



ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCHOOL OF INFORMATION STUDIES FOR AFRICA

A COMPUTER-BASED LIBRARY AND INFORMATION MANAGEMENT
SYSTEM FOR THE NATIONAL LIBRARY SERVICE OF MALAWI :
A PLAN AND STRATEGY FOR IMPLEMENTATION.

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN
INFORMATION SCIENCE

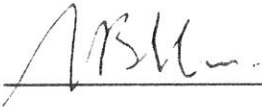
BY

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31 May, 1993

DECLARATION

The thesis is my original work and has not been presented for a degree in any other university.




Sandy Kachale

31 May, 1993

The Thesis has been submitted for examination with our approval as university advisors.



Professor A. Neelameghan



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DEDICATION

To my late mother **Anne Gilivala Kafumula**, and to my grand
father **R.R. Kalamos Milanzi**.

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ABSTRACT

This document discusses the need for augmenting and extending application of computer systems in library, documentation and information institutions in Malawi with particular reference to the National Library Service (NLS). Background information on the NLS system in terms of its establishment, structure, resources and services is also provided.

Developments in Information Technology (IT) applications to library and information systems are highlighted emphasizing the expanding capacity of computer systems, data transmission systems and networking including Local Area Networks that are finding wider use in Africa.

The existing information systems and services in Africa are reviewed including the existing networks which can promote cooperation among information institutions, transfer and sharing of information resources in the continent.

Application of computers to Information Storage Retrieval and Dissemination (ISRDR) is discussed with particular reference to the areas of library and information services that can benefit from IT. The general conclusion is that computers improve management and facilitate information handling activities.

As a pre-planning requirement, a detailed analysis and evaluation of the NLS was carried out and the findings documented in this thesis. Included is also a survey of application of computers in library and information institutions in Malawi, revealing an encouraging take-off of the technology in the field. Types of computers, peripherals, application softwares and their use are discussed and this has formed the basis for a proposal for the new system in the NLS. Based on the ongoing IT developments in libraries and information systems in the country and the problems being faced in the use of computer systems, a survey of selected computer vendor organizations is also documented forming the basis and criteria for system choice.

Proposals on requirements for a new computer based system for the NLS and the design of prototype databases using micro CDS/ISIS version 3.0, are presented. Such a system will improve management and facilitate NLS operations, and introduction of user-oriented services such as SDI services, current awareness services, referral services, etc. Criteria for choice of computer system and phases of system implementation such as installation, retrospective conversion of card catalogue to machine readable form, etc, are outlined. Conclusions and recommendations based on the research are presented in chapter nine.

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LIST OF ABBREVIATIONS

- ADD - Agricultural Development Division
- BIP - British Books in Print
- CAS - Current Awareness Services
- CDS/ISIS - Computerized Documentation System/Integrated
Set of Information Systems.
- CD-ROM - Compact Disk-Read Only Memory
- CIPD - Cataloguing in Publication Data
- CODE - Canadian Overseas Development Through Education
- COM - Computer Output Microfilm
- COMLA - Commonwealth Library Association
- DAS - Direct Access Storage
- DAT - Digital Audio Tape
- DBMS - Data Base Management System
- DDC - Dewey Decimal Classification
- DFD - Data Flow Diagram
- DTP - Desk Top Publishing
- ECA - Economic Commission for Africa
- EDP - Electronic Data Processing
- EMAIL - Electronic Mail
- EPA - Extension Planning Areas
- FST - Field Select Table
- HIPO - Hierarchical Input Process Output
- ICLARM - International Centre for Living Aquatic
Resources Management
- IFLA - International Federation of Library Associations
and Institutions
- ILCA - International Livestock Centre for Africa

ILLIS - Inter-Library Loan Service
ISBN - Internation Standard Book Number
ISDS - International Serials Data System
ISBD - International Standard Bibliographic Description
ISO - International Standard Organization
ISSN - International Standard Serial Number
IT - Information Technology
LAN - Local Area Network
LC - Library of Congress
MALA - Malawi Library Association
MARC - Machine Readable Catalogue
MCDE - Malawi College of Distance Education
MIS - Management Information System
MODEM - Modulation Demodulation
MRF - Machine Readable Form
NIC - Network Interface Connection
NLS - National Library Services
NOS - Network Operating System
OCR - Optical Character Recognition
OPAC - Online Public Access Catalogue
PADIS - Pan African Dovelopment Information System
PADISNET - PADIS Network
Q/A - Question Answer Service
RCIC - Rural Community Information Centres
SAS - Serial Access Storage
SDI - Selective Dissemination of Information
UNICEF - United Nations International Childrens Emergency
Fund
WAN - Wide Area Network

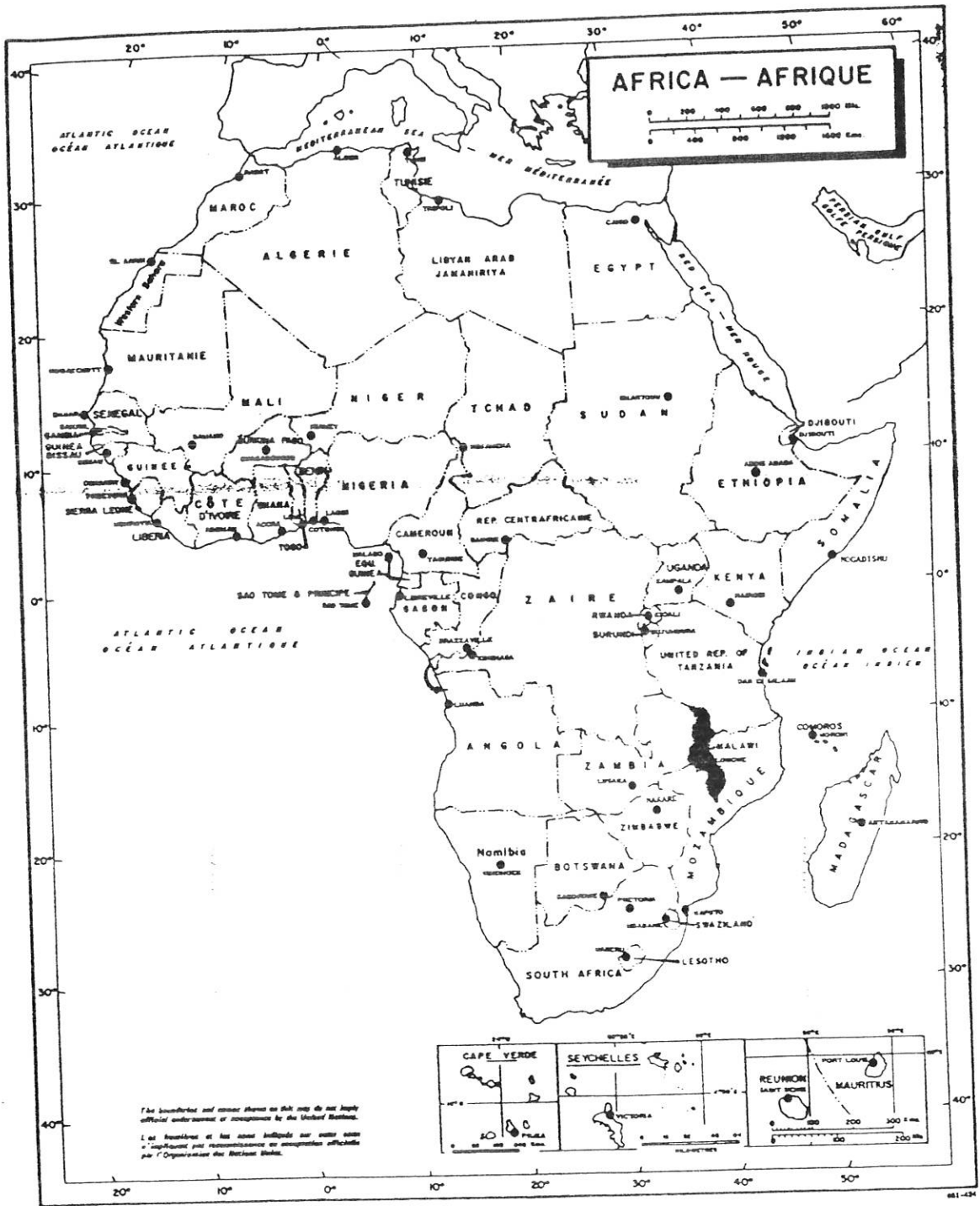
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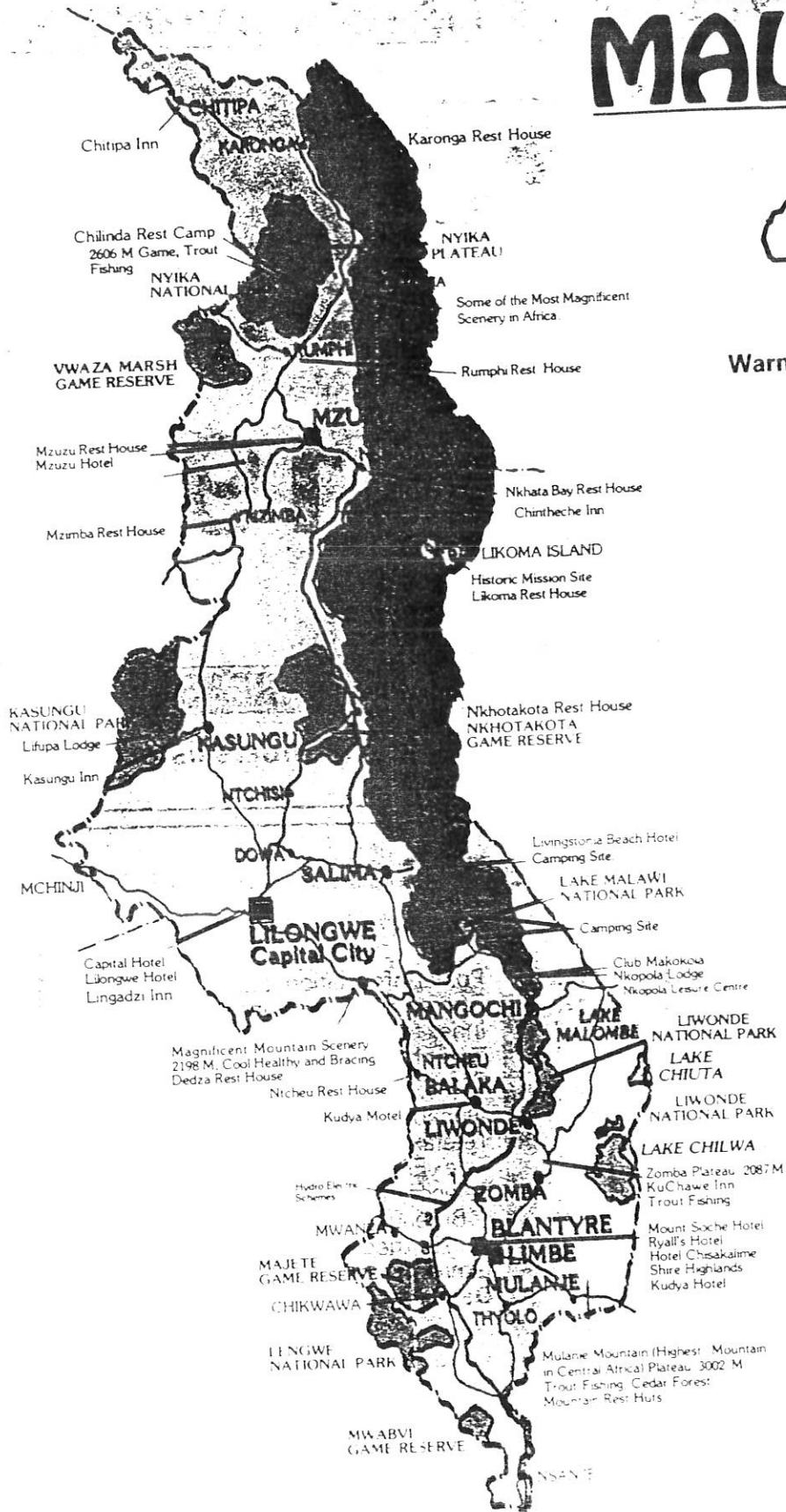
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MALAWI



Warm Heart of Africa



LEGEND

- Capital City
- Major Towns
- Regional HQ
- Other Towns
- Natural Parks and Game Reserves
- International Boundaries
- Main Roads

CHAPTER ONE

OBJECTIVES, BACKGROUND, JUSTIFICATION AND METHODOLOGY

1.1 OBJECTIVES

1.1.1 General Objectives

The general objective of this research is to propose a plan that can form the basis for the development of a computer-based system for library and information management operations in the National Library Services of Malawi (NLS). The expected benefits of the new system include:

- a. Improvement in staff working efficiency
- b. Reduction of workload
- c. Improvement of services
- d. Maximization of user satisfaction
- e. Developing a system that is more user friendly.

1.1.2 Specific Objectives

With a view to achieving the general objective, the following specific objectives have been formulated:

1. To ensure maximum utilization of the existing micro CDS/ISIS software, for information storage and retrieval, and database management in the NLS system.

2. To Develop new user-oriented services in the NLS in order to serve a wide range of users. Such services include:
 - a. Selective Dissemination of Information (SDI) Services.
 - b. Current Awareness Services (CAS)
 - c. Customized Question Answer (Q/A) Services.
3. To develop prototype for local databases for cooperation and information interchange through:
 - a. A Local Area Network (LAN) and/or Wide Area Network (WAN)
 - b. Union Catalogues
4. To propose with prototype a computer-based system for house-keeping routines such as:
 - Serials Control
 - Circulation Control
 - Cataloguing
 - Acquisitions Control
 - Management Information System

1.2 LIMITATION

The system will be implemented at the NLS, which implies that the operating staff, the user group and infrastructure/facilities will be that of the NLS.

1.3 JUSTIFICATION

1.3.1 Introduction of Information Technology (IT) in Africa

Use of computers in Africa as tools for information systems management is not a new phenomenon. Survey of literature from PADIS database (ECA/PADIS, 1988) indicates that IT was introduced in Africa as early as the 1960s (see Table 1.1). But from the 1960s to the present, the rate of development in IT applications in Africa has been quite slow as compared to the developed countries which also started using computers at almost the same period. This is not surprising because IT experiences in Africa have been a result of flow or diffusion of the technology from the developed to the developing nations. And all along, progress of IT in the developing nations has suffered due mainly to the lack of the required technical knowledge and skills, lack of adequate computer hardware and software procurement capabilities, inability to develop the technology in Africa suitable to the African environment through R&D (Research and Development), lack of manpower training opportunities and lack of supportive infrastructure.

Table 1.1 Introduction of IT in Africa

Country	Period of IT take-off
Ghana	Early 1960
Nigeria	Early 1960
Zambia	Early 1960
Kenya	Early 1960
Sierra Leone	1963
Tanzania	1965
Malawi	1966
Zimbabwe	1970
Mauritius	1972
Gambia	1980

In Ethiopia, Sirak (ECA/PADIS, 1988) writing on the 'Survey of the development of computer use in Ethiopia', stated that most organizations installed computer systems within the last 10 years.

However, first applications of IT in these countries was for non-bibliographic data processing such as government statistical data in financial and economic planning. This implies that the informatics infrastructures were installed in these countries in data processing centres or within a ministry department whose responsibility was the provision of data processing services to departments and ministries. This shows that the driving force to apply computers to this sector of the economy was to control the overwhelming volume of data and governmental transactions.

In a recent survey of 1989-1990, PADIS prepared a follow-up study to a similar 1988 survey on the use of microcomputers in information and documentation centres in Sub-Saharan Africa (ECA/PADIS, 1989). A questionnaire similar to that of the 1988 survey was sent to PADIS mailing list of libraries, documentation and information centres.

The issues addressed included, among other things:

1. Types of activities undertaken, kinds of user services provided, documentary collections and staff.
2. Type and characteristics of the computer equipment used, where applicable, and institutions plans for computerization.
3. Kinds of software used, equipment and personnel problems encountered, training and acquisitions of equipment policies, etc.

62 centres responded to the questionnaire but one questionnaire was discarded as invalid and eight others returned unfilled questionnaires because they were not using any computer system.

Table 1.2 shows findings extracted from this survey.

Table 1.2 Computer use by type

Type of Computer	Percentage of using institutions
Mainframe computers	8.2
Minicomputers	13.1
Microcomputers	70.5

Out of the 61 respondent institutions, results showed that 75.4% of the respondents used computer facilities yet the majority of these institutions had only one computer. This table also implies that development of the use of computers in library, documentation and information systems in Africa followed the development of the microcomputer technology. Mainframe and minicomputers when they came into the market and even now are associated with high purchase and maintenance costs so that most libraries used computers in their systems by leasing them from computer organizations or acquiring them on a cooperative basis with other interested libraries. The realization of the need of computer manufacturers to provide the power of the computer system to the users themselves led to the development of microcomputers which are both affordable and manageable.

The same survey it was found out that these computers were mostly used for bibliographic and library database management and word processing as shown in table 1.3.

Table 1.3 Purpose of Computer use

Purpose	Percentage of users
Biblio./Lib. db Manag.	57.4
Word Processing	54.1
Financial/Manag. Appl.	16.4
Numerical/Statist. Appl.	16.4
Other Applications	8.2

Librarians are then aware that computers can assist in improving management of the library system operations such as bibliographic and database management activities, and an efficient method of generating management information system through generation and circulation of reports using word processors. Table 1.4 presents data on the use of computers in bibliographic and library management activities, extracted from the same survey.

Table 1.4 User services Facilitated by microcomputers.

Type of Services	Percentage of Institutions Applied
Bibliographies	72.1
Selective Dissemination of Inf.	48.8
Current Awareness	44.2
Question Answer Service	30.2
Online Searches	32.6
Other Services	9.3

Most African countries, however are not capable of providing specialized user oriented services to their communities, neither do they have efficient control over their information system due to the nature of the manual systems presently used. As for the systems that claimed to use computers, the specialized user oriented services provided, and control of the system itself are both inadequate because of lack of adequate computer facilities, professional expertise in the use of the systems and inadequate peripheral devices such as CD-ROM drives, magnetic tape disk drives, etc, which can facilitate provision of these services. In Africa there are some regional information and documentation institutions which try to alleviate the situation by generating user-oriented services from their own database resources. PADIS, International Livestock Centre for Africa (ILCA), UNEP, HABITAT etc are among them. PADIS, an information resource system for development information in Africa disseminates development information partly through its SDI service. But, The problem is that not all African countries benefit from this service. For example, a study of PADIS SDI service user group has shown that the number of users in Africa was reported in 1991 to be 173 only (ECA/PADIS, 1991) which is small considering the African Population. Moreover, in many countries such as Malawi there are no

individuals or institutions subscribing to this service. This implies that African nations are deprived of development information available at PADIS databases which can be disseminated through the SDI service. Therefore, unless these nations work towards development of their own computer-based systems in their library, documentation and information systems, and disseminate information from both local and foreign databases using similar SDI services, there will definitely be a gap in dissemination of user oriented specialized information. Table 1.4, above, shows that 48.8% of respondents implement own SDI services. The case of Malawi is that there is no institution at the moment that provides SDI services to end users. Apart from dissemination of user oriented services there are several other advantages that a computerized system would bring to the NLS. These include: (1) Better management control over the existing system; (2) Labour saving due to data entry redundancy control, facilitation of error correction and data entry in different format; (3) Reduction in running costs; (4) Provision of more user-friendly service; (5) Timely generation of management reports on the library operations, etc, in different formats.

1.3.2 Malawi's Need for Adequate IT Application in Library, Documentation and Information Institutions

IT holds the key to the future development of Malawi, and to its effective participation in regional and international cooperative information systems, networks, etc. IT comprises of the following technologies: computer technology, telecommunications technology, electro-optic technology, audio-visual technology and other information handling technologies. There is a need in Malawi therefore to develop and maintain appropriate infrastructures for application of IT in data generation, processing and use.

Networking is essential for industrialists, investors and economic operators to access timely and reliable information, circulation of information between partners in the private and public sector in Malawi and between Malawi and other countries; it also facilitates sub-regional and regional economic groupings in improving productivity, profitability and reducing costs. This will also enable Malawi to participate in PADIS network, contributing to PADIS database resources on grey literature and to utilize other information resources.

As shown in table 1.1, IT was introduced in Malawi as early as 1966, to process the first population data at the National Statistical Office. The Government Computer Committee was established in the department of data processing, which took up the responsibility of preparing guidelines to control procurement of hardware and software. On the issue of human resource development, Malawians obtain knowledge and skills in information technology through the following programs conducted incountry:

1. Bachelor of Computer Science degree conducted at Chancellor College of the University of Malawi.
2. IT courses conducted as a component program course for Bachelors degree in Technical Education, Engineering and Commerce offered at the Polytechnic of the University of Malawi.
3. Computer Society of Malawi in collaboration with the Malawi Polytechnic offers programming courses on a part time basis.
4. Government Computer Training Centre in the Department of data processing of the Ministry of Finance offers courses for both IT professionals and end-users.
5. Computer vendor organizations in Malawi offer training courses on use of their systems. These organizations include: Computer Sales and Services, Xerographic (MW) Ltd, etc.

Major computer centers in Malawi include the Department of Data Processing (1983), the Ministry of Finance, previously, National Statistical Office (1966), Department of Post and Telecommunications Systems and Banks.

Human resources developed from the above mentioned IT facilities are mostly consumed in the following applications.

Data Transaction Process

- . Foreign Trade Statistics
- . Government Accounts, Payroll and Pensions
- . Population Census

Operational and Management Control Information Systems

- . Department of Land Husbandry-Satellite Image Processing
- . Department of Surveys-Aerotriangulation
- . Malawi Public Debt Information System
- . Meteorological Department-Climate Data Analysis

Sectoral Information Systems

- . Department of Agricultural Research - Chitedze Library Reference Service

It is to be noted that the development of a computerized system for agricultural research at Chitedze has been achieved through foreign expertise. This implies that although this technology has potential of application in library and information services, there has been practically no utilization of IT and human resources developed from the above mentioned programs in libraries, documentation and information systems in Malawi.

However, there is a growing need and interest in librarians in Malawi to use the available computer technology and employ the human resources developed from the above programs for better management and control of library operations in Malawi. In order to make use of these resources requires introducing computer systems in the library and information institutions which may orient the IT programs to include information storage, retrieval and dissemination techniques. IT use in library and information systems in Malawi is mostly at word processing level and many institutions reporting to possess at least one computer system have been acquiring them for the only reason of improving word processing and not for the improvement of library operations. It is from these arguments that research towards identifying the potential for the use of computer-based systems in library and information management is justifiable.

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1.4 METHODOLOGY

1.4.1 Planning the Investigation

1. What was to be investigated was determined such as SDI profiles, Serials Union catalog data, etc.
2. Examination of similar studies conducted in the same area such as profile designs from PADIS, Directory of non-book materials available in Malawi a product of a survey conducted in the area , etc. This approach provided guidelines and discovery of deficiencies of previous studies.

1.4.2 Samples

1. A sample population of 50 was assembled for SDI user profiles by preparing a list of NLS users, including a list of agricultural researchers obtained from research institutions and university lecturers. The users were selected based on the nature of work and activities they are involved in. NLS documents collection and records were investigated; eight libraries claiming to use a computer system in the country were also identified and surveyed.
2. Five computer vendors were identified from a telephone directory, and surveyed.

1.4.3 Survey Methods

These included:

1.4.3.1 Questionnaires to survey a geographically scattered population on the following:

- a. SDI profiles in Malawi, fifty users were targeted.
- b. Serials Data for Union Catalogue from sample library and information institutions in Malawi including the NLS chain of libraries.
- c. Computer vendor organizations in order to find out the available computer systems in the country and human resource development programs supported by them.
- d. Selected library and information institutions claiming to possess a computer system. The purposes of this survey were:
 - . to investigate the uses of the computer systems, problems encountered, etc.
 - . to propose a mechanism for networking and electronic data interchange.
- e. non-book materials available in Malawi so as to develop a prototype database in machine readable form.

Samples of questionnaires used are given in the appendix I, II, and III.

1.4.3.2 Physical Layout and Formulation of Questions.

- Easy to follow questionnaire was designed.
- The type of answers suggested for 1c and 1d were free answers which required a YES or NO or choosing from 4 or more alternatives.
- Made use of answer boxes mostly placed in the left margin of the forms.
- Clear instructions were given to the respondents as to what they should do e.g, 'place a tick in the appropriate box.'
- Open invitation, at the end of the questionnaire or in some questions, to respondents to add comments of their own.

- No modifications of questions was found necessary following a test trial.

1.4.3.3 Inquiries

Inquiries were made on the NLS system and the type of questions asked included: (1) What tools do you use to do an activity; (2) What type of inquiries do users make and what

answers do you give; (3) What questions could not be answered.

1.4.3.4 Interviews

These were used to analyze NLS through discussions with staff members. There was no misinterpretation of questions posed.

Two well known forms of interview were used:

- Structured, where previously formulated questions were asked in a particular sequence
- Unstructured, where the answer to one question was used as basis for the next.

1.4.3.5 Observation

This technique was used in order to assess how much time a user spends in seeking for a particular information source or the staff spends in doing a particular activity.

Existing library circulation records were examined to determine the use of the library and to establish patterns of the reading habits of user groups, to follow staff operations etc.

1.4.3.6 Literature Survey

The following information systems provided the much needed information in literature survey:

- . PADIS and ILCA database resources

- . Library and information sources in Malawi and in Addis Ababa University libraries

- . Searches on CD-ROM database

1.4.3.7 Analysis and Documentation

A detailed analysis of the existing NLS system was conducted and documented using systems analysis techniques.

1.4.3.8 Other Methods Used

Several institutions in Malawi were visited in order to carry out investigations and collect relevant data.

1.4.4 Data Processing and Analysis Method

Collected data was analyzed using both manual and automated techniques. The following software packages available at SISA computer facility were used:

- . Harvard graphics to process graphical data.
- . Word Perfect 5.1 mainly for word processing.
- . CDS/ISIS for creation of prototype databases.
- . dBASE III+ software for sample database development in order to establish the differences with CDS/ISIS software.

CHAPTER TWO

THE MALAWI NATIONAL LIBRARY SERVICES SYSTEM

2.1 ESTABLISHMENT

2.1.1 Act of Parliament No. 31, 1967

The Malawi National Library Service (NLS) was established by the Malawi Government Act of Parliament No. 31, 1967. The Act was instrumental for the establishment of the NLS board and for controlling and regulating the National Library Services. Under this Act, the Minister responsible is given powers to amend schedules in the Act by Order in the Malawi Government Gazette, according to the advice of the Board. The Minister has the authority therefore, by the advice of the Board, to structure library regulations that shall be used to govern the use of the library. The NLS is therefore the only public library funded by the Malawi government.

2.1.2 Survey Reports

In its establishment, following reports formed the basis (Ngaunje):

- . The Valley Report, 1951
- . Hall's Memorandum, 1953
- . The Makin Report, 1960
- . The Flood Report, 1965

2.1.3 Implementation

In 1968, the Act was implemented following the appointment of the Library Board and the first director of the NLS.

2.2 THE NLS BOARD

The NLS Board was established with 13 members appointed by the Minister of Education and Culture.

2.2.1 Membership of the Board

The composition of the 13 members of the Board was as follows:

1. The Chairman of the Board
2. Representative from the Ministry of Education and Culture.
3. Representative from the Department of Economic Planning and Development.
4. Representative from the City of Blantyre.
5. Representative from the Ministry of Local Government.
6. Representative from the Catholic Secretariat
7. Representative from the Northern Region
8. Representative from the Central Region
9. Representative from the Southern Region
10. Representative from the Department of Information

11. Representative from the Christian Council of Malawi
12. Representative from the University of Malawi
13. Representative from the British Council

2.2.2 Government Notice No. 15, 1979

This notice raised the Board membership to 15 by incorporating the following members:

14. Representative from the City Council of Lilongwe
15. Representative from the City Council of Mzuzu.

As of now, a representative from Zomba Town Council has also been included bringing the total to 16.

2.2.3 Term of Office

New Board members are appointed for a two year period, under the approval of His Excellency the Life President of Malawi, Ngwazi Dr. H. Kamuzu Banda, Minister Responsible for Statutory Bodies.

The Minister of Education holds the power to terminate or alter appointments to the Board subject to approval by the President of Malawi. Members of the Board, on the other hand, are free to resign, should they wish to, provided a notice is submitted.

The National Librarian, who is the director, is also Secretary to the Board.

2.2.4 Functions of the Board

The functions of the NLS Board are:

1. To promote, establish, equip, maintain and develop libraries in Malawi.
2. To act accordingly in the proper advancement of its functions alone or with others.
3. To act in accordance with the written laws of Malawi.
4. Appointment of a Director and other staff of the NLS
5. To appoint a working committee from among its members for assisting or advising the Director in his day to day administration of the NLS.
6. To report to the Minister of Education and Culture at the end of each financial year on the conduct of its business, copies of which will be laid before parliament.

2.3 NLS INTERNATIONAL MEMBERSHIP

The NLS is a member of the following major bodies:

1. Commonwealth Library Association (COMLA)
2. International Federation of Library Associations and Institutions (IFLA)

The NLS also participates in various international meetings, workshops, conferences, etc.

2.4 OBJECTIVES OF THE NLS

Among other functions the NLS was empowered by the 1967 Act to perform the following functions:

1. To promote, establish, equip, manage, maintain and develop libraries in Malawi. This objective is achieved by means of provision of advice, training and secondment.
2. Acquisition and circulation of books, periodicals and other information sources so as to provide a free public library service to the people in Malawi. This is achieved by acquiring and maintaining bookstocks, its various established service points, running Rural Library Services, School Library Services and Postal Lending services.

The purposes, methods of operations, and the management of the National Library is geared to serving Malawi citizens who contribute to the running of the services through tax.

The NLS is therefore responsible for timely provision of and accessibility to documents and other information services to every member of the community. The NLS is expected to provide timely, reliable, and relevant data and information needed by planners, decision makers, program executives, researchers, other professionals and para-professionals, extension personnel, the citizen at

large - that is, every one in one way or other involved in development activities.

Guided by its goals and objectives the NLS has been able to expand its services and service points. This has been achieved by its awareness of the ongoing trends and problems in the community related to library materials such as: (1) awareness of national developments and development plans in education; (2) awareness in cultural and intellectual fields through user studies, discussing with users, planners, decision makers, etc; (3) through observations and experiences. Based upon the widely accepted notion that the library is a potential factor in advancing education and is also a valuable tool in economic and social progress in terms of development information, the NLS therefore has a positive influence in the thinking and lives of the community in Malawi and as such the NLS tries to organize a collection which reflects the needs of the society within its given resources.

2.5 NLS ORGANIZATIONAL STRUCTURE

The NLS is governed by the NLS board. The NLS board has been responsible to hold and administer library property and funds, to formulate policies, provide guidance for the course of action of NLS library affairs.

The Board is therefore ultimately responsible for all activities concerning the NLS such as its purposes, policies, functions, organization, services, funds, its governmental and public relations, its expenditures and costs, its public image and further improvements. In general terms the NLS Board performs its functions along the following lines:

- . To ensure the NLS general efficiency and progress
- . To ensure good relations with the Local government and establish library interest in government organizations and national planning.
- . Selecting and appointing the National Librarian, defining his/her functions, providing him/her with full and uninterrupted authority in administrative matters, evaluation and providing support in the performance of his/her duties.
- . Formulation and making policy decisions as advised by the National Librarian.
- . Defining the functions and qualification of staff members, providing necessary support and assistance to the National Librarian in recruiting qualified staff and deciding on salary scales.
- . To provide continued contact with the NLS and its operations in cooperation with the National Librarian through which the Board is able to assess the services, costs and user satisfaction.

- . To enhance both public and official appreciation of the NLS in terms of objectives, problem areas, developments, so as to improve its public relations.
- . Is answerable to the NLS organization in relation to issues of public views and relations concerning the NLS services to the community, financial management and operation costs, personnel matters and implementation of the policies.

The Director of Malawi National Library Services is designated **National Librarian**, who reports directly to the Board. The National Librarian is assisted by the Deputy National Librarian who is also the Head of Branch Libraries Department. The organization Chart of the NLS is shown in fig 2.1.

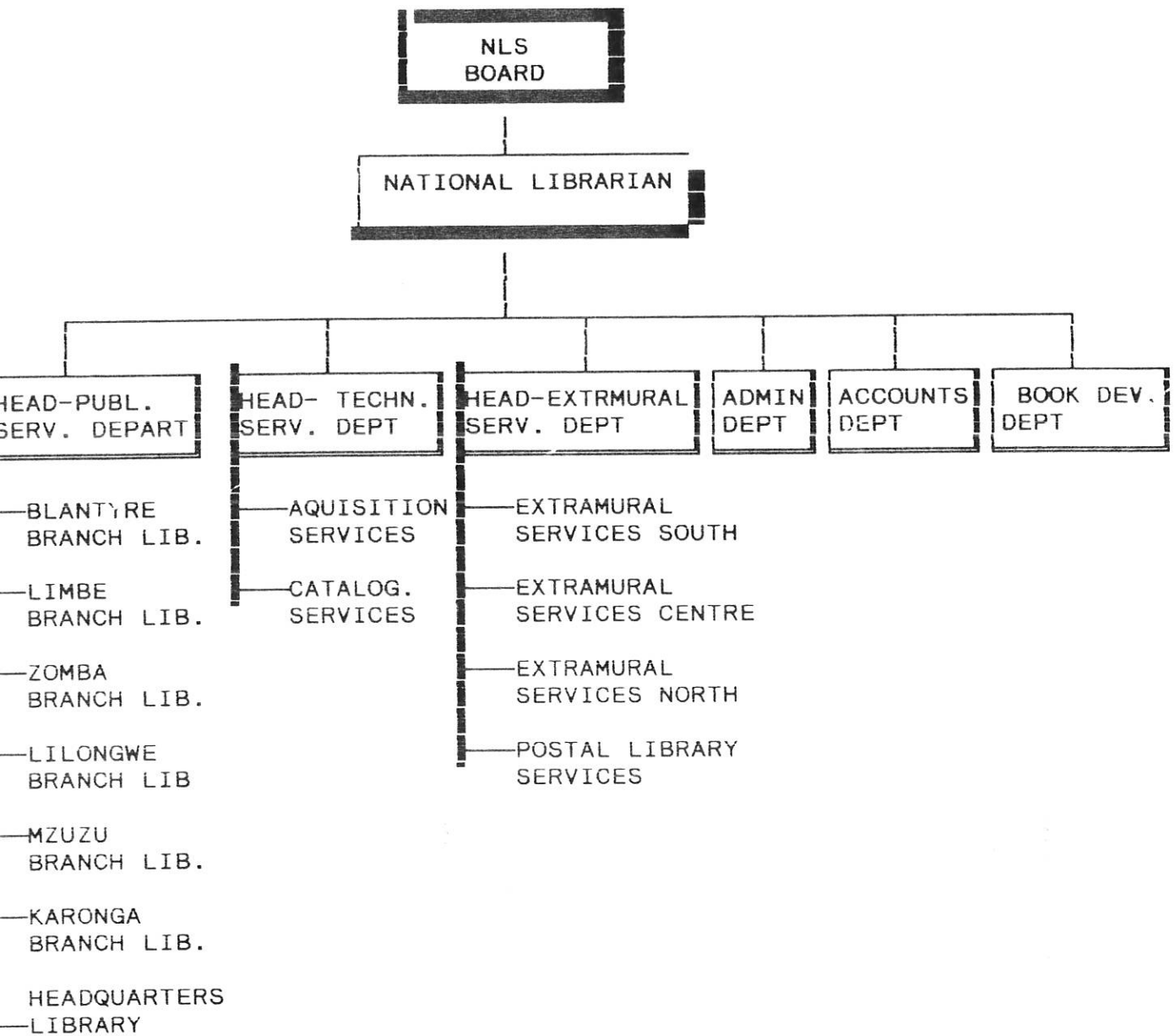
2.6 PERSONNEL STATUS

2.6.1 Branch Libraries Department

All branch libraries shown on the organization chart are controlled by a central management system operating from the headquarters library in Lilongwe. Members of staff operating this department at various branches in the country, hold the following posts.

- Principal Librarian
- Senior Assistant Librarians
- Chief Library Assistants

FIG 2.1 NATIONAL LIBRARY SERVICES ORGANIZATION CHART



- Senior Library Assistants
- Library Assistants
- Library Attendants
- Copy Typists
- Guard/Messenger/Cleaners

2.6.2 Extramural Services Department

This department has its subsystems in the three regions of the country. The central management system coordinates all operations in the regions. The workforce operating the services is as follows.

- Senior Librarian - Head of Department
- Assistant Librarians
- Senior Library Assistants
- Library Assistants

2.6.3 Technical Services Department

Technical services operations are conducted centrally at the Head Quarters Library in Lilongwe. The following posts are held by staff operating this service:

- Senior Librarian - Head of Department
- Librarian
- Senior Library Assistants
- Library Assistants
- Book Restoration Assistant
- Typists

2.6.4 Personnel and Administration Section

This is a section controlled by a Personnel and Administrative Assistant working under the National Librarian

2.6.5 Accounts Section

This section is managed by the Chief Accountant assisted by one Accounts Assistant.

2.6.6 Book Development Department

This is a new subsystem being implemented within the NLS system of services. Its working structure is yet to be defined.

2.6.7 Personnel Development Plans

The table below gives the proposed NLS long term personnel development plans geared to building up its staff resources. The period when this proposal would be accomplished was not stated in the source document.

Table 2.1 NLS Long Term Personnel Development Plans

Post	Total No. of Staff to be Developed
1. National Librarian	1
2. Deputy National Librarians	3
3. Principal Librarians	2
4. Senior Librarians	7
5. Librarians	9
6. Senior Assistant Librarians	4
7. Assistant Librarians/ Chief Library Assistants	10
8. Library Assistants/ Senior Library Assistants	62
9. Library attendants	19
10. Guard/Messenger/Cleaner	10
Total	127

* Source : From the Proposed Organization Structure, in the National Librarians Office.

2.7 FUNDING AUTHORITY

The NLS services are supported by both Local and external funding.

2.7.1 Local Sources

The NLS major funding body is the government of Malawi. The government's annual subvention is supplemented by grants from other local funds. Fig 2.2 (a), (b), (C) show the local sources and the flow of their financial contributions as from 1984/85 to 1990/91.

FIG 2.2 FLOW OF LOCAL FINANCIAL SOURCES
(a) Government Subvention

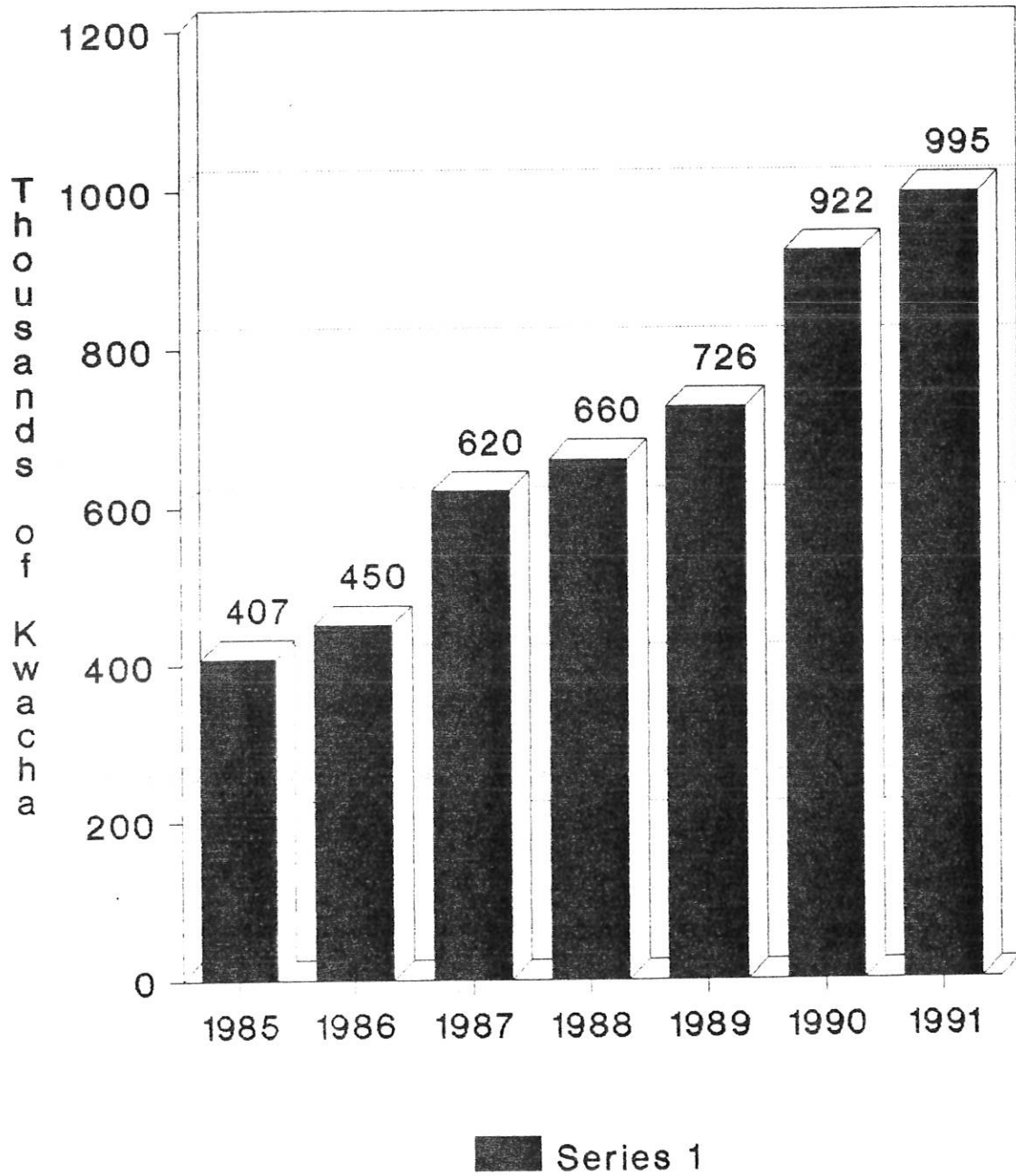
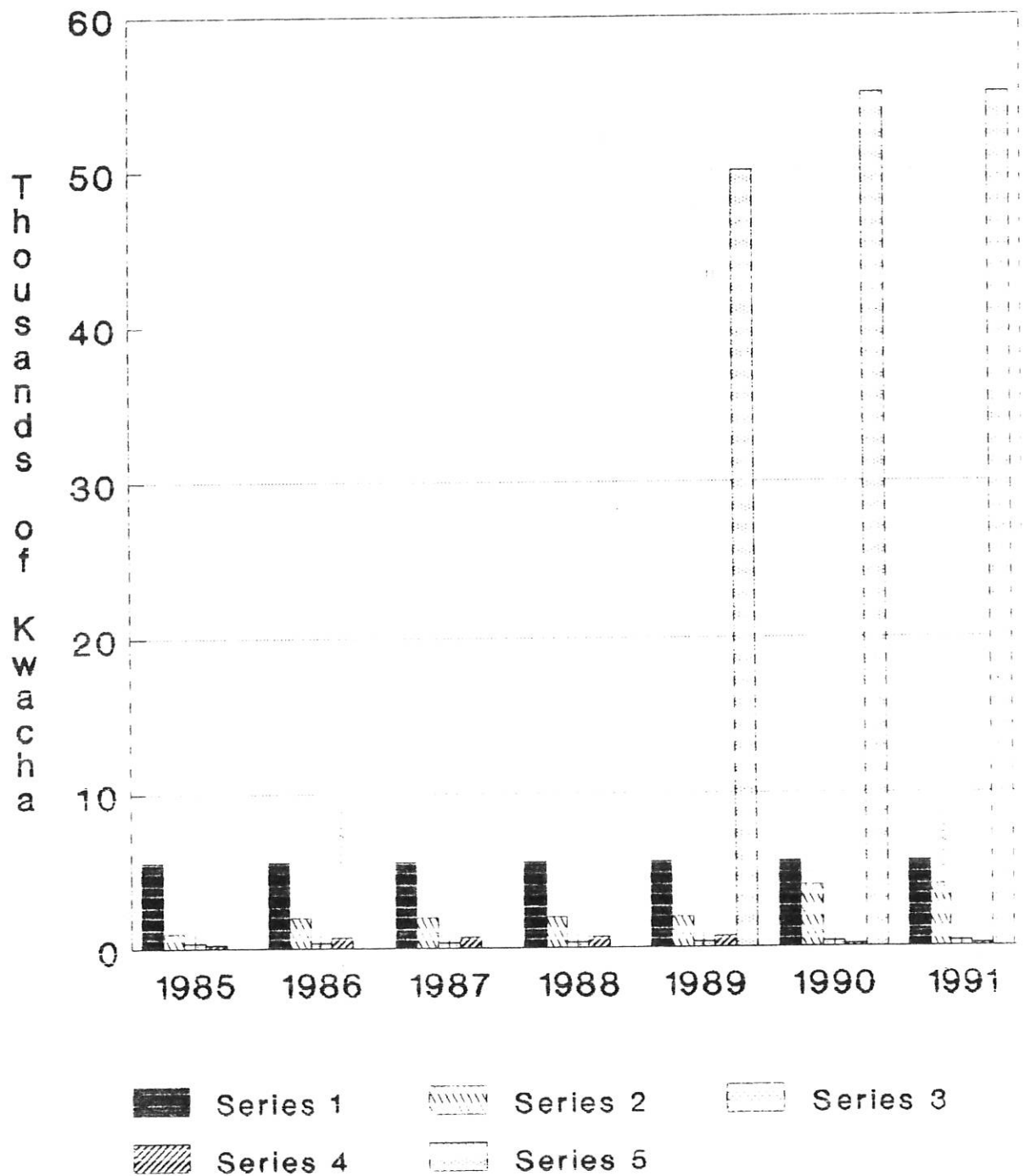
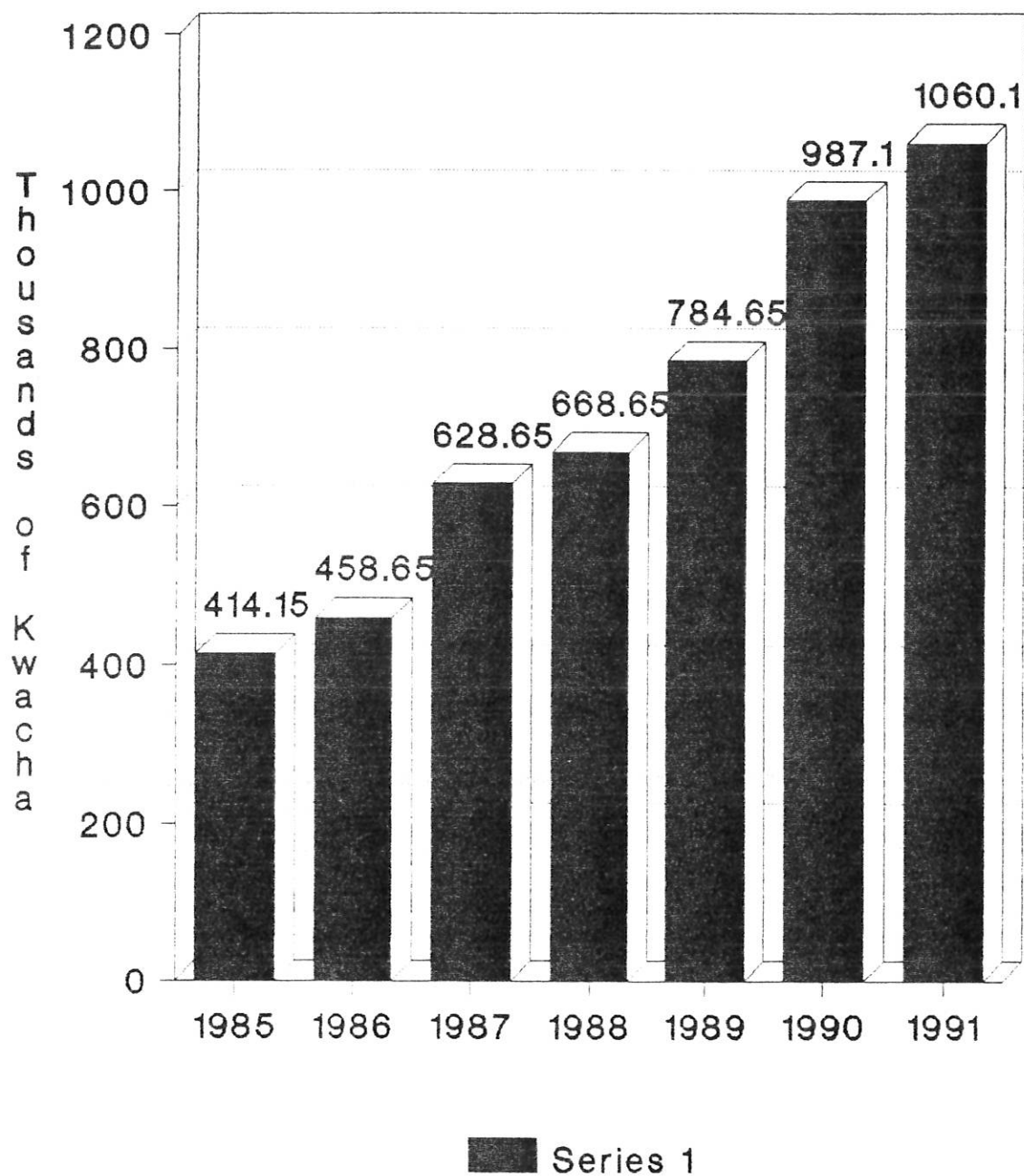


Fig 2.2 FLOW OF LOCAL FINANCIAL SOURCES
(b) minor sources



Series 1: City of Blantyre. Series 2: City of Lilongwe
Series 3: City of Mwanza. Series 4: Municipality of Zomba
Series 5: Ministry of Education and Culture

Fig 2.2 FLOW OF LOCAL FINANCIAL SOURCES
(c) Total of sources



Other supplementary local sources include funds generated from within the organization itself such as hire of its social amenities (Hall services), staff secondment, overdue fines etc.

2.7.2 External Sources

The NLS has had donations from a number of foreign organizations such as:

- . Canadian Organization for Development Through Education (CODE)
- . Ranfurly Library Service (London)
- . British Government ODA Book Development Program
- . Indian High Commission
- . Unesco
- . South African Embassy

Foreign contribution have always been in the form of books or grants to purchase both local and foreign books or grants to run workshops, etc. Table 2.2 shows the two major donors in 1990/91 and the value of their grants.

Table 2.2 Major External Donors (1990/91)

British Council	K40,962
CODE	79,463
CODE	C\$105,000*

*1991/92 donation

CODE is the NLS's biggest donor as shown in table 2.2. In 1991/92 CODE has again donated Can\$105,000 and in 1992/93 has pledged to donate Can\$100,000.

In 1990/91 financial year, the NLS operating budget was K1,274,729.

2.8 OPERATIONAL SYSTEM AND SERVICES

The NLS operates seven branch libraries in Blantyre, Limbe and Zomba (southern region), Lilongwe (central region) and Mzuzu and Karonga (northern region), where lending, reference and information services are provided. These service points are shown in the organization chart (fig 2.1). The NLS also operates extramural library services in the form of postal book lending services from the headquarters (Lilongwe) and also runs a special postal service to registered students of the Malawi College of Distance Education (MCDE). This Department also operates Rural Library Services and School Library Services throughout the country.

The NLS caters for all ages and groups in the country. For example it maintains a special childrens collection; the information and book needs of teenagers and young adults, parents, farmers, businessman, managers, industrialists, economists, medical practitioners, politicians, scientists, engineers, etc are reflected in the NLS materials and services. To promote use of the

library material, it publicizes, displays special materials, holds workshops, etc.

2.9 SERVICES

2.9.1 Public Services

The volume of reading materials lent out by the NLS lending services to the public was well over one million during 1990/91 (NLS Annual Report, 1990/91).

2.9.1.1 Book Issues

Fluctuations of the public library service utilization reflected in book issue statistics as from 1984/85 to 1990/91 is an indication of library collection development, fig 2.3 (a), (b).

2.9.1.2 Membership

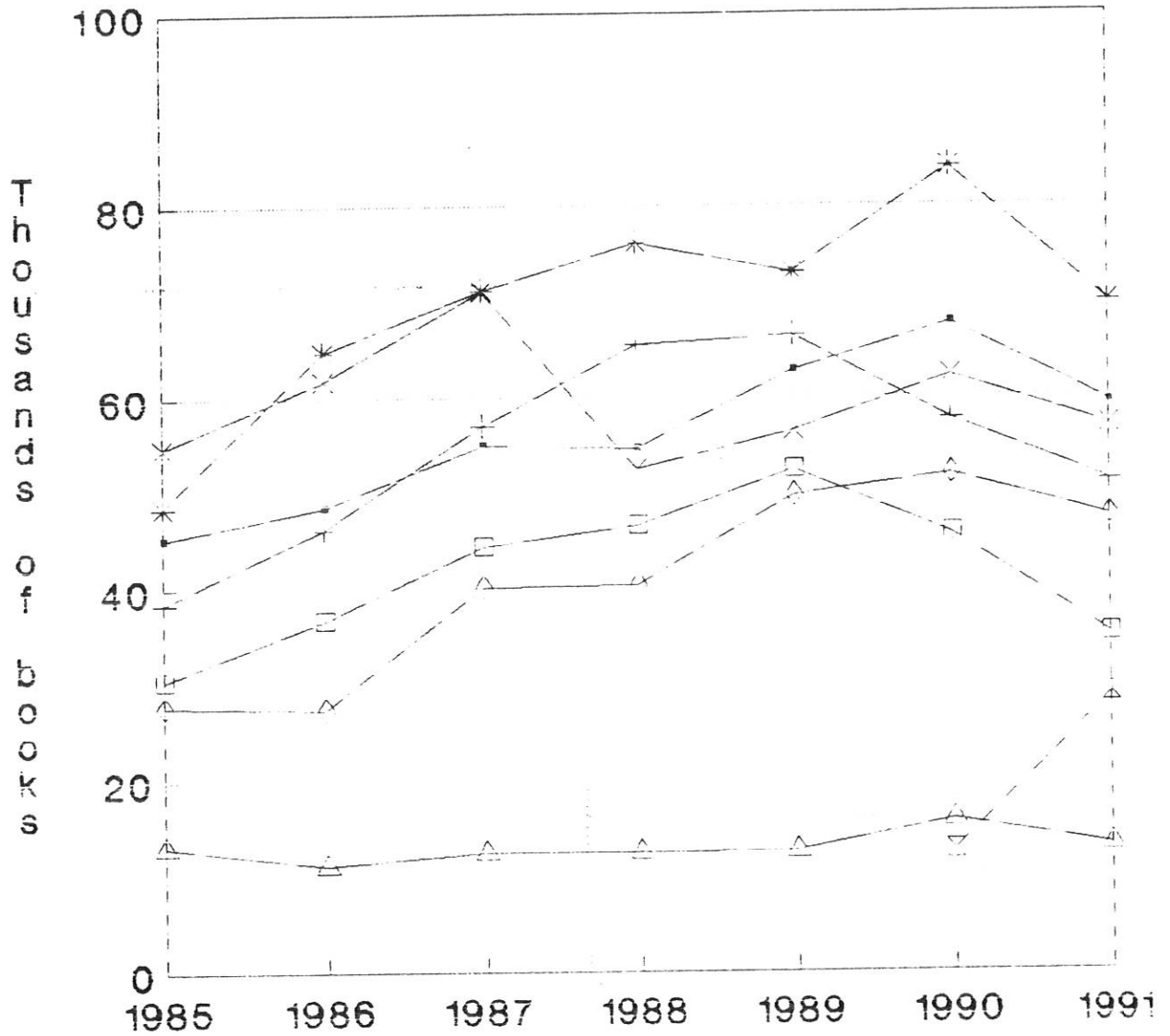
The NLS serves over 28,786 registered members by public service alone (NLS Annual Report, 1990/1991). However, there is unaccounted number of users that utilize the services for reference, general information and reading.

2.9.1.3 Growth in Collection

The NLS total annual expenditure for books and periodicals is about 18% of total annual budget (NLS Annual Report, 1990/91). Donations contribute a substantial amount to collection development.

Fig 2.3 LIBRARY USE

(a) as reflected in book issues in individual service points

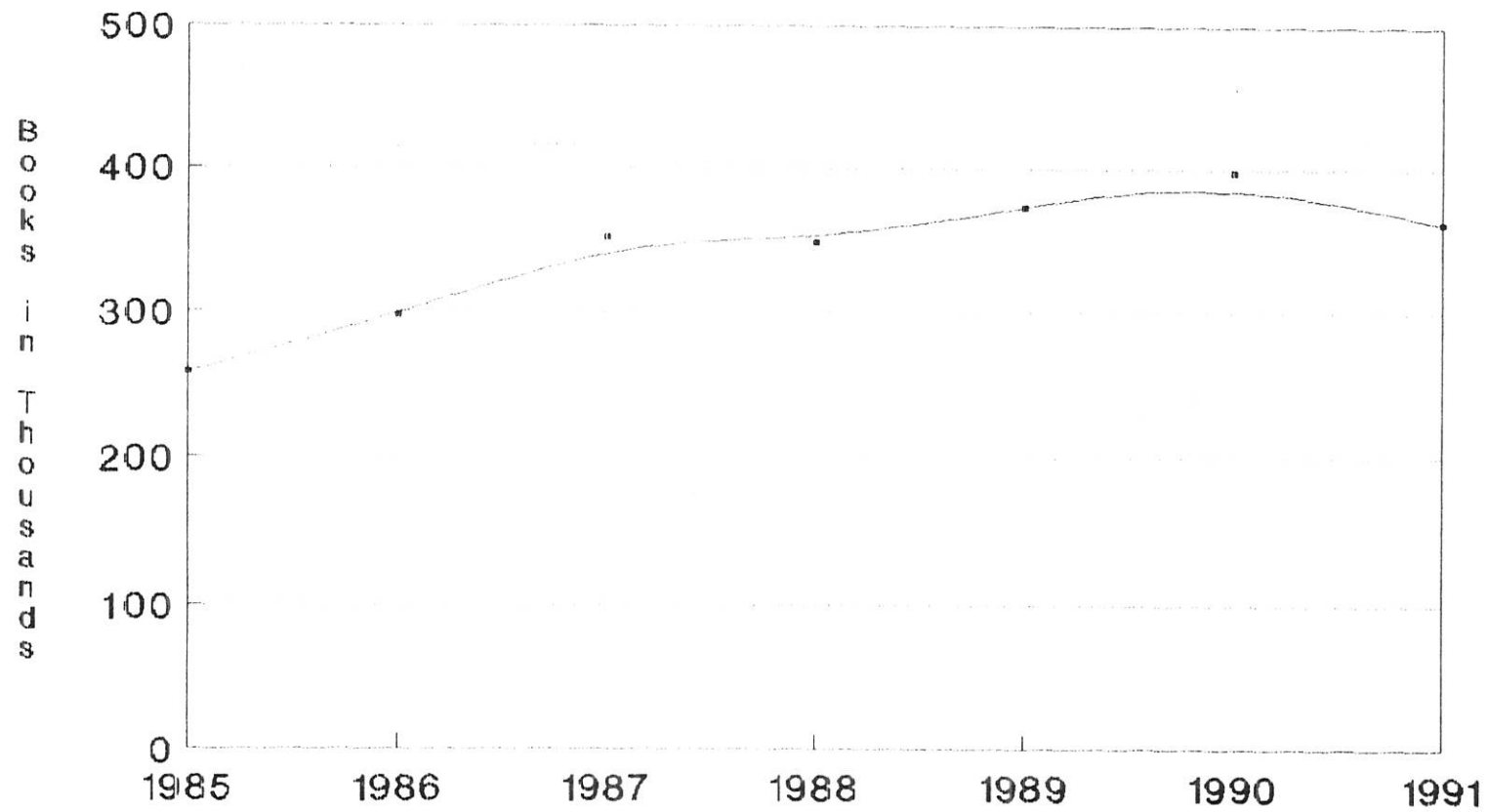


Series 1 - KTB Series 2 - LBB Series 3 - ZBR Series 4 - LBR Series 5 - H/O
 Series 6 - MCP Series 7 - Postal Series 8 - ZAP

series 1:KTB. Series 2:LBB. Series 3:ZBR. Series 4:LBR. Series 5:H/O
 Series 6:MCP. Series 7:Postal. Series 8:ZAP

Fig 2.3 NLS LIBRARY USE

(b) Total of use in all Service Points



Series 1

Fig 2.4 a graphical representation of growth of the collection as from 1987/88 to 1990/91. Book losses and collection weeding contribute to the fluctuations.

2.9.2 Services to Schools

The NLS operates a library service within the Extramural Services, to schools especially primary schools where NLS books are lent out to registered institutions and exchanged after every three months. Selection of books to be exchanged is controlled by the needs and requests of the respective institutions.

Other services provided include:

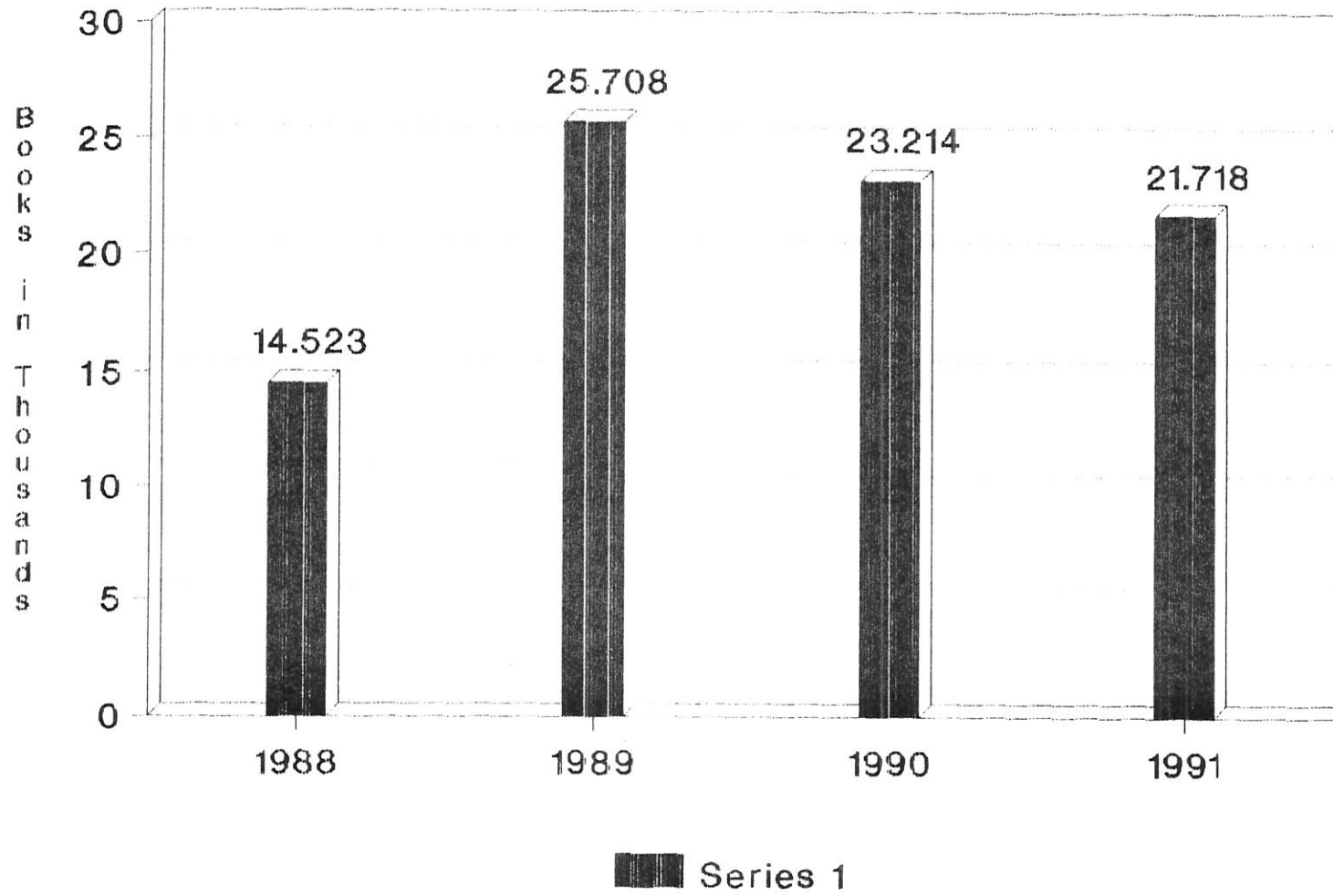
- . Book donations
- . Organization and development of the school libraries
- . Conduct of teacher librarian workshops to train selected primary school teachers in library organization and management.

The total number of school libraries operated by this service is well over 370 primary schools, secondary schools, MCDE centres, Technical colleges and others.

2.9.3 Services to Rural Communities

In an attempt to serve a substantial proportion of the Malawi population living in the rural areas, the NLS created the Rural Library Services with the objective of disseminating functional information through a

FIG 2.4 NLS GROWTH IN BOOK COLLECTION



coordinated approach with the already existing functional centres and communities in collaboration with the Ministry of Community Services.

The National Advisory Council on Literacy and Adult Education formed a Rural Information Service Committee with the NLS as chairman. Through the coordination of the committee the following institutions make donations of booklets as reading materials aimed at promoting literacy skills among rural communities:

- . UNICEF
- . Extension Aids Branch of the Ministry of Agriculture
- . Health Education Services of the Ministry of Health
- . Department of Information and other material producing agencies.

This service is also responsible for the organization, distribution, stimulation of interest and interpretation of these reading materials. These services are extended to over 409 Rural Service centres in:

- (1) Agricultural Development Divisions (ADD)
- (2) Extension Planning Areas (EPA)
- (3) Rural Development Projects (RDP) and Estates
- (4) Rural Community Information Centres (RCIC)
- (5) Community and Rural Growth Centres
- (6) Hospitals
- (7) Malawi Young Pioneer Training Bases.

The computer based system to be recommended will have an effect on these services in one way or another, which will be discussed in the evaluation Phase of this thesis (chapter 5).

CHAPTER THREE

DEVELOPMENTS IN LIBRARY AND INFORMATION TECHNOLOGY.

3.1 DEFINITION OF INFORMATION

Information is defined as follows:

"...information is the communication of intelligence or knowledge ... for the work of documentation and information facilities, information is new knowledge disseminated in accordance with the information requirements of the receiver for the fulfilment of his tasks in government, science or technology" (Schutz et al 1975 in ECA/PADIS, 1988).

3.2 DEFINITION OF INFORMATION TECHNOLOGY

Information Technology (IT) is defined as the technology which supports activities involving the creation, storage, manipulation and communication of information, together with their related methods, management and application. IT is therefore seen as a broadly based technology needed to support information systems (Oliver et al 1991). This chapter will focus on IT related to library automation using computer systems.

3.3 PHASES OF IT DEVELOPMENT IN LIBRARY AND INFORMATION SYSTEMS

Experimentation in use of computers in libraries in both North America and UK started at almost the same time as the reported computer application in Africa - 1960s.

According to Tedd (1978), it was mostly the special and university libraries which took early interest in developing computerized library systems in the USA, while in the UK, it also included the public libraries. Encouraged by the librarians' interest, H.P. Luhn of IBM in 1961 developed programs for producing key-word indexes to titles of articles in Chemical Abstracts and the Douglas Aircraft Corporation started to produce catalog cards by computer.

In the late 1970s, encouraged by these developments, several libraries in these countries installed microcomputers in their libraries, following the development of microcomputer technology which is more easily affordable and manageable, requiring much less stringent environmental conditions than the mainframe or minicomputers. These micros were in due course used for both database development, provision of online access to the library collection database and implementation of a computerized circulation system. It was mainly in the 1980s that many libraries acquired micro computers and the technology experienced its rapid and extensive utilization in libraries. As pointed above, this was mainly due to the availability and development of the microcomputer systems and their capability to be used as intelligent terminals to remote computer systems or to control a variety of library functions such as the

creation and maintenance of local databases, serials control and acquisitions management, circulations control and provision of new user oriented specialized information services. Many librarians were also motivated by the concept that this new technology was capable of providing an integrated system to control a variety of library functions.

Processing of data in machine-readable form also introduced new media or devices through which information can be disseminated. In the same literature review, Tedd also indicated that in 1960 there were about 250,000 bibliographic records available on online services but by 1982 this number grew to 77 million. The extensive availability of information in machine-readable form therefore motivated librarians and information experts to automate their systems. Other motivating factors include the fact that machine readable records are multi-usable meaning a single bibliographic record can be simultaneously accessed by more than one user.

Remarkable developments in telecommunications and networking have improved exchange and timely accessibility to accurate and reliable information.

3.4 EXPANDING STORAGE CAPACITY AND PROCESSING SPEED OF COMPUTER SYSTEMS

Microelectronics developments in the present generation computers has improved remarkably the capacity of electronic data processing (EDP), especially due to the integration and extensive application of micro-electronic devices called "silicon chips" or "semiconductor devices" (Oliver et al 1991, p18).

The reduction in production costs of microcomputer systems makes them affordable by library and information centres while the miniaturized nature provides a computer hardware which can be easily accommodated and managed in the various library departments or at home or offices and can be linked to the library computer system for library database searching from the home or office.

The main storage in modern computers is typically bigger than those of just ten years ago by a factor of tens or even hundreds and the size and power of microprocessors has been increased so that the microcomputers of today are much more powerful than minicomputers were in 1972 (Oliver et al 1991, p18).

These remarkable developments in computer technology offer the library user fast access to the databases via online search: (1) serially, that is sequential retrieval of records; or (2) Directly, that is random retrieval of records using indexed file structure.

The retrieved records can be held in the RAM for the user to analyze from the screen before they can be sent to the printer. Simultaneous accessibility of same database records is possible for users working at different search terminals in the library.

Computers are able to perform accurately repetitive tasks on large volumes of data. Library operations typical of routine jobs can exploit these abilities to process and maintain data and provide the required information to users.

Modern microcomputer systems can contain RAM memory capacity of up to 64 MB (64,000,000 Bytes) or more and offer features of expandability.

3.4.1 Backing Storage

Backing storage is provided for the offline mass storage of databases, programs, etc not currently being processed but may be transferred to the online disk and main memory when needed. This storage media provides a pool of accessible data. Main devices for backing storage which library and information systems can make use of include:

3.4.1.1 Magnetic Storage Devices

3.4.1.1.1 Magnetic Tapes

Large quantities of data can be stored on magnetic tapes. Since these devices offer a serial or sequential data storage and retrieval, they are mainly usable for archival purposes, or for transportation of files to other locations. These can be used by library systems to take a back-up of databases on disks.

3.4.1.1.2 Magnetic Disks

These devices include: (1) Magnetic disks such as diskettes or floppy disks and hard disks. They are mostly used for bulk data storage in microcomputers.

Libraries take advantage of the massive storage capacity of these hard disks in order to develop and store a machine readable data base of all library resources thus promoting online storage and retrieval of documents in a library, facilitating development of integrated databases and integrated library applications software, promoting networking of different library departments so that each department can store its own records within the same system.

3.4.1.1.3 Optical Disks

These are mass storage devices where read/write of data on the disks is by means of laser technology. Categories of optical disks include:

1. Read only media-Data can only be read from it. These are of two types namely (1) Video disks and (2) compact disks. Compact disks are normally called CD-ROM.

The CD-ROM technology:

CD-ROM disks measure 4.75 inches in diameter only but they are capable of storing the following quantities of data:

- . Equivalent of up to 250,000 pages of text
- . 1500 floppy disks
- . 74 minutes of audio

This tremendous storage capacity has caused the prediction of a revolution in the information industry that will change forever the manner in which we manipulate information (ECA/PADIS, 1991).

CD-ROM disks need special drives called CD-ROM drives connected to a computer. The laser beam, as the "read" head of the drive reads the data.

Users cannot record or change data on the disk because CD-ROMs are read-only memory.

CD-ROM technology is geared towards systems where large quantities of static (semi-static) information can be accessed on a regular basis. One of the largest users of CD-ROM technology are libraries, they can access by online search bibliographic databases. This technology has helped easy transportation of bibliographic databases

and can overcome some of the information handling problems libraries encounter. Table 3.1 shows the comparative performance of backing storage media devices.

3.5 DATA TRANSMISSION SYSTEMS AND NETWORKS

3.5.1 Communication Systems

In a manual based library system or small scale library computer systems, users wishing to make inquiry of library collections renew borrowed library material or to find any information of interest from the librarian, without physically visiting the library usually use the existing telecommunications system: the telephone system because if uninterrupted a two way communication is instantaneous and cheaper unlike alternatives such as mailing, fax or telex. In a telephone system the electrical signal transmitted is the direct signal of the voice transmitted.

The Modem (MODulation-DEModulation) is a device meant to facilitate conversion of digital signal from computer terminal to analog signal (modulation) for transmission on the telephone line and demodulation of the analog signal to digital signal to be accepted by the computer system fig 3.1. This technology is very useful in wide area networks.

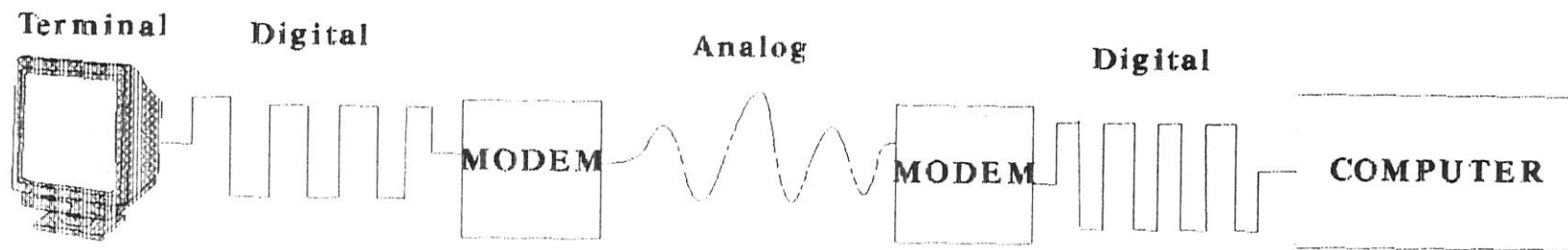
Table 3.1 The comparative performance of backing storage media/devices

Devices and Media	Typical Access Time	Typical Storage Capacities	Typical Transfer rate	Type of Storage SAS* or DAS+	Where used as Primary Medium
1. Magnetic Tape Cassette	A search is required several minutes	Up to 155K Bytes	10-33000 cps	SAS	Small microcomputer systems
2. Floppy Disc	260ms	180 K bytes to 1.25 M bytes	24000 cps	DAS	Microcomputer based systems
3. Magnetic Tape	A search is required several minutes	40 M bytes	160000 cps	SAS	Minicomputers and Mainframe - mostly as a back-up medium for disk
4. Magnetic Disk	60ms	60 M bytes	312000 cps	DAS	Minicomputer and mainframe
5. Optical Disk	100ms	1 G byte	200000 cps	DAS	Minicomputers and mainframe - for archiving or online back up

SAS* (Serial Access Storage) DAS+ (Direct access storage)

Source: E.C. Oliver, 1990.

Fig 3.1 Data Transmission Using MODEMS



MODEMS are used in computerized library systems to establish a communication link from a terminal at office, home etc to the computer system in the library or between two library computer systems located widely apart.

The domestic telephone line in conjunction with these devices can transmit data at speeds between 20-120 characters per second. There are also private telephone systems which can be leased or rented. These are permanently wired data transmission lines instead of dial-up lines, and are capable of transmitting data at much higher speeds of over 1000 characters/second. Libraries are busy systems with multiple users and installation of data transmission lines can be expensive. To reduce installation costs it is useful to incorporate multiplexing devices which would make it possible to use one line for a number of separate users simultaneously.

In order to install the above data transmission equipment, libraries may require to know the average volume of data that may be carried per unit time. This will determine the baud width of the channel to be installed that will have capacity to carry the required data volume. Data transfer rate is the number of bits transmitted per second known as baud (unit), for example a 300-baud line can carry 30 characters per second, assuming 10 bits are required to transmit one character.

Coaxial cables are commonly used in library and information LANS because this medium can carry up to 140 million bits per second which is equivalent to about 2000 telephone lines. Other cabling systems available include optical fibre and microwave technologies.

There have been quite a number of installations of digital telephone exchange systems in Africa replacing analog systems so that it is possible to transmit speech over digital communication systems.

3.5.2 Available Communications Software

For a user to communicate with a computer system and for a computer to perform assignments and control routines requires a software. A software is defined as program instructions that direct the operation of the hardware (Davis G.B. and Olson 1985, 29). The term is often used to mean not only the programs themselves but their associated documentation (Oliver et al 1991, 203). There are basically softwares of two types:

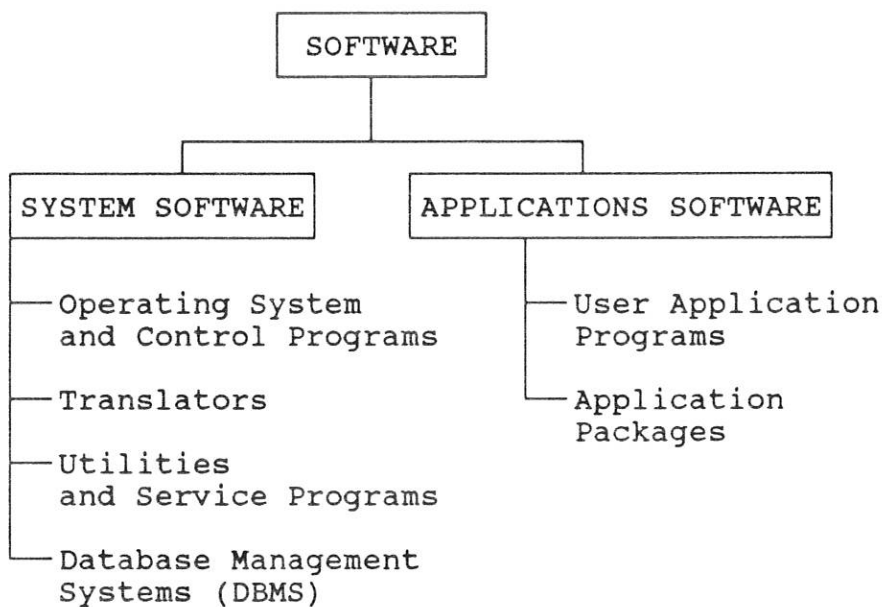
3.5.2.1 System Software

This is software provided by the manufacturer to control performance of the computer system. It is usually a collection of programs called systems programs installed in order to operate the system.

3.5.2.2 Applications Software

These cover a wide range of programs which can be provided by the manufacturer, suppliers or user programs produced by users themselves. Most applications programs require systems programs in order to operate.

A more detailed subdivision of software types is given below.



Libraries installing computer systems would require both Systems Software and applications software. The following section discusses the requirement of a DBMS in a library environment.

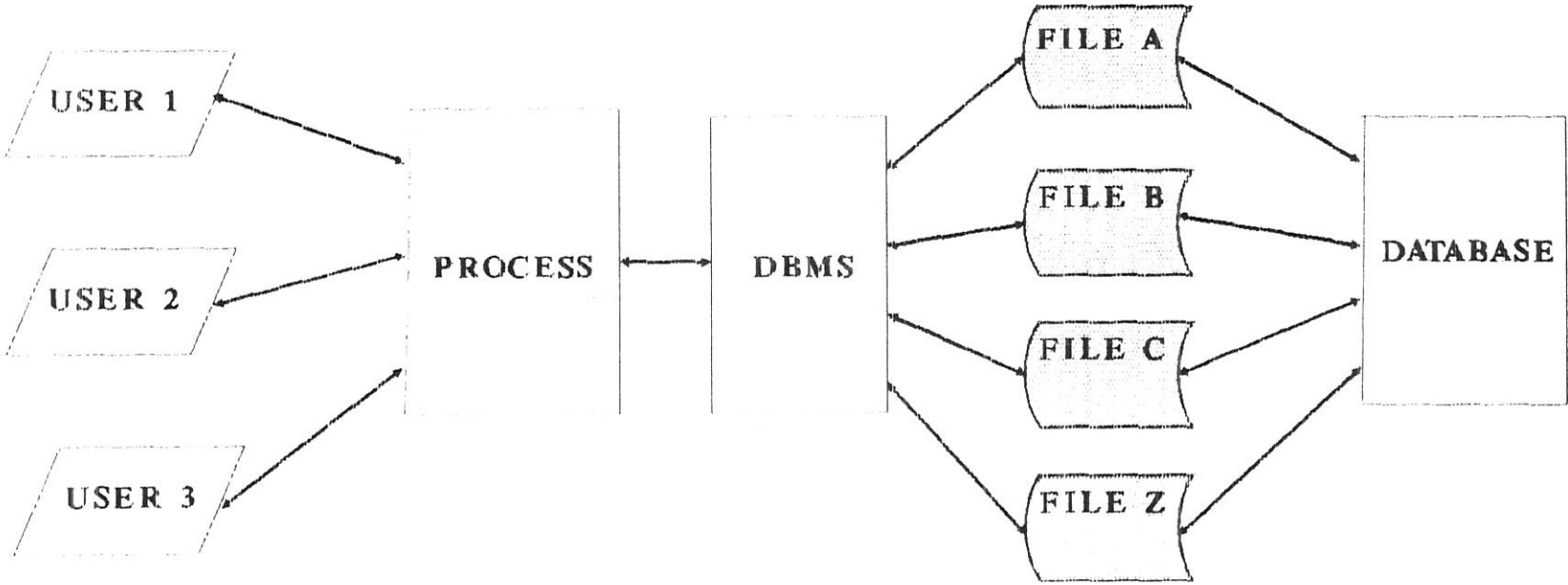
3.5.3 Application of DBMS to Libraries

DBMS is defined as a complex software system which constructs, expands and maintains the database. DBMS enables the creation of integrated file systems where data is pooled into a set of interlocking and interdependent files accessible to a number of users. An integrated file system is advantageous in many ways, one of them being that when a book transaction record enters an integrated file system, all the appropriate files are updated. Fig 3.2, shows schema of an integrated file structure.

DBMS is capable of performing the following activities in a library system:

- a. Allocation of storage to data
- b. Maintenance of indices for searching, retrieval of data and data cross-references.
- c. Database structure can easily be changed
- d. Can perform data maintenance jobs such as:
 - (i) addition of new records
 - (ii) deletion of unwanted records
 - (iii) amendments to records
- e. Expansion of the base by addition of new sets of data to existing records.
- f. Provides an interface with user programs which may be written in a number of different programming languages.

Fig 3.2 INTEGRATED FILE SYSTEM
(Schematic View)



Adapted from Oliver et al (1990, 235)

- g. Ability to process files in a variety of ways such as:
 - (i) serial or sequential processing of a complete file
 - (ii) selective sequential or random processing of records
 - (iii) Retrieval of selected records
- h. Provides database integrity and security such as:
 - (i) data protection against unauthorized access.
 - (ii) data protection against corruption
 - (iii) Provision of recovery and reinstall facilities after hardware or software failure.
- i. Keeps statistical records of frequency of use of data in a database which can facilitate weeding of the database.
- j. Stores frequently required data in fast access memory.
- k. Allows import and export of records between different databases.

3.5.4 Interface Devices:

Connection of communications devices to computer systems, between two computer systems or between communication devices require use of interface devices which are either of serial or parallel types.

Communications interfaces are advantageous because:

(1) Different peripherals such as printers and disk drives can be used without modifying the microcomputer hardware or software; (2) Data can be transferred from one machine to another, for example, in cases where floppy disks are incompatible etc.

Libraries can utilize this facility to communicate with another computer at a distance for online searches as long as the required communication devices installed use standard protocols.

3.5.5 Networking Systems

A computer network refers to an interconnection set of two or more computers.

Local Area Networks (LANs). This is a network used to connect computers in a single room, rooms within a building or buildings on one site. Data is digitally transmitted in LAN usually using coaxial cabling system. A number of LAN schemes have been in use, the common ones being Ethernet, Token-Ring by IBM and Novell/Netware.

Wide Area Networks (WAN). This network interconnects computers on separate sites, separate cities even separate countries. Increasingly WANs use mostly fibre optic cabling system.

3.5.5.1 Networking System Structures

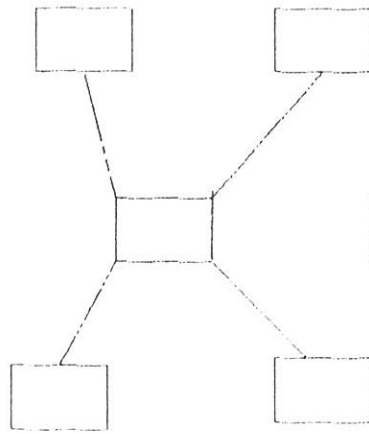
These are standard network structures that can be employed. These are shown on fig 3.3 (adapted from Oliver et al 1991, 119), the boxes stand for computers and the connecting lines stand for cabling system.

3.5.5.2 Application of Networks to Libraries

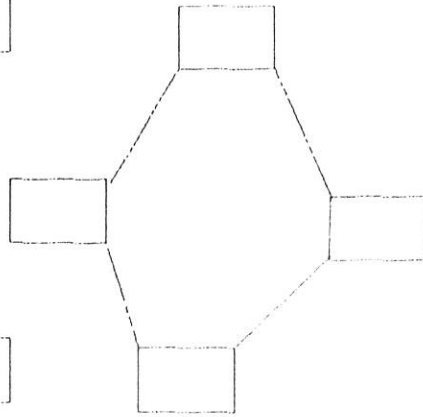
Networking systems are a valuable development in library applications. With a network system libraries can effectively computerize their whole operation by interconnection of microcomputers. Libraries using LAN network systems will gain the following benefits:

- a). The sharing of resources - A variety of equipment can be attached to the network such as microcomputers, central disk store, printing facilities which can be shared by everyone using the system. Staff resources and database resources can also be shared. One printer for example can serve a number of users, a database held on one machine can be accessed from another.
- b). Provision of local facilities without the loss of central control.
- c). Even distribution of work, processing load, etc.
- d). Shared risk and mutual support.

Fig 3.3 Network Structures (Standard)



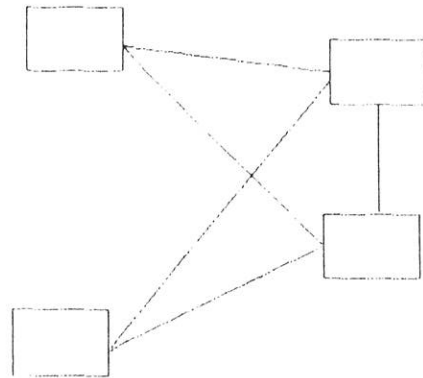
1. Star Network



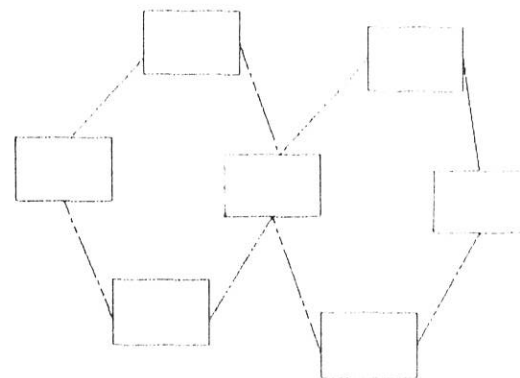
2. Ring Network



3. Multidrop Network



4. Mesh Network



5. Interconnected Rings

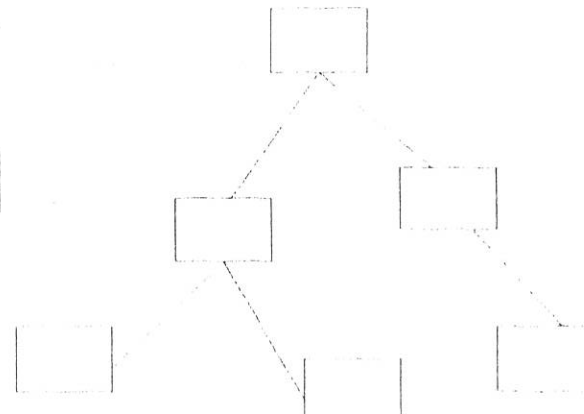
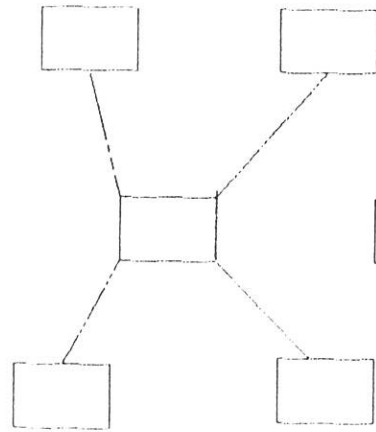
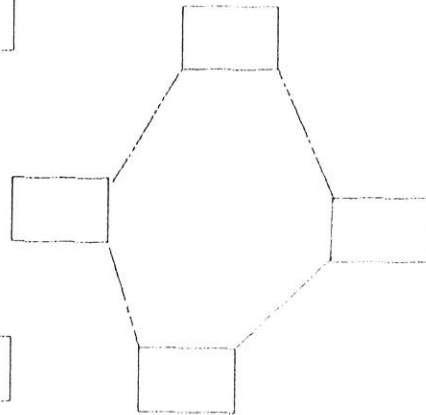


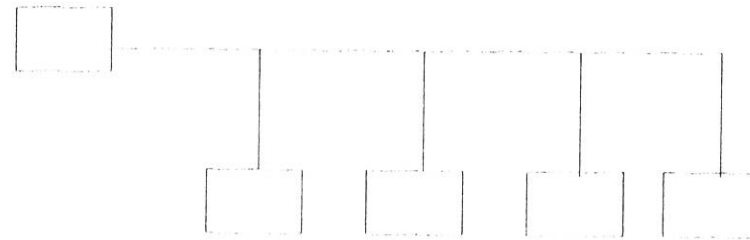
Fig 3.3 Network Structures (Standard)



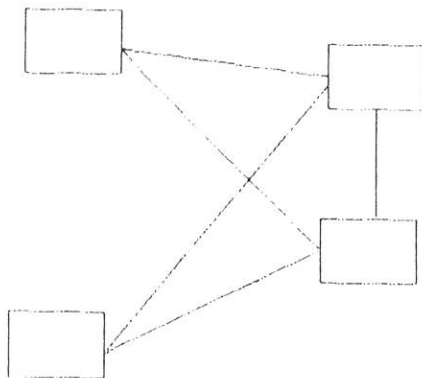
1. Star Network



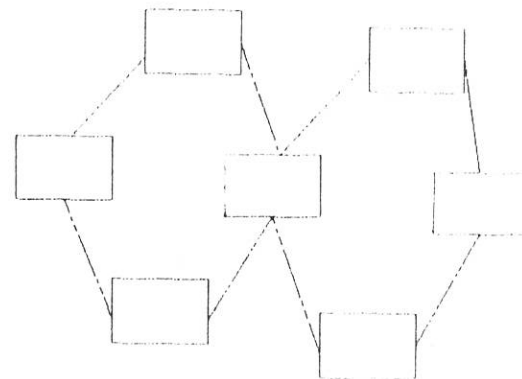
2. Ring Network



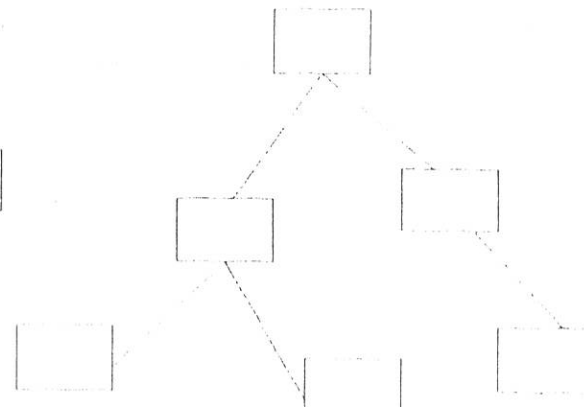
3. Multidrop Network



4. Mesh Network



5. Interconnected Rings



- e). LAN operating systems and application software are not quite expensive but can allow increased usage of machine resources.
- f). Its multi-usability can allow a number of library users to carry out online search of databases simultaneously.
- g). Expensive softwares can be shared.

3.6 THE EXISTING INFORMATION SYSTEMS AND SERVICES IN AFRICA

Information System of an organization refers to the practice of information handling in an organization: collecting, processing and storage, retrieval and dissemination (Oliver et al 1991). An organization needs information in order to plan, organize its operations, co-ordinate and control so as to achieve its objectives.

However, The present definition of terms "information system" and "information services" refers to the collectivity of information handling institutions: libraries, documentation centres, information analysis centers, etc more particularly institutions using modern methods and concepts of information handling (systems analysis concepts, computers, micro-reprography, etc) are emphasized in the information systems definition (ECA/PADIS, 1978). The operational definition of information services in this document will refer to user-oriented products of information systems.

3.6.1 Information Systems in Africa

There are several types of information systems available in Africa which are sources of information for development. The following systems are usual sources of information sought by individuals in African countries (Aiyepoku cited in ECA/PADIS, 1988):

1. Libraries and Documentation centres
2. National Archives
3. International Information Systems such as PADIS, AGRIS, UNEP, HABITAT, etc.
4. Organizational Information System (Document collection at Offices)

Effective utilization of these information systems, however, require ease of access to the information sources and services and availability of reliable and timely information.

3.6.2 Information Services

There is a range of information services provided by the regional information systems such as PADIS and ILCA and some well developed libraries and documentation centres in African countries. Information services provided by PADIS and ILCA will be cited as examples below.

3.6.2.1 User Services:-

Delivery of user services may be in the form of

- (a) Published indexes to development literature.
- (b) SDI bulletins
- (c) Customized question/answer service, and
- (d) Documents/microfiche delivery

Additionally there are other user services that an information system can provide such as those enumerated in table 3.2 (Neelameghan 1992, p 123).

3.6.2.2 Other Services

These include provision of:

1. training courses relating to (a) Operations Management of library, documentation and information centre (b) Computerized documentation techniques (c) Desktop publishing techniques, etc.

2. Advisory Services:-

These are specialized services provided by specialists in the field concerned e.g. advice on relevant regulatory measures relating to export/import of goods; on technology acquisitions, etc.

3. Network building:-

Library and information systems can cooperate in building up a network system for information resource sharing. The PADISNET will be discussed below as an example.

Most of the library and information systems in African countries are not well developed so as to provide most of the above mentioned information services. One of the reasons being their total dependence on the manual based systems for their operations. Development of computer-based systems in library and information services in African countries would promote scientific management of these systems so that more specialized user-oriented information services can be easily provided.

3.7 LIBRARY AND INFORMATION NETWORK SYSTEMS IN AFRICA

Individual local area networking systems may exist in Sub-Saharan African countries which may not be well known on the international scale, for example, the Chitedze Agricultural Research Station in Malawi operates a Local Area network system using microcomputers. However, one of the prominent network system in the African continent is the PADIS network called PADISNET.

3.7.1 PADISNET

PADIS is acronym for Pan African Development Information System established in 1980 with overall objective of establishing a regional information system in Africa which will serve as a conduit for information and data for development, centred around national, sub-

regional and regional networks to which all members will contribute information and share their information management techniques (UNECA/PADIS 1992).

Under a grant from IDRC, PADIS has initiated a pilot project in information technology that will improve utilization of its databases and facilitate communication on development information in the region. PADISNET project will electronically link selected nodes of the PADIS network. Nodes will use modems communication to send messages, request database searches, exchange information over bulletin boards and participate in electronic conferences on issues related to development information. PADIS will act as a gateway for the network to access external databases and networks, such as BITNET. Experiments on access to PADIS databases and testing of the applicability of recent information technology, including the use of optical storage media eg CD-ROM, Scanners and facsimile transmission will be conducted.

Fig 3.4(a) and (b) shows a successful networking system installed in PADISNET, the text was obtained from UNECA/PADIS 1992.

Malawi can make use of this network by contributing database input records of grey literature in Malawi to the PADIS database. The University of Malawi Library and other selected institutions were already identified as participating centres in the Network. The NLS can also easily participate in this network if information storage and retrieval at the NLS can be done using computers.

FIG 3.4 PADIS COMMUNICATION LINKS

(A) General View

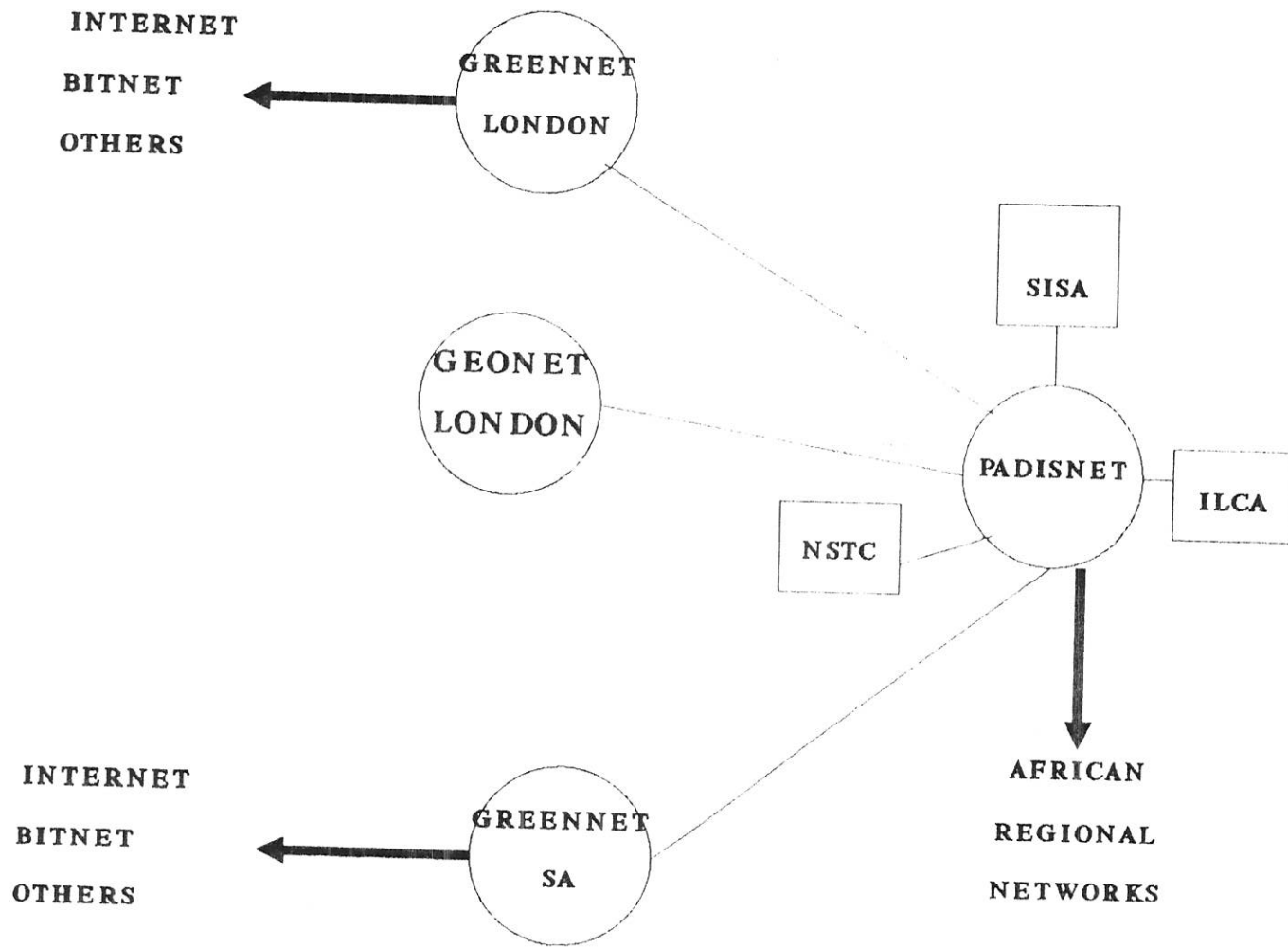
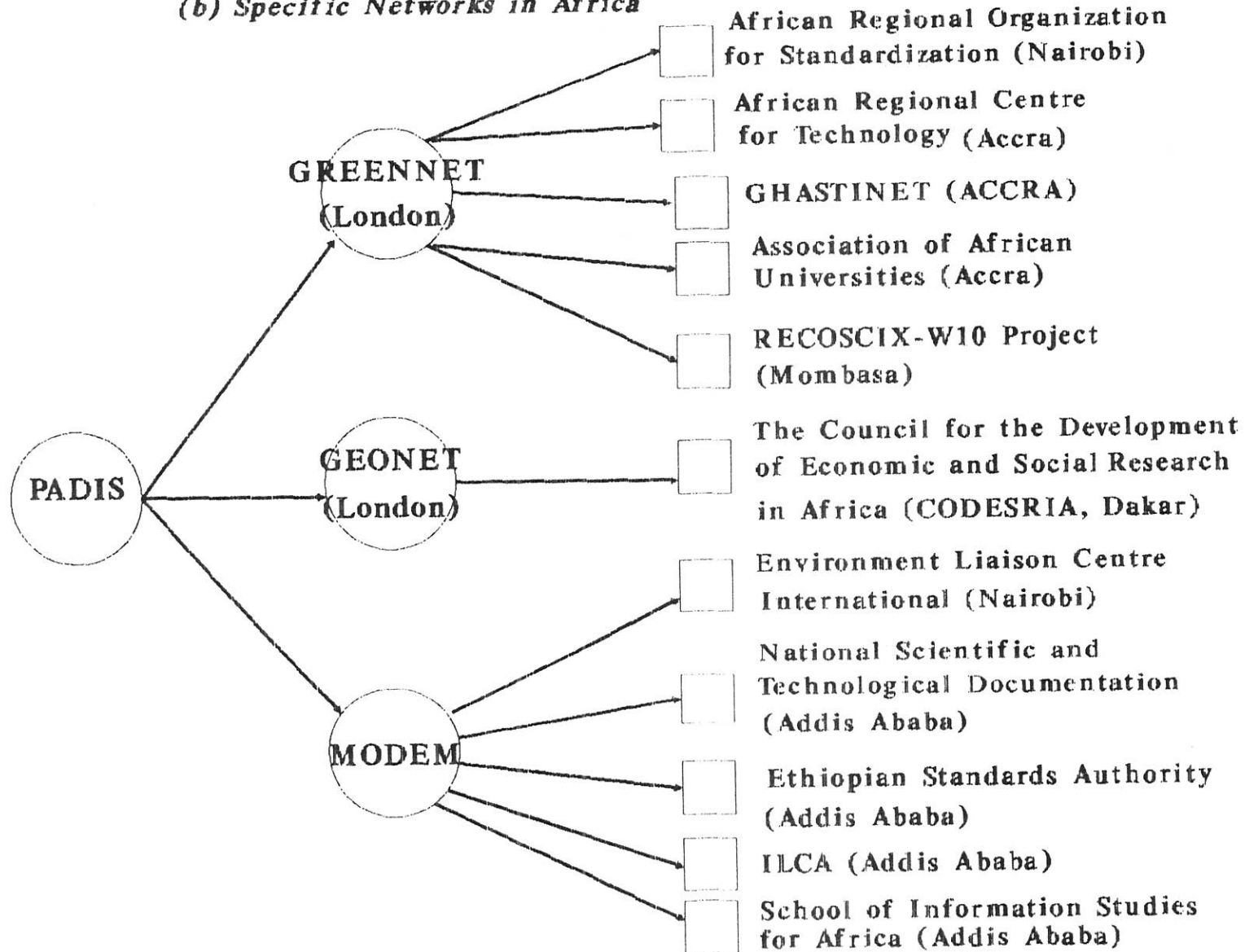


FIG 3.4 PADIS COMMUNICATION LINKS

(b) Specific Networks in Africa



CHAPTER FOUR

APPLICATION OF COMPUTERS TO LIBRARY AND INFORMATION SYSTEMS

4.1 INTRODUCTION

There is perhaps no area of library and information systems where computers can not be used. Since the main function of library and information systems is information storage, retrieval and dissemination (ISR), computers can support these functions. As reviewed in chapter 3, experience has indicated that at the time when the type of computers on the market were mostly mainframes, computers were seen as appropriate for only large library systems with large house-keeping transactions. Today, with the remarkable developments of the microcomputer technology, the availability of microcomputer hardware and software on the market has opened for applications in even smallest libraries and information units.

The widespread awareness of use of computers in library systems and appreciation of their capability is encouraging many library and information institutions to use computers in some or all of currently manual based library operations. This chapter will discuss computer application areas in library systems.

4.2 ACQUISITIONS MANAGEMENT

Document ordering process in most libraries is done by the acquisitions department. Its operations include selecting, bibliographic checking, ordering, receiving and accessioning.

4.2.1 Document Selection

. Several publishers now use computers in their operations and some of them offer bibliographic selection services to subscribers in machine readable form. Examples include Oriel Bibliographic Services Ltd, Blackwell Bibliographic Services. Their main function is to disseminate information about forthcoming publications. Selection of documents can therefore be conducted in machine readable form from publishers catalogues on CD-ROM databases such as the commonly used BIBLIOFILE, magnetic tapes or computer output on microfiche (COM) cards.

. In document selection process, requests for orders can be sent to the acquisitions department electronically. For example in a university library where the library and departments are electronically networked, departments requests can be sent to the library through the computer system.

. Bibliographic checking can be done easily from the bibliographic sources, the order file or the library catalog if records are stored in machine readable form, and this minimizes chances of duplicate selection/ordering.

4.2.2 Ordering Process

Computers can assist in the following operations:

. Production of orders or order slips in multiple copies

. Sending of orders to publishers electronically using e-mail technology.

4.2.3 Receiving Ordered Materials

In this application computers assist in the following:

. When ordered materials are received, it is easier for the librarian to search and retrieve order records from the order file and make the necessary updating.

. The librarian can make online searches in the order file for overdue orders so that inquiries and/or claim notices can be sent to suppliers.

4.2.4 Notifications

. Automatic production of notifications of receipt of materials to users who had requested for the materials to be ordered.

. Automatic generation of claim notices for outstanding items or damaged items e.g 4.2.3.

4.2.5 Listings and Accessioning

. Production of list of items on order can be performed automatically.

. Production of accessions list of newly acquired materials can also be done easily and automatically.

4.2.6 Accounting

. Accounting for acquisitions expenditure

. Can alert the librarian on the status of the acquisitions account.

. Maintain statistics of orders.

4.2.7 File Maintenance

. A computer system can be used in the creation and maintenance of order files so that the librarian can input new orders, make deletions and amend the order records.

. Creation and maintenance of the suppliers file can also be done more easily in machine readable files.

4.2.8 File integration

. Order records of items received can be searched, retrieved and integrated into the cataloguing process.

Preliminary cataloguing done during bibliographic description of materials to be ordered, can be utilized in the cataloguing process.

4.2.9 Management Reports

. Production of order statistics reports in various formats for management.

. Production of assessment reports on supplier/vendor performance.

. Production of financial expenditure reports for management.

Entirely manual based acquisitions systems can not benefit some important bibliographic services mentioned earlier. These Services collect information on forthcoming publications from cooperating publishers, catalogue them in MARC format and distribute them in machine readable form. For example, there are three main services offered by Blackwell (Tedd 1978, p66).

1. Blackwell forthcoming Book Service which is produced every month on COM microfiche in author, title and class-mark orders for books within 4-12 weeks of publication.
2. Blackwell Work/MARC tape service produced every two weeks.

3. Blackwell pre-publication SDI service providing subscribers with information on items in their subject interests, which are due for publication.

The Library of Congress also, among other services, prepares machine readable bibliographic information on CD-ROM databases called Bibliofile.

4.3 SERIALS CONTROL

The International Serials Data System (ISDS) defines a serial as follows (Tedd 1978, p111)

'A serial is a publication issued in successive parts and intended to be continued indefinitely. Serials include periodicals, newspapers, annuals (such as reports, yearbooks, directories, etc), journals, memoirs, proceedings, transactions, etc ... of societies and monographic series. A serial can be in print or near print form and its parts usually have numerical or chronological designations.'

Management of serials is one of the most difficult house keeping operations especially in a manual system. Management includes planning, organization, and control. The unpredictable nature of serials makes them difficult for control. Computer systems are therefore often employed to assist in the serials control operations. The word 'unpredictable' is used to refer for example to the fact that the system of publication and distribution of serials makes it difficult for librarians to predict when the serial issues would be received.

This is because some serials may be received regularly, others are irregular and some issues can be merged into a single issue. Additionally serials being one of the most expensive library resources require a better management control. Computers can be used to control the following operations:

4.3.1 Subscriptions Control

. Details of when a particular subscription is to be renewed can be included in the master record of the serial. The librarian can then search every week or month for records of subscriptions which are due to expire. A list can be displayed and the librarian can decide on which ones to renew.

. The system can produce automatically renewal notices to the suppliers.

. The system can handle automatic financial accounting by subtracting renewals from the subscriptions fund, and showing level of expenditure per month.

. Report production in different format such as selective list by fund, supplier, country of origin and analysis of cost.

4.3.2 Cataloguing of Serials

. The serial bibliographic record can be stored in electronic form, can be indexed using keywords, title, and other access points, etc, in order to facilitate retrieval.

. Titles of some serials frequently change and these changes can be easily shown in the bibliographic record.

4.3.3 Holdings Listings

. Holdings lists can be produced in various formats such as by subject, title, location, supplier, keyword, etc.

4.3.4 Union Catalogue

. Computers facilitate cooperation in management of serials. A union holding of serials can be developed and various holdings lists can be produced and distributed to participating institutions thus promoting resource sharing.

4.3.5 Registration of Serials

. Computers can assist in fast clerical processing of issues received thereby reducing staff labour. Some libraries receive a large number of issues in a single day and manual registration of these issues can be time-consuming and labour-intensive.

. Computers can assist in alerting the librarian of the arrival day of specific serial issues.

. Computers can generate automatically claim notices to suppliers.

.Updating of the holding file can be performed.

4.3.6 Circulation listing

. The library can maintain a mailing list of individuals for serials circulation.

. User requests about serials can be easily searched in the database, matched and sent or provided to them.

. On receipt of a serial from a supplier, keying in title of serial or subject descriptors could generate a printed record showing names of individuals who requested or are interested in the serial.

4.3.7 Binding

Computers can assist in this operation to:

. Keep record of serials (volumes, issue number, missing issues) to be sent for binding, date sent for binding and expected date of receiving it back.

. To generate automatically a note to be sent to the binders containing binding descriptions such as style, colour, indexes, title page, how many issues to be bound in a volume.

. The system can alert the librarian on volumes supposed to have been received but have not yet arrived.

. Production of bindery lists and financial reports

. Keep name and addresses and performance records of binding firms.

4.4 CATALOGUING SERVICES

Some libraries have fully developed online Public Access Catalogues (OPAC).

Online computerized bibliographic catalogue is an organized machine readable accumulation of bibliographic records maintained on disk or comparable computer storage media for access by users working at remote terminals (Saffady 1983). This can be achieved by full conversion of manual bibliographic catalogues into machine readable form and/or taking entries created during the acquisitions stage, amend them to comply with cataloguing rules in use and store the entry as part of the catalogue database. Computer systems can therefore be applied in the following activities.

4.4.1 Catalog Creation

. Facilitates cataloguing with copy by checking catalog records in machine readable form e.g on CD-ROM databases, Library of Congress (LC) catalog tapes or machine readable catalog record from other local institutions.

. Integration of pre-catalog records from acquisitions file thereby saving labour and avoiding duplicate data entry.

. Makes it easy to update the existing catalog records such as making amendments, additions, deletions, etc.

. The system saves storage space because the whole library collection record can be stored in electronic form. However, a manual catalogue may also be necessary, especially in developing countries, where frequent power failure and other problems necessitate the maintenance of such a back-up and also the library may not have the resources to provide for a large number of catalogue access terminals.

4.4.2 Subject Indexing

. To promote speedy retrieval of online bibliographic record, each document acquired by the library undergoes document analysis. Vocabulary control tools such as thesaurus can be used to assign terms that would describe the subject of the document. Microcomputers have been used to perform this operation in the following areas.

4.4.2.1 DBMS Software

DBMS software such as micro CDS/ISIS can automatically generate an inverted file of indexing terms, specified in the Field Select Table (FST) using different indexing techniques. A dictionary of search terms can also be generated automatically from the inverted file and users can search the database using terms in the dictionary.

4.4.2.2 Machine-Readable Thesaurus

. Thesauri, subject headings and other vocabulary control tools are available in computer-readable form. These can be used in the generation of index terms and in selecting search terms for fast online retrieval.

4.4.3 Record Searching

- . Interactive online searching is possible
- . More than one user can search a single record simultaneously from various terminals in the library.
- . Remote accessibility can be facilitated
- . Both batch processing and real-time systems are possible.
- . Implementation of additional access points to database record is possible
- . It permits a high information retrieval capability because the system allows the user to further analyze and refine his search strategy using Boolean logic.

4.4.4 Resource Sharing

- . The system enhances resource sharing through creation of a union catalog and exchange of catalog records.
- . It is easy to duplicate the catalog in other forms such as book form or Computer Output on Microfiche (COM) and distributed to other libraries or branch libraries.

4.4.5 Database Integrity and Security

. The nature of creating catalog records avoids data entry redundancy.

. Database changes to one record in transaction operations can update related records automatically.

. Back-up copies of the database can be taken on magnetic tapes and stored in remote secure locations.

. No unauthorized interaction with the database is possible, that is to say, the database can be password protected from intentional damage.

4.5 CIRCULATION CONTROL

Automation of circulation system requires implementation of at least the following:

(1) online library catalog; (2) a record of library borrowers stored online; (3) application programs for circulation transactions stored online; (4) online transaction file be created, setting up a relational chain with the catalog file and the borrowers file. Circulation systems especially in large libraries involve considerable routine, repetitive work and therefore most suitable for computer applications, for instance, for improved management of the following circulation activities.

4.5.1 Loan Operations

. The system can make use of bar codes and bar code readers for fast data capture and in checking out and checking in of items on loan and simultaneous updating of the loan records.

. Reduction in staff labour in check-in/check-out operations.

. Reduction of congestion at circulation by speeding up of document check-in/check-out operations.

. Provision of status report of an item in the collection, at the the circulation desk.

. Records for overdue items can be easily retrieved and notification letters automatically generated.

. Overdue charges can be automatically calculated.

4.5.2 Managing Requests and Reservations

. Due to fast retrieval capability of the system a question answer service on database resources can be provided.

. The system can prevent checking-out of items on reserve by other users.

. Provision of active management reports in different formats.

4.5.3 Information on Delinquent Borrowers

. Provision of active information of delinquent borrowers at the circulation desk.

4.6 INTERLIBRARY LOANS

There is no library that can claim to be completely self sufficient to satisfy all information needs of all its users. There is therefore a great need for cooperation and many libraries have already implemented cooperative services in order to share resources and avoid wasteful duplication of resources through Inter-library Loan Services (ILLS).

Research by Reisman et al (1972) has also shown that users interest in a document depends upon its timely availability (refer to fig 6.1 chapter 6). The value of ILLS to users will therefore depend upon the methodology of executing the service.

Developments in telecommunications have facilitated the use of microcomputers as terminals capable of transmitting ILLS between libraries (Burton 1991, p133). This has been improved by the growing use of fax, electronic mail, etc. Computers therefore have improved management of the following ILLS operations.

4.6.1 Creation of Loan Requests/Forms

. There are software packages available to generate automatically loan requests in the required loan format which can be easily printed.

. In networked systems, requesting libraries can search databases of other libraries in the network so as to establish whether the documents represented in the requests are available before asking for them.

4.6.2 Transmission and Receiving of Requests

. Loan requests and notification letters can be transmitted to destination libraries by fax, e-mail, etc.

. When a number of requests have been received the ILLS file can be searched for details of persons who requested the documents, to facilitate routing.

. Monitoring overdue items

4.7 MANAGEMENT STATISTICS

. Various statistics and financial reports required by management concerning ILLS can be automatically generated. For example, analysis of ILLS to identify monographic and serial titles which are regularly requested can be presented. From such reports the librarian can decide which documents to order for own collection development rather than continuously relying on ILLS which might eventually prove costlier.

4.8 WORD PROCESSORS

Word/text processors eg wordstar, wordperfect and spreadsheet software eg Lotus 1-2-3 are routinely used in library work and offices.

4.9 OTHER APPLICATION SERVICES

Several of the information services mentioned in chapter 3 can be more effectively and efficiently provided through the application of IT.

4.9.1 Current Awareness Service (CAS)

CAS service is meant to keep users on a mailing list or the library users in general, aware of recent acquisitions in an information system.

CAS is a general information service where recently received information in a particular field is disseminated to all interested persons in general. Other CAS services include the production of a bulletin of new acquisitions, a list of the serials held by the library or contents of the serials which have been received recently, arranged by subject, etc. CAS services can be disseminated in several ways, including a mailing list, or posting on the notice boards.

4.9.2 Selective Dissemination of Information (SDI)

H.P Luhn (quoted by Tedd 1978, p145), in 1961, defined SDI as follows:

'that service within an organization which concerns itself with the channelling of new items of information from whatever sources, to those points within the organization where the probability of usefulness in connection with current work or interest is high.'

SDI services were first developed in non-library systems and later were gradually applied in library environments, though their application in the library systems was limited to the capability of the existing manual based systems. With the development of computer

use in libraries, especially microcomputer technology, SDI services are now being widely provided. The concept of an SDI is for provision of an individualized information service. In this service libraries are committed to providing comprehensive access to current information using relevant sources of information. Libraries and information systems are therefore able to disseminate information tailored specifically to user needs and interests.

4.9.3 Referral Services

Computer applications afford the development and management of referral database by which users are referred to other appropriate sources of information including experts, institutions, databases etc.

4.9.4 Desk Top Publishing (DTP)

Desk top publishing combines features of word processing, graphic design and printing in a single package (Wilkinson, 1992). DTP applications in libraries include production of various lists, notices, bulletins and newsletters, posters, magazine articles, catalogues, reports, manuals, books, etc.

4.9.5 Electronic Mail

Electronic mail service is similar to that of the postal service in the sense that (1) each user has a "mailbox" accessible through a computer terminal within the system, by keying-in an account number and a password. The user is made aware of the message when it gets displayed on his/her screen, and (2) the message consists of (i) a header, specifying the address or account number of both the sender and the receiver; and (ii) the text of the message.

Library and information systems make use of e-mail to send messages through the network to different institutions.

4.9.6 Other Information Sharing Technologies

There are many technologies which library and information systems can make use of in order to exchange and share information services. Examples include the bulletin board, electronic or tele-conferencing, teletex, viewdata (videotext) and hypertext technology.

CHAPTER FIVE

SYSTEMS ANALYSIS OF THE NATIONAL LIBRARY SERVICE OF MALAWI

5.1 INTRODUCTION

Inadequacies of manual systems and the availability of technology for automation have prompted organizations to analyze their systems in order to collect data that would reveal the problems of the old system and facilitate its replacement with a new one or implement operation procedural changes.

Chapman et al (quoted by Tedd 1978, p 38) defines systems analysis as follows:

'the logical analysis of the present system; the evaluation of the efficiency, economy, accuracy, productivity and timeliness of existing methods and procedures measured against the established goals of the library; and the design of new methods and procedures to improve the flow of information through the system'

A series of stages are involved in the systems analysis in order to arrive at a decision to replace the old system by the new, a process known as **System Life Cycle** (Oliver, 1991, p248). The systems analysis of the NLS was conducted guided by the system life cycle shown in fig 5.1a below:

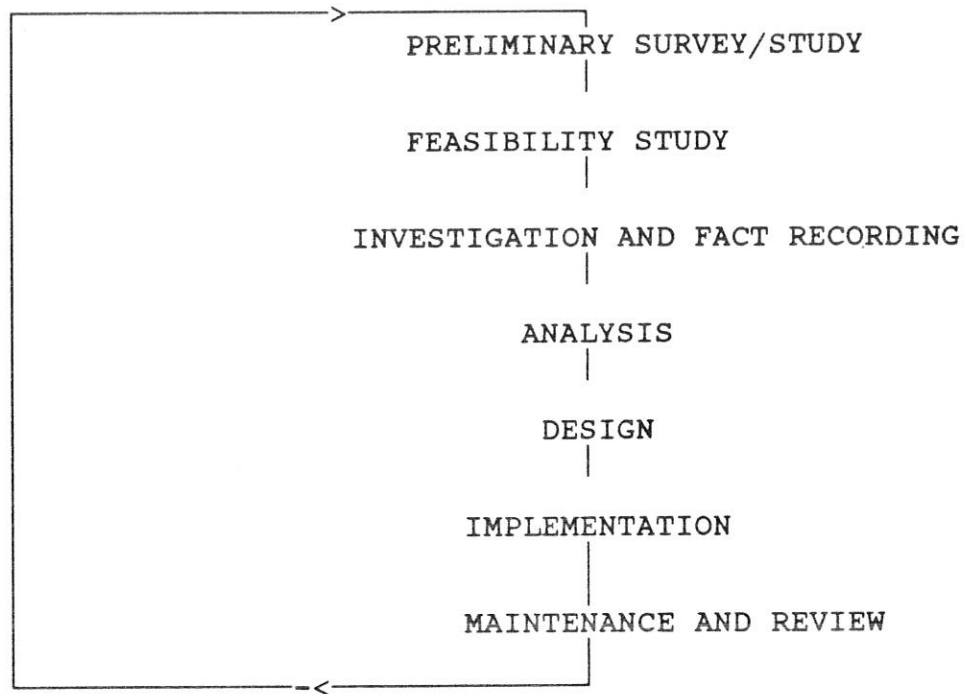


Fig 5.1a The System Life Cycle (Oliver et al 1991, p 248)

5.2 RESEARCH MOTIVATION

This work was motivated from: (1) an awareness of information needs of users and the modern IT developments which can be utilized to solve limitations of the existing manual system of the NLS; and (2) the NLS management development plans which included creating a Book Development Department in the NLS to venture into Desk Top Publishing (DTP) using a microcomputer system. This systems analysis work was carried out to identify specific areas of the NLS which may require expansion, reviewing, improvement or replacement. Automation, however, is not the only solution to limitations of

manual systems, computerization being a costly venture some manual systems can be improved simply by modifying operational procedures.

5.3 PRELIMINARY SURVEY/STUDY

This was conducted in order to establish the need to conduct the systems analysis, and to formulate objectives of the study.

5.4 INVESTIGATION AND FACT RECORDING

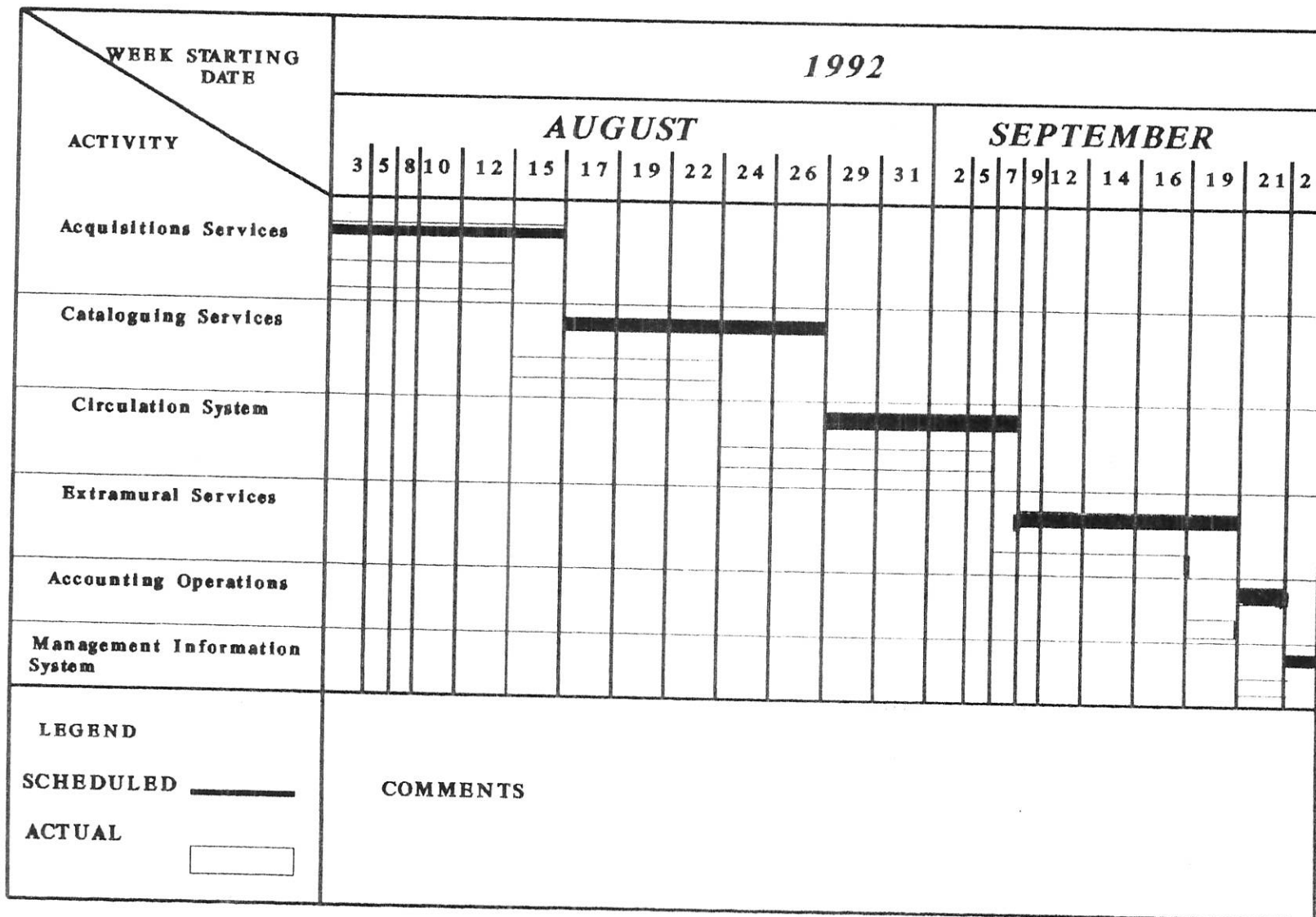
A detailed study was conducted in order to find out how the NLS system operates in practice, to better understand the system and documentation of the findings.

5.4.1 Planning for Systems Analysis

Various technical approaches were used to analyze the NLS system, (1) a gantt chart (fig 5.1b) was drawn, scheduling activities to be performed, areas to be analyzed and indicating start and expected finish periods of each activity; and (2) a structured approach of systems analysis development was adopted.

The structured analysis methodology was chosen because: (1) it makes use of graphical models by providing standard tools and techniques for system development such as Data Flow Diagrams (DFD), Decision Tables and Top-Down Design techniques such as use of HIPO

Fig 5.1b NLS SYSTEMS ANALYSIS DEVELOPMENT PLAN



(Hierarchical Input Process Output) charts; (2) it also emphasizes on user communication; and (3) personnel working with the system under investigation are involved in the provision of information (Aktas, 1987).

DFD symbols used in Flowcharting include:

ARROW to represent data flow

CIRCLE to represent data transformation

BOX to represent a net originator or receiver of data, typically outside the boundary of study.

STRAIGHT LINE OR SLASH to indicate data storage file.

5.4.2 Conducting the Analysis

Several preparatory activities were necessary prior to the detailed study. These included: (1) the NLS organization chart was studied to identify the different subsystems to be evaluated and establish contact with heads of departments; (2) management consensus was sought through discussing with the National Librarian; and (3) a working outline of areas to be investigated was distributed to the concerned departments in order to provide guidance and involvement in the provision of information about their activities, etc.

5.5 ANALYSIS OF THE ACQUISITION SYSTEM

5.5.1 Introduction

Analysis of this system was conducted based on the following objectives:

1. To identify its existing problems in the NLS
2. To assess information needs of the acquisitions activities.
3. To assess the resources and manpower available to support the system.
4. Make recommendations based on the findings.

5.5.2 The System Environment

The NLS acquisitions services are centralized, that is, all library collection development activities in all branch and main libraries in the NLS are done in the Acquisitions unit of the main library in Lilongwe. This acquisitions system is a subsystem of the Technical Services Department. In general the acquisitions services include book and periodicals purchases, gift and exchanges services and accountability for the expenditure.

There are four main activities done in acquisitions and these include: (1) Selection; (2) Bibliographic checking; and (3) Order processing and accessioning

5.5.3 Selection Process

Based upon user needs assessment and analysis of circulation statistics, branch libraries and the extramural services department prepare a suggestion list of books to be considered for ordering. All suggestion lists are sent to the Technical Services Department.

5.5.3.1 Selection Criteria

The suggestion list is tested for rejection or approval based on satisfaction of the following criteria.

- checking book reviews of this suggested documents.
- the relevance and importance of the book to the NLS objectives.
- availability of the material in the system, in other libraries or in print.
- binding characteristics of the book in terms of hard cover or paper back.
- inclusion in standard bibliographies or indexes.
- price of book
- whether the item is already on order

Some books are received on approval basis from publishers so that the subject matter and other characteristics of the books can be easily evaluated before ordering.

Requests that match the majority of the requirements are approved while those which do not are either rejected or deferred. A decision is then made, depending upon available alternatives, whether to buy, to get in exchange or to get as a gift. Decisions are also made regarding rush orders, standing orders, etc.

5.5.3.2 Tools used in document selection

Publishers catalogue is the main tool of document selection. Fig 5.2 shows data flow diagram for document selection

5.5.4 Bibliographic Checking

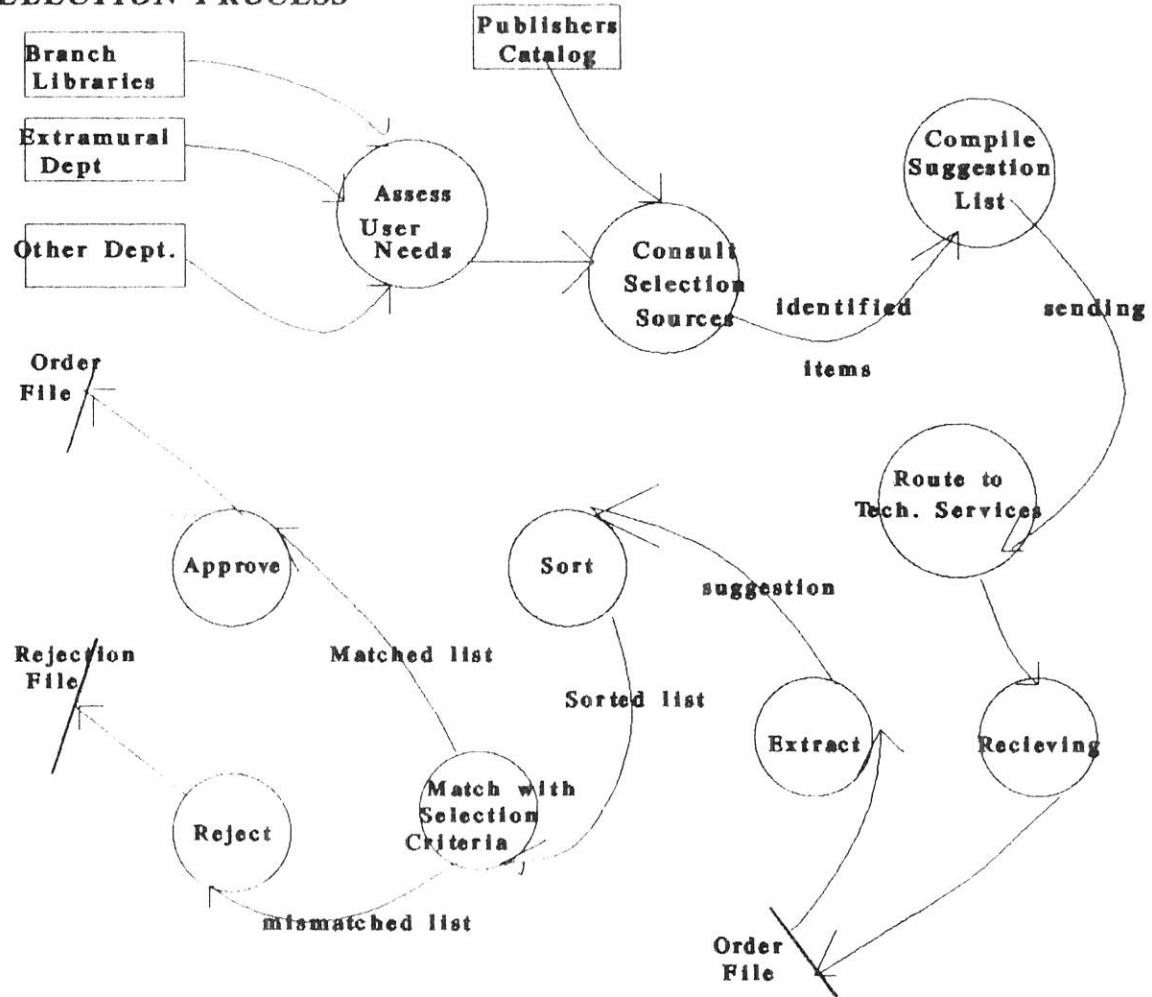
The approved list goes through bibliographic checking process in order to verify bibliographic information. This process is meant to ensure that the documents to be ordered are described in the correct format.

5.5.4.1 Tools Used

The following tools are used for imprint checking.

- Publishers catalogues
- Whitakers Catalogue on Microfiche
- Books in Print (American)
- British Books in Print (BIP) on microfiche
- A. Bowker Serials Bibliography
- ULRICH's International Periodical directory

Fig 5.2 SELECTION PROCESS



- Checking public catalog holdings
- Checking process file

Fig 5.3 shows a dataflow diagram for bibliographic checking

5.5.5 Processing and Sending Orders

Orders are then prepared and sent to the suppliers. Fig 5.4 shows dataflow diagram for order processing and sending the orders, fig 5.5 shows data flow chart for receiving arrived orders and claiming and fig 5.6 shows data flow diagram for donations process.

5.5.5.1 Processing orders for serials

The procedure for processing serials for order is different from that of books. The differences include: (1) orders for serials are sent direct to publishers while books are acquired through an agent; (2) subscriptions for serials is usually once or twice a year while orders for books are almost continuous; and (3) Subscriptions to serials have to be paid in advance while payment for books is done on receipt of the books and related invoices.

Annual reviews and multi-volume books, the volumes of which are not published at the same time are paid for when the issues have been received. On the other hand, there may be discount benefits on advance payments for multi-volumed books.

Fig 5.3 DATAFLOW DIAGRAM FOR BIBLIOGRAPHIC CHECKING

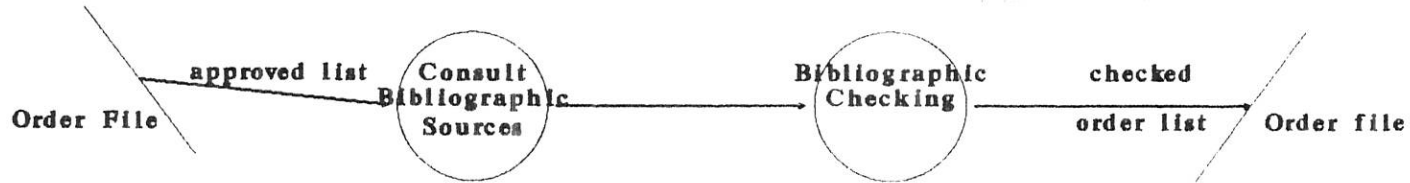


Fig 5.4 DFD FOR ORDER PROCESSING AND SENDING

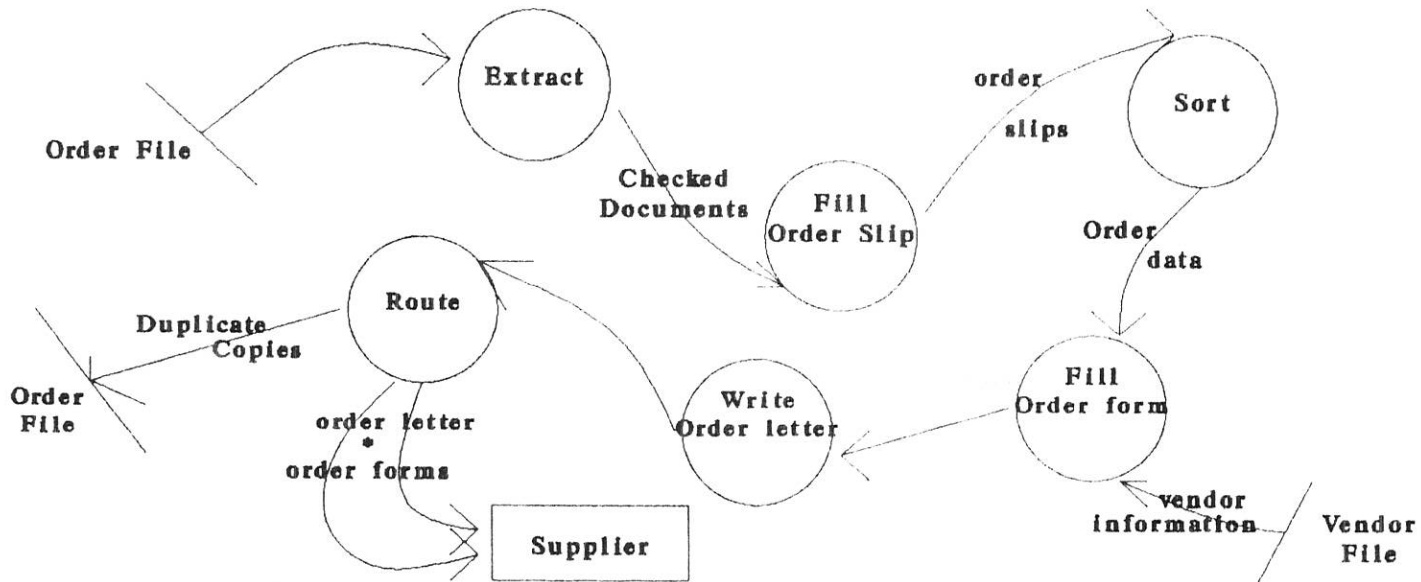


Fig 5.5 DFD FOR RECEIVING AND CLAIMING

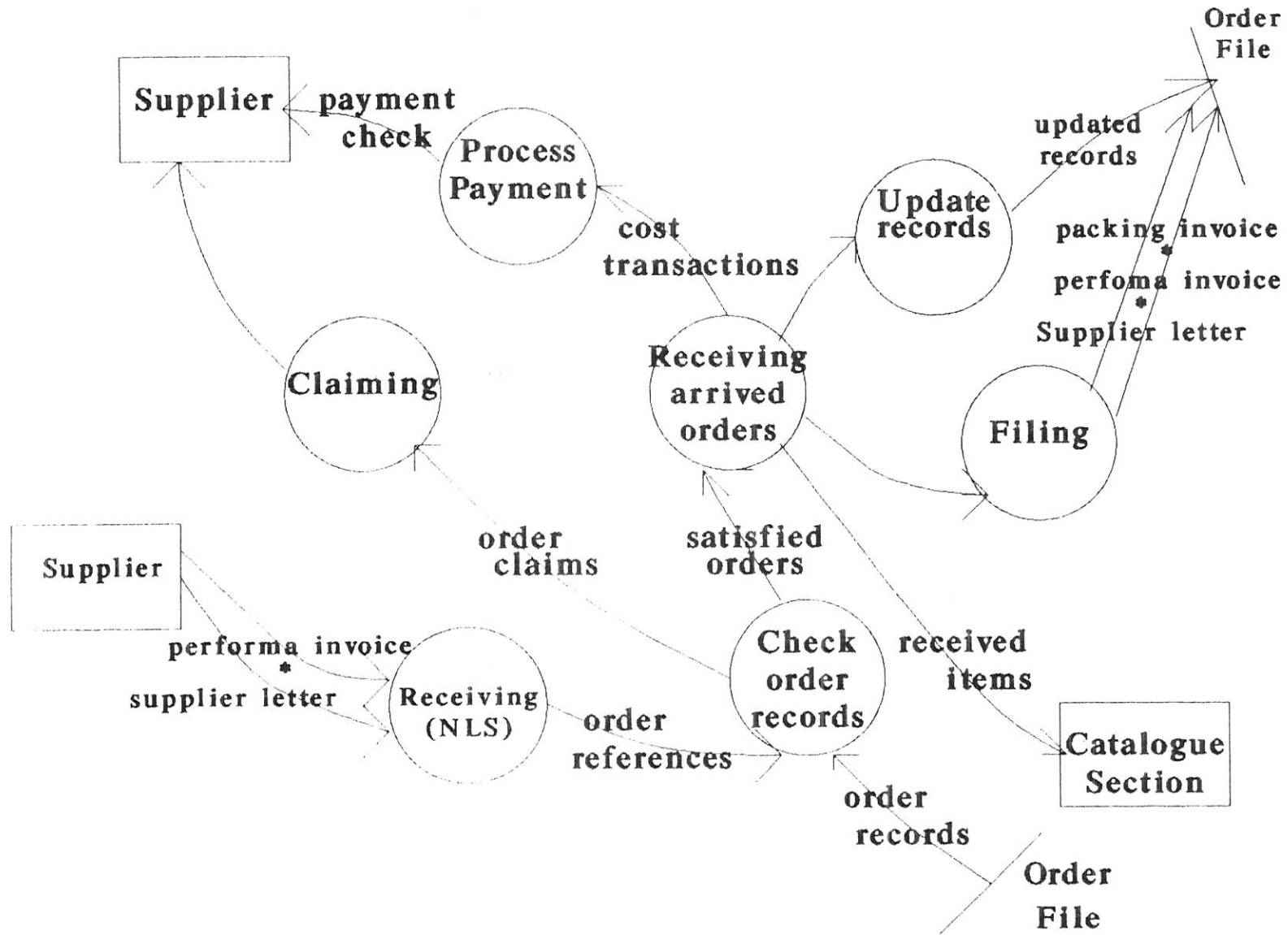
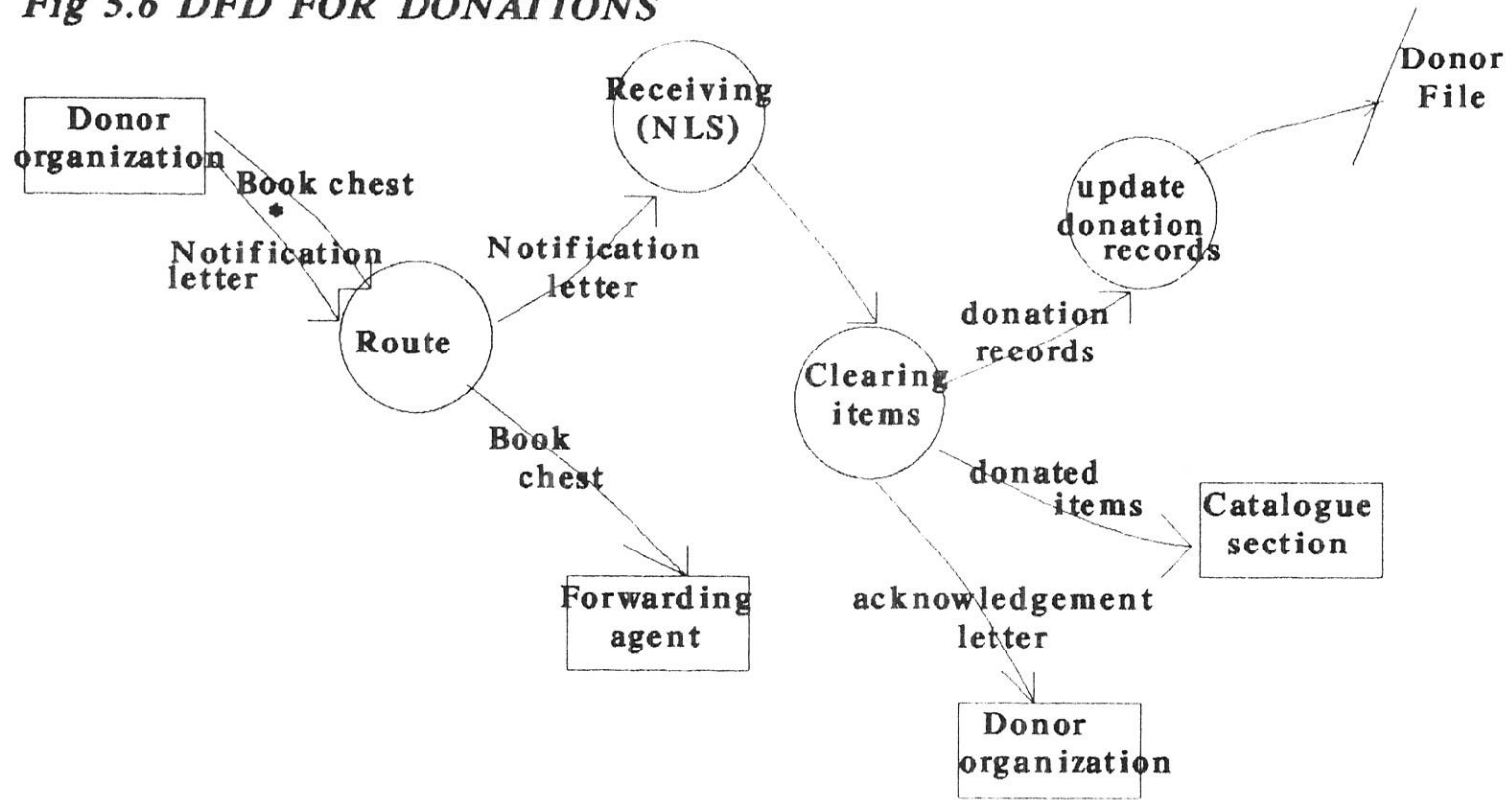


Fig 5.6 DFD FOR DONATIONS



5.5.5.2 Local acquisitions

For local acquisitions, the publisher is approached directly. These local publishers include Malawi Government Press, Ministries concerned and some private publishers.

5.5.6 Major Files Maintained in Order Processing

1. Local Publishers File
2. Foreign Supplier/Publishers File
3. Donors File
 - 3.1 Major Donors Files
 - 3.2 Minor Donors Files
4. Serials Files
 - 4.1 Serial purchases file
 - 4.2 Serial donations file
 - 4.3 Periodicals Subscriptions Register
5. Order File

5.5.7 Data Fields for Order File

Invoice Number
Reference Number
Quantity Ordered
ISBN
ISSN
Title
Price
Total Cost

5.5.8 Data Fields for Supplier Files

Name

Address

Reference Number

Invoice Number

Quantity Ordered

Price

Total Cost

Status of Order

5.5.9 Data Fields in Serials File

Title

Supplier

Acquisition Type

- Subscription or donation
- How acquired (supplier/publisher)

Holdings

Year

Volume Number

Issue Number

Dates

Published Price

Frequency

Address of Supplier

5.5.10 Data Fields for Acquisition Processing

Author

Title

Edition

Date of Publication

Publisher

Price

Supplier

Illustrations

Paper or hard back

Date of Order

Report

ISBN

ISSN

Total Cost

5.5.11 Data Fields for Donors File

Name

Address

Number of Boxes

Clearing Agent

Shipment Number

Outstanding Orders

Dispatch Date

Notification Reference Number

Number of Boxes Expected

Number of Boxes Received

Date Received

**5.5.12 Volume of Acquisitions by Expenditure
(1991/92 Statistics)**

Books	K 211,143.00
Periodicals and subscriptions	K 13,876.00
Binding and Repair	K 5,849.00
Total	K 230,868.00

14.32 % of total budget was spent on acquisitions

5.5.13 NLS Major Suppliers

1. JMLS, Box 17, Gamble Street, Nottingham NG7 4FJ, UK.
Tel. (0602) 708021. Fax (0602) 787718.
2. James Askew & Sons Ltd, 218-222 North Road Preston,
Lancashire England PRI 1SY.
Tel. 0772 555947. Telex 67583 ASKEWS G.
Fax 0772 54860.
3. SMI (Overseas) Ltd, Box 5, Stevenage, Hertfordshire
SG14SS, England. Tel. 0438 74811. Fax 0438 748844.
Telex 825617 SMG.

5.6 ANALYSIS OF THE CATALOGUING PROCESS

The following procedure as represented in the dataflow diagram of fig 5.7 is followed in the cataloguing process.

1. When a new book arrives in the cataloguing section, the accession register is checked and the book is accessioned.

The cataloguing section also maintains the accession register.

2. The master catalogue is searched for an existing record of a similar book, if a record already exists then a duplicate catalogue card is typed.
3. If a record does not exist in the master catalogue then a catalogue card is originated.
4. The following bibliographic tools are checked for document description:
 - . British National Bibliography (BNB)
 - . Cataloguing in Publication Data (CIPD). The NLS mostly uses the British CIP because it contains Title, Author, Class Number - Dewey Decimal Classification (DDC) or Library of Congress Classification (LC).
 - . When a record is located in these tools, cataloguing with copy procedure is followed. However the NLS makes some modifications in cataloguing with copy in order to suit local needs.
 - . If a record can not be located in any of these tools the NLS originates a catalogue record.
 - . In original cataloguing process, Anglo-American Cataloguing Rules (AACR2, 1988 rev. ed.) and DDC schemes are consulted. The LC Subject Headings List is also consulted.

. Catalogue cards are then typed, added to the public catalogue and the master catalogue is updated. A book card is also typed, the book itself is also processed by tack backing, ownership stamp and marking the call number and then sent to the circulation department.

5.6.1 Data Fields on Catalogue Card

Author

Title

Statement of Responsibility

Edition Statement

Statement of Responsibility relating to
Edition Statement.

Place of Publication

Publisher

Date of Publication

Pagination

Series Statement

Bibliography

Notes

ISBN

Tracings

Class Number

Accession Number

Price

5.6.2 Processing Book Card

1. A record is prepared consisting of
Accession Number, Author, Title and Price.
2. This record is typed on a pink card for shelf list
and a yellow card for circulation are typed.
3. The pink card is filed in the sequence of Class
Number for stock taking.
4. The yellow card is for circulation transactions.

5.6.3 Binding Activities

Documents which need major binding are sent to the printing presses for binding. Only minor binding is done in the library by the Book Restoration Assistant.

A list of documents for maintenance services is produced containing the following data elements:

- . Author
- . Status of Book

The Restoration Assistant also produces a list of bound/restored documents.

5.6.4 Existing Problems of the System

1. Delays are experienced in dispatching of processed books to service points. Among other reasons, the typist has to type several catalogue cards for each document and the librarian has to check every card. Cards per catalogue entry have to be

processed for every service point the book is going to and an extra card is processed for the master catalogue.

2. Books to be catalogued are so many, there is a heavy workload on the cataloguing librarians resulting in backlogs.
3. There are frequent demands for increasing the number of typists.

5.6.5 Volume of Work

The volume of books catalogued in a financial year is given below for the period from 1987/88 to 1990/91.

YEAR	No. of BKS CATALOGUED.
1987/88	14523
1988/89	25709
1989/90	25708
1990/91	21718
Average	21914.5

5.6.6 Workforce

The following is the workforce of the Technical Services Department.

Librarians	2
Library Assistants	7
Typists	5
Restoration Assist.	1
Total	15

5.7 ANALYSIS OF CIRCULATION SYSTEM

There are two major activities done in the Circulation Department, oriented to the library user and these include (1) Registration of Borrowers (2) Check-out/Check-in transactions. These operations are illustrated in the DFD of Fig 5.8 and Fig 5.9 respectively.

5.7.1 Registration Card Data Fields

Name

Address

Firm or Organization

Tel. No.

Occupation

Age (if under 21)

Village /Permanent Address

Agreement Statement

Position/Relationship

Signature

Date

Expiry Date

Issue Ticket Number

Staff Name

Student

Institution

Standard/Form/Year

Fig 5.8 DATA FLOW CHART FOR REGISTRATION OF BORROWERS

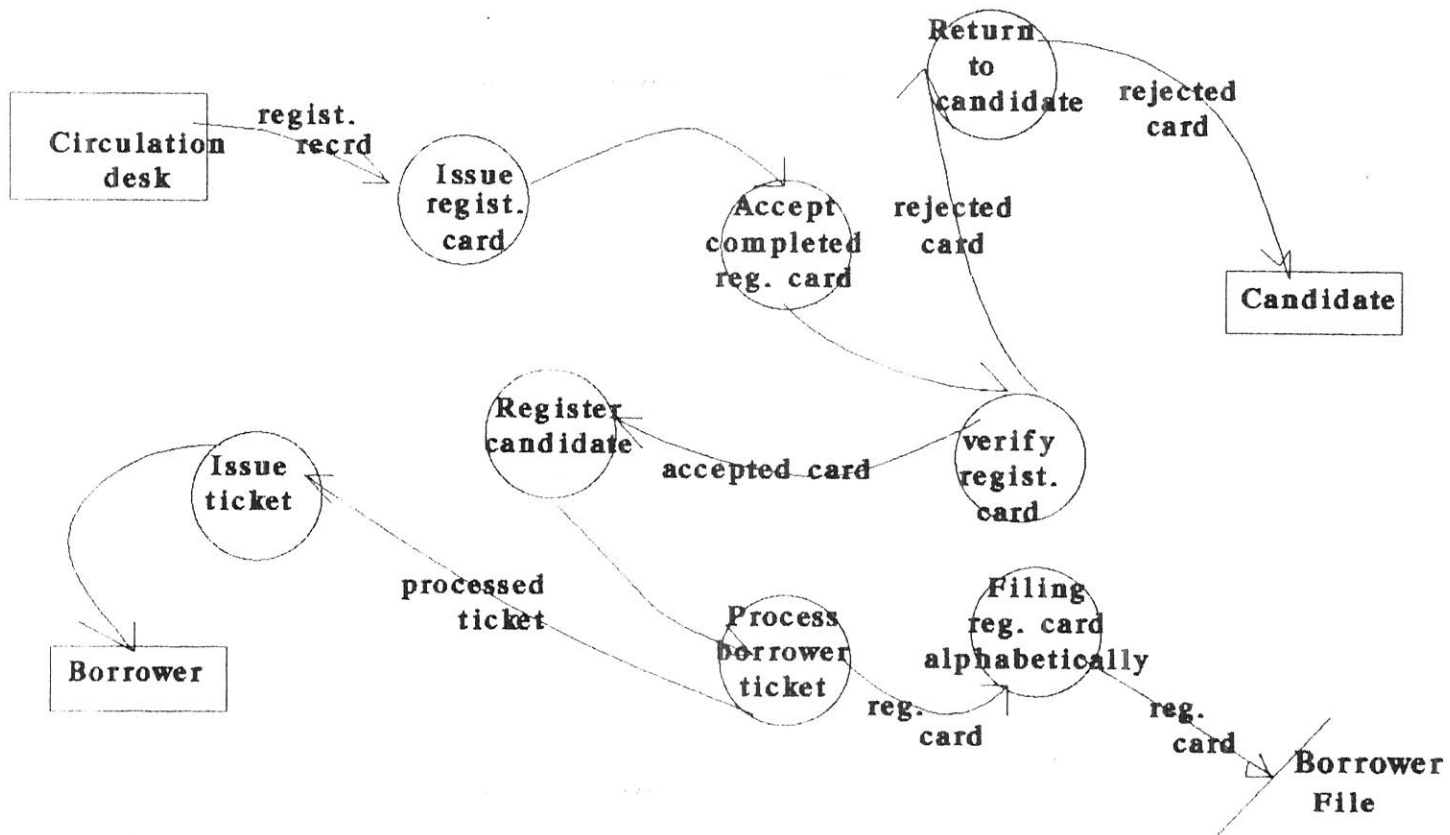
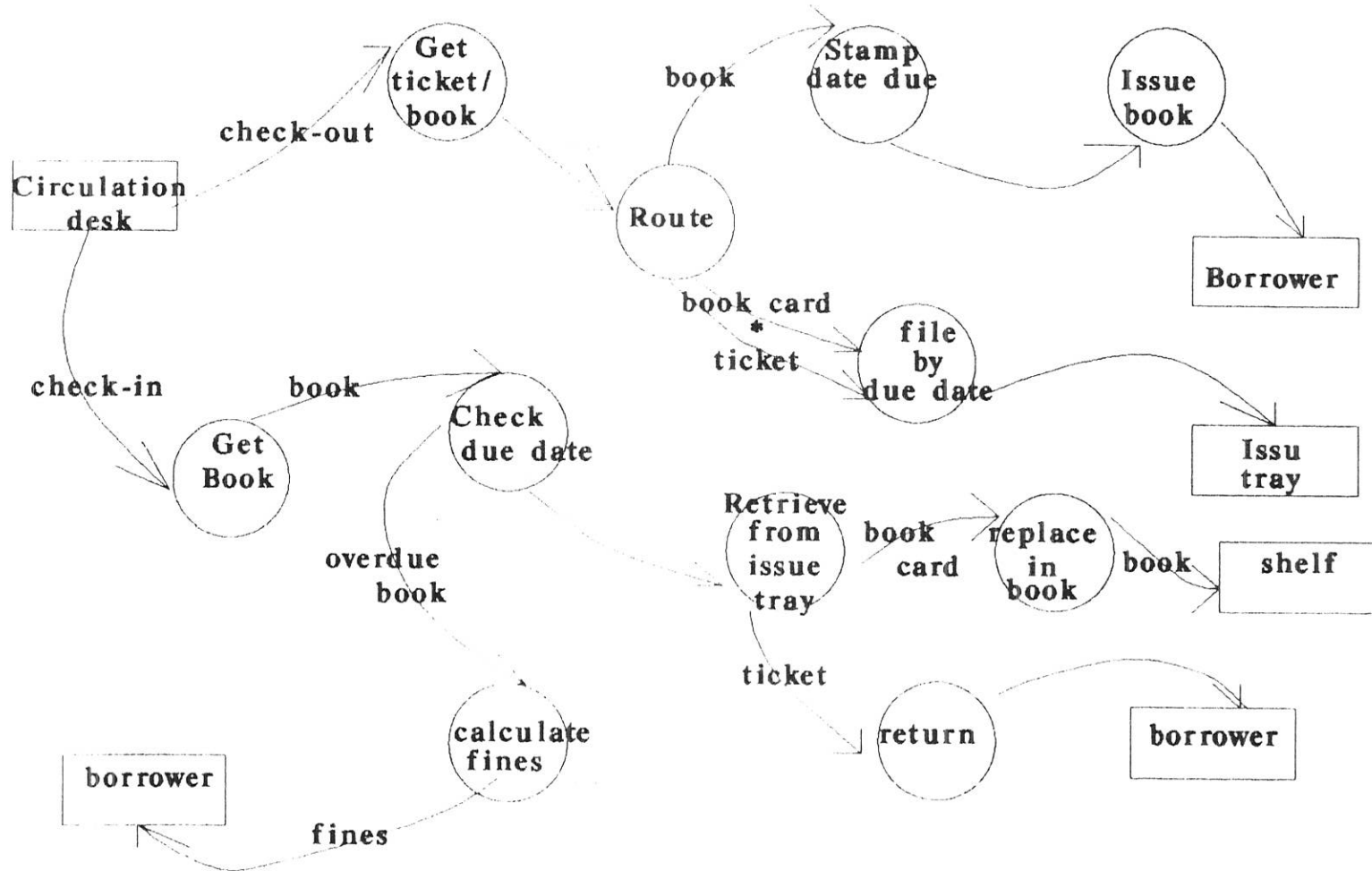


Fig 5.9 DATAFLOW DIAGRAM FOR CIRCULATION TRANSACTIONS



Referee

Name
Address
Signature
Date

5.7.2 Borrower Ticket Data Fields

Name
Address
Expiry Date
Ticket Number
Name/ Address of Library

5.7.3 Major Files Maintained

1. Reservations File
2. Monthly Issue Statistics File
3. Tickets Replacement Book File
4. Tickets Renewals Book File
5. Queries Book File
6. Quarterly Reports File
7. Correspondences File

5.7.4 Forms and Notices Maintained

1. Overdue Books Notices
2. Withdrawn books form
3. Accession Register

2. Stock Records Forms

where data is entered under the following fields:

Branch Name
Month
Date
Adult Non-fiction
Adult Fiction
Junior Non-fiction
Junior Fiction
Reference
Malawi Collection
Total

5.7.5 Volume of Work

5.7.5.1 Book Issue Transactions

The following statistics were recorded for book issues:

MONTH/YEAR	No. ISSUED	No. of DAYS
January 1992	7476	26
February 1992	6885	26
March 1992	7609	26
April 1992	7224	26
May 1992	5933	26
June 1992	6510	26
July 1992	6070	26
August 1992	5564	26
Average	256	1

5.7.5.2 Book Overdue

The following book overdue statistics were recorded over four financial years as from 1988/89 to 1991/92

YEAR	No. of OVERDUE BKS
1988/89	63
1989/90	239
1990/91	332
1991/92	1117

As the collection grows, the number of books reported overdue also grows, which may imply among other things that the existing circulation system is becoming incapable of controlling overdue issues.

5.7.5.3 Books on Reservation

Within the first four months in 1992, 426 reservation forms for books were filled by users and out of this about 256 were satisfied implying that the existing system is capable of satisfying about 62% of reservations. One of the reasons why the 38% book reservations are not satisfied is that the existing circulation system cannot easily identify books on reserve when they are being checked-in or checked-out; or information on the status of books in the library cannot be readily provided.

5.7.5.4 Registration

Between January 1992 and April 1992, 706 new or renewed members were registered, giving an average of about 8 people registered in a day. However, statistics also showed that about 542 borrowers had their membership expired within the same period, giving an average of 5 expired memberships in a day. Assuming that all the 5 expired user membership were registered anew then growth of library membership within the said four months was at 3 persons a day.

5.8 SERVICES

5.8.1 Reference Service

The NLS reference service objective is to assist users in locating information to satisfy their needs. Provision of this service therefore requires specialized professional skills in information. User queries vary from simple questions concerning library collections to more complex questions about specialized subjects.

Analysis of the NLS reference work showed that effective assistance of users in reference work depended mostly on the experience of the librarian to locate the documents in question. Most of the reference work is restricted to enquiries pertaining to the library collection whereby the user is directed to the sources and locations of information. A service where the

librarian actually conducts a search so as to provide the user with factual data or bibliographic information, is not provided.

The basic reference work which a computer-based system can provide include: (1) a Question Answer Service e.g provision of factual information on population statistics, addresses, etc; (2) referral service , referring users to their sources of information; and (3) literature/database search. The computer-based system to be proposed will be geared to providing such a service.

5.8.2 Analysis of the Extramural Services

5.8.2.1 Postal Services

The system of operating the postal services is similar to the in-house circulation system except for the following:

1. Users are registered by post
2. The library Keeps readers tickets
3. The remote user sends requests to the library and the librarian searches the library collection to match the specific user needs or provide alternative information sources to those needs.
4. Books are dispatched twice a week for a loan period of two to two and half months depending on location of the user.
5. The remote user does not know when his or her card will expire.

5.8.2.2 School and Rural Library Services

This service is similar to the postal services except for the following:

1. Reading materials are delivered at the registered institutions door steps by the NLS.
2. To register an institution requires payment of a membership fee of four Malawi Kwacha.
3. The services are directed to community centers and school libraries.
4. The NLS delivers about 150 books to each center for a loan period of three months.

5.8.2.3 Statistical Summaries

(1) School and Rural, as at Sept. 1992

No. of Staff 1992	8
No. of districts Serving	24
No. of Institutions Serving	853
Book Donations to Institutions	28787

(2) Postal, as at July 1992

No. of staff	7
No. of Registered Users	2905
Total no. of requests received	10416

Over 860 files are maintained by the department with 853 files containing a record of each institution

In general, the following activities are performed by either or both the Circulation Department or/and the Extramural Services Department.

- . Issuing application forms
- . Receiving and processing duly completed registration cards/forms and request forms.
- . Searching for books
- . Generation of statistical data based on transactions
- . Shelving Books
- . Issuing of books
- . Filing of:
 - request forms
 - readers tickets
 - membership cards
 - letters
 - issue cards in trays
- . Processing the following
 - reminder notices
 - readers tickets
 - queries
 - management reports
- . Preparing jiffy bags
- . Withdrawing expired membership cards
- . etc

5.9 ANALYSIS OF ACCOUNTS DEPARTMENT

In order to ensure maximum utilization of computer facilities to be recommended, the accounts operations of the NLS were also analysed as follows.

5.9.1 Sources of Accounts Data

- . Source documents/forms such as invoices

5.9.2 Input Media of Data

- . input forms

5.9.3 Data Processing Method

- . Manual means

5.9.4 Output Media of Data

- . output Forms
- . Files

5.9.5 Tools Used

For data capture the following source documents are used:

- . Cash Book Payments/Receipts
- . Purchase/Requisition Book
- . Petty Cash Book

Data elements captured from these sources are posted to the nominal ledger on a monthly basis.

A desk calculator is used to assist in calculations.

5.9.6 Files Handled

. Major files maintain include not less than 10 which also contain about 68 subfiles.

The accountant expressed a requirement for a computer system to be used to create an accounts database which would help improve accounting operations and timely generation of reports, considering that the department has a total workforce of two.

5.10 ANALYSIS OF MANAGEMENT INFORMATION SUPPORT SYSTEM

5.10.1 Sources of Management Information

Management (National Librarian's Office) was asked on sources of information consulted for decision making and control of operation of the services. The sources mentioned include the following:

- . Internally generated reports
- . Special reports from departments
- . Statistical reports/records from other related institutions.
- . Personal observations/interpretations
- . External enquiries/comments/press writings, etc.
- . Government Reports
- . Professional press e.g IFLA professional body. This brings a good assessment of ongoing work in the profession and reflects future plans of the profession.

5.10.2 Data Processing Methods

Management data is manually processed, however, with the increased volume of work handled, the NLS management expressed a need to use computer systems for its operations.

5.10.3 Information Output Media

The following media is used to convey or record management needs, actions and decisions.

- . Verbal communication
- . Printed media through memoranda, circular, meetings, etc
- . Personal files which are usually confidential
- . General files

5.10.4 Files Maintained

More than 16 major files containing 450 subfiles are maintained in management operations. There are also several management forms generated and maintained.

5.10.5 Management Plans of Action Relating to Application of IT to NLS Environment

. Desk Top Publishing - UNISYS PW2 300 SERIES was acquired in 1992 for this purpose. However, interacting with the system, it showed that its microprocessor i386SX has a slow processing speed (20 MHz) and a low memory

capacity (2 MB RAM). Management projected that by 1992/93 a much more powerful computer might be acquired for the same function.

. The computer system available is also going to be used for stock control facilities and word processing.

. Presently the available computer system is used for serials data entry for contribution to the National Serials bibliographic database resident at the Malawi National Documentation Center.

5.11 COST-BENEFIT ANALYSIS

To bring a distinction between similar terminologies 'Cost benefit' and 'Cost Effectiveness' Clayton (1987) states that cost benefit can be thought of as when benefits exceed the costs of achieving a given set of objectives and cost effectiveness is when the same benefits can be achieved more cheaply by using a particular system or method in preference to the other.

Clayton further states that the study of cost benefit is something which librarians and information workers have tended to shy away from, for a good reason that the quantification of benefits from information services remains elusive which Martyn and Flower quoted in the same book relate it to the ignorance of librarians and information officers of the economics field.

These problems were experienced in this analysis work because of difficulties associated with putting a monetary value on NLS services. It was observed that library systems are basically associated with intangible benefits which pose a difficult problem to cost benefit analysis.

Interest in the present study was basically on the benefits that library automation can bring, that are stated in the specific objectives in Chapter one. Computerization projects are quite costly but in the age where computer technology is gaining ground in the information field, technology transfer and application in libraries and information institutions can help in satisfying the changing information needs of the community.

The NLS analysis work, however, showed that the existing system incurs the following costs. Only expenses on issues that would be affected by the computer system to be proposed were identified.

The NLS total operating budget (TOB) in 1991/92 was at K1612480 (National Library Service Balance Sheet as at 31 March, 1992 : Accounts Report).

Office and Other Expenses 1991/92 Statistics

	Expenditure	% of TOB
Water and electricity	K 11771	0.73%
Postage and Telephone	42335	2.63
Office and library stationary	64018	3.97
Maintenances (premises, equipment, motor vehicles)	77489	4.80

Staff and Library operation expenses

Staff salaries	K 411852	25.54
Books	211143	13.09
Periodicals and Subscriptions	13876	0.86
Binding and repairing materials ..	8141	0.50
Insurances and licences	20331	1.26
Total	860976	53.39

Introducing a new computer based system is likely to increase expenses in the above factors.

5.12 PROBLEMS OF THE EXISTING SYSTEM

The analysis helped in identifying existing problems of the system. Only problems that can be alleviated by application of computer systems will be discussed in chapter 6.

CHAPTER SIX

EVALUATION OF THE NLS SYSTEM

6.1 INTRODUCTION

An evaluation was necessary to establish the fitness of the existing NLS system for a change. Issues considered include inadequacies of the existing system, and costing of the new system considered in chapter 8, if provided by system vendor organisations. However, not all NLS operation procedures require automation. There are some operational procedures that can be improved by simply changing the procedures or by employing both manual and automated systems within a single system. This will be looked at in the design phase in chapter seven.

Evaluation of the NLS therefore involves assessing the impact of the manual system in terms of its problems and identifying areas where automation can be used to improve the operations. A comparative evaluation on use of computer systems in libraries and information institutions in Malawi will also be made on the basis of a survey conducted in Malawi.

6.2 EVALUATION OF THE EXISTING ACQUISITIONS SYSTEM

The present NLS acquisitions policies do not give much emphasis on the development of the collection as was the case when the system started. With the changing attitude of considering libraries as information centers the policies need to be oriented towards information dissemination. The implication is that only documents that users are interested in should be procured.

Development of the much needed NLS library resources depends largely on an adequate library budget. Proper management of budget allocations and appropriate accountability for library expenditure can improve budget control. The NLS book budget is allocated annually from the NLS annual total income. However, the management requires periodic generation of financial and statistical data as the basis for scientific planning and management. Without periodic review of acquisitions expenditure the following cases may arise:

1. Some book acquisition funds may remain underpent towards the end of the year resulting in excessive expenditure in the last months of the year without adequate planning of book selection; or
2. The book fund may get exhausted too early resulting in missing out on some valuable publications coming out later in the year.

To control these problems the system should be capable of readily producing periodic reports of the status of the fund account so that the acquisitions librarian can be aware of situations requiring administrative intervention. Periodic production of acquisition reports using manual systems is time-consuming and labour intensive involving too much paper work. Timely generation of management information would ensure sound decision making so that proper financial management is practised.

The analysis of the NLS acquisitions system also revealed the following problems.

1. Duplication of data entry, record keeping routines, etc.
2. Laborious bibliographic checking of items to be ordered because the librarian has to consult printed bibliographic catalogues, acquisitions files and library catalogues.
3. Vendor selection, typing of purchase orders in multiple copies, maintenance of outstanding order file, vendor files and fund file are labour intensive and time consuming.
4. Manual generation of claim and order cancellation notices are also time consuming.
5. Bulky storage of inactive order records.

6. Bibliographic sources are limited to the printed media which provide limited access points.
7. Users are not aware of items on order and their status.
8. Order records end up in the archive file and are not utilized in the cataloguing process.
9. To decide on documents to be ordered from a large list and given several selection conditions is time consuming.

6.2.1 Specification of Operation Requirements

Based on the problems expressed, there is a need for a new system that can satisfy the needs of the acquisitions system.

The NLS requires an integrated library system where acquisitions services would form an integral part of the whole library database. The concept of an integrated library system is that a single large bibliographic database will contain subsets of individual databases designed to control data processing needs of the various technical services, circulation services, reference services and management information system applications. A system is therefore required by which:

- Book selection and order records will be created and stored in machine readable form facilitating later searching, retrieval editing, and updating in order to

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- Book selection and order records will be created and stored in machine readable form facilitating later searching, retrieval editing, and updating in order to

support order processing, accessioning, cataloguing and other operations so as to avoid duplication of data entry, record keeping routines, etc.

✓ - An integrated database of library in-process and catalogue files can provide adequate information to users on the status of the library collection. Librarians can then respond to inquiries on whether a book is on request, on order, has been received, is being catalogued or is in circulation, etc.

✓ - The laborious bibliographic checking of items to be ordered using printed media can be minimized by making use of fast access bibliographic tools such as CD-ROM databases e.g BIBLIOFILE, instead of total dependence on the printed bibliographic catalogues and library files.

The labour-intensive and time-consuming operations such as typing of purchase orders in multiple copies, manual file updating procedures, filing, etc, can be reduced or eliminated by replacing them with automatic generation of orders, data entry, searching and updating electronically.

- Automatic file maintenance activities whereby processing a transaction file record, related acquisitions, fund and vendor records would be automatically updated. Additionally the system should be able to generate automatically claim or order cancellation notices.

- Sorting out and storage of inactive order records into an archive file on micro storage units, will be facilitated.

- Automatic generation of acquisitions status reports by on the spot record enquiry and generation of different reports in various formats such as summary reports, different listings, vendor/supplier performance reports, statistical reports, etc will be possible.

6.3 EVALUATION OF THE CATALOGUING OPERATIONS

It was observed during analysis that cataloguing involved handling of large files of bibliographic records; and the work is complex involving, two interrelated activities namely, descriptive cataloguing and production of catalogue cards. The NLS uses internationally accepted bibliographic control tools such as AACR2 and DDC schemes.

Descriptive cataloguing being a technical process, the technical librarian is expected to make an acceptable decision on the document at hand. This makes the activity a time consuming process as is reflected in the NLS cataloguing backlogs. The NLS receives a large number of books as gift sometimes in one lot, and to catalogue them manually is indeed time consuming. Cataloguing backlogs delay the flow of already acquired materials into circulation.

Library material acquisitions are based on user requests and research conducted by Reisman A, et al (1972, p 145-152) has indicated that users utilization of a library document depends upon its timely availability, (fig 6.1). The main reasons for the declining utility include that users tend to look for alternatives because users requests are meant to solve their immediate needs.

The NLS catalogue does not cover documents in process. To cut down the overall cost of cataloguing, low cost publications are usually neglected. Usability of such resources is therefore limited.

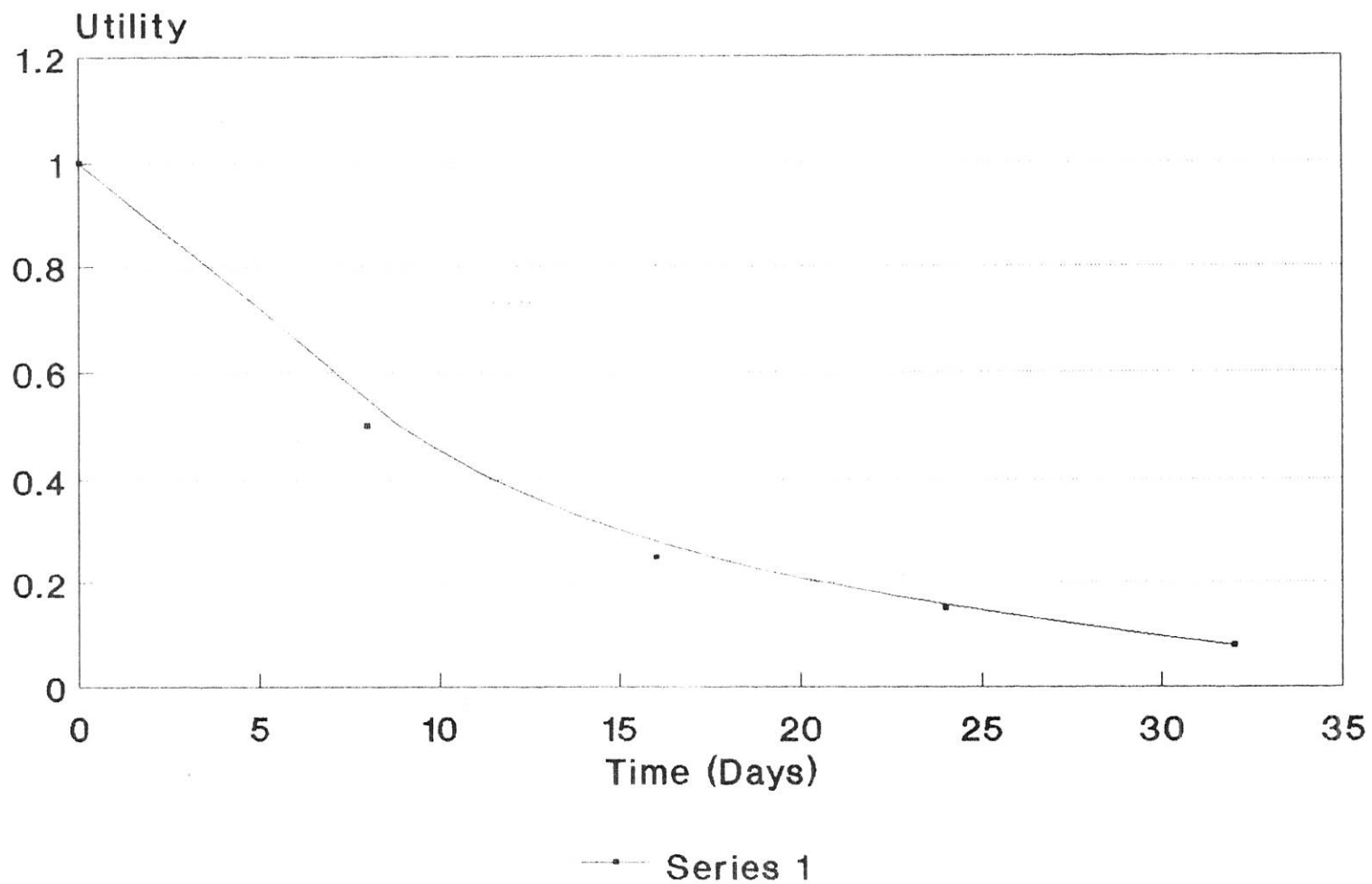
Typing and copying to produce complete catalogue card sets is also time consuming.

Timely access to updated or revised bibliographic control tools is in most cases hindered by publication and distribution delays and cost implications.

The printed bibliographic catalogues provide a limited number of access points to the record thus hindering fast and precise retrieval. Access by such retrieval parameters as title words, class numbers and ISBN are not provided.

Multiplication of catalogue cards for filing under various headings such as author, subject and class number increase cost of cataloguing and the additional entries use up more storage space. Also as the number of catalogue entries increases, the time taken to locate any

Fig 6.1 Utility Curve for Timeliness of ILLS Material Delivery



Extracted from: Reisman A, et al. "Timeliness of library materials delivery: a set of priorities," *Social-Economic Planning Sciences* 6:145-52, 1972.

one entry therein also increases. Manual filing of catalogue cards is also tiresome and time-consuming.

Weeding of the library collection or simply general catalogue updating activities require manually retrieving the cards and refiling.

The NLS maintains a centralised union catalogue for the materials located in its branch libraries. But the branch library users do not have access to the union catalogue and therefore are unaware of the reading materials available system-wide.

Sharing of resources using a manual system entails delays in accessibility to the documents. Increased operational costs are also experienced due to routing of interlibrary loan requests.

A user wishing to consult the catalogue need to go to the library and if the document required is already loaned out then the user's time is wasted.

The NLS experiences delays in dispatch of books to its seven service points, because, among other reasons the typist has to type several cards for each entry before a book is dispatched. And the librarian has to verify each and every card. The Technical Services Department therefore experiences an increased workload in doing repetitive time consuming operations.

Research conducted by Urquhart and Schofield (1971, p 273-286) indicated that other surveys in America including their own showed that in most libraries, up to 50% of readers' requests are for books that are not on the shelves when required. This implies that manual systems which do not effectively account for book status in the library can be very frustrating to users.

6.3.1 Operation Requirements of a New System

In order to mitigate the effect of the problems requires developing a new system which would be able to utilize the available technologies in bibliographic description and cataloguing. Use of machine-readable bibliographic products such as LC MARC (Machine-Readable Catalogue), CD-ROM bibliographic database, which provide additional access points, can improve searching and cataloguing capabilities; additionally, these sources provide extensive storage capacity of bibliographic data. ISBD (International Standard Bibliographic Description) can also be used that would encourage resource sharing such as exchangeability of bibliographic information.

This would also enable developing a catalogue on a minimum storage space in electronic or microform and facilitate duplicating of the catalogue in electronic or microform and stored in other secure locations as a back-up system.

On security issues control measures will be required such as use of passwords to discourage unauthorized use and accessibility to records. On record searching, the system should offer ~~offer~~ the end-user fast access to database records using multiple search keys, and possibly where users can inquire the database from home or offices through telecommunication facilities.

The new system would also reduce duplication of effort, reduce typing and filing operations, reduction of cataloguing backlogs and simplify record updating and deletions.

The system should also show record of items in cataloguing process, accommodate description of microdocuments and easily apply both descriptive and analytic cataloguing techniques.

6.4 EVALUATION OF THE CIRCULATION SYSTEM.

There are several problems affecting the NLS circulation system and those identified included the following:

1. The record keeping operations are labour intensive, involving time-consuming work routines such as filing of single or multiple copy book cards, identification of overdue items, preparation of borrower notices and the calculation of overdue charges.

2. Most of the circulation control operations are clerical rather than professional in nature and their routine operations are associated with the problems such as errors in filing and related record keeping tasks. The following errors were specifically identified as existing in the NLS system: (1) misplacing of readers' tickets and book cards, (2) issue of wrong tickets to a reader during check-in, and (3) placing a wrong card in a book during check-in. These errors result in duplication of readers tickets and book cards, and inefficiency in circulation work.

The nature of the manual based circulation system makes it difficult to keep accurate book circulation statistics which can be used for further development of the library collection. Additionally, a reader consulting the card catalogue for a specific book cannot immediately know the item's circulation status.

3. Manual check-in/check-out procedure is slow especially at peak periods and this can lead to crowding at circulation desk, inefficient operation and user dissatisfaction.
4. Other observed problems included (1) loss of tickets by readers; (2) accidental destruction of tickets by readers; (3) fraudulent registration;

- (4) excessive use of stationary for reservations and inability to accommodate reservations;
- (5) laborious calculation of overdue charges;
- (6) delays in production of management reports;
- (7) inability to show the exact status of book transactions; and (8) inability to provide on the spot information about fraudulent borrowers.

6.4.1 Specification of Operation Requirements

In order to atleast partially solve the above identified problems there is a need for a system which can do the following:

1. Storage of library catalog and files on a direct access storage system such as on a hard disk so that it can provide (a) online circulation transaction system; and (b) direct updating of the master file.
2. A system which can later be expanded to include use of direct data capture devices such as the Optical Character Recognition (OCR) Technology for direct data capture and data entry into a computer system.
3. Provision of active information of delinquent borrowers at the circulation desk.
4. Provision of active information on documents on reserve.

5. Facilitate a question answer service on the database records. In order to access a specific record in a file of book cards using the existing NLS system requires knowledge of due date and the accession number of the book.
6. Control filing operations, eliminate use of reader tickets and book cards, automatically list overdue items, generate overdue claim notices, automatic calculation of overdue charges, reduce erroneous clerical procedures, etc.
7. Facilitate timely production of periodic management reports related to circulation issues. The existing system requires manual searching of several records in different files in order to gather data. The report format also has to be drawn, the report written and typed all resulting in delay in the submission of the reports.

6.5 EVALUATION OF EXTRAMURAL SERVICES

Postal library and School and Rural library services experience almost similar operational problems, characterized by the existing manual system. These problems include:

1. About 779 files of School and Rural library centres are maintained. Filing, searching and updating of such a large number of files is time consuming and

labour intensive and additionally the files consume a large physical storage space.

2. So many requests are handled per library center and manual searching of documents representing those requests both from the catalogue and the book shelves is tiresome. About 150 relevant reading materials are collected from the library shelves and loaned to each of these centres in a day.
3. Book cards from these 150 books are manually sorted in accession order and an accession list is handwritten, and on an average 600 book cards would be handled in a day for the four library centres to be served.
4. Books are sometimes removed from the main lending shelves and kept in shelves in this department in anticipation of requests to be received and to reduce the laborious hunting for books.
5. As is also the experiences in other departments, management report production is time consuming and experiences delays in submission.

In addition to the common problems experienced in the department, the postal services department also faces the following problems:

labour intensive and additionally the files consume a large physical storage space.

2. So many requests are handled per library center and manual searching of documents representing those requests both from the catalogue and the book shelves is tiresome. About 150 relevant reading materials are collected from the library shelves and loaned to each of these centres in a day.
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4. Books are sometimes removed from the main lending shelves and kept in shelves in this department in anticipation of requests to be received and to reduce the laborious hunting for books.
5. As is also the experiences in other departments, management report production is time consuming and experiences delays in submission.

In addition to the common problems experienced in the department, the postal services department also faces the following problems:

6. Communication system with the remote reader is not continuous for example, when the department receives back a book by post, the reader is not informed, neither does the reader inform the department when he receives a book. The service is therefore based on mutual trust but this leads to book losses claimed by both sides.
7. The department keeps readers' tickets in addition to different files and therefore the reader does not know when his membership will expire because the expiry date is written on the ticket. The expiry date is known to the librarian through manual searching of the records.
8. A large number of requests is handled and filed in 9 files according to DDC class numbers.
9. Due to inability of the collection to satisfy all reader's requests, the required books may be obtained through ILLS, which sometimes delays provision of the materials to the user.

6.5.1 Specification of Operation Requirements for Extramural Services.

For a solution of the identified problems a system is required that:

1. Will facilitate developing a database of centre libraries and users records in electronic form so that

record searching, updating, amendment, etc, can be easily done;

2. Can provide fast searching of catalog records right from workstations located in the department in order to satisfy user requests and provide information on the status of the records; and
3. Can eliminate manual sorting of book cards and maintenance of reader tickets, automatically produce accessions lists, electronically process requests, promote efficient ILLS and ensure timely production of management reports.

6.6 EVALUATION OF ACCOUNTS OPERATIONS

Although this department is small and its volume of work is not labour intensive, there is a need to create, process and store accounting records in electronic form in order to improve efficiency and ensure timely production of accounting reports and utilize the computer based system to be proposed.

6.7 MANAGEMENT OPERATIONS

NLS management handles a large number of files and reports from each department. Data from such reports is gathered, processed and the output is circulated within the system. A system that can enhance management of these operations and assist in planning and decision making can be helpful.

It should be made clear that some of the requirements mentioned above cannot be easily implemented because they would require more resources, time and action by other institutions e.g. the Post, Transport and Telecommunications (PTT). This paper is mostly interested in requirements that can be implemented within the given resources of the NLS.

6.8 COMPARATIVE EVALUATION OF APPLICATION OF COMPUTERS IN MALAWI - SURVEY.

In order to further evaluate the effectiveness of the existing NLS system and assess use of computers as an alternative system, a survey of application of computers to improve library and information systems management in Malawi was conducted and this will be analyzed in the following sections. Eight library and information institutions claiming to use computers were identified, mostly from a list of fifteen library and documentation centers in Malawi visited by a PADIS fact finding mission in 1987 on the participation of Malawi in PADIS (ECA, PADIS 1987). Questionnaires were sent to the 8 institutions and some of them were also visited for on the spot assessment (see appendix I for list of institutions). The following are the findings of the survey.

6.8.1 Type of Library and Information System

Value Label	Value	Frequency	Percentage
Academic Library	0	4	50
Special Library	1	3	37.5
Public Library	2	1	12.5
School Library	3	0	0

6.8.2 Documentation Activities

Value Label	Value	Frequency	Percentage
Bibliographic	0	8	100
Referral	1	3	37.5
Numeric	2	1	12.5

6.8.3 Specialization

Value Label	Value	Frequency	Percentage
Sectoral	0	3	37.5
Multisectoral	1	5	62.5

6.8.4 Services Provided

Value Label	Value	Frequency	Percentage
List of additions	0	6	75
SDI	1	1	12.5
Bibliographies	2	7	87.5
Online Searches	3	2	25
Question Answer Service	4	7	87.5

6.8.5 Classification System Used

Value Label	Value	Frequency	Percentage
Library of Congress	0	5	62.5
Dewey Decimal Classif.	1	1	12.5
Universal Decimal Classif.	2	1	12.5
Colon Classification	3	1	12.5

6.8.6 Subject Headings Used

Value Label	Value	Frequency	Percentage
Library of Congress	0	4	50
Sear's List	1	1	12.5
Other	2	1	12.5
Not Stated	3	2	25

6.8.7 Types of Indexing

Value Label	Value	Frequency	Percentage
Subject/Keyword/Descriptor	0	7	87.5
Title	2	6	75
Author	3	6	75
Geographical	5	3	37.5
Other	6	3	37.4

6.8.8 Thesaurus/Subject Headings List used

Value Label	Value	Frequency	Percentage
Library of Congress	0	2	25
CAB	1	3	37.5
International Techn. Thes.	2	1	12.5
AGROVOC	3	1	12.5
OECD Macrothesaurus	4	2	25
Medical	5	1	12.5

6.8.9 Timeliness of ILLS

Value Label	Value	Frequency	Percentage
1-7 days	0	2	25
8-15 days	1	3	37.5
16-30 days	2	0	37.5
>30 days	3	3	37.5

6.8.10 Does Your Information System Use a Computer System?

Value Label	Value	Frequency	Percentage
Yes	0	8	100
No	1	0	0

6.8.11 Computer Facilities Used

Value Label	Value	Frequency	Percentage
Mainframe	0	0	0
Minicomputer	1	0	0
Microcomputer	2	8	100

6.8.12 Model/Make of Computer System

Value Label	Value	Frequency	Percentage
IBM or IBM Compatible	0	6	75
UNISYS	1	4	50
BULL MICRAL	2	1	12.5
COMPAQ	3	1	12.5
MACINTOSH	4	1	12.5
EPSON	5	1	12.5
Other	6	1	12.5

6.8.13 Microcomputers with Hard Disk (HD)

Value Label	Value	Frequency	Percentage
Yes	0	7	87.5
No	1	1	12.5

6.8.14 LAN Networking

Value Label	Value	Frequency	Percentage
Stand alone	0	7	87.5
Networked	1	1	12.5

6.8.15 Number of Terminals per institution

Value Label	Value	Frequency	Percentage
One Terminal	0	3	37.5
Two Terminals	1	2	25
Three Terminals	2	0	0
Four Terminals	3	2	25
>4 Terminals (8)	4	1	12.5

6.8.16 Operating System used

Value Label	Value	Frequency	Percentage
DOS	0	8	100
Other	1	0	0

6.8.17 Application Software Used

Value Label	Value	Frequency	Percentage
CDS/ISIS	0	5	62.5
dBase	1	1	12.5
INMAGIC	2	1	12.5
Others	3	2	25

6.8.18 Availability of CD-ROM Drives

Value Label	Value	Frequency	Percentage
Yes	0	6	75
No	1	2	25

6.8.19 Make/Model of CD-ROM Drives

Value Label	Value	Frequency	Percentage
Phillips	0	5	62.5
Hitachi	1	1	12.5
IBM	2	1	12.5

6.8.20 Use of the Computer System

Value Label	Value	Frequency	Percentage
Biblio./Lib. db. Man.	0	7	87.5
Word Processing	1	8	100
Man. Info. System	2	3	37.5
Other (e.g accounting)	3	2	25

6.8.21 Online Access to Remote Databases

Value Label	Value	Frequency	Percentage
Yes	0	0	0
No	1	8	100

6.8.22 Computer Equipment Related Problems

Value Label	Value	Frequency	Percentage
Lack of Software	0	0	0
Inadequate Computer Memory	1	3	37.5
Slow Processing Speed	2	2	25
Lack of Spare Parts	3	2	25
Lack of Maintenance	4	1	12.5
Environmental Conditions e.g unstable electricity	5	4	50
Lack of Peripherals	6	0	0
Not Stated	7	1	12.5

6.8.23 Personnel Related Problems

Value Label	Value	Frequency	Percentage
Shortage of Trained Staff	0	3	37.5
Lack of HW/SW Training opportunities	1	2	25
Others	2	0	0
Not Stated	3	2	25

6.8.24 Staff Training

Value Label	Value	Frequency	Percentage
Locally	0	5	62.5
Abroad	1	3	37.5

6.8.25 Maintenance Services

Value Label	Value	Frequency	Percentage
Vendor Contract	0	6	75
Hired Technicians	1	1	12.5
Library Staff	2	0	0
Not Stated	3	2	25

6.8.26 Effectiveness of Using the Computers e.g improvement of efficiency.

Value Label	Value	Frequency	Percentage
Yes	0	7	87.5
Not Stated	1	1	12.5

6.8.27 Future Plans to Develop the Computer System

Value Label	Value	Frequency	Percentage
Yes	0	6	75
Not Stated	1	2	25

6.9 COMPUTER APPLICATION IN LIBRARY AND INFORMATION INSTITUTIONS IN MALAWI - IMPLICATION.

Type of Library and Information System

The above survey shows that application of computers in libraries in Malawi is gaining ground especially in academic libraries (50%) and this includes mostly college libraries of the University of Malawi.

Documentation Activities

Most institutions surveyed perform bibliographic activities (100%) irrespective of whether computers are used in the process or not and 62.3 of the institutions are specialized in multisectoral documentation. Out of those that provide bibliographic services, 87.5% stated that they use computers for this activity. It is to be noted out that most of the institutions using computers for bibliographic work are using them mostly for preparing records for serials for input to the National Union of Serials at the Malawi NDC. The NLS is one of the contributing libraries.

Services Provided

On services provided, such as, Current Awareness Services (CAS), bibliographies and Question Answer (Q/A) Services, it has to be noted that in most cases these

services are generated using the existing manual systems because most institutions are at an elementary level of computerization as reflected by their inability to provide SDI Services (12%) and Online Searches (25%).

Every institution surveyed, however, reported that it uses atleast one computer system. It was generally observed that as the number of micros per institution increases, the number of institutions having them decreases and this trend is shown in fig 6.2.

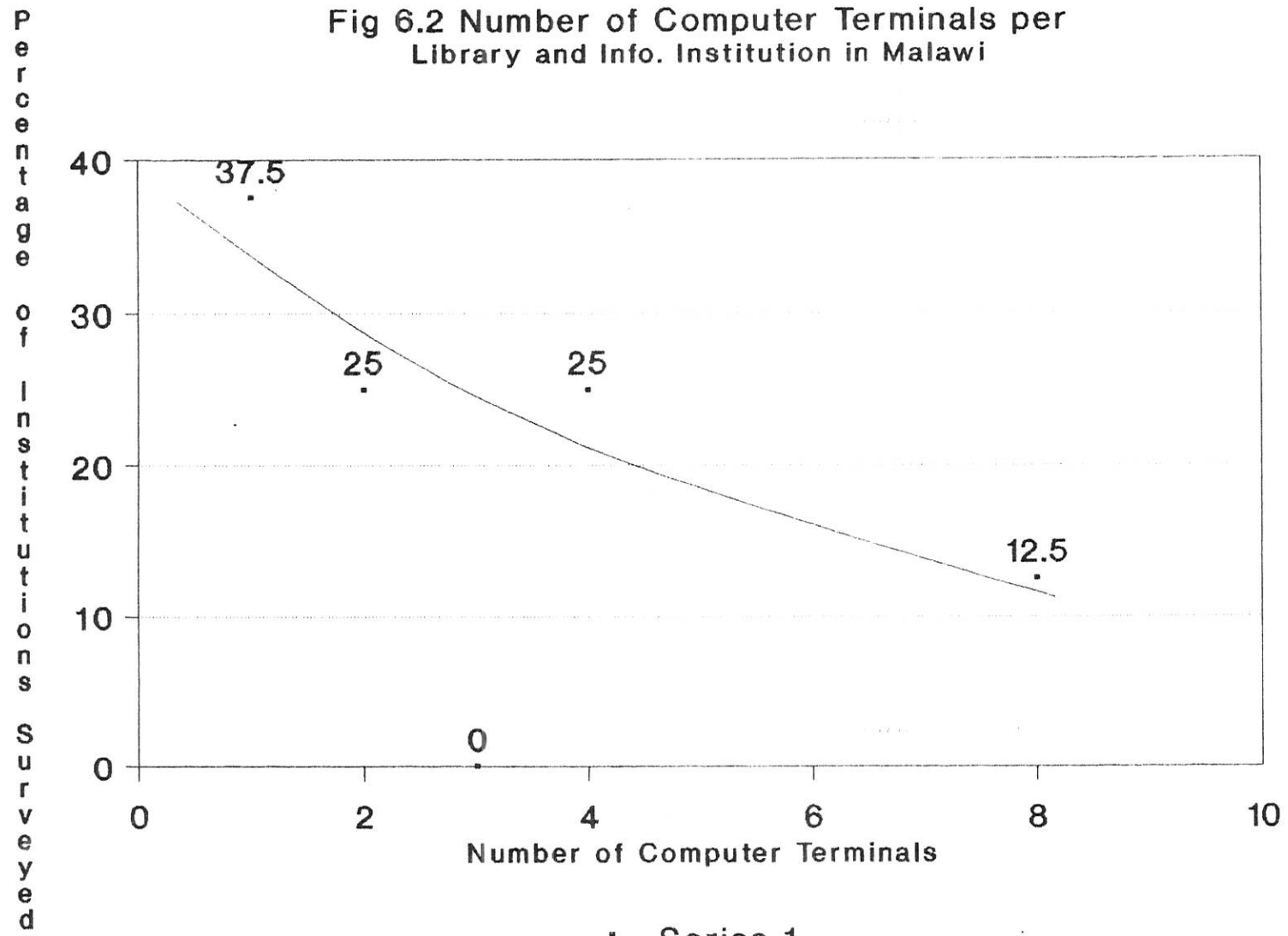
Use of Computers

All institutions surveyed reported using computers for word processing - this should have been the driving force to computer use in libraries in Malawi; 37% use them for Management Information System (MIS) and 12.5% use for accounting, publishing, etc.

Computer Facilities

All institutions reported using micros, the largest number (75%) being users of IBM or IBM compatible machines followed by UNISYS machines 50%, and all respondents' machines use MS-DOS operating system.

Fig 6.2 Number of Computer Terminals per Library and Info. Institution in Malawi



• Series 1

Networking

Only one institution representing 12.5% of respondents reported to have installed a Local Area Network (LAN) while the rest 87.5% relied on stand alone machines. However, institutions having more than one computer system mentioned plans to install a LAN in the future in order to share the available resources.

CD-ROM Drives

Six out of the eight institutions surveyed reported to have a CD-ROM drive, used for online search on CD-ROM databases, the most common one being Phillips (62.5%). It can be argued that while only 12.5% provide online searches on in-house bibliographic records, 75% are able to provide searches online to CD-ROM databases. Chitedze Agricultural Research Station library system which uses a LAN stated that its Phillips CM-100 CD-ROM drive does not work with the network due mainly to its hardware and software incompatibility with the CD-ROM system. The institution uses UNISYS and IBM computer systems. The International Centre for Living Aquatic Resources Management (ILCARM) centre in Lilongwe, Malawi has a Philips CD-ROM machine used for searching ASFA database on CD-ROM diskettes.

Application Software Used

The majority, 62.5%, use CDS/ISIS followed by dBase and INMAGIC 12.5%. Version 3.0 of Micro CDS/ISIS, released late 1992 for public use, has multi-user capability in a LAN environment. CDS/ISIS has data import/export facility in ISO 2709 format and programs are available for converting record formats of DBASE and INMAGIC to ISO 2709 (Abebe et al 1992, 137-159). Programs are also available to convert structured text in ASCII format to the ISO 2709 format. These features make it possible to exchange databases among library/information centres. Participants in information networks such as PADIS, DEVINSA, IDIN, DIVINER, etc, are using the software for such data exchange purposes.

Computer Related Problems

On computer equipment related problems, 50% of respondents experienced a major problem related to unstable electricity, while 37.5% expressed lack of adequate computer memory. The range of memory capacity was reported between 640 KB to 4 MB RAM with most of the institutions having systems of memory capacity less than 4 MB RAM.

On personnel problems, most institutions expressed shortage of trained staff (37.5%), however, 62.5% reported to be using staff locally trained on short courses.

On maintenance problems, most institutions (75%) stated that maintenance is done by vendor contract. However, there is one institution which stated that despite the provision of maintenance facilities, most vendor technicians are not competent enough to solve maintenance problems and another institution lamented that maintenance contracts add to the cost of IT use. 12.5% of the institutions surveyed hire technicians for machines without dealer companies resident in Malawi, and these institutions also experience spare parts problems.

Effectiveness of Using Computer Systems

The majority expressed appreciation of the effectiveness of computer applications in library and information environments because they experienced improvements in information storage and retrieval, provision of better access to catalogued items in machine readable form, accessibility to international databases on CD-ROM which researchers would otherwise have not been able to use, improved staff working morale and of the image of the library system vis a vis users.

Inter-library Loan Service (ILLS)

Over 37% stated that it took between 16-30 days to get resources from other institutions and an equal number indicated that it took over 30 days. It follows that 75%

of the institutions would wait for more than 15 days to get resources from other libraries. Computers are however not being used in this operation. The main focus of this study on ILLS is that libraries should be able to provide the much needed resources with minimum delay to the user.

Conclusion

These findings show that IT application in libraries in Malawi is just developing. Results of this survey will contribute to the design specifications for extension of application of IT in the NLS.

CHAPTER SEVEN

NLS SYSTEM DESIGN

7.1 INTRODUCTION

This chapter, in a sense, is a continuation of the discussions in chapter 5 and proposes design features of a new system in accordance with some of the requirements specified in chapter six.

There are two components of designing a system (Brookes et al. 1982, p 111): (1) the logical design which includes all the user's logical requirements. Three parts are therefore involved in defining the new logical system:

- . Developing the new logical DFD e.g using HIPO charts
- . Designing the files
- . Updating the data dictionary

and (2) the physical design which follows the logical design. This enables operation of the logical on the selected hardware and in the organizational environment, requiring further specification of the input, output files, processing methods and requirements.

Design of data base files will be emphasized in this chapter.

7.2 GENERAL SYSTEMS DESIGN

7.2.1 Application System Software

Application software to be recommended plays an important role in the logical design of the new system. Survey of computer use in library and information institutions in Malawi (chapter 6) has revealed that micro CDS/ISIS is dominantly used in Malawi (62.5%). In order to encourage compatibility of application systems, facilitate exchange of database records, and promote resource sharing of library and information systems and services, this thesis recommends micro CDS/ISIS software for major applications of the NLS activities. This software is already available on the NLS UNISYS micro-computer, installed in order to prepare serials records in machine readable form for input to the NDC Union Catalog of Serials database. However, CDS/ISIS and Dbase softwares were tested for their capability in library environments through sample database creation, searching and report production for purposes of this research work. It was found out that CDS/ISIS is more suitable to library application because of the following reasons (1) it has a variable length field structure; and (2) its record searching capability is very powerful. Dbase on the other hand, despite its fixed length structure, can be used in information storage and retrieval but its search capability is limited.

However Dbase has a programming feature which is easier to learn and use than the PASCAL programming associated with CDS/ISIS.

To control some operations such as circulation transactions, circulation control Pascal programs are available which can be obtained at a cost.

7.2.2 Decision Table for Book Selection

Table 7.1 is a decision table drawn to assist in book selection. Conditions considered are taken from those specified in chapter five. Construction of this table was guided by Brookes et al (1982, p 49). Columns marked R at the bottom of the table would be eliminated because they are irrelevant. This decision table can be used in designing a program to control this process.

7.2.3 Databases to be Developed

The systems analysis in chapter 5 has shown that some fields occur in different files of the existing NLS system. The different record fields were each given an identification number from 1 to 55 and the different files in which they occur were marked with a star as shown in table 7.2. In order to reduce repetition of data entry and save storage space of data an integrated data base is recommended.

TABLE 7.1 NLS DECISION TABLE FOR BOOK SELECTION

CONDITIONS	TRUTHS															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Available in Bibliog. Sources?	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N
Relevance to NLS Objectives?	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	N	N	N	N
Available in the System?	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N
Price > K60.00?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
ACTIONS																
Approve			*	*								*				
Defer	*	*								*						
Reject					*	*	*	*	*		*		*	*	*	*
					R	R							R	R		

FIG 7.2 MATCHING DATA FIELDS APPEARING REPEATEDLY IN DIFFERENT FILES

FILE NAME	DATA FIELDS																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Order File	*	*	*	*	*	*	*	*													
Supplier File	*	*	*					*	*	*	*										
Serial File						*	*		*	*		*	*	*							
Acquis File				*	*	*	*	*	*						*	*	*	*	*	*	*
Donor File		*																			
Catalogue Card				*		*	*								*	*	*	*			
Registration Card									*	*											
Borrower Ticket									*	*											

NOTE: Most data fields which occur only once were not included. This table was drawn in order to determine a requirement for an integrated database

The detailed design of the above databases will involve: (1) developing the database record structure by designing the Field Definition Table; (2) structuring the system worksheet; (3) structuring the input sheet for data capture, (4) structuring the Field Select Table (FST); (5) formulating the display formats; and (6) sample record entry. Samples of some data base files will be created.

7.3 MODIFICATIONS

7.3.1 Malawi Union Catalog of Serials

It was originally planned when writing the proposal to, among other things, develop a union catalog of serials available in Malawi libraries and information institutions but while I was in Malawi conducting the research, it was found out that this is being implemented at the Malawi NDC. The NDC started its work in 1992. The union catalog of serials to be developed will therefore consider only serials being held within the NLS system. Examining machine readable serial records for input to the NDC, it was found that the holdings field contained an identification code such as NLS-NLS to signify the National Library Service. This therefore does not indicate which branch library of the NLS is holding that particular serial. It will be proposed in this chapter how that additional information in the holdings field will be included.

7.3.2 Referral Database

On this issue, it was originally suggested in the thesis proposal that a referral database on different aspects in Malawi shall be created and established at the NLS. Later developments indicated that in a mission to Malawi (Neelameghan, 1989), it was recommended to set up an integrated research database called MAL under CDS/ISIS in the NDC. Data entry worksheets recommended included:

Name	For entry of data relating to
MALMO	Monographs
MALPP	Periodical publications/serials (whole)
MALAM	Analytics in monographs
MALAS	Analytics in Serials
MALIN	Corporate bodies (institutions)
MALRP	Research projects
MALPE	Persons
MALSY	Information Systems and Services
MALAC	Activities/events
MAL	A default worksheet for controlling all fields useful for editing records.

The NLS can only participate on a cooperative basis to create records for input into the referral database at the NDC.

7.4 DETAILED DESIGN

7.4.1 Integrated Database

This integrated database will be called **NLS** database. Development of the database structure is guided by formats prepared by Di Lauro (1990) and the NDC (1992) of Malawi.

Comparing fields described in the NDC bibliographic entry format and fields in the NLS catalogue records showed great similarities. To promote compatibility of field names and field tags in Malawi for purposes of information system resource sharing, the NDC format will form the basis in this database design. Other fields will of course be added in order to serve NLS local needs.

7.4.1.1 NLS Data base structure

<u>FIELD DEFINITION TABLE (FDT)</u>			<u>DATA BASE: NLS</u>			
<u>?</u>	<u>Tag</u>	<u>Name</u>	<u>Len</u>	<u>Typ</u>	<u>Rep</u>	<u>Delim/Pattern</u>
-	010	Record Number of Parent	6	X		
-	011	Record Number(s) of Part(s)	6	X		
-	012	Rec. No. of other lang ver(s).	6	X		
-	015	Bibliographic Level	1	A		
-	020	Source of Record	7	A		
-	022	Date of Entry	8	N		yyyymmdd
-	023	Date of Verification	8	N		yyyymmdd
-	040	Language of Text	50	X	R	
-	041	Language(s) of Analysis	50	X	R	
-	042	Language(s) of Summaries	50	X	R	
-	050	Physical medium	15	X	R	
-	060	Type of Material	3	A		
-	100	ISBN	100	X	R	ac

- 101	ISSN	12	X		9999-9999
- 115	Accession Number	250	X	R	
- 120	Document Number	100	X	R	
- 200	Title	500	X		a
- 230	Variant Titles	500	X	R	a
- 260	Edition Statement	250	X		ab
- 300	Editors/Personal Author	500	X	R	ab
- 310	Corporate Authors	500	X	R	ab
- 320	Meeting	300	X		abcij
- 330	Author's Affiliation	400	X		ab
- 400	Publication	300	X	R	abc
- 450	Serial Numbering and Dates	100	X		
- 460	Physical Description	100	X		abcd
- 465	Price	100			ab
- 466	Processing Status	3	X		
- 467	Number of Copies	2	X		
- 480	Monographic Series Statement	500	X		abc
- 490	Part Statement (Citation)	150	X		ab
- 500	Notes	100	X		
- 520	Frequency	100	X		ab
- 600	Abstract	1500	X		
- 610	Classification	50	X		ab
- 620	Descriptors-Controlled	500	X	R	
- 625	Descriptors-Local	500	X	R	
- 693	Acquisition Type	10	X		
- 694	Order Date	8	N		yyyymmdd
- 697	Source of Item	100	X		
- 700	Title (Second Level)	500	X		ab
- 709	Edition Statement (Second Level)	250	X		ab
- 710	Personal Author (Second Level)	500	X	R	
- 711	Corporate Author (Second Level)	500	X	R	ab
- 712	Meeting (Second Level)	500	X		abgij
- 715	Publication (Second Level)	300	X	R	abc
- 717	Total Cost	10	X		
- 718	Invoice Number	10	X		

- 720	Start Date	8	N	yyyymmdd
- 721	End Date	8	N	yyyymmdd
- 722	Order Number	20	X	
- 723	Number of Copies Ordered	2	N	
- 724	Expected Date	8	N	yyyymmdd
- 725	Number of Copies Received	2	X	
- 726	Received Date	8	N	yyyymmdd
- 727	Claim Date	8	N	yyyymmdd
- 728	Reminder1	8	X	mn
- 729	Reminder2	8	X	mn
- 730	Reminder3	8	X	mn
- 731	Annual Subscription	10	X	
- 732	Expiry Date	8	N	yyyymmdd
- 733	Expected Renewal Date	8	N	yyyymmdd
- 734	Circulation status	10	X	
- 735	Total Financial Allocation	10	X	
- 736	Cummulative Expenditure	10	X	
- 737	Number of Issues for Bindery	3	N	
- 738	Cummulative Number of Issues	3	N	
- 739	Style of Binding	100	X	
- 740	Number of Issues Bound in Vol.	3	N	
- 741	Missing Issues	10	X	
- 742	Date Sent for Bindery	8	N	yyyymmdd
- 743	Binding Firm	200	X	ab
- 744	Cost of Binding	10	X	
- 745	Name of Person	30	X	
- 746	Nationality	15	X	
- 747	Mailing Address	200	X	
- 748	Telephone Number	10	X	
- 749	Affiliation	100	X	
- 750	Affiliation Code	10	X	
- 751	Main Fields of Specialization	100	X	
- 752	Permanent Address	100	X	
- 753	Occupation	30	X	
- 754	Age	2	X	

- 755	Issue Ticket Number(s)	65	X	
- 756	Referee ID/Name/Address	200	X	abc
- 757	Name/Adress of Institution	200	X	abc
- 758	Number of Boxes	3	N	
- 759	Clearing Agent	200	X	ab
- 760	Shipment Number	10	X	
- 761	Date of Request	8	x	yyyymmdd
- 762	Date of loan	8	x	yyyymmdd
- 763	Remarks	300	x	
- 764	Renew Date	8	x	yyyymmdd
- 765	Date of Return	8	x	yyyymmdd
- 766	Status	3	x	
- 767	No. of Copies per Year	2	N	
- 768	No. of Issues per Year	2	N	
- 769	Total Annual Subscription	10	X	
- 770	Outstanding Orders	100	X	
- 771	Reference Number	15	X	
- 772	Number of Boxes Expected	3	X	
- 773	Number of Boxes Received	3	X	
- 774	Fund Number	10	x	
- 775	Supplier Authority Code	6	X	
- 776	Authority Record Notes	100	X	
- 777	Authority Record Date	8	X	yyyymmdd
- 778	Supplier Name and Address	200	X	
- 779	See References	100	X	
- 970	Data Entry Person	15	X	
- 971	Verified by	15	X	
- 998	Holdings	100	X	R abcd
- 999	Record ID	3	A	

A-Insert(after)	B-Insert(before)	C-Change Line	D-Delete line
P-Previous page	N-Next page	T-Top	E-Bottom
	Y-Next line	X-Exit	

7.4.1.2 Data base worksheets

a. MONOG file worksheet

WORKSHEET NAME : MONOG DATA BASE NAME : NLS

Date of Entry (022)-----

Type of Material (060)--- Bibliographic Level (015)_

Record Number of Parent (010) -----

Record Number(s) of Part(s) (011) -----

Record No. of other Lang ver(s) (012) -----

Acquisition Type (693) -----

Source of Item (697) -----

(20)Source of Record ----- Order Date (694)-----

Price (465) -----

Language of Text (040) -----

Language(s) of Analysis (041) -----

Language(s) of Summaries (042) -----

ISBN (100) -----

Title (200) -----

Variant Titles (230)-----

Edition Statement (260) -----

Editors/Personal Author (300) -----

Corporate Authors (310) -----

Author's Affiliation (330) -----

Meeting (320) -----

Publication (400) -----

Physical Description (460) -----

Monographic Series Statement (480) -----

Classification (610) -----

Accession Number (115) -----

Descriptors-Controlled (620)-----

Editors/Personal Author (Second Level) (710) -----

Corporate Authors-Parent (310) -----

Corporate Authors-Second Level (711) -----

Author's Affiliation (330) -----
Meeting (320) -----
Publication-Parent (400) -----

Publication-Second Level (715) -----

Physical Description (460) -----
Monographic Series Statement (480) -----
Classification (610) -----
Accession Number (115) -----
Descriptors-Controlled (620) -----

Descriptors-Local (625) -----

Physical Medium (050) -----
Processing status (466) --- Number of copies (467) --
Notes (500) -----
Abstract (600) -----
Holdings (998) -----
Data Entry Person (970) -----
Verified by (971) ----- Date of Verification (23) -----

Variant Titles (230) _____
as in field 200

Edition Statement (260) _____
^aEd. statem. ^bStatem. of Resp.

Editors/Personal Author (300) _____
Enter names separated by % for
repeated entry. Enter [ed] for editors/compiler.

Corporate Authors (310) _____
^aMain Body
^bSub-body. Enter % for repeat entry.

Author's Affiliation (330) _____
^aMain body
^bSub-body

Meeting (320) _____
^aMeeting name ^bOther parts of name ^cLocation
^iYear ^jNumber of meeting

Publication (400) _____
^aPlace ^bPublisher
^cDate % for repeated entry

Physical Description (460) _____
^aPagination ^bDescription ^cOther

Monographic Series Statement (480) _____
^aName of series ^bStatem. of
Resp. ^cSeries number

Physical Medium (050) _____
Enter code number 010(paper), 020(film),
Notes (500) 040(magnetic), 050(laser/optical), 900(other).

Holdings (998) _____
Location Code separated by % for repeated entry.

7.4.1.3 Field Select Table (FST)

The following integrated FST is drawn to cater for all files in the data base.

DATA BASE NAME : NLS FST for Sorting FST name: NLS

<u>ID</u>	<u>IT</u>	<u>Data Extraction Format</u>
- 20	0	V20
- 60	0	V60
-200	4	V200
-230	4	V230
-300	0	V300
-310	1	V310
-400	4	V400^b
-480	4	V480^a
-500	2	V500
-600	2	V600
-620	0	V620
-625	0	V625
-700	4	V700
-710	0	V710
-711	1	V711
-718	0	V718
-722	0	V722
-724	0	V724
-726	0	V726
-728	0	V728

-729	0	V729
-730	0	V730
-743	0	V743
-745	0	V745
-750	0	V750
-757	0	V757
-765	0	V765
-766	0	V766
-771	0	V771
-775	0	V775
-778	0	v778
-998	0	V998
-999	0	V999

7.4.2 Book Order Files

A. Order Worksheet

WORKSHEET NAME: ORDER DATA BASE NAME: NLS

Order Number (722) -----

Order Date (694) -----

Title (200) -----

ISBN (100) -----

Edition Statement (260) -----

Editors/Author (300) -----

Publication (400) -----

Number of Copies Ordered (723) --

Number of copies Received (725) --

Price (465) -----

Total Cost (717) -----
 Invoice Number (718) -----
 Supplier Authority Code (775) -----
 Physical Description (460) -----
 Expected Date (724) -----
 Received Date (726) -----
 Claim Ddate (727) -----
 Reminder 1 (728) -----
 Reminder 2 (729) -----
 Reminder 3 (730) -----
 Record ID (999) ORD
 Remarks (763) -----

 Date of Entry (22) -----
 Data Entry Person (970) -----
 Date of Verification (23) -----
 Verified by (971) -----
 Record ID (999) ---

b. Order display format

DISPLAY FORMAT NAME: ORDER DATA BASE NAME: NLS
 mhl, if v999:'ORD' then 'Mfn: 'mfn(4)##,'Order no.:
 'v722,c31,'Order Date: 'v694/,'Title: 'v200/,'ISBN:
 'v100/,'Edition Statement: 'v260/,'Author/Editors:
 'v300/,'Publication: 'v400^a,x2,v400^b,x2,v400^c/,'Price:
 'v465,x4,'Total Cost: 'v717/,'Physical Description:
 'v460^a,x3,v460^b/,'Supplier: 'Ref(L(v775))/,'Expected
 Date: 'v724, x2,'Received Date: 'v726/,x2,'Claim Date:
 'v727/,'Reminder 1: 'v728,x2,'Reminder 2:
 'v729,x2,'Reminder 3: 'v730/,'Remarks: "v763##,'Date of
 Entry: 'v22,x2,'Data Entry Pers.: 'v970/,'Date of Verif.:
 'v23,x2,'Verif. by: 'v971 fi##

Total Cost (717) -----
 Invoice Number (718) -----
 Supplier Authority Code (775) -----
 Physical Description (460) -----
 Expected Date (724) -----
 Received Date (726) -----
 Claim Ddate (727) -----
 Reminder 1 (728) -----
 Reminder 2 (729) -----
 Reminder 3 (730) -----
 Record ID (999) ORD
 Remarks (763) -----

 Date of Entry (22) -----
 Data Entry Person (970) -----
 Date of Verification (23) -----
 Verified by (971) -----
 Record ID (999) ---

b. Order display format

DISPLAY FORMAT NAME: ORDER DATA BASE NAME: NLS
 mhl, if v999:'ORD' then 'Mfn: 'mfn(4)##,'Order no.:
 'v722,c31,'Order Date: 'v694/,'Title: 'v200/,'ISBN:
 'v100/,'Edition Statement: 'v260/,'Author/Editors:
 'v300/,'Publication: 'v400^a,x2,v400^b,x2,v400^c/,'Price:
 'v465,x4,'Total Cost: 'v717/,'Physical Description:
 'v460^a,x3,v460^b/,'Supplier: 'Ref(L(v775))/,'Expected
 Date: 'v724, x2,'Received Date: 'v726/,x2,'Claim Date:
 'v727/,'Reminder 1: 'v728,x2,'Reminder 2:
 'v729,x2,'Reminder 3: 'v730/,'Remarks: "v763##,'Date of
 Entry: 'v22,x2,'Data Entry Pers.: 'v970/,'Date of Verif.:
 'v23,x2,'Verif. by: 'v971 fi##

7.4.3 Union Catalogue of Serials

A union catalogue database of serials is available in the NLS which is used to create input records to the National Union Catalogue of Serials resident at the NDC. There is therefore no need to design another database in this thesis for this function. However, examining the database structure it was found out that in the holdings field the NLS is supposed to enter its identification code (NLS-NLS) for serials held in the library system. This therefore does not indicate which of the NLS libraries is holding the serial. To develop a union catalogue of serials to be utilized within the NLS system it is recommended that the serials database be integrated in the proposed NLS integrated data base, the holdings field should be updated to contain identification codes of NLS branch/main libraries. Newly created records for serials can be searched, downloaded and the holdings field amended to suit the requirement of the NDC and sent to the NDC for input to the national database.

MEMB File, CENTER File, SUPPL File, DONOR File, etc. The above files can be developed following similar procedures been used to develop other file structures above. The field definition table already contains the required fields to develop these files.

7.4.4 Serials Control Files

A prototype database will be developed for serials control. The following files will be created to control this operation:

- (1) SRLS file to register receipt of the issues of each of the serials;
- (2) SUBSC file to control subscriptions; and
- (3) BIND file to Control bindery operations.

The following display formats will also be created:

- (1) REGIST.PFT to display the register;
- (2) SUBSC.PFT to display subscriptions records; and
- (3) BIND.PFT to display records for bindery.

The prototype data base was created on diskette.

a. SRLS worksheet

WORKSHEET NAME: SRLS DATABASE NAME: NLS

Order Number (722) -----

Order Date (694) -----

Title (200) -----

ISSN (101) -----

Serial Numbering (450) -----

Frequency (520) -----
 Number of Copies Ordered (723) --
 Number of copies Received (725) --
 Supplier Authority Code (775) -----
 Expected Date (724) -----
 Received Date (726) -----
 Claim Date (727) -----
 Reminder 1 (728) -----
 Reminder 2 (729) -----
 Reminder 3 (730) -----
 Remarks (763) -----

 Record ID (999) SRL

b. SUBSC worksheet

WORKSHEET NAME: SUBSC DATA BASE NAME: NLS

Record ID (999) SUB

Title (200) -----

Annual Subscription (731) -----
 No. of Issues Per Year (768) --
 No. of Copies per Year (767) --
 Total Annual Subscription (769) -----
 Total Financial Allocation (735) -----
 Cummulative Expenditure (736) -----

Expiry Date (732) -----
Expected Renewal Date (733) -----
Renewed Date (764) -----
Circulation Status (734) -----

c. BIND worksheet

WORKSHEET NAME: BIND DATA BASE NAME: NLS

Record ID (999) BIN

Title (200) -----

Serial Numbering (450) -----

Missing Issues (741) -----

Style of binding (739) -----

Date sent for bindery (742) -----

Expected Date of bound vol (724) -----

Received Date of bound vol (726) -----

No. of Issues Bound in a vol (740) --

Cost of Binding (744) -----

Name/Address of Binding Firm (743) -----

7.4.5 Inter-Library Loan Service (ILLS)

ILLS basically involves the loaning of material to and from other libraries (Westlake and Clarke 1987).

To run an ILLS in the NLS assisted by a computer system will require the following:

1. Details of registered libraries in the ILLS network.
2. Rules for loan such as:
 - renewal periods
 - fines and overdue charges
3. Mechanism for automatic generation of loan notices (ILLIS format).
4. ILLS catalog file comprising:
 - author
 - Title
 - ISBN
 - etc
5. The NDC in Malawi holds a union catalog of serials in computer readable form (CDS/ISIS database). This database can be made available on diskettes to other libraries who would conduct a search on them in order to find the library holding the documents on request. The requests can then be routed to the holding library.
6. A union catalogue of monographic materials can also promote effectiveness of ILLS in a similar manner as 5 above. A computer-based system can also promote duplication of the catalogue in printed form or copying of the entire catalogue on to magnetic tapes which can be distributed to cooperating libraries in the ILLS network, provided the libraries use

compatible magnetic tape drives.

In the NLS, ILLS operation files will be integrated in the NLS database. These Files will include those specified above, namely:

1. Registered institutions in the ILLS network called INST file with Record ID bearing ILI.
2. ILLS catalog file called ILLCAT
3. ILLS notice format called ILLNOT which will be interrelated to the ILLCAT because of similarity in fields.

7.4.5.1 Designing ILLS Files

a. INST file worksheet

WORKSHEET NAME: INST DATA BASE NAME: NLS
Name/address of institution (757) -----

Tel. No. (748) -----
Code name (750) -----
Record ID (999) ILI

b. INST file display format

DISPLAY FORMAT NAME: INST DATA BASE NAME: NLS
mhl, if v999:'ILI' then 'Mfn: 'mfn(4) 'Name/address:
'v757^a/,c15,v757^b/,c15,v757^c/,'Tel.No.: 'v748/,'Code
name: 'v750 fi ##

c. ILLCAT worksheet

WORKSHEET NAME: ILLCAT DATA BASE NAME: NLS

Request Ref. No. (771) -----
Date of Request (761) -----
Request User (745) -----
Type of Material (60) ---
Author (300) -----
Title (200) -----

Title (Second Level) (700) -----

Serial Numbering and dates (450) -----
Physical description (460) -----
Lending Library Code Name (750) -----
Date of loan (762) -----
Remarks of Lending library (763) -----

Renew dates (764) -----
Date of return (765) -----
Status (766) -
Record ID (999) ILC

d. ILLNOT display format

DISPLAY FORMAT NAME: ILLNOT DATA BASE NAME: NLS

mhl, if v999:'ILC' then 'Mfn: 'mfn##,'Request ref. no.:
'v771/,'Date of Request: 'v761/,'Request user:
'v745/,'Type of Material: 'v60/,'Author:
'v300|;|/,'Title: 'v200/,'Title (Second Level):
'v700/,'Serial numbering and dates: 'v450/,'Physical
description: ''Pages: 'v460^a, x3,'Mode:
'v460^b/,'Lending Library Name: 'Ref(L(v750), v757^a/,

v757^b/,v757^c)//,'Date of loan: 'v762/,'Date of Return:
'v765/,'Renew date: 'v764/,'Remarks of Lending Library:
'v763 ## fi##

7.4.6 Question Answer Service

Users will inquire for information in the NLS database by presenting their queries to the librarian on the circulation desk or any other access station. By searching through the database, the librarian will be able to provide the required information to the queries.

7.4.7 Current Awareness Services (CAS)

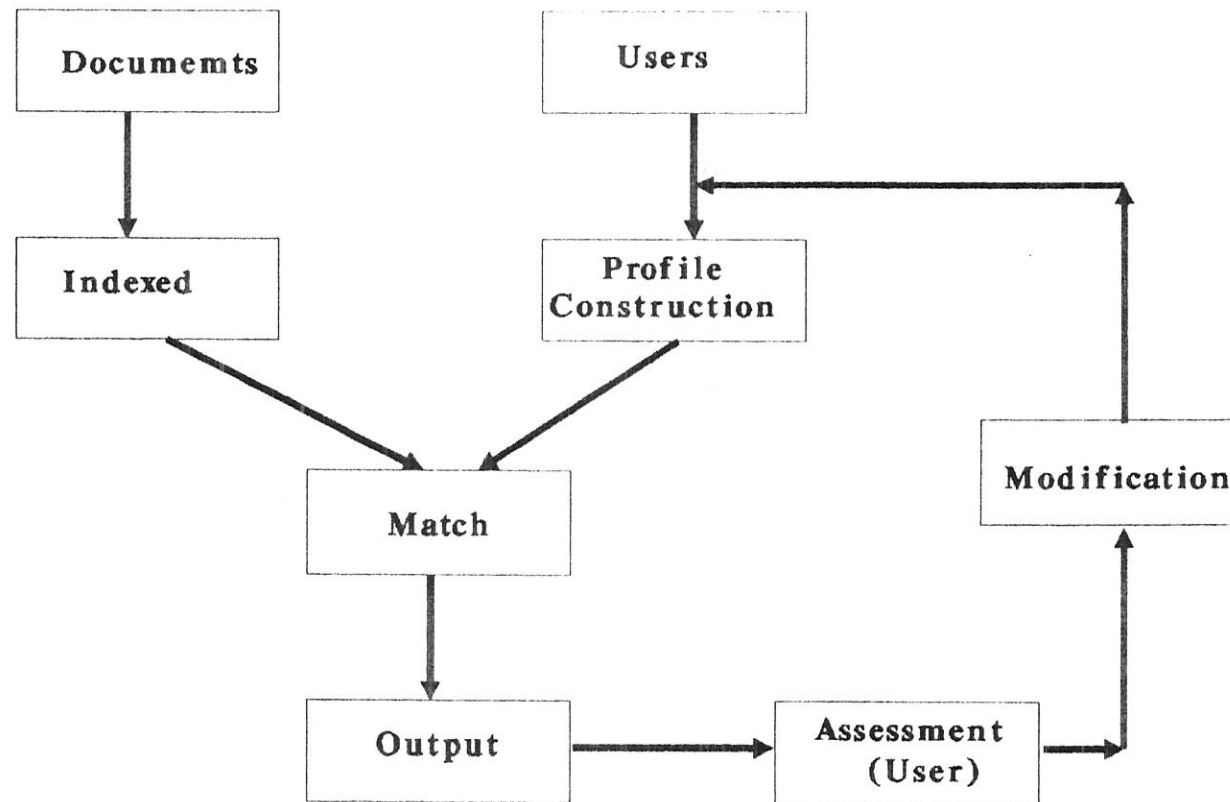
In this service users will be made aware of current developments in their respective fields of interest.

7.4.8 NLS SDI Service

SDI service is defined in chapter 4 section 4.9.2. An SDI system is comprised of components shown on fig 7.1 below (Tedd 1978, p 146). Development of SDI system at the NLS will be guided by this flow diagram.

In order to provide this service from the NLS system, a survey was conducted in order to find out whether people would be interested in the service, and if they were interested, they were asked to fill the attached SDI user profile form. A sample population of 50 was picked from the NLS library users catalogue (25), university

Fig 7.1 AN SDI SYSTEM



Adapted from Tedd 1978, p146

lecturers (15) and researchers from agricultural research institutions (10). They were selected based on the nature of their work, and their current activities which may require provision of specific and updated information. Out of the 50 targeted population, 62% expressed interest in the service and filled in their profiles while the remaining 38% did not respond. Lack of response could imply the following: (1) lack of interest in the service; (2) the service being unfamiliar they did not exactly know what it was all about and were not certain to provide their profiles; and (3) they were not involved in any activities requiring provision of personalized information. However, almost all university lecturers and agricultural researchers expressed interest in the service and provided their profiles.

The subject descriptors in the profiles were analysed in order to find out their specific information needs. A list of descriptors would help to decide on types of external databases, local or foreign, to be acquired in order to develop the SDI service database. It was thought that a **USER -----> SDI approach** would ensure a successful SDI service than a **SDI-----> USER approach**. In this approach it was felt that users themselves must decide on what the content of the SDI database should be by first developing their profiles and then developing the database according to the needs expressed in the profiles other than first developing the SDI database and

then looking for customers (users) to use the product (SDI service). Some SDI services experience problems partly because the service is developed without the user in mind.

7.4.8.1 SDI Profile Worksheet

PADIS and ILCA SDI profile worksheets were examined, a worksheet suitable for user profiles in Malawi was structured. A sample worksheet is shown in appendix II.

7.4.8.2 Developing the SDI Database

Subject descriptors were extracted from the different profiles received, and the following analytical table was generated.

Subject Field	Freq.	Perc.
Agriculture	23	36
Medicine	7	11
Business	7	11
Management	5	8
Marketing	5	8
Inform. Techn.	5	8
Engineering	5	8
Education	4	6
Social Sc. (general)	3	4

The analysis gives an approximate idea of the relative

interest areas of users. The division between Applied sciences and Social Sciences is roughly 55 and 45 percent respectively. If the NLS has to subscribe to/obtain on loan basis, external databases available locally or abroad then databases containing records on Applied Sciences should be given first priority.

The survey of use of computers in library and information institutions in Malawi in chapter six showed that some institutions have CD-ROM drives which implies that CD-ROM databases are available in these institutions. Externally produced databases on CD-ROM or Magnetic tapes are quite expensive to subscribe to. A directory of all CD-ROM databases available in Malawi is therefore necessary so that library and information institutions in the country can share the resources and other important databases which are not available can be acquired on a cooperative basis. Data base resources available at PADIS and ILCA can be obtained on diskettes or microfiche, free of cost.

Local database inputs will include bibliographic information on books, journals, non-conventional literature in Malawi, etc.

The above sources can be searched, the retrieved records would be edited and downloaded into the SDI database. This would require a program to convert the CD-ROM database to ISO 2709 format for downloading on CDS

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Local database inputs will include bibliographic information on books, journals, non-conventional literature in Malawi, etc.

The above sources can be searched, the retrieved records would be edited and downloaded into the SDI database. This would require a program to convert the CD-ROM database to ISO 2709 format for downloading on CDS

databases.

7.4.8.3 Management of the SDI Service

CDS/ISIS would be used to run the SDI service. Database records will be downloaded on CDS/ISIS database monthly. The service will be run on monthly basis where every month new records will be downloaded into the database and records used in the previous month would be downloaded on magnetic tapes as an archive file. The information selectively retrieved from the database would be disseminated to the users once a month. CDS/ISIS has a Pascal program interface called NEWSDI which is used to create the users profiles as a text file and match the users descriptors with the contents of the database when the program is run. The matched records will be analysed and disseminated to the intended users.

7.4.8.4 SDI feedback analysis system

In order to assess the effectiveness of the system a feed-back analysis mechanism would be adopted. The SDI service will be disseminated accompanied by an evaluation form which the SDI user will fill and send back. This is meant to determine the precision ratio of the references provided to each user. A feedback analysis devised by

ILCA will be adopted in the NLS system.

The Precision Ratio (P-R) for each user is calculated using the following formula:

$$\text{Precision Ratio} = \frac{a}{(a+b)} \times 100$$

Where a = number of items marked relevant by user,

b = number of items marked not relevant by user.

The accepted ration is 60% - 70%. If it is less than 60% then the service is not satisfying user needs adequately and if it is greater than 70%, it means that the service contains some irrelevant references in addition to the relevant ones. If the service is not satisfactory to a particular user, he/she may be asked for profile modification. This evaluation system would be conducted for a period of about six months, if the service is satisfactory then the user would be receiving only references without the evaluation forms.

7.5 UNBM DATA BASE

This is a data base for non-book materials in Malawi.

a. Data base structure

Field Definition Table (FDT)		DATA BASE: MLW-UNBM				
?	Tag	Name	Len	Typ	Rep	Delim/Pattern
-	20	Source of Record	7	A		
-	22	Date of Entry	8	X		yyyymmdd
-	23	Date of Verification	8	X		yyyymmdd
-	40	Language of Item	50	X	R	
-	50	Physical Description	15	X	R	
-	60	Type of Material	3	A		
-	115	Accession Number	30	X		
-	200	Title	300	X		a
-	400	Production Details	1000	X		abcde
-	465	Price	100			ab
-	500	Notes	100	X		
-	610	Classification	50	X		ab
-	620	Descriptors-Controlled	500	X	R	
-	625	Descriptors-Local	500	X	R	
-	693	Acquisition Type	10	X		
-	694	Order Date	8	X		yyyymmdd
-	697	Source of Item	30	X		
-	970	Data Entry Person	12	X		
-	971	Verified by	12	X		
-	998	Holdings	100	X	R	abcd

A-Insert(after) B-Insert(before) C-Change Line D-Delete line
P-Previous page N-Next page T-Top E-Bottom

Y-Next line

X-Exit

b. UNBM worksheet - to create a catalogue of non-book materials.

WORKSHEET NAME : UNBM DATABASE NAME:MALLI
Source of Record (020) ----- Type of Material (060) ---
Title (200) -----

Language of Item (040) -----
Physical Description (050) -----

Classification (610) -----
Accession Number (115) -----
Acquisition Type (693) ----- Source of Item (697) -----
Price (465) ----- Order Date (694) -----
ProductionDetails (400) -----

-----Descriptors-Controll
(620) -----

Descriptors-Local (625) -----

Notes (500) -----

Holdings (998) -----
Data Entry Person (970) ----- Date of Entry (022) ----- Verifi
by (971) ----- Date of Verification (023) -----

c. Index fields for the FST

20	0	V20
200	4	V200

Y-Next line

X-Exit

b. UNBM worksheet - to create a catalogue of non-book materials.

WORKSHEET NAME : UNBM DATABASE NAME:MALLI
Source of Record (020) ----- Type of Material (060) ---
Title (200) -----

Language of Item (040) -----
Physical Description (050) -----

Classification (610) -----
Accession Number (115) -----
Acquisition Type (693) ----- Source of Item (697) -----
Price (465) ----- Order Date (694) -----
Production Details (400) -----

-----Descriptors-Controll
(620) -----

Descriptors-Local (625) -----

Notes (500) -----

Holdings (998) -----
Data Entry Person (970) ----- Date of Entry (022) ----- Verifi
by (971) ----- Date of Verification (023) -----

c. Index fields for the FST

20	0	V20
200	4	V200

620	0	mhl(V620%)
625	0	V625
998	0	V998^a

An input sheet and display formats shall be similarly created as above. The input sheet is similar to the one designed for monographic materials above for the fields that are identical, except that in the physical description information such as: (1) viewing time for non-book materials software will be included; and (2) the field will hold exact description of make/model of the non-book materials hardware, etc.

7.6 CONCLUSION

The above data base and file designs will form the basis for developing a new system to assist in the various operations of the NLS services.

CHAPTER EIGHT

COMPUTER SYSTEM SELECTION AND IMPLEMENTATION PLAN

8.1 CHOOSING THE SYSTEM - SURVEY

A survey of computer vendor organizations in Malawi was conducted in order to investigate the types of computer products and services they offer. This would help to specify in general terms the hardware and software systems that can be considered for procurement. Three vendor organizations were identified, whose products are quite popular in libraries and information institutions in Malawi. Questionnaires were hand delivered and their responses were also collected in person. This also provided an opportunity to make personal interviews related to the survey. Since the survey sample population was very small and the main interest in this study was on the vendors and their products, to analyze their responses, the vendor organizations were coded as follows:

Vendor Name	Ref. Code
Computer Sales and Services	01

UNISYS	02
Xerographics	03

YES or NO responses were also coded 1 and 0 respectively. The following are the findings.

1. When was the company established in Malawi?

01	02	03
1984	1974	1982

Vendor 02 stated that its company had changed trade names three times, implying that computer systems that were sold under the previous trade names are no longer sold now. This can mean that organizations which purchased such systems are now having maintenance or spare parts problems, etc. In order to promote compatibility and easy maintainability of computer systems, libraries should purchase systems which they are reasonably sure will continue to sell.

2. Is the company a subsidiary /agent of another company?

01	02	03
1	0	1

Vendor 02 is the only independent computer vendor in

this survey in Malawi.

This paper recommends procurement of computer systems from vendor organizations that are independent in the country for the reason that agents or subsidiaries may decide to close thus creating a problem of replacement of computer devices and inability to solve other related problems.

3. Which of the following services does your organization offer in Malawi?

	01	02	03
Consultancy	0	0	1
Training	1	1	1
Sale of hardware	1	1	1
Sale of software	1	1	1
Maintenance	1	1	1
Sale of Spare parts	0	0	1

Vendor 03 seems to satisfy all the required services. To avoid facing problems of lack of consultancy and lack of spare parts, vendor 03 is commendable for computer systems procurement. As indicated in the comparative analysis survey in chapter six, 25% of the surveyed institutions mentioned lack of spare parts as one of their problems.

4. What types of computers do you sell in Malawi?

	01	02	03
Mainframe computers	0	0	0
Minicomputers	1	0	0
Microcomputers	1	1	1

Of the three organizations surveyed only vendor 01 sells minicomputers as well as microcomputers. Libraries in Malawi wishing to use computers in their systems on a cooperative basis through a wide area network then vendor 01 can facilitate such a project. Modern minicomputers can provide a large storage capacity and can handle several remote microcomputers or terminals located in different cooperating libraries.

In this survey no prices for systems sold were released based on the argument that prices are based on the existing foreign exchange rate. However one vendor indicated that usually the prices range from K10,000.00 to K150,000.00. All the three vendors surveyed stated that the hardware was imported as a whole and no hardware assembling was done in the country.

5. What are the computer softwares that you sell in Malawi?

01	02	03
PEGASUS	EXCEL	PC TOOLS V7.1
WORD PERFECT 5.1	WORD PERFECT 5.1	WORD PERFECT 5.1
PEGASUS BUSINESS MANAGER	MS WORD	LOTUS 1-2-3 V2.3,3.1
FREELANCE GRAPHICS	CAMERION	LOTUS SMART SUIT
LOTUS 1-2-3 for Windows	TETROPLAN	LOTUS AMIPRO V3
MULTIMATE	NYLON	MICROSOFT WINDOWS V3.1
DBASE	AUTOMATE	MICROSOFT EXCEL V4
SYMPHONY		DBASE IV
LOTUS NOTES		SUPERBASE 4
AMIPRO		SYBIZ A/C's for Windows
CC:MAIL		SYBIZ A/C's for DOS
		PEGASUS A/C
		SAGE A/C

No application softwares specific to library needs are sold in Malawi, however, from the above list the following softwares can be applied to library environments: word perfect, Dbase, PC Tools, Microsoft Windows 3.1, etc.

6. Please specify computer hardware sold in terms of Make/Model, Main Memory (RAM), Operating System (OS) and Hard Disk Capacity.

	01	02	03
Make/Model	IBM, Epson Laptops	UNISYS	TAYCHA
RAM	640 KB	2 MB, 4 MB, 8 MB (exp. to 32 MB)	2 MB for DOS 4 MB for Windows
OS	DOS v3.3, v4.01, v5.0	MS-DOS/Windows, Microsoft OS/2, Novell Netware, SCO UNIX/Xenix	MS-DOS v5.0
Disk Cap.	20-300 MB	52-338 MB	40 MB - 1.2 GB

Since 75% of the surveyed institutions in chapter 6 use IBM or IBM compatible computers it is recommended that the NLS system should use similar systems. Most systems sold in Malawi use MS-DOS. This operating software is suitable for most application softwares.

The NLS holds about 200,964 books (Annual Report, 1990/91). "The average length of a record is 300 characters ..." (Lucy A. Tedd, 1988, 127). In this case, record refers to book record in machine readable form and a single character is stored in one byte. If a single book requires on an average 300 bytes of storage space in a computer system then the 200,964 NLS books would need $300 \times 200964 = 60.29$ MB or approximately 60.5 MB of disk storage.

Growth in NLS book collection as from 1987/88 to 1990/91 financial years is given below (see fig 2.4, chapter 2)

Financial Year	Total Additions
1987/88	14,523
1988/89	25,708
1989/90	23,214
1990/91	21,718
Total	85163

The average growth in four Financial Years is about 22,000 books a year. This will require $300 \times 22000 = 6.6$ MB annually . The NLS will therefore need not less than 60.5 MB of hard disk capacity for catalog conversion alone and an additional 6.6 MB every year for annual additions. However, the library collection does not grow steadily because of reductions through book losses and

weeding, thus creating storage space for new acquisitions, which is not accounted for in the above calculations.

It can however be estimated that in 10 years time the NLS would need $\{60.5 \text{ MB} + (6.6 \times 10 \text{ MB})\} = 126.5 \text{ MB}$ of disk storage capacity for catalog conversion and development assuming a steady growth rate in collection and no weeding of collection and book losses occur in the stated period. For creation and development of other library databases such as Users Records, SDI databases, database of non-book materials, Community information records, management records, etc, and for installation of office softwares for word processing, spreadsheets, accounting, etc, it can be estimated that an additional 100 MB will be required bearing in mind that some of the inactive library files will have to be stored offline in tapes and floppy disks. The NLS would therefore require about 226.5 MB. A server of about 300 MB of disk storage capacity is recommended to hold various applications software packages, the network software; and to create and develop an on-line system over a period of 10 years. Magnetic tapes will be used for massive offline storage of database records. To install a micro computer system of a large storage capacity can be achieved in several ways which may include procurement of a server of large storage capacity, interconnection of several hard disks

in a local area network, use of a disk unit or a disk pack or mere use of microcomputer systems of expandable storage capacity.

Supposing a user searching the NLS database retrieves 50 records, then these records would require about $50 \times 300 = 15000$ Bytes = 15 KB of RAM. A terminal of 640 KB of RAM for on-line search would be quite suitable. Systems with large RAM would be required in database development activities such as downloading, loading, copying files, record creation, massive record retrieval etc. In such cases a PC of about 2 MB RAM or more would be required, library databases being characteristic of large bibliographic data.

The Novell Netware provided by vendor 02 would be required as a LAN software in the NLS.

7. System Installation Services

	01	02	03
Provided	1	1	1
Charges	Free	Free	Free

For stand alone single systems bought from the vendor organization, installation charges are free but for systems bought elsewhere and for multiple systems involving networking, the installation charges range from K80 - K160 per hour depending upon vendor organization.

8. Do you provide maintenance services to your systems, if so, under what conditions?

01	02	03
1	1	1

All vendor organizations surveyed stated that they provide a 12 months warranty of free maintenance on all products bought from them and in the subsequent years, maintenance is by a contract with a charge of 10% of gross hardware price. If the NLS buys a system at K80,000, then annual maintenance costs after 12 months would be K8,000. These maintenance costs are indeed high for institutions which are non-profit making organizations like the NLS, and the total maintenance cost would depend upon the number of computer systems in the NLS. For a large number of computer systems installed in an institution, it is cost effective to employ a full time systems technician because his annual salary would be less than the overall annual maintenance costs. Consumables such as paper, ribbon, ink, diskettes, photocopying units, etc would bring in additional costs. When user services such as CAS, SDI, retrospective search, etc, are provided, the demand for photocopying of documents will increase to a considerable extent.

The above shows that most computer peripherals required for library application are available in Malawi vendor organizations.

CD-ROM drives can be used to access CD-ROM databases, MODEMS can be used for data communication between remotely located systems especially in WAN environments.

Magnetic tapes and tape drives can be used for sequential storage of back-up copies of library databases. Bar code readers in library systems is usually used for circulation control for direct data entry into a computer system from the source objects. A file server can provide a large disk storage capacity especially in LAN environments.

Acoustic couplers have been replaced by MODEMS in data communication, which provide a similar but advantageous functions. Dashes shown in the above table mean not stated.

As far as responses for this survey are concerned, vendor 03 seems to provide most of the required computer system peripherals needed in library environments.

11. If library and information institutions in the country would like to install LANS or WANS in their systems, what advice can you give in terms of hardware and software specifications?

Vendor 03 provided a more valuable and specific recommendation which included the following:

1. Allow plenty of RAM in the server, at least 8 MB
2. Use a fast 16 bit NIC in the server
3. Allow large hard disk drive 320 MB at least
4. Go down the Windows route, selecting all software with windows based application.
5. Pinboard for Windows is an excellent EMAIL system.
6. Consider Lantastic peer to peer NOS (Network Operating System) for small networks and Novell for larger systems.
5. Use diskless workstations for security using a boot ROM on the NIC.

Other vendors agreed generally on a requirement for a large disk capacity, fast processor speed, large random access memory (RAM) and a software that can cater for the network. 8 bit, 16 bit, and 32 bit microcomputer systems can be provided by vendor organizations in Malawi. Also 20 MHz to 33 MHz processor speed computer systems are available in Malawi.

The choice of a vendor system will require consideration of other factors in addition to those stated in this survey. These include:

1. Compatibility of the new system with the already existing systems in similar institutions in the country in order to promote resource sharing through data exchange.
2. Compatibility of the computer system with the existing telecommunication devices such as MODEMS and Posts and Telecommunication protocols in Malawi.
3. Compatibility of the system to work with the selected application software such as Micro CDS/ISIS
4. Capability of the system to do what suppliers claim it can do. This can be verified by testing the system in the given environment.

On this issue vendor 02 stated that customers are provided with an opportunity to test the suitability of the system by working with it in their environments for a period of about a month before deciding to buy it.

8.2 IMPLEMENTATION PLAN

8.2.1 Financial Resources

In 1991/92, the NLS operated at a budget of K1,612,480 (Accountant Report, 1992). The sources of income in this budget included donations which accounted for about 16.10% of the total budget (donation included

cash for a specific project, video equipment and book donations). Apart from the government subvention (75.63% of the total budget), other income sources included local grants, staff house rents and other unreliable sources such as pension recoveries, interest on advances, lost books recoveries, fines for overdue books and hire of hall. Details of financial sources are given in chapter 2. Of the total operating budget, the total recurrent expenditure was about 93.35%. Considering the following points (1) about 24.37% of the total operating budget is from unreliable sources; (2) the minimum and maximum cost of a single computer system is 0.62% and 9.93% of this total budget; (3) about 93.35% of the budget is the total recurrent expenditure, then it is not feasible that the project of developing a computer based system in the NLS can be undertaken based on its annual budget.

The most feasible approach is to consult the NLS donor organizations. As the donors have approved previous proposals and funded the projects, this can be one of the projects to be presented. It has to be recalled that CODE has already sponsored a project for desktop publishing in the NLS so that there is a UNISYS microcomputer installed for this purpose.

8.2.2 Requirements of the New System

It is proposed that a pilot computerization project be implemented at the NLS headquarters library because this is the coordinating centre of all NLS services in the country and such activities as acquisitions and cataloguing, drawing project proposals and their implementation is done centrally here.

8.2.2.1 Hardware Required

8.2.2.1.1 File Server

The NLS will require a maximum of about 300 MB of hard disk storage capacity according to the calculations and requirements stated above. A minimum of about 60.5 MB will be required for conversion of the card catalogue into MRF. Procurement of a server of not less than the above storage capacity is recommended. The Server should also have (1) a RAM of not less than 4 MB; (2) 33 MHz and 16 bit or more processor speed (3) 16 KB or more of cache (4) can accommodate additional mass storage devices such as tape back-up, CD-ROM drives, second 3.5-inch or 5.25-inch diskettes; and (5) should have standard features such as parralel printer port, and expandable serial ports.

8.2.2.1.2 Diskless Personal Computers (PCs)

The following terminals with a microprocessor of about 640 KB RAM, 25 MHz and a disk drive of either 3.5-inch or a twin disk drive of both 3.5 -inch and 5.25 -inch will be required in the following departments.

Technical Services Dept. : 2 terminals

. To cater for the volume of acquisition and cataloguing work.

Extra-mural Services Dept. : 2 Terminals

. One to be used in the postal services section and the other in the School/Rural services.

Circulation Dept. : 4 Terminals

. 3 dummy terminals for on-line searching to public access catalogue.

. 1 dummy terminal to be located in the reference section for on-line searching.

. 1 diskless PC to be located at the circulation desk for searching databases on-line, facilitate Question Answer Service and for report processing and production.

Accounts Dept. : 1 Terminal

. One PC for creation and processing of accounts records in MRF.

Management Office : 1 Terminal

. One PC for management information storage, retrieval and processing.

6 Branch Libraries

. One stand alone PC system for each branch library for local information storage and retrieval and data processing.

8.2.2.1.3 Peripherals

1. Printers

. One **laser printer** located in the central computer room to cater for all printing activities in the NLS system.

. One **line printer** to be located in the National Librarian's office to cater for management confidential reports printing.

. Six **line printers** one for each of the branch libraries.

2. Back-up Devices

. One magnetic tape drive and magnetic tapes for back-up copies of the database.

3. Diskettes

. Several diskettes will be required for offline storage of records.

✓

4. A MODEM will be required for wide area networking at the advanced stages of computerization of library systems in Malawi, to facilitate on-line search in databases of other library systems and communication through e-mail.

5. CD-ROM Drives

. One CD-ROM drive will be required in order to provide on-line search to databases on optical disks. Most CD-ROM databases are distributed with a search software integrated in it. Phillips or IBM CD-ROM drives are the most used in Malawi but this paper recommends Phillips, Hitachi or Sony CD-ROM because they are compatible.

The NLS will have to subscribe to some CD-ROM databases that can prove valuable to its user group. Some specialized centres in Malawi already use CD-ROM databases, and it is desirable that the NLS, through the ILLS network, take advantage of this in serving its clientele.

6. Uninterrupted Power Supply (UPS)

The survey on use of computer systems in libraries in Malawi showed that one of the problems faced is unstable electricity. An UPS will be needed at the NLS headquarters to alleviate the problem. Other units will need at least voltage stabilizers and spike controls.

7. Other Neccessities

Tape/disk storage racks, coaxial cables for interconnecting computers in a network, etc, will also be needed. Costing of these devices can be best done by the vendor organization. The library will only have to present its requirements to them.

8.2.2.2 Software Required

8.2.2.2.1 Micro CDS/ISIS

Micro CDS/ISIS will be used to develop different files in the NLS database(s). A prototype integrated database has been designed and sample data records have also been created for serials control as stated in chapter 7. Micro CDS/ISIS v3.0 is already available in the NLS.

This version of CDS/ISIS is networkable and therefore would promote resource sharing in the NLS LAN system.

8.2.2.2.2 Dbase IV

dBase would be required for development of accounts records database and management record database. Dbase is both menu and command driven which makes it easier to learn and version 4 has Clipper which is an advanced programming tool. Generally, Dbase has good features for reports production and its programming language is easy to learn and use. Apart from accounting purposes, Dbase may be used to develop program modules to control some library operations.

FOXBASE is also recommended. It is faster, more powerful and has better programming features (in creating relational databases) than dBase IV.

8.2.2.2.3 Word Perfect

This application software package is suitable for textual data. The NLS already has Word Perfect 5.1 for its text typing purposes.

8.2.2.2.4 PC Tools

This will be required for purposes such as formatting diskettes, checking bad sectors in corrupt diskettes, etc.

Other software packages that may be required are Harvard graphics, Lotus 1-2-3 (for spreadsheet work) and a statistical package such as SPSS/PC+ or SAS will be useful for generating a variety of statistics.

8.2.3 Local Area Network

A file server of the estimated disk capacity should be installed at the headquarters library and the required PCs be connected in a local area network (LAN) with the server. In the initial stages of implementation the PCs will be distributed as follows: (1) four of the dummy terminals to be located in the circulation department will be first deployed in the Technical Services

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Department to be used together with the other two PCs, for conversion of the card catalogue and for cataloguing of new acquisitions in MRF. This implies that the Technical Services Department will initially have 6 terminals; (2) two in the Extra-mural Services Department; (3) one in the National Librarian's office; (4) one in the Accounts Department; and (5) one in the Circulation Department. All files created in the various departments will be stored in the server through sharing of storage space. The National Librarians files and accounts records will be created and stored in the same server using passwords to discourage unauthorised use of such records.

CDS/ISIS v3.0 and Dbase IV, word perfect 5.1, PC Tools, etc, are both networkable and these shall be easily shared in the LAN system, accessible from any workstation in the system.

8.2.3.1 LAN Network Software

Novell Netware is the recommended software for the NLS network management.

8.2.3.2 Network Structure

A star network structure using coaxial cabling system is recommended. The advantage of this network structure is that if a cable connecting one PC to the server

develops a fault, other PCs in the network will not be affected. The star network structure is shown in chapter 3, fig 3.3

8.2.4 Manpower Requirements and Training Resources

The new system will be run by the existing NLS personnel. The available professionals and para-professionals in each of the departments will have to be trained in the application of the computer system in their operations. Additional staff may be deployed in the Technical services department or new recruits would be required in this department for a certain period of time to strengthen the workforce to be involved in the conversion of the card catalogue to an on-line catalogue in MRF.

Academic institutions offering information technology courses mentioned in chapter 1 can be used as sources for new recruits or the conversion work can be contracted out during vacations or for providing hands-^{on}~~no~~ experience to the trainees. In turn libraries in Malawi will be able to utilize the output products from such courses.

However, the major strategy on manpower resources is utilization of the existing NLS staff. To effectively make use of the existing manpower will require selecting a few individuals and sending them to the existing computer technology training courses in Malawi. These may

later be resource persons for in-house training of using computers for library applications. Several computer training courses exist in Malawi. For instance the Data Processing Department Computer Training Centre in Blantyre offers the following courses which libraries can make use of:

Courses	Price	
	<u>Res.</u>	<u>Non-Res.</u>
Computer Appreciation for Managers	K710	K530
Introduction to Micro Computing	K710	K530
Introduction to Word Processing	K1420	K1060
Advanced Word Processing	K1420	K1060
Introduction to Lotus 1-2-3	K1420	K1060
Advanced Lotus 1-2-3	K1420	K1060
Introduction to dBase IV	K1420	K1060
Advanced dBase IV	K1420	K1060
Data prep. and Data Control Procedures	K710	K530
Working with DOS	K710	K530
Using a Novell Local Area Network	K710	K530
Novell Local Area Network Administration	K710	K530
Working With Windows	K710	K530
Introduction to WordPerfect for Windows	K990	K760
Introduction to Lotus 1-2-3 for Windows	K1420	K1060
NCC Certificate in Systems Anal. & Desig.	K7750	K6900
NCC Diploma in Computer Studies	K13500	K8736

8.2.5 NLS Database Development Procedure

Six terminals will be used for data entry in order to facilitate conversion of the card catalogue to MRF. Assuming that a data entry person is able to create 10 records in one hour in MRF by data entry through keyboard, in 8 working hours in a day he can create 80 records. Six data entry clerks working on the six terminals located in the Technical Services Department will be able to create $80 \times 6 = 480$ records in a day. In 26 working days in a month and in 12 months in a year they will be able to create $480 \times 26 \times 12 = 149760$ records a year. A card catalogue containing 200,964 records and an additional 21292 records added annually to the collection would take $222255/149760 = 1.484$ which is less than 1.5 years maximum. The records created will need to be verified, which can take about 50% of the time and effort taken to create the records. In actuality it would take less than this time because not all records will be created through keyboard entry. There are several bibliographic sources in MRF which can be used for this purpose by searching and downloading the retrieved records.

The Extra-mural Services Department and other departments would be simultaneously creating their records in MRF. Concurrently, other services such as SDI and development of the non-book materials database will

Activities 1-6 include:

- 1 = NLS database Development (Monographic and
serials catalogue, Users, Institutions,
etc).
- 2 = On-line Search of the NLS catalogue
- 3 = SDI Service Implementation
- 4 = ILLS Implementation
- 5 = Automated Circulation System (Circulation
Program Implementation)
- 6 = NBM Database Development

8.2.7 System Management

The new system will require a Computer System Supervisor who will be responsible for database management, user technical support and user operations support. Technical support is basically concerned with ensuring that the hardware continues to operate properly. This includes not only routine tasks of maintenance and cleaning but help in the procurement of consumables such as floppy disks, printing paper, ink, etc, reconfiguring and upgrading machines, and fault detection and correction. While operations support is basically concerned with helping the users of devices such as Workstations, Personal Computers and Word Processors. The help takes form of assistance in the installation and use of applications packages and interactive software,

training in the correct use of devices, media and software, and dealing with problems and queries as they arise (Oliver et al, 1991, p305).

The System Supervisor requires to have a sound knowledge of the structure of the database and the database management system (DBMS). The supervisor must be one who is conversant with the NLS, its systems and the information needs of the institution. Responsibilities of the supervisor will include the following:

1. The data in the database meets the information needs of the NLS.
2. To ensure that the facilities for retrieving data and for structuring reports are appropriate to the needs of the NLS.
3. Provision of manual for users describing the facilities the database offers and how to use them.
4. Preparation of data dictionary if required.
5. To supervise addition of new records, deletion of unwanted records, amendments of records, addition of new files of data, addition of new fields to records already present in the database, etc.
6. Security and privacy of the database
7. Periodic appraisal of data held in the database, to ensure that it is complete, accurate and not duplicated.

8. Periodically taking back-up copies of the database on magnetic tapes and remote storage of such tapes in secure locations.
9. Prevent unauthorised copying of data or software packages and exchange of diskettes with other systems which might introduce disk virus from other systems.

8.2.7.1 Database Security and Privacy

Close supervision and high standards of discipline are required to ensure durability of the computer system. Accesses to the central computer room housing the server, and other peripherals or unused consumables, should be restricted to operating staff and the room should have necessary security provision.

A tape/disk library may be located in the room. File security measures are very essential noting the following issues: (1) vital and irreplaceable files shall be backed-up and stored on magnetic tapes and disks; (2) Reels of tape or disks, are physically identical and therefore if no labeled, can be confusing to the NLS operation staff or any intended user; (3) the common practice of re-using tapes and disk by "over-writing" with new data can, if not properly controlled, result in the loss of files; (4) magnetic storage media are very easily damaged by an unsuitable environment.

To remedy these issues the following will be practised: (1) Tapes and disks must be clearly labelled with a unique reference number. (2) A register shall be kept indicating contents of each tape/disk. (3) Tapes and disks shall be kept in a suitable arrangement on appropriate racks stored in a special library.

8.2.7.2 Confidential and Delicate Files

Since the installation will be completely in-house and a number of users shall have to access the databases in a single server via terminals located in different departments, access to confidential files of the database shall be provided through a system of passwords.

8.2.7.3 System Working Environment

Good working conditions of the computer system are essential to maintain durability and smooth operation of the system. The computer room will therefore require provision of the following:

- (1) adequate fire fighting appliances.
- (2) adequate working space
- (3) heating and lighting
- (4) air conditioning

- (5) availability of UPS device to control problem of unstable electricity. This is an expensive device and is therefore optional.

8.2.8 System Evaluation

The new system will have to be evaluated periodically in order to find out if it is achieving the objectives of the project.

8.3 PROPOSAL FOR WIDE AREA NETWORKING

Upon successful implementation of the pilot project at the NLS headquarters library, the six branch libraries will be provided with the specified computer systems for local information storage and retrieval and local data processing. A WAN network would then be required, networking all the branch libraries using the existing telephone lines and modems. This will require knowledge of data communication protocols held by the Ministry of Transport, Posts and Telecommunications in Malawi and determination of the volume of data transfer required within the WAN and whether this data volume will be compatible with the existing cabling system.

Other library and information institutions using computer systems should also participate in the WAN. This is why compatibility of computer systems is of vital importance in resource sharing and data exchange by electronic means eg e-mail. The WAN system can improve other services such as ILLS, and exchange of bibliographic information on-line.

CHAPTER NINE

CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

There is a need for augmenting the application of computers to manage and control library and information systems in Malawi. The survey of use of computers in library and information systems in Malawi (chapter 6) has revealed that information technology use in the majority of institutions is limited to word processing applications. Very few institutions have been able to utilize the available technology for database development and management and for providing services to users. Several reasons were identified which included: (1) inadequate IT facilities in the institutions, most of the institutions surveyed possessed a single PC system; (2) librarians lack the required knowledge and skills in the use of computer systems in their professional duties; (3) inadequate availability of training courses in the use of computers specific to library applications. However, there is a widespread awareness among the librarians and information scientists in the country of the capability of IT and softwares such as micro CDS/ISIS for information storage and retrieval. Most institutions having a computer system are participating on a cooperative basis to establish a union catalogue of

serials, whose database is resident at the National Documentation Centre.

The survey of computer systems available in Malawi in vendor organizations (chapter 8), showed that there are systems available in the country with adequate storage capacities to handle storage and retrieval of bibliographic information. Peripherals that may be required in library environments for provision of specialised information services are also available. What is not available in the country is the range of already made application softwares specific to library and information operations such as circulation control, available at a cost in the developed countries. However, there is an application software development firm in Malawi which can be contracted to prepare a program to solve a specific library problem or programmers who can be employed on a full time basis can also prepare similar programs.

User survey of the proposed SDI (chapter 7 section 7.4.8) has also revealed a commendable interest of users in the provision of the service. However, an effective country-wide SDI service can best be provided by using computer-based systems. This implies that application of IT in library and information institutions in Malawi can ensure adequate satisfaction of the information needs of the community.

The systems analysis of the National Library Service (chapter 5) has revealed some inadequacies of the existing system. An automated system is considered in this thesis as an appropriate system that can help address some of the inadequacies (see chapter 6). The NLS has the potential to take up a computerization project through donor agencies who have assisted the organization in its earlier development project proposals. Adequate utilization of IT in the NLS would improve management and control of its services, ensure the organization's participation in future networking systems in the country and in Africa as a whole, promote resource sharing and maximize utilization of available resources within the NLS, ensure participation in sharing and timely provision of information resources with other library and information systems in the country; and the NLS would also be able to provide specialised user-oriented services.

9.2 RECOMMEDATIONS

Based on the findings, this thesis strongly recommends the following: (1) project proposals in library and information systems should be oriented to procurement and use of computer systems; (2) Services in these institutions should emphasize on provision of user-oriented services such as SDI, CAS, Q/A, etc and the

use of compatible computer systems; (b) cooperation in the development of data bases such as union catalogues, referral data bases etc,; (c) sharing of information resources through exchange of information products, Inter-Library Loan Service network, establishment of a Local Area Network so that available resources within an institution can be efficiently utilized, and Wide Area Networks so that different systems can easily communicate and data transfer can be facilitated, bearing in mind that information is for use, is sharable and transferable.

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APPENDIX I

Regional Library South

P.O. Box 30074

Chichiri

Blantyre 3

15th July, 1992

Dear Sir/Madam,

I am a Graduate Student in the School of Information Studies for Africa (SISA), at Addis Ababa University, Ethiopia, conducting a research on :

" A COMPUTER-BASED LIBRARY AND INFORMATION MANAGEMENT SYSTEM FOR THE NATIONAL LIBRARY SERVICE OF MALAWI : A PLAN AND STRATEGY FOR IMPLEMENTATION"

This questionnaire is part of the research concerned with a survey of "Application of computer systems in library and information institutions in Malawi".

Would you please fill out the attached questionnaire and return it to me by 30th August, 1992 using the enclosed envelope which contains my address and a postage stamp.

Thanking you in anticipation of your favourable assistance.

Yours Faithfully,

Sandy Kachale

SURVEY OF APPLICATION OF COMPUTER SYSTEMS IN LIBRARY AND
INFORMATION INSTITUTIONS IN MALAWI

QUESTIONNAIRE

PART 1: GENERAL INFORMATION

1. Name of the institution _____

2. Name of the information system (Library, Documentation
or information centre) _____

Address _____

Telephone _____

Telex _____

Fax _____

3. If your information system is a library to which
category does it belong? (Please tick one)

Academic Library Public Library

Special Library School Library

Other (please specify) _____

4. Type of Documentation activities

Bibliographic Sectoral

Numeric Multisectoral

Referral Other (please specify) _____

5. Type of user services provided
- Current awareness services
 - Bibliographies
 - Selective Dissemination of information
 - Online Searches
 - Others (Please specify) _____
6. Classification system used
- Library of Congress
 - Dewey Decimal Classification
 - Universal Decimal Classification
 - Colon Classification
 - Others (Please specify) _____
7. Subject Heading List used
- Library of Congress
 - Sear's List
 - Others (Please specify) _____
8. Types of Indexing
- Subject Author
 - Keyword Title
 - Descriptor Geographical
 - Others (Please specify) _____
9. Thesaurus used _____
10. Do you feel that your information system meets needs of your users?
- Yes Partially No

11. If the answer to question 10 is NO or PARTIALLY, what other sources of information do you use to meet user needs.
12. If you get materials from other sources, how long does it take to get them?
- 1-7 days 8-15 days
- a month more than a month

PART 2: COMPUTER FACILITIES

13. Does your information system use computer facilities?
- Yes No
14. If the answer to question 13 is NO, are there plans to computerize your information system?
- Yes No
15. Please describe the computer facilities used by your information system.

MAINFRAME COMPUTER

Make/Model _____

Main Memory _____

Operating System _____

Disk units _____

Tape units _____

Disc capacity _____

Date installed _____

MINICOMPUTER

Make/Model _____

Main Memory _____

Operating System _____

Disk units _____

Tape units _____

Disc capacity _____

Date installed _____

MICROCOMPUTER

Make/Model _____

Main Memory _____

Operating System _____

With Hard Disk? Yes No

16. Are your microcomputers Stand Alone or
Networked

17. Does your institution have any CD-ROM drives?
 Yes No

If YES please describe them in terms of make/model.

18. For what purpose does your information system use
computers?

Bibliographic/Library database management

Word processing

Management information system

Others (please specify) _____

19. If the computer facilities are being used for bibliographic purposes, what software do you use?

CDS/ISIS for serials

MINISIS

Dbase

Others _____

20. Currently do you have any on-line access to remote databases?

Yes No

PART 3. PROBLEMS

22. What kind of problems do you encounter in the use of computers in your information system?

a) Equipment related problems

Lack of or inadequate peripherals (printers and their accessories, tape drives, etc.)

Lack of software

Inadequate computer memory

Slow processing speed

Lack of spare parts

lack of maintenance

Environmental conditions (unstable electricity,
heat, humidity, dust, etc.)

Others (please specify) _____

(b) Personnel Related Problems

Shortage of trained staff

Lack of training opportunities in
hardware/software use.

Others (please specify) _____

22. How were staff trained in use of computers?

Locally

Abroad

23. Do you feel that use of computers has improved your
information system operations?

Yes No

Give a reason for your answer _____

APPENDIX II

SURVEY OF USER PROFILE FOR SDI SERVICE IN MALAWI

QUESTIONNAIRE

1. SURNAME _____ OTHER NAMES _____

2. NATIONALITY _____ SEX [] male [] female

3. PERMANENT MAILING ADDRESS _____

Telephone:

Office _____

Home -----

4. MAIN FIELDS(s) OF SPECIALIZATION

(Please describe briefly the nature of your work)

5. DESCRIPTION OF THE TOPIC(s)

(Please describe in detail your specific field of interest in which you would like to receive a regular update).

6. AFFILIATION

(Please give the name and address of the institution where you are currently working).

7. AFFILIATION CODE (Please give the institution's acronym).

THANK YOU FOR FILLING OUT THE QUESTIONNAIRE

APPENDIX III

SURVEY OF COMPUTER VENDOR ORGANIZATIONS IN MALAWI

QUESTIONNAIRE

PART 1. GENERAL INFORMATION

1. Name of the organization _____

Address _____

Telephone _____

Telex _____

Fax _____

2. When was the firm/company established in Malawi? ____

3. Is the firm/company a subsidiary or an agent of
another company? _____

4. Please name its parent organization and where it is
located (if applicable).

PART 2. SERVICES

5. What services does your organization offer in Malawi

[] Consultancy

[] Training

- Sale of hardware
- Sale of software
- Hardware/software maintenance
- Sale of hardware spare parts
- Others (Please specify) _____

6. What types of computer hardware do you market in Malawi?

- Mainframe computers
- Minicomputers
- Microcomputers
- Others (please specify) _____

7. The computer hardware that you sell in Malawi is it imported as a whole or is it assembled in the country?

8. Please give below the different computer software that you sell and their prices.

9. Please give below the types of computer hardware that you sell in terms of Make/Model, Operating system, Disk capacity and their prices.

10. Do you provide computer system installation services. If yes, what is the range of installation costs.

11. Do you provide maintenance services to your systems? If so, under what condititons.

12. If you provide training services of computer systems, please give the types of training, cost and duration.

APPENDIX IV

LIST OF INSTITUTIONS/ORGANIZATIONS SURVEYED

A. SURVEY OF APPLICATION OF COMPUTERS IN LIBRARY AND INFORMATION INSTITUTIONS IN MALAWI.

1. Bunda College of Agriculture Library
Box 219, Lilongwe.
2. Chancellor College Library
Box 280, Zomba.
3. Chitedze Agricultural Research Station Library
P.O. Box 158, Lilongwe.
4. Malawi Bureau of Standards Library
Box 946, Blantyre.
5. Malawi College of Medicine Library
P/B 303, Blantyre.
6. The Malawi Polytechnic
P/B 303, Blantyre 3.
7. National Documentation Centre
Box 30745, Lilongwe 3.
8. National Library Services
Box 30314, Lilongwe 3.

B. SURVEY OF COMPUTER VENDOR ORGANIZATIONS IN MALAWI

1. Computer Sales and Services in Malawi
Box 1445, Blantyre.
2. UNISYS
Box 934, Blantyre.
3. Xerographics
Box 5052, Limbe.

APPENDIX V

LIST OF PERSONS THAT PROVIDED INFORMATION

1. Alide Y. P/B 303, Blantyre 3.
2. Bagshaw C. Box 5052, Limbe.
3. Campbell C.J. Box 158, Lilongwe.
4. Chigona W.M. Box 2630, Blantyre.
5. Chikuse H.T. Box 30644, Blantyre.
6. Chilunga F. Box 2225, Blantyre.
7. Chilunga T.G. Box 5748, Limbe.
8. Chipeta J.E. Box 77. Blantyre.
9. Chipinda Phiri C.G. Box 2165, Blantyre.
10. Chuma J. Box 30745, Lilongwe 3.
11. Daudi A.T (Dr). Box 5748, Limbe.
12. deQueiros K. Box 415, Blantyre.
13. Faiti D.E.O. Box 480, Blantyre.
14. Girachi B (Dr). Box 728, Blantyre.
15. Gunda B.H.M (Dr). Box 11, Thondwe.
16. Gunde B.F. Box 241, Lilongwe.
17. Ironside D.A. Box 5748, Limbe.
18. Kabambe V.H. Box 158, Lilongwe.
19. Katalama T.M. Box 407, Blantyre.
20. Kazembe P.M. Box 258, Lilongwe.
21. Khoropa C. Box 21, Blantyre.
22. Lawrie J.H. P/B 360, Blantyre 3.
23. Lesego M.E. Box 30361, Blantyre 3.
24. Lipunga D.M. Box 2047, Blantyre.
25. Mabomba R.S. Box 30314, Lilongwe 3.

26. Masanjika R. P/B 303, Blantyre.
27. Mhango J. Box 5748, Limbe.
28. Mhango G.M. (Prof). P/B 303, Blantyre 3.
29. Momba C. Box 30314, Lilongwe 3.
30. Munthali S.C. Box 5748, Limbe.
31. Muwalo E.S. Box 5748, Limbe
32. Ngwale M. P/B 303, Blantyre 3.
33. Ngwira N.C. Box 30644, Blantyre 3.
34. Nyirenda M. P/B 303, Blantyre 3.
35. Nyirenda A.K. Box 30314, Lilongwe 3.
36. Sambandam F. Box 1445, Limbe.
37. Soko M.M.M. Box 5748, Limbe.
38. Zulu P.N.H. Box 5748, Limbe.
39. Zambezi B.T (Dr). Box 158, Lilongwe.

