ORDER-CODE	3	NUMERIC
RECEIPT-DATE	8	DATE
DELIVERY-ADDRESS	35	CHAR
DEPART-CODE	4	CHAR
TOTAL-PRICE	12	CHAR
ORDER-DESCRIPTION	200	CHAR
PUBLISHER-CODE	3	NUMERIC
CURRENCY	5	CHAR
SUPPLIER-CODE	3	CHAR
QUANTITY	6	NUMERIC
ORDER-VOTE	13	CHAR
ORDER-DATE	8	DATE
LICENCE-NO	13	CHAR
LICENCE-DATE	8	DATE
LICENCE-DESCRIPTION	200	CHAR
LICENCE-EXPIRY	8	DATE

(vi) DATABASE NAME : PRICE3

Fieldname	Length	Type
ORDER-NO	13	CHAR
UNIT-PRICE	8	CHAR

ORDER-STATUS	50	CHAR
ISBN	13	CHAR

(vii) DATABASE NAME : SUPPLIER3

Fieldname	Length	Type
SUPPLIER-CODE	3	NUMERIC
SUPPLIER-NAME	30	CHAR
FAXNO	13	CHAR
PUBLISHER-CODE	3	NUMERIC
SUPPLIER-ADDRESS	30	CHAR

(viii) DATABASE NAME : INVOICE3

Fieldname	Length	Type
INVOICE-NO	13	CHAR
INVOICE-DATE	8	DATE
INVOICE-PAYEE	30	CHAR
INVOICE-DESCRIPTION	200	CHAR
INVOICE-AMOUNT	12	CHAR
INVOICE-VOTE	13	CHAR

(ix) DATABASE NAME : LPO3

Fieldname	Length	Type
LPO-NO	13	CHAR
LPO-DATE	8	DATE
LPO-DESCRIPTION	8	CHAR
LPO-VOTE	13	CHAR
LPO-AMOUNT	12	CHAR

SUPPLIER-CODE	3	NUMERIC

(x) DATABASE NAME : BOOK-VOTE3

Fieldname	Length	Type
VOTE-NO	13	CHAR
AMOUNT	12	CHAR
VOTE-NAME	30	CHAR
BALANCE	12	CHAR

(xi) DATABASE NAME: PVOUCHER3

Fieldname	Length	Type
VOUCHER-NO	13	CHAR
VOUCHER-DATE	8	CHAR
VOUCHER-PAYEE	30	CHAR
VOUCHER-VOTE	13	CHAR
VOUCHER-DESCRIPTION	200	CHAR
AUTHORIZED-BY	15	CHAR
APPROVED-BY	15	CHAR
STAFF-NO	11	CHAR

(xii) DATABASE NAME : DONATION3

Fieldname	Length	Type
DONOR-NAME	30	CHAR
DONOR-ADDRESS	35	CHAR
DONATION-DATE	8	DATE
DONATION-DESCRIPTION	200	CHAR
DATE-RECEIPT	8	DATE

SUPPLIER-CODE	3	NUMERIC

(x) DATABASE NAME : BOOK-VOTE3

Fieldname	Length	Type
VOTE-NO	13	CHAR
AMOUNT	12	CHAR
VOTE-NAME	30	CHAR
BALANCE	12	CHAR

(xi) DATABASE NAME: PVOUCHER3

Fieldname	Length	Type
VOUCHER-NO	13	CHAR
VOUCHER-DATE	8	CHAR
VOUCHER-PAYEE	30	CHAR
VOUCHER-VOTE	13	CHAR
VOUCHER-DESCRIPTION	200	CHAR
AUTHORIZED-BY	15	CHAR
APPROVED-BY	15	CHAR
STAFF-NO	11	CHAR

(xii) DATABASE NAME : DONATION3

Fieldname	Length	Type
DONOR-NAME	30	CHAR
DONOR-ADDRESS	35	CHAR
DONATION-DATE	8	DATE
DONATION-DESCRIPTION	200	CHAR
DATE-RECEIPT	8	DATE

(xiii) DATABASE NAME : EXCHANGE3

Fieldname	Length	Type
PARTNER-NAME	30	CHAR
PARTNER-ADDRESS	8	CHAR
XCHANGE-DATE	8	DATE
X-DESCRIPTION	200	CHAR
X-RECEIPT-DATE	8	DATE

(xiv) DATABASE NAME : KARDEX-RECORD3

Fieldname	Length	Type
ISSN	13	CHAR
TITLE	70	CHAR
REN-DATE	8	DATE
BIND-DATE	8	DATE
FREQUENCY	15	CHAR
IMPRINT	30	CHAR
ISSUE-NO	5	CHAR

(xv) DATABASE NAME :JOURNAL- ROUTING3

Fieldname	Length	Type
ISSN	13	CHAR
STAFF-NO	11	CHAR
DEPART-CODE	4	CHAR
LOCATION	15	CHAR

(xvi) DATABASE NAME : CATALOGUE3

Fieldname	Length	Type
CATALOGUE-NAME	15	CHAR
BOOK-CODE	2	NUMERIC
CONTENT	20	CHAR
BOOK-NO	35	CHAR
RECORD-DATE	8	DATE
RECORD-NO	7	NUMERIC

(xvii) DATABASE NAME : TIME-BOOK3

Fieldname	Length	Type
STAFF-NO	11	CHAR
SURNAME	15	CHAR
MIDDLE NAME	15	CHAR
LAST NAME	15	CHAR
DATE	8	DATE
TIME	10	CHAR
SIGNATURE	15	CHAR

(xviii) DATABASE NAME : OVERDUE-NOTICE3

Fieldname	Length	Type
BORROWER-ID	12	CHAR
OVERDUE-DATE	8	DATE
OVERDUE-DESCRIPTION	200	CHAR
OVERDUE-MESSAGE	50	CHAR
SURNAME	15	CHAR
MIDDLE NAME	15	CHAR

LAST NAME	15	CHAR

(xix) DATABASE NAME : RECALL-NOTICE3

Fieldname	Length	Type
BORROWER-ID	12	CHAR
RECALL-DATE	8	DATE
RECALL-DESCRIPTION	200	CHAR
RECALL-MESSAGE	50	CHAR
SURNAME	15	CHAR
MIDDLE NAME	15	CHAR
LAST NAME	15	CHAR

(xx) DATABASE NAME : CLAIM-NOTICE3

Fieldname	Length	Type
ORDER-NO	13	CHAR
ORDER-DATE	8	DATE
SUPPLIER-CODE	3	NUMERIC
DELIVERY-ADDRESS	35	CHAR
INVOICE-NO	13	CHAR

(xxi) DATABASE NAME : CLAIM-DATE3

Fieldname	Length	Type
ORDER-NO	13	CHAR
CLAIM-DATE	8	DATE
SUPPLIER-ADDRESS	35	CHAR
DELIVERY-DATE	8	DATE

(xxii) DATABASE NAME : PUBLISHER-CATALOG3

Fieldname	Length	Type
PUBLISHER-CODE	3	NUMERIC
CATALOGUE-NAME	30	CHAR
PUBLISHER-NAME	30	CHAR
PUBLISHER-ADDRESS	35	CHAR
CONTENT	50	CHAR

(xxiii) DATABASE NAME : CARREL3

Fieldname	Length	Type
CARREL-NO	3	NUMERIC
CARREL-DATE	8	DATE
CARREL-EXPIRY	8	DATE
SURNAME	15	CHAR
MIDDLE NAME	15	CHAR
LAST NAME	15	CHAR
BORROWER-ID	12	CHAR
CARREL-USAGE	30	CHAR

(xxiv) DATABASE NAME : OCCURRENCE-BOOK3

Fieldname	Length	Type
OCC-DATE	8	DATE
DESCRIPTION	200	CHAR
STAFF-NO	11	CHAR
SIGNATURE	15	CHAR

(xxv) DATABASE NAME : FINE3

Fielname	Length	Type
BORROWER-ID	12	CHAR
FINE-DATE	8	DATE
SURNAME	30	CHAR
MIDDLE NAME	15	CHAR
LAST NAME	15	CHAR
FINE-DESCRIPTION	50	CHAR
AMOUNT	9	CHAR

(xxvi) DATABASE NAME : ACCESSIONLIST3

Fieldname	Length	Type
BOOK-NO	35	CHAR
LIST-NO	2	NUMERIC
ACC-DATE	8	DATE
AUTHOR	15	CHAR
IMPRINT	30	CHAR
PRICE	8	CHAR
MAILING-ADDRESS	35	CHAR

(xxvii) DATABASE NAME : BINDERY-RECORD3

Fieldname	Length	Type
BOOK-NO	35	CHAR
BIND-DATE	8	DATE
DATE-RECEIPT	8	DATE

(xxviii) DATABASE NAME : RESERVE-COLLECTION3

Fieldname	Length	Type
BOOK-NO	35	CHAR
BOOK-CODE	2	NUMERIC
PLACEMENT-DATE	8	DATE
LOAN-DURATION	15	CHAR
STAFF_NO	11	CHAR

(xxix) DATABASE NAME : AUTHORITYLIST3

Fieldname	Length	Type
RECORD-NO	5	NUMERIC
AUTHORITY-NAME	15	CHAR
RECORD-DATE	8	DATE
LOCATION	20	CHAR

(xxx) DATABASE NAME : CATALOGUE-SOURCE

Fieldname	Length	Type
SOURCE-NAME	20	CHAR
SOURCE-CODE	2	NUMERIC
BOOK-NO	35	CHAR
CONTENT	50	CHAR

(xxxi) DATABASE NAME : DEPARTMENT3

Fieldname	Length	Type
Depart-code	4	NUMERIC
DEPART-NAME	30	CHAR
LOCATION	30	CHAR
STAFF-NO	11	CHAR

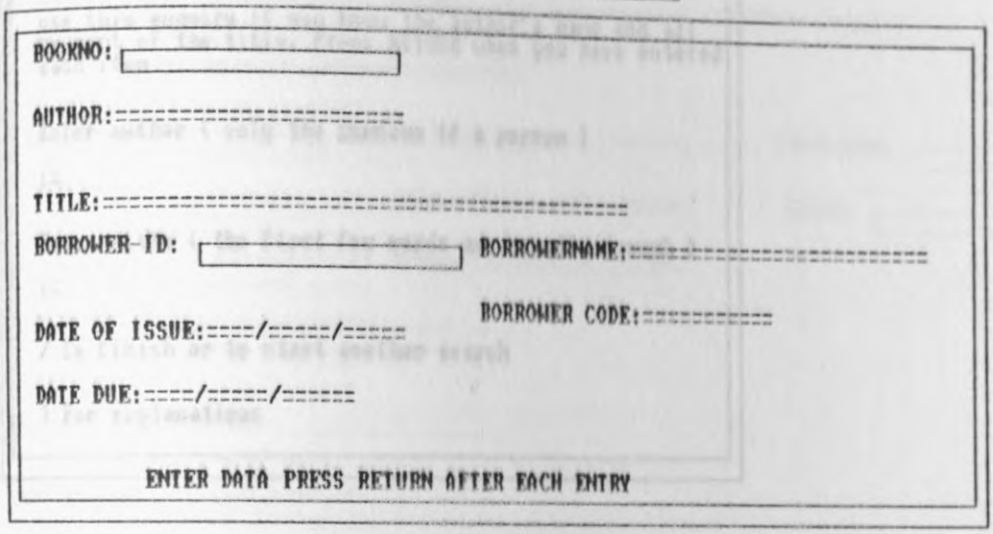
(xxxii) DATABASE NAME: ADDRESS3

Fieldname	Length	Type
BORROWER-ID	12	CHAR
BOX-NO	8	NUMERIC
TOWN-CODE	6	CHAR
TEL_NO	12	CHAR

(xxxiii) DATABASE NAME : LOANS3

Fieldname	Length	Type
BOOK-NO	35	CHAR
LOAN-DATE	8	DATE
BORROWER-ID	13	CHAR
BOOK-CODE	2	NUMERIC
LOAN-DURATION	15	CHAR
DUE-DATE	8	DATE
BORROWER-CODE	2	NUMERIC

FIG.16 BORROWING INPUT SCREEN



:========== Display Fields

FIG.16b Input Screen For Author/Title enquiry

```
AUTHOR/TITLE ENQUIRY

use this enquiry if you know the author's name and all
or part of the title. Press RETURN when you have entered
each item

Enter author ( only the surname if a person )

:=

Enter title ( the first few words are usually enough )

:=

/ To finish or to start another search

? For explanations
```

FIG.16c Output Screen For Author/Title enquiry

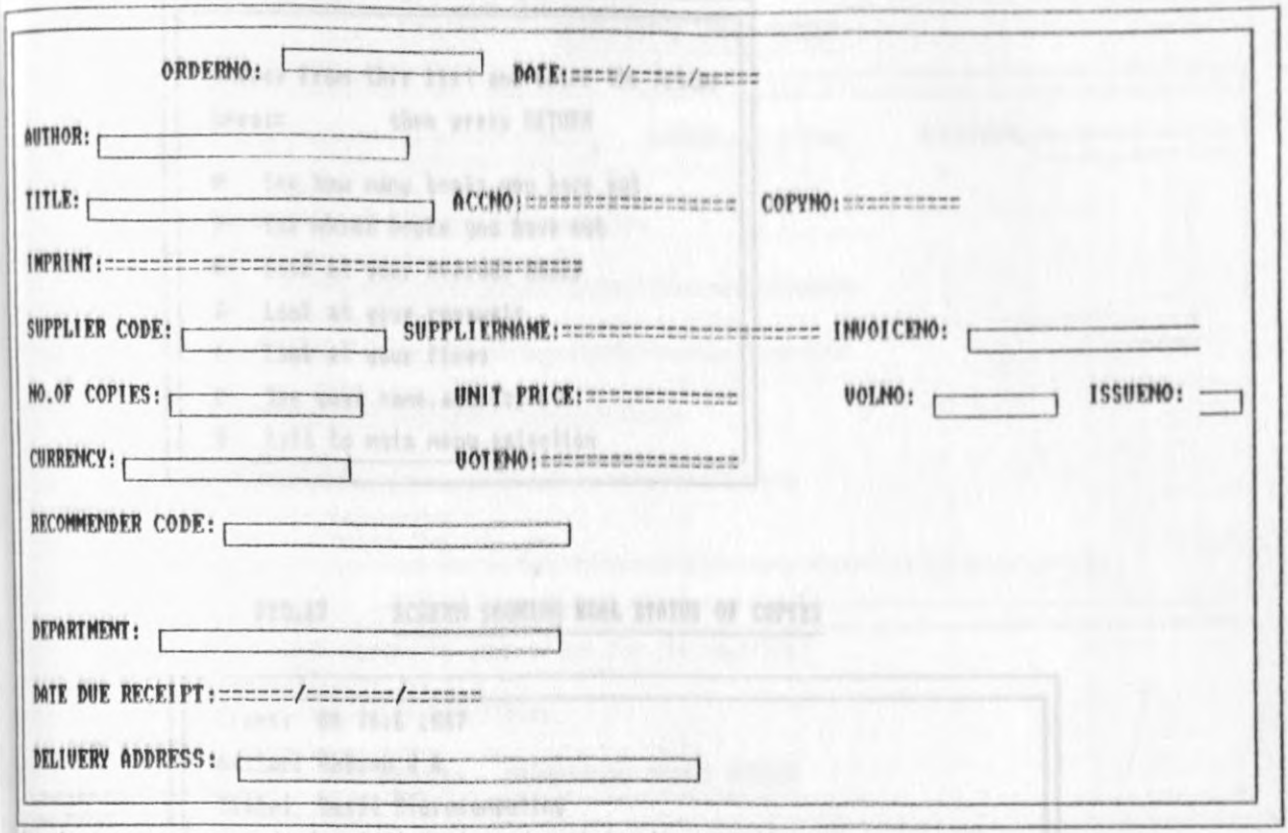
```
AUTHOR/TITLE ENQUIRY

Title: '' Introduction to Psychopathology of life
Author: '' Jones Nakhumicha ''

   No item exactly matches your search
   There are 2 items with this title

Code
 D          To display records for this title
 A          To search for this author
 B          To go back and start another search
 /          Finish or start another search
 ?          For explanations
```

FIG.16d Input Screen for Acquisitions



The above input screen is for both books and periodicals acquisitions

KEY: ========== Display fields

FIG.16e Output Screen for Acquisitions

ORDERNO: Li564100/93 DATE: 12/08/93
AUTHOR: Rowley J
TITLE: Library Automation ACCNO:0002000000 COPYNO: 1-20
IMPRINT:London:ALA,1988
SUPPLIER CODE: 0010 SUPPLIER NAME: BOWKER INVOICENO: 0188888832
NO.OF COPIES: 20 UNIT PRICE: 18.95 VOLNO: N/A ISSUENO: N/A
CURRENCY:Sterling pounds VOTENO: 674225
RECOMMENDER CODE: AH1-11993
DEPARTMENT: Library
DATE DUE RECEIPT: 24/11/93
DELIVERY ADDRESS: University Library Box 30197 Nairobi

FIG.16a PUBLIC QUERY BORROWING QUERIES MENU

```
Choose from this list and enter the letter
here:=          then press RETURN

M-  See how many books you have out
B-  See which books you have out
O-  Look at your overdue books
R-  Look at your renewals
F-  Look at your fines
P-  See your name,address etc
X-  Exit to main menu selection
```

FIG.17 SCREEN SHOWING REAL STATUS OF COPIES

```
Class:  QA 76.6 .H67
Author: Hobson J A
Title:  Basic Microcomputing

Copies:      Active holds:      Pending:
CPY          Accno:             Location:        Status
1            5824185            CHO              On loan due 29/08/93
2            5824196            JKML             In the library
3            5824198            RESERV           Ask in Reserve
```

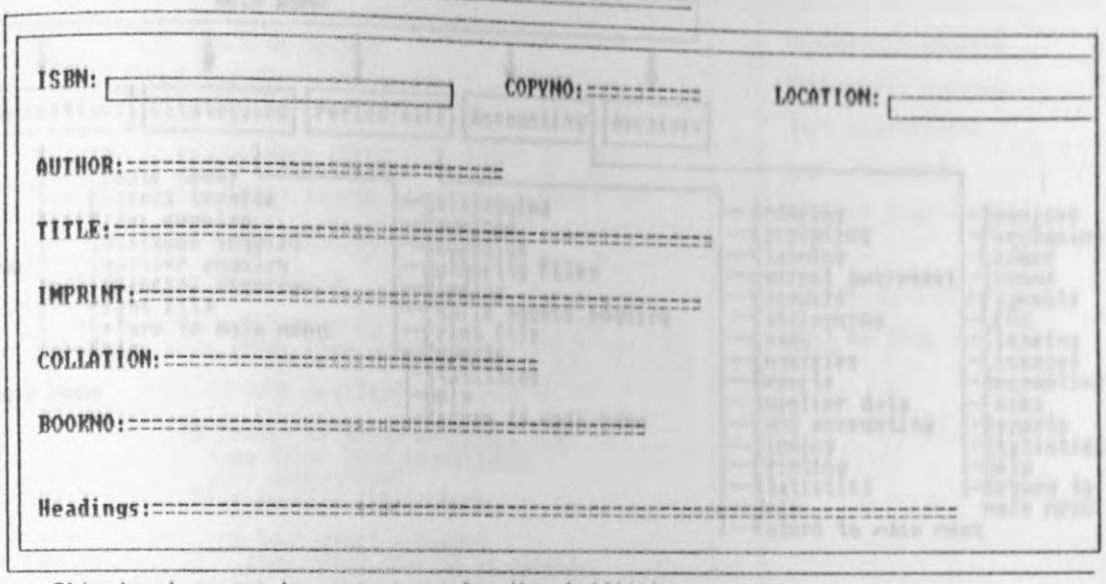
FIG.17a STAFF SCREEN SHOWING REAL TIME STATUS OF COPIES

```
Function: Bibliographic query/update          Press 'HLP' for help

Class: HD 400 .S53
Author: Campbell
Title:  Seven theories of society
Borrower: Smith A b          Borrid: 50901243
Issued: 02/08/93
Due   : 07/08/93
Status: Current

    No further transactions
```

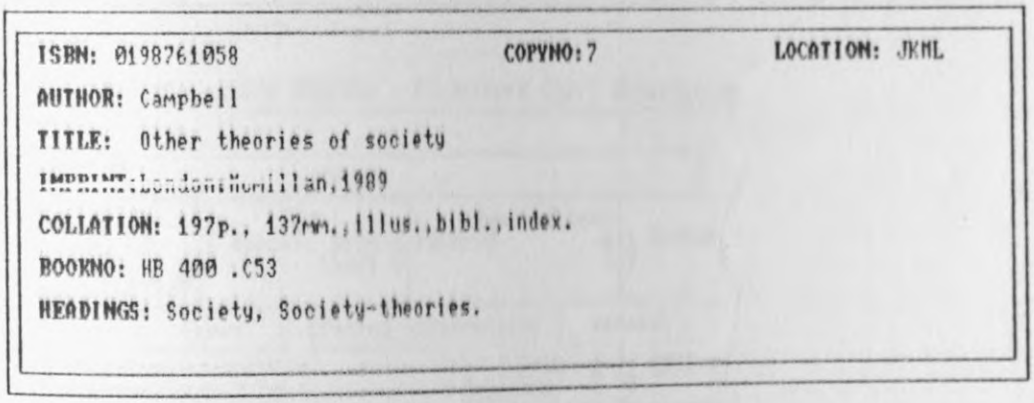
FIG.16f CATALOGUING INPUT SCREEN



This input screen is same as one for the shelflist

KEY: ========= Display fields

FIG.16g CATALOGUING OUTPUT SCREEN



MAIN MENU FOR LIBRARY FUNCTIONS

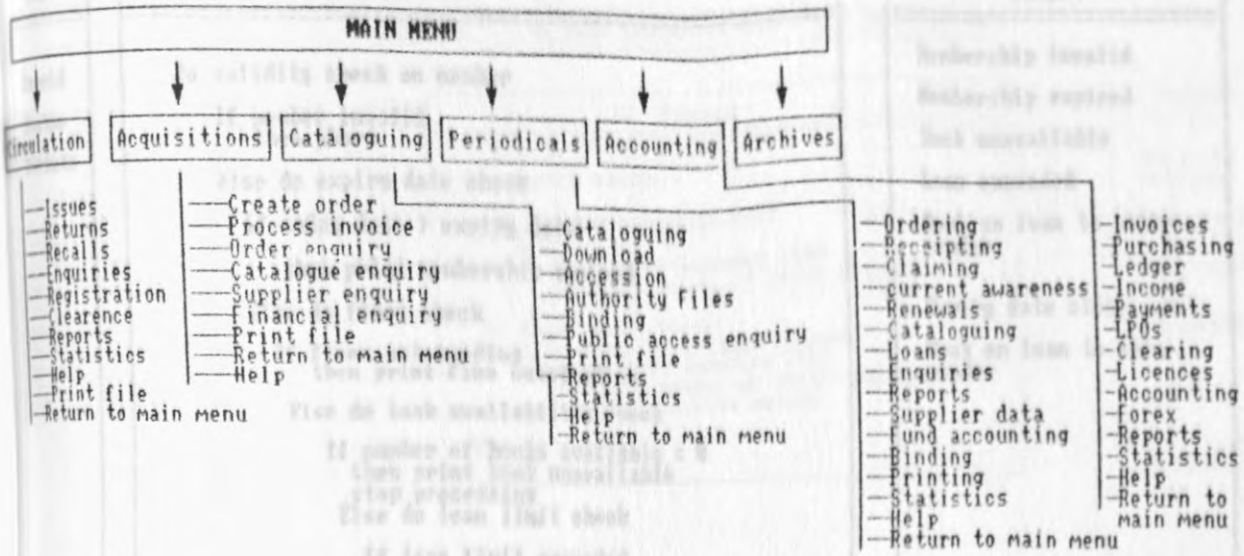


FIG.19 ISSUE PROCESS : Hipo Chart description

Input	Process	Output
Borrid Bookno Duedate	Do validity check on member If member invalid then abort Else do expiry date check If today date) expiry date then print membership expired Else do fines check If fines outstanding then print fine outstanding Else do book availability check If number of books available = 0 then print book unavailable stop processing Else do loan limit check If loan limit exceeded then ouput message on screen Else Decrement number of books available Create borrower-book link END	Membership invalid Membership expired Book unavailable Loan exceeded Book on loan to other reader Expiry date close Book on loan to this reader

FIG.19a ISSUE PROCESS : Structured Chart Description

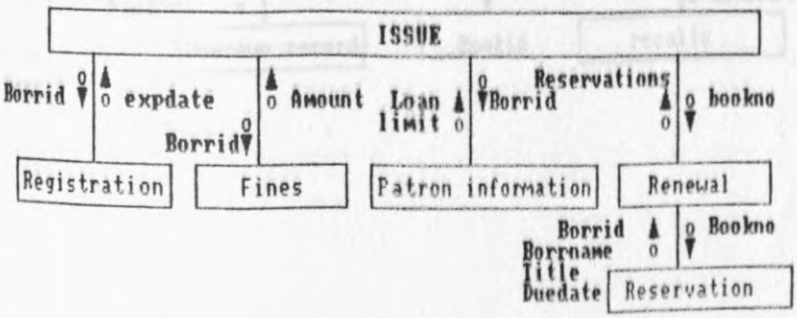


FIG.19b RETURNS PROCESS : Hipo Chart Description

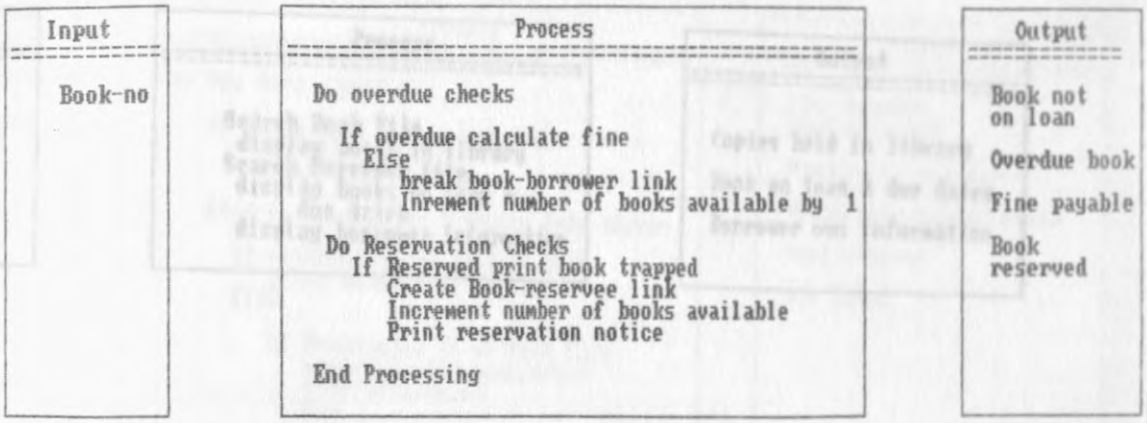


FIG.19c RETURNS PROCESS : Structured Chart Description

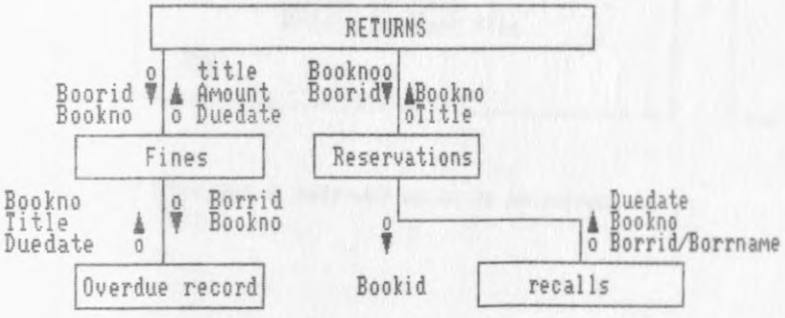


FIG.19d ENQUIRIES PROCESS : Hipo Chart Description

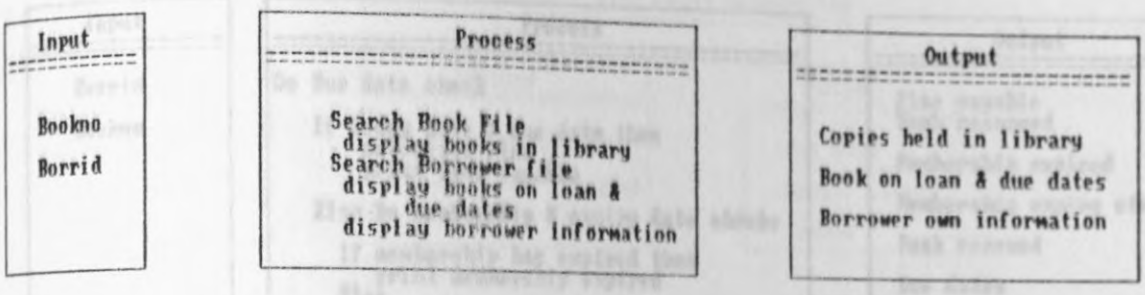


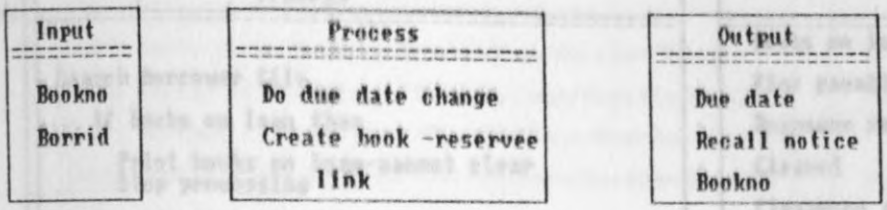
FIG.19e **RENEWAL PROCESS : Hipo Chart Description**

Input	Process	Output

Borrid
Bookno
	Do Due date check
	If today date > due date then
	calculate fine
	print fine payable
	Else Do membership & expiry date checks
	If membership has expired then
	print membership expired
	Else
	If Membership is invalid then
	print invalid membership
	stop processing
	End
	Do reservation checks
	If book is reserved then
	print book trapped
	stop processing
	Else
	Update bookfile
	Update borrower file
	End
		Fine payable
		Book reserved
		Membership expired
		Membership expiry close
		Book renewed
		Due dates

his process can be performed whenever a borrower wants to re-borrow
ook(s) already in his possession.

FIG.19f RECALLS PROCESS : Hipo Chart description



N.B. This process is performed when there is demand for book(s) on loan to borrower.

FIG.19g CLEARENCE PROCESS : Hipo Chart Description

Input	Process	Output

Borrid
Borrname
	Search borrower file
	If books on loan then
	Print books on loan-cannot clear
	Stop processing
	Else Do fine checks
	If fine are pending then
	Print fine payable-cannot clear until fine is paid
	Stop processing
	Do Checks on branch libraries
	If member then
	Print clearence from branch needed
	Else
	Deregister borrower
	Archive borrower record
	Stop processing
	End
		Books on loan to borrower
		Fine payable
		Borrower mebership libraries
		Cleared
		Clearence slip
		Cannot be cleared
		Unit price(s) of book(s)

This process is performed whenever the library membership expires
or terminated

FIG.19h STATISTICS PROCESS : Hipo Chart Description

Input	Process	Output
Borrcode Bookno Author	Count daily Issue/Returns/Reservation/Overdue/Recalls Count weekly Issue/Returns/Reservations/Overdue/Recalls Count monthly Issue/Returns/Reservations/Overdue/Recalls Count yearly Issue/Returns/Reservations/Overdue/Recalls	Number of issues Number of reservations Number of recalls Number of overdues Active titles Number of returns

FIG.19: REGISTRATION PROCESS : Hipo Chart Description

Input	Process	Output

Borrcode
Borrid
Department
Address
Date
Borrname
	search registration file
	If registered then
	print already registered
	Stop processing
	End
	Else
	Add borrower to registration file
	End
		Borrower not on file
		Borrower entered
		Expiry date
		Borrower category

N.B. This process is performed when new member wants to register with library.

ORDER PROCESSING : Hipo Chart Description

Input	Process	Output

...erno
...N
...plier code
...ntity
...artment
	Search on-order file
	If Book is on order then
	print book ordered
	stop processing
	end
	Else Search PC file
	If book already in stock
	print bookno,copyno,imprint,title,
	author,price
	confirm order
	stop processing
	end
	If book is new order then
	Search bibliographic file
	print book details
	transfer book detail to input screen
	confirm order
	stop printing
	Do book fund check
	If book fund exhauted then
	print vote exhauted-order invalid
	Else
	Balance:= vote amount - Net price
	End
		Bookno
		Copyno
		Delivery address
		Orderslips
		Order accepted
		Order rejected
		Net price
		Quantity
		Vote number
		Vote balance
		Order list

FIG.20a ORDER PROCESSING : Structured Chart description

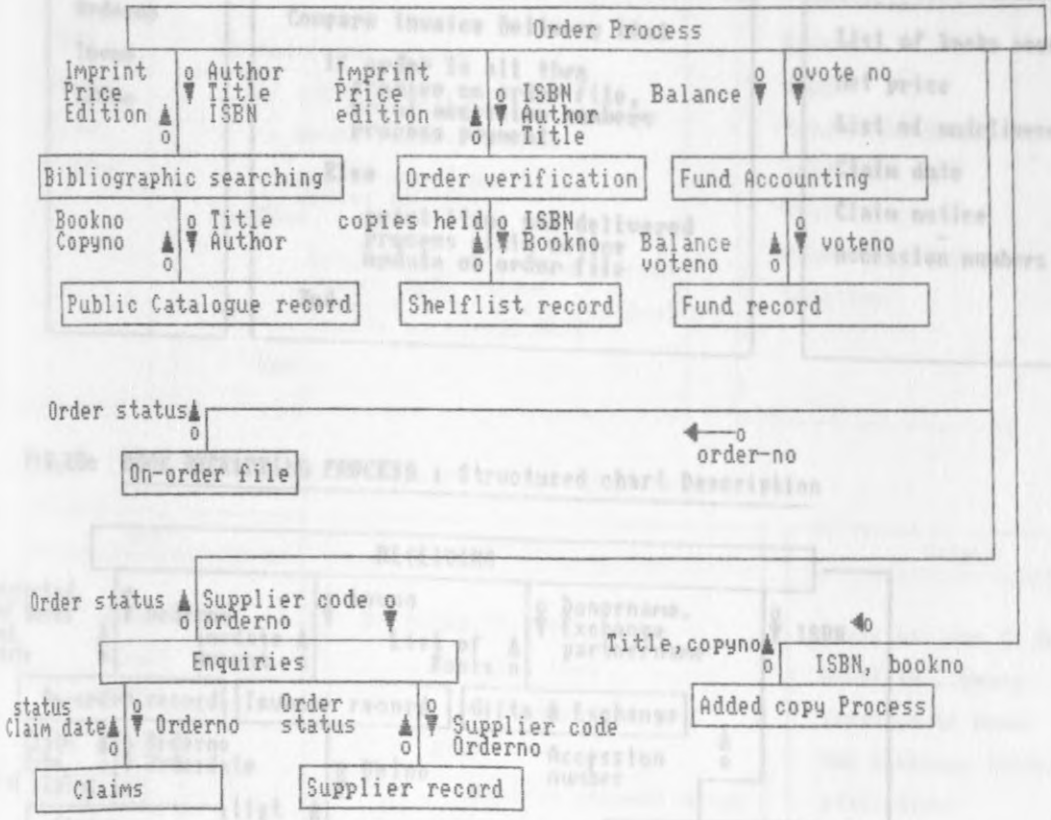


FIG.20b BOOK RECEIPTING PROCESS : HIPO CHART DESCRIPTION

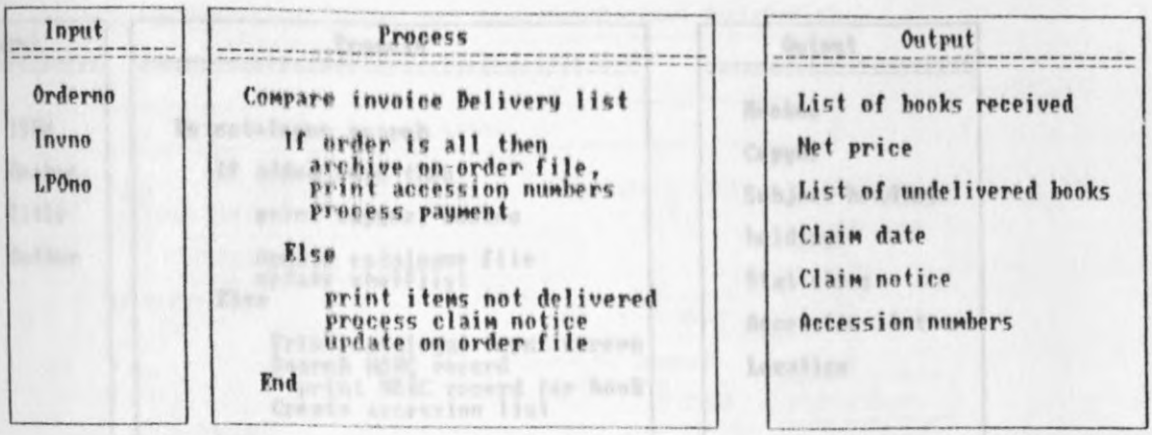


FIG.20c BOOK RECEIPTING PROCESS : Structured chart Description

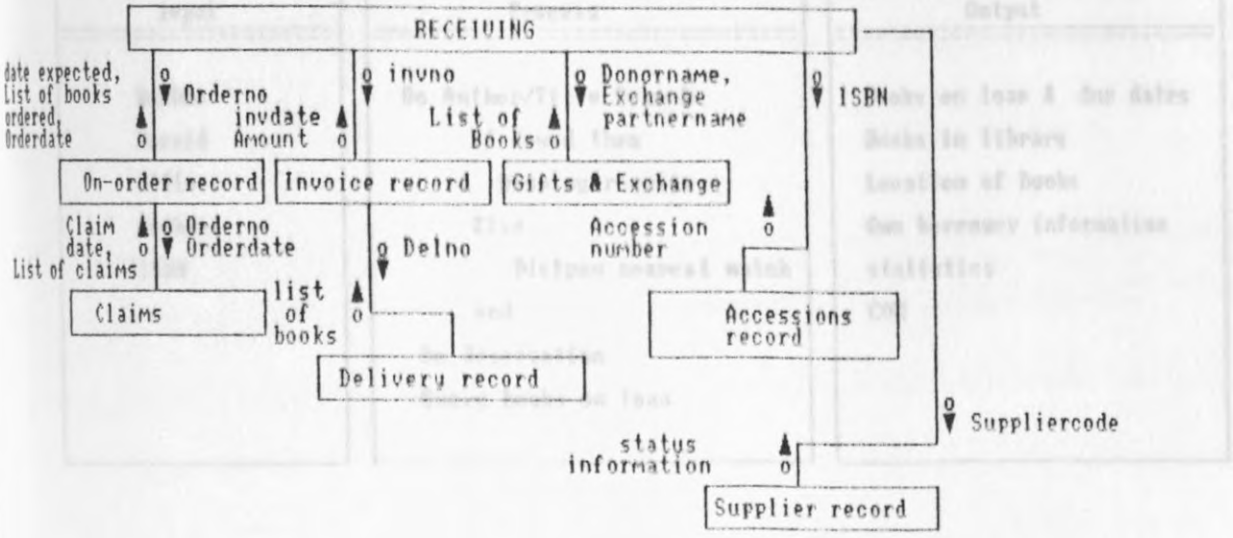


FIG.21 ONLINE CATALOGUING PROCESS : Hipo Chart description

Input	Process	Output

ISBN
Bookno
Title
Author
	Do catalogue search
	If added copy then
	print copyno, bookno
	update catalogue file
	update shelflist
	Else
	Print catalogue input screen
	Search MARC record
	print MARC record for book
	Create accession list
	End
		Bookno
		Copyno
		Subject headings
		holdings
		Statistics
		Accession list
		Location

FIG.21a ONLINE PUBLIC ACCESS PROCESS : Hipo Chart Description

Input	Process	Output

Bookno
Borrid
Title
Author
ISBN
	Do Author/Title Search
	If found then
	Display results
	Else
	Dislpay nearest match
	end
	Do Reservation
	Query books on loan
		Books on loan & due dates
		Books in library
		Location of books
		Own borrower information
		statistics
		COM

FIG. 22 PERIODICAL FUNCTIONS: Structured chart Description

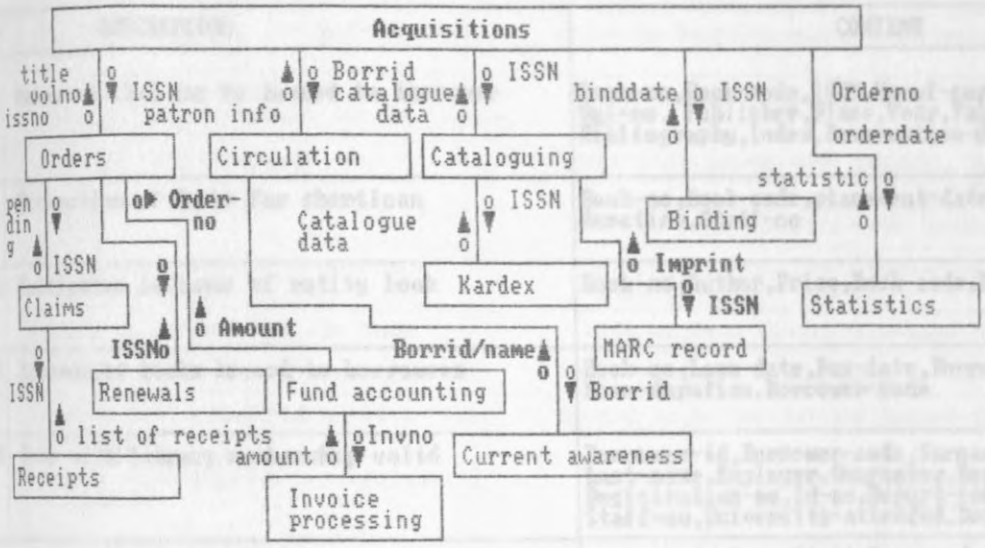


FIG.23 NORMALIZED DATA DICTIONARY ENTRY FOR ENTITIES

ENTITY	DESCRIPTION	CONTENT
BOOK3	Material that can be loaned to borrower	Book-no,Book-code,ISBN,No-of-copies, Vol-no, Publisher,Place,Year,Paginition, Bibliography,Index,Reservation-date
RESERVE-COLLECT-ION3	Collection of Books for shortloan	Book-no,Book-code,placement-date,Loan-duration,Staff-no
COPY3	Particular instance of entity book	Book-no,Author,Price,Book-code,Title
LOANS3	Records of books loaned to borrowers	Book-no,Loan-date,Due-date,Borrower-id, Loan-duration,Borrower-code
BORROWER3	User with Library membership valid	Borrower-id,Borrower-code,Surname,Middle-name, Last-name,Employer,Guarantor,Registration-date, Registration-no,Id-no,Depart-code,Signature, Staff-no,University-attended,Designation
LIMITS3	The bounds for the Borrower	orrower-id,Loan-limit,Expiry-date,Base-library
ADDRESS3	The residence or place of work for borrower	Borrower-id,Box-no,Town-code,Tel-no
ORDER3	The details for an order sent to Supplier for delivery of books	Order-no,Order-code,Receipt-date,Delivery-address Depart-code,Total-price,Order-description, Currency,Supplier-code,Licence-no,Licence-date, Licence-description,Quantity,Order-vote, Order-date,Licence-expiry

FIG.23a NORMALIZED DATA DICTIONARY ENTRY FOR ENTITIES

BINDERY RECORD	Books sent to bindery for repair	Book-no,Bind-date,Date-receipt
CLAIM-NOTICE	Notice to Supplier for undelivered Order	Order-no,Supplier-address,Delivery-date
SUPPLIER3	Company that has been awarded the contract to supply books to the Library	Supplier-code,Supplier-name,Supplier-address, Faxno
CATALOGUE-SOURCE	Source of Catalogue data	Source-code,Source-name,Content, Book-no
INVOICE3	The bill from Supplier for Books ordered	Invoice-no,Invoice-date, Invoice-amount,Supplier-code ,Invoice-payee,Invoice-vote,Invoice-description
LPO	Authorization for local purchase of goods	LPO-no,LPO-date,LPO-description,LPO-vote,LPO-amount,Supplier-code,Order-no
BOOK-VOTE3	Vote to be debited for the book	Vote-no,Vote-amount,Vote-name,Balance
CLAIM-DATE	Date when claim is sent to Supplier	Order-no,Claim-dates,Supplier-adress,Delivery-date
AUTHORITYLIST3	Authoritative names and headings used in Catalogue	Record-no,Authority-name,Record-date
VOUCHER3	Payment voucher giving authorization for payment	Voucher-no,Voucher-date,Voucher-payee,Voucher-payee Voucher-vote,Voucher-description,Authority-by, approved-by
DONATIONS3	Insititution or individual donating books to the Library	Donor-name,Donor-address,Donation-date,Donation-description,date-receipt
CARREL3	Private Study room in the Library	Carrel-expiry,Carrel-usage, Last name Carrel-no,Carrel-date,Borrower-id,Surname,Middle name
EXCHANGE3	Partner with whom the library can exchange materials	Partner-name,Partner-address,Xchange-date, X-description,X-receipt-date
ACCESSIONLIST	List of new book acquisitions	Book-no,List-no,Acc-date,Author,Title,Price,Mailing-ad
INDEX-RECORD3	Records of periodicals held in the Library	ISSN,Title,Vol-no,Ren-date,Bind-date, Frequency,Imprint,Price
JOURNAL-ROUTING3	selected periodical titles sent to staff with interest in that given subject area	ISSN,Routing data,Location,Staff-no,Depart-code
CATALOGUE3	Records of all books in the Library	Catalogue-name,Type,Content,Book-no,Record-date
TIME-BOOK3	Record for arrival-time of staff below grade of Lecturer	Staff-no,Surname,Initials,Date,Time, Signature
OVERDUE-NOTICE3	Notice to borrower asking that he returns the books overdue in his possession	Overdue-date,Overdue-description,Overdue-message Surname,Initials,Address,Borrower-id
RECALL-NOTICE3	Notice to Borrower to return books in his possession that Are required by many other borrowers	Recall-date,Recall-description,Recall-message, Surname,Initials,Address,Borrower-id
HOLDLIST	Holdings for Books	Record-no,Record-date, Book-code
DEPARTMENT	Department where Staff works	Depart-code, Depart-name,Location,Staff-no
ITEM	Unit Price of an item on the order	Order-no, Item-description,Order status
OCCURRENCE-BOOK	Book in which events in the Library are recorded	Occ-date,Staff-no,Signature,Description
PUBLISHER-CATALOG	List of Books for sale from Publisher	Publisher-code,Publ-name,Publ-addr,Conten
FINE	charge levied to Borrower	Borrower-id,Fine-descr,Fine-date,Names,Signature

FIG.24 E-R DIAGRAM FOR NORMALIZED ENTITIES

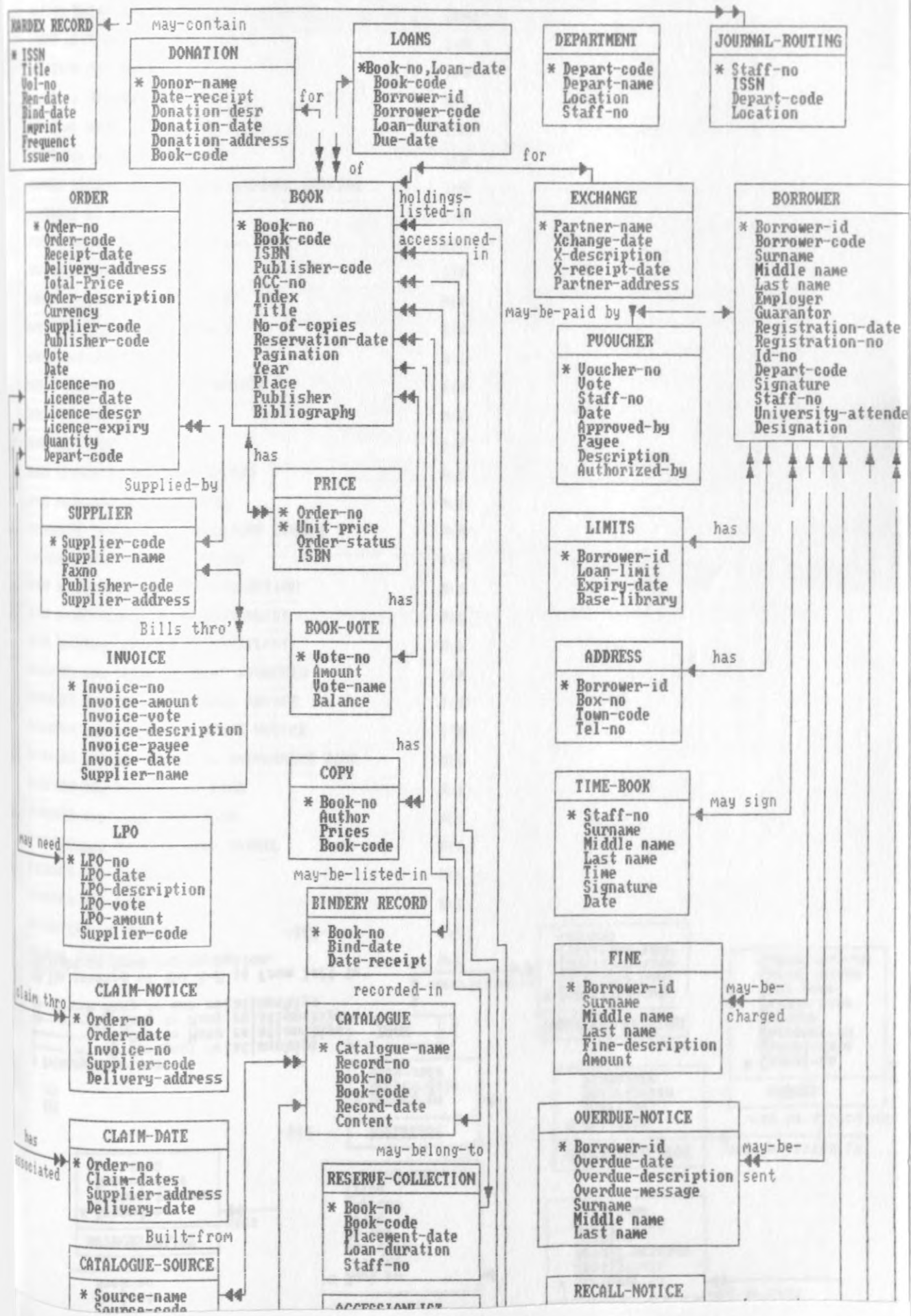
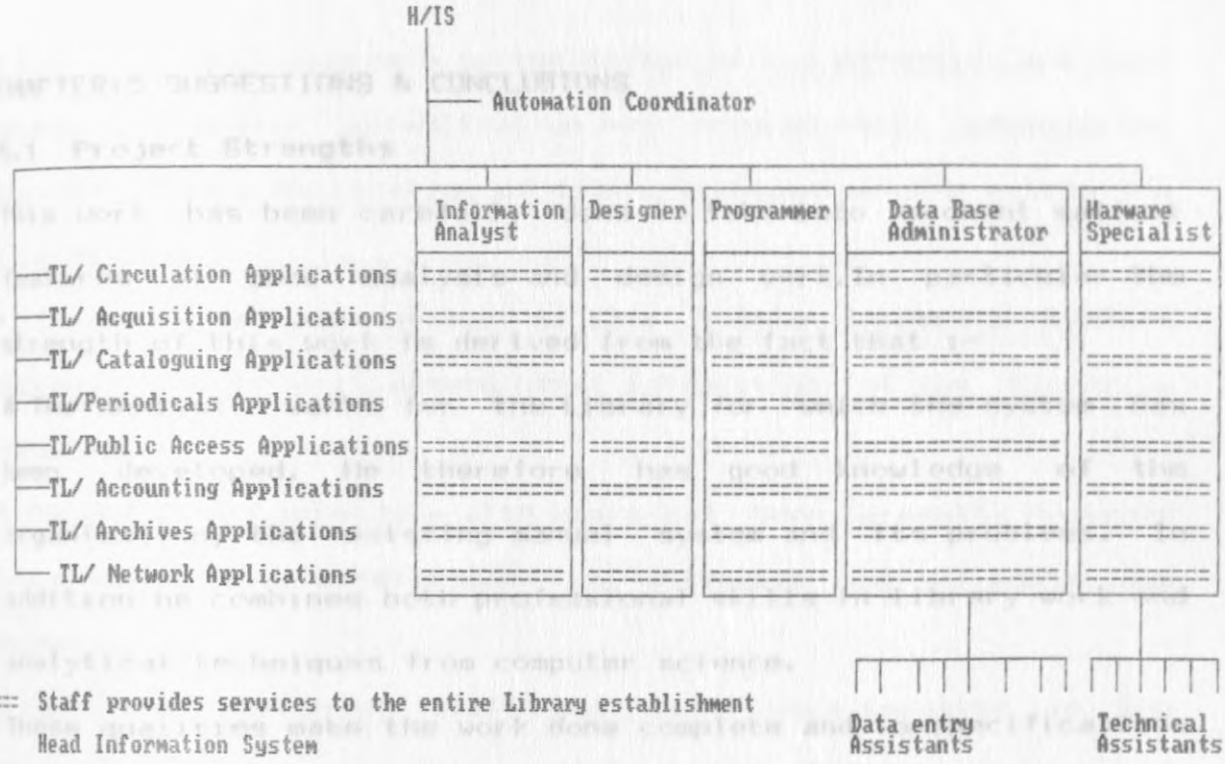


FIG.24a ENTITY-RELATIONSHIPS

Entity-Relationship	Type
LOANS of BOOK	1:M
DONATION for BOOK	1:M
LOANS to BORROWER	M:1
PRICE of BOOK	1:M
ORDER for BOOK	1:M
KARDEX RECORD may-contain JOURNAL ROUTING	1:M
EXCHANGE of BOOK	1:M
PUBLISHER-CATALOG advertises BOOK	M:M
SUPPLIER supplies BOOK	1:M
ORDER supplied-by SUPPLIER	M:1
SUPPLIER bills-via INVOICE	1:M
ORDER may-need LPO	M:1
ORDER claim-thro' CLAIM-NOTICE	1:M
BOOK has BOOK-VOTE	M:1
BOOK has COPY	1:M
BOOK listed-in BINDERY RECORD	M:1
BOOK recorded-in CATALOGUE	M:1
CATALOGUE built-from CATALOGUE SOURCE	M:M
CATALOGUE uses AUTHORITYLIST	1:M
BOOK belongs-to RESERVE-COLLECTION	M:1
BOOK accessioned-in ACCESSIONLIST	M:1
BOOK holdings-listed-in SHELFLIST	M:1
BORROWER may-be-paid-thro' PVOUCHER	1:M
BORROWER may-be-sent RECALL-NOTICE	1:M
BORROWER may-be-sent OVERDUE-NOTICE	1:M
BORROWER may-be-listed-in OCCURRENCE BOOK	M:1
BORROWER may-be-charged FINE	1:M
BORROWER may-sign TIME-BOOK	M:1
BORROWER may-be-allocated CARREL	M:1
BORROWER has ADDRESS	M:1
BORROWER has LIMITS	M:1
DEPARTMENT of BORROWER	1:M
JOURNAL ROUTING of BORROWER	M:1

FIG.25 STAFF STRUCTURE OF THE PROPOSED SYSTEM



CHAPTER:5 SUGGESTIONS & CONCLUSIONS

5.1 Project Strengths

This work has been carefully done to take into account salient features of good analysis and design work.In particular the strength of this work is derived from the fact that :-

The analyst works for the Library for which the system has been developed. He therefore has good knowledge of the organization, the existing manual system and its problems. In addition he combines both professional skills in library work and analytical techniques from computer science.

These qualities make the work done complete and to specifications as demanded by the objectives of the project.

All major components of the system are investigated, analyzed and designed using extensively scientific techniques and tools of both Soft and Hard Systems approaches such as interviews, Data flow diagrams, Flow charts, Decision tables, Data dictionary, HIPO Charts,Structured charts,Structured English, E-R diagrams and Normalization. This approach ensure completeness in the work done, standardization and aids documentation.

This work include a specifications document appendix xix that reflects accurately the needs of the Users and can be used as basis for seeking tenders from potential Suppliers. In addition it is vital to management as it records needs and constraints,it identifies important aspects such as means of control of input and output,security of data and general plans for automation.

The integrated approach to the design of the database achieved through systematic normalization has ensured that redundancies and unnecessary duplication of data reminiscent in the system are eliminated.

The analysis and design of this System adopted a Systems approach which will ensure that integration of the System is enhanced.

The database interface with users has been carefully designed to promote easy interaction by extensive use of menus and prompts.

A cross-section of staff and users were involved in the analysis and design of this work to ensure that the end product meet the specifications and is acceptable. (Refer to appendix xx for the list of staff and users interviewed)

The data elements identified as of value to the organization have been documented in the data dictionary and much of it used in the design. The rest is reserved for future developments of the system.

The input design has been done to ensure minimum entry of only necessary data so that transactions take the minimum time thus increasing productivity.

The outputs are carefully designed to promote clarity with headings at the top of screen or printout,details at the centre and messages at the bottom. The important data elements are easiest to find from left to right.

Maintenance of all library materials on computer has been taken into account to ensure that staff can keep track of them and so promote accountability and increase stock use.

The system has been designed using modular approach to simplify maintenance work and facilitate future enhancements.

A number of packages on the market have been included to give the Library wide options to evaluate using specifications prepared and make a reasonable choice.

The design work has ensured that security of library materials is enhanced, status of materials can be monitored, use of multiple keys for searching, prompt recall of overdue and other materials needed urgently, automatic calculation of fines on overdue books, immediate updating of transactions and production of relevant reports to aid management planning among, others. All these lead to effective utilization of library resources.

Some time was spent at the beginning of this Work to gather information about history,present and past objectives and anticipated future of the Organization.This revealed what members of the Organization think it is doing and how it is perceived by the users.

5.2 Project Weaknesses

Though efforts have been met to design an integrated system for the library, some two systems namely Library Accounts and Archives have not been fully included in the design. This is basically due to time constraint.

However, modular approach of the design undertaken will ensure that they can be included at later date without a problem.

No capital and recurrent costs for the system have been worked out due to time constraints though the financial feasibility done earlier in this work and experiences of others who have automated do indicate that the benefits of automating eventually outweigh the costs.

Though the acquisition functions of the Library are not confined to books alone, this Work does not address the 'non-book' materials. However, this aspect can be integrated in Accounts System in future as part of a purchasing module.

The system as designed cannot capture the signature of borrowers to ensure accountability and security of library materials.
This aspect will be handled simply through mutual trust between the user and staff.

Though many may think that it would have been helpful to try and simulate the working of the proposed System through prototyping,this I considered was not necessary because:-

* there are many examples of Systems on the market that have been tested and proved to meet requirements for Libraries similar to the University Library whose use can be considered.
* Prototyping is best reserved for areas where there is robust paradigm and where there are stakeholder groups with strongest and legitimate interest in them.

This scenario does not exist in the University Library.

* Prototyping if it is later proved to be desirable may be quickly accomplished by asking the Suppliers to prototype before the system is acquired.

* Given the amount of analysis and design work for Library of the University Library size,no inch of time could allow for prototyping.

5.3 Implementation issues: proposals

The weaknesses identified above will make basis for part of future developments on the system.

5.3.1 Developing Inhouse-System vis-a-vis buying Off-the-Shelf

The choice of a System is difficult because the pace of technology quickly alters possibilities. However,it is necessary to be careful over the matching of the Specifications and the System purchased or developed.

There are four main possibilities of automating the Library namely:-

In-house developed System,

Turnkey or Off-The-Shelf System

Bureaux services

Cooperatives

As hinted elsewhere the last two options are not suitable for the University Library because Bureaux Services are mainly batch and Cooperative Schemes that can provide Computing Services are not available in Kenya.

In-house developed Systems were common in the 1960's and early 1970's. Though they take into considerations local practices and the Library can have full control of the System they have the following limitations:-

Development is time consuming and many years may pass before the Library has smooth operation of the System.

Library would need to have access to specialized personnel such as Programmers,Designers,Analysts and Maintenance staff. These calibre of Staff are not available now and it will take considerable time before they can be acquired.

The Cost of developing,maintaining and operating the System can be very prohibitive.

Current trends are geared towards Off-the-Shelf packages for the reasons given below.

Nowadays Library Automation is dependent on Off-the Shelf Packages because:-

They usually include a computer and all other essential Hardware,Software and Documentation such as Descriptive,Training and Reference Manuals.

Some Vendors install the System,train Staff to operate and manage the System and provide on-going maintenance and support of Hardware and Software.

Many of these Systems can be tailored to meet most library requirements.

The Vendor will be responsible for making System work in the Library.

Since the cost of development is spread over many users,they tend to be relatively cheaper.

Staff need not have Computer background as prerequisite to operate and manage the turnkey System.

There is no transaction or service fees other than Hardware and Software maintenance that will have to be paid.

It is important to emphasize that though there are many Off-the-Shelf packages on the market to meet the automation needs of the University Library,a number of these Systems must be evaluated against a profile of the requirements of the Library before reasonable choice is made. The requirements which emerged as an aspect of Systems Analysis and further defined by Design must form the basis Tendering process.

5.3.2 Hardware Platforms for Implementation

In cases where the Vendors of the Off-the-Shelf System do not provide Hardware for the implementation of the System,they usually give advice on hardware on which the System can run.Even though it is necessary for the Library to independently find out the suitable hardware whose maintenance can be locally achieved. The library can find out through:-

Exhibitions

Visits to installations with similar Systems

Conferences

Trade literature

Some of the widely used Off-the-Shelf Systems such as Libertas,Geac,Tinlib,Dobis Libis,and Urica provide Hardware to implement the Systems.

Some Libraries may opt to use the Parent Organization Computer but this option is fraud with problems because:-

It is difficult to guarantee the type of response times anticipated.

It is difficult to guarantee that the Library jobs or access to the System would be on schedule and regularly.

Library has needs which affect the choice of the machine or peripherals.Occasionally main computer services do not accept the Library to affect its configurations.

Where the Library is expected to purchase its own Hardware the suitable option has been to buy Minicomputers to provide Stand-alone Systems which are dedicated to Library house-keeping functions and which could be expanded as the System required. This was because Minicomputers do not need special environments nor a team of people to run them.Their ability to support lot of peripherals made them as capable as main-frames. They could accept similar software packages and permit multi-user access times. Today trends are towards powerful Microcomputers that can equally perform like Mainframes,so the concept of Minicomputers is infact fading.

5.3.3 Management of Change

The changes to library consequent upon the development of new technology are complex and involve alterations to working practices,working relationships,attitudes and levels of expertise and technical changes.The Manager needs to know that technological changes however small will also have an effect on social aspects of the working environment. The greatest challenge for management is the productive management of change.

5.3.3.1 Staff Resistance

In the course of this Project Work it became apparent that Library Staff whereas they would appreciate the improvement in the levels of services provided by the Library,they have reservations about the implications of automation for them. In particular the recent Staff appraisal requirement in the University and the World Bank requirement for reduction in Staffing levels has raised eye-brows in the Library.This suspicion is held by both junior Staff and some senior Staff. This I reckon may be the tip of the iceberg. My independent judgement from talking to staff show that Staff may be suspicious because:-

They have little or no experience with computers and so they are apprehensive of the uncertainty and don't know what to expect when the computer is introduced.

Main Library Staff feel that there is need for coordination of Computing services from a centralized place,but the sites Library Staff feel there is need to introduce new ideas at local level rather than involve the Main Library.

The question of centralized coordination raises the question of who will be in control and how will the rest fit in.

They are simply resisting transparency that will be occasioned by the computer.

The sites complain that there is no feedback from the Main Library on enquiries pertaining to automation.

Some senior Staff may be concerned about their power bases being disrupted or shifted that affecting their status.

Fear for losing their jobs.

Fear that they may require to acquire new skills which they imagine are needed to use the computer.

Fear that some social groupings may be broken up.

Some Staff generally feel use of computer has some associated ill-effects.

5.3.3.2 Approaches to Resistance

The process of managing change is continuous right from the time of conceiving the idea for change up to the time the System is installed and operated and the post-implementation period. During this process the approaches to resistance must include:-

The need to obtain Senior Management Support and commitment.

Developing and implementing the System with full participation of all affected parties.

Enough time must be taken to introduce the change,create the vigor,create favorable environment,and give Senior Management time to get accustomed. need to build up an awareness to see change as in their best interest.

The Systems purpose,characteristics and scope must be stated clearly.This will centre discussion on facts rather than fiction.

Need to provide sound examples of Computerization projects where there have been no redundancies.

Need to humanize the information System by ensuring that users will feel that they are making a worthwhile contribution to the organization.

Need to emphasize the challenges when introducing the System.

Need to cultivate habit of change so that people can be used to the idea.

Need to sell the benefits of the new System while assuring Staff that their jobs are safe.

The time-table for implementing the System will need to be explained.

Need to fit the System to the User rather than vice-versa.

Need to provide good leadership with a vision for the future and articulate resources.

Need to provide education and training in preparation for change.

Restructure the organization to accommodate the change and cultural re-orientation for staff.

5.3.4 Information Function Policies

There is need for the Library to work out important information policies relating to:-

Staff-Selection,recruitment,development and appraisal in order to attract and retain most qualified staff.

Hardware/Software procurement: There is need for policies that would encourage Acquisition standardization,Integration and interfacing compatible with OSI model to facilitate system interconnection,procedural connectivity and compatibility across equipments.

Need for policies dealing with network planning,objectives and configuration.

Policies relating to quality of user services that the Library is committed to providing need to be clearly spelled out.

Data distribution: there is need to decentralize some of the processing to the branch Libraries in order to respond to local needs.

Need to develop data security procedures to secure data against unauthorized access .

5.3.5 Campus-wide Network

Future developments of the system will have to be geared towards hooking the entire university libraries to the proposed Campus-wide network to enhance information dissemination to users wherever they are in the University.

5.3.6 Library Staff Structure

The staffing structure as it stands can not cope with the rigor of automating an organization of the University Library magnitude.

There is need to restructure part of the positions and create new ones to reflect responsibility, coordination, authority and chain of command in the technical arm of the structure.

Current trends in Management of Library Automation are towards developing permanent or Semi-permanent project teams often based on the Matrix(FIG.25) Structure because:-

The Matrix Structure would place the Systems Manager(Automation Coordinator or Systems Librarian) in a good position to coordinate the many interrelated aspects of a particular project both inside and outside the organization.

Because of greater coordination greater control over both personnel and material resources can be achieved.

This type of Structure can support several major projects active at once as specialized personnel can move from one project to another as the situation demands.

Matrix Structure would promote Specialization and therefore efficiency.

Integration can be achieved

This structure promote user/information function relationships.

This Structure encourages commitment to carrying out a set of defined tasks.

The Matrix Structure for the anticipated Library Automation should support the following Skills:-

Head- **Information System:-** This is a position that would be both administrative and technical. The occupant would be responsible for policy,planning,budgeting on matters relating to Library automation.

Automation Coordinator:- The person who should be technically qualified and holding Senior position in the Library Management hierarchy will be responsible for:-

Coordinating the progress of the Project with Management.

Liaise with outside services i.e Computer facilities.

Built up working relationships between staff that require technical expertise.

Conduct training of Staff though this may initially be done by Vendor.

Communicate progress to all staff

Directs aspects of Library operations that involve automation.

Supervise Analysts,Programmers and Designers.

Diagnose malfunctions that result from operations.

Outline procedures to be followed.

Work closely with other Library Staff in defining their requirements.

Systems Analyst/Information advisor:-

This Staff will be responsible for:-

Carrying out information requirement analysis

Carrying out feasibility studies.

#Identifying and evaluating alternative solutions.

Liaison between Users and the Head-Information System.

Planning tasks to be accomplished.

Costing proposed system.

Preparing documentation

Designer:-

The designer would be responsible for:-

Design of new applications.

Design file structures,records for input and output.

Produce design documentation.

Design security and recovery procedures.

Data Base Administrator:-

This person will be responsible for;-

Maintaining DBMS.

Tuning up DBMS to optimize performance.

Develop backup procedures.

Develop standards.

Programmer:-

This Staff will be responsible for:-

Coding in-house developed Systems.

Maintaining operating Systems.

Installing new packages

Training of users.

Hardware specialist:-

The Hardware specialist will be responsible for:-

Advising Head-information System on Communication matters between Main Library and the Branches.

Give advise on H/W acquisitions,interfacing and development.

Help sort out Communication problems.

Planning for networking.

Advise on communication H/W and S/W.

Other Skills:-

Other critical skills will include keying in operators and technicians.

5.3.7 Staff Training

Staff training to respond to the challenges of automation must be planned well in advance. Training will equip staff with requisite skills and confidence to handle and manipulate the new equipment. Aspects of staff training to be considered should include:-

developing long term staff development plan with regard to managing change effectively in the library,

determining the objectives,

reviewing job and Organization Structure and its management to embrace the ideals of automation,

identifying the people to train,

establishing the training needs for each individual,

identifying training modules,

preparing content for training,

carrying out the training programme,

reviewing the programme to establish whether it is responding to the needs of the times so that new applications can be developed or system replaced.

5.3.8 Maintenance Support

The Library must ensure that maintenance arrangements are made local as much as possible. Direct support from the Vendor or his agent should be preferred to third party maintenance support.

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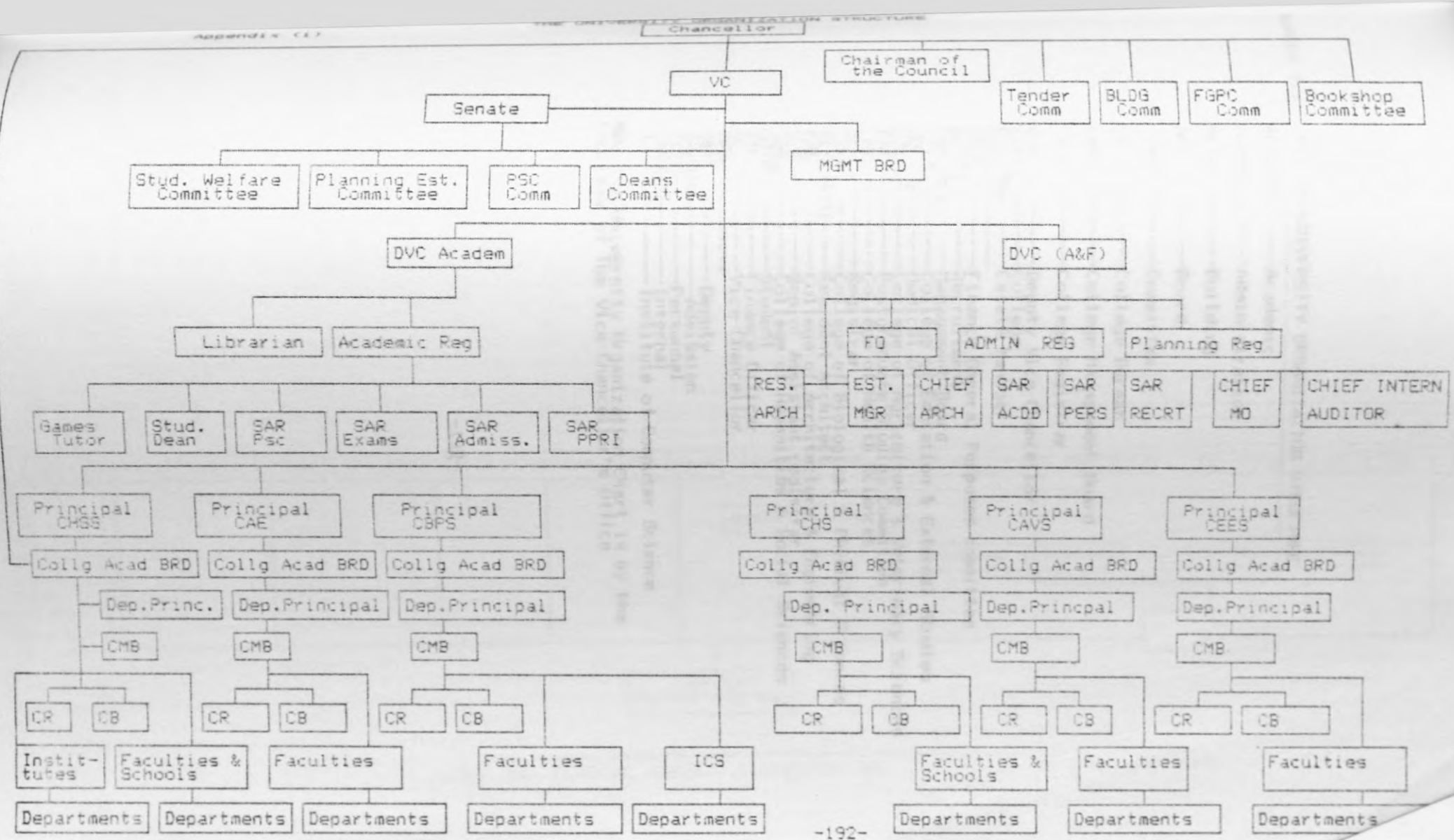

THE ORGANIZATIONAL STRUCTURE
Chancellor
Chairman of the Council
VC
Tender Comm
BLDG Comm
FGPC Comm
Bookshop Committee
Senate
MGMT BRD
Stud. Welfare Committee
Planning Est. Committee
PSC Comm
Deans Committee
DVC Academ
DVC (A&F)
Librarian
Academic Reg
FO
ADMIN REG
Planning Reg
RES. ARCH
EST. MGR
CHIEF ARCH
SAR ACDD
SAR PERS
SAR RECRT
CHIEF MO
CHIEF INTERN AUDITOR
Games Tutor
Stud. Dean
SAR Psc
SAR Exams
SAR Admiss.
SAR PPRI
Principal CHSS
Principal CAE
Principal CBPS
Principal CHS
Principal CAVS
Principal CEES
Collg Acad BRD
Collg Acad BRD
Collg Acad BRD
Collg Acad BRD
Collg Acad BRD
Collg Acad BRD
Dep.Princ.
Dep.Principal
Dep.Principal
Dep. Principal
Dep.Princpal
Dep.Principal
CMB
CMB
CMB
CMB
CMB
CMB
CR
CB
CR
CB
CR
CB
CR
CB
CR
CB
CR
CB
Institutes
Faculties & Schools
Faculties
Faculties
ICS
Faculties & Schools
Faculties
Faculties
Departments
Departments
Departments
Departments
Departments
Departments
Departments
Departments

Appendix (ii) KEY TO UNIVERSITY ORGANIZATION STRUCTURE

ACADEM--------Academic

ADMIN---------Administration

BLDG----------Building

BRD-----------Board

COMM----------Committee

CB------------College Bursar

CMB-----------College Management Board

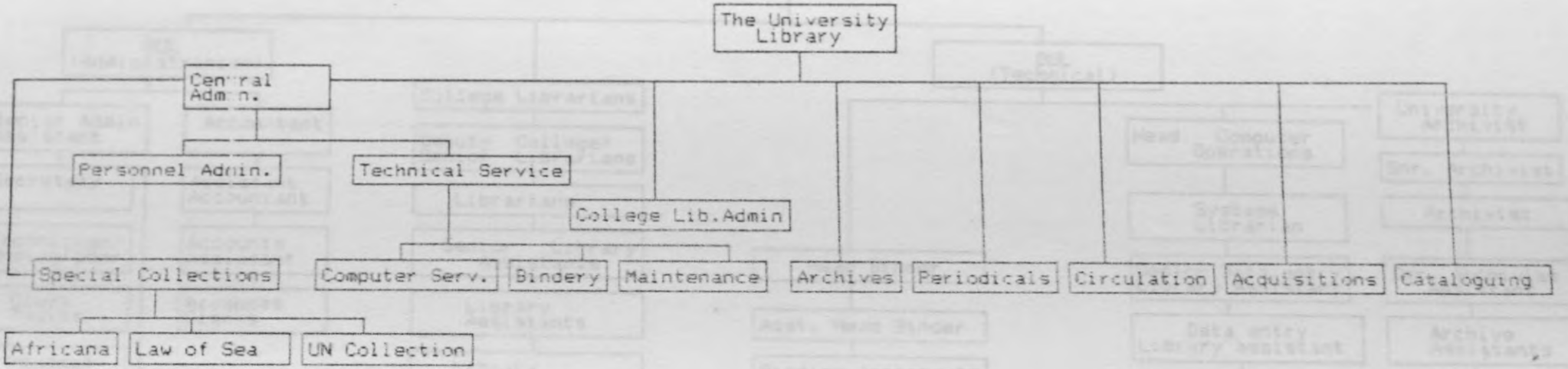
CR------------College Registrar

DVC-----------Deputy Vice Chancellor
COLLG---------College
EST MGR-------Estate Manager
ACDD----------
FGPC----------Finance General Purposes committee
RECRT---------Recruitment
MGT BRD-------Management Board
CEES----------College of Education & External Studies
MO------------Medical Officer
CAVS----------College of Agriculture & Veterinary Sciences
PSC-----------Postgraduate Studies Committee
CHS-----------College of Health Sciences
REG-----------Registrar
CBPS----------College of Biological & Physical Sciences
RES ARCH------Resident Architect
CAE-----------College of Architecture & Engineering
SAR-----------Senior Assistant registrar
CHSS----------College of Humanities & Social Sciences
STUD----------Student
FO------------Finance Officer
VC------------Vice-Chancellor
PPRI----------
DEP-----------Deputy
ADMISS---------Admission
PERS-----------Personnel
INTERN---------Internal
ICS------------Institute of Computer Science

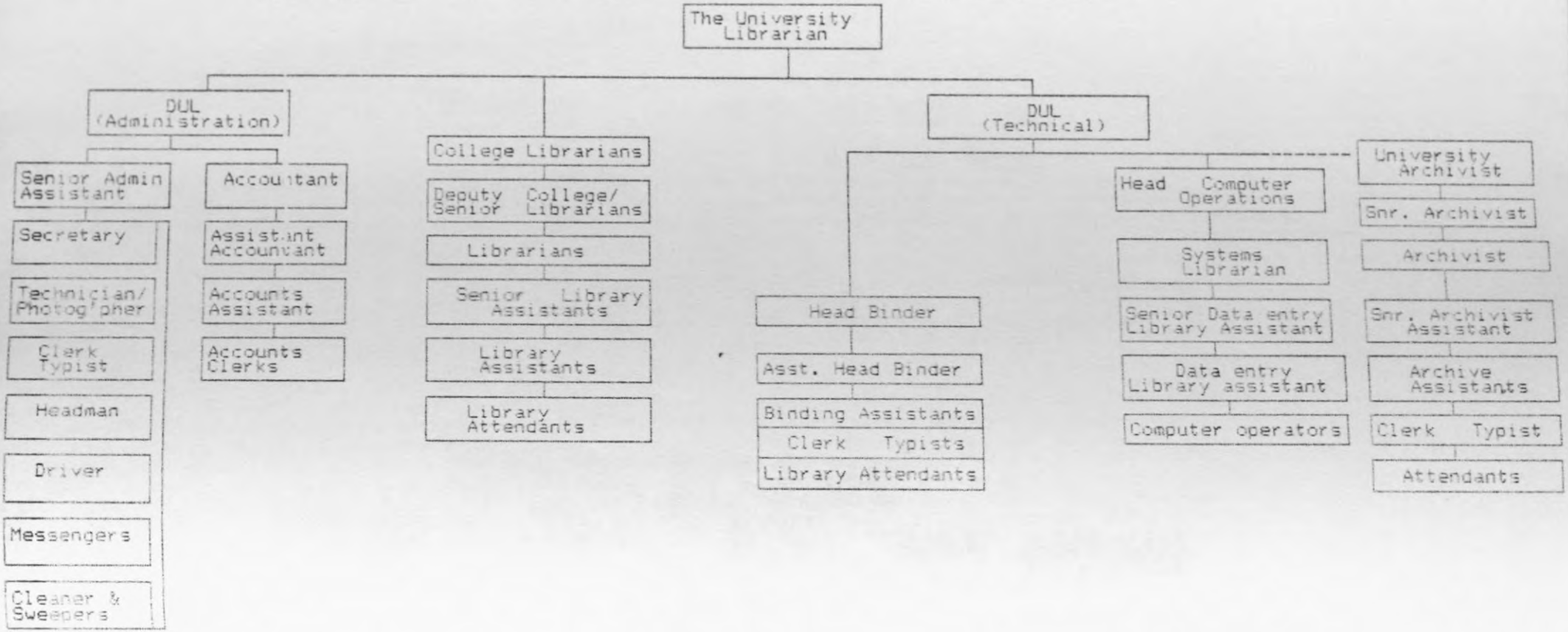
NB: The University Organization Chart is by the Courtesy of The Vice-Chancellor's Office

Appendix (iii)

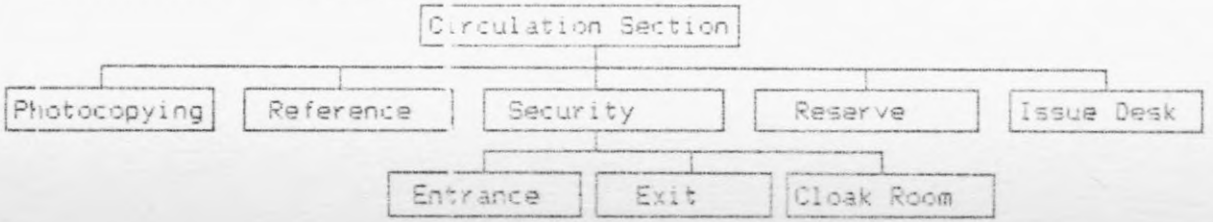
THE UNIVERSITY LIBRARY ORGANIZATION CHART



Appendix (iv) UNIVERSITY OF NAIROBI LIBRARY SYSTEM: STAFF STRUCTURE

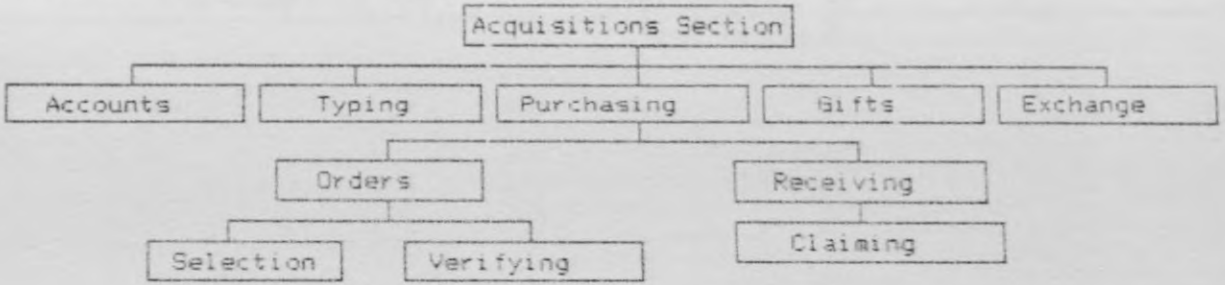


Appendix (v) CIRCULATION: SECTION CHART



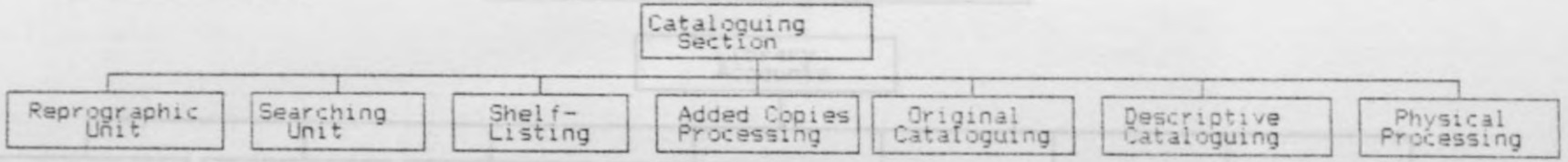
Appendix (vi)

ACQUISITIONS: SECTION CHART



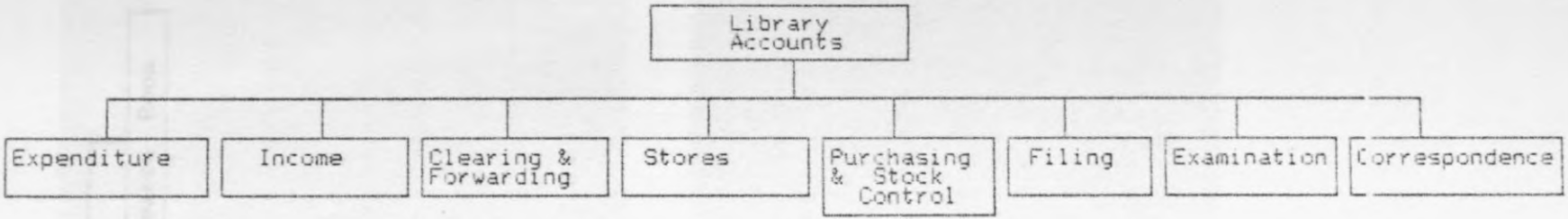
Appendix (vii)

CATALOGUING: SECTION CHART



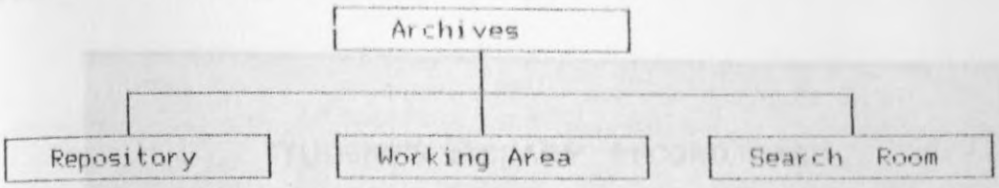
Appendix (viii)

LIBRARY ACCOUNTS : ORGANIZATION CHART

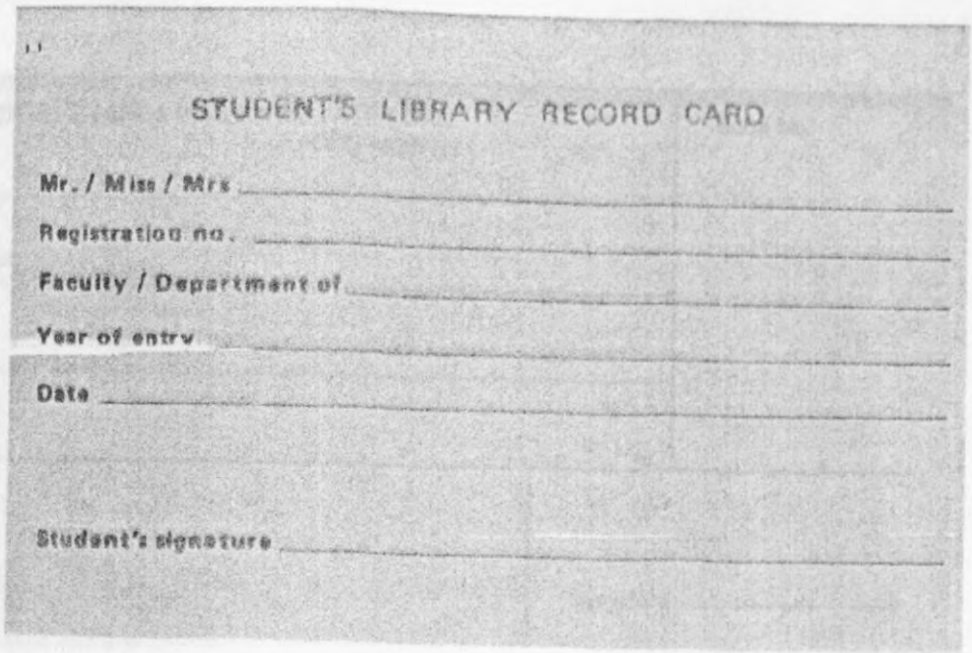


Appendix (ix)

ARCHIVES : SECTION CHART



Appendix (x): Registration form



STUDENT'S LIBRARY RECORD CARD

Mr. / Miss / Mrs _____

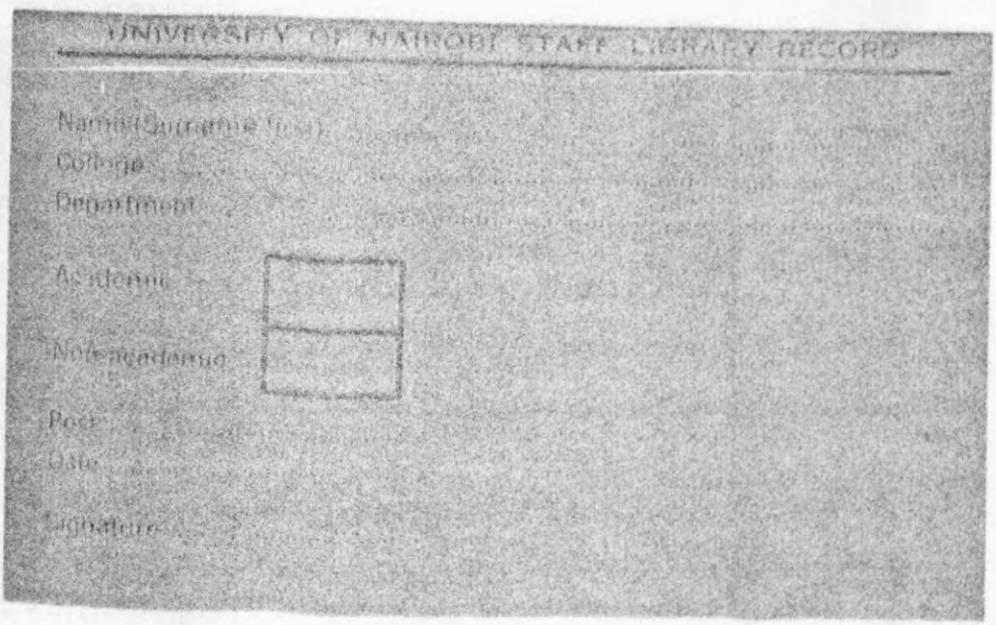
Registration no. _____

Faculty / Department of _____

Year of entry _____

Date _____

Student's signature _____



UNIVERSITY OF NAIROBI STAFF LIBRARY RECORD

Name (surname first)

College

Department

Academic

Non-academic

Post

Date

Signature

Appendix (xi): Borrower forms

ACADEMIC STAFF & POSTGRADUATE LOAN
ONE MONTH

Book No.

Author

Title

30573-3x5 1/4

Signature

Name:

Book No

Author

Title

UNDERGRADUATE, NON-ACADEMIC/STAFF &
O/Bs' LOAN - 14 DAYS

Signature

30572-3x5 1/4

Appendix (xii): Order form

Author:

Title:

Date Publisher:

Place: Edition: Vols:

Series:

No. of copies: Price:

Supplier:

Order No: Date: Dept.

Send invoices in duplicate to Librarian, University of Nairobi
P.O. Box 30197, Nairobi, Kenya.

Appendix (xiii): Claim form

UNIVERSITY OF NAIROBI
LIBRARY DEPARTMENT

Ref: 201.100 Claims

P.O. Box 30197,
NAIROBI, Kenya.

Dear Sirs,

Re: CLAIMS FOR OUTSTANDING ORDERS.

On checking our records we find that the orders below which we sent to you before ..... have not yet been supplied in full. May we request you to supply all the required items as ordered as soon as possible. Please send us progress reports in respect of all the items which you cannot immediately supply.

Yours Sincerely,

VII/jmn.

Senior Librarian - Acquisition Section.

ORDER NO. _____ DATE OF ORDER _____

ITEM.	AUTHOR.	TITLE/DATE	PUBLISHER.	COPIES.

Appendix (xiv)

MACMILLAN DISTRIBUTION LIMITED
HOUNDMILLS, BASINGSTOKE,
HANTS, RG21 2XS, ENGLAND

INVOICE

INVOICE NUMBER 640514X
DATE & TAX POINT 13-SEP-90

PLEASE REMIT TO THE ABOVE ADDRESS — ALWAYS QUOTE INVOICE No. — PRINTED BOOKS UNLESS OTHERWISE STATED

CHARGE TO —

UNIVERSITY OF NAIROBI BOOKSHOP
P O BOX 30197
NAIROBI KENYA
INV NOT TO EXCEED PNDS 120

DESPATCH TO —

UNIVERSITY OF NAIROBI BOOKSHOP
P O BOX 30197
NAIROBI KENYA
INV NOT TO EXCEED PNDS 120

POST

RECEIPT

ACCOUNT	75918000B
PAGE	1
BATCH	3197/002
BRICK	0820
CODE	
PICK LIST	148154/01
INV DISTR	108000
TYPE	INV

ORDER REF	QTY	SBN	INTERNAL USE ONLY	TITLE		PRICE	TRADE DISC %	VALUE	VAT
167484	1	333455584	G0943	JOHN V:MAC DICT MATERIALS/MANUFACTURING	N	35.00	30.00	24.50	1
167484	1	333166728	M0551	LUKES S:SIGHT/POWER A RADICAL VIEW	N	4.99	30.00	3.49	1
167484	1	333511786	J1052	LONGLEY D:DATA & COMPUTER SECURITY PR	N	17.95	30.00	12.57	1
167484	1	333460570	L0552	COOK C:DICTIONARY HISTORICAL TERMS PR 2E	N	8.95	30.00	6.27	1
167484	1	333281942	L0555	MANN M:MAC STUDENT ENCY OF SOCIOLOGY PP	N	9.95	30.00	6.97	1
167484	1	333454626	L0592	SLESSER M:DICTIONARY OF ENERGY PR 2E	N	10.95	30.00	7.67	1
167484	1	333460502	L0593	LONGLEY D:DICT INFORMATN TECHNOLOGY PR 3E	N	10.95	30.00	7.67	1
167484	1	333424409	P0991	MCMULLAN R:MAC DICTIONARY OF BUILDING PR	N	7.95	30.00	5.57	1
167484	1	333541804	I2011	ISAACS A:MACMILLAN COMPACT ENCYCLOPEDIA	N	8.99	35.00	5.84	1
167484		333436431		IAU:JD:INTERN HANDBK UNIV 1989-91 12E					
				NOT YET PUBLISHED 1 RECORDED					
167484		333449207		LAMMING R:MAC DICT BUSINESS,MANAGEMNT PR					
				REPRINTING 1 RECORDED				DUE NOV-90	
167484		333378725		WHITEHOUSE R:MAC DICT OF ARCHAEOLOGY PR					
				REPRINTING 1 RECORDED				DUE SEP-90	
167484		333393341		SEYMOUR-SMITH C:MAC DICT ANTHROPOLOGY PR					
				REPRINTING 1 RECORDED				DUE NOV-90	
167484		333441257		CHAPMAN R:NEW DICTIONARY AMERICAN SLANG					
				CONSIDERING REPRINTING 1 RECORDED					
167484		029467403		STRICKBERGER M:GENETICS 3E PR					
				MARKET CLOSED 1 NOT RECORDED					
				YOUR ORDER HAS BEEN REFERRED TO:-					
				PURNELL DISTRIBUTION CENTRE					
				PAULTON, BRISTOL BS18 5LG					

C. & F.
NAIROBI

ITEMS BOOKS WEIGHT

WE HEREBY CERTIFY THIS INVOICE IS TRUE AND CORRECT AND THE ONLY ONE ISSUED BY US FOR THE ABOVE GOODS

ITEMS ZERO RATED UNLESS OTHERWISE STATED

TOTAL VAT

INVOICE TOTAL

Appendix (xv): Catalogue record

Kik
BF
713
.C7
1983

Craig, Grace J
Human development / G.J. Craig.- 3rd ed. - New Jersey : Prentice-Hall, 1983.
587 p. : ill.

1. Developmental psychology. I. Title.

Appendix (xvi)

A - GENERAL WORKS

RESEARCH OPPORTUNITIES IN COMMONWEALTH DEVELOPING COUNTRIES : 1984.		MED REF. AZ 488 .C65R4
THE WORLD BOOK ENCYCLOPEDIA. 1972		MED. AE 5 .W55 1972

B - PHILOSOPHY & RELIGION

ANDERSON, B.W.	The living world of the old testament. 1988.	LAW BS 1171.2 .A5 1988
BENJAMIN, L.T.	Psychology. 1990.	KIK BF 121 .B397 1990
BOISARD, M.	L' islam et la morale internationale. 1979.	IDIS BP 173.5 .P64
CULTURES AND TIME. 1976.		UN BD 638 .C84
FOCILLON, H. 1881-1943	The life of forms in art. 1989.	ADD BH 301 .F6F613
HALL, E.	Child psychology today. 1982.	KIK BF 721 .H217
HUBBARD, LA F.R.	The dynamics of life. 1983.	BP 605 .S2H7964
KALAT, J.W.	Introduction to psychology. 1990.	KIK BF 121 .K26 1990.
KAMIL, A.A.	Islam and the race question. 1970.	UN BP 190.5 .R3K3
KAYODE, J.O.	Understanding African traditional religion. 1984.	BL 2400 .K39
LEVIN, G.R.	Child psychology. 1982.	KIK BF 721 .L521
NORTHCOTT, W.C.	Christianity in Africa. 1963.	BR 1360 .N6
PSYCHOLOGY AT WORK. 1987.		BF 481 .P7 1987.
PUTNAM, H.	Reason, truth and history. 1981.	BC 6 .P8
REES, H.W.	Advances in child development and behaviour. 19-	BF 721 .A45
TAYLOR, C. 1931-	Hegel and modern society. 1979.	B 2948. .T393

APPENDIX (XVII)

	New Books Received	CATALOGUING								CARDS					No of books Ordered	COMPUTER			
		Original Cataloguing (O)	Classification and Indexing (T)	Physical Description (T)	CIPS (T)	NUCS (T)	Added Copies	Shelf Listing	Physical Processing	Volumes Spine-marked	Pilots sent C C S	Permanent cards received	P/Cs Sorted	Permanent Cards Filed A/T Subj Cl.		Data Bases Files created	Data Collection Titles	Data Input	Other Work Done
							T Y	T Y	T Y										
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
TOTALS 30																			

CIPS = Cataloguing-in-Publication Service CARDS = Data Bases / Files Created NUCS = Union Catalogue A/T = Author/Title Subj Cl. = Subject Classification

Appendix (xviii): Kardex record

YEAR	VOL.	COPIES	ISSUES	INVOICE NO.	INV. DATE	PRICE	DATE RECD	CALL NO. LOCATION	REMARK
VOL	N								
	NO.	REC.	NO.	REC.	NO.	REC.	NO.	REC.	
JAN									
FEB									
MAR									
APRIL									
MAY									
JUNE									
JULY									
AUG									
SEPT.									
OCT.									
NOV.									
DEC.									

SOURCE: EDITOR:

PUBLISHER: ORDER NO: DATE:

TITLE:

Appendix (xix): Template of System Specification for Suppliers

(i) Introduction

This document provides a specification of the facilities and features required in the computer system which will be installed to meet the service and administrative goals of The University of Nairobi for a period of 7 years and beyond.

(ii) Abstract The document contains the following:-

Statistical information concerning the library's present operations and projections for the next 7 years.

Details of the facilities and functions which the system must provide,levels of performance required.

A statement specifying what information prospective vendors must provide.

A time table for the implementation of the system.

(iii) general Requirements

Although detailed requirements are specified here,there is a general requirement that the system should have flexibility. Suppliers need not therefore restrict their submissions to the detailed requirements if they think the system they offer includes other features of interest to the library.

(iv) Cost

Although cost will not be necessarily the paramount consideration(support offered after implementation,for example will be a major factor),it is important that the library is presented with a very clear statement of capital and recurrent costs.Full itemization is therefore required.

(v) Descriptions of the level of operations at the library with Projections to 7 years.

(a) Overview of the current system

At present (1993) all the major systems of the library are manual.Circulation control is based on a two-slip voucher system. Public Catalogue access uses 3''x 5''cards filed in removable cabinets in which they are arranged alphabetically in three sequences of author,title and subject. In addition the library uses Microfiche catalogue for accessing back issues of Kenya Parliamentary debates.

All the cataloguing activities are based on AACR2 and classification uses Library of Congress scheme. The Cataloguing System also maintains a shelf-list that is arranged alphabetically by class number. The Shelf-list is for staff use only.

Acquisition of books is separated from the serials.

Some aspects of reference materials have been computerized.These include:

Theses

Institute For Development Studies research papers,

Union list of periodicals held in Kenyan libraries,

List of shortloan materials,

List of articles from Law journals.

Theses databases are used by staff to perform searches on behalf of the users.

(b) Terminal Requirements

The current and anticipated levels of activity indicate that the following numbers of terminals are desirable to handle the load:-

3 Circulation control barcode terminals,

10 public access terminals,

27 staff access terminals,

4 printers performing at minimum of 100cps.

(c) Annual levels of activity

The following data refer to current annual levels of activity and projections to the end of 7 year period.

Stock:	1993	2000
Monographs, volumes	: 352,196	506,196
Monographs, titles	: 100,000	107,000
Serials, volumes	: 151,200	156,600
Serials active titles	: 1200	-
Serials inactive titles	: 1300	-

Present Catalogue:		
Average record length,characters	: 400	400
Maximum record length,characters	: 500	500
Acquisitions:		
Monograph volumes bought per year	: 10,000	-
Serial volumes bought per year	: 1200	-
Orders placed per year	: 10,000	-
Exchange & gifts received/year	: 12,000	-
Inter-library loans:		
Applications sent per year	: 200	
Applications received per year	: 200	
Circulation:		
Issues + Renewals per year	: 102,000	
Discharges per year	: 88,000	
Reservations/day	: 30	
Maximum daily issues + Discharges	: 1000	
Maximum items on loan	: 800	-
Average number of items on loan	: 900	-
Maximum active reservations	: 20	-
Maximum reserved volumes/day	: 20	
Maximum number of registered users	: 20,000	-
Maximum no. of active users	: 17,500	-
Annual deletions/additions to User file	: 3000	-

Peak hrly transactions anticipated

(including circulations,cataloguing

public access and all acquisitions

transactions) : 400

Average daily enquiries anticipated

at public access terminals : 500

Volumes sent to Bindery/month : 200

Volumes received from Bindery/month: 103

(vi) Opening Hours

The library currently opens during term time from 8.00 A.M to 10.00 P.M weekdays and from 8.00 A.M. to 5.00 P.M on Saturdays. During vacations the Library opens from 8.00 A.M to 5.00 P.M weekdays and From 8.00 A.M to 12.00 noon on Saturdays. During public holidays the Library remains closed.

Particular attention should be paid to evening and weekend operation in making proposals for maintenance and service.

(vii) The functions & facilities & levels of performance required.

(a) Levels of System integration

The Library is seeking a system with completely integrated software ,integrating the following functions:-

Circulation, including both incoming and outgoing inter-library loans,

Cataloguing,

Acquisitions of all materials,including serials,

Binding preparation,

Online public access to the catalogue and circulation files,

Access to external bibliographic and other data bases via EIDONET,

Provision of access to library files by terminals linked to the University campus network,

A view data system facility for the provision of local information,

The production of management and operational reports.

(b) Hardware & Software

Hardware and software must be able to handle all the above functions in the detail listed below, at loads postulated up to 2000. proposals must state whether the initial configuration is designed to do this,or whether and at what time additional hardware or software will be required at an interim stage,and at what extra cost. Functions available immediately upon implementation of the remainder,must be clearly stated.

(c) System serviceability

The Supplier must guarantee that in any four week period the serviceability of the system will not fall below 95%, and in a twelve month period not below 99%.

The system must also provide suitable back up facilities,which must be described,to cope with equipment breakdown and malfunction.

Suppliers must state what compensation they are prepared to offer when the above serviceability criteria are violated.

(d) Current library security System

The library currently utilizes a 3M Tattle Tape Electronic security system. suppliers must ensure that their equipment does not adversely affect and is not adversely affected by the operation of the security system.

(viii) The System & System Operation

(a) Hardware

All items of hardware must be described and original manufacturers must be named in the case of items not manufactured by the supplier.

(b) Levels of human intervention

Operations should be as automatic as possible. The nature and frequency of staff intervention must be precisely described. Detailed requirements are:

Guaranteed response times at peak periods of activity must be according to Boss (1984)[14]

An average of 2 secs and maximum of 4 secs for online catalogue update or enquiry,

An average of 1 sec and maximum of 2 secs for an issue or return transaction,

A full description of back-up and false safe arrangements must be provided to permit continuation of at least basic circulation functions(i.e issues,returns) in the event of power failure or interruptions to power supply,

There must be safeguards to ensure:-

data security

File privacy

Input validation

Audit requirements,

Facilities must be described for recovering and rebuilding files in the event of major failure,

Control of access to different parts of the system must be provided by password and/or by location of terminal,

Details should be given of space required by minicomputer and associated peripherals, and of any specific environmental requirements such as air conditioning,dust,heat and temperature control

(c) Level of support

Suppliers must provide details of the various levels of support,including type of support(e.g telephone),response times to reports of faults,and the procedures for reporting faults,applying corrections and implementing updates.

(d) Health & Safety at work

The Suppliers are reminded of observance and adherence to safety regulations and so their equipments must conform to the Healthy and safety at work.

(ix) Information Required from Potential suppliers.

(a) System Features

Suppliers must state unambiguously whether and how they are able to meet the above stated requirements. If some feature of the system are not presently available, a clear statement of the likely date of availability must be given.

(b) Maintenance

Arrangements for maintenance and service must be described,e.g guaranteed maximum call out response,whether weekend call out incurs extra charges.

(c) Retainability of current system

Consideration must be given to transfer of features of the present system. The library may wish to retain part or all of its present microcomputer-based databases.

Suppliers must state how the present catalogue and issue/borrower records will be converted and be transferred.

(d) Company's History

Suppliers must provide information on the company's history and background,together with financial statements for past three years and declaration on the commitments made to library systems if this is not the sole activity of the company.

(e) Special requirements for implementation

The length of time needed and any special requirements for delivery,installation,and testing must be clearly stated.

(f) Training

The type and extent of training provided must be stated.

(g) Documentation

The documentation provided must be listed.

(x) Time Table

The library hopes to start an initial service on the new system by(specify date). To this end the system should be installed and commissioned by(specify date). The following time table will be adhered to as far as possible:-

Return of Proposals	Specify date
Invitation to tender,	
Notification of shortlisted	''
Suppliers, and demonstration,	
Evaluation and discussion	''
Memorandum of agreement	''
Award of contract	

(xi) Proposals format

Suppliers are required to present their proposals in the following format:-

(i) Management summary.

(ii) Mandatory requirements

(iii) Desirable requirements

(iv) Facilities provide by the supplier but not asked for by the library.

(xii) Description of the system

Overview

Detailed lists of hardware & software

Delivery & installation date

(xiii) Total costs

Itemized hardware & software

Delivery & installation

Implementation including transfer of records from the present system.

Maintenance

Software licensing/rental

Training

Documentation

Any other recurrent costs(any costs mentioned else where but not included in this section will be considered waived).

(xiv) Commitment to support

(xv) Details of the Supplier organization

(xvi) Any other details the supplier wishes to include

(xvii) Replies should be addressed to:-

The University Librarian,

University of Nairobi,

P.O.Box 30197,

NAIROBI.

Appendix (xx): LIST OF INTERVIEWEES

INTERVIEWEE	DESIGNATION	DATE
1. M.E. KIMANI	UNIVERSITY LIBRARIAN	26-7-93
2. V. INOTI	SENIOR LIBRARIAN-ACQUISITIONS	13-7-93
3 S.N. MUTIE	SENIOR LIBRARIAN-CIRCULATION	28-7-93
4. F.E.KHAYUNDI	SENIOR ARCHIVIST	2-8-93
5. E.KARIUKI	LIBRARY ASSISTANT-PERIODICALS	5-7-93
6. A.NOREH	SENIOR LIBRARIAN -CATALOGUING	13-7-93
7. E.KAMAU	LIBRARIAN -CATALOGUING	28-7-93
8. J.WERE	SENIOR LIBRARIAN-COMPUTER SECTION	23-7-93
9. E.MAKINNAH	LIBRARY ASSISTANT-RESERVE	1-7-93
10. A.OULU	LIBRARY ASSISTANT-CIRCULATION	1-7-93
11. MUNARI	SENIOR LIBRARY ASSIS-CIRCULATION	5-7-93
12. H. MUKOLWE	LIBRARY ASSISTANT-AFRICANA	9-8-93
13. D.G THUO	ACCOUNTS ASSISTANT	6-8-93
14. S.GITAU	LIBRARY ASSISTANT-ACQUISITIONS	13-7-93
15. D.K MULONZIA	LIBRARY ASSISTANT-CATALOGUING	12-7-93
16 D.KWEYA	OUTSIDE BORROWER -EGERTON VARSITY	17-793
17. J.M.MULWA	DEPUTY UNIVERSITY LIBRARIAN(T)	13-7-93
18. S.MATHANGANI	DEPUTY UNIVERSITY LIBRARIAN(A)	3-9-93
19. R.ANDANJE	UNDERGRADUATE STUDENT-B.A 3RD YEAR	6-8-93
20. J.WASITIA	UNDERGRADUATE STUDENT-B.A 3RD YEAR	2-8-93
21. NYINGI	LIBRARY ASSISTANT-ACQUISITIONS	13-7-93
22. N.MAUNGU	SENIOR LIBRARIAN-AFRICANA	8-8-93
23. S. RANJI	OUTSIDE READER	18-8-93

24. C.SHADRACK	OUTSIDE BORROWER	18-8-93
25. G.GATERO	LIBRARIAN CIRCULATIONS	7-8-93

Appendix (xxi): LIST OF ABBREVIATIONS/ACRONYMS

AACR2 = Anglo-American Cataloguing Rules 2d.ed

ASLIB = Association of Special Libraries Bureaux

CD-ROM = Compact Disk Read Only Memory

CDS/ISIS= Computerized Documentation Service/Integrated Set of Information System

COLLATION= Pagination,book-size,indexes,illustrations,bibliographies

COM= Computer Output Microform

Data Star= Swiss Online Bibliographic Database

DFD= Data Flow Diagram

DIALOG= North-American Online Bibliographic Databases.

ECA= Economic Commission for Africa

DEC= Digital Equipment Corporation

DVC (A&F)= Deputy Vice-Chancellor(Administration & Finance)

E-R= Entity Relations

FAO= Food and Agriculture Organization

FIDONET= Wide Area Network

GATT= General Agreements on Tarrifs

GEAC= GEAC's Integrated Library system

HIPO= Hierarchy-Input-Process-Output

IBM= International Business Machines

ICS= Institute for Computer science,University of Nairobi

IFLA= International Federations of Library association

IME= Information Made Easy

IMPRINT= Place of Publications,Year,Publisher

ILCA= International Livestock Centre for africa

ILL= inter-Library Loans

ISBN= International standard Book Number

ISSN= International Standard Serial Number

ISO= International Standard Organization

MARC= Machine Readable Cataloguing

LPO= Local Purchase order

1NF= 1st Normal Form

OPAC= Online Public access Catalogue

OSI= Open System Interconnection

PC= Public Catalogue

UK= United Kingdom

UN= United Nations

UNEP= United Nations Environment Programme

UNESCO= United Nations Educational Scientific and Cultural
Organization

US= United States

VC=Vice Chancellor

WHO= World Health Organization