ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

SCHOOL OF INFORMATION STUDIES FOR AFRICA

AN ACADEMIC RESOURCE CENTRE IN THE UNIVERSITY OF MALAWI: ITS NEED AND A PLAN FOR ITS DEVELOPMENT, TOGETHER WITH PROTOTYPE DATABASES.

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

BY

VOTE DUNCAN SOMBA

JUNE 1993

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15 May 1993

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

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31 May 1993

To my beloved auntie, Ate Auntie Mary Somba, with love.

Assistant all of Chancellor College, who assisted me in the distribution of questionnaires to researchers and teaching staff, and in the collection of the returns.

Thanks are also due to the following organizations and institutions that provided me with assistance in various forms.

University of Malawi, Chancellor College; Pan African Development Information System and the International Livestock Centre for Africa in Addis Ababa.

ABSTRACT

The Academic Resource Centre (ARC) discussed in this thesis is an information facility designed to provide information support for the efficient and effective performance of the statutory and public service functions of the University of Malawi and its associated institutions and organizations including related government departments, parastatals, research centres etc. It is conceived as an information centre forming an integral part of the university college and institutions associated with higher learning and research in Malawi.

The ARC will utilize viable information technology in conjunction with manual methods. Pre-planning studies undertaken include: a review of trends in information technology (IT), a survey of accessibility to IT in Malawi, an assessment of the existing information support systems of the University of Malawi and their inadequacies in relation to the information and data needs of the variety of users of the academic and research community and the related government and parastatal organizations. Based on the findings, plans to develop the ARC and steps to implement the plans are proposed. The ARC is conceived as a networking of

information systems within the university and the associated institutions as well as of appropriate institutions in the country and abroad. The ARC plan outlines the requirements in terms of manpower, systems design and implementation. Libraries and information centres which could participate in the ARC network are mentioned.

A set of integrated databases consisting of: bibliographic records; information on curriculum development, academic prospectus etc; profiles of experts and institutions; of databases and information systems; of ongoing projects and researches in the University of Malawi, Government and other selected research institutions, is presented as prototypes for the databases to be developed at the ARC. Data entry guideliness are also provided.

Training facilities for IT personnel are not adequate in the country and it has led to under-utilization of equipment and heavy reliance on vendor service support for the systems. Some suggestions are made in overcoming this problem.

Introduction of IT in libraries, documentation and information centres in the country is slowly gaining ground and currently is largely being applied in special

libraries and to a certain extent in academic libraries as well. However, IT applications to generate information products and services is currently limited to word processing and in-house bibliographic database management. Emerging ITs, such as CD-ROM, networking and desktop publishing, are yet to be widely used in Malawi. The need for developing national databases to capture and disseminate information generated in the country is emphasised.

PART THREE

Chapter 9 analyses and comments on the results of the survey on the information needs of teaching staff, researchers in selected research centres and decision makers in selected government departments. Chapter 10 analyses and comments on the findings of the survey on the applications of IT in libraries, and information centres in Malawi.

PART FOUR

Chapter 11 analyses the existing systems in the University of Malawi and proposes planning for an Academic Resource Centre and the design of prototypes of databases that could be developed by the ARC to generate information products and services. Chapter 12 presents conclusion and recommendations.

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LIST OF ABBREVIATIONS

ADMARC: Agricultural Development and Marketing Corporation

AGRIS: Agriculture Information System

ALA: American Library Association

ARSO: African Regional Organization for Standardization

ARC: Academic Resource Centre

ASUTECH: Anambra State University of Technology

BOLD: Bibliographic Online Display

CARS: Chitedze Agricultural Research Station

CD-ROM: Compact Disk Read Only Memory

CDS/ISIS: Computerized Documentation System/Integrated Set of Information System

COBOL: Common Business Oriented Language

CODE: Canadian Overseas Development trough Education

DREA: Department of Research and Environmental Affairs

DSS: Decision Support System

DTP: Desk Top Publishing

ECOWAS: Economic Commission for West African States

EDSAC: Electronic Delay-Storage Automatic Computer

ENIAC: Electronic Numerical Integration and Calculation

ESAMI: Eastern and Southern Africa Management Institute

FAO: Food Agriculture Organization

FORTRAN: Formula Translator

FRIM: Forestry Research Institute

GDP: Gross Domestic Product

IBM: International Business Machine

ICL: International Computer Limited

IDRC: International Development Research Centre

ILCA: International Livestock Centre for Africa

ISS: Information Support System

IT: Information Technology

ITU: International Telecommunication Union

JC: Junior Certificate

LAN: Local Area Network

LIBPLAN: Library Manpower Planning (Software)

LSI: Large Scale Integration Circuits

MAC: Multiple Access to Computer

MALA: Malawi Library Association

MANEB: Malawi national Examination Board

MCDE: Malawi Centre for Distance Education

MFIS: Materials Flow Information System

MIE: Malawi Institute of Education

MIM: Malawi Institute of Management

MIS: Management Information System

MSCE: Malawi School Certificate of Education

NAM: National Archives of Malawi

NATIS: National Information System

NCR: National Cash Register

NDC: National Documentation Centre

NLS: National Library Service

NSO: National Statistical Office

OCR: Optical Character Recognition

ODA: Overseas Development Association

OPC: Office of President and Cabinet

PADIS: Pan African Development Information System

SADCC: Southern Africa Development Cordination Conference

SDI: Selective Dissemination of Information

SDC: Systems Development Corporation

UNDP: United Nations Development Programme

UNECA: United Nations Economic Commission for Africa

UNESCO: United Nations Educational Scientific and Cultural Organization

UNIMA: University of Malawi

UNIVAC: Universal Automatic Computer

UO: University Office

UOML: University of Malawi Libraries

UPE: Universal Primary School

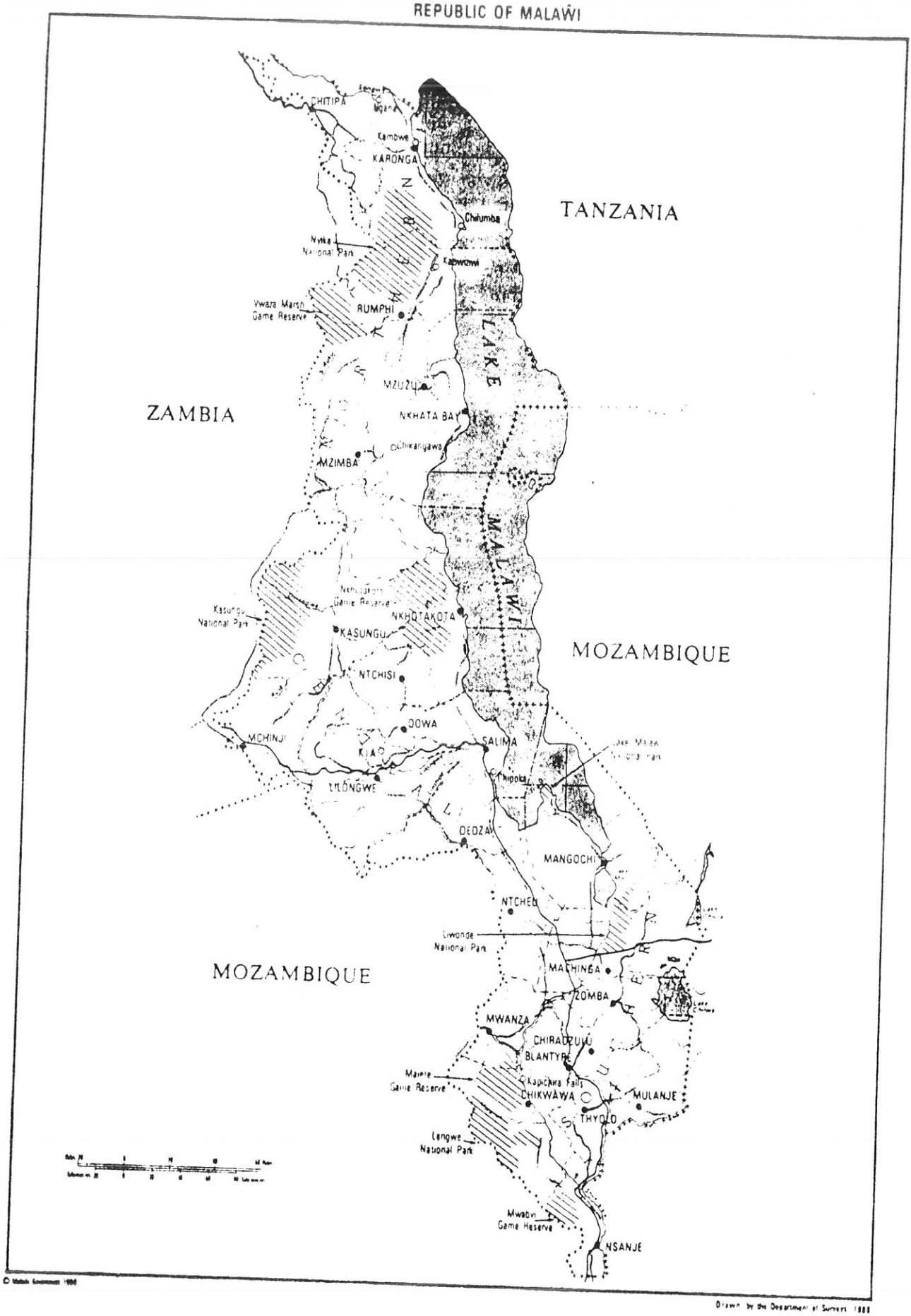
USIS: United States Information Service

WAN: Wide Area Network

WORM: Write Once Read Many Times

WRU: Western Reserve University


AFRICA — AFRIQUE
MAROC
ALGERIE
LIBYAN ARAB JAMAHIRIYA
EGYPT
MAURITANIE
MALI
NIGER
TCHAD
SUDAN
SENEGAL
GUINEE
NIGERIA
ETHIOPIA
CAMEROUN
KENYA
ZAIRE
ANGOLA
ZAMBIA
NAMIBIE
BOTSWANA
SOUTH AFRICA
LESOTHO
MADAGASCAR
CAPE VERDE
SEYCHELLES
REUNION
MAURITIUS



Drawn by the Department of Surveys 1988

PART ONE

CHAPTER ONE

INTRODUCTION

1.1 INFORMATION AS A SURVIVAL NEED

Every living organism has needs, the satisfaction of which is necessary for sustaining the organism's life and for its development. This applies especially to the human beings. One of the most important of these is the need for information. Human beings are complex, adaptive, cybernetic systems. Such survival through adaptation is based on timely availability of accurate information of the changing characteristics of the environment.

1.2 BACKGROUND AND JUSTIFICATION

The collection, processing, and communication of information, goes back in time much beyond the present micro-electronics. The term technology also dates back to the earliest existence of man when it assisted man in practical tasks of handling information such as cave drawings, paintings, making pictures etc. (Mckee:1985). All these helped man to symbolize, record and pass information across space and through time.

Using transport man was able to distribute information through space and time. The search for better ways, to manage information, has gone through various stages of changes and improvements and the technology being used in the processing of information has advanced at a fast pace in the last five decades. Developments in information technology (IT)- computer, telematics and electro-optic technologies. These include: the microchip; significant increases in the storage capacity and reduction in the cost of electronic data storage of developments in electro-optic media, such as CD-ROM; increases in the computing and information processing power of micro-and mini-computers; time sharing capabilities; development of telematics and powerful portable, relatively low cost software package for the small computers. These have facilitated flow of information and access to information and data.

In today's world, it is obvious that there can never be a meaningful socio-economic development without a sound information base for planning.

In essence modern society depends on information. "Information is a resource and like other resources... oil, ore, crops etc. Its value can be enhanced by processing. Unlike other resources that are finite in supply and easily exhausted if used imprudently, the amount of available information tends to increase over time, often at a geometric rate (Zwangobani E:1988). As the reserves of information grow, so does the need for more efficient means for processing it. The sheer quantity of the raw data now available in areas such as agriculture, business, education, energy resources, and government is well beyond the ability of the human mind to process, at least within a reasonable time.

Computer technology makes it possible to collect, store, manipulate, transmit and disseminate information at phenomenal speed compared to manual methods.

Until recently the computer was affordable only to a few. Only in the last decade, with the introduction of microcomputer-based technologies, has the cost of owning and operating a computer decreased significantly. Microcomputers are now penetrating regions and sectors where computer had not been known before.

Developments in telecommunications, with the improvement in telephone communications via satellites, use of optical fibre etc. have greatly improved the ability to communicate information over long distances, thus enabling information systems disseminate information through networks and access to remote databases.

Microcomputer based technologies and associated software programs, offer a broad range of applications, for solving some of the problems related to information management. Their very availability, however imposes in turn the need to develop a viable information services sector that can use the technologies effectively.

1.3 INFORMATION TECHNOLOGY AND DEVELOPMENT IN AFRICA

In Africa the adoption of information and communications technologies has proceeded at a relatively slow pace, due in part to the severe economic crises that most African countries have experienced in the last decade. Part of Africa's lack of development over the years, may be is attributed to the information poverty, which has characterized the socio-economic development

planning efforts of many of these countries, since their attainment of political independence. The prevailing situation is not because the planning environment of these countries lack data on which they could base various meaningful socio-economic planning exercises. On the contrary the problem has been the ~~of~~ inability of African countries to develop and maintain appropriate infrastructures for data generation and use.

In this situation, is the progression to informatics- based tools possible? If so, given the present limitations of financial resources, manpower and infrastructure how can they be most effectively introduced in Africa?

The Lagos Plan of Action for the economic development of Africa, 1980-2000 published by the Organization of African Unity (1981) documents the commitment and resolve of African Heads of States as part of the process of achieving a new international economic order. The proposed strategy for attaining this objective is collaborative self reliance. This approach implies a high level of interdependence and coordination of efforts

among African countries in the planning and execution of socio-economic plans and projects. The regional and international organizations in Africa will rely on their respective human, material, and other resources for the evolution, planning and execution of various policies, programmes and projects aimed at achieving some level of socio-economic development in the continent.

This initiative by Africa's leadership derives from some earlier initiatives (Adedeji, 1983) designed to change the picture of the sad state of the continent's economy is characterized by:

(1) Continued underdevelopment as demonstrated by the inability of these countries to provide the basic necessities of life for their citizens.

(2) Continued exploitation of the material/mineral and human resources of the continent by industrialized countries.

(3) Structural weakness in the productive sectors of Africa's economy and

(4) The continents overdependence on the export of basic raw materials and minerals for survival.

This poor performance of the African economy points to a significant missing link in the development equation of nations in the continent. The missing link is the information which development planners in these countries require as an input for making gainful decisions, planning, projects implementation and monitoring. Falae (1988) confirms this assertion when offering solutions to the problems associated with the dearth of social data in Nigeria. Thus, if African countries have failed to achieve socio-economic development in spite of the immense material, mineral and human resources of the continent, it is more because Africa's development programmes have not benefited sufficiently from data and information support relevant to socio-economic planning.

Similarly, authors like O'Brien and Halleiner (1983) observed correctly that the vulnerability of developing countries at the international bargaining table stem from their lack of information and expertise. Consequently these nations have often entered into bilateral and multilateral agreements which have not been in their best interests.

The traditional African society was certainly an information- based society. Records were kept of births, deaths, harvest and other significant events with symbols, markings on the wall or wood. Songs and festivals also served as reference points for recalling memorable dates of events. The trans-Saharan trade routes provided the linkage for information exchange in the continent. It also provided an avenue for transfer of technology, as well as a source for the development of new skills through the knowledge gained during the process of interaction between traders or scholars on the continent.

This state of interdependence among African societies thrived until the advent of colonialism. Chiders (1984) described the destruction of this order in the following words:

" **Peoples accustomed to trading and travelling and exchanging ideas over many centuries, now found themselves confronted either by imperial navies on the open seas, or by colonial boundaries....The historical trans-Saharan caravan routes between the**

Mediterranean and the West Africa were severed. Old, old communications lines within Africa, down its great rivers, across its lakes and by land were suddenly sliced into colonial segments. Natural lines of passage of people, ideas and goods all across the Asian land surface similarly became subject to new policy decisions made in distant European capitals. A great silence fell upon the old axes of human intellectual and commercial intercourse across the world."

The existing information and communication systems in Africa were disrupted and replaced with one which responded to the information needs of colonial administration. From that time on until independence (1950's and 1960's), the pursuit for economic and other policies were based on the interests of the colonial powers.

At the time of their respective independence, African nations inherited information systems which required some fine tuning or radical overhaul, in order to serve Africa's interests.

The inability of the African environment to effectively manage the continents information requirements, created a false atmosphere of lack of information tradition in the continent. The sum total of the position today is that Africa needs information. It must therefore develop the necessary human, material, and technological resource bases required for efficient generation and use of information.

Africa has entered its fourth development decade in a weaker economic position than any other developing region. (ECA Information Technology Report, 1991). There is no question that a dynamic approach is needed in every section to bring Africa out of its current development malaise. Information support for development is no exception to this. Solutions to Africa's socio-economic problems require a constant and adequate supply of reliable and timely information.

A dynamic approach to information sharing can contribute to re-awakening of African development, particularly through a strategy emphasising networks, information resource centres etc.

1.4 INFORMATION RESOURCES OF MALAWI

Malawi is a developing country in which much emphasis is placed on agricultural development. It has a great potential in its soil and its people are used to working on the land. It has also a climate which makes the growing of certain crops an obvious activity. As a supporting role to agricultural development the country has developed quality research institutions in all the three regions. In addition, the Government has also established an appropriate educational system such as, the University of Malawi, colleges, schools, training centres, institutes etc. Research, is being undertaken in these institutions, in the research stations and the University, but very little sharing and collaboration takes place among them. It is not surprising to find duplication of research, valuable completed research gathering dust with no one to disseminate.

A review of the provision of information, the infrastructure, and appraisal of application of information technology by libraries, information and documentation centres in Malawi, highlight a number of deficiencies in the development of information systems (Abate, 1987).

Centralised resource centres are lacking in the country. Among the information centres and libraries in the country and providing services, the notable ones are the University of Malawi Libraries (UOML), the National Archives of Malawi (NAM), Chitedze Agriculture Research Library (CARS), Department of Research and Environmental Affairs (DREA), and the National Library Service (NLS).

1.4.1 University of Malawi Libraries (UOML)

The University of Malawi is composed of five colleges which are located geographically apart and specialising in different fields. Each college has its own library with collections and services pertinent to the fields of specializations of the college. At present, there is an attempt to set up a union catalogue of the holdings of the University of Malawi Libraries (UOML) and its branch libraries. Unfortunately there is no indication that the (UOML) have made efforts to increase the utilization of its service either by on or off campus users. There is reason to suspect that the collection is under-utilized and especially the special collections such as Malawiana and government publications.

1.4.1.1 Users of the UOML

Aside from students and faculty, local and foreign researchers frequently use facilities available at the main library at Chancellor College, and to a lesser extent those at Bunda College of Agriculture. Such users are mainly interested in Malawiana and government publications. Again there is no indication of efforts by UOML to increase the number of external users and the stock. Hence, the need for a centre which will have a wider scope in those fields not covered by UOML such as information support for curriculum development; development of new courses, administrative units, just to mention a few.

Studies by expatriate staff who visited the University, A.J. Lovedy (1979) and G. Dereck (1986) reveal a need for a centralized system of resource sharing. To some extent efforts have been made to implement this. However technical and financial limitations would not make this possible for some years to come. In general, these colleges offer reading room facilities, and some reference assistance to the academic community.

1.4.1.2 User Needs

Very little has been done in terms of studying user's needs in the UOML environment. Therefore the college libraries are not providing user-oriented services such as current awareness and SDI, data for decision making, information marketing, information analysis, consolidation and repackaging, etc.

In all the colleges, there is a considerable amount of quality research being carried out but very little is known and shared. An example of this would be graduate and post-graduate thesis work. There is no register/ database of current research in progress.

1.4.2 Other Information Institutions

There are several institutions in Malawi with mandates for providing information, documentation and library services. The National Archives is responsible for enforcing the national printed works deposit legislation. As such materials published by private and Government sources have to be deposited with the National Archives.

The Department of Research and Environmental Affairs has a mandate to implement the National Documentation and Information Centre. A preliminary description of the future system has been prepared. The National Library Service has the mandate for the expansion of public libraries throughout Malawi.

1.4.2.1 National Archives

The library of the National Archives is one of the oldest libraries in Malawi dating back to colonial times. It has a valuable collection of older development literature as well as of more recent published material on social, cultural, political and development issues. Like the other centres, the National Archives suffers from a critical shortage of qualified manpower.

The National Archives posseses a large capacity microfiche/film machine which it has not been able to utilize, for lack of trained staff, among other reasons.

By virtue of its mandate as the national legal deposit library the National Archives is one of the most

important sources for published development literature and hence will be an important node in the academic resource centre.

1.4.2.2 Chitedze Agriculture Research Station (CARS)

Chitedze Agriculture Research Station (CARS) Library is the only research library which is computerized. It has a better mechanism for information processing and provision. The centre possesses IBM personal computers and CD-ROM for on-line retrieval. Undoubtedly the CARS documentation centres is the most advanced centre in Malawi in terms of the use of information technologies. It has well established relationships and information exchange arrangements with one of the colleges of the University, Bunda and other primary sources of agricultural information in the country. It is also an AGRIS (Agriculture Information System) input centre.

Unfortunately its services are limited to a small group of researchers in the field of agriculture and the collection is also relatively small.

Nevertheless the experience and capacity of the CARS documentation centre is extremely valuable in the development of other automated information systems, particularly in the agriculture sector. As such CARS should be one of the nodes in the network of the resource centre.

1.4.2.3 The Department of Research and Environmental Affairs

The Department of Research and Environmental Affairs operates a small documentation centre. The collection is not yet classified and organised . In addition, the DREA is sponsoring a proposal for a National Documentation Centre (NDC). Undoubtedly, DREA is also one of the most appropriate institutions to host the centre.

1.4.2.4 Malawi Institute of Education (MIE)

The Malawi Institute of Education is an independent parastatal organization established in 1987. It was established with particular responsibility for

undertaking research and disseminating information on such subjects as primary in-service training, and primary curriculum development. The Institute also undertakes some in-service training for a range of educational personnel. To support these objectives the Institute has a library. It has two professional staff and four para-professional staff.

In terms of IT, the library possesses 2 stand-alone microcomputers IBM PC and UNYSIS 640K, both using MS-DOS operating system. Running on these microcomputers are the following software: CDS/ISIS (Microcomputer version), word processing, Lotus 1-2-3 and MULTIMATE. Unfortunately these computers are mainly used for word processing and producing library accessions bulletins. With the establishment of the National Documentation Centre, it is hoped that they will be a computer user group, which will provide training to institutions having microcomputers. Hence institutions like these will benefit and put these computers to their full use.

The Institute is also likely to be a node in the ARC network.

1.4.2.5 ICLARM Aquaculture Project

Operates a small information centre which has about 2,300 volumes of books, periodicals and maps. The centre is manned by one professional librarian. It possesses one stand alone microcomputer IBM/PC XT with 640K memory and 30MB storage capacity in hard disk, one Epson LX-800 printer and a CD-ROM player (Phillips CM 110). Currently the computer is used for cataloguing, entering records on trial basis using CDS/ISIS, word processing and preparing accessions list bulletins for staff.

The centre searches such databases as ASFA on CD-ROM and provides services to a small community of researchers and project staff. These valuable information resources need to be shared with other researchers in the country. Therefore it should also be a node in the academic resource centre.

There are also other small departmental information units. However, in general the functions and tasks are defined for them by the needs of their respective constituents. Some of them include:

- The Malawi Commission for Unesco Library. Holds about 11,000 volumes in books, Unesco reports and periodicals. Mostly provides referral services. Currently it has not yet acquired computers but it is hoping to acquire one soon.

- The Malawi Institute of Management Library. Operates a library of relatively large size with 5,000 volumes holdings. It has a microcomputer, currently it is used for word processing.

-Forestry Research Institute Library: Holds about 5,000 volumes. It offers its services to its rearchers in the field of forestry. It expects to acquire microcomputers and CD-ROM drives very soon.

In these institutions, the country has important academic and research information sources but not widely used. The lack of expertise in information processing, storage and retrieval; information networks and low level of information technology employed; and absence of centralised resource centre to coordinate, have mainly contributed to the present state. As such planning and decision making and research management,

have frequently taken place without sufficient facts and most projections have been based on outdated or inadequate information.

Sharing and dissemination would make it possible for this data, information to be used for the development of the various institutions and the country as whole.

Indeed there is need to comprehend the vast and varied elements of information systems. This therefore needs to be seen by policy makers and planners as another important pillar on which the nation's economic activities rest.

A clear need exists for the strengthening of Malawi's information systems and one way of doing it, is by establishing an Academic Resource Centre (ARC) which will coordinate and share reliable and timely information using appropriate technologies.

Taking into consideration the resources available and user groups of the institutions, it is not unreasonable to conclude that the UOML is the most competent institution to host and manage the resource centre.

The centre should have a wide scope in terms of coverage of subject areas, services offered, types of information etc., and should be capable of capturing, processing, storing and disseminating information using appropriate modern information technology.

1.5 SCOPE AND OBJECTIVES OF THE STUDY

The objective of the present study are:

1. (a) To make a feasibility study of the application of IT in establishing an Academic Resource Centre.
   (b) Propose plans to develop the Academic Resource Centre.
   (c) To propose steps to implement the plan.

2. To set up a prototype integrated database consisting of
   (a) Bibliographic records.
   (b) Information on curriculum development, academic prospectus etc.
   (c) Profiles of experts and institutions
   (d) Profiles of databases and information systems.
   (e) Profiles of ongoing projects and researches in the University of Malawi, Government and other selected research institution.
   (f) Provide data entry guidelines

3. To propose a local area network within the ARC and a wide area network linking other selected centres and the colleges of the University of Malawi.

1.6 LIMITATIONS

The discussion and plan for the development of the ARC is restricted mainly to the University of Malawi and selected Government Ministries and Departments and selected Research Centres.

1.7 METHODOLOGY AND SOURCES OF DATA

In order to set up an Academic Resource Centre, a multi-pronged approach for gathering the necessary information was adopted. This involved a combination of literature survey, questionnaire survey, direct observation, personal interviews, discussions with different experts and in some instances through meetings.

In order to develop an integrated database, a detailed system analysis was carried out at the University of Malawi. The existing systems were studied.

1.7.1 Literature Review

The literature review involved, surveying numerous books and articles on information technology, information systems, information resource centres especially those dealing with Africa and Malawi in particular. To get the wider picture, other documents covering IT from other parts of the world were also reviewed.

Some of the major publications reviewed include: Journal of American Society for Information Science, Computers in Africa Magazine, Society of Malawi Journal, numerous papers on information technology from Pan African Development Information System (PADIS), University of Addis Ababa Library, Malawi Library Association Bulletins (MALA), publications on ILCA's information network etc.

1.7.2 Questionnaire

Four sets of questionnaires were prepared. One set for surveying the information needs of researchers, academic and administrative staff of the university, and decision makers mainly those from the selected Government Ministries and Departments.

The second set of questionnaires was for the survey of IT in the University of Malawi Colleges libraries, archives, documentation and information centres in Malawi. These were distributed to institutions with libraries and information centres.

To collect information on experts questionnaire/ worksheets were distributed to academic and administrative staff, researchers and decision makers. Worksheets for collection of information about institutions were also distributed to a large number of libraries, archives, documentation, and information centres in Malawi. This was felt necessary since the databases on experts and institutions in PADIS were found not to be comprehensive.
(Annexes 10 and 11 presents sample questionnares of experts and institutions)

1.7.3 Personal Interviews

In addition to questionnaires, interviews were also arranged with some senior information experts, librarians, telecommunications experts, decision makers (especially in Government), people from the mass media, Data Processing Unit, computer firm executives such as ICL (Malawi), the Computer Sales Service, and UNISYS (Malawi). (A list of some of the people interviewed appears in annex 1)

1.7.4 Systems Analysis

To develop an integrated database, detailed system analysis was carried at the University of Malawi. This included all the campuses of the university. Study of the existing system was done.

1.7.5 Methods of Analysis and Survey

Data and information were collected on the following:

1. The existing information infrastructures in Malawi
2. The existing IT infrastructure in the country
3. User needs of the Academic and administrative staff of the University of Malawi,researchers in various research institutions and decision makers in governments departments.
4. The application of IT to libraries, documentation and information centres.

The following are the software and methods used to process, analyze data and write the thesis.

- SPSS PC+ V2.0 was used to process the results of the two surveys carried in this study.
- Micro CDS/ISIS, software was used to produce a prototype integrated database.
- LIBPLAN: was used to estimate the manpower needs of the ARC.
- Word perfect 5.1 software was used to process the main text of the thesis.

1.8 WORKING DEFINITIONS AND SCOPE OF SOME TERMS USED

1.8.1 Africa

In this thesis Africa and Sub-Saharan Africa are used interchangeably. The discussion is mostly limited to Sub-Sahara African. It excludes South Africa and the Arab North Africa. If reference is made to North Africa, it should be understood in the context of the sentence in which it is used.

1.8.2 Information/Informatics Policy

The concepts of information policy, informatics policy, national information policy and policy on systems and services are used in the thesis interchangeably. They should be taken to mean a set of guiding principles of a strategy and programmes for the development and use of information resources, services and systems (Montviloff, 1990). Thus they are policies concerned with the dissemination of research results, subsidizing and stimulating the information industry, telecommunications,

libraries, documentation, and information centres. Archives and museums, organization of governmental information resources and computer and information literacy (Manten and Timman, 1983)

1.8.3 Information Systems and Services

Information systems include libraries, documentation centres and information centres. While information centres/services, include the provision of information and data, through information systems and networks of different types in public and private sectors (Data banks; databases; library systems, library services documentation centres services; information analysis; consolidation and repackaging centres and services; archives statistical services etc. (Montviloff, 1990)

1.8.4 Resource Centre

Refers to an information facility designed to provide information for use to support the statutory and public service functions of the University of Malawi and its associated institutions and organizations including

related government departments, parastatals, research centres etc. It is an information centre forming an integral part of the university college and institutions associated with higher learning and research.

1.8.5 Telecommunications

The International Telecommunications Union (ITU) (1986, 5) defines telecommunications as any transmission, emission or reception of signs, signals, writing, images, sound, or intelligence of any nature by wire, radio, optical or electromagnetic systems. However, the study does not discuss all the forms of telecommunications available, only some aspects, mostly two way common carrier communications e.g. telephone, telex, facsimile etc.

1.8.6 Information Technology

Information technology refers to "the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by microelectronics based combination of computing and

telecommunications " (Langley and Shain, 1985, 164). Included in this technology are word processors, videotex, teletex, electronic mail LANs, WANs, communications facsimile, video, discs, fibre optics, digital technologies, use of satellites, CD-ROM, hypertext, etc. In this study emphasis is placed on computer and telecommunications technologies (telematics).

1.8.7 Information

In this study information is defined as mankind's accumulated knowledge derived from all subjects in all forms and from all sources that could help its users to reduce levels of uncertainty. Specifically information is used as data of value in planning and decision making, in the execution, monitoring and evaluation of public and private sector programmes of any community (Aiyepeku, 1982,12).

CHAPTER TWO

EDUCATION DEVELOPMENT IN MALAWI

2.1 INTRODUCTION

Every country is continuously involved in socio-economic development activities intended to improve the standard and quality of life of its citizens." Development is the bridge between the hopes and dreams of the people on the one hand and the realities of the world on the other". And most countries in Africa have formulated planned programmes for development (5-year plans, long range plans, annual plans, sectoral plans etc).

Essentially, planning involves the optimal allocation of the available and mobilizable resources in the different components of the plan. A knowledge of the needs and aspirations of the people, the demographic, economic, political and related scenario, the existing

resource constraints, the sources and strategies for mobilizing additional resources (finance, human, physical, technological etc) is essential even at pre-planning stage. The implementation and monitoring of the plan and evaluation of the progress continuously again requires to be supported with timely and reliable data. And of the resource, the most precious is human resources, for it is human expertise that can explore, mobilize, and utilize properly all other resources, physical, and machine. Development focused on the achievement of social goals involves using the products, processes, and practices resulting from scientific and technological developments both within and outside the country together with the formulation and implementation of legal, administrative, political and institutional policies, programmes and projects (Neelameghan A, 1990). It is, therefore, important to recognize information as a vital and strategic resource and to raise the level of information consciousness at all levels of the economy and government.

Education of people of a country at all levels, is seen as the basic strategy to raise the human resource potential as well as enhancing their awareness; the crucial role of information in development planning as well as in their daily information. It is education that

can bring about cultural and attitude change and the need to share the knowledge, information and data within and beyond their national boundaries. The more educated a society is, the greater its capability to generate and use information as well as more intense information activities in the education sector. It cannot be over emphasised that effective and timely development of information systems and services is heavily dependent upon the availability of manpower of appropriate quality and in adequate numbers.

Education in Malawi is governed, guided and operated by a range of regulations and institutions. By far the most dominant organization is the Ministry of Education and Culture. It directly employs a staff of 18,936 (1987), provides financial support to many of the other institutions and acts as a central policy making body for its administrative units at lower levels throughout the country. The Ministry is guided on major policy matters by the National Advisory Council on Education on which are represented universities, voluntary agencies involved in education, the Malawi National Examinations Board (MANEB) and various prominent public servants.

2.2 POLICY AND STRATEGY

The broad policy objective of the education sector in Malawi is to develop an efficient, viable, and high quality system of education of a type and quality appropriate to the political, social and economic aspirations of the nation. Education is seen as an important vehicle for promoting national consciousness and cohesion, and for furthering effective economic independence. It is also seen as a means of reinforcing the high ethical standards of Malawian society, so necessary if social justice is to be maintained in the face of economic progress. Finally, the role of education as a catalyst to development is recognized, both in the medium term through the provision of specific skills in short supply, and in the longer term through the impact of improved general standards of education; however the emphasis is increasingly toward equipping the nation's youth with the skill and motivation for self-employment and self-improvement. In achieving these broad policy objectives, there are three fundamental concerns namely, that equity of access to educational opportunities is achieved for all communities, that there is a proper balance in the resources allocated to each component of the system, and that the efficiency and quality of the individual components are improved.

In pursuit of these fundamental concerns effectively and efficiently, their implementation plan require easy flow and exchange of information.

(a) Among those responsible for development policy and planning

(b) Among individuals and groups in the communities ie regional offices, districts, offices, beneficiaries of and participants in development activities and

(c) Between those of (a) and of (b).

In a study of those factors that influence success or otherwise of over 200 rural development projects, some ten out of the twenty factors identified related to the flow of information between the planning and the implementation personnel and the people at the grass roots who were expected to benefit from the projects (Neelameghan A, 1981).

2.3 EDUCATION IN MALAWI: BACKGROUND

With a view to understanding the role of information in the development of Malawi's education, it will be useful to examine briefly the background and development trends of this sector in the country.

Although formal education in Malawi commenced under the direction of various missionary societies in the last quarter of the 19th century, the first formal education plan for Malawi was launched only in 1973. While the appetite for learning fostered by the missionaries had built up, Malawi's ability to satisfy this appetite was constrained by a shortage of physical and human resources on the one hand, and a rapidly expanding youth population on the other. The first education plan designed to cover the period from 1973 to 1980, gave as its major objectives the fulfilment of the specific needs of the labour market, the development of more relevant school curricula, and the improvement of efficiency in the utilization of resources.

The specific targets relating to these objectives included raising the gross enrolment ratio at the primary level from 33.5 per cent to 50 per cent. And at the secondary level enrolment ratio from 3 per cent to about 15 per cent of the respective age groups. At the primary level, enrolments increased sharply, the 1980 target being exceeded by 20 per cent; but the output of teachers did not keep pace and teacher-pupil ratio and expenditure per student fell. The number of full time secondary school students increased by 30 per cent to 18,000 but

this fell short of the required target of over 60,000. Some progress was made in curriculum development, asset utilization and equity in the distribution of facilities.

Today the formal education system remains conventional, primary, secondary and tertiary structure.

2.3.1 Primary Education

There are three types of primary institutions: Government primary schools (constructed and administered by the central government), assisted schools (constructed and administered by missionary societies and eligible for financial assistance from the government) and unassisted schools (wholly-owned but not in receipt of any government support). All teachers in government and assisted schools are paid by government.

Currently there are 2,500 schools with a total of 12,300 classrooms serving 900,000 enrolled children, or the equivalent of 50 per cent of the 6-13 year age group. Teaching these are 16,000 staff of whom 11,700 or 73 per cent are fully qualified. Students to teacher ratio averages 56, and classes of over 100 are common.

2.3.1.1 Brief Background

Due to the limited resources, it was not possible to introduce Universal Primary Education (UPE). Instead, the Government developed an open but selective system which admitted any pupils with motivation and resources, but which was geared to identifying and selecting talented individuals who were given opportunity to further education. A pupil's progress through the system was also eased somewhat by the elimination of interim bottlenecks created by examinations after two or five years of primary schooling. Only the primary school leaving examinations taken after 8 years of schooling was left to stand. The resulting system did lead to substantial, quantitative improvements if not qualitative. Even allowing for the natural growth of the school age population, primary school education became more widely accessible with the passage of time. Pupil enrolment (table 1) would seem to attest to this:

TABLE 1. STUDENT ENROLMENT : 1969/70-1985/86

	Primary	Secondary	Tech-nical	Teacher Training	University
1969/70	333,102	9,686	236	1079	977
1974/75	611,671	13,843	529	1283	1228
1979/80	779,676	16,431	694	1856	1620
1983/84	847,157	21,769	522	1890	1961
1985/86	926,310	24,918	510	1954	1974

Source: Ministry of Education and Culture (1987).

There were 260,000 pupils at the time of independence in 1964 which increased by 1985 to 899,459 in the country's primary schools. One factor however remained to worry teachers, parents, and planners alike. The primary school system was and continues to be plagued by a very high pupil wastage rate. In the period under review over 60 per cent of those who entered standard one or grade 1 did not qualify for a primary school leaving certificate, the dropout rate being particulary high for girls. However, there is a need to increase the enrolment numbers in primary education from the current level of 926,000 to over 1,450,000, with focus on the proper geographical distribution of primary education facilities according to needs (Malawi Government, Statement of Development Policies 1987-1996). This will need physical constructions and expansion of existing structures, but

importantly, it is necessary to collect data on the needs and resources and constraints of the different regions/localities of Malawi.

Among other things improving the quality of education at primary school involves several factors, including the availability of larger number of qualified teachers, better school administration, teaching materials, new curricula, and examinations and a reduction in rates of both dropout and repetition. All these factors call for prudent resource management.

It is often said that information is a key to management effectiveness. Ross and Murdick (1983) defines management as the process of converting information into action. Then it is clear that management success depends primarily on what information is chosen and how it is processed and disseminated. Thus the difference between a good manager and a poor one lies, at least in part, in their ability to access and use timely, relevant and reliable information.

The need to review primary education curriculum with emphasis on the basic skills of reading, writing and numeracy; techniques for the continuous assessment of student achievement; the quality and volume of teaching

aids; changes in the primary school leaving certificate examinations etc cannot be achieved properly and effectively without proper data collection and information support.

2.3.2 Secondary School

In 1964 at independence the country had 16 secondary schools only some 75 per cent of which operated under the auspices of missionaries. The situation was desperate and called for a quick remedy. The new government's answer was to make provision for the establishment of at least one secondary school in each district, and to establish a correspondence college which would make secondary education up to junior level available to independent candidates. Towards the 1980's instead of trailing behind the missionaries, the Government now took the lead. By 1985 the country could boast of not less than 65 secondary schools and student enrolment rose correspondingly from 5,900 in 1964 to 14,400 in 1975 and 24,320 in 1985. (Kandoole, 1989)

Perhaps the most important achievement of the period lay in the extent to which it was possible to redress imbalances that plagued secondary education during the colonial period. One of these was the low representation

of girls. At the time of independence there was only one girl for every twelve boys in secondary school. Twenty five years later, the ratio had improved to 5:1.

Another achievement was the steps taken to restructure the curriculum and make it more relevant to the needs of the country. This involved the introduction since 1970, of courses in agriculture, home economics, woodwork, metalwork, which had not featured in the curriculum during the pre-independence era.

Currently the secondary education structure consists of a four year course, two years to Junior Certificate (JC) level, and a further two years to the Malawi School Certificate of Education (MSCE) level. There are 75 schools taking full time pupils and they are of 3 types: government (36), Government-aided (24), and private (15).

A fully government-funded organization, the Malawi College of Distance Education (MCDE), also offers written lessons and radio broadcasts in most subjects in the secondary curriculum to those students who fail to obtain places in the full-time day schools. The MCDE also runs a number of night secondary schools where formal instruction is offered to those who failed to get into full-time day institutions.

The students take the same (Junior Certificate and Malawi School Certificate of Education) examinations. There are 90 MCDE centres and night secondary schools. Of the estimated 14-17 age group population of 550,000, the equivalent of about 5 per cent or 23,000, receive full-time secondary education and a further 2.75 per cent or 15,000 receive correspondence course support. There are 1,300 teachers for the full time students, or one per 18 students and 200 professional Malawi College of Distance Education staff, or one per 75 students. About 23 per cent of the full time teachers are expatriates and 45 per cent hold degrees. The final examination, the Malawi School Certificate of Education is run by an independent body, the Malawi National Examination Board. As with primary education, fees are charged for tuition and boarding.

However, there are also deficiencies in the system that need the attention of the planners and decision makers. The current output from the secondary schools does not meet the manpower requirements, there is a need to increase capacity to meet these manpower requirements of the economy both in direct employment or as an input into tertiary education. To achieve this there is need to increase in both full-time, correspondence secondary school education, capacity and some expansion in

technical vocational training. There is also need to increase the level of women participation in secondary education through administrative and organizational action.

The planning, management, and evaluation of development programmes such as these, require theoretical and practical knowledge and a mass of data describing the situation and trends which can be used to forecast and making viable plans. This requires the proper flow of management data and information. Data required in the fields of education are contained in formal market surveys and studies. If such do not exist, they need to be instituted.

Here, the information support systems together with national demographic and census systems should be able to provide indicators of the provision for and/or availability of educational facilities and infrastructure and thereby assist in decisions, on optimizing the establishment of new schools, number of female and male students, allocation of funds and number of pupils and teachers to schools etc. Examples of such information include percentage of secondary school going pupils in the age group 11-14 to total population in these age groups classified according to sex; districts having no

enough primary school to feed the secondary schools; percentage of secondary passed per 100,000 population etc.

2.3.3 Teacher Training Colleges

A major task of Government at the time of independence was that of streamlining and standardizing the existing missionary-sponsored teacher training institutions in a bid to raise standards and improve the quality of teachers. It embarked on a programme of building bigger and better equipped teacher training institutions, while phasing out some of the missionary supported ones. Between 1967 and 1988, six large teacher training colleges were built at Lilongwe, Blantyre, Mzuzu, Domasi, Karonga and Kasungu. This resulted in a corresponding increase in the enrolment of teacher trainees from 1,368 in 1964 to 1,800 in 1985.

Two categories of primary school teachers are trained, T3 and T2 teachers. The former are admitted to college with a junior certificate qualification and the latter with an MSCE qualification. Both courses have a common pedagogical core and last 2 years. Total output is about 1,200 teachers a year.

The development of this sub-sector might be taken as the second priority after primary education itself. A number of in-service training courses are also provided at these colleges. Teachers for secondary schools are trained in the faculty of education at the University.

Most of the objectives in this field which include increase in the supply of teachers in line with increased student enrolment, improving the quality of both pre-service and in-service training, increase the efficiency of the training machinery itself etc have not been fulfilled.

There is need to make changes in the curriculum in both course structure and content. The curriculum currently emphasises academic rather than professional subjects. More emphasis should be given to teaching methods, to school management and to student assessment techniques. (Malawi Government: Statement of development policies 1987-1996).

With almost 2,500 under-qualified and under-trained primary teachers and a further 1,800 teachers whose basic education itself is only at the primary level, there is also a need for a major in-service training effort. Again this calls for a strong information support

especially in areas of curriculum strengthening, training of the under-trained teachers, and management of school administrations.

2.3.4 Technical Education

There have also been improvements in the provision of technical and vocational education. Technical education is currently offered to over 800 students in a range of subjects at the polytechnic which is part of the

University, as well as at three government aided technical colleges. They offer a 4-year apprenticeship course consisting of a first year full-time apprenticeship followed by three years of alternative institutional and industrial training. Courses offered include carpentry, brickwork and plastering, plumbing, motor mechanics, electrical installation, and diesel and general fitting. The aided technical colleges offer two-year full time courses in carpentry and brickwork up to a craft certificate level. These six institutions, taken together employ 80 teaching staff.

A number of government departments and parastatals provide specific technical vocational training. These include, the Ministry of Works and Supplies and the

Malawi Railways. These account for a further 600 students at any one time. There are approximately 5,000 part time students enrolled in evening classes run by the Polytechnic and technical colleges. Fees are not charged for any basic courses where the student is not in receipt of any income.

The efficient and effective performance of these activities calls for the provision of data and information in terms of market needs. This need could be summarized in the following five major marketing concepts:

(a) Market segmentation- Identification of actual and potential markets and non markets within public and private sector.

(b) Consumer analysis- Determination of the needs and preferences of the wider market in the country. This calls for information gathering.

(c) Market positioning - Prioritizing clients and groups, that is policy making.

(d) Marketing program - Determination of optimum mix of the products, price delivery, promotion (planning, customization, coordination)

(e) Market audit - Evaluation of plan and implementation on the basis of data and information gathering. Making judgements and reporting.

Information needs in the market survey would include such indicators as number of technical/professional graduates turned out as percentage of total population, manpower needs of the private and public sectors etc.

2.3.5 University of Malawi

In the field of higher education, the country's step ahead revolved around the founding and nurturing of the University of Malawi.

The University of Malawi was established by an Act of Parliament in 1964 and opened its doors to students in 1965. It was established to meet the specific needs of the labour market, that is, the function of producing intermediate level manpower for public, parastatal and private sectors of the economy; to improve on the meagre number of 33 university graduates in the country at the time of independence; and development of more relevant school curricula and the improvement of efficiency in the utilization of resources.

The University offers courses at five campuses: At Bunda college of Agriculture in Lilongwe, at the Polytechnic in Blantyre, at Chancellor College in Zomba, at Kamuzu College of Nursing in Lilongwe and at the

School of Medicine in Blantyre. This structure largely affects the distribution of tertiary education in the country.

2.3.5.1 Brief Background

The University began with one college, Chancellor in 1965. It evolved into an umbrella system in 1976 when four other colleges were added to it, namely, Soche, Mpemba, and the Polytechnic in Blantyre and Bunda college of agriculture in Lilongwe. It turned out its first graduates and diplomates in 1969 in such diverse fields as public administration, education, engineering, business studies, law, the sciences, the social sciences and the humanities.

Two new colleges were added to the University in the 1970's and 1980's. The first of these was the Malawi Institute of Education at Domasi which opened in 1979 as a joint venture between the University and the Ministry of Education and Culture. It serves as a centre for developing curricula, in-service training for teachers, preparation of teaching materials for primary schools and undertaking research and dissemination of information. Currently it has a staff of 25. It was followed by the establishment of the Kamuzu College of Nursing in 1980,

the fourth college in the University, charged with the training of nurses at diploma and later at degree levels. Up to then nursing education had been the responsibility of the Ministry of Health. In 1988 plans were approved to add a medical faculty to the University, which became operational in 1990.

The University also diversified its curriculum in response to the needs of the Malawian economy. At Chancellor College this involved the launching of courses in computer science and demographic studies and of masters level courses in industrial chemistry, biology, and education. Similarly, at the Polytechnic new courses were introduced at diploma and degree levels in such areas as business administration, hospital administration and management studies. This was in response to the needs of commerce and industry as well as of the public sector. Bunda college also expanded and diversified its academic programmes which were instituted in 1967. First there was the introduction of degree courses in the mid seventies, ten years later by the introduction of Msc courses in agronomy, livestock production and agricultural economics and education.

Since its inception, the University has expanded, currently taking nearly 2,000 students and covering a wide range of faculties and absorbing 22 percent of the government budget.

However, it is recognized that the present output of 500 graduates a year does not meet the nations requirements for scientific and technical manpower. With some exceptions however the necessary output expansion should be largely undertaken by means of increasing utilization of the existing facilities and staff rather than physical expansion. Other possible developments relate to the introduction of more graduate master degree courses and undergraduate external degree courses.

This calls for information systems to support university's planning and decisions in such matters as new courses to be introduced, curriculum changes and developments, expanding numbers of students and faculty etc.

2.3.6 Other Educational Bodies

Other bodies in some ways involved in educational matters include: the central examination body, the Malawi National Examinations Board, which has recently been

created by combining the Malawi Certificate Examinations and Testing Board and the Examinations Section of the Ministry of Education and culture.

The Malawi College of Accountancy was established in 1981 to tackle a critical shortage of accounting staff. It operates in Blantyre and Lilongwe, teaching students a range of technical and professional courses.

While the need to improve access to basic primary, secondary and university education by devoting more physical and human resources to these sectors is accepted as important, questions of quality, efficiency and equity are also seen as requiring urgent action.

2.4 RESEARCH ACTIVITIES

Malawi's economy is predominantly based on agriculture, accounting for 45 per cent of the total GDP and provides jobs to approximately 85 per cent of the population. Agricultural products account for 90 per cent of the country's exports and the growth rate of the economy is largely dependent on the performance of this sector. As a result the Government has put all effort on agriculture research and almost all research is centred on it. The Government has established several agriculture

research stations in all parts of the country. This is coordinated by the research department of the Ministry of Agriculture. These researches are aimed at providing the means of solving the technical and economic problems facing producers of all food and cash crops. Exceptions to this include tea, tobacco and coffee each of which have their specialised non-governmental research bodies.

Although agriculture research continues to dominate the economy, the Government has realised the need for research in other areas as well, and has established the National Research Council by an act of Parliament in 1968. Later the name was changed to Department of Research and Environmental Affairs under the Office of the President and Cabinet. The Department's statutory functions include coordinating all research activities in the country and promoting scientific research and relate such research to the needs of the country; and to advise the Government on scientific and technological research policies. The Government has also encouraged research in other fields, such as forestry, at the University of Malawi, and associated institutions.

However, one area that is lacking and so recognized by the Government is the weak relationship between the farmer's knowledge requirements and the research

programmes. More attention needs to be devoted to the technical and socio-economic analysis of farming systems and the effective dissemination of the research findings.

2.5 DIRECTIONS OF CHANGE

In trying to meet these challenges there have been adaptations adjustments, rationalisations, restructuring and some transformations in government and administrative structures. As pointed out change in the orientation of planning from a growth oriented paradigm to one of growth with equity. This re-orientation has called for new planning strategies.

Change in the structure of planning from that of a centralized approach to decentralized approach. This is more directed toward sub-national, bottom upward planning with multiple developments objectives.
This has called for:

(a) Need for disaggregated data and information for planning at different levels and analyzing and processing the data with speed and accuracy.

Another important influencing factor is the informatics revolution covering a whole range emerging new technologies, micro-electronics, the micro-chip; telematics; and networking; optical electronics; powerful portable software; fast information processing; use of aerial photography, remote sensing, mapping geographical (geocoded) information systems etc.

The present study has revealed that these challenges and changes in the development of education and the country as a whole have not been effectively matched by data and information systems in the country, disclosing a gap between what is desirable and what is available-an information crisis vis-a-vis education development planning.

The crisis is due partly to the top down approach to planning and centralized control of government functions. The data systems favoured macro-level planning, for example national accounting systems covering national income, national savings and investment; foreign trade, monetary system, etc. Data is generated at aggregated level with some sectoral disaggregation suited to planning at national level. This has proved to be less useful and relevant to decentralized sub-national level planning with multi-objective approaches.

Adaptation and/or transformation of information and data systems to the new planning strategies while perceived to be necessary is slow in implementation. There is an obvious need to develop information systems to assist in the administration of education in the country and these may cover functional areas already discussed, such as:

* School curriculum development
* Management of examinations
* Management of school records
* Geocoded information
* Management of teachers and other staff of educational institutions
* School enrolment and attendance
* School buildings etc.

The information and data provided by these systems can be used along with those from national demographic and census systems for sub-national and local planning. The systems can also be used for deriving indicators of the provision for and/or availability of educational facilities and infrastructure and thereby assist in decisions on optimising the establishment of new schools, allocation of funds and number of pupils and teachers to schools etc. Information systems for educational

administration with capability for mapping infrastructural facilities by local administrative units (eg village, municipality) will also be of particular help to development planners and decision makers.

In summary, inadequate information can lead to incorrect decision making or sub-optimal solutions to problems. Timely delivery of appropriate information is necessary for the efficient execution of plans.

An appropriately designed information system can permit the possibility of early warnings and reduce the occurrence of crisis management situations. Information systems development is an integral part of the formulation of development plans, national and sectoral. Information support as mentioned earlier, is vital in the planning process, that is selecting appropriate priorities and optimal allocations of available resources, in increasing productivity and conserving human resources by minimizing unnecessary and unintended duplication, as well as triggering new lines of work, in making informed judgement on development issues; and in enhancing peoples general awareness of their environment and the changes therein and thereby improving their capacity to cope with change.

2.6 INFORMATION MANPOWER DEVELOPMENT

A major constraint to the development of information systems is the shortage of information professional manpower in Malawi. Currently the University of Malawi Chancellor College is offering Bachelor of Computer Science degree and at the Polytechnic as part of the basic degree in technical education, engineering and commerce. There are also others offering on a small scale; these include the Computer Society of Malawi which offers programming courses on a part time basis, and the Government Computer Training Centre in the Department of Data Processing of the Ministry of Finance. More resources need to be devoted to increasing the level of awareness of informatics in decision making, planning, plan implementation and monitoring. This can be done by organizing sensitization seminars, documentation services to alert management to the potentials of informatics and to assist in re-training staff. Training needs have to be established on the basis of the range of courses and subjects offered.

2.7 CONCLUSION

There are many obstacles and constraints to technological development of information systems to

support education in Malawi. These include lack of awareness of the value of information, lack of management skills and experiences, massive illiteracy, poorly developed communication infrastructure to support information transactions, lack of financial resources, unemployment, scattered rural communities etc. These can only be overcome by integrated and sustained action at the national level. Hence the setting up of a Malawian information system supporting education is not only for the rapid acceleration of our social and economic development but also to overcome our excessive dependence on the industrialized countries for information. But this technological self reliance should not be seen as simply a drive towards self-sufficiency in response to immediate pressures such as shortage of foreign exchange.

Furthermore, if an information support system is to be set in Malawi it should not duplicate the efforts of developed countries but rather should concentrate in limited number of assignments most relevant to the situation in Malawi's education. Information technology can be applied in education, for eradicating illiteracy. This could be done through intersection of two major technologies (telecommunications and microcomputers) with video technology. Information systems already exist in which a database of audio and visual information is

stored on a videodisc connected to a microprocessor and used to remote TV displays. This would enable instructor to use TV display in remote districts/provinces. A microprocessor enables the instructor to interact with a video database in the same conversational way a user interacts with an on-line computer database.

Malawian institutions which manage technical data and research projects will be obliged to computerize, if they wish to keep pace with the level of research of the developed world, in fields concerning the deployment of human resources, research and analysis, the use of transmission of data or the management of projects etc.

The large investments in governmental, private or other projects should go hand in hand with the capacity to handle the data produced. The analysis, processing and dissemination of these data can only be realized by the use of modern tools. Hence Information support system for education in Malawi is not a fashion or a luxury but a basic necessity, a guarantee of success if used prudently.

CHAPTER THREE

INFORMATION TECHNOLOGY:AN OVERVIEW

3.1 SCOPE OF THE CHAPTER

This chapter presents a brief overview of the development of information technology, and of information and information products arising from IT applications and networking. Some emerging issues relating to IT applications in the African countries are examined. This is a prelude to the discussion of application of some of these technologies to the development of the Academic Resource Centre in the University of Malawi.

3.2 INTRODUCTION.

For thousands of years man has been using various methods for collecting, processing and disseminating information. Among these methods, the major early technologies included carving of scripts on various objects, and then printing which have helped man to record and pass on ideas and information on his experiences from generation to generation across space and through time. This enabled man to transcend his

inherited limitations. Together with the improvements in the means of transportation, human interactions increased multifold, generating more ideas and experience. The old methods of recording and dissemination of information were found inadequate. Therefore, the search for better, faster, cheaper, and more reliable methods of information management were intensified.

A study of the broad sweep of human history shows that it took many millennia for mankind to evolve from the nomadic hunter stage to the early farming stage (by about 8000 B.C.). Individuals and Societies were able to devote more time to relatively sophisticated pursuits, as food gathering became more efficient. The transition from the agricultural to the industrial phase (starting around the seventeenth century) was relatively more rapid, and mainly involved the control and use of energy for manufacturing and production. The most recent era involving the development of electronics and other modern technologies began in the 1950's and has accelerated even more sharply as we approach the 21st century. All these developments were mainly possible because of the ability to manipulate information.

Each age may be represented by a typical tool or implement: the hunter's spear, the farmer's plough, the

industrial worker's lathe, and the brain worker's computer. In the past three decades we see the rapid acceleration of powerful technologies, that are novel, of wide application, and influential that we may indeed call it the second revolution. The basis of accelerated growth is electromagnetic in many inter-connected forms, photography, photocopy, cinematography, telegraphy, telephony, radio communications, radar, solar and telemetry and holography; sound and video recording and reproduction; vacuum tubes, transistor, printed circuits, lasers, fiber/optics and (in rapid succession) integrated circuits (IC), large scale integration (LSI) and very large scale integration (VLSI) of circuitry on a tiny semi-conduction chip and finally the bewildering variety of electronic digital computers. All these devices are closely interrelated and any advance in one tends to generate advances in the others. The progress has been truly amazing. In only about 40 years, electronic communication and news media have become common place and computers have proliferated, becoming increasingly fast, or more powerful, smaller and cheaper so that now there is scarcely a human activity in which they are not to be found bearing an increasing share of repetitive information processing.

Today the level of development of technology has reached a higher stage to be applied in almost every walk of life. Furthermore, the advances in satellite and data communication technologies have paved the way for transmitting and disseminate data/information anywhere in the world within a few minutes or seconds. Thus, today we are witnessing a revolution that continues fundamentally to transform human society.

In order to understand and appreciate this technology, a brief review of its history will be useful. The following sections will therefore review the developments and growth of computer technology and telecommunications, two principal components of information technology (IT). It will also look at the trends and future developments.

3.3 COMPUTER TECHNOLOGY

The history of the development of computer technology dates back to the use of notches on sticks; the use of a Abacus in 450 BC in Asia and Greece (Wu, 1979).

The computer concept originated when a 19-year old French philosopher and mathematician Blaise Pascal,

developed a rotating adding machine in 1642. Since Pascal's invention a number of people contributed in one way or another to the development of the modern computer. Notably are Gottfield Leibnitz, a German mathematician who constructed a machine to add, subtract, multiply, divide, and calculate square roots. In 1694, Charles Babbage, a British mathematician and engineer who by 1822 developed the concept and built a machine that could execute complex computations and print the results. Ada Augusta Byron, worked closely with Babbage on his machine and she is often referred to as the first computer programmer. Dr Herman Hollerith, who was commissioned by the United States Census Board to develop a technique for speeding up the processing of census data, developed a device to code data onto punched cards and automatically tabulate. Hollerith was also one of the founders of the International Business Machines (IBM) Corporation.

3.3.1 1940-1950'S

However, the history of modern electronic computer systems began less than 50 years ago in the late 1940's. The first electronic digital computer was built in the US, ENIAC (Electronic Numerical Integration and Calculation). It was unveiled at the Moore School of Electrical Engineering of the University of Pennsylvania

in 1946. Built under the supervision of J.W. Mauchly and J. P. Eckert, it weighed 30 tonnes, filled the space of two car garages and contained 18000 vacuum tubes which failed on an average rate of once every seven minutes. It cost half a million dollars at 1946 prices.

The first active computer to have the stored program feature was the EDSAC (Electronic Delay -Storage Automatic Computer) completed in 1949 at Cambridge University in England. Instead of wired control panels, instructions stored in the computer itself controlled the operations of the machine. But the first commercial electronic computer was invented only in 1951, the UNIVAC 1 (Universal Automatic Computer). It was during this period that the concept of technology was taking root in the field of information science.

During this period, several specialists in information science developed Jury rigged technology to investigate the problems of information organization. In the process they used punched card machines, punched paper tape machines, knitting needles and even a modified egg candler. Mortimer Taube, identified as the founder of coordinate index, provided a method for coordinating index terms. He called his index terms uniterms and provided a set of uniterm cards on which appeared the

identification numbers of the documents relevant to each uniterm. Searching was accomplished by selecting the uniterm cards pertinent to the requests and correlating their document numbers. Fred Jonker built a machine, the termatrix to facilitate this process. It looked and functioned somewhat like an egg candler. Selected uniterm cards were placed in the device in front of a light source which illuminated their common document numbers. Jonker's egg candler was nicknamed the peek-a-boo system. Today we use the phrase "optical coincidence" to describe the same process. (Becker, 1984)

This was also the period of knitting needle technology. It is said that many researchers in America and elsewhere kept private shoe boxes filled with " databases" on edge notched cards. Slipping knitting needles into coded hole locations and a good shake of the wrist caused the selected cards to fall to the floor while the remaining ones clung to the needles. It was Carvin Mooers who turned this technology into a fine art. In its day, Mooers superimposed coding as he dubbed it and knitting needle technology provided the most sophisticated way to perform searches.

About this time, the first generation computers, made their debut into the information field and a spate of new technological ideas emerged. Hans Peter Luhn of IBM invented a variation of the IBM sorter which gave the machine enhanced searching capabilities. Luhns machine "read" IBM, longitudinally rather than cross wise. Coded information was entered on to the cards as punched patterns rather than as single column board. When IBM punched cards were laid end to end in this way, it was like reading a ribbon of codes in combination. Luhns machine never made it to IBM's product line but it did provide the company with a machine that it used to demonstrate magnetic tape reading technology. James W. Perry, Allen Kent, and Jesse H. Shera at Western Reserve University (WRU) invented another pre-computer experiment machine for information searching. Their technology used relays as switches and punched paper tape as a medium for storing abstracts, index terms and search requests. The WRU machine was able to search an abstract a minute and handle 10 questions simultaneously. In many ways, it can be considered the forerunner of today's high speed text array processors.

3.3.2 The 1960's

This is the time when the second generation computers appeared and were available for commercial installation. These used transistors instead of vacuum tubes. This greatly reduced the heat generated by the machines. It also made possible the development of computers which were significantly smaller and more reliable than those of the first generation. These were faster, had increased storage capacity and required less power to operate. Examples of such computers were IBM 701, 704 and 709. Programming of second generation computers was in high level languages, FORTRAN (Formula Translator) and COBOL (Common Business Oriented Language).

Researchers like H. E. Tillet, P. Baxendale, R. M. Hayes, A. Barton, L. N. Caplan, M. E. Maron, L. C. Ray, H. P. Edmundson, Don Swanson, T. R. Savage and many others used this technology to investigate the computer's ability to perform such tasks as automatic indexing, automatic abstracting, machine translation, automatic searching, automatic dissemination and automatic question answering. This was the beginning of natural language data processing and provided the basic foundation for much of today's on-line and other text-related information systems.

Two early demonstrations are worthy of mentioning in this context. One called BOLD (Bibliographic On-Line Display), originated with the Systems Development Corporation (SDC) under Harold Borko's aegis (Borkos Own Little Demonstrator). The second, called library USA, was sponsored by the American Library Association (ALA) at the network World's Fair. BOLD used a Q32 military computer which possessed attributes of the third generation computer technology long before such machines became available publicly. Borko programmed the computer to demonstrate interrogation of a central data base from multiple cable connected terminals. During the same year ALA, using third generation computer technology (i.e. UNIVAC 490) featured the same capability in the US pavilion at the World's fair. However, ALA's demonstration took a bold step forward by providing the public with simultaneous on site and remote access to its UNIVAC store of bibliographical records through any teletype terminal connected to the standard dial-up commercial telephone network. The public was thus able to make direct inquiries to a central data database from various points in the US and receive identical print outs to those provided to the fair. Eight hundred thousands such printouts were generated on a 1200 line/minute high speed printer during the year the fair was open. A year later J.C.R. Licklider, Robert Fano and Mike Kessler in

a project called MAC (Multiple Access to Computer) evolved several operational programs which established time-sharing and on-line access as reliable interactive computer methods using third generation computer technology coupled with telecommunications technology.

BOLD, Library USA, and MAC demonstrated the ability of computer technology to:

(a) Maintain and dynamically update a database.

(b) Interface smoothly with the standard telephone network.

(c) Serve many users simultaneously in remote locations.

(d) Search and select combinations of text in natural language; and

(e) Exhibit 'proper' manners when responding to questions couched in plain english by humans.

3.3.3 The 1970'S

For information scientists the years 1970 to 1980 will probably be remembered as the information technology decade. It was during this period that experiments and demonstration gave way to practice and operational programs. Information science and technology had come of

age. The fourth generation computers that entered the scene were characterised by Large Scale Integrated Circuits (LSI), increased speed, greater reliability and storage capacities approaching billions of characters. The LSI technology allows circuits containing thousands of transistors to be densely packed on a single silicon chip.

Also during this period the pace of technological change quickened and individual contributions to the field became more diffuse and hard to personalize than had been the case in previous years. Since 1970's people in different professions have become acquainted with information technology applied for a variety of purposes. The spread of on-line computer technology has been the most spectacular and significant influence of all. In previous years, computers were mainly used within institutions. In the late 1970's and in the 1980's, microelectronics (microchip) and miniaturization led to the mass production of personal microcomputers with capabilities matching the early big machines but at a much lower cost. The power of the PC's has increased spectacularly.

This means for example, that a computer terminal will someday be able to accept instructions form a user, perform an information search at a designated time, use limited judgement in contacting other sources of information, revising the strategy of a search as circumstances dictate, and it is hoped, to learn from past mistakes. In time we may even see a pocket size information terminal, like a hand-held calculator which will bring us individual messages on command.

3.4 FUTURE COMPUTER TECHNOLOGY

Developments in computer technology are certain to continue. Manufacturers are already employing microprocessors that condense data and programs into a single chip. A form that in the future, will increase our ability to swap applications and programs with one another. Certainly other technological advances can be expected as personal computers and home television access stations rapidly spread to home and offices. The fact that most of the population in the West will soon be able to operate terminals from the home opens up vast scope for information access and use and will undoubtedly generate new and varied information technology products and services. For example, supercomputers, which the Japanese refer to as fifth generation technology. They are expected to incorporate parallel associative processing principles to a significant degree and provide a spring board for further developments in artificial

intelligence which can, among other things, accept problems in natural language (Bishop, 1986).

The increased speed of supercomputer will represent another advance in the technology. In 1966, the fastest computers were able to perform one million operations per second. Today's state of the art supercomputers can exceed processing rates of more than one hundred million operations per second. Substantial increases in micro-miniaturization of electronic computer circuitry and the integration of extra large capacity memory devices. Moreover new concepts in supercomputer technology architecture should enable these machines to carry out many similar operations in a parallel or concurrent manner rather than sequentially. If manufacturers of supercomputers are successful in extending the limits of existing technology, they will have opened up a new door which many researchers believe will lead the way to symbolic supercomputers capable of emulating cognitive processes.

Concurrent technological advancement can be expected in input and output machines that are so vital to non-numerical processing. For example special purpose database management and high speed searching technology are sure to come into their own.

Optical scanning of printed text in multiple type fonts is another technology which should experience

improvement. In 1960, Automatic Optical Character Recognition (OCR) technology was limited to reading only one standard type font at a time (ie, the text match technique). Today OCR machines have heuristic programs capable of teaching themselves how to adapt to a new type font when it is encountered. In the future as reference memory capacity become greater and electronic scanning technology becomes more refined we can look forward to further improvements in both reading versatility and accuracy.

Smart copier technology may take the technology scene by storm. The smart copier is the offspring of the marriage between computer technology and printing technology. It uses a laser character generator to write information processed and generated by computer. The laser converts the digital data emanating from the computer into image data on a selenium drum. Thereafter the xerographic process takes over at a high speed and prints the information in any format onto paper or film. This development has records managers in a quandary because with smart copies there is no original. The smart copier is an example of a new technology.

3.4.1 CD-ROM Technology

One of the major developments in the field of IT is the invention of the CD-ROM technology. It is a development from the optical family. This has remarkable impacts in the traditional publishing and document delivery activities, and has opened up new horizons for information processing, storage and retrieval as well as education and training.

Optical disks are durable, have high storage capacity, and random access memory etc. They can be divided into three main categories: Pre-recorded optical read only disks, blank recordable WORM (Write Once Read Many Times) disks and erasable disks. CD-ROM (Compact Disk Read Only Memory) belongs to the group of pre-recorded storage devices and it is mainly used for mass distribution of permanent information. Others are currently at the development stage and it should not be assumed that CD-ROM is the final word in optical publishing. The long term economic future of these technologies is not certain but CD-ROM seems to be the most promising media for general textual database publishing.

CD-ROM technology is by no means unfamiliar to those who have browsed the audio record shops. CD audio disks contain sound whilst CD-ROM contains data. The technological development from audio disks to data disks is a logical and natural consequence of compact disc technology which is based on laser beam (Light Amplification by Simulated Emission of Radiation). The information the disk carries is moulded on to one surface by the laser beam and it is represented by a spiral of microscopical small valleys and plains. The final CD-ROM's are moulded from the master disc and the digital information encoded as the pattern of pits and flat surfaces. The information is read by means of a laser and so there is no contact between the CD-ROM and the reading head on the drive. Damage to the CD-ROM through wear is therefore avoided.

When one first looks at this technology its potential seem to be unlimited. The advantages of CD-ROM are huge storage capacity. One CD-ROM can hold up to 270,000 pages of text (A4) approximately 600 MB, that is equivalent to 1500 floppy disks (5.25"), 18,000 pages of computer graphics or 4500 Hrs of digitized voice (16kbs). This is as much as one thousand single sided floppies. An entire text of 20-volume encyclopedia with index to every word, filling 25 per cent of the total space on the disk

(Heimburger, 1988). Storage capacity is expected to increase by 4 times by the year 2000 A.D.

Since CD-ROM size is the same as an ordinary musical disk, the savings in space are enormous. And if one considers distribution and mainly costs of 1,000 pages and later alone two hundred times that amount, it is clear that a CD-ROM can dramatically cut costs.

One can foresee extensive use of CD-ROM in African countries. Several databases are available on CD-ROM. Some information centres and networks serving developing countries are producing CD-ROM databases. The International Agricultural Research Centres have prepared a CD-ROM database of all their productions. The Latin American Health Sciences Information Network is successfully running a CD-ROM based cooperative programme in which over 55 health science libraries in 17 Latin American countries input national health science literature references via the respective national nodes which is consolidated at BIREME. (Centro Latino-Americano e do Caribe de Informacao em Ciencas da Saude), (Pan American Health Organization of the World Health Organization, Sao Paulo, Brazil). The consolidated micro CDS/ISIS-based CD-ROM databases are periodically distributed to the participating centres. The database

consists of references to health science literature of the region. ADONIS project of the European Community, now commercialized, consists of full-text of current issues of some 400 most frequently used bio-medical journals, distributed on CD-ROM disk.

3.5 FUTURE COMMUNICATIONS TECHNOLOGY

Advances in communications technology will also have an impact on tomorrow's information environment. The signals emitted by tomorrow's information machines, computer facsimile equipment, television cameras, videodisc players, and so forth all require broad bandwidth channels for their efficient communication. Our narrow band telephone wires originally designed to carry voice signals are simply not up to the job to take advantage of the broad bandwidth capabilities provided by satellites, microwave stations, fiber optics, and coaxial cables. Most countries of the world are engaged in major upgrading of their communications systems. When national communication systems finally become broad bandwidth system they will contain the point to point links needed to move information in all signal form efficiently.
Once broad bandwidth channels are in wide spread use, a totally new integrated telecommunication infrastructure, a new nerve system will be available for information

exchange. A broad bandwidth national telecommunications network will make it possible to mix signals bidirectionally, voice, digital and voice signals and thus to accommodate different information devices on the same line at the same time. It will enable us to tap information on a single cable in our homes or offices and through gateways in our LAN reach out to external information networks in our own countries and throughout the world. It will vastly increase the density of information messages exchanged. It heralds a new on-line era because it will accelerate data systems and technology in all media.

In 1979, the Xerox Corporation introduced the Ethernet Local Area Network concept which incorporated many of the local features of this new developments. Ethernet makes it possible to link different office machines information a single network over a common coaxial cable. It meets several objectives. It allows many users access to the same data, say one or more electronic databases. It enables a set of users to share the same central computer. It permits the information network to grow regardless of the changes which may occur in the individual devices. Such as a model upgrades and design changes. The later benefit is particularly significant. It means that an organization can plug in

new machines gradually as its needs dictate, or as technology develops into new and better information machines. In other words it provides a hedge against technological obsolence.

Of course it will be a decade or more before a broad bandwidth telecommunication upgrading takes place, but the trend is certainly in that direction. Unmistakable signs are already evident, facsimile and electronic mail companies are now serving several hundred cities across the world.

National telephone and telex networks in other countries are developing similar integrated digital service networks capable of carrying voice, text, data, and video signals. As communication links are used more to create geographically and functionally decentralized information networks, the data processing industry and the communications industry are more likely to compete rather than coexist.

3.6 RELEVANCE TO AFRICA

Electronic mail, telefacsimile and related technologies will be more widely used in the future among libraries and information centres both within Africa and across national boundaries. Telecommunications infrastructures are being strengthened which will also enhance their capacity for online access to remote databases. In this connection, Africa will need to arrive at an optimum mix of use of CD-ROM databases and online services. International and regional networks are supporting networks and telematics development. For example, PADIS through a grant from the International Development Research Centre, (IDRC) Canada, is currently implementing a project entitled computer network in Africa. The project will experiment with various IT's to improve telecommunications, data transmission, and document delivery, such as facsimile transmission, scanning, CD-ROM and optical erasable discs. Equipment will be shared with a dozen potential project partners selected from PADIS national, sub-regional and institutional participating centre throughout Africa.

3.7 GROWTH OF INFORMATION TECHNOLOGY INDUSTRY

The information technology is currently among the leading industries in the world.

The following table shows its growth and estimates for the period (1986-95): (Gabel, 1989, 59)

Table 2

World Production of Information Technology Systems Growth Estimates, 1986-95.

	$ Billion (1)			Average Annual % Growth
	1986	1990	1995	
Hardware	224	253	621	12
Software	84	174	433	20
Telecommunications and computing services	85	107	143	6
Total	393	643	1197	13

(1) At 1985 exchange rate

(2) Telecommunications equipment solely for the public network.

(Source: Gabel 1989,56)

3.8 THE SOCIO ECONOMIC IMPACTS OF IT

3.8.1 Amplification

Technology allows us to store more information, access more information, send more information more quickly than was previously the case. It is an energy amplifier whether we are talking of computer-aided design, flexible manufacturing process, image enhancement systems or word processing. Real reductions in labour related costs can be attributed to IT investments in a wide range of final activities. In commercial terms this raises output, improves quality control, allows for customised manufacturing service provision and gives high tech companies competitive edge over their more manually based market competitors. In the information business/information industry, the availability of electronic databases linked via global telecommunications networks and gateways will increasingly marginalise traditional print based repositories of information e.g. libraries.

3.8.2 Globalisation

The growth of packet switched networks and satellite communications and the associated cost reductions in high-volume data transmission make a mockery of national

boundaries. Information distribution has become a global activity, reinforcing Marshall McLuhan's vision of a global electronic village. Markets for information services and products are increasingly defined in international rather than national, regional or local terms. This both increases market opportunity and competitiveness. It has also created a host of new problems relating to ownership and control and the flow of data across national borders.

3.8.3 Acceleration

Instant access to information most notably financial, is having a profound influence on the way banks stockbrokers, speculators and investors conduct their affairs and is likewise creating new problems for regulatory bodies. In the business and commercial sectors, the wide availability of information (particularly value added or proprietary information) is reducing the time required for decision making and policy formulation. Decision making is facilitated by easy access to electronic information stockpiles and additionally by the availability of a new generation of psychological software designed for executive level personnel.

3.8.4 Massification

The railroad and press barons of yester year have been replaced by a new breed of electronic information barons. Within the electronic information market, buyouts, mergers and vertical integration are common place. Many companies including blue chip organisations like IBM are moving into the electronic information business. Progressively, control and ownership is being vested in a relatively small number of resource rich organizations. This has important long term social implications. An off-cited fear is that in the absence of explicit government regulation, a two-tie information society may emerge, consisting of privileged informatically literate elite and a disfranchised information poor.

3.8.5 Mystification

It is still the case that the majority of the population is informatically and technologically illiterate. The pace of developments in leading edge organizations is so vastly different from the rate of absorption of the new technologies at the grass roots level that the bulk of population will be excluded from participation in the so called "wired" society. This

situation may disappear in time. May be a generation problem but this will not come about without considerable government inspired initiatives and greater stimulation of the domestic market in terms of its use of public information service.

3.8.6 Transformation

Technology changes jobs. It also creates new employment opportunities. The introduction of gas lamps had an impact on the candle making industry; the advent of the electric light bulb in turn had a negative impact on the gas light industry. Technology clearly does eliminate jobs but also though not necessarily to an equivalent degree creates new jobs and opportunities. Structural unemployment, however would seem to be here to stay. The progressive mechanization, automation and robotization of work functions, will continue to result in the displacement of labour. Governments are faced with the challenge of finding alternative work, educational or leisure opportunities for those dislocated by the introduction of the new technology. The new flourishing high tech industries are creating a new stratum of professional wealth. This further exacerbates the gap between the unwaged and the nouveau riche. How can this new wealth be redistributed in such a way as not to

dissipate motivation and enterpreneurism, yet avoid inequitable distribution of national income?

3.8.7 Intensification

One of the effects of technological change has been the creation of a heightened information awareness throughout society, but especially within the business community and government itself. The realisation that information is an important personal, organizational and social resource, which can be capitalised, which has a market value and which requires effective management has begun to shift attention from the hardware to the content of information system and the uses to which information can be put. The technocentricity of the 1970's and early 80's is it seems, being counter-balanced by a new found information awareness. Information may be intangible, but the market now recognises that information can in some respects be treated like any other commodity. It is, however, an unusual commodity; one which does not deplete on consumption, which can have multiple life cycles, which can be easily replicated or mass produced which violates some of the basic rules of ownership, which can have positive externalities and which, perhaps most importantly, has the features of social good. It is this last aspect which necessities some form of government

information policy or legislative framework to ensure that the rights of access of every man are protected in a free market economy.

3.9 SUMMARY OF THE IMPACT OF IT ON INFORMATION MANAGEMENT

Table 3

The table below gives a summary of the impact of information technology on the various aspects of information handling.

INFORMATION ACTIVITY	CONVENTIONAL TECHNOLOGY	INFORMATION TECHNOLOGY
1. Generation	Writing;Typing carbon copy; Typesetting Dictionaries for spelling	Word processing, Character recognition; instrument record of phenomenon;Voice recognition;Spelling checkers
2.Record/store	Paper;Microform Handbook;filing cabinet	Magnetic media,video cassette,electronic/ filing;database CD-ROM
3.Organization processing, Indexing, Retrieving	Card index,punched abstracting indexing	DBMS,ISR,Automated Hardware solution
4.Manipulation; Synthesis	Centralised data processing, Calculator,manual graphics,manual diary	DDP;software solution Electronic scheduling IBS;AI;Fifth generation
5.Communication and Dissemination	Post;Telephone Telex;personal communication	E-Mail,telefax,CD-ROM View data,computer conferencing,electronic document delivery,laser optical/Disk
6.Weeding out; destruction	Shred;Burn; destroy medium	Magnetic and optical erasure, re-use medium

Source: A. Neelameghan (Lecture notes)

Integration of computer and communication technologies
Table 4

	computer technology	communication technology
1930's	General theory of computer Turing machines	Television
1940's	First general purpose digital computer(ENIAC) cybernetic theory,game theory	Colour television,long distance dialling,by colour television, broadcasting, photo-typesetting
1950's	Information theory first commercial computer (UNIVAC) first compiler FORTRAN high speed drum printer second generation ALGOL	Tape recorder,cable TV holography,direct distance dialling, educational TV,video tape recording
1960's	First computer utility (CTSS/MAC) COBOL,3rd transistors,sketchpad PL/I,1st online generalize database management system 4th generation integrated circuits	echo touch tone telephones,computer typesetting,global TV laser printing,public TV video cassette
1970's	Touch tone dial input and remote graphic output logical functions but in hardware (5th generation), long hand written input briefcase computers	electronic video,tape recorder,flat screen wall TV
1980's	Artificial intelligence application computers, learn from experience on non-trivial tasks,personal computers,laser memory oral input	3.D television,laser communication
1990's	Emergence of pack aged higher order logistics heuristics	

Source: JASIS, May, 2(5) 1987.

PROGRESSION IN INFORMATION TECHNOLOGY (IT) APPLICATIONS

Table 5

Application	Initiation Individual stand alone	Expansion stand alone	Formaliz-ion integ-rated app-lications	Maturity integrated systems
Technology	Early computers	Second/ third generation computers	Total MIS or other systems	Database Database communications
Personal special	Programmer/ operator	Programmer analyst	Data process analyst	Information Technology special/info specialization
Management	Technical in dept.of pplica-tions	Informal controls among depts	Formalized control	Formal planning management control
User capabi-lities	Hands of attitude	User dependent on DP personnel	Knowledge particip-ation	participation in design development

source:A. Neelameghan (lecture notes)

CHAPTER FOUR

INFORMATION TECHNOLOGY AND INFORMATION SHARING IN SUB-SAHARAN AFRICA

4.1 INTRODUCTION

Contributing more effectively to development and raising the living standards of almost 1.4 billion inhabitants of the African countries (of whom over 70 % live in rural areas under difficult circumstances), is one of the greatest challenges of today. Since 1850, mastery of the physical world through science and technology has helped to bring about a six fold increase in the average global real per capita income. Nevertheless these aggregate numbers mask glaring inequalities that need to be addressed urgently. Thus, the roughly 25% of the worlds population in the industrialized countries produce and consume about 12 times more per capita than their 3rd world brethren.

Many of the fundamental structural changes that are transforming these western societies such as, the shift from the industrial to the post industrial economy; large investments in research and development; adoption of

strategies and institutional structures for the application of research results to develop new products and services, coupled with their vigorous efforts to seek markets for these products and services, developments in their information industry, and move towards information economy; are being driven by technological improvements in areas like microelectronics and informatics. These changes cannot be ignored by African countries, if they are to take their place as equals in the global environment and compete successfully in the international market.

4.2 AFRICA'S POLITICAL AND ECONOMIC BACKGROUND

In a discussion on information technology (IT) and information sharing in Africa, one ought to take stock of the socio-economic and political realities in the continent because the implementation and review of IT is likely to face similar obstacles and possibly the same destiny as the other sectoral and multi-sectoral efforts.

Shortly after political independence, (decolonization) begining about the 1950's, the majority of African countries set themselves the task of building their economies. There was an immediate realization that resources were scarce, that the limited resources had to

be allocated optimally; that priorities for the distribution of resources had to be defined, and that due to the infantile nature of the private sector, the role of governments in economic life had to be relatively stronger. It was realized that economic growth did not necessarily bring development and that equity was equally, if not more important. These were the realities that led to the pursuit of development policies and development planning as instruments of charting African economic and social development over the last three decades.

Needles to say, results have been mixed across countries and overtime within countries. Both internal and external economic and political factors have influenced the performance of African economies and the attainment of development goals and the implementation of the stated policies and plans. After three decades of applying and pursuing development policies and plans, a large number of countries still find themselves in an economic straight jacket. Partly the situation is so because, the plans have always fallen short of setting out the objectives, strategies and tactics. The plans end up often being blueprints with no explicit guidelines for development. Unrealistic goals and objectives are set, "political slogans " dominate the plans, instead of the

actual data and information on all the resources to be harnessed for the development. " White elephant " projects stand out in several Sub-Saharan African countries, poor infrastructures. Despite the continued condemnation of neo-clonialism African countries continue to look upon their former colonizers and the other developed countries for aid and even to feed their starving population. Some of the factors contributing to this have been identified to be inappropriate policies/and plans, low level of R and D into the problems of Africa, low level of development of library, documentation and information systems and of information technology in the region, and inadequacy of resources (human, financial, facilities) to implement the plans.

4.3 COMPUTERIZATION IN AFRICA

Computerization in Africa is not a recent phenomenon. Ethiopia, Zimbabwe and Zambia started using computers in 1960, and Kenya in the mid-sixties. A summary of introduction of information technology in some of the African countries is given in table 6. These systems were all in the public sector and were based on hardware and software designed by and for the industrialised nations. In most of these countries computerization began with financial and statistical

applications, where initially the large volume of data and governmental transactions was the major impetus for change. Centralized administrative systems required elaborated management and support infrastructures. These were easily set up with the help of the supplier and they could be maintained within a limited and tightly controlled government environment (Kaul, 1988). Computers were concentrated in government sectors for various reasons including that of the cost and size of the equipment available at the time being mainly mainframes. As such, they tended to be separated from the general administrative and commercial environment and did not stimulate similar IT developments in important sectors such as agriculture, education, public health, public utilities and small scale business. Economic, social and cultural factors constituted the main barriers to expansion. For the African management the computer was seen as synonymous with suppression of employment on the one hand and a technology too advanced and expensive for Africa on the other. Africans preferred the intensive use of local, cheap labour. However, this started changing with the developments in IT computer, telematics and electro-optical technologies that have important impacts on African countries. These include the microchip; significant increases in the storage capacity and reduction in the cost of data storage; developments in

The availability of large databases in such fields as agriculture and medicine on CD-ROM (eg databases of FAO, CAB International, National Library of Medicine (USA), the Pan American Health Organization, Pan African Development Information Service (PADIS) is already making a significant impact in Africa.

Micros linked to data communication networks provide access to remote databases, for instance, agriculture scientists in the University of Malawi, Bunda college of Agriculture as well as others in the continent can access the databases of FAO in Rome or of other regional/international centres and similarly health researchers in some African countries access databases at the National Library of Medicine in Maryland USA. The larger centres in some countries are able to subscribe to a few commercial databases or online services.

Electronic mail and messages and facsimile systems enable print graphics and handwritten texts to be transmitted over telephone lines both within and across national boundaries. Such facilities are being used by field workers to transmit and receive reports, bibliographies, memoranda etc, and are likely to be used much more extensively in the future both in the work place and at home.

Satellites and broadcast media in distance teaching/ learning as well as for exchange of information has been successfully used in the Caribbean, Asia, and the Pacific islands and this is likely to spread to Africa in the near future. Computers are now being used in data handling in agricultural and rural development, meterological forecasting, marine production, management of health services, rural data banks and other programme areas (Some sectoral computerization in some African countries is listed in table 7 and 8).

4.4 PROBLEMS OF IT IN AFRICA

With the increased diffusion of IT in Africa, problems associated with its use have also increased.

A review of the development of information infrastructure in Africa, and an appraisal of the application of information technologies by libraries, information, documentation and data centres established to meet the information requirements of development planners in the countries of Africa, highlight a number of inadequacies. The shortcomings derive primarily from a lack of appreciation of the role of information in development, by the political and planning officers of most countries in Africa. This has resulted in a number

of policy gaps in those areas which are vital to the acquisition and use of modern information technologies for implementing socio economic development projects and programmes. These major constraints affecting IT in Africa have been summarized by various authors, including Gupta (1987), Zwangobani (1988) and Wilson (1990). The following are among the major constraints,

(i) Shortage of skilled manpower and inadequate training facilities.

(ii) Inadequate telecommunications services and related infrastructure

(iii) Lack of foreign currency

(iv) Information technology planning and policy deficiencies

4.4.1 Manpower

Any new development requires adequate human and financial resources and facilities and equipment. For many African countries, while IT offers a more efficient and effective means of information handling there are problems particularly due to lack of expertise needed to use IT and some other features of IT itself. The problems in this area include:

(a) Lack of Africa-based training opportunities.

(b) Traditional approach to librarianship adopted by some of the schools of library science; and

(c) The inadequacy of re-training facilities for both middle-level and managerial information workers (DEVSIS study team, 1979).

Fourteen years later, this analysis still holds. International and regional information systems/programmes have of necessity helped to train in short courses and workshops persons to utilize IT and methodology specific to the respective systems. While this has been useful, only a negligible proportion of the requirements of trained information manpower have been trained in Africa. However, first degree courses in computer science have been introduced. The University of Nairobi, Institute of computer science; University of Malawi, Chancellor college; Addis Ababa university; Sierra Leone University and the University of Zimbabwe just to mention a few are now providing undergraduate courses in computer science and information processing (Kaul 1988). Despite this, the situation still remains the same as facilities for advanced courses in computing, system analysis and design, database management techniques, telecommunications etc. are not widely available.

Individuals are sent abroad for studies in these subjects but due to the scarcity of foreign currency, only a few get the opportunity. The future of Africa information services lies in the leadership capacity of information practitioners. It has been noted that:

> **" It is essential that information practitioners do not remain librarians, documentalists or information scientists alone but that there should emerge a class of information managers who act as politicians and defend the information cause at political forums; as salesman who sell competitive information products in a difficult market place; as public relations officers who form and change consumption habits; and as managers who raise the financial technological and human resources for information pursuit" (Dejen Abate, 1987)**

But two pre-requisites have to be fulfilled for such information managers to emerge (1) Information workers will have to be academically on par with the administrative and technical officers they are to relate with; and (ii) that their status in terms of financial renumeration and social recognition should approximate those with equivalent responsibilities (Gehrke, 1985).

This calls for library and information science schools in Africa to up-date their curricula, acquire and develop appropriate facilities and teaching expertise in IT, in preparing value added products and services, information analysis, consolidation and repackaging, decision support systems, information use, promotion and marketing, and in information and information technology management.

4.4.2 Infrastructure

The inadequacy of the existing information infrastructure is yet another problem area. A large number of development institutions still operate with virtually no in-house information support. The physical resources available to existing information centres leave much to be desired. Information services utilizing state-of-the-art technologies and associated practices that could serve as demonstration sites are virtually absent in several countries of Africa.

The inadequacy of investment in information infrastructure does not mean governments have been totally indifferent. Substantial investments have been made to build and maintain information collection, and delivery capacities in the form of national and sectoral libraries, documentation centres, archives, statistical

offices etc. The utilization of these capacities has however been much below optimal or desirable levels (IDRC, 1988). The core cause of under-utilization could be traced to the imbalance in the supply and demand for information. Generalizations regarding developing countries arrived at by D. Abate, following in depth study of national information systems in India and Ghana depicts the African situation equally well:

> **" Most libraries and documentation centres still operate on the notion that when information is available, it will be utilized without sufficient consideration to the intrinsic (sources, delivery modes and channels, time factor, language factor, retrieval efficiency, coverage) and extrinsic limitations (socio-political framework, economic infrastructure, motivation to seek information).**
>
> **Too much emphasis has been placed on the supply of services and too little on mobilizing demand. New information services have tended to be based on traditional library services, user studies are conducted only occasionally... little effort has been put into positive marketing of services". (Abate, 1987).**

This calls for effective information promotion, marketing of information products and services and user sensitization and orientation. This could only be done through creating specialized resource centres/information centres.

Alongside these shortcomings in information supply, one finds demand constraints. Numerous authors have attributed the root cause for under-utilization of information in developing countries to the fact that reading habits and the motivation to use information are under-developed. Rote learning, acquisition of factual knowledge by heart is practised in most high schools and universities. There is less training in individual problem solving and in using various information sources (Gehrke, 1985). Capacity utilization within African information services has proved to be a much more difficult exercise than capacity building. On the other hand information may still be under-utilized due to low level of research and development activities in Africa.

4.4.3 Inadequate Telecommunications

Efficient telecommunications infrastructure is the key factor in the development of abroad based information technology infrastructure, as it facilitates wide area

networks. Unfortunately with the telecommunications infrastructure in most African countries being underdeveloped. It is quite difficult to implement wide area networks. In many countries data communications lines are only available in the urban centres. The more technically capable countries provide data communications between the large urban centres but not to the growth points in the rural areas (Zwangobani, 1988)

Neelameghan (1992) summarises some of the features of IT that are causes for concern which also apply equally to African counties. These include:

-problems of accessibility at affordable cost to the accelerating innovations in IT.
-Lack of adequate local and national infrastructure including an information industry and expertise to effectively utilize IT.
-Effect on aggregate employment and related social and political issues.
-Possible control and censorship of information by national governments or other entities.
-Freedom of access to and publication of information
-Assault on privacy and confidentiality of information whether it relates to an individual or to a corporate entity including government.

-Sovereignity and conflicts vis-a-vis nation states.

-Intellectual property and business law related matters.

-Trade in information across national borders.

-Copyright legislation for machine readable data.

-Legislation regarding software production, distribution and use.

-Costs and pricing of data and facsimile transmission and

-the pace of IT developments leaves too little buffer time for national authorities and managements to understand, assimilate and assess their likely impact on the social, political, economic and technological fabric of the country.

Much of the information required by researchers in Africa are produced and documented in the developed countries. The acquisition of information sources databases or access to them requires substantial amounts of hard currency and foreign exchange facility both of which are serious handicaps to Africa. Neelameghan (1992). confirms this sad state in the following words:

" There is little that third world countries can offer in exchange for information. Even vigorous marketing for information products and services

may not bring in revenue commensurate with the cost of production and distribution. Practically all the networks and systems are being supported at least for the first few years by international agencies. The question is: Can the networks, other than those that are activities of some international agencies themselves, become self reliant and self supporting when international funding is withdrawn at some stage? "

The conclusion which derives from the foregoing observations is that if Africa must achieve the socio-economic development goals and to create an African Economic Community, then the various countries must give priority to the development of their information infrastructures. They must strengthen existing establishments, as well as create additional ones at the national and regional levels in order to ensure the availability of data and information relevant to their planning process on a continuing basis. Greater emphasis in this connection must be placed on the use of appropriate IT, to ensure timely and well processed information.

By the same token, African countries must place adequate emphasis on the acquisition and use of modern IT

in view of the important role which these technologies play in the generation and dissemination of information to support development planning.

African countries should place emphasis attention on this, in their efforts at getting information technologies respond to their individual and collective needs for planning, development and execution of projects and programmes.

4.5 PERTINENT ISSUES OF INFORMATION TECHNOLOGY SHOULD SOLVE

IT ought to address the following problems if it has to take root and develop in Sub Saharan Africa. As regards foreign economic relations in terms of trade and financing, recommended policy stance, emphasise economic cooperation.

> **" Economic integration has rightly not lost attraction as a component in programmes for African recovery, despite the extremely limited success or total failure of the schemes that have been tried, thus continued hope in integration as a developmental mechanism is the difficulty countries of Africa see in the way of an alternative" (Atherton,1987).**

Therefore, the imminent shift in development strategies in favour of agriculture and industrialization linked to agriculture, forms one of the basis for priorities in information technology activities. A large number of African countries already possess agricultural libraries and documentation centres, agricultural statistics units etc. Lately there has been discussions about early warning systems, food security information systems, environmental monitoring systems etc. All these would never be a reality without proper IT application. A more important issue however, is how these services could effectively meet needs arising form multi-dimensional agricultural/rural development concerns (farm management, adult education, farm credit, water management, appropriate technology etc.) and the heterogenous user environment of the agricultural/rural development involving planners, extension agents, peasant leaders, district administrative officers, etc. In addition, the agricultural rural development information problematique requires innovative information collection, processing and delivery methods and continuous experimentation on and updating of those methods. Recent technological advances in remote sensing, communications and data processing provide new potentials (Abate, 1987)

Similarly, sectoral development strategies in the areas of trade, industrialization, transport and communication, and natural resources exploitation, form a second area of subject emphasis. Trade and industrial information services are still at a very embryonic stage. In depth knowledge on the extent of their natural resource base is an aspiration African governments have not been able to realize as yet. The information needs and information seeking behaviour of the African private sector is still very little understood.

Public administration and economic planning, implementation and monitoring form the weakest links in the chain of government functions. Some of the shortcomings are a result of inadequate availability and use of information. In addition, there has emerged the need to follow-up and monitor the structural adjustment and re-adjustment process virtually all sub-Saharan African countries have subjected themselves to particularly on the impact of these adjustments on social and economic life. The impediments in this area of emphasis are threefold, namely

(a) the absence of suitable indicators to explain and monitor the phenomena;
(b) the mechanisms for generating information and data, and
(c) and, the information systems that will regularly collect, process and deliver information once

indicators have been defined and data generation routines are established.

Along side these three areas of emphasis, information support for development pursuits takes numerous forms. Conventional thinking gave exclusive emphasis to printed textual sources. Outputs of activities with major information components (e.g. cartography and mapping; geological surveys) were not considered as information outputs for dissemination and enhanced utilization.

4.6 AN INFORMATION INDUSTRY FOR AFRICA

Other obstacles and constraints to technological development in African countries include: lack of management skills and experiences, massive illiteracy, massive unemployment, scattered rural communities etc. These can only be overcome by integrated and sustained action at the national, regional and international levels. The development of an African information industry would not only support acceleration of Africa's social and economic development but also to overcome the continent's excessive technological dependence on the industrialized countries. But the technological self-reliance should not be seen as simply a drive towards

self-sufficiency in response to immediate pressures, such as shortage of foreign exchange. Furthermore, if an information industry is to be set up in Africa, it should not simply duplicate the efforts of developed countries but should concentrate on a limited number of assignments most relevant to the situation in the continent.

The industrial sector in most African countries is very much underdeveloped and it would be quite unreasonable in the mean time to expect too much from the African countries.

However, as Gabel (1989) wrote:

"There are some skills and an embryonic national industry in Algeria, Cote d'Ivoire, Senegal and Gabon but the plans use technology which is imported or applied by foreign firms".

Also with the help or in collaboration with foreign companies computers have been assembled in some countries in Africa.

The computer fair held in Cameroon, in April 1988 saw the introduction of the Cameroonian PC "Ramses I" and Senegal's "Taww" (Gabel, 1988). TEK a firm established in 1986 in Botswana started the manufacture and assembling

of its own IBM PC compatible machine under the label TEK PC 88 (Computers in Africa, 1989). It is important to note that in all the above cases the electronic components used for the assembly are imported from outside Africa.

One country in Sub-Saharan Africa that is establishing itself in computer manufacturing is Nigeria. The Anambra State University of Technology (ASUTECH) of Nigeria had by 1983 developed its own brands of mainframe and microcomputers. The University team led by Professor O. N. Mobison, an electrical engineer and computer scientist designed four computers; three main frames- the ASUTECH 800, the ASUTECH 801 AT and the ASUTECH 8000 and one microcomputer-the ONUKU (the ibo word for "stupid man") (Computers in Africa, 1990). Fabrication of these computers has been done in Nigeria using imported electronic components. The University has also gone on to establish the ASUTECH computer company to continue the production of the computers.

4.6.1 Software Production

While the quantum of manufacture of hardware in Africa in general is negligible, software production appears to be doing better although it also has its own

problems. Nigeria, Zimbabwe, Cote d'Ivoire and Kenya have the potential to produce software. Although software development may not be capital-intensive, it certainly requires considerable computer skills and expertise. Africa has very few qualified computer scientists and as such locally developed software in most countries lack quality and sophistication when compared to world standards. In most cases they are just first attempts at writing and developing computer software. Despite the skilled manpower problems of software development, some notable successes have been recorded, such as that of Tara Systems Ltd, a Nigerian company. Tara has developed a good number of packages among which are Autobank, a complete merchant/commercial banking software system; Tarabank for branch banking; Tarafarcs for international banking operations; Taraman; a personnel/payroll system; Tarastock for inventory management; and TaraGL, a multi-company, multi-currency accounting system (Fiofori, 1990). Of all the banking packages in use in Nigeria, Tara's Autobank system has the largest installed base. Tara systems Ltd is also active in Ghana, where it is the largest database supplier, in Cote d'Ivoire and the Republic of Benin.

Another notable acheivement in the field of IT in Africa is the production of the CD-ROM databases. A Zimbabwe media technology company, has developed the

Svinga CD-ROM disk containing details of over 75 national parks and Safari areas; 200 cities, towns and villages; 50 lakes, dams, and rivers; 200 biographies of prominent Zimbabweans; and also included are nearly 1000 maps, drawings and pictures and extensive economic data (Dickinson 1991, 14). The Svinga CD-ROM is basically an information source for visitors and investors.

4.7 REGIONAL ALLIANCES

Information and information exchange are identified as the substance and modality in most regional and international cooperation arrangements be it for political, economic, trade, technological, social or cultural purposes.

The formation of regional alliances of nations (eg SADCC, ECOWAS, ARSO) call for information support for the effective performance of their functions of coordination and promoting cooporation in various sectors of the countries involved and among the countries as a whole. Some areas of common interest in such regional alliances and intercountry interactions (and on which information and data are required by the participating entities) include markets for products and services, trade opportunities, customs, duties and related regulations;

bilateral and multilateral agreements, treaties and contracts; available technologies and innovations; expertise and skilled manpower available in different fields; demographic data; sanitation and communicable diseases; epidemics and health legislations; environment related matters; natural resources; financial resources; financing agencies and ongoing projects. Databases and information products covering such areas are produced in the participating institutions. Thus, there is need to have such information resource centres which would use modern technologies and produce databases for the benefit of the country and the region as a whole. The system should also provide information on development plans and priorities, infrastructure and on policies and strategies, modalities of resource sharing, laws and regulations relating to transborder data among the participating entities.

4.8 TELECOMMUNICATIONS

Information gains value when it is exchanged and used. To be exchanged and used it must be transferred or delivered. The need for effective and efficient means of information transfer is becoming ever more pressing with the exponential growth of information, especially in the scientific and technological domain, and with the

increasing recognition of the importance of information to development. The distinction between the computer and telecommunications technologies is disappearing.

In many of the African countries telecommunications facilities have been described as deficient. In a majority of cases, however the development of these facilities are rated as uneven, low, grossly inadequate and under-invested. The implementation of telecommunications in many African countries is characterized by:

(a) Conflicting policy signals from governments

(b) Haphazard and uncoordinated planning

(c) Poor quality service

(d) Underutilzation of available resources

(e) Lack of manufacturing capability

(f) Inadequate logistic machinery (manpower, equipment/tools, transportation)

(g) Proliferation of different technologies leading to problems of inter-networking, the system and inadequate executive capacity (UNECA 1992).

Measures for determining the penetration of telecommunications within a country reveals a poor state of development in Africa. For example the United Nations

(1979) study showed that the telephone penetration or density in Africa was 0.44 lines per 100 persons as compared to 4.5 lines per 100 in South America, or with the 5.2 lines per 100 in Asia. Minshul (1989) also indicated that according to the figures compiled by AT and T, the US telecommunications giant, the number of telephone lines in Africa (including South Africa) in 1986 had reached just over 3.2 million, with a density of 0.6 lines per 100 persons and only 0.9% of the world total.

Additionally, African telephone networks are concentrated in urban areas, where they are often poorly maintained and offer mediocre quality service. In the US, nearly one third of all households have personal computers, many of them equipped with modems. In the business sector, they have become nearly universal. While the statistics of computer density in Africa is not known, it is clear that many important institutions operate without any computers (and without access to direct telephone lines), and in fact even some national participating centres in the network of the Pan African Development Information System (PADIS) have no computers (UNECA, 1988)

An important factor to be borne in mind by African leaders, decision makers, planners is that the heart of

IT lies in the ability to transfer data from its source to the destination where it is needed, using the fastest means possible. Therefore data communications infrastructures need to be adequately developed in Africa

TABLE 6

INTRODUCTION OF INFORMATION TECHNOLOGY IN SOME AFRICAN COUNTRIES

Gambia early 1980's Kenya (Mid 1960's)	Regional Agrshymet program,Ministry of Meteorology and Hydrology,population, Housing census,central statistical department,General ledger,Accountant general's department
Malawi (1966) Mauritius (1972)	Processing of first population census at National Statistics Office Centralised data processing service to all ministries and government departments,Ministry of Finance
Nigeria (early 1960)	Government utility corporations for documentation and billing
Sierra Leone (1963)	National population census,Central statistical office,Ministry of Economic,Planning and Development
Tanzania (early 1960's)	National provident fund system, Ministry of Finance.
Zambia (early 1960's)	Government accounts,payroll and persons,Ministry of Finance
Zimbabwe (Early 1970's)	Treasury Computer Bureau as centralised computing resource for government payroll,accounts and administrative data processing

TABLE 7

SOME SECTORS COMPUTERIZED IN AFRICAN COUNTRIES

Country	Sector	Purpose
Angola	Energy	petroleum:geophysical research, prospection and production
Botswana	Education	processing of primary school leaving certificate
Gambia	Trade	Processing of foreign trade statistics
Cote d'Ivoire	Health	Management and distribution of pharmaceutical products in major hospital centres
Kenya	Mass media	Daily nations use computers in the production of its newspapers
Malawi	Education	Processing census data; Malawi national examinations;processing of bank transactions; in the university for teaching purpose and university library
Nigeria	Transport	Transportation;policy studies in the ministry of works
Senegal	ISRA	Publication of data on rain soil and general agriculture conditions using desktop publishing
Zambia	mining	Production control,mechanization and cartography in the copper mines
Zimbabwe	posts	Post office: Management of current accounts and savings (deposits)

Source:Birindelli (1989),computers in Africa(1989)
National Research Council (1989), and Kaul (1988)

TABLE 8

MAJOR COMPUTER CENTRES IN SOME SELECTED AFRICAN COUNTRIES

COUNTRY	CENTRES
Botswana	Government computer Bureau(1982)
Gambia	Central Statistics Department(1981)
Ghana	Central system development unit (1981) Ministry of Finance, economic planning
Kenya	Government computer centre
Malawi	Department of Data processing (1983), Ministry of finance previously National Statistical Office (1966)
Mauritius	Data processing division (1972) Ministry of Finance
Nigeria	Central computer unit,Ministry of Finance
Sierra Leone	Central statistical office(1963),Ministry of economic planning and development
Tanzania	Government computer services centre(1965),Ministry of Finance
Zambia	Data processing unit,Ministry of finance
Zimbabwe	Department of central computing services,scientific computing centre(1988) Ministry of economic development and planning. Treasury computer bureau (1970's)

Source: Kaul (1988).

CHAPTER FIVE

INFORMATION TECHNOLOGY STATUS AND BACKGROUND IN MALAWI

5.1 INTRODUCTION

The background of IT in Malawi can best be described in the following professional activities whose main objectives have been to strengthen national information infrastructures by preparing the existing information centres to the changing world in terms of modern information technologies.

The Intergovernmental Conference on the Development of Information Services in East Africa held in Arusha, Tanzania, in April, 1976, was a landmark in the development of modern information systems in Malawi. According to R. S. Mabomba (1983), the conference provided the impetus for the development of documentation activities in the country and led to several infrastructure strengthening decisions and activities over the years. These included among others, the creation of the NATIS Committee with the mandate to set up a coordinated system of library and information service in Malawi. The issue of information technology featured very prominently as it was seen to be a means for the

coordination. Malawi was also an active member of the Council for the Development of Information Systems and Services in Eastern and Southern Africa set up by the Nairobi Conference (1973) whose objectives were, among other things, to foster resource sharing in information in the region with emphasis on the use of IT.

The country also participated actively in the preparations to establish SADIS secretariat through the NATIS Committee. J. J. Uta (1988) confirmed and brought the trend up to date at the Zambian network seminar held in Lusaka in February 1988, in a paper in which he identified institutions in Malawi which will be participants in future networks.

5.2 INFORMATION TECHNOLOGY IN MALAWI

As mentioned above, the field of information technology is still young in Malawi. Computers were first introduced in the country in 1966 (Refer to chapter 4 page 1). As is the case with most of the third world countries, computer applications in Malawi began with the public sector. The first organ of the Government to acquire computers was the National Statistical Office (NSO). It used computers primarily for processing of the first population census results. Since then, computers

have been proliferating into both the public and the private sectors. A report by the National Statistical Office (NSO) confirms this. It indicates that the country has been importing small quantities of electronic data processing equipment and some mainframe computers form around 1970. The 1978 report also confirms this by giving a comprehensive report of the number of IT products imported in the country since 1966.

At present, it is difficult to make an accurate assessment of the number of organizations using computers and the types of installations available. (An attempt has been made in this study and the findings are given in chapter ten).

To-date the investment made in computers and related products is very considerable compared to what it was, some 15 years ago, to warrant proper examination, as to whether the service is being used to the optimal benefit of the country as a whole in relation to the investment made. Unfortunately the information available does not categorise the IT products in use in Malawi. Probably a look at the main manufacturing companies represented in the country may reveal the types of some of the products in use

The major firms include:

(a) International Business Machines (IBM)

(b) International Computer Limited (ICL)

(c) National Cash Register (NCR)

(d) Unisys-Manufacturers of Burroughs products

(e) Olivetti

(f) Wang products

(g) Geo-Services, dealers of Bull computers

A few institutions operate equipment for which there are dealers within the country. A good example of this is the Malawi National Examinations Board which uses Hewlett Packard machines. With the scarcity of foreign exchange resources, it is unlikely that many more organizations will follow suit.

By far the biggest user of computers in the country is the national Government itself together with its parastatal organizations. The private sector is steadily picking up, especially in using personal computers. As companies compete in trade and quality of products and services, they are looking for better information. Such information provision can be facilitated by the use of computers. More and more firms are realising this and introducing computers. This applies equally to other areas of the economy namely research institutions, higher learning institutions etc.

Almost all the computers used in the country use imported software packages. Very few are designed locally (Masanjika, 1989)

5.2.1 Coordination Mechanism

By and large there is some form of central coordination of IT activities in Malawi. The Government Computer Committee in the Department of Data Processing, Ministry of Finance laid down guidelines for hardware and software procurement as well as coordinating manpower.

5.2.2 Fiscal Incentives

To encourage the importation of computers and related technology the government has instituted a deliberate measure, to stimulate computerization in the country. The import tariff was reduced for microcomputers though not for larger systems (mainframes).

5.2.3 Human Resource Development

Manpower availability has been cited as a critical constraint in the computerization activities of most governments in Africa. Allied to this is the limited training facilities in the various countries. Malawi is no exception. Masanjika (1983) confirms this:

" In Malawi, most of the users of computers have very little knowledge about what a computer can do and the benefits they can derive from it. Very few of the manufactures or dealers offer reliable back up service. Some of the users order products very much unsuitable for their requirements ".

After ten years, the validity of this assertion still holds. There is also a shortage in the country of people with sufficient knowledge to carry out computer installations, maintenance and repairs. At present relevant courses are taught only in the University of Malawi. Although computer science subjects are offered in various degree programmes especially engineering and mathematics, the University generally does not offer degree programmes in computing and information systems. Looking at the growth rate of 10 to 12% of IT services in the country, it is clear that the University will soon be overburdened. However there are also some institutions offering sub-professional IT training. These include, the Polytechnic and some private institutions. Some form of in-house training is also available in the various major computer centre (A summary of computer institutions in the country appears in table 9).

There are also government departments which offer some informatics training though not at a certificate level. The Ministry of Finance, through its Data Processing Department is offering in-service training programmes for civil servants through some form of persuasion. It is in the Ministries where planners and policy makers are. If departments can manage to bring to their attention the need for systematic development of IT in the country, then the country will see accelerated developments in this area.

Courses can be introduced in the technical colleges, not only to reduce the pressure on the University but also to expedite the training programmes at the lower level.

5.3 PROFESSIONAL ORGANIZATIONS

The Computer Society of Malawi is the only professional organization in this field in Malawi to spearhead IT development. It is however young, weak and not very effective. As part of its objectives of encouraging computer awareness in the country, short courses and seminars are organized. The Society would benefit very much from the introduction of a national policy on informatics which would define its role. One of

the problems the society has tried to tackle is that of standardization. Lack of a body responsible for overall IT affairs has contributed to the independent development of services in this area. The Society has little or no control over the situation.

In recent years, the private sector as mentioned above, is increasingly acquiring IT products. It is in this area that standardization is most needed.

Insufficient knowledge of the products has led some of the practitioners to acquire equipment which is not suitable for their requirements. Some of the equipment needs facilities from the telecommunications department. There have been instances where prior checks to ensure that the equipment will conform to what is already existing are known not to have been done. The results have always been very costly indeed. The creation of a body responsible for overall informatics would help alleviate some of these problems. Most people interviewed were positive in their views that such a body should be created but that it should not be too rigid and restrictive in its approach. It should encourage development.

It is also important to mention briefly the question of having a unified informatics policy. There is no one who does not need information. It is therefore important that this resource is properly preserved, processed and used to ensure that it is not wasted and supports development. Popular opinion has it that IT application in Malawi must be introduced cautiously for reasons such as:

(a) IT is developing fast and some of the products tend to be dated and obsolete quickly; and

(b) Malawi lacks experience in this field and does not have sufficient trained manpower to be able to guide it successfully.

Not everything that is offered by IT is useful to Malawi. In the business sector an innovation may have adverse results on an existing service. For example, in the telecommunications department, the introduction of facsimile service is faster and cheaper to the user, but it brings in less revenue to the Department. So the Department tends to hesitate when acquiring more costly, more efficient, but offering cheaper services equipment vis-a-vis that which is less modern but brings in more revenue. Obviously, if the costly service, once introduced, is going to benefit the whole country by

improving the service, then profits alone should not be the primary consideration. Possibly, it is in such circumstances that the Government should step in to assist.

5.4 TELECOMMUNICATIONS

As observed in chapters 3 and 4, a well developed telecommunications infrastructure is an important component of a country's information technology infrastructure. It facilitates the transmission of information and data, both within and outside the country. Wide Area Networks (WAN) and sometimes, even Local Area Networks (LAN) are only possible if telecommunications facilities in the country are well developed. This section therefore reviews the telecommunications infrastructure in the country.

The telecommunications industry in Malawi falls under the Department of Posts and Telecommunications. Since independence, telecommunications networks have been expanding, by 10 per cent in the last 15 years and 8.5 per cent a year in the 1980's. However, at 0.62 per 100 population, telephone density is still low by regional standards. In 1987 there were 21,800 subscribers and were almost entirely urban, and although 45 per cent of these

are classified as residential, many of the connections are used for business purposes. (Malawi Government. Statement of development policy 1987-1996)

5.4.1 Telecommunications Facilities Available

The existing telephone networks is comprised of different types of technology made by a variety of manufacturers. Step by step, crossbar and digital switching apparatus coupled to analogue and digital microwave systems, radio systems, cable and open wire transmission routes. The ways and means of integrating, developing and maintaining such combinations is a problem faced by all telephone administrations. The Malawi Post Office has formulated a clear policy on how this is to be managed. In relation to switching equipment, a decision was taken some years ago to move at a measured pace over to modern digital equipment, making efficient use of other types of equipment, as long as it is economical to do so. Equipment that is replaced is commonly moved and used elsewhere, or at least used as a source of spares. Clear guidelines exist for planning exchange modernization, expansion, and rehabilitation, and work is now well under way in the Southern and Northern regions of the country. In relation to trunk transmission this is also being progressively digitalized.

At independence, Malawi depended on other countries in the region for external telecommunications links, but since the two direct satellite earth stations have been built, one "B" station to India and the far East, and "A" station to Europe, North America, and parts of Africa. These are able to transmit and receive data. The only problem is that the data communication facilities are at present weak and are not very helpful in the transmission of data within the country. Much needs to be done to fully develop this technology in the country.

Microwave links to Zambia and Tanzania have also recently been introduced and one with Zimbabwe in under construction. In 1981 an international gateway exchange was commissioned which offers direct dialling from most parts of Malawi to 33 countries, and a semi-automatic service to the rest of the world.

Telecommunications traffic growth has also been accelerating in recent years from an estimated 8.2 per cent a year in 1982 to 9-10 per cent a year in 1987. Call rates during business hours at an average of 5 calls per subscriber which is extremely high by international standards. Some 70 per cent of domestic traffic is on trunk routes and 30 per cent local. International traffic has grown particularly rapidly by 10 per cent a year between 1975 and 1981 and by 22 per cent a year between 1981 and 1987.

A number of organizations, such as the Agricultural Development and Marketing Corporation (ADMARC), Malawi Bureau of Standards and Commercial Banks would have been operating on-line service in the country already, had the facilities been suitable. However, the Telecommunications Department continues to bring in new technology. Currently it is installing bureaufax throughout the country to assist those who cannot afford to buy the facilities. Also in progress, is a feasibility study into the introduction of online service, DIALOG into the country.

The Meteorological Department and the Land Husbandry branch in the Ministry of Agriculture have remote sensing facilities which they use for weather forecasting. Although remote sensing equipment is very expensive it is a very necessary facility.

Table 9

SOME OF THE INSTITUTIONS PROVIDING IT TRAINING IN MALAWI

University of Malawi Chancellor college offers a Bachelor of Computer Science Degree programme.

Malawi Polytechnic of the University of Malawi offers IT courses as part of the basic degree in Technical Education, Engineering and Commerce.

Computer Society of Malawi in conjunction with Malawi Polytechnic offers programming courses on part time basis.

Government Computer Training Centre in the Department of Data processing of Ministry of Finance, operational since October 1987, offers courses for both IT professional and end users.

Computer Sales and Services, Business Computer Services Ltd and ICL (Malawi) provides training on the use of their hardware and software.

PART TWO

CHAPTER SIX

INFORMATION SUPPORT SYSTEM

6.1 INTRODUCTION

For a long time, men have been working together to accomplish tasks, making decisions about scarce resources in uncertain situations, management of available resources has been practised, and exploring new ways of achieving their goals.

In today's world, managers find themselves more and more remotely placed from the resources they use. They are frequently in direct contact with the men, machines, materials and money they manage. Organizations have to look at national and global levels even when considering 'local' matters. Managers face greater complexity in many of the decisions because more factors have to be taken into account. The rate of change in these factors is accerelating. Hence the stakes and risks involved in making decisions are relatively high.

Enterprises are constantly being subjected to external influences and interventions. Hence, the trend and developments in the environment i.e. the economy, the

political, regulatory, social, technological and related factors/issues at the local, sectoral, national, regional and international levels need to be constantly scanned, to alert decision makers of their likely impact on the programmes, projects etc.

In any enterprise today, because of the scale, complexity and rapidity of change, information support system is the key to management effectiveness. This is equally applicable to the University of Malawi. An important function of the proposd Academic Resource Centre (ARC) of the University of Malawi will be to provide information support for the effective management of the University's academic and related affairs.

This chapter therefore discusses briefly management information systems. Specifically the following points will be discussed.

* Information support systems for organizational level managers.
* Information support systems for planning and control.
* Decision support systems and expert systems.

6.2 COMPUTER BASED INFORMATION SYSTEMS

Most information systems in the 1970's aided lower and middle level managers with only a minimal impact on upper levels of management. Even today, few corporate executives use computers to help make their decisions. However, this is changing. New applications of mordern information technology (IT) are focusing on the needs of managers,

From small independent applications such as payroll or customer invoicing to massive networks of computer based tele-processing. The current challenge in information processing is to use the capabilities of computers to support managerial activities. Of course, an information support systems can exist without computers, but it is the power of the computer which can facilitate access to timely and appropriately processed information.

Therefore, information support systems include computer-based information systems and other applications of modern information technology (IT).

6.3 MANAGEMENT ACTIVITIES

The primary objective of management is to achieve defined goals. Management is a process consisting of activities of planning, organizing, directing, staffing and controlling, performed to determine and accomplish stated objectives. (Franklin and Terry 1988). To achieve the goals, an enterprise needs five major resources and these are: people, information, physical facilities and equipment and finance.

Making a better economic life possible, improving social standards, and achieving more efficient and effective government are the challenges to managers in their respective areas of operation. As an institution of higher learning, concerned with the development of the human resources necessary for the development of Malawi, these are important objectives to be achieved. Management makes human effort productive. It brings better equipment, plants, offices, products, services, and human relations to the organization.

In order to accomplish these activities, a manager needs information. A significant part of a manager's time, as much as 80%, is spent in processing and communication of information (Davis and Olson, 1985).

Therefore the primary objective of an information system for the organization should be to provide the managers with relevant, reliable and timely information to assist them in making gainful decisions.

In designing such a system, it is necessary for the information professionals to understand the process of decision making, the characteristics of the environment in which decisions are taken, the factors including the decision making style or behaviour of the decision maker that can influence the decisions.

6.4 USES OF MANAGEMENT INFORMATION SYSTEM

A management information system (MIS) is designed to provide each executive/manager information necessary for:

* Identifying and choosing among alternative courses of action.
* Planning the end results for which the executive is responsible and the specific actions to achieve the end results.
* Evaluating and measuring the performance of the executive and his assistants on the basis of appropriate criteria and taking corrective action.

The executive's task areas may range over a wide field; therefore the information needs should also be correspondingly diverse. For instance, information may be required to (Neelameghan 1992):

1. Formulate objectives of the organization
2. Formulate major strategies and policies to meet specific objectives
3. Prepare long range plans
4. Report to the higher bodies e.g University senate/council, the Ministry concerned, etc. on the result of the operation of the organization.
5. Inform the public about selected policies of the organization.
6. Inform employees about the status and performance of the organization.
7. Provide basis and background to take decisions about specific matters as they arise.
8. Build background for outside contacts such as legislators, governments etc
9. Be warned of possible troubles and problems ahead.
10. Keep abreast of current operations and developments.
11. Allocate capital resources optimally.
12. Exercise control over day to day operations
13. Aid in training of staff and permit management by exception.

On the other hand, the information support systems should make an impact on the quality of managers activity, by:

- Causing faster awareness of problems and opportunities
- Enabling managers to devote more time to planning
- Permiting managers to give timely consideration to more complex relationships
- Assisting in decision implementation, etc.

The design and implementation of information support systems for management in an organization should necessitate the identification of information requirements for staff at different levels. This should be preceded by a study and understanding of the organizational structures and chains of authority and responsibility. This is so because the information flow pattern differs. It is mostly according to how the organization is structured.

It is also important that the executive as well as the information systems person(s) or intermediary have a fair idea of the extent of the information gap in any decision making situation.

It is also helpful to identify the information gaps to be filled in by the executives, staff and those to be filled in by the information system.

Specific reports generated by and the information the system should (Neelameghan, 1992)

* Cover the more significant elements.
* Facilitate measurement and performance by drawing correct comparisons.
* Include only essential facts so that the user can learn without being confused.
* Be easy to read and understand.
* Be distributed to only those needing them.
* Be issued as promptly as possible and on fixed schedule whenever applicable.
* Cover the appropriate periods of time for the subject; and
* Use appropriate techniques in the presentation and format. Figure 1 illustrates a generalized model indicating some of the functions listed above.

The requirements for routine transaction processing tend to be stable and relatively easy to identify; information requirements for management and decision making activities are more changeable and more difficult to define. (a summarized list of information services appears in annex 15)

6.5 DIFFERENT LEVELS OF MANAGEMENT AND THEIR INFORMATION NEEDS

A factor that complicates the issue of information needed by managers is the organizational level of the managerial job. In small institutions where there are few managerial levels, the manager seems to be a generalist, knowledgeable about most (if not all) of the institutions activities. In a large organization however a manager knowledgeable in all aspects of the enterprise's operations is difficult to find and managerial levels are created, and different types of information may be needed by managers at different levels.

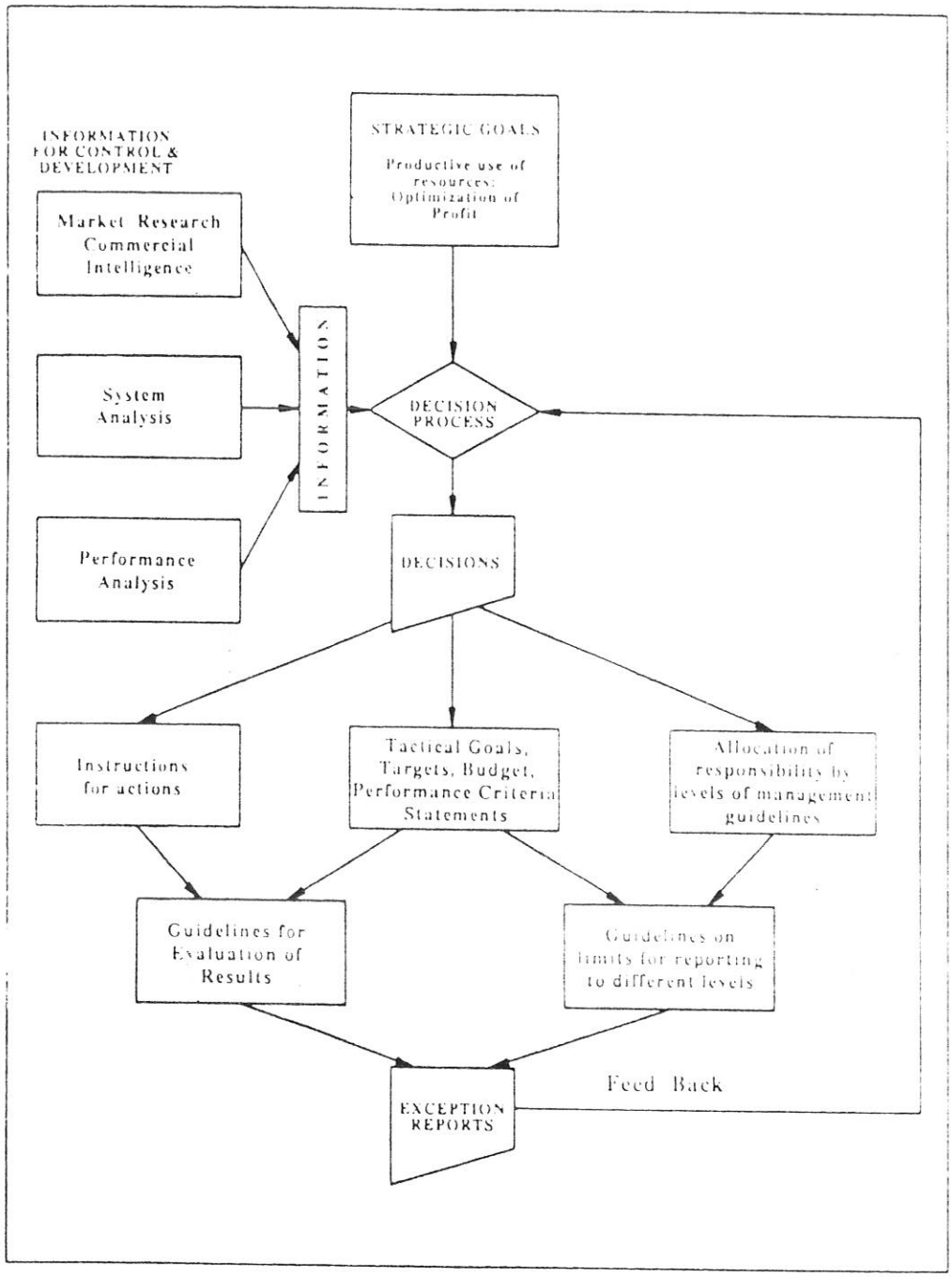


Figure 1: A generalized model indicating some of the functions of an Information Supprt System (ISS).

Three levels of management these are usually recognized:

-Top level management, mainly concerned with strategic planning.

-Middle level management, mainly concerned with tactical planning.

-Lower level management, mainly concerned with operational planning.

Figure 2, below illustrates an example of the different management level including external and internal information.

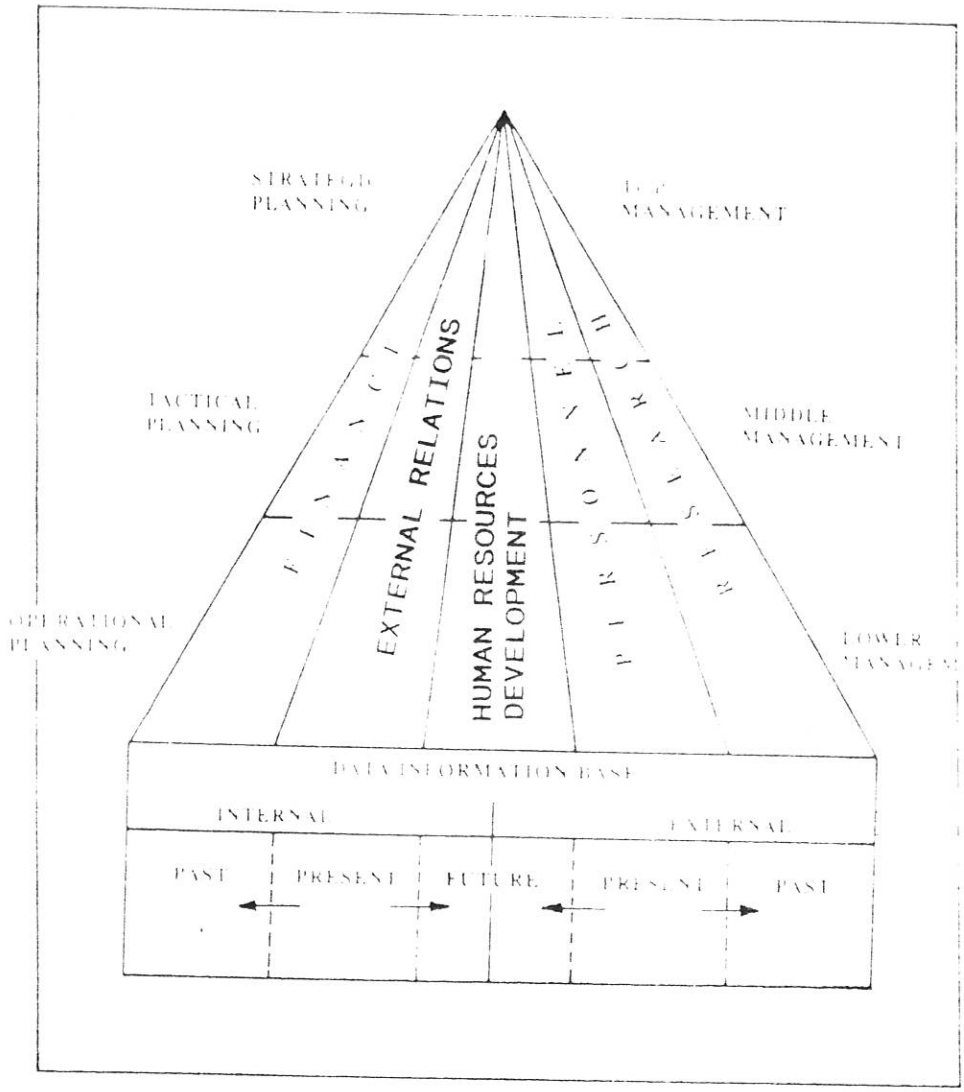


Figure 2 illustrating different management levels and their planning strategies for an academic institution

6.5.1 Top Level Management and Strategic Planning

Top level managers must have a general understanding of the enterprise's activities. Since they are charged with strategic planning i.e. weighing risks, making major policies and decisions on such matters for example as new directions of development, new projects, planning the mobilization of resources, and so on. Actually in real life situations, strategic decision making is rarely a clear cut straight forward process. The process more often than not, is ill structured, fuzzy and it is not easy to trace back how a particular decision was arrived at. Arriving at a decision may entail a period of days and weeks with different routes tried and abandoned. Even so in a number of situations, especially in crisis management a quick response may be expected of the decision maker. Further, there are usually several participants and contributors to the decision process involving different perceptions, assumptions and expectations of the actors which need to be brought out through brain storming, co-operative problem solving compromises and consensus building.

6.5.1.1 Information Support System (ISS) Required

In an organization, strategic decisions made by those in managerial positions or in authority can affect the functioning and operations of the organization as a whole. Therefore, the primary objective of an information system for the enterprise should be to provide the decision makers with relevant, reliable and timely information to assist them in making gainful decisions.

Data requirements of this ISS are generally for processed, summarized data from a variety of sources. The information relates to:

* outlook/ forecast of the economy in the organization's current and prospective political environment.
* current and prospective political environment.
* current capabilities and performance of the organization in terms of the defined goals.
* programmes of other related or competing institutions.
* opportunities for new programmes and projects based on current or expected developments.
* alternative strategies.
* projections of resource requirements for alternative strategies.

The database of the ISS can provide some facts, figures and information, but the decision is based on judgment how these bits of information are organized and utilized. Much of the data cannot be collected on a regular basis, and much of it cannot be specified completely in advance. Some argue that it is impossible (or certainly impractical) to have ISS for top level mangers (strategic planning activities), because it is difficult to process data of rumours, facts, hunches , etc.) gathered. But ISS can only be an aid to their activities. (A model of an information system is illustrated in figure 3).

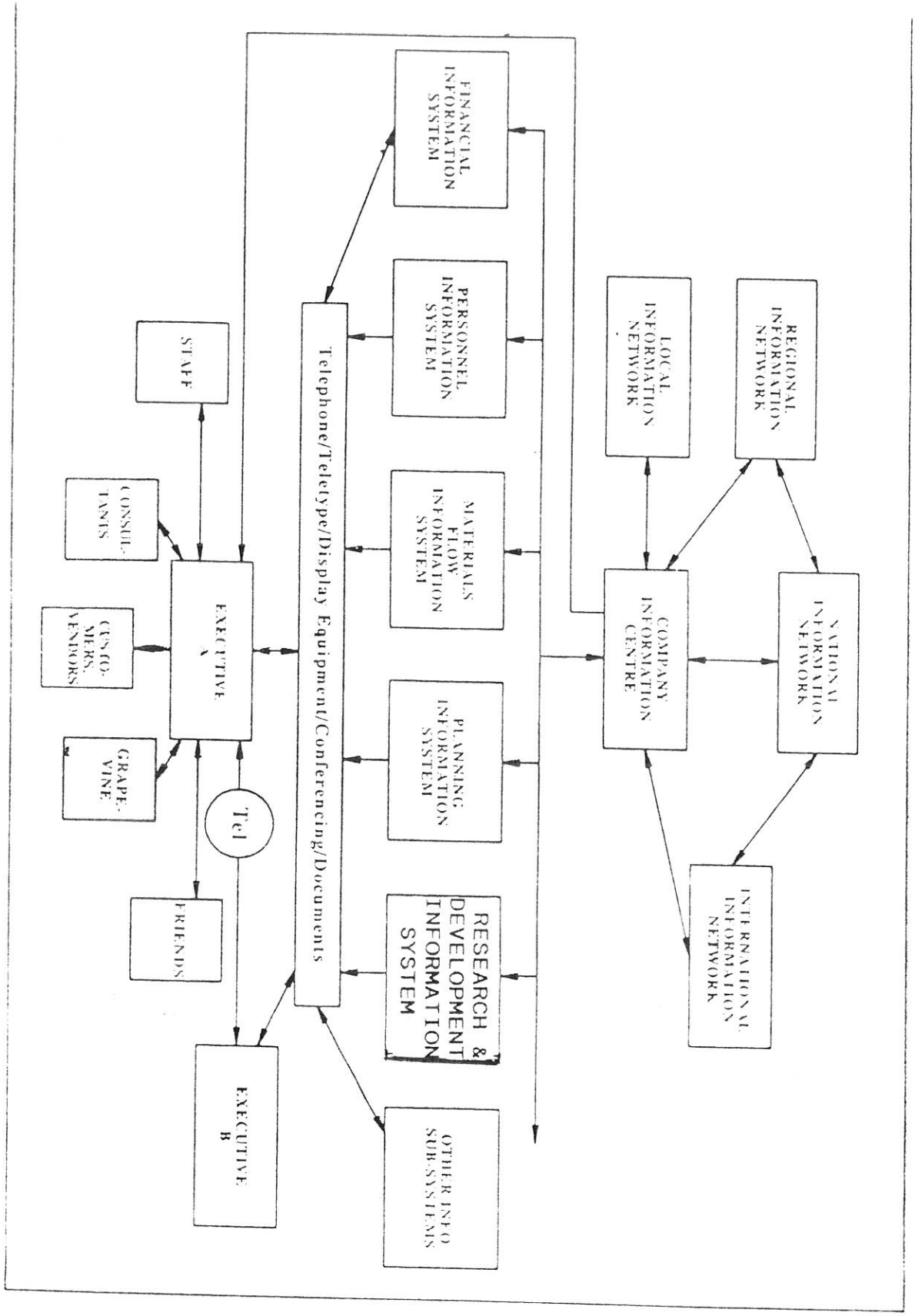


Figure 3: A model of the information system for academic organization

6.5.2 Middle Level Managers and Tactical Planning

Middle-level managers are responsible for making the tactical decisions that will allocate the resources and the controls needed to implement the decision and plans made by the top level. The information support will be in the nature of: (Mittra, 1986).

* Planning and budget models to assist managers in finding problems in preparing and revising plans and budget.
* Variances, reporting programs to process scheduled reports showing performances and variances from planned performance or other predefined standards.
* Problem analysis models to analyze data to provide input for decisions making.
* Decision models to analyze a problem situation and provide possible solutions for management evaluation.
* Inquiry models to assist in responding to inquiries. The types of information needed in this level are:
* Planned performance (standard, expected, budget, etc.
* Variance from planned performance
* Reason for variance
* Analysis of possible decision or course of action.

The outputs from the ISS include plans and budgets, scheduled reports, special reports, analysis of problem situations, decisions for review, and inquiry responses. Summary information is also needed, it must be processed so that trends may be observed, reasons for performance variations may be understood, and solutions may be suggested.

6.5.3 Lower Level Managers and Operational Planning

Lower level managers need relatively more detailed information and guidelines. Therefore, the ISS for the lower level management should also reflect these facts. Normally at this level, most of the activities are operational. Here the functionaries make use of stabilized procedures and decision rules, and a large percentage of the decisions are programmable. The operating decisions and resulting actions usually cover short time periods (a day to a week). Individual transactions are often important, so that the ISS must be able to respond to both individual transactions and summaries of transactions. ISS for lower-level managers consists of:

* transaction processing
* report processing
* inquiry processing

Most of the information required by lower level (first level) managers can be supplied through the database and transaction processing systems.

6.6 INTERNAL AND EXTERNAL INFORMATION

The proportion of the external and internal information used at the different management and planning levels varies. (This is illustrated in fig 4).

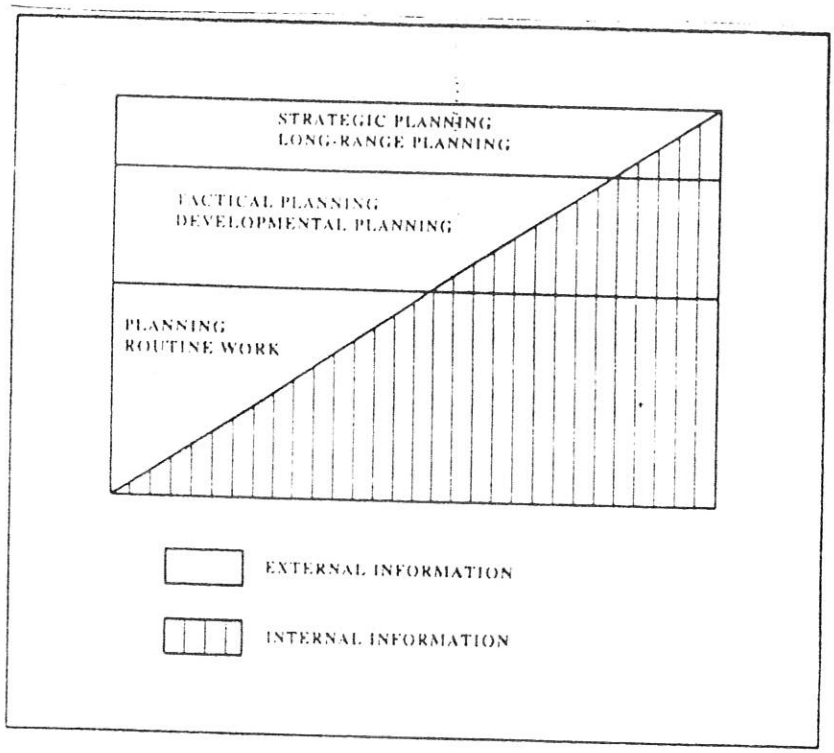


Figure 4: external and internal information for different levels of managenent and different types of planning

The relative difference in the area of the rectangles indicates the relative number of persons involved in long range planning, developmental planning and routine work planning respectively.

In short, managers use their time differently, need internal information with varying degrees of detail and need different mixes of internal and external information in order make their decisions.

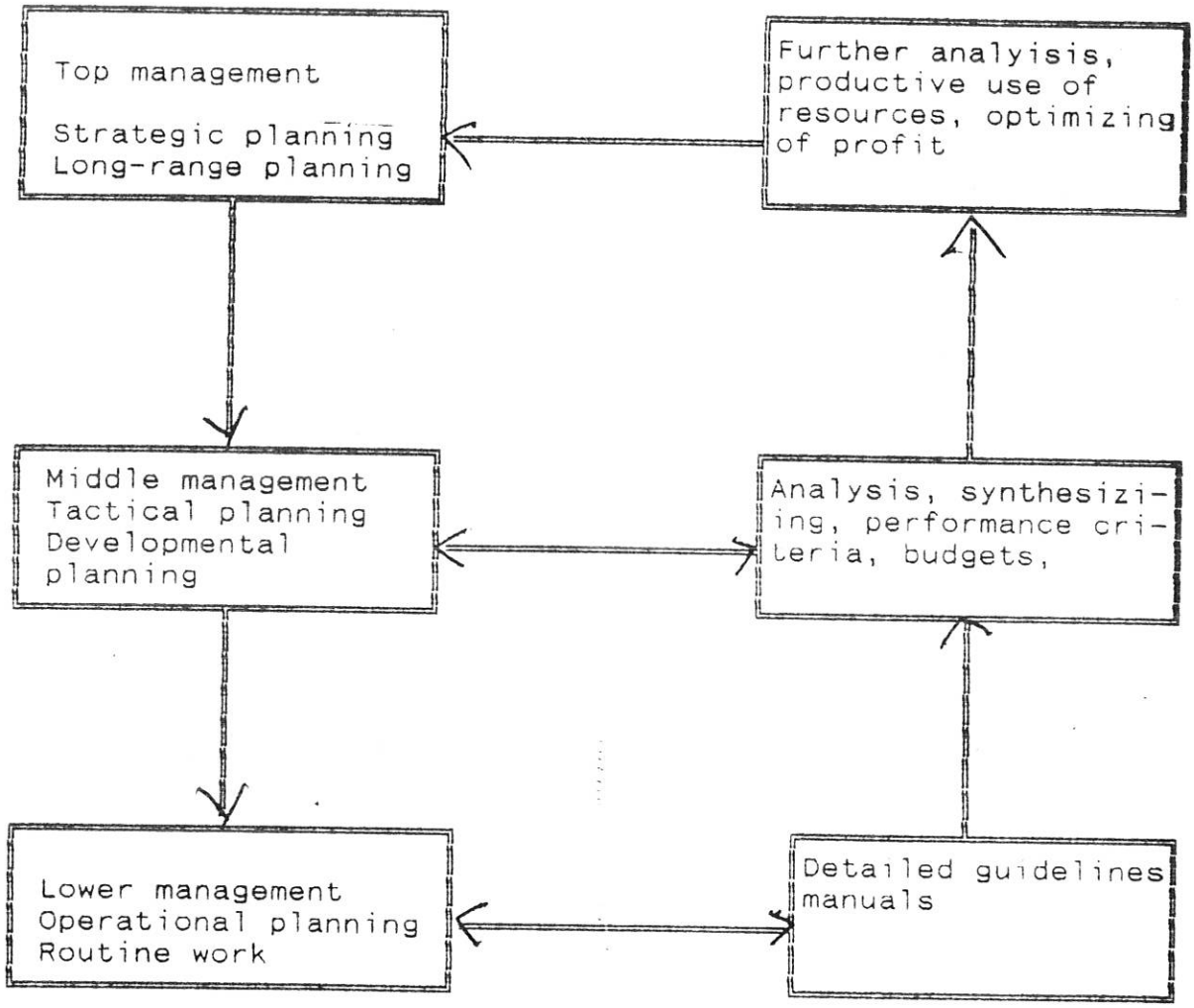


Figure 5: Level of detail of information

6.7 INFORMATION SYSTEMS FOR MANAGEMENT FUNCTIONS

(Planning, control and decision making)

Information systems can provide support for management at all levels.(Operational, control, middle-level and top-level). Each of these levels of management activity includes planning, control and decision making. ISS can be developed to assist each type of functions of management at different levels.

6.7.1 Information Systems for Planning

Planning is an ongoing organizational function that provides the frame for operational activities and decision making. The organizational mission is translated into operational objectives through planning activities. Planning activities in an organization are to be supported by three broad categories of information i.e. environmental information, information on competition and internal information.

6.7.1.1 Source of Planning Data

The sources of planning data are internal data organized and processed for planning purposes, external datafrom various sources, and from environmental

scanning. The internal data reflects the historical performance of the organization. However, it should not be the sole input to planning because external factors may invalidate historical performances for projection. The principal executives and planning staff need to continuously survey the evolving trends in major environmental factors likely to affect the programmes, services and activities, such factors being socio-economic, political and technological of domestic and /or external origin.

6.7.1.2 Processing

The processing needed for planning data involves:

* Analysis of historical data to obtain relationships useful for projections
* various projection and forecasting techniques to estimate future values
* computations internal to the plan and computation required for outputs
* Output of the results in a meaningful format

The computational support can range from sophisticated statistical techniques to a fairly simple spreadsheet computational procedure.

6.7.2 Information Systems for Control

Control consists of procedures to determine deviations from plans and indicate corrective action. Every major organizational function has a set of controls associated with it.

The control process requires measurement of performances and a standard for comparison. The standard can be a budget or plan that was previously arrived at following consideration of alternatives and surrounding conditions. The purpose of control is also to reduce uncertainty regarding the task to be performed, how it is to be performed, and when it will be performed. The control report issued to management represents a comparison of actual performance with planned performances.

Information systems are used extensively for control purposes, primarily in reporting variances from standard. System corrections can be performed by programmable decision rules, but mainly serve the purpose of notifying a decision maker when corrective action is required.

The computer can improve the control process in several ways (Davis and Oslo, 1985).

* the standard can be more complex.
* the computation of deviation and identification of causes can be more sophisticated
* reporting with computers can use irregular time intervals, and can be done more frequently.

Computational support for control includes variance analysis plus other analysis which might assist in understanding both the reason for variances and the course of action that will correct future performances. Information system for control is continuous monitoring of performances rather than simple periodic reporting. Monitoring makes use of the planning model plus the concept of control limits to track performance.
For control purposes, comparative advantages of computer based information system are the capability to monitor performance continuously rather than periodically and to make comprehensive analysis of performances.

6.8 DECISION SUPPORT SYSTEMS

In recent years there has developed a need for a kind of system different from the traditional batch-oriented computer application. Managers who want fast answers to their information needs are using Decision Support Systems (DSS) (Mittra, 1986).

A decision support system, DSS for short, is a computer based information system that helps a manager make decisions by providing him or her with all the relevant data in an easily understandable form. As the user of DSS, the manager formulates the problem by using an interaction and probably menu driven front end. The system then accesses a database to locate the necessary data, utilizes a repertoire of mathematical and /or statistical models and finally produces the desired information at the users terminal. The user can explore several " what if" scenarios in order to arrive at a decision. The DSS thus merely helps the manager make a decision it does not and cannot make the decision for the manager. This shows that inorder to design a DSS, it is necessary to have a database supported by a sophisticated database management system, a set of mathematical tools in the form of optimizing and non-optimizing models, and an on-line interactive system that can be used by the manager to tap the resources of the DSS (Mittra, 1986)

The major components of a DSS are identified as:

* A database with access to a wide variety of corporate data
* A quantitative capability that utilizes models and other analytical techniques
* A user-friendly computer interface.

(Figure 6 provides an example of an information hierachy of a DSS.)

In most instances, decision support systems are designed to support high-level managers in making relatively unstructured decisions. DSS tend to be used in planning, analyzing alternatives, and trial and error search for solutions. They are generally operated through interactive dialogues with users. Decision support systems rest 90% on data and only 10% on computation.

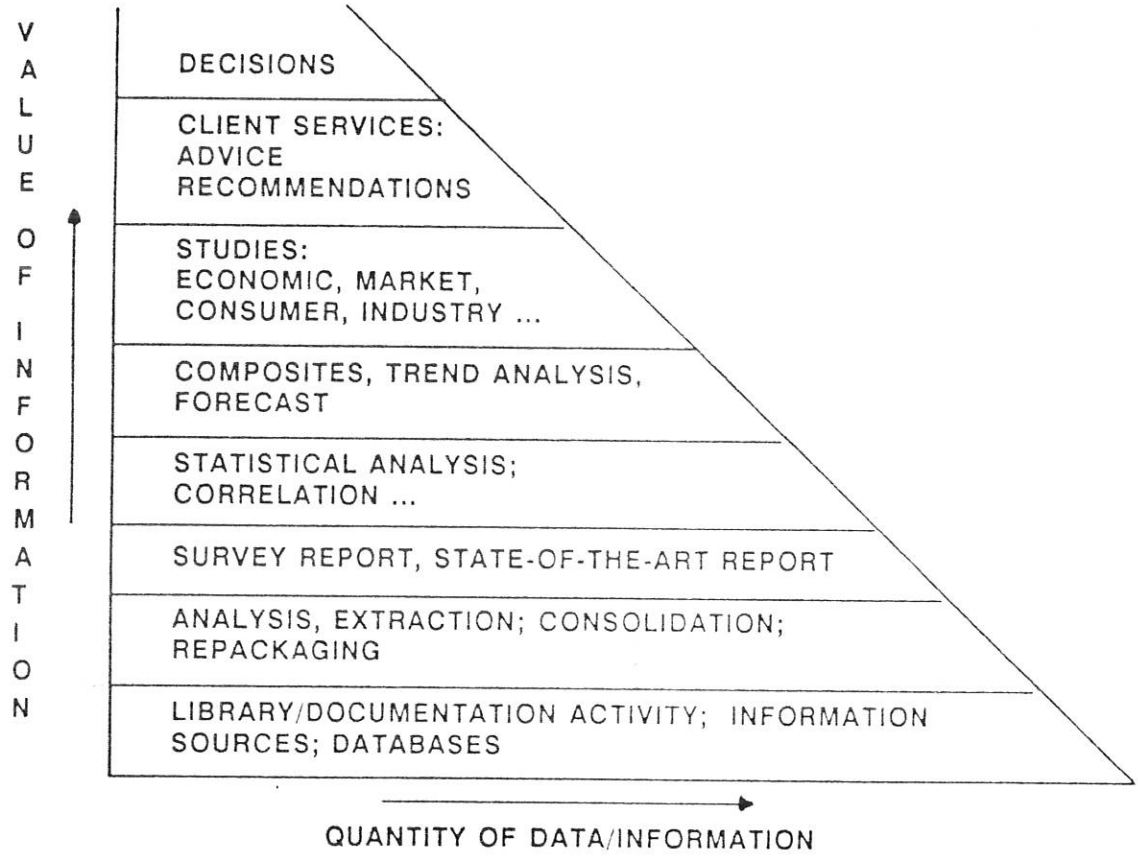


Figure: 6. An example of an information hierarchy in a DSS

6.8.1 Characteristics of DSS

DSS may have some or all of the following characteristics:

* Existences of a large database, so large that the manager has difficulty accessing and making conceptual use of it. Necessity of manipulation or computation in the process of arriving at a solution.
* Necessity of judgment to decide upon available alternatives by asking "what if" questions.

Classes of Decision support systems:

- File Drawer systems
    - allows immediate access to data items eg. air line reservations requests, status enquiries for inventory information.
- Data Analysis Systems.
    - allows manipulation of data by means of either analysis operations tailored to the task and setting or general analysis operations

eg. budget analysis system and financial system for analysis alternatives investment opportunities.

- Accounting models

  . These calculate the consequences of planned actions on the basis of accounting definitions. They typically generates estimate of income, balance sheet, etc. based on variations of input values to the definitional formulas. eg. Monthly budgeting systems for operational decision making. and many others such as optimization models, suggestion models, etc.

6.8.1.1 Development of DSS

A decision maker faced with a problem must first decide if it justifies the development a DSS. Usually a situation warrants a computer based DSS, because of some the following:

* complex manipulation of data
* several iterations before an acceptable result is achieved
* frequent need for re-analysis

In developing the system, one or more of the following may be adopted:

6.8.1.2 Programming language

Programming languages designed for algorithmic processes or procedural logic are better adapted to programming DSS than data processing languages.

6.8.1.3 Spreadsheet Processor

The spreadsheet processor is the widely available and commonly used model building and programming facility. The spreadsheet processor defines an output in the form of a work sheet traditionally used to develop plans, budgets, and other analysis.

6.8.1.4 Analysis Packages

In some DSS applications, the significant elements are statistical analysis or use of standard computational models. For example, a DSS may be needed to perform linear programming analysis to compute sample statistics as part of making projections for the numbers of students and over a period of 10 years, for whom academic programs and facilities may have to be provided.

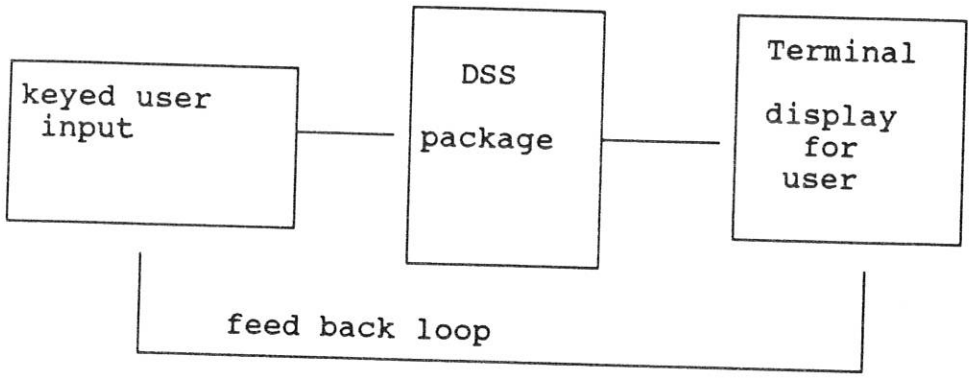
I.6.8.1.5 Model generator

A model generator (or decision support systems generator) is a software package which facilitates the development of models and decision support systems. It is a comprehensive package incorporating the capabilities of the first three approaches.

6.8.2 Impact of DSS on Management

A DSS is designed and implemented with managers as the end users. Its impact is on decisions in which there is sufficient structure for computer tools and analytical techniques to be useful, but where the managers judgement is essential. The real pay-off from the managers view point is in the degree to which the DSS extends the range and capability of his/her decision making process to make it more effective. The manager sees the DSS as a supportive tool under his/her own control that does not attempt to automate the decision process, predefined objectives, or impose solutions. It accepts input from the manager, process it and then provides the output for review. If the output is not satisfactory, then the manager can repeat the process until the solution is satisfactory as shown in figure 7. It must be clearly understood that no DSS can ever take the decision making authority away.

FIGURE 7: TYPICAL FEEDBACK LOOP IN A DSS



6.9 EXPERT SYSTEMS

For along time, before the industrial revolution, men have sought to enhance their limited abilities by inventing mechanical contrivances: the pick and shovel, the wheel barrow, and similar simple tools are examples that dates back to antiquity. More recently motor vehicles, manufacturing robot and, finally, computers have been added to the panoply of artificial assistants. The technology continues to move forward, enabling us to build tools that further enhance our limited, through uniquely human, capabilities. Until recently, most of these productivity tools were developed as aids to performing brutal labour or clerical tasks. In fact, computer has become widely accepted as an assistant that is exceptionally competent at well-defined, repetitive

tasks. Now research has led to a new kind of tool: a computer that serves as an assistant whose skills include finding reasonable solutions to problems for which there may be no hard and fast "right" answers. The "expert" computer system uses extensive experience-based knowledge of a subject to guess intelligently in a way similar to what a human expert may do.

6.9.1 Examples of Expert systems

Imagine yourself as a database manager who reviews dozens of expense reports for accuracy and legitimacy. Suppose you had a computer system which could look at numbers of new articles added in the database and spot mistakes in the same way you do. Your time might be freed to look at such interesting things as improving the centre's policies.

An expert system is a computer application that guides the performance of ill-structured tasks which usually requires experience and specialized knowledge. Expert systems can help managers and professionals in different tasks in areas where people make decisions and plans.

6.9.2 Characteristics of Expert Systems

Some of the characteristics of an expert system are:

* using an expert system, a non-expert can achieve performance comparable to an expert in that particular problem domain
* it uses a knowledge-base, data and decision rules which represents expertise
* expert systems are less mechanical, the exhibit a learning behaviour
* trial and error performance, re-learning, and adjusting to parameters
* they are costly to develop. Some experimential systems have required from 10 to 25 work years of effort and millions of dollars.

6.9.3 Expert systems Development

There are five main components needed in developing a workable expert system.

Knowledge base - contains the knowledge of the expert(s) plus the facts provided by the users during the interaction with the system.

Inference engine - infers or deduces knowledge that is not explicitly contained in the knowledge base.

User interface - formulates recommendations and questions to the user, it is an intelligent interface.

Explanation part - which explains to the user how the system arrived at a specific conclusion.

Knowledge Acquisition Module - the expert knowledge is obtained.

Clearly, the development of expert system follows a life cycle very similar to development of a traditional information system. The major difference is the knowledge base, which contains not only data but also relationships between data.

CHAPTER SEVEN

INFORMATION SUPPORT FOR THE FUNCTIONAL UNITS OF THE UNIVERSITY OF MALAWI

7.1 MODUS OPERANDI

The interview method was adopted for gathering the information necessary to understand the present state of management of the University of Malawi.

Key administrative personnel were interviewed to gain an understanding of their functions performance and potentials. In addition, the interviews provided information on the job responsibilities and problems confronting the various administrative departments of the University. A set of selected questions (see annex 13) was formulated for use in the interview.

7.2 INTRODUCTION

In the development planning exercise of a university objectives of its different divisions/departments such as academic, curriculum development, research, finance, transport administration, social welfare, personnel administration etc., have to be taken into consideration. These require reliable, relevant, timely data and information on the past, the present and forecast for each division, on their performance and the likely impact of developments in one field on the other areas, available resource options and strategies for the mobilization of resources with a view to arriving at gainful decisions. Assessing the qualitative needs of education and training on the other hand can facilitate the educational services to upgrade and update the content of education, curriculum, course materials etc.

The trend in most universities in Africa as they grow the university administration becomes increasingly more and more complex. As a consequence new situations, problems and activities are handled haphazardly resulting in redundancy, overlapping and conflict of interests, making the problems of coordination difficult.

At least part of the problem arises from the lack of an efficient and effective information system to support the management functions of the university. Information support is indeed a key factor in maintaining smooth communication internally among the university units on the one hand, and between them and appropriate external entities on the other. Such communication is also a vital link in the steps toward gainful decision making.

7.3 UNIVERSITY OF MALAWI

The University of Malawi was established in 1965 and offers courses at 5 campuses: Bunda College of Agriculture in Lilongwe, at Polytechnic in Blantyre, at Chancellor college in Zomba, at Kamuzu College of nursing in Lilongwe and at School of Medicine in Blantyre. This structure largely reflects the distribution of tertiary education institutions which pre-date it.

These were Bunda College of Agriculture, the Polytechnic (which offered diploma courses in engineering, technical and business studies) the Soche Hill College in Blantyre (where secondary school teachers were trained to diploma level), an Institute of Public Administration and a staff training college, (both in Blantyre), and Chancellor College itself (originally

located in Blantyre and offering degree courses in Arts, sciences and social sciences). From 1965, the university had a college structure made up of these five units. In 1973, with the exceptions of Bunda college of Agriculture and the polytechnic, these were a new site merged with Chancellor college which was then moved to Zomba). (See chapter two regarding the University's development)

7.4 FUNCTIONS OF THE UNIVERSITY AND THEIR INFORMATION SUPPORT SYSTEMS

The University is centrally coordinated by the University office which acts as the headquarters of all the functional units. There is however partial decentralization of some of these units into smaller units in every college of the University.

Having considered the background of the University's development, we can now look at the different functional units and their broad types of information support systems. Here, the typology of functions proposed in a Unesco document quoted by Neelameghan in the paper, " Information Support for Administrative Units" (unpublished) will be used. Though it has its limitations, it is helpful in understanding the common functional areas of the information needs and information

system design considerations. The information systems are designed to support an organization's.

1. Internal management functions
2. Statutory functions
3. Public services management functions
4. Policy making and planning functions

Of the above categories, the first three have the primary purpose of supporting administrative functions, whereas the fourth is essentially designed as an information supply system for assisting planning and decision making. It should, however be noted that the first three categories may also provide information and data as by products to assist planning and decision functions. The two categories which directly apply to the university will be the ones discussed in detail below.

7.4.1 Information Systems Supporting Internal Management Functions

A university has a number of administrative routines to perform. These are mainly concerned with management of resources namely finance, personnel, business management units, communication etc. They generate a variety of data/information, documentation and paper work, and they

also continuously use information. Below the units and their information support are discussed.

7.4.1.1 Financial Units

Most of the operating units of the University have been pleased with the services rendered by the financial units. This fact was consistently pointed out in the interview sessions with the finance personnel. The finance department has two sections these are cash and accounts, budget administration and loans section

7.4.1.1.1 Cash

This section is responsible for cash control or cash custodianship, the cash receipt, disbursement and safe custody of university money in accordance with university rules and procedures.

7.4.1.1.2 Budget Adminstration Section

It is responsible for controlling budget expenditures and for data accumulation and compilation of all university budgets, recurrent as well as capital. The budget office regularly communicates with the Planning and Programming Office to make sure that budget proposals

follow future plans of the university. It also has sections of the internal audit, which in addition to being responsible for financial audit, is also responsible for business operational audit and academic policies, procedures and records audits. The office also administers all students financial assistance programs, student services such as student loans, award of stipends, staff loans etc. The performance of such routines in each of these areas is usually guided by practical administrative manuals, codes etc.

The office is reported to be generally efficient; however, certain deficiencies were also pointed out. The treasurer or cash officer whose function is cash control/custodianship, has problems mainly because signatures on documents required for disbursement of cash cannot be checked for authenticity, the information required to authenticate the documents being not readily available to the office of the treasurer and as a result the stated objective of control usually is not achieved.

Another objective of the finance office is to plan the cash position of the university. Again because the information required for cash budgeting is not readily available, the cash planning function is not performed to the desired level of efficiency. Usually this has

resulted in a number of problems one of which being the inflexibility in budget administration. Infact, during interviews with deans and heads of departments and other budget responsibility centre heads they complained of the lack of flexibility in the use of approved budgets. These complaints largely emanate from the systems inability to allow deans and administrative heads to make transfers among categories of their approved budgets resulting in the under-utilization of funds in some categories while there existed strongly felt needs in other categories which remain unsatisfied. This of course raises strong doubts about the effectiveness of the internal budgeting process itself. Could this be the result of the general inability of deans and administrative departments heads to forecast their budgetary needs? One causative factor appears to be the lack of timely and reliable information support at every stage of budget formulation.

7.4.1.1.3 Required Information System

A finance and budget management information system may be designed to serve the following:

Recording the budget presented by each faculty/department, computation of totals, printing out results, supporting systems for budget negotiations

between finance and various units of the university. Preparing periodic financial reports, provide executives at all levels the basic financial facts about the university for example, overhead costs, direct costs, cash flow budget etc.

A system to assist forecasting employee taxes, house rents etc., future plans of the University in terms of financial requirements, system for checking authenticity of checks, system for monitoring students and staff loans, external debts and loans .

In brief, the financial and budget management information system should cover budget, loans, monetary resource mobilization etc.

7.4.1.2 Personnel Administration

This office, mainly administered through the University Registrar's Office, deals with the routine (clerical) activities, such as contract preparations, maintenance of academic, personnel records and routine correspondence relating to staff matters. It also deals with all policies and procedures relating to recruitment, salary scales, promotions and retirement benefits for both academic and administrative staff and also support staff,

students examinations, performance evaluation, disciplinary actions, holiday schedules, union affiliations, compensations, pensions, superannuation etc. It is also responsible for staff development programmes both for senior staff and support staff. It makes sure that all personnel records are kept complete, though the interview showed that there is more to be done in this respect.

The usual practice is that all documents entered are coded with the codes identified on the personal file itself. Unfortunately this is not being done vigorously and errors occur. Hence need for information technology application to enhance proper recording and retrieval. Information technology will also ensure proper filing, neatness and the security of records maintenance.

During the interviews with personnel of this section, it was also noted that some of the temporary workers had no personal files although each of them was supposed to have such a file. The reason appears to be too much paper work to handle, hence temporary worker's files are neglected. Here again appropriate information technology would facilitate maintenance of personal files for all categories of staff. The department also deals with personnel policies and procedures for each category

of employee. It makes sure that each category is clearly defined, strictly adhered to, and relevant information disseminated to the employees. This department also has the responsibility to make sure that ongoing programs for upgrading of staff are established guided by the established personnel policies.

There is ample scope in the personnel department for application of information technologies for the creation of databases, information systems supporting personnel management.

Applications of new technologies for office automation for example in word processing, electronic mail and messaging, telex and telefax, electronic scheduling, reprography, records and archives management etc. They could also be designed to provide information and data on such matters as the number of employees in various categories, wages paid, loss in working hours, overtime, absenteeism and measures of labour efficiency. These could help to improve the performance of office personnel, the quality and the speed with which the work is performed and the provision of data and information to senior officials.

7.4.1.3 Public Relations Office

This is an office in the Registrar's Office which deals with dissemination of information to the university community and to the outside world about the university. In other words it is a public relations function of the university. Those interviewed about the information communication in the university revealed the following inadequacies:

Staff are mostly ignorant about what is going on in the university leave alone about plans, events etc. The little that the staff know about events and activities of the University came to them from other sources and occasionally through gossip and rumours. There is need to set up an information system comprising of database of current and forthcoming events both in the university and outside especially those needing the university attention and with the modern technologies such as LANS, bulletin boards etc, the information can be communicated rapidly to the university community. Within this office, the grapevine information system could also be of great importance, this will be able to capture circulation of information by hearsay and rumours, no organization can avoid these. It is a useful alerting source on various matters. Some of the information circulated in this way may not be available through other formal channels.

7.4.1.4 Business Units

(a) Purchasing and Stores Department

This department deals with procurement of materials such as furniture, academic equipment, stationery for the university etc. The activities are decentralised to the extent that each campus of the university has its own purchasing unit. This section is also responsible for property control, undertakes an annual inventory of non-expendable university property etc. Because of apparent lack of coordination between the section and the various academic departments in each college, the responsibilities of coding, issuing, transferring and deposing of university property have not been performed efficiently and effectively. This problem has also been accentuated by the apparent refusal of staff to sign for property under their custody. This obviously calls for a materials flow information system (MFIS). The MFIS is to provide information and data on the physical flow of goods through the university: incoming materials, facilities, inventories etc.

(b) Maintenance Department

This department is responsible for the maintenance of the grounds and building in each campus. Several factors adversely affect the operations of this department. One such factor is that this department mostly operates independently of the Estates and Development Office, which is responsible for conducting feasibility and design studies and supervising construction of new physical facilities. Consequently the unit responsible for maintaining the facilities is not consulted with respect to the types of building materials used and on the types of maintenance materials and this has complicated the maintenance activities. Here again here the problem is that of communication and coordination.

7.4.2. Information Support System for the Statutory Functions.

The University of Malawi established by an Act of Parliament was assigned the statutory function to provide higher education in the country. The efficient and effective performance of this function obviously calls for the provision of data and information derived from the appropriate data bases and information sources to the officers concerned.

Information systems to assist in the administration of education in the university usually covers such functional areas as:

-Allocation of teachers to courses.

-Courses offered in different faculties.

-Time table preparation

-University curricula development

-Management of examination

-Management of teachers and other staff of the educational institution.

-University enrolment and attendance

-University physical development (Buildings)

-Geocoded information on the number of schools in different areas, districts, regions etc.

-Library services

The information and data provided by these systems can be used along with those from the national census and statistical systems for national planning. The systems can also be used for deriving indicators of the university needs to increase manpower or the areas the university is weak, help the university estimate the number of schools in a particular area and be able to decide whether to open university extension services etc.

Information systems for educational administration with capability for mapping infrastructural facilities by local administrative units (eg municipality) will be of particular help to the university decision makers.

7.5 THE ROLE OF THE UNIVERSITY OF MALAWI LIBRARIES

As discussed in chapter eight, the role of the UOML can be summarised as follows:

-To host the ARC

-To make available its information resources to the ARC.

-To facilitate the use of existing computers, other IT equipments, and some of its expertise, in the smooth running of the ARC

7.6 GENERAL MANAGEMENT PROBLEMS DUE TO INFORMATION DEFICIENCY.

7.6.1 Lack of Institutionalism in Decision Making

The impression sometimes one gets is that the university policies and procedures have not been adhered to. In lieu of the established policies and procedures a more personalized approach to decision making has been adopted, which seems to have resulted from the apparent attitude of the decision makers that a person is worth more than a policy.

The existence of personalized decision making even on a small scale could have adverse effects on the credibility of the university administration. Lack of institutionalised and firmly adhered to policies and procedures could spawn a confidence crisis with respect to university management practices.

7.6.2 Management by and in Crisis

This relates to the dearth of formal planning and timely actions throughout the university. This in turn could have led to what may be called " the firebrigade" approach to decision making, otherwise referred to as management by crisis.

Another observation concerns the manner in which policies and procedures are "proclaimed". Concerned units are not in some cases consulted. University's wide communication is seldom made when new policies and procedures are effected or when they make contacts with the concerned offices (if of course, it has not been made public by gossip and rumours).

In the discussions, so far, the information support systems for different administrative levels were seen independently, that is, information support systems for

finance, personnel administration etc. But, as the number of independent systems grow in the organization, the duplication of data processing occurs, and integration will be needed. These problems can be better handled with an integrated Management Information System (MIS). It is a system for providing information to support operations, management, and decision making functions in an organization. Annex 11 one provides some sample databases to be included in this MIS such as a profile of experts which could assist administrators to allocate relevant researchers, profile of institutions which could also help the personnel department to have a clear picture of what institutions are available for staff training both in short courses and long ones.

There is obviously need to develop information support system for all of the university functions. At present the university does not have its own electronic data processing unit, neither does it have units such as financial information units, archives and records management. With the increasing application of microcomputers in information and data processing, the systems can handle/utilize vast numbers of documents, files, and messages that pass routinely through a university much more than it has been possible with traditional systems. There is need to have a system which

should be capable of presenting analyzed and synthesized data in a readily usable form to different user units at different levels.

The following aspects should receive careful consideration in setting up the information system:

- Establishing a reliable data collection mechanism at the source and training of personnel for inputting data into the system.
- Installation of microcomputers for performing specific planning and analytical tasks at various levels and networking them among themselves and with larger computer systems, thus establishing viable communications network throughout the university.
- Formulating/adopting relevant norms and standards for the work involved at various stages of data collection, input, processing, networking and dissemination.
- Acquiring/developing suitable software for handling the various planning and data processing tasks.
- Building up a sound personnel base; expert conversant with hardware, software and information system design, development and operation in statistical method, etc.
- Sensitizing top policy makers and planners about the potential of modern information systems and
- Managing smooth transition from the existing system to

the new system making optimal use of existing resources personnel, hardware, software administrative structures etc

7.7 CONCLUSION

Re-organisation and rationalisation of the administrative machinery and its methods of work cannot by itself generate dynamism and efficiency in administration. Improvements in the calibre, attitude, skills and above all morale of personnel are essential to set the tone and effectiveness of the administration. In a world in which powerful current of change, the university as a higher learning institution can no longer afford not to accept the use of information technology nor delay making IT an integral part of management.

7.8 RECOMMENDATIONS

The pros and cons of introducing a more flexible budgetary process should be reviewed.

The necessity of having a university data processing centre should be seriously considered. The organizational structure, responsibilities and degree of automation of

such a centre should be planned. In addition, the functional relationship of this centre to the various university operating units should be specified, in particular, the relationship between the data processing centre and the planning unit, the financial unit and faculties.

The entire system of property control should be reviewed with a view to establishing effective controls over the use and movement of non-expendable items. It should be noted that such control need to be preceded by establishing a proper system.

CHAPTER EIGHT

CAPACITY AND CONSTRAINTS OF THE UNIVERSITY OF MALAWI LIBRARIES (UOML) TO ACCOMMODATE THE ACADEMIC RESOURCE CENTRE (ARC) AND RESOURCE NETWORK

8.1 INTRODUCTION

The capacity and constraints of the UOML were discussed with key persons in the library system and assessed through survey of documents and files of the University Library System made available for study. The assessment was in terms of the quality and size of UOML's human resources, its document holdings, availability of information technology tools (e.g. the number of computers available and their use); the products and services generated; the community of users served; capability to link with other libraries and information centres within and outside the university; experience in coordinating information resource sharing schemes; methodologies and standards used; future plans and programmes; the mandate given to the University by the

Government of Malawi and the future role it will play in the development of Malawi's overall information and documentation infrastructure. The findings of the interviews and survey are discussed below.

8.1.1 Manpower Resources of the UOML

The college and branch campus libraries that come under the jurisdiction of the UOML possess a relatively high percentage of the total population of professional librarians in Malawi. The system has the largest concentration of staff that underwent post-graduate, first degrees, holders of basic level education in library education. The existence of different campuses and college libraries has facilitated the emergence of a small team of library staff exposed to technical and managerial tasks. On the other hand the founding of the Malawi Library Association in April 1976 has also increased the number of non-professional staff in the university.

However, problems exist especially in the number of persons with adequate experience in automation, information technology and documentation management techniques. UOML does not have staff who have had training at the higher academic courses in library

automation. UOML management admits that it suffers from a critical shortage of technical personnel (cataloguers, acquisitions, librarians, subject specialists etc)., inspite of its relatively better manpower position.

Plans are under way to introduce a library and information studies degree programme in the near future once the financiers are identified. It is hoped that such a programme will alleviate the current situation in the university and the country as whole.

8.1.2 Document Delivery

As an academic library system, the UOML's collection by and large is the largest in the country and consists of academic literature, text books, journals, etc. However, the main branch at Chancellor College has a relatively large and perhaps the largest collection of Malawiana documents, including government and UN publications. Each of the branch libraries has a small collection of similar material. Unfortunately the UOML has not provided for supporting specialised areas such as on ongoing researches in the University, curriculum development etc.

All the same, the available holdings cover a wide range of subject areas including historical, cultural, anthropological as well as legal, statistical and economics, etc., documents issued by the government; theses, and conference papers.

The UOML is not a legal deposit library but there is enough reason to believe that a reasonable proportion of the materials published in the country and received in other libraries is obtained by the UOML.

8.1.3 Information Products and Services

This is the area the UOML is deficient many ways. At present the services of the UOML are typical of those of a university library, the conventional routine services, including lending services, reading room facilities and reference assistance to the academic community. Accessions lists are produced regularly and circulated to a large number of information institutions in the country. There is an attempt to prepare a union catalogue of the holdings of all the branch libraries.

Due to lack of experienced manpower in the use of IT, the UOML, though having several stand alone computers, has not yet started providing important

information services to the university community, researchers, planners, government officials. Such services could include:

- Selective dissemination of information to researchers.
- Information support systems to the university management etc.
- Value-added information products to selected specialist user groups.
- Information support to the government departments.
- Services to the industrial and business sector.

These services should obviously be provided through cooperation and resource sharing with other academic and specialized institutions.

There is however no indication of the UOML increasing its services to the outside community of researchers, government officials etc.

8.1.4 Experience in Coordinating Resource Sharing Schemes

The UOML had been the subject of detailed studies by expatriate consultants who visited the University in 1979 (A.J. Loveday) and in 1986 (G. Dereck). The recommendations of the consultants were used to re-

organize the library structure and the source of impetus for some badly-needed improvements in library infrastructure development. Both consultants recommended centralization in respect of acquisition, cataloguing, classification, catalogue and card production, binding, etc.

The underlying reason for the centralized service was based on shortage of manpower rather than of resource sharing. The end result is that there now exists an embryo of a union catalogue of the holdings of the University libraries. To some extent, efforts have been made to make copies of the union catalogue available at each of the participating libraries. This was later dropped because it was found to be expensive and time consuming. Given staff limitations, the manual system in operation, does not facilitate the realization of such an undertaking.

As regards information sharing between the UOML and other information centres within and outside the country, the situation requires redressing. During the interviews, it was noted that very little sharing goes on. Some of the reasons identified include:

1. Absence of a carefully formulated inter-library loan policy.
2. Inadequate postal and communication services and linkages.
3. Lack of computer links within the country and external databases through dedicated lines.
4. Non availability of funds for capital and recurrent costs and acute shortage of foreign currency.
5. Lack of established mechanisms for keeping track of the published and particulary unpublished grey literature e.g. reports, feasibility studies, evaluations etc. produced by planners, economists, scientists, consultants and others.
6. Lack of well organized library and information systems and services at the national level.

In this context, it is also to be noted that at a meeting held in 1987 in Zomba, Malawi, about strategies for resource sharing, members discussed several points and the recommendations were then placed before the government for action. The following were some of the recommendations:

(a) that there was a need for government to be committed to resource sharing;

(b) that there should be a national information policy which will also incorporate the policy on information sharing;

(c) that there was a need for efficient bibliographic control as a prerequisite to resource sharing;

(d) that the government should facilitate cheap transportation of library materials by charging a minimum amount of 2c per book per parcel.

At present there is no national policy covering all types of libraries on inter-library loans. The UOML has a union card catalogue at Chancellor College which facilitates the inter-library loan transactions. These libraries are also prepared and eager to offer assistance in obtaining books, periodicals, photocopies and other research materials from co-operating libraries inside and outside Malawi.

It is necessary that the UOML should formulate a policy on inter-library loans which the UOML itself must follow and which the users and potential users of these libraries, be they internal or external, must be made aware of and follow.

In spite of its limitations, the central technical services of the UOML is the only undertaking in Malawi that has any resemblance of an information resources sharing scheme, the inter-library loan scheme, the union catalogue and the sharing of staff and facilities should be seen as assets in considering UOML the lead role in national information service delivery and hence a centre for the Academic Resource Centre (ARC)

Also, considering that at the present the University of Malawi has plans in the pipeline waiting funding to network all its branch colleges and that partial automation has already begun with aid from the Rockfeller Foundation, UOML certainly has a claim to host to the ARC.

8.1.5 Methodologies and Automation

The UOML uses the Library of Congress classification scheme and the Anglo-American Cataloguing Rules (AACR2). All operations are done manually. Consultants who studied the structures and services of the UOML had dwelt on the automation issue. Dereck (1986) was particularly in favour of automating the union catalogue to enable availability of copies at the branch libraries. However financial and technical limitations could not make this

possible. Nevertheless, there are now hopes that within the next 2 to 3 years the catalogue will be computerized.

One of the recommendations of Dereck (1986) was that the UOML should keep its methodologies compatible with international standards by producing records according to AACR2 and compatible with MARC format. The degree and level of compatibility to be maintained between the ARC and the UOML will be discussed and examined in chapter eleven. The issue here is that ARC would be using CCF and therefore there may be a need for a format conversion.

8.1.6 Mandates of the UOML

The present mandate of the UOML is much less broad and much less national in character than that of the National Archives. The decisions by the Government to make the UOML the Pan African Development Information system (PADIS) national participating centre, however, bestows upon it a new role and hence a broader mandate than before. ARC should be able to benefit from it.

8.2 POSSIBLE ROLES OF THE UOML IN THE OVERALL DEVELOPMENT OF MALAWI'S INFORMATION AND DOCUMENTATION SERVICE

Malawi, like other countries at a similar level of development, suffers from handicaps posed by underdeveloped information and documentation services. Upgrading the available information services to a level conducive to achieving Malawi's development aspirations will be a long term and arduous task. It will involve among other things, mobilization of considerable financial resources; development of training and educational facilities; premises; equipment and technical support; policies and legislation and an appropriate institutional environment. Seen from such a long-term perspective, choice of UOML as the host to the ARC is not a response to that challenge, but it should be seen as a simple and cautious start that could contribute to improvement of a national information infrastructure in the long run.

8.3 CONCLUDING REMARKS

The conclusion is that, UOML is perhaps the most competent institution to host the ARC. The fact that UOML possesses trained manpower, some aspects of IT in position, experience in coordinating library resource

sharing, relevant collection of nationally generated literature, leads one to this choice.

On the other hand, the fact that the user base of the UOML is at present restricted to the academic community, its information products and services are narrowly defined; its lack of qualified manpower in IT and that its present mandate is not sufficiently broad, are the present constraints. However, there are already efforts afoot to overcome the constraints so as to enable both the ARC and the UOML mutually benefit.

8.4 OTHER INSTITUTIONS TO SHARE ARC INFORMATION PRODUCTS

There are also other information centres, research institutions, libraries, documentation centres, etc. that are likely to assist and benefit from the ARC. Some of these institutions are briefly described in the following sections.

8.4.1 Department of Research and Environmental Affairs (DREA)

Recognizing the necessity and importance of the applications of science and technology to socio-economic development programmes, Malawi government implemented a

series of measures to integrate science and technology into the national development planning. Several research centres and manpower training programmes have been promoted and supported to carry out research and development and scientific and technological services. With a view to institutionalizing and co-ordinating science and technology activities in the country, the Government established the National Research Council (NRCM) in 1974 in the Office of the President and Cabinet (OPC). In 1991 the name was changed to Department of Research and Environmental Affairs (DREA). Its functions include:

- Advising the government on scientific and research policy in relation to the country's development programmes.
- Collection, analysis and dissemination of research results and reports and information about the country.
- Liaison with external organizations on matters concerning science and technology, as well as channelling research information and resources received to assist the country's research and development efforts, and
- responsibility for the compilation and maintenance of national registers of research projects and of workers and bibliographies of research publications.

The DREA is organized into five functional areas.

- Research and development (R and D).
- Environmental protection.
- Documentation and information.
- Council affairs.
- Support services.

In 1988, DREA was chosen to sponsor the National Documentation Centre (NDC). A study was conducted by Unesco consultants in close cooperation with the national authorities to set up the NDC (Neelameghan, 1989). The following were some of the objectives, being implemented presently.

(a) Install the CDS/ISIS package and the ABC software provided by Unesco for verification/analysis of data on national scientific and technological potential (STP) on the IBM-PC compatible micro available at DREA.

(b) To set up an integrated research database using CDS/ISIS, including information on research publications, institutions, projects and personnel, with appropriate output formats for the publication of inventories and

bibliographies as well as an interface for transfer of STP data into the database.

(c) To train the NCRM staff in maintenance and use of the computerized information system and assist them in initiating regular collection of bibliographic and STP data and the provision of related information service;

(d) Advise the national authorities, in so far as possible given the work constraints of the above tasks, on the establishment of the National Documentation Centre and national information network.

The NDC is now being implemented and integrated databases of research publications, projects and profiles of institutions and information services of persons and events are being developed. It is anticipated that this will greatly enhance DREA's capacity to carry out its mandates and responsibilities. Undoubtedly ARC can share and exchange information with DREA, hence DREA will be an important node in the ARC network.

8.4.2 National Library Service

The National Library Service of Malawi (NLS) was established by an Act of Parliament passed in 1967 and became operational a year later. The NLS has the mandate for the extension of public libraries and service throughout the country, that is, to promote, establish, equip, manage, maintain and develop libraries in Malawi. From the phenomenal growth of public library service in Malawi, it would seem that the provisions of the Act are adequate for country's needs.

To achieve this objective, the NLS established 7 service points and in all the three regions of the country. These act as the regional centres in each of the three regions.

8.4.1.1 Services Offered by the NLS

The five basic services offered by the National Library include:

- Rural Community Library Service: NLS provides reading materials to the rural communities in association with the Ministry of Community Service.
- School Libraries Service: Provides reading materials to

primary and secondary school libraries.

- Consultancy through secondment: NLS provides assistance in establishing and organizing new libraries both in the government and private sectors. This is usually done by seconding one of the NLS professional librarians to the library or information centre concerned.
- Postal Service: A postal book loan service to users who are at a distance from the libraries
- Workshops/seminars for teacher librarians: Conducts seminars/short courses for both primary and secondary school/teacher librarians to equip them with the knowledge for managing their respective school libraries. These workshops are funded by the Canadian Overseas Development through Education (CODE).

8.4.1.2 Information Technology Use by the NLS

At present, there is nothing really worthy of calling IT equipment, except one UNISYS computer originally meant for desk top publishing (DTP). It was donated by the British Council but due to lack of qualified personnel, the computer is mainly used for word processing and sometimes inputting serials records for the union catalogue of serials. However, there are plans to purchase more powerful personal computers for

cataloguing. The services rendered by the NLS and its mandate makes it one of the important nodes in the ARC network.

8.4.3 The National Archives

The documentary heritage of a nation is recorded and preserved in its archival materials, constituting a valuable treasure, a record of past achievements and failures from which the present and the future generations can benefit in planning the development of the nation.

The library of the National Archives is one of the oldest libraries in Malawi dating back to colonial times. It has a valuable collection of old development literature as well as more recent published material on social, cultural, political and development matters relating to Malawi.

Like the other centres the National Archives suffers from a critical shortage of qualified manpower. The National Archives has a large capacity microfiche/film machine which has not been utilized, due to the lack of trained staff, among other things.

By virtue of its mandate as the national legal depository centre, the National Archives is an important source of information on Malawi and hence can be an important node in the ARC network.

8.4.4 Chitedze Agriculture Research Station (CARS)

The CARS Documentation Centre provides information services to agricultural research conducted not only at Chitedze but also at all the other agricultural research stations in Malawi. CARS is the "headquarters" for agricultural research in Malawi. Recently CARS benefited from World Bank funding to strengthen its agricultural research capacity. The Documentation Centre acquired a new-custom made building; an agricultural information expert was also made available. The centre has IBM personal computers with CD-ROM drive. Databases have been acquired for on-line retrieval. Without doubt the CARS Documentation Centre is at present the most advanced centre in Malawi in terms of use of IT.

It has a relatively large collection of non-conventional literature on Malawi's agricultural development. It has well established relationships and information exchange arrangements with Bunda College of Agriculture and other primary sources of agriculture information in and outside the country.

The experience of CARS will be valuable in the establishment of the ARC, and CARS would be a specialized node in the ARC network.

8.1.5 Library of the Office of the President and Cabinet

This library is housed within the OPC and is in close proximity to the Economic Planning Division. Its aim is to provide documentary information support to high level socio and economic policy and decision making. The library has been created recently and at present has only one staff member. Given the importance of its clientele its development has to be well planned and adequate resources made available. This library could be a channel for the ARC products to reach decision makers and hence it could be an important node in the ARC network. For it to be strong and effective it has to strengthen its contacts with other sources of information to enable policy and decision makers using its services get access to timely and pertinent information. one such source will be the ARC. On the other hand, it will also provide access to important sources to ARC users for information originating from the OPC and the Economic Planning Division.

8.4.6 Forestry Research Institute of Malawi (FRIM)

The library of FRIM is relatively well stocked and maintained and is the best source of forestry information in the country. The library is operated by an executive officer with a Malawi Library Association Certificate. There is no assistant staff.

In 1991 the library acquired some 420 items, a 20% fall compared with previous years. Books are issued primarily to FRIM researchers but other organizations, such as, the University of Malawi, Bunda College of Agriculture, forestry college, Department of Agricultural Research and individuals, are also served.

A gestestner photo-printer suitable for high volume report production was obtained by the library in 1989 under a World Bank funding.

Use of the library by FRIM and forest department staff in particular should be promoted, and ways and means should be found to increase accessibility to its collection. One way will be to include the library in the ARC network which will enhance the availability of its products to researchers through ARC's SDI services.

During the interview with the executive officer, it was indicated that the parent institution had in its possession, 4 IBM compatible personal computers.

1. IBM PS/2 model 30, '286 processor, 20 MB hard disk, 3.5" 720 KB disk drive, DOS 3.3 and with black and white display, supplied with Epson FX 100 dot matrix printer.

2. IBM PS/2 Model 50z, '286 MB hard disk, 3.5" 1440 KB floppy disk drive, DOS 3.3 with black and white display supplied with Epson LQ 1050 24 pin dot matrix printer .

3. Wang 361/20S, '386 SX processor, 40 MB hard disk, 3.5" KB floppy disk drive, 2MB RAM, DOS 4, VGA colour display and with a mouse, supplied with Epson HQ 300 dot matrix printer.

Machines 1 and 2 are maintained in a pool and their use is shared amongst research and secretarial staff. Software supplied for use with the machines include: Lotus 1-2-3, Word perfect 5.1, Multimate 2, Database IV

The computers are primarily used for word processing. They are used for writing reports and papers on the behalf of researchers and not for routine correspondence. Their use for statistical analysis is limited, primarily due to lack of appropriate software but also probably due to lack of training.

The third machine has recently been installed for the use of the Indigenous Species Silviculturist. It has been supplied under the FRIM/Aberdeen research project funded by ODA. Software supplied operates through windows although the installed RAM and DOS is insufficient to make full use of windows. Software supplied include: Windows, DOS 4.0, Word, Lotus 1-2-3 and Minitab.

Good use is being made for the existing computer facilities. Priority is given to research related functions over secretarial work. All interested scientific staff can obtain access to computers; though at times there may be competition for access .

As regards the library funding for one computer to be installed in the library is available. The library would acquire forestry and agro-forestry databases on CD-ROM (TREE-CD), with an ODA supported grant from CABI. Additional databases (MPTS of ICRAF, INSPIRE) will also

be installed once the computer system is in place. Surely the ARC will benefit from this specialized information base.

8.4.7 Ministry of Health Information Centre

The Information Centre of the Ministry of Health is a medium-sized documentation centre with a collection of about 15,000 monographs and subscribes to 40 serial titles. It coordinates the Ministry of Health's extensive library systems consisting of six major libraries, 24 district hospital libraries and several hundred health information units. In spite of the two foreign volunteers assigned to it recently, the centre remains critically under-staffed for the size of the tasks it is required to accomplish.

The centre's premises are inadequate. It has recently acquired an IBM PC/XT with multimate software and has plans to acquire a CD-ROM player and relevant international medical databases. Its users are basically researchers and medical practitioners. The centre is currently undergoing some major improvements including weeding and reorganization. For medical information and documentation, the centre with its links to health centres throughout the country could become a specialized

node in the ARC network. On the other hand the centre and its associated units can benefit through access to other relevant specialized information resources in the ARC network.

8.5 INTERNATIONAL AGENCIES

There are a number of libraries run by international organizations and by foreign governments in Malawi. These include the British Council, UNDP, USIS, just to mention a few. The British Council runs two public libraries one in the capital city, Lilongwe and the other in the commercial city, Blantyre. These libraries cover various subject areas such as British history, economics, english literature etc. They also offer a video library service.

The United States Information Service (USIS) also runs the J. F. Kennedy Memorial Library in the capital city. It is a well stocked and computerised centre.

The UNDP library is also located in the capital city, it has collections of reports and other documents related to development generated by various UN agencies. These libraries receive a number of periodicals and are open to the public. They could be useful information sources to users of ARC.

8.6 OTHER RESEARCH INSTITUTIONS

The following research institutions also operate small library/documentation centres and are important to the enrichment of the ARC information resources.

- Lunyangwa Research Station: Specialising in rice production.
- Makoka Research Station: Specialising in cotton and maize research.
- Centre for Social Research: Specialising in Socio-economic Research
- Bvumbwe Research Station: Specialising in citrus fruits
- Mimosa Tea Research Station: Specialising in tea research.
- Education Research Bureau: Specialising in all levels of education.
- Forestry Research Department: Forestry matters
- Geological Survey Department: Specialising in geology, minerals etc.
- Fisheries Research: Specialising in aquatic research
- Zomba Veterinary Station: Specialising in entomology, parasitology and trypanosomiasis

8.7 INFORMATION RELATED PROFESSIONAL ASSOCIATIONS

8.7.1 Malawi Library Association

The Malawi Library Association was founded and inaugurated in April 1976. One of its objectives, as provided in the constitution is to encourage the establishment and development of libraries, archives documentation and information centres in Malawi, and to promote their better administration. The Association is run by an elected executive committee.

Concerned with the general slowness of library and information development in the country, the Association undertook, as a matter of priority, to provide training facilities for library assistants already in employment. The University Library System and the National Library Service provided in-service training for their non-professionals staff. Their efforts could not meet the nation's needs and the Association supplemented by starting a course at certificate level for staff responsible for running libraries of government ministries and departments, statutory bodies and private concerns. It is hoped that these efforts will hasten development of library and information service, in Malawi.

To date, close to 200 library assistants have been trained. Teaching is done by the available professional librarians who are members of the Association, on a voluntary basis. The University provides a training librarian to coordinate the running of the course. Much is owed to the National Library Service and the University of Malawi for their encouragement, financial support and for providing the tutors.

The Association publishes a journal called the MALA bulletin.

8.8 INFORMATION POLICY ON INFORMATION SYSTEMS AND SERVICES

For the ARC to get established on a firm foundation, to be of benefit not only to the academic community but also to other sectors of the national economy and, in turn, benefit from interactions with other information centres, libraries, etc., a comprehensive national information policy will be a great support. Therefore, a brief note on the status of information policy in Malawi is in order in this study.

Like many other countries in Sub-Saharan Africa, Malawi has no overall national information/informatics

policy as yet (Chilambe, 1986). However efforts have been made towards formulation of a national information/informatics policy.

The formation of the Malawi Library Association (MALA) in 1976 and its inauguration a year later, ushered in a new consciousness among the small circle of information professionals in the country. Following initiatives taken by UNESCO in 1974 in encouraging Member States to harmonize their documentation, library, and archival services into a National Information System (NATIS) capable of supporting the process of socio-economic development, the creation of MALA was an appropriate step in this direction and the Association has played a sufficient role in laying a lasting foundation for the country's library and information systems development.

8.8.1 Department of Research and Environmental Affairs (DREA)

The Department of Research and Environmental Affairs (DREA) in the Office of the President and Cabinet, then NRC, was identified as the competent organ of the Government having the necessary authority and instruments for piloting the country's disparate information

resources on the path to a unified system. As early as March 1977, MALA submitted to the Department a document explaining the NATIS concept and its relevance to Malawi and asking the Department to coordinate all actions to be taken to achieve the NATIS objectives. The Department, at its 11th meeting, concluded that the NATIS philosophy was worth pursuing and encouraged the creation of appropriate mechanisms to oversee its development.

In March 1987, the Documentation and Information Services Committee organized a seminar on National Policy on Library and Information Services under UNESCO sponsorship and with the collaboration of the Malawi National Library Service. Although the Committee had met several times earlier to discuss NATIS-related issues, this was the first time a major seminar had been held for considering the establishment of the National Documentation Centre. It became the principal activity of the Committee, then an official policy had to be defined and adopted to guide its implementation. The objectives of the seminar were threefold:

(a) To draw attention of the government to the need for an overall national policy on library, documentation and information services in Malawi.

(b) To sensitize all the agencies in Malawi involved in, concerned with or interested in the collection, processing, dissemination and use of documentary information about the need for a national policy as the basis for planning and effective coordination of information activities and assign the responsibilities for ensuring the provision of information services.

(c) To lay the foundation and initiate the procedure for, the formulation of a national policy.

The seminar resolved that the main goal of Malawi's national policy should be the achievement of optimal utilization of information and professional knowledge generated and available in the country or abroad as a planning, decision-making and problem solving resource. For the purpose of easy implementation by the government, the following five elements of the national policy were articulated:

1. <u>Development of manpower</u>

It shall be government's policy to promote and support the training of information workers of all

categories (librarians, archivists, and documentalists) to meet the country's manpower needs and to give appropriate professional status, recognition and incentives and professional development opportunities for the effective management of the country's library and information services

2. Generation and collection of information resources

It shall be government's policy to strengthen the generation of indigenous information and publishing, through widening the number, range, coverage and by better quality of information materials and by intensifying the collection of information available locally and abroad

3. Organisation, storage and retrieval of information

It shall be government's policy to provide a full range of services and information and document delivery mechanism appropriate to different user groups, promote efficient methods of resource management and stimulate optimal utilization of emerging technologies to ensure that information services are cost effective.

4. Effective access to and utilization of information

It shall be government's policy to ensure that people of all categories and in all localities have easy access to a wide range of information sources through the development of information networks, resource sharing programmes, and to strengthen the perception of users regarding the value and utility of information and its application to planning.

5. Co-ordination of Library and information services

It shall be government policy to evolve a national coordinating mechanism to ensure effective and optimal implementation of the national policy on libraries and information services, projects, programmes in the country in order to avoid unnecessary duplication of effort and avoid waste of resources in the national information system development and operation.

The policy proposal document was submitted to the NRC for the official endorsement by government.

PART THREE

CHAPTER NINE

INFORMATION NEEDS

9.1 INTRODUCTION

This chapter discusses the results of a survey of information needs of researchers, teaching staff, and management in the University of Malawi and decision makers and executives in selected research institutions and governments departments concerned with higher education and research.

Over the past decade information has been gaining recognition as a key element in the development process. Researchers, research managers, and executives concerned with higher education have known that information is crucial to their work at all stages.

Among the major information producers and consumers in Malawi are the researchers and the members of the teaching staff in the University of Malawi and other academic institutions. These researchers need information on ongoing researches and what has been achieved in their fields of specialization. They also need information to help them in their teaching. In turn they generate information which need to be disseminated as quickly and

as widely as possible, both within and outside the country. The decision makers, planners and executives in government departments and parastatals also need data and information in making gainful decisions and effective performance of their administrative functions.

9.2 TEACHING STAFF

The University of Malawi has the following operational objectives:

- Advance science and technology .
- Impart knowledge by teaching.
- Advance knowledge through research.
- Study, preserve and develop the Malawian culture heritage.
- Satisfy the manpower needs of Malawi.

Teaching staff in the university are called upon to fulfil the above objectives by conducting research, and therefore they need to be kept updated about current developments in their respective areas of interest. They need to update their teaching materials frequently with the latest information available. The information and data necessary for these purposes need to be accesed, selected, processed and presented in forms convenient for use.

The proposed ARC need to know the needs of its potential users so that it can provide services relevant to their needs. Taking this into consideration, a survey was conducted, aimed at finding the information needs of the potential users of the ARC. In particular, the survey was aimed at assessing as to whether their information needs are being met by the libraries, information centres and documentation centres, and the areas on which ARC should concentrate to satisfy users.

9.3 METHODS OF DATA COLLECTION

A questionnaire (Annex 2) was used in the survey. It consisted of two parts. Part I aimed at collecting general information about the users, such as academic qualifications, fields of specialization, affiliation, services being offered, whether conducting any research, and subjects taught where applicable. Part II was concerned with the user's sources of information, such as the availability of library/documentation services at their respective institutions; the purpose for which they use such services; information services provided to them; whether their information needs are satisfied; alternative sources of information; whether the lack of information had any impact on their work; distance they travel to get to other sources of information; time it

takes for them to obtain information materials requested through their libraries; number of journals they subscribe to; and those journals they have no access to.

The questionnaire was distributed to a sample of 100 academic and administrative staff of the university, researchers in selected research institutions; and decision makers in selected governments departments.

The following were the institutions surveyed:

- University of Malawi (UNIMA). All its colleges.
- University Office (UO).
- Chitedze Agricultural Research Station (CARS).
- Lunyangwa Agricultural Research Station (LARS).
- Malawi Institute of Management (MIM).
- Malawi Institute of Education (MIE).
- Malawi Export Promotion (MEPC).
- Forestry Research Institute (FRIM).
- Department of Research and Environmental Affairs (DREA).
- Office of President and Cabinet (OPC).

9.4 RESPONSES AND DATA PROCESSING

Out of the 100 questionnaires distributed, 70 were collected but only 68 were used in the analysis. The other two were invalid. Thus the response rate was 68% and the quality of responses was quite good. (A summary of the responses according to broad categories of respondents is presented in Annex 3). The responses were coded and processed using SPSS PC+ V2.0 (Annex 4). The following sections review the responses

9.4.1 Sex and Nationality

Out of the 68 valid responses 58 (85.3%) were Malawians and the remaining 10 (14.7%) belonged to other nationalities. Of the total 68, 57 (83.8%) were male and 11 (16.2%) were female respondents.

9.4.2 Qualifications (Highest Degree/Diploma)

Of those surveyed 42.7% held Masters degree, 35.3% Doctorate, 13.2% Bachelors degrees, 2.9% Postgraduate diplomas, and 5.9% indicated other qualifications.

9.4.3 Field of Specialization

These were grouped into broad disciplines: 33.8% belonged to Agriculture and related areas, 17.6% to Social Sciences, 16.2% to Science and technology, 14.7% to Medicine and veterinary science, 7.4% to Humanities, 5.9% to Administration and 4.4% to education.

9.4.4 Services Offered

Out of the total, 33.8% indicated that they were researchers, 20.6% were involved in research and teaching, 19.1% were engaged in teaching and training, 10.3% were engaged in research and consultancy, while 5.9% were engaged in administrative work, 5.9% indicated to have other duties than the ones mentioned above, and 4.4% indicated to be engaged in consultancy alone. Asked if they were currently conducting any research, 56 (82.4%) responded in the affirmative.

9.4.5 Type of Information System

A great majority (82%) indicated that they had a library in their institution while a small number of 8 (11.8%) indicated that they had a documentation centre.

9.4.6 Reasons for which they Use the Library

Most (97%) responded that they used the library to borrow books and journals; followed by consulting journals (86.8%); and for other purposes (10.3%).

9.4.7 Library Services Provided

Of the respondents, 76.5% indicated that they received current awareness in their libraries/documentation centres; Selective Dissemination of Information (SDI) 32.4%, 75% indicated that they received reference services and 32.4% on-line searches.

9.4.8 Information Needs Satisfied?

A majority (72%) indicated that the library/documentation centre met their requirements to 'some extent'; 20.6% said 'yes'; and 7.4% indicated that it did not.

9.4.9 Alternative Sources of Information

Close to 30% indicated that they got information from friends and other institutions within the country, while 20.6% obtained information from abroad; 14.7% got

information from both local and foreign sources; and 10.3% from other sources, such as, personal collections, grapevine etc.

9.4.10 Effect on Work

The lack of access to information was reported by 27.9% to have serious impact on their work; but 60.3% did not find it a serious limitation.

9.4.11 Time Taken

When information material is requested through the library either by inter-library loan from other libraries in the country or obtained from abroad by using coupons, 29.4% indicated that it took over a month to reach them, 17.7% said it took a month; 8 to 15 days for 13.2% and 1 to 7 days for 4.4%. About 35.3% did not indicate anything while in the same group some stated that it depended on the distance from where the materials were coming from.

Regarding the distance travelled, if they did, to other sources of information, 33.8% indicated that they travelled well over 10Km, 26.5% indicated a distance of 1 to 5 Km, while 8.8% indicated a distance of 6 to 10 Km; and 30.9% did not indicate anything.

9.4.12 Number of Journals Subscribed to.

Asked to indicate the number of journal to which they subscribed personally, 55.9% indicated zero or not stated, 16.2% subscribed to 1 journal, 13.2% to 2 journals, 4.4% to 3, 5 and 6 journals and 1.5% to 8 journals.

9.4.13 Number of Journals Not Accessed

Asked to state the number of journals to which they have no access other than those they subscribed to, and those the library subscribed, 11.8% indicated 2 journals, 4.4% indicated 1, the same percentage was true for 8 and 10 journals, 2.9% indicated 3 journals, 1.5% indicated 20 and also the same percentage was indicated for 21 journals. Some of these journals include:

* Journal of biotechnology and tissue culture.
* Journal of agricultural education and curriculum development
* Indian journal of archives
* Fish phyisiology and biotechemistry journal.
* Journal of agronomy
* Computers management finance and industrial relations
* Journal of clothing and textile

* Journal of research methods materials
* Journal of fisheries

9.5 ANALYSIS AND DISCUSSION OF THE RESULTS

9.5.1 Information Services Provided

The study revealed that the common services offered in order of preference were the current awareness, (bulletins and accessions lists), reference service, selective dissemination of information and on-line services. Actually, SDI and on-line received the same ranking.

The provision of reference service received very high ranking because each and every college of the University of Malawi has a reference section, and most of the libraries/documentation centres surveyed had also reference sections. This does not mean that these libraries are providing reference services but rather the respondents answered positively because of the mere existence of the reference section. This may therefore explain why the category received top ranking.

In most of these libraries including the University of Malawi Libraries, there is no provision for a reference librarian or any detailed reference work. As a result users usually end up not getting the information they need.

As for on-line service, some of the research centres especially agriculture research centres such as Chitedze Agriculture Research Station and Bvumbwe Agriculture Research Station, have direct access (on-line access) to FAO databases in Rome.

9.5.2 Satisfying Information Needs

It is quite difficult to meet all information needs of a researcher; this should not stop libraries from making all efforts to provide comprehensive and relevant information and services. The survey indicates that a large number of people have their information met to some extent, although a certain number did indicate that their needs were not met at all. This is a matter requiring detailed study by librarians/information scientists concerned.

9.5.3 Other Sources of Information

It is observed from the study that researchers, teaching staff whose information requirements are not met, tend to look elsewhere to meet their information needs. It is incumbent upon libraries/documentation centres to try and work out solutions to find ways and means of acquiring the information from appropriate sources to meet their users needs. Whereas African countries continue looking at the developed world for economic aid, they should also try to obtain information and data in the form of printed materials, databases, online access etc.

9.5.4 Journal Subscription

The few who indicated that they subscribed to journals normally are foreign researchers or teachers who are fully funded by some international organizations.

In conclusion, the result is that the researchers, teachers and others have to do with what is available in their libraries and in most cases these are neither current nor comprehensive. It is therefore clear that researchers and teaching staff are unable to keep up-to-date with the developments in their respective fields. It explains why a number of respondents use information abroad as the only alternative.

There is thus a great need to assist the researchers, teaching staff, administrators in their quest for information and knowledge. An academic resource centre with all its information service and products as described in chapter eight would form a starting point and a model to provide efficient and timely information service.

CHAPTER TEN

SURVEY OF THE APPLICATION OF INFORMATION TECHNOLOGY IN LIBRARIES, DOCUMENTATION AND INFORMATION CENTRES IN MALAWI

10.1 SOURCES OF DATA

In order to get up to date information on the status of IT in libraries, documentation and information centres in Malawi, a questionnaire survey was conducted. Questionnaires were sent to 32 institutions. Addresses of most libraries/information centres were obtained from the directory of libraries in Malawi. Additional libraries were noted from the Post Office Telecommunications Corporation 1991 telephone directory and a few from personal contacts.

10.2 THE QUESTIONNAIRE

The questionnaire used for the survey (Annex 6) was based on the one that was used by PADIS in its survey on the use of Microcomputers in information and documentation centres in Africa 1990. Modifications were made in order to adapt it to the objectives of the present survey. Like the PADIS questionnaire it consists of three parts.

Part I: Sought general information: name and position of the individual filling the questionnaire, name and address of the institution, type of library, telephone, telex and facsimile, facilities, type of activities undertaken, kinds of services offered, size and type of collection and staff.

Part 2 : Sought information on the type and characteristics of the computer equipment used if any and where applicable, plans for computerization, computer applications, kinds of software, user service and formats of outputs provided by using computers, availability of CD-ROM drives, local and external databases used, access to remote online databases and plans for online access to remote databases.

Part 3: Sought information from only those institutions that indicated that they had or had access to computers. It sought information on the problems they had encountered, both personnel and equipment, availability of local servicing for computers, training of personnel, and whether the use of computers had any impact on the work of the institution.

10.3 RESPONSES AND DATA PROCESSING

After reminders and personal contacts, 21 institutions (Annex 5) representing 66.7% response rate returned the questionnaires. All the questionnaires were included in the analysis since the responses were all good.

The responses were coded and processed using SPSS PC+ V2.0 statistical package. The following were the results of the survey. Statistical frequency tables of responses to the questionnaire are presented in Annex 7.

10.3.1 Type of Information System

Almost 48% of the responding institutions indicated that they had a special library, 23.8% academic, 9.5% school, 19.0% public library.

10.3.2 User Service Provided

Current awareness service, seem to be the most common in almost all the respondent institutions followed by SDI and bibliographic services.

10.3.3 Professional staff

The survey revealed that staff are lacking in most of libraries and information centres in Malawi. This is true because out of the libraries surveyed, 80% percent had 2 qualified librarians/documentalists/information specialist. It is a pity that most of these institutions are run by unqualified personnel. A point to note in the statistical tables is that only the University of Malawi was the odd one out with 8 professional staff.

Regarding data processing specialist, libraries do not have these on their staff lists.

10.3.4 Computer Facilities

Computers are slowly proliferating into Malawi information institutions, about 68% indicated having computer facilities and most of them are using the facilities.

10.3.5 Telephone, Telex and Facsimile Facilities

All respondents had telephone facilities. Very few appeared not to have telex and facsimile services.

10.3.6 Institutions with Computers

This section presents results of only those institutions that indicated the availability of computers.

10.3.7 Utilization and Location of Computers

According to the survey, computerization in Malawi is more common in special libraries than in the other 3 categories included in the survey.

Regarding location of computers, it seems most of the computer facilities are located within the library/documentation and information centres.

10.3.8 Types of Computers

Most of the institutions are using microcomputers. Mainfames seem not to be common in the country's libraries/documentation/information centres, perhaps this could be attributed to the fiscal measures instituted by government (refer to chapter 5 for details). Combinations of microcomputers with minicomputers were also available.

10.3.9 Networks of Micros

Most of the microcomputers available were stand alones with a small number networked within the institution.

10.3.10 CD-ROM

CD-ROM use in Malawi is still very minimal, despite its immense advantages. Part of this state is mainly attributed to the cost of acquiring them. Out of the twelve institutions only five had the facility.

10.3.11 Use of Computers

Regarding the purpose for which computers were used, it is a pity that most of these computers are not used to their full potential, these computers are solely used for word processing. However there are few institutions who are using the computers for bibliographic and library database management, financial management, desktop publishing, numerical and statistical applications etc.

10.3.12 Software for bibliographic applications

Regarding the use of software for bibliographic and library database management applications, CDS/ISIS

(Micro) seem to be doing very well, it received about 68% indications. This could partly be attributed to the establishment of the NDC which has a CDS/ISIS user group which provides training and distributes the software.

10.3.13 Formats of user services

The most common computer generated service to the users was the computer print out. It is only obvious that other means like diskettes, magnetic tapes received no indications. In a developing country like Malawi user services through diskettes or magnetic are alomst unthinkable.

10.3.14 Databases

These are not yet developed what the country has, are just embrryos. However the survey showed that 3 institutions had developed databases. With the proliferation of microcomputers and telecommunications, one only hopes that there will be more emphasis given to this.

10.3.15 Efficiency

All the institutions in the survey indicated that use of the computer had improved efficiency in doing the work to which computers were applied.

10.3.16 Training

Most of the available professionals in the country were trained outside the country through scholarships from international organizations. This is an indication that the country does not have enough training institutions for information specialists. This is one of the areas professional librarians/documetalists have to address.

10.3.17 Problems in the Use of Computers

There were a number of problems which the insitutions indicated. Most of these problems were mainly lack of computer facilities. Some of them included inadequacy of peripherals, inappropriate software, lack of software documentation, inadequate computer memory, lack of spare parts, lack of satisfactory domestic maintenance, and environmental conditions.

10.3.18 Servicing of Computers

It seems that a majority of the repondents receive service locally from the vendor organizations. Very few call for experts when the problem cannot be solved within the country.

10.3.19 Institutions Without Computers

Asked on whether they had plans to introduce computers in their libraries, it is encouraging that most of these libraries without computers indicated that they had plans to install computers by 1992, 1993, and 1996.

10.4 ANALYSIS AND DISCUSSION OF THE SURVEY RESULTS

The survey revealed a number of points worthy discussing. Among the these, important points are the following:

10.4.1 Type of libraries

Most institutions using computers are those attached to private and parastatal organizations. In fact 66.7% of libraries using computers are special libraries, and they are mainly affiliated/located in private and parastatal research or business environments. The availability of computers in these organizations can be attributed to mainly to 2 factors the importance of computers interms of improving efficiency in information handling and the availability of funds for the acquisition of the equipment.

One other thing to note is that special libraries have led the way in computer applications followed by academic libraries. The academic libraries, who in this

case are mainly the colleges of the University, have lagged behind despite the fact that these libraries have played a leading role in the introduction of computer facilities in the country. However, plans are under-way to computerize house keeping operations in the university, after which they are expected to play a leading role in the introduction of computers in libraries in Malawi as they could also serve as training institutions

The number of public libraries using computers is very low. Infact only one library indicated having and using computers. This can be attributed to two major reasons: lack of trained manpower and lack of funding.

As far as school libraries are concerned, the situation is that of apathy. The school libraries in my opinion have no future in as far as computerization is concerned. Unless the level of computerization in the country reaches a high proportion, I do not see how computers can be introduced in school libraries. Poor funding, lack of building infrastructure and lack of qualified manpower are the major barriers to the introduction of computer in school libraries in the country.

The potential for the introduction of computers in special libraries in Malawi exists, this is because they have acces to the various facilities, both in terms of

funds and equipment, that their parent institutions offer. Academic libraries follow on the list, but considering the fact that most of them are public funded institutions, they will progress at a slow pace. Public libraries and school libraries will be the last institutions to be computerized, if at all, among libraries.

10.4.2 Computer Application

The survey revealed a high incidence of computers being used for word processing activities. The sad thing to note is that some of the libraries that indicated as having computers located within their buildings, use them for nothing but word processing. Bibliographic and library databases management applications seem to be doing well. There is an indication of some libraries using computers for cataloguing and classification and to some extent desktop publishing.

No institution indicated the use of computers for circulation control, serials control and management information system.

It is difficult to understand the reasons why some libraries, despite the fact that their parent organizations have coputers, do not use the facilities for library functions. One thing that comes to mind is the critical shortage of information manpower. It is

training that produces the Malawian library managers who can bring a difference to this situation.

A closer examination of the course contents of the institutions which have been training information professionals in the country, reveals that none of them has a detailed information technology and management of IT. The kind of training has resulted in most libraries remaining static and are not changing or evolving to become 'information age' institutions. The librarians still place emphasis on the collection of information materials, organizing and presentation of the collection in relatively static form (e.g. books and peridicals), and not on the process of communication of information which in turn will demand the application of IT. The library's emphasis is more on having than communicating, more on preserving older materials than quickly accessing new materials.

The second implication is that even without a comprehensive survey one would be right to claim that most of Malawi library managers today are "computer illiterate". Illiteracy in the context of this study is taken to mean the inability to properly understand and apply computers to library functions.

10.4.3 Software for Bibliographical/Library database Management.

Micro CDS/ISIS appears to be gaining ground as the main software for information storage and retrieval systems in the country. This could be attributted to two major reasons: First the software is distributed free of charge by UNESCO and secondly the recent establishment of the National Documentation Centre (NDC), which has so far been conducting various training courses in the use of CDS/ISIS. Thus the sofware is readily available, and training is also available. The potential for this software in Malawi looks promising, considering the number of computers using it.

10.4.4 Online Access and Networking

In the whole survey one institution indicated as having online access to remote database. The main reasons for this could be the fact that there are no developed bibliographic or any form of electronic databases in the country. Those libraries that have developed their in-house databases, the number of records is so small to necessitate sharing.

Fifty eight per cent indicated that they had plans for online access to remote databases. As long as no institution develops databases worthy searching these plans will not be effected. While the Post and

Telecommunications does provide data communications line to user when they request, it is a fact that telecoms, tarrifs in the country are quite high. Thus connect charges to other remote databases in the country, worse still outside the country are prohibitive. The high telecommunication charges are also hindering wide area networks.

However, if ESADIS were operational, online access to various databases at ESADIS, and at PADIS to those institutions that can afford the cost, is feasible.

10.4.5 CD-ROM Technology

CD-ROM Technology advantages has been discussed briefly in chapter 4. Despite the opportunities presented by this technology for libraries to improve their services, only 33.3% institutions had CD-ROM drives. Thus, they are also the only ones with access to the external databases available on CD-ROMs.

It is quite true that the price of CD-ROM drives and subscription to various databases could be quite high, but the benefits derivable from this technology, definitely justifies investiment in it. CD-ROM databases could be put to various uses. For example, BIBLIOFILE CD-ROM databases provides the complete Library of Congress Catalogue (MARC) on disk. This can be used in cataloguing and classification activities and in the production of

catalogue cards. Other databases like CABI, CAS, BIOSIS, AGRIS, LILACS etc., provide other services and other inforamtion storage and retieval services.

10.4.6 Databases

Twenty five per cent of those using computers indicated as having developed in-house databases. This small number is a matter of concern, especially considering the fact that the country has no major electronic databases where information on various subjects could be accessed.

Bibliographic databases enable the scientists and researchers to gain access to information on research already performed, information needed for the management of science and technology, for problem solving and information on the evolution of scientific knowledge or the pursuit of science studies (DREA 1988). Thus the lack of databases, especially local ones, implies that scientists and researchers are not well informed about research developments in their country.

10.4.7 Data Processing Personnel

Libraries have no data processing personnel on their staff lists, as revealed in the survey. The reason is

simple, no computer specialist in Malawi today can be expected to work in a library, when there are better, and well paid positions available for computer specialists in other organizations.

Libraries therefore should train librarians in the use of computers in libraries.

PART FOUR

CHAPTER ELEVEN

SYSTEM ANALYSIS REPORT

11.1 SCOPE AND OBJECTIVES OF THE STUDY

It will be useful to recall the objective of the present study (see chapter 5).

1. (a) To make a feasibility study of the application of IT in establishing an Academic Resource Centre.
   (b) Propose plans to develop the Academic Resource Centre.
   (c) To propose steps to implement the plan.
   (d) To propose a local area network within the ARC and a wide area network linking other selected centres and the colleges of the University of Malawi.

2. To set up a prototype integrated database

11.2 SCOPE OF THE STUDY

The discussion and plan for the development of the ARC is restricted to the University of Malawi, selected Government Ministries and Departments and research centres.

11.3 METHODOLOGY AND SOURCES OF DATA

In order to set up an Academic Resource Centre, a multi-pronged approach for gathering the necessary information was adopted. This involved a combination of literature survey, questionnaires survey, direct observation, personal interviews, discussions with different experts.

In order to develop an integrated database a detailed system analysis work was also carried out at the University of Malawi. The existing systems were studied.

11.3.1 Literature Review

The literature review involved surveying files that the researcher was allowed access, numerous books and articles on information technology, information systems,

information resource centres especially those dealing with Africa and Malawi in particular. To get the wider picture, other documents covering IT from other parts of the world were also reviewed.

11.3.2 Personal Interviews

Interviews were carried out with some senior information experts, librarians, other academic and administrative staff of the university, Data Processing Unit, computer firm executives such as ICL (Malawi) the Computer Sales Service and UNISYS (Malawi). (The list of some of the individuals interviewed appears at Annex 1)

11.4 BACKGROUND INFORMATION

In the ALA Glossary of Library and Information Science (1983), the word 'resource' is defined as wealth, materials, supplies which a person or country can use; that which helps in doing something; that which can help to or for support. The word academic is referred to as something forming an integral part of a college, university, or other academic institution (post secondary;

Thus, the ARC in this study is a centre forming an integral part of the university, organized and administered to meet the information needs of academic and administrative staff, students, affiliated staff of other research institutionsand executives in government bureaux and parastatals concerned in someway with higher education and academic matters of Malawi. The ARC is expected to serve users who need precise and specialised information

The ARC's imperative is to find a way to integrate information processing technology within an academic setting so that the benefits of the information age can be harnessed to improve the efficiency and effectiveness of research, education and administration. A reource centre's information resources include documentary sources (e.g. library resources), databases,experise in different specialities available within academic, research and professional community, other institutional resources etc. All these resource bases need to be identified and networked to ensure quick access to them. The proposal is for a network a LAN within the university system and a wide area network (WAN) using telecommunication facilities to link other information within and outside the country. The system should serve as decision support system enabling professionals and scientists in the academic community to organize data, extract information, develop ideas and evaluate actions. The networking will enable sharing of resources, ideas

and experiences. Information processing will be distributed and integrated across micros with emphasis on the desk top computer as the end-user window into the system.

The challenge is not only to plan, develop and implement new technologies but also to foster the adaption of existing structures (hardware, software and personal computer) to support end user computing. The ARC concept is more than the acquisition of a microcomputers for every desk, but derives the idea that which ever area is involved, be it, education, research, administration, information must be put into the context of a system or systems which the average user can access easily and directly. Thus it is essential that the underlying concept of an ARC be supported by the leadership of the university and that ARC expresses the information management philosophy of the institutional leadership from the start.This consensus forms the basis for organizational change.

The products and methodologies developed in this plan will have direct applicability to the campus as a whole and will be transportable to other sites in a phased branching process.

11.4.1 Users

Users would range from the most sophisticated professionals i.e. academic and administrative staff, researchers, politicians, educators to the non-specialists general users who have an important task to perform in a particular sector (e.g agriculture, finance, industry)

In the succeeding paragraphs, the ARC user groups researchers scientists, university administrative and teaching staff and the decision makers and their information requirements are discussed.

11.4.1.1 Researchers and teachers

Scientists, researchers, teachers etc are some of the major users of scientific and technological information. They may be academics engaged in teaching and research activities or they may be involved in research and development activities in research institutions. Commenting on the value of information, Atherton (1977) remarks that the work of the above-mentioned user groups necessitates effective communication:

- to stimulate thought and action by injection of, and interaction with, other people's ideas, knowledge, experience and achievements.

- to promote continuous awareness of what others are doing so that individual workers (or groups) may know of developments in their own special fields, and in wider fields, such as descriptive or technology .
- to diminish the probability of unwitting duplication of work and to save time and effort.
- to provide introductory and background information for work in unfamiliar fields.
- to provide specific information and data needed for work in hand and to meet specific requirements.

Echoing similar views, Voigt says that " scientist refer to information sources mainly in three circumstances"

- while getting current awareness of results both in their particular narrow field and the related disciplines
- in their day to day work, when they need some factual information, figures, methods and designs and
- when embarking on a new problem or a project as well as when completing it and writing about it- a retrospective search to identify as many published and unpublished sources on the subject as possible.

Shcherban (1977) has identified seven stages when information is supplied for scientific and technical work. These are worth mentioning because they provide a clear guidance for the type of scientific information the ARC should concentrate on.

1. Overall familiarization with the problem, and problem statement. Drawing up a plan and the provisional terms for the solution of the problem of primary and secondary importance. This stage requires a general acquaintance with information available on the subject.
2. Gathering scientific knowledge about the subject of study. Retrospective searching of the broadest possible scope of literature without any pronounced critical approach.
3. Coordination and interpretation of scientific data. A critical evaluation of the ideas and hypothesis of different authors. The relevance criteria for the information needed are specified and the amount of documents used is reduced
4. Statement of hypothesis and choice of a working hypothesis, which is the most important stage of research in a technical science. As to the use of information, it is characterized by in-depth analysis rather than broad coverage. Sometimes, however a working hypothesis may be chosen under the influence of what might appear irrelevant information.
5. Providing the working hypothesis, the most important stage in basic research. The information used depends on the specifics of research; for

instance, the proving of an assumption may require gathering factual data scattered in literature.

6. Statement of conclusions and recommendations. Predictions as well as generalizations, are frequently made at this stages. Information is often used to shed light on precedence and priority aspects.

7. Description of the research results. The information gathered and processed is, as a rule, minutely documented.

In terms of information type, researchers and scientist would require:

- scientific and technical information - enabling learning, research, technical decisions and actions.
- Experimental information
- Know why information
- Know how information

These are not mutualy exclusive types there is an overlap among these.

11.4.1.2 Decision makers

Problem solving and decision making are two important activities managers, policy makers, planners etc. While problem solving is the seeking of answer to a question, decision making is the cutting off of further considerations of the problem, the elimination of all alternatives but one, and essentially a commitment to action. Thus, decisions are made at a number of points in the sequential problem-solving process. For example:

(a) Goals which involve both values and empirical considerations.
(b) Sub-goals and means in means-ends claims of action.
(c) Ranges of input values.
(d) Selection from among alternative means-ends claims.
(e) Basic assumptions.
(f) Available data - should these be accepted or rejected.
(g) Final action to implement the selected solution to the problem.

In other words, decision making in its broadest context includes among the activities preceding the

decision: (1) Finding occasions for making a decision; (2) Finding possible courses of action; and (3) choosing among courses of action. For decisions to be good and valid, the essential ingredient should be information. Recognizing its importance, it has been said that the recipe for a good decision is 90 percent information and 10 percent inspiration. Steiner (1969) made similar observation when he remarked that "Information flows are as important to the life and health of business as the flow of blood to the life and health of an individual."

11.5 OBJECTIVES OF THE ARC

Reflecting the above mentioned user needs, the objectives of the centre are therefore very complex and extensive. The overall objectives of the information system may be summarized as follows:

- Building up a good and valuable document collection relevant to the organization or system's needs in order to support the service activities.
- Acting as a control point for filling of the organization's or system's technical scientific administrative reports and other related documents, and organizing them for use in order to, and the exploitation of the know how, and reduce or eliminate

duplication of work. (A good centre becomes over the years, an organization's coperate memory)

- Exploiting the literature (published and unpublished) and other sources of information in order to provide the staff with new and up to date information on subjects relevant to their fields of specialization.
- Providing an efficient and effective information retrieval and dissemination system
- Be a clearing house, referral and switching centre for information on all aspects
- Be a partner in the integrated development of various information and documentation systems in the fields concerned and the related sectoral information systems in the country and operate as a feeder to user of relevant international systems and services.
- Fulfilling these objectives in an economic and balanced manner possible, commensurate with effectiveness

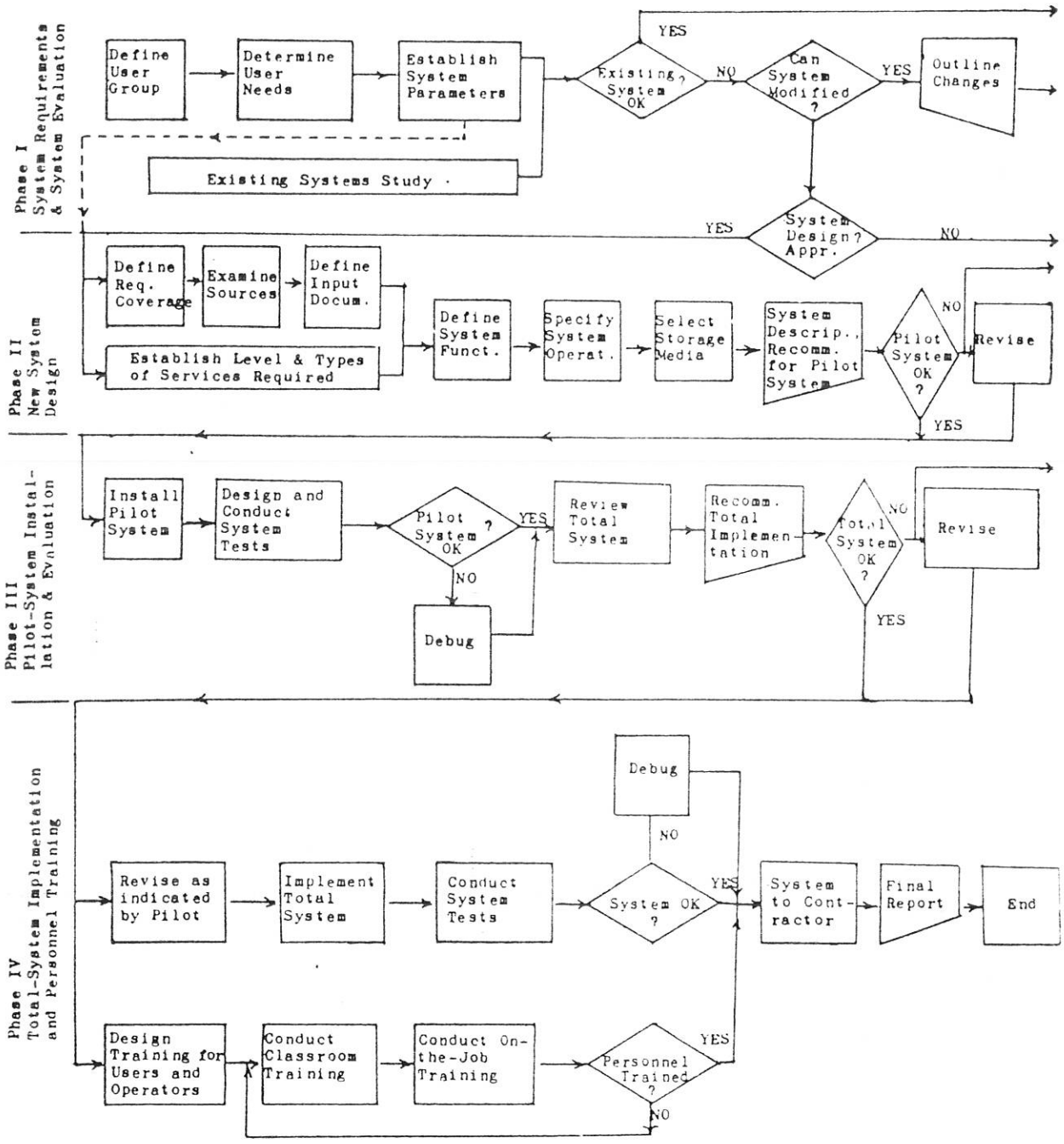
11.5.1 Three basic elements

For achieving these objectives, three basic elements of the information system should be carefully planned and developed:

* Information sources and database.

* Library and information service.
* Manpower for the operation and management of the system.
* Choice of appropriate methodologies techniques and technologies for developing and operating the system.

The planning of these elements are dealt with in the design phase of the project. The diagram below indicates the whole system's design and implementation phases. (Seetharama, 1983)



FLOW-CHART OF INFORMATION SYSTEM DESIGN AND IMPLEMENTATION

As indicated in chapter 7 this ARC is envisaged to be in the University of Malawi Chancellor College and therefore the University would provide the inputs to the system. Such inputs would include materials and personnel. Some of the major functions will be:

1. Acquisition
2. Cataloguing
3. Circulation
4. Serials control
5. Stack maintenance
6. Database development
7. Information service
8. Networking
9. Supervision and management.

There will be need to plan the number of personnel in each of these categories to support the inputs to the ARC (This will be discussed in the detailed design phase).

To start with, materials will include the 4 computers availble at the Centre Library (Chancellor College) and others in the branch college libraries and the participating centres

11.6 WHY THE UNIVERSITY OF MALAWI

On the basis of the survey the University of Malawi Libraries were found to be appropriate institution to host the ARC for the following factors:

Quality and size of manpower resources: The system has the largest number of professionals that had done post-graduate studies.

Document holdings: Its collection by and large is the most comprehensive in the country and relatively up to date. Abate D. (1986) confirms this assertion in his report to Government of Malawi on the participation of the University of Malawi as centre to Pan African Documentation Information System (PADIS).

Methodologies: The use of compatible methodologies is the basis for co-operation in information work. On the other hand, the introduction of new set of methodologies in library and information services impose the additional burden of processing materials a second time. Fortunately the University of Malawi uses the Library of Congress Classification Scheme, and Anglo American Cataloguing Rules (AACR). And the records are in MARC compatible form. The ARC is envisaged to use Common Communication

Format (CCF). There is a conversion software package which can convert MARC compatible records to CCF and therefore there should be no difficulties as compared with the situation in other libraries visited.

Training: Appropriate training will have to be provided to some of the staff of the UOML who are to work in the ARC. There should be no major difficulties in this respect because most of the staff of UOML have at least hands on experience with the computer.

Equipment: Admittedly all libraries and documentation centres visited were ill equipped. Equipment requirements include reproduction equipment, computers, audio visual equipment, modem and other communications devices. Some of these equipments are needed immediately. However, the UOML is relatively well equipped in this regard.

System and network design: Here I refer to tools to be used for the processing of information; procedures to be followed in coordination and resource sharing plans for implementation of activities etc. As discussed in chapter seven, the UOML has plans already in the pipeline to network all its branch libraries. At the present time work to automate the UOML's union catalogue has already started with assistance of the Rockfeller foundation.

Appraisal of user's needs: The UOML has a routine procedure for adapting to the changing needs of its users (i.e. the academic community) by delegating the choice of materials to faculty members. However, this procedure applies to text books, reference material, periodical titles in general and not to the Malawiana collection. At least it is the only library with some built in mechanisms for gauging user's interests.

Perhaps the last but not least is the obvious reason that the ARC, by its very nature and functions, needs to be in the highest academic institution of the country.

11.7 ORGANIZATION OF THE UNIVERSITY OF MALAWI

In order to develop the ARC in the UOML, it is necessary to look at the University's organisational structure and the place of the UOML therein.

The University is composed of five colleges which are geographically apart and specializing in different fields. Each college has its own branch library and specializing in information sources to the respective college's needs.

Following recommendations by the consultant who visited the University in 1979 and 1986, the central structure was created and the main tasks of cataloguing, acquisitions, classification, binding, catalogue card production were centralized and done at Chancellor College. The central library is located at Chancellor College library because it is the main campus of the University, and the largest in the University.

11.7.1 Chancellor College Library

During my survey of the Chancellor College library, the following were the findings in relation to the ARC.

11.7.1.1 Main Sections

The library is composed of the following sections: Cataloguing, acquisitions, circulation, serials and periodicals, stack maintenance, reference section, administration, the local collection and the computer section. The computers that are available are merely used for word processing. The library houses a collection of about 190,000 volumes in books, journals and reference materials. Note that this does not include papers and periodicals such as, newspapers and popular magazines.

11.7.1.2 Opening and Closing Hours

The library is open from from 8.00 am to 10.00 p.m. Monday through Friday. On Saturday and Sundays, the library is open from 8.00 am to12.00 noon.

11.7.1.3 Arrangement of Books

All the materials are arranged according to the Library of Congress Classification Scheme with the exception of bound volumes of periodicals which are arranged alphabetically.

11.7.1.4 Problems

The library suffers from shortage of staff in both categories-professional and support staff. During the study it was noted that some services such as, user studies, library statistics, detailed current awareness services, reference services etc. were not adequately performed. For example, the current statistics about the stock of the library was that of 1984 stock-taking. In terms of current awareness, it was only the accessions list that provided the users information about additions to the library's collection. On provision of Selective Dissemination of Information (SDI) the librarian lamented

on the shortage of staff, but expressed optimism that in future it may be possible with the introduction of IT tools.

The other area of concern was the inability of students and sometimes staff alike in properly using the catalogue. This was attributed to poor library orientation.

Taking these into consideration, the ARC has to give priority attention to covering the shortcomings of the present system and the provision of information service and products applying IT, to establish its usefulness to the academic and management groups.

11.7.1.5 Limitations of the Existing Facilities

Currently the library is not automated. There are very few staff members who are trained in IT applications, and the methodologies to be used by the ARC are somewhat different from the conventional library practices. Most of the available equipment and software are not adequate. However, plans are underway to acquire more computers. As discussed in chapter 8, the Rockfeller foundation has already started feasibility studies to automate the union catalogue (refer to chapter 8 for details). The ARC is hoped to benefit from these developments.

System and network design: These were not in place at the time of the study. A detailed study had already been conducted by UNESCO to network the college libraries of the University. If funds are available this may be realized.

Users needs: Systematic study of user's needs has not been undertaken. However as discussed in chapter eight, the University has a routine procedure for adapting to the changing needs of its users by delegating the choice of materials to the faculty members. But this study showed that such delegation was extended only to selected faculty members and not to administrators at all.

11.8 USE OF COMPUTERS

The proposed ARC is expected to use computers extensively for the following reasons:

1. For better management of the operations with efficiency, effectiveness, accuracy and at reduced costs. Computers can process information much faster and more accurately than human beings and are particularly suited to perform routine operations like sorting, filing and sending notices which are typical of the ARC routines.
   Computers can reduce work load in the acquisition, cataloguing, circulation departments.

2. IT can also assist in providing new and improved services to satisfy the information needs of users. Such services include current awareness, selective dissemination of information, question answer services etc., which are poorly done or not at all present.
3. As mentioned in chapter 4 CD-ROM technology and CD-ROM databases enable access to a wide range and quantity of information sources. CD-ROM databases such as the British Library Bibliographic Services Division's recently published books in MARC format, Bibliofile, and commercial publishers book catalogues facilitate document selection, ordering and cataloguing tools in computer readable form.
4. IT promotes information exchange and resource sharing through development of networks.

11.9 ORGANIZATIONS SURVEYED

1. Chancellor college library where interviews were set up with management and selected para-professional staff.
2. Other University of Malawi college libraries, namely Polytechnic, Bunda college of Agriculture, College of Medicine and Kamuzu college of nursing.
3. Selected research centres, researchers and government officials.

11.10 DESIGN ALTERNATIVES TO MEET THE ABOVE OBJECTIVES

As discussed in the analysis report,(the first pages of this chapter) the existing systems were found inadequate with problems that need to be solved. As far as efficient delivery of information products and services to satisfy user's needs is concerned they were found to be wanting. Unless there is a better mechanism for processing and repackaging of relevant information and provision of timely delivery of information using IT is adopted, the current unsatisfactory situation will continue.

The analysis report revealed that the UOML has microcomputer terminals in all its libraries. The terminals were reported to be idle most of the time apart from being used for word processing. They could be better utilised in the ARC's information services and products to begin with and additional computer facilities should be acquired as need arises.

In designing a syetm, it is necessary to examine the advantages and disadvantages of alternatives, approaches with a view to choosing the one that is reliable and feasible in this context.

11.10.1 Design a New System

This alternative is to come up with a totally new system replacing existing one.

11.10.1.1 Advantages

* It will allow the consideration of all the special features of the proposed system.
* Flexibility, to meet possible changes in user requirements, expansion and technology can be achieved.
* Can be designed and developed to satisfy user's needs and requirements.

11.10.1.2 Disadvantages

* It is very expensive to design a new system.
* It takes a much longer time.
* It needs trained manpower who may not be available.

11.10.2 Modifying the Existing System

The second alternative is to modify or adapt the existing system and adding any new features required.

11.10.2.1 Advantages of Modifying the Existing System

* It is relatively less costly because it utilizes some of the existing structures and facilities.
* It gives a framework or a starting point to continue developing the proposed system.

11.10.2.2 Disadvantages

* It may not be flexible to allow pssible changes.

11.10.3 Computer Based or Manual Based

The other major alternative to be considered is whether the system should be totally computer based or totally manual based. The proposal is that the system should be computer based. The factors that call for the application of computer based technologyinclude the following advantages:

11.10.3.1 Advantages

* The need for efficiency accuracy and speed required for the ARC, is dependent on the use of appropriate information technologies.

* The handling and processing of a large number and variety of records and the generation of different types of information products and services, will be greatly facilitated by the use of electronic devices and methods.
* The need to link with other centres within and outside the country.

11.10.3.2 Disadvantages

* Costly to implement (hardware, software, new personnel and training of personnel etc.).
* Presupposes that users are knowledgeable about online access and retrieval of information.
* Maintenance services, which should be available to the establishment whenever required, are difficult to ensure in Malawi as there is no vendor with such capacity.

If advantages outweigh the disdvantages and a computerized system is preferred, the next alternative to be considered is in respect of how to establish the computerized system. There are two major options:

11.10.4 Purchasing a Universally Applicable System or Developing the System According to the Requirements of the Proposed System.

These two alternatives have the following advantages and disadvantages, especially in the context of the proposed system:

11.10.4.1 Advantages of Buying a System

* The system is a tested and proved one.
* It could be implemented without delay.

11.10.4.2 Disadvantages of Buying a System.

* It may not satisfy all the special requirements of the proposed system.
* It may not allow the use of the existing material and human resources.
* Since it may not utilize the existing resources, maintenance and modification of the system once developed may become difficult within the university.
* If the system had been developed for some time, it may not incorporate the most technological advances in the field.

11.10.4.3 Advantages of Developing the Required System

* Since it is purposely designed for the new system, it will address all the requirements.
* Allows the use the existing resources and incorporate the desired features of the existing system
* Offers the possibility of using the best technology available in the market.

11.10.4.4 Disadvantages of Developing the System

* Usually takes a longer time to develop, test and establish the system.
* Not always easy to find the skilled personnel to develop and maintain the system in-house.
* Usually relatively more expensive to develop, test and operate.
* If it is not properly tested and proven, the risk of failure is high.

Considering these design alternatives, the following design is recommended: Build on the existing facilities, use appropriate technology, add new subsystems, and features necessary, and adapt to suit local needs.

11.11 USE OF EXISTING FACILITIES

As mentioned earlier, the Chancellor college library has its own computer centre. The centre has 4 stand alone IBM PS/2 micros each with 640KB RAM and 30MB disk storage capacity.

The hardware system configuration combines such features as high resolution 12" and 14" monitors; 1 CD-ROM drive; single and double/twin internal 5.25" (1.2 MB); 3.5" (1.44 Mb) floppy drives and two dot matrix Epson-800 printers and a mouse.

11.11.1 Software

There are a wide variety of software packages that run on these microcomputers. Among these are micro CDS/ISIS, Lotus 1-2-3, Wordperfect, Multimate, Windows, etc. Considering the requirements of ARC and the needs of its users, micro CDS/ISIS software package available is recommended for use in database development and information retrieval.

11.11.2 Capability of CDS/ISIS

Micro CDS/ISIS, developed and distributed free of charge to non-profit making organizations especially developing countries, is aproven DBMS package for the creation and manipulation of textual records. It is being used in some ten thousand institutions around the world of which some 300 are in Africa. The PADIS survey (1988, 1990) indicate its growing population in Africa. Version 3.0 of the software released late 1992 has multi-user capability and can operate in LAN environment using such such network sofware as Novel network, minimal hardware requirements; IBM PC compatible, 640 RAM, afloppy drive and hard disk, DOS 3.0 and above.

11.12 DESIGN BLOCKS OF THE SYSTEM

11.12.1 Input

The input to the system is first captured in the input sheets presented in annex 10 phase, and then the data will be entered into the computer.

The input for the ARC will consists of :

1. Documents and non-documentary (e.g. audio-visual) materials.
2. Ongoing research activities in the country
3. Curriculum materials etc.
4. Profiles of experts, institutions databases.
5. Location tools, vocabularly control tools e.g. thesaurus.

11.12.2 Data Collection

Data will be collected by staff concerned. The document description will follow the CCF format.

11.12.3 Processing

Processing of the information before inputting into the computer will be done by the analyst. This implies things like making abstracts, keyword in context etc.

11.12.4 Output

The output will be search results on the VDU, the printed version of the inventory and/or copied versions onto the diskettes.

11.12.5 Control

Data entry, modifications of records, database structure etc will be restricted by passwords.

11.12.6 Cost Effectiveness Analysis

Cost effective analysis i.e. the benefits derived from the proposed system over the cost of its implementation and operation for each alternative may be difficult because of the time constraint and lack of pricing materials. Under the present conditions such analysis may not be necessary because much of the benefits to be gained by establishing the proposed system is not in terms of cost benefits rather in terms of efficiency and effectiveness in providing information services and products.

11.12.7 Recommendations

Taking the requirements and the different features of the system presented above, the following is recommended: Use of the existing facilities to develop and add a new sub system using the CDS/ISIS software itself.

11.12.8 Computer Based System

Almost all the important and critical features of the ARC can be realised only under a computerized system which makes this alternative appropriate. The features include:

1. Updating of data from the terminals
2. Effective control of data through access authorization of data and using reliable storage media and programming controls.
3. Generating various forms of outputs easily

11.13 DETAILED SYSTEM DESIGN

The following is a presentation of a computer based ARC.

11.13.1 Input Specification

The ARC concept is foreseen to be an integrated database and therefore, the system proposes the use of ABNCD+. ABNCD+ is an integrated database developed using UNESCO's micro CDS/ISIS and Pascal interfaces (1990). Essentially, integration enables the provision of a wider range of information to users and a more efficient use of computer resources.

The ABNCD+ system has three main databases:

1. ABNCD consisting of bibliographic records, profiles of institutions, information system projets and experts. The types of documents included in the bibliographical records of ABNCD include:

* Monographs and collections: Book, report, thesis, conference proceedings etc
* Part of monograph (analytic/monograph)
* serial (whole).
* Part of serial (analytic/serial, e.g., articles in periodical publications)

* Non book materials such as audio and video cassettes, micro-firms etc, can also be catalogued.

2. THES, a thesaurus (e.g. macrothesaurus of OECD+)
3. SRLS, a union catalogue of serials. CDS/ISIS PASCAL programs interface the database.

As pointed out in the analysis report, prototype databases will be developed (Refer to annex 11 for sample records of databases to be developed in the ARC).

11.13.2 Database Specification

The database will be composed of the ABNCD+ version of CDS/ISIS. The bibliographic files will consists of data fields that describe the type of information in different databases that will be created. The field Definition Table of ABNCD is given in annex 12.

11.13.3 Control

To ensure that the proposed system performs well and is protected from misuse, the following major organizational and procedural control and security measures will be put in place

11.13.4 Administrative Control

Qualified personnel; for database management and supervision of overall of the system; contingency plans for use in the event of a system failure or damage are set by lab management. These plans include a back up system of all files

11.13.5 Input Control

The various input forms used to capture the required data clearly indicate where each data element should be recorded to ensure input integrity.

11.13.6 Programming Control

Verification of input data is done by the system which double checks the correctness and completeness of data by requesting the encoder constantly on completing each record before accepting the data into the system.

11.13.7 Database Control

Only authorised personnel will be inputting data. Authorization will be effected through passwords for inputting or updating the database. Necessary measures

have to be taken especially for the room that keeps the backup files, it has to be kept free from dust and under a normal temperature and humidity.

11.13.8 Output

Printed version of the information products and services, outputs via the terminals screens or copied to diskettes will be generated to meet the users requirements.

11.14 IMPLEMENTATION PLAN

To implement the system, the following major steps are to be taken.

11.14.1 Training

The need for manpower training requires no emphasis as the efficiency and effectiveness of the ARC will largely depend on the academic and professional competence of the staff and on the facilities and environment provided for their work and development.
In the fact finding report (analysis report), it showed that there were only a few staff members with IT training. While as most of the staff who are to enter data into the database have hands-on computer experience, most of them have no experience with CDS/ISIS software. It is therefore necessary that they be trained. The training is to be on a continuous basis for efficiently running of the system and to meet any modifications. The staff with direct responsibility for the control or management of the system should make necessary arrangements and if possible conduct the training.

11.14.2 Type of Ttraining

The types of training required includes: Teaching sessions, workshops and seminars for staff and other users, long term and short term training.

11.14.2.1 Personnel

Additional staff are to be recruited. Preference should be given to those with CDS/ISIS knowledge or at least computer knowledge. These would be staff both at professional and para-professional level. Their main functions would be system management, inputting and database maintenance.

11.14.3 Manpower Planning

As per Ranganathan's model, a library is like a hospital. In a hospital there are medical superintendents, surgeons, anaesthetists, general practitioners, specialists, nurses, pharmacists, skilled technicians, clerical staff and unskilled cleaners etc. Except for the skilled technicians, clerical and unskilled staff, all others are more or less 'professionals'. Even some of the skilled technicians handling X-ray, EEG, EEG, etc, need to be dedicated

medical professionals. While a hospital attends to physical needs, a library attends to intellectual needs. Hence a library/information centre too, except for skilled and unskilled staff all others have to be professionals in one sense or the other. This therefore calls for staff strength, prudent staff training and planning. The ARC concept has to be built on this philosophy.

The staff strength required for the ARC depends upon various factors such as, number of working days in a year, opening hours, leave allowed in a year, total stock, number of documents added in a year, number of documents circulated in a day, number of ready reference queries handled per day, types and quantum of services offered, number of readers requiring guidance in a day and so on.

A set of programs to run on an IBM PC/AT and compatibles has been developed by F. J Devadason, taking into consideration the above mentioned factors and more. The system can be used for checking the present staff strength of a library /information centre, for estimating its future requirements and for planning staff strength for a new library. The computerized planning programme is called LIBPLAN.

The programme was used to determine to determine the manpower requirements of the ARC. (Annex 14 presents the printout of manpower requirements of the ARC).

11.14.4 TESTING

Any new systen requires testing before it is operational. Since in this study micro CDS/ISIS has been chosen and adopted, such testing of the software database has already been done prior to its release for public use. However, it will be necessary to mention briefly the stages of testing. The recommended testing for any new system invlovles:

input testing: Testing input forms for design rules, contents and friendliness. This is done by distributing sample forms to a sample of academic and administative staff.

Output testing: Testing for design rules, contents and formats and accuracy and appropriateness.

Process testing: Comparing the modified programs against a checklist of potential errors. Test for the program logic and correct use of formulas and accurate computation by the tester. Reviewing key program

statements. After the above tests, the program passes through tests of various functions by simulating all of the data. Then the user will be allowed to interact with the system with his/her usual future information needs under the tester's supervision.

Database Testing: Testing for the operation, data security, content and accuracy by checking the output in response to the system request, testing its record creation and deletion ability, and trying with wrong commands and requests to see whether it rejects or alerts the operator. Completeness of files and records sholud also be checked.

Control testing: Testing for programming controls effectively (ability to detect wrong attempts trough mechanisms such as by trying to read/write to wrong file, inputting fields with incomplete or missing data.

11.15 ROLE OF PARTICIPATING CENTRE

To start with, the proposed ARC network will comprise of the following institutions:

- All the five campuses of the University of Malawi
- Chitedze Agricultural Research Station
- National Library
- National Archives
- National Documentation Centre
- Department of Research and Environmental Affairs
- Forestry Research Institute
- Malawi Institute of Education

As discussed in chapter eight the focal point is the University of Malawi, Chancellor College Library. It has already enough computers and with the required storage space. It also has access to the parent institution's computer facilities.

11.15.1 Hardware and Software

For a start, each institution in the network should have:

(a) A microcomputer IBM PC/XT/AT or a compatible equipment for each centre with 640K RAM, and one floppy disk drive (preferably for 3.5" HD; hard disk capacity of at least 20 MB;

(b) printing equipment

(c) If possible, participating centres should also acquire CD-ROM drives.

The software recommended is micro CDS/ISIS obtainable free of charge from UNESCO. This will be obtained by Chancellor College which is the focal point and distributed to those participating centres which do not have the software.

Each participating centre should concentrate in developing databases agreed upon in specialized areas. For example Chitedze Agriculture Research station Library could concentrate on all aspects of agriculture.

The participating centres should also identify the titles of journals each centre will be abstracting and indexing for input into the ARC. This should be agreed upon, in order to avoid duplication of work. The centres should also take stock of the number of important journals that they are not subscribing to, in order for them to work out other means of having access to them.

The system should exploit all the possible sources of information for inclusion in the different databases of the ARC. Initially each centre should abstract and index materials from its own resources that is journals available, reports, research results produced etc. These will be sent to the centre through the network.

11.15.2 Bibliographic Standards

Standards on the preparation of bibliographic records among the cooperating centres should be agreed upon. This is necessary in order to ensure easy merging of records at the focal point and exchange of information among the centres participating in the network. The standard proposed in this study for bibliographic records is CCF.

11.15.3 Coordinating Committee.

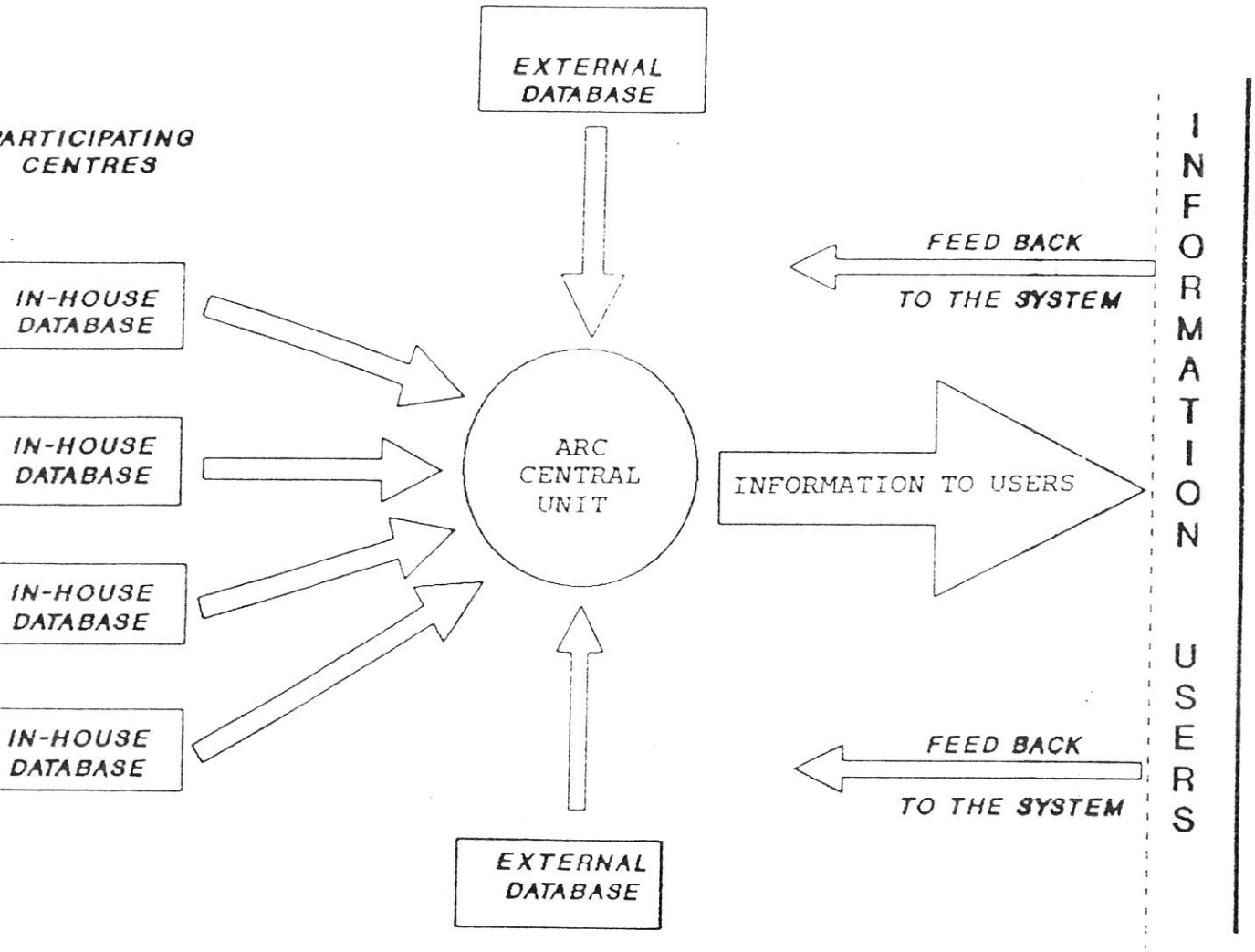
Mechanisms for coordination of the system must be worked out in order to facilitate smooth operation of the project. Thus a committee, comprising of individuals in charge of each participating centre should be formed. This committee should then be advising the librarians/information scientists/documentalists of each centre on the running of the ARC, new devlopments in IT, latest records added, financial implications etc., and make appropriate recommendations.

11.15.4 Finance

The participating centres should also agree on the amount of money each centre is going to contribute in order to set the project in motion. This can be in cash or kind.

11.15.5 Project Operating Mechanism

Each participating centre, using micro CDS/ISIS and the agreed format for the preparation of the records should prepare monthly inputs into the ARC. (Figure 8 shows a schematic view of the ARC's network)



SCHEMATIC STRUCTURE OF THE PROPOSED ARC NETWORK

CONCLUSION AND RECOMMENATIONS

The following are the major conclusions that have been drawn from the study.

12.1 INFORMATION INFRASTRUCTURE

Malawi has relatively rich in information resources. Coordination of the information activities in the infrastructure at the national level is absent and thus its growth and development is haphazard. There is an urgent need for the establishment of a mechanism to coordinate all information activities in the country. A policy on information systems and services could provide the missing link.

12.1.1 National Information/Informatics Policy

As stated by Chilambe (1986) and Mwiyeriwa (1988), Malawi has no overall national information policy in places. However, efforts have been made, especially by the library professionals, to propose the structure of NIP. The draft proposal was already submitted to government. One can only hope that the government will take a serious approach to this issue.

Implementation of the policy will necessitate the establishment of the ARC on a firm foundation and to benefit not only the academic community alone but also to other sectors of the national economy and in turn, benefit from interactions with other information centres, libraries etc.

12.1.2 Computer and Computer use

On the whole, computerization has proliferated in all sectors of the Malawian economy and its applications are being diversified. However, the use of certain information technologies that hold the promise of improving information dissemination, networking, information sharing and the management of information systems and services are still under-utilized.

The CD-ROM, despite its relatively low cost, vast storage potential, ease of use, is still not much in use. Desktop publishing also despite its relatively low cost and potential for producing excellent printed outputs, especially scientific documents, is also just establishing itself mostly in newspaper production and advertising.

Electronic mail and computer conferencing in the country are almost unheard of. Thus, scientists and other information users are missing an opportunity of accessing and exchanging information by these two means.

12.1.3 Local Databases

There are currently no electronic indigenous databases developed on a large scale for individual use or that can serve as a basis for information sharing. Various research publications, both scientific and non-scientific are not being catalogued and indexed and entered into a database that could provide access to others, and as such the chances of duplicating effort in reserch are quite high as information on current, local research developments is not easily accessible in electronic form.

The ARC should provide a starting step for the provision of these electronic databases.

RECOMMENDATIONS

The following are the majors recommendations on various topics discussed in the thesis:

12.2 DEVELOPMENT OF IT

In the absence of a comprehensive, will defined national/informatics policy, the onus remains with the government to play an important role in monitoring the growth and development of all aspects of the information infrastructure. Taking this information account, the government of the Republic of Malawi should:

- Promote the provision of training and support research and development in the information and information technology areas. It should also subsidize research and development.
- Encourage individual free enterprise and individual endeavor in IT.
- Create an environment that will enable among other things proper coordination and management of information systems and optimum utilization of resources.
- Encourage the development of the information industry in the country, publishers, information and

library services, software bureaus, information and information products distributors etc.

- Invest in IT for the modernization of information services and systems
- Review matters related to the importance of IT, the cost and pricing of the equipment.
- Work out a mechanism for maintaining data, national information manpower requirements at all levels.
- Promote and support the establishment of training of undergraduate, graduate level in information science and information technology and
- Make all efforts to introduce computer studies at secondary level.

12.3 INFORMATION USE, PROMOTION, SENSITIZATION AND MARKETING.

The information professionals, in particular the librarians in the country should work out a mechanism for promoting the use of information, sensitize the policy makers and promote information marketing activities. User sensitization programmes should be conducted regularly aimed at various groups of users. Possibilities should be conducted regularly aimed at various groups of users. Possiblities of marketing of information to the industrial sector must be explored.

12.4 PROFESSIONAL BODIES

Professional bodies should conduct programmes to familiarize their members with IT applications in their areas of operation. Malawi Library Association and the Computer Society of Malawi should diversify their areas of operation and not restrict themselves to the traditional way of using computers.

Coordination for a comprehensive national information and informatics policy should be done among the associations. Liasing in Matters of common interest should be encouraged.

12.5 MANPOWER DEVELOPMENT

For the ARC to continue developing in future, there is an urgent need to restructure the existing training programmes in library studies. The scope and course content should incorporate the current trends and new techniques affecting the profession. Areas, such as, information technology and its applications in libraries, information marketing, desktop publishing as a means of acqusition and dissemination of information. At present, short courses to sensitize the library managers on computer applications should be encouraged.

The introduction of degree programmes in information and computer science at the University of Malawi should be considered as priority area. The infrastructure, as already pointed out in Chapter 5 is available. What remains is to take definite and serious steps towards the esatblishment of such a programme.

12.6 UNIVERSITY OF MALAWI LIBRARIES.

The UOML should make all necessary efforts towards automation, especially in the areas of information storage and retieval. The necessity for this institution to automate is quite overwhelming in order not to lag behind in the electronically communicated academic world. They should install equipment for network access and CD-ROM stations to access datbases on CD-ROMs. If the University does not automate, participation in regional activities will be futile. The University of Malawi is a PADIS participating centre but lack of computer facilities has definitely an adverse impact on the level of participation in the project. The centre cannot network itself to PADIS. Therefore the ARC concept should be given priority as a starting point to national later regional and international networks.

There is also a vital need to automate the libraries, documentation and information centres supporting the information needs of the key research institutions, industries, governments departments, banking sectors etc. These institutions require timely and reliable information for their operations and improvement of efficiency.

The need for the improvement of information repackaging, processing and dissemination to researchers and the teaching staff in the country's research and higher education institutions cannot be overemphasised. Libraries, research institutions, documentation and information centres in the ARC network and those out of it as proposed in chapter eight and eleven, should try as much as possible to adopt the systems information products and services, either on individual basis, funds permitting, or on cooperating basis. Such a method of disseminating information will ensure that information users in these institutions are kept abreast on developments in their areas of interest.

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ANNEX ONE

LIST OF SOME OF THE PEOPLE INTERVIEWED DURING DATA COLLECTION PERIOD BETWEEN 17 JULY AND 15 SEPTEMBER 1992

1. Mr S.S. Mwiyeriwa	University Librarian University of Malawi
2.Mr A.W.C Msiska	College Librarian University of Malawi Chancellor College
3. Mr F.F. Kanyongolo	Lecturer University of Malawi Chancellor college
4. Ms. F. Matenje	Librarian, periodicals section University of Malawi Chancellor college
5. Mr S. Kachale	Assistant librarian National Library Service
6. Mr V. Phiri	Librarian Kamuzu Academy
7. Mr R. Masanjika	Librarian College of Medicine
9. Mr Najira	Librarian National Archives
10. Mrs Chiotha	Archivist National Archives
11. Mr Phiri	Senior engineer Post and Telecommunications Engineering Dept.
12. Mr P.D. Mwaimu	Librarian Malawi Institute of Education Library.
13. Mr Kalitera	(ICL) Malawi

14.	Mr F.P.F. Ziyabu	Librarian Forestry Research Institute Library.
15.	Mr G. Salanje	Cataloguer Central Library Service.
16.	Mr Malunga	Assistant Registrar Chancellor college.
17.	Mrs C.B. Jamu	Librarian ICLARM Aquaculture Project Library

ANNEX TWO

The University of Malawi
Chancellor College Library
P.O. Box 280.
ZOMBA.

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.....
.....
.....

Dear Sir/Madam,

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

DEVELOPING AN ACADEMIC RESOURCE CENTRE IN THE UNIVERSITY OF MALAWI.

My research, among other things, involves survey of information needs of academic and administrative staff and researchers in selected research institutes, the university of Malawi and other academic institutions. Attached to this letter is a questionnaire for the survey. Please help me by answering and returning it by 30 th August 1992. Using the self addressed and stamped envelope enclosed. Also attached is a self explanatory letter from my dean.

Please feel free to use additional sheets wherever necessary. Also ensure that you read each question because even if you do not have computer facilities, there are questions that are applicable to your institution.

The data to be collected from the survey will assist me in the preparation of my thesis which I am expected to submit sometime in June, 1993.The success of my study purely depends upon your co-operation. I will, therefore, appreciate your assistance in filling out the questionnaire.

Thanking you in anticipation of your favourable assistance.

Yours Sincerely

VOTE D. SOMBA

Att/d...

SURVEY OF INFORMATION NEEDS OF ACADEMIC AND ADMINISTRATIVE STAFF OF THE UNIVERSITY OF MALAWI, RESEARCHERS IN SELECTED RESEARCH INSTITUTES AND DECISION MAKERS IN GOVERNMENT.

QUESTIONNAIRE

PLEASE TYPE OR PRINT. THE COMPLETED QUESTIONNAIRE SHOULD BE RETURNED BY 1ST SEPTEMBER 1992 TO:

VOTE D. SOMBA
UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE
P.O.BOX 280
ZOMBA

PART I GENERAL INFORMATION

1. Surname..... Other name(s).....
   Nationality..... Sex: () Male () Female

2. Permanent Mailing Address Telephone: Office.....
..... Home.....
..... Telex.....
..... Fax.....
.....
.....

3. Academic Qualifications
   HighestDegree/Diploma.....
   Subject(Major).....
   Institution.....

4. Major fields of specialization
   (Please indicate what you consider to be the best subject areas in which you are particularly competent and be specific)
.....
.....
.....
.....
.....

5. Affiliation
   (Give the name and address of the institution where you are currentlyworking).....
.....
.....
.....

6. Services offered(The category of work you do. Please tick where appropriate)
() Research

() Training/Teaching
() Consultancy
() Others(Please specify).....
.....

7. Are you currently conducting any research?
() Yes () No
If YES what is it about? (Please be brief and specific)
.....
.....
.....
.....
.....
.....

8.If you are engaged in teaching, what subjects/courses do you teach?
.....
.....
.....
.....

PART 2. INFORMATION NEEDS

9.Does your institution have any of the following information system?(Tick where appropriate)
() Library
() Documentation centre/Information centre

10.If any of the above information system is available,for what purpose do you use its facilities?
() Borrow books and journals for preparation of teaching materials or research.
() Information for administrative and academic decisions.
() Others (Please specify).

11.Does your information system provide you with any of the following services?
() Current awareness services (Informing users of the new items received e.g. public display of new items added to the collection)
() Selective dissemination of information(Supplying specific information to specific users about items received relevant to their field of specialization.
() On-line searches of databases (Interactive interrogation of databases containing bibliographic information or source data held on a host computer
() Question and answer service
() Reference service

12. Do you feel that your library/documentation/information centre meets your information requirements? (Tick one)
() Yes () To some extent () No.

13. If the answer to QUESTION 12 is NO or TO SOME EXTENT what other sources of information do you use to meet your information requirements?
.....
.....
.....
.....

14. Please indicate if possible,the extent to which inadequate information facilities hamper your work as researcher, administrator or lecturer?
() No limitations
() Some limitations but not serious
() Serious limitations(Please explain).....

.....
.....

15. If you get materials from other sources through your library/documentation centre/information centre, how long does it take to get them?
() 1-7 days
() 8-15 days
() A month
() More than a month

16. If you travel in order to have access to other library/documentation centre/information centre, how far do you travel?
() 1-5 KM
() 6-10 KM
() Above 10 KM

17. What is the number of journals to which you personally subscribe to?
.....journals

18. Approximately what is the number of journals(those you know) that are of interest to your field of specialization that you have no access to?(This should exclude the number that you personally subscribe to and those subscribed to by your library/documentation centre/information centre)
.....journals

19. What materials relevant to your field of specialization would you like your library/documentation centre/information centre to add to its collection? Name those materials that are currently not

available in your institution.

.....

.....

.....

THANK YOU VERY MUCH FOR YOUR TIME FILLING OUT THIS QUESTIONNAIRE

ANNEX THREE

RESPONSE RATE OF THE CATEGORIES OF RESPONDENTS WHO RETURNED THE QUESTIONNAIRES.

CATEGORY	NO. OF QUES. SENT	NO. RETURNED	RESPONSE RATE
University teaching staff	40	32	80%
University administrative staff	15	5	33.3%
Researchers in selected research institutions	25	19	76%
Decision makers in selected governments departments	20	14	70%

ANNEX FOUR

STATISTICAL FREQUENCY TABLES OF DATA ON INFORMATION REQUIREMENTS OF ACADEMIC AND ADMINISTRATIVE STAFF OF THE UNIVERSITY OF MALAWI, SELECTED RESEARCHERS AND DECISION MAKERS IN GOVERNMENT.

NATIONALITY

Label Value	Value	Frequency	Percent	Valid percent	Cum percent
Malawian	1	58	85.3	85.3	85.3
Foreigner	2	10	14.7	14.7	100.0
TOTAL		68	100.0	100.0	

SEX

Value Label	Value	Frequency	Percent	Valid percent	Cum Percent
Male	1	57	83.8	83.8	83.8
Female	2	11	16.2	16.2	100.0
TOTAL		68	100.0	100.0	

HIGHEST DEGREE/DPLOMA

Value Label	value	Frequency	Percent	Valid percent	Cum percent
Doctorate	1	24	35.3	35.3	35.3
Masters	2	29	42.7	42.7	78.0
Post-Grad Dip	3	2	2.9	2.9	80.9
Bachelors	4	9	13.2	13.2	94.1
Others	5	4	5.9	5.9	100.0
TOTAL		68	100.0	100.0	

DISCIPLINE OF SPECIALIZATION

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Sci/tech	1	11	16.2	16.2	16.2
Social scie.	2	12	17.6	17.6	33.8
Education	3	3	4.4	4.4	38.2
Humanities	4	5	7.4	7.4	45.6
Medicine	5	10	14.7	14.7	60.3
Agriculture	6	23	33.8	33.8	94.1
Admin.	7	4	5.9	5.9	100.0
TOTAL		68	100.0	100.0	

SERVICES OFFERED

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Research	1	23	33.8	33.8	33.8
Train/teach	2	13	19.1	19.1	52.9
Consultancy	3	3	4.4	4.4	57.3
Res/Consult	4	7	10.3	10.3	67.6
Res/Teach	5	14	20.6	20.6	88.2
Admin	6	4	5.9	5.9	94.1
Others	7	4	5.9	5.9	100.0
TOTAL		68	100.0	100.0	

CONDITION RESEARCH

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
No	0	12	17.6	17.6	17.6
Yes	1	56	82.4	82.4	100.0
TOTAL		68	100.0	100.0	

PART II

TYPE OF INFORMATION SYSTEM

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Library	1	60	88.2	88.2	88.2
Documentation	2	8	11.8	11.8	100.0
TOTAL		68	100.0	100.0	

A. LIBRARY USE

1. **BORROW BOOKS/JOURNALS**

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	2	2.9	2.9	2.9
Borrow bks/Jr.	1	66	97.1	97.1	100.0
TOTAL		68	100.0	100.0	

2. CONSULT JOURNALS

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not Stated	0	9	13.2	13.2	13.2
Consult Jr.	1	59	86.8	86.8	100.0
TOTAL		68	100.0	100.0	

3. ADMINISTRATIVE INFORMATION

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	65	95.6	95.6	95.6
Admin. info.	1	3	4.4	4.4	100.0
TOTAL		68	100.0	100.0	

4. OTHER USES

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	61	89.7	89.7	89.7
Other uses	1	7	10.3	10.3	100.0
TOTAL		68	100.0	100.0	

B. LIBRARY SERVICE PROVIDED

1. Current Awareness Services

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not provided	1	16	23.5	23.5	23.5
Service prov.	2	52	76.5	76.5	100.0
TOTAL		68	100.0	100.0	

2. SELECTIVE DISSEMINATION OF INFORMATION

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not prov.	0	46	67.6	67.6	67.6
Service prov.	1	22	32.4	32.4	100.0
TOTAL		68	100.0	100.0	

3. ON-LINE SEARCHES

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not prov.	0	46	67.6	67.6	67.6
Provided	1	22	32.4	32.4	100.0
TOTAL		68	100.0	100.0	

4. QUESTION ANSWER SERVICES

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not prov.	0	68	100.0	100.0	100.0
TOTAL		68	100.0	100.0	

5. REFERENCE SERVICES

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not prov.	0	17	25	25	25
Service prov.	1	51	75	75	100.0
TOTAL		68	100.0	100.0	

INFORMATION NEEDS MET?

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
No	0	5	7.4	7.4	7.4
To some extent	1	49	72.0	72.0	79.4
Yes	2	14	20.6	20.6	100.0
TOTAL		68	100.0	100.0	

LIMITATIONS ON WORK

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
No limit.	0	8	11.8	11.8	11.8
Some limit.	1	41	60.3	60.3	72.1
Serious limit	2	19	27.9	27.9	100.0
TOTAL		68	100.0	100.0	

ALTERNATIVE INFORMATION SOURCES

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	17	25.0	25.0	25.0
Abroad	1	14	20.6	20.6	45.6
Local	2	20	29.4	29.4	75.0
Local/abroad	3	10	14.7	14.7	89.7
Other sources	4	7	10.3	10.3	100.0
TOTAL		68	100.0	100.0	

PERIOD OF TIME

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	24	35.3	35.3	35.3
1-7 days	1	3	4.4	4.4	39.7
8-15 days	2	9	13.2	13.2	52.9
A month	3	12	17.7	17.7	70.6
Above a month	4	20	29.4	29.4	100.0
TOTAL		68	100.0	100.0	

DISTANCE TRAVELLED

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Not stated	0	21	30.9	30.9	30.9
1-5 KM	1	18	26.5	26.5	57.4
6-10 KM	2	6	8.8	8.8	66.2
Above 10KM	3	23	33.8	33.8	100.0
TOTAL		68	100.0	100.0	

NUMBER OF JOURNAL SUBSCRIBED TO

Value Label	Value	frequency	Percent	Valid percent	Cum percent
Zero/not std.	0	38	55.9	55.9	55.9
1	1	11	16.2	16.2	72.1
2	2	9	13.2	13.2	85.3
3	3	3	4.4	4.4	89.7
5	5	3	4.4	4.4	94.1
6	6	3	4.4	4.4	98.5
8	8	1	1.5	1.5	100.0
TOTAL		68	100.0	100.0	

NUMBER OF JOURNAL NOT ACCESSED TO

Value Label	Value	Frequency	Percent	Valid percent	Cum percent
Zero/not st.	0	30	44.1	44.1	44.1
1	1	3	4.4	4.4	48.5
2	2	8	11.8	11.8	60.3
3	3	2	2.9	2.9	63.2
4	4	1	1.5	1.5	64.7
5	5	15	22.0	22.0	86.7
6	6	1	1.5	1.5	88.2
8	8	3	4.4	4.4	92.6
10	10	3	4.4	4.4	97.0
20	20	1	1.5	1.5	98.5
22	22	1	1.5	1.5	100.0
TOTAL		68	100.0	100.0	

ANNEX FIVE

LIST OF LIBRARIES AND DOCUMENTATION CENTRES THAT RESPONDED TO THE QUESTIONNAIRE ON THE SURVEY OF IT IN LIBRARIES,DOCUMENTATION AND INFORMATION CENTRES IN MALAWI

University of Malawi
Polytechnic Library
P/B 303
Chichiri, Blantyre 3.

National Library Service
P.O. Box 30314
Lilongwe 3

Ministry of Energy and Mining
Geological Survey Dept Library
P.O. Box 27
Zomba

National Archives Library
P.O. Box 62
Zomba.

Malawi Export Promotion Council
Documentation Centre
P.O. Box 1299
Blantyre.

Tea Research Foundation of Malawi
Documentation Centre
P.O. Box 51
Mulanje

American Embassy
John F. Kennedy Memorial Library
P.O. Box 30373
Lilongwe 3

Department of Forestry
Forestry Research Institute
Library
P.O. Box 270
Zomba

University of Malawi
Chancellor College Library
P.O. Box 280
Zomba.

University of Malawi
Kamuzu College of Nursing
P/B 1
Lilongwe.

Kamuzu Academy Library
P/B 1
Mtunthama,
Kasungu

Department of Research and
Environmental Affairs
P.O.Box 30745
Lilongwe 3.

Parliament Building Library
P.O. Box 80
Zomba

Bureau of Standards
Documentation and Information
Service (MBS-DIS)
P.O. Box 946
Blantyre

National Commission for UNESCO
Documentation Centre
P.O. Box 30278
Lilongwe

Malawi Institute of Education
Library
P.O. Box 50
Domasi

Blantyre Teacher's College
P/B 502
Limbe

Ministry of Agriculture
Lunyangwa Agric. Research
Station
P.O. Box 59
Mzuzu.

Malawi Institute of Management
P.O. Box 30801
Lilongwe 3

ANNEX SIX

The University of Malawi
Chancellor College Library
P.O. Box 280.
ZOMBA.

.....
.....
.....
.....

Dear Sir/Madam,

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

DEVELOPING AN ACADEMIC RESOURCE CENTRE IN THE UNIVERSITY OF MALAWI.

My research, among other things, involves survey of of IT in the libraries, documentation and information centres in Malawi . Attached to this letter is a questionnaire for the survey.Please help me by answering and returning it by 30 th August 1992.Using the self addressed and stamped envelope enclosed.Also attached is a self explanatory letter from my dean.

Please feel free to use additional sheets wherever necessary. Also ensure that you read each question because even if you do not have computer facilities, there are questions that are applicable to your institution.

The data to be collected from the survey will assist me in the preparation of my thesis which I am expected to submit sometime in June, 1993.The success of my study purely depends upon your co-operation. I will, therefore, appreciate your assistance in filling out the questionnaire.

Thanking you in anticipation of your favourable assistance.

Yours Sincerely

VOTE D. SOMBA

Att/d...

QUESTIONNAIRE ON THE SURVEY OF INFORMATION TECHNOLOGY IN LIBRARIES, DOCUMENTATION AND INFORMATION CENTRES IN MALAWI.

PLEASE TYPE OR PRINT. THE COMPLETED QUESTIONNAIRE SHOULD BE RETURNED BEFORE 30 TH AUGUST, 1992 TO:

VOTE D. SOMBA
UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE
P.O.BOX 280
ZOMBA

SURVEY NO....

PART 1. GENERAL INFORMATION

1.Name of person filing the questionnaire.....
.....
.....Position.....
.....

2.Name of the information System (Library,Documentation or information centre).....
.....
Address.....
.....
.....
Telephone.....
Telex.....
Fax.....
Date of Establishment.....

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

() Academic library
() Special Library
() Public library
() School Library

4.Parent Organization (if any).....
.....

5.Type of documentation activities (Tick where appropriate)

() Bibliographic
() Numeric
() Referral
() Sectoral
() Multi-sectoral

6.Type of user services provided (Tick where appropriate)

() Current Awareness Services
() Bibliographies

() Selective Dissemination of Information
() On-line Searches
() Question Answer Services
() Others (Please specify).....
.....
.....
.....

7.What is the size of your information system collection?

Number of	Total
books	.....
Periodicals	.....
Documents	.....
Maps	.....
Microforms	.....
Audio Visual materials	.....
Others(Please specify)	.....

8.Classification systems used (Tick where appropriate)
() Library of Congress
()Dewey Decimal Classification
() Universal Decimal Classification
() Colon
() Others (Please specify).....
.....
.....

9.Subject heading list used (Tick where appropriate)
() Library of congress
() Sear's list
() Others(Please specify).....
.....
.....

10.Types of indexing (Tick where appropriate)

() Subject	() Author
() Keyword	() Descriptor
() Title	() Geographical

() Others (Please specify).....
.....
.....

11.Thesaurus used (If any)
.....
.....

12.Professional staff
(a) Number of Librarians/Documentalists/Information Scientists
.....
(b) Number of computer/data processing specialists.....
.....
(c) Total number.....

PART 2: COMPUTER FACILITIES

13.Does your institution have any computer facilities
(Tick one)
() Yes ()No
If answer is YES, go to QUESTION 14 and if answer is NO go to QUESTION 26.

14.The computer facilities are:
() Located within the library/Documentation/Information Centre.
() Located within the parent institution
() Shared with another institution: (name).....

15.Describe the computer facilities in your institution in the spaces below (Please write where appropriate and feel free to use additional sheets if necessary)

(a) Mainframe computer

Make/ Model	Main Memory	Operating System	Date Installed	Disk Units	Tape Units	Disk Capacity
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....

(b) Minicomputers

Make/ Model	Main Memory	Operating System	Date Installed	Disk Units	Tape Units	Disk Capacity
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....

(c) Microcomputers (In case of more than one system,please use one line per system)

Make/model	Main memory	Operating System	Date Installed	Hard Disk?
(i)				() Yes Capacity in MB... ()No
(ii)				()Yes capacity in MB... ()No
(iii)				() Yes Capacity in MB... ()No

16. Microcomputers are:
() On their own () in a network
17. Does your institution have any CD-ROM drives?
() Yes () No
If answer is YES, describe them below in terms of make/model
.....
.....
.....
.....

18.Does the Library/Documentation/Information Centre utilize these computer facilities?(Tick one)
() Yes () No
If the answer is YES, go to QUESTION 19 and if NO go to QUESTION 26.

19.For what purposes are the computer facilities being used? (Tick where appropriate)
() Bibliographic/Library database management
() Word processing
() Financial management
() Management applications
() Numerical/Statistical applications
() Others (Please specify).....
.....
.....

20. If the computer facilities are being used for bibliographical purposes, what software do you use (Tick where appropriate)

() CDS/ISIS (Mainframe version)
() CDS/ISIS (Microcomputer version)
() MINISIS
() Database
() Others (Please specify).....
.....
.....
.....

21.In what format do you provide computer-generated services to users? (Tick where appropriate)

() Computer printouts
() SDI
() Current Awareness
() Diskettes
Bulletins
() CD-ROM
() Magnetic tape
() Others (Please specify) .....
.....
.....
.....

22.Databases

(a) Local databases (Those developed within the institution)

Name	Number of Records	Frequency of Updating	Number of Records added in 1990
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

(b) External database (Those acquired from outside)

.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

23.Currently do you have any on-line access to remote databases (Tick one)

() Yes
() No

24.If answer to QUESTION 23 is YES, list down the remote databases you have access to and institutions where they are located:

.....
.....
.....

25.IF the answer to Q23 is NO, do you have any plans to connect your system to remote databases (Tick one)
() Yes () No

26. If your institution does not presently have or utilize the computer facilities, are there plans to install or use them in the near future? (Tick one)
() Yes () No
IF YES, when do you intend to do so? (Tick one)
() In 1992
() In 1993
() In 1994
() In 1995
() In 1996
() In 1996-2000
() Planned but no definite date

27.If planned,what type of computer does your institution intend to introduce (Tick where appropriate)

	Make/Model (If known)
() Mainframe	.....
() Minicomputer	.....
() Microcomputer(s)	.....

28. What do you intend to use the computers for?
.....
.....
.....
.....

29.Are there plans to link the computers with other local research centres/libraries etc?
() Yes ()NO

30.If Yes to QUESTION 29 when do you intend to implement?
() 1992
() 1993
()1994
()1995
() 1996
()2000

PART 3: PROBLEMS

(This part is only for those using computers)

31. Have you encountered any problems in the use of computers in your institution? (Tick one)
() Yes () No

IF YES go to QUESTION 30 and if NO go to question 31.

32. What kind of problems? (Tick where appropriate)
(a) Equipment problems
   () Lack or inadequacy of peripherals (printers ...etc)
   () lack of inappropriate software
() Lack of software documentation
() Inadequate computer memory
() Slow processing speed
() Inavailability of spare parts
() Inavailability or un satisfactory domestic maintenance
() Environmental conditions (Unstable electric current, heat, humidity, dust etc)
() Others (Please specify).....
.....
.....
.....
(b) Personnel problem
() Shortage of trained staff
() Lack of available training for staff in software,hardware use.
() Rapid rate of skilled manpower turnover
() Others (Please specify).....
.....
.....

33. How were staff trained in the use of computers?
(a) Sent abroad
   () For short (under three months) courses
      Number of staff.....
   () For long courses
      Number of staff.....
(b) Trained locally
   () Individually: Number.....
   () In groups : Number.....
   () Self trained: Number.....
   () Others (Please specify.....
   .....
   .....
   .....

34. Are you able to obtain service for your computers locally?
(Tick one)
  () Yes () No

35. IF answer to Q 32 is NO what do you do when service is needed?
(Tick where appropriate)
() Use back up system
() Mail whole system abroad
() Identify faulty parts internally and send those for replacement.
() Call for experts from abroad
() Others (Please specify).....
.....

.....
.....
.....
.....
.....
.....
.....
.....

36. Do you feel that the work in your library/Documentation/Information Centre has become more efficient since the introduction of computers?

() Yes () No

37. IF YES in what way and IF NO what do you think is the reason?

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

THANK YOU VERY MUCH FOR YOUR TIME IN FILLING OUT THIS QUESTIONNAIRE

ANNEX SEVEN

STATISTICAL ANALYSIS FOR THE QUESTIONNAIRE OF SURVEY OF INFORMATION TECHNOLOGY IN LIBRARIES DOCUMENTATION AND INFORMATION CENTRES IN MALAWI

TYPE OF LIBRARY

Value Label	Value	Frequency	Percent	Valid percent	Cum Percent
Academic	1	5	23.8	23.8	23.8
Public	2	4	19.0	19.0	42.8
Special	3	10	47.6	47.6	90.4
School	4	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	100.0

DOCUMENTATION ACTIVITY

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Bibliographic	1	6	28.6	28.6	28.6
Sectoral	2	3	14.3	14.3	42.9
Referral	3	1	4.8	4.8	47.7
Multi-sectoral	4	5	23.8	23.8	71.5
Biblio & referral	5	5	23.8	23.8	95.3
Biblio/Ref/Sec	6	1	4.8	4.8	100.0
	TOTAL	21	100.0	100.0	

LIBRARY COLLECTION

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/none	0	4	19.0	19.0	19.0
100-1,000	1	3	14.3	14.3	33.3
1,001-5,000	2	6	28.6	28.6	61.9
5,001-10,00	3	3	14.3	14.3	76.2
Above 10,000	4	5	23.8	23.8	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF PERIODICALS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	4	19.0	19.0	19.0
0-99	1	5	23.8	23.0	42.8
100-1,000	2	8	38.1	38.1	80.9
1,000-5,000	3	2	9.5	9.5	90.4
Above 10,000	5	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF DOCUMENTS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	12	57.1	57.1	57.1
Less than 100	1	3	14.3	14.3	71.4
100-1,000	2	2	9.5	9.5	80.9
1,001-5,000	3	2	9.5	9.5	90.4
Above 10,000	5	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF MAPS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	12	57.1	57.1	57.1
Less than 100	1	5	23.8	23.8	80.9
100-1,000	2	4	19.0	19.0	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF MICROFORMS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	14	66.7	66.7	66.7
Less than 100	1	4	19.0	19.0	85.7
100-1,000	2	1	4.8	4.8	90.5
1,000-5,000	3	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF A.V. MATERIALS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	9	42.9	42.9	42.9
Less than 100	1	10	47.6	47.6	90.5
100-1,000	2	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	

NUMBER OF OTHER MATERIALS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	12	57.1	57.1	57.1
Less than 100	1	7	33.3	33.3	90.4
100-1,000	2	1	4.8	4.8	95.2
1,001-5,000	3	1	4.8	4.8	100.0
	TOTAL	21	100.0	100.0	

TYPES OF SERVICE OFFERED

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	5	23.8	23.8	23.8
Service provided	1	16	76.2	76.2	100.0
	TOTAL	21	100.0	100.0	

BIBLIOGRAPHIC SERVICES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	9	42.9	42.9	42.9
Service provided	1	12	57.1	57.1	100.0
	TOTAL	21	100.0	100.0	

SELECTIVE DISSEMINATION OF INFORMATION

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	8	38.1	38.1	38.1
Service provided	1	13	61.9	61.9	100.0
	TOTAL	21	100.0	100.0	

ONLINE SEARCHES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	19	90.5	90.5	90.5
Service provided	1	2	9.5	9.5	100.0
	TOTAL	21	100.0	100.0	

QUESTION ANSWER SERVICE

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	7	33.3	33.3	33.3
Service provided	1	14	66.7	66.7	100.0
	TOTAL	21	100.0	100.0	

OTHER SERVICES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	14	66.7	66.7	66.7
Provided	1	7	33.3	33.3	100.0
	TOTAL	21	100.0	100.0	

CLASSIFICATION USED

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
LC	1	8	38.1	38.1	38.1
DDC	2	9	42.9	42.9	81.0
UDC	3	1	4.8	4.8	85.8
Others	5	3	14.3	14.3	100.0
	TOTAL	21	100.0	100.0	

SUBJECT HEADING LIST USED

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/None	0	5	23.8	23.8	23.8
LC	1	8	38.1	38.1	61.9
Sears List	2	4	19.0	19.0	80.9
Others	3	4	19.0	19.0	100.0
	TOTAL	21	100.0	100.0	

INDEXING

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	2	9.5	9.5	9.5
Subject	1	1	4.8	4.8	14.3
Author	2	1	4.8	4.8	19.1
Keyword	3	1	4.8	4.8	23.9
Subject & keyword	5	1	4.8	4.8	28.7
Author & title	7	1	4.8	4.8	33.5
Author & subject	8	2	9.5	9.5	43.0
Aut/Tit/Sub	10	9	42.9	42.9	85.9
Aut/Tit//Sub/Des	12	1	4.8	4.8	90.7
Aut/Sub/Geo/Des	13	1	4.8	4.8	95.5
Aut/Tit/Key/Sub	16	1	4.8	4.8	100.0
	TOTAL	21	100.0	100.0	

THESAURUS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not used	0	13	61.9	61.9	61.9
Thesaurus used	1	8	38.1	38.1	100.0
	TOTAL	21	100.0	100.0	

COMPUTER FACILITIES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available	0	7	33.3	33.3	33.3
Available	1	14	66.7	66.7	100.0
	TOTAL	21	100.0	100.0	

LOCATION OF COMPUTER

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	7	33.3	33.3	33.3
Within Library	1	9	42.9	42.9	76.2
Within parent inst.	2	5	23.8	23.8	100.0
	TOTAL	21	100.0	100.0	

TYPES OF COMPUTERS

(a) Mainframes

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available	0	21	100.0	100.0	100.0
	TOTAL	21	100	100	

(b) Minicomputers

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not availble	0	21	100.0	100.0	100.0
		21	100.0	100.0	

(c) Microcomputers

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available/N.A.	0	8	38.1	38.1	38.1
Available	1	13	61.9	61.9	100.0
	TOTAL	21	100.0	100.0	

CD-ROM DRIVES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	14	66.7	66.7	66.7
Available	1	7	33.3	33.3	100.0
	TOTAL	21	100.0	100.0	

LIBRARY USE COMPUTERS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	7	33.3	33.3	33.3
Yes	1	14	66.7	66.7	100.0
	TOTAL	21	100.0	100.0	

TELECOMMUNICATIONS FACILITIES

(a) Telephone facilities

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Available	1	21	100.0	100.0	100.0
	TOTAL	21	100.0	100.0	

(b) Telex facilities

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not indicated	0	7	33.3	33.3	33.3
Available	1	14	66.7	66.7	100.0
	TOTAL	21	100.0	100.0	

(c) Facsimile facilities

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not indicated	0	5	23.8	23.8	23.8
Available	1	16	76.2	76.2	100.0
	TOTAL	21	100.0	100.0	

INSTITUTIONS WITH COMPUTERS

Type of Library

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Academic	1	3	21.4	21.4	21.4
Public	2	1	7.1	7.1	28.5
Special	3	9	64.3	64.4	92.8
School	4	1	7.1	7.1	100.0
	TOTAL	21	100.0	100.0	

LIBRARY USE COMPUTERS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	2	14.3	14.3	14.3
Yes	1	12	85.7	85.7	100.0
	TOTAL	14	100.0	100.0	

LIBRARIES USING COMPUTERS

Type of Libraries

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Academic	1	2	16.7	16.7	16.7
Public	2	1	8.3	8.3	25.0
Special	3	8	66.7	66.7	91.7
School	4	1	8.3	8.3	100.0
	TOTAL	21	100.0	100.0	

Location of libraries

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Within Library	1	10	83.3	83.3	83.3
Within parent Ins	2	2	16.7	16.7	100.0
	TOTAL	21	100.0	100.0	

Mainframe computer

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available	0	12	100.0	100.0	100.0
		12	100.0	100.0	

Minicomputers

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available	0	11	91.7	91.7	91.7
Available	1	1	8.3	8.3	100.0
	TOTAL	12	100.0	100.0	

Microcomputers

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not available	0	1	8.3	8.3	8.3
Available	1	11	91.7	91.7	100.0
		12	100.0	100.0	

Network of Micros

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/Not stated	0	2	16.7	16.7	16.7
Stand alone	1	8	66.7	66.7	83.4
Networked	2	2	16.7	16.7	100.0
	TOTAL	12	100.0	100.0	

CD-ROM

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/not stated	0	7	58.3	58.3	58.3
Available	1	5	41.7	41.7	100.0
	TOTAL	12	100.0	100.0	

COMPUTERS USED FOR

Bibliographic/Library Database management

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	3	25.0	25.0	25.0
Yes	1	9	75.0	75.0	100.0
	TOTAL	12	100.0	100.0	

Word Processing

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Yes	1	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Financial/Management Application

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	9	75.0	75.0	75.0
Yes	1	3	25.0	25.0	100.0
		12	100.0	100.0	

Numerical/ statistical Applications

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	10	83.3	83.3	83.3
Yes	1	2	16.7	16.7	100.0
	TOTAL	12	100.0	100.0	

Other Applications

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	7	58.3	58.3	58.3
Yes	1	5	41.7	41.7	100.0
	TOTAL	12	100.0	100.0	

Current Awareness Service

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	6	50.0	50.0	50.0
Service provided	1	6	50.0	50.0	100.0
	TOTAL	12	100.0	100.0	

Selective Dissemination of Information

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	9	75.0	75.0	75.0
Service provided	1	3	25.0	25.0	100.0
	TOTAL	12	100.0	100.0	

On-line Service

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	11	91.7	91.7	91.7
Provided	1	1	8.3	8.3	100.0
	TOTAL	12	100.0	100.0	

Other Sources

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not provided	0	6	50.0	50.0	50.0
Service provided	1	6	50.0	50.0	100.0
	TOTAL	12	100.0	100.0	

Software Used for Database Management

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
CDS/ISIS (Micro)	1	8	66.7	66.7	66.7
Others	3	4	33.3	33.3	100.0
	TOTAL	12	100.0	100.0	

FORMAT FOR COMPUTER GENERATED SERVICES

Computer printouts

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	1	8.3	8.3	8.3
Yes	1	11	91.7	91.7	100.0
	TOTAL	12	100.0	100.0	

Diskettes

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	7	58.3	58.3	58.3
Yes	1	5	41.7	41.7	100.0
	TOTAL	12	100.0	100.0	

CD-ROM

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Current Awareness/SDI bulletins

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	7	58.3	58.3	58.3
Yes	1	5	41.7	41.7	100.0
	TOTAL	12	100.0	100.0	

Magnetic Tape

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Other Formats

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	10	83.3	83.3	83.3
Yes	1	2	16.7	16.7	100.0
	TOTAL	12	100.0	100.0	

DATABASES

Local Databases

Value Label	Value	Frequency	Percent	Value Percent	Cum Percent
Not stated/N.A	0	9	75.0	75.0	75.0
Available	1	3	25.0	25.0	100.0
	TOTAL	12	100.0	100.0	

External Databases

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	11	91.7	91.7	91.7
Available	1	1	8.3	8.3	100.0
	TOTAL	12	100.0	100.0	

Online Access to Remote Databases

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	11	91.7	91.7	91.7
Yes	1	1	8.3	8.3	100.0
	TOTAL	12	100.0	100.0	

Plans for Online

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	5	41.7	41.7	41.7
Yes	1	7	58.3	58.3	100.0
	TOTAL	12	100.0	100.0	

PROBLEMS IN THE USE OF COMPUTERS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	4	33.3	33.3	33.3
Yes	1	8	66.7	66.7	100.0
	TOTAL	12	100.0	100.0	

Training

Short courses-Abroad

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	9	75.0	75.0	75.0
Yes	1	3	25.0	25.0	100.0
	TOTAL	12	100.0	100.0	

Long courses- Abroad

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	10	83.3	83.3	83.3
Yes	1	2	16.7	16.7	100.0
	TOTAL	21	100.0	100.0	

Trained Locally

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	1	8.3	8.3	8.3
Individually	1	7	58.3	58.3	66.6
In Groups	2	2	16.7	16.7	83.3
Self-trained	3	2	16.7	16.7	100.0
	TOTAL	12	100.0	100.0	

MEASURES TAKEN WHEN THE SYSTEM IS DOWN

Service for Computers Locally

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No/N.A.	0	3	25.0	25.0	25.0
Yes	1	9	75.0	75.0	100.0
TOTAL		12	100.0	100.0	

Use Back up System

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A	0	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Mail System Abroad

Value Label	Value	Percent	Percent	Valid Percent	Cum Percent
Not stated	0	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Identify/Replace Faulty Parts

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	12	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Call for Experts Abroad

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	9	75.0	75.0	75.0
Yes	1	3	25.0	25.0	100.0
	TOTAL	12	100.0	100.0	

OTHER MEASURES

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

Efficiency improved

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Yes	1	12	100.0	100.0	100.0
	TOTAL	12	100.0	100.0	

LIBRARIES USING COMPUTERS AND FACING PROBLEMS

Inadequacy of peripherals

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	5	62.5	62.5	62.5
Yes	1	3	37.5	37.5	100.0
	TOTAL	8	100.0	100.0	

Inappropriate Software

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A	0	6	75.0	75.0	75.0
Yes	1	2	25.0	25.0	100.0
	TOTAL	8	100.0	100.0	

Lack of Software Documentation

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	7	87.5	87.5	87.5
Yes	1	1	12.5	12.5	100.0
	TOTAL	8	100.0	100.0	

Inadequate Computer Memory

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	4	50.0	50.0	50.0
Yes	1	4	50.0	50.0	100.0
	TOTAL	8	100.0	100.0	

Slow processing speed

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	4	50.0	50.0	50.0
Yes	1	4	50.0	50.0	100.0
	TOTAL	8	100.0	100.0	

Lack of spare Parts

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	3	37.5	37.5	37.5
Yes	1	5	62.5	62.5	100.0
	TOTAL	8	100.0	100.0	

Lack/Unsatisfactory Domestic Maintanance

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	2	25.0	25.0	25.0
Yes	1	6	75.0	75.0	100.0
	TOTAL	8	100.0	100.0	

Environmental Conditions

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	1	12.5	12.5	12.5
Yes	1	7	87.5	87.5	100.0
	TOTAL	8	100.0	100.0	

Other Equipment Problems

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	4	50.0	50.0	50.0
Yes	1	4	50.0	50.0	100.0
	TOTAL	8	100.0	100.0	

Shortage of trained Manpower

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	2	25.0	25.0	25.0
Yes	1	6	75.0	75.0	100.0
	TOTAL	6	100.0	100.0	

Lack of Training Facilities

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated	0	3	37.5	37.5	37.5
Yes	1	5	62.5	62.5	100.0
	TOTAL	8	100.0	100.0	

Rapid Rate of Turn-over

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not staed/N.A.	0	8	100.0	100.0	100.0
	TOTAL	8	100.0	100.0	

Other Personnel Rated Problems

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	7	87.5	87.5	87.5
Yes	1	1	12.5	12.5	100.0
	TOTAL	8	100.0	100.0	

INSTITUTIONS WITH COMPUTERS BUT LIBRARIES NOT USING THEM

Type of Library

Value label	Value	Frequency	Percent	Valid Percent	Cum Percent
Special	1	2	100.0	100.0	100.0
	TOTAL	21	100.0	100.0	

Year Computers to be used

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Planned/N.D.	1	2	100.0	100.0	100.0
	TOTAL	2	100.0	100.0	

Computers to be Used For

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A	0	2	100.0	100.0	100.0
	TOTAL	2	100.0	100.0	

LIBRARIES WITHOUT COMPUTERS

Year Computers to be Installed/Used

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
No plans	0	2	28.6	28.6	28.6
1992	1	1	14.3	14.3	42.9
1993	2	2	28.6	28.6	71.5
1996	3	1	14.3	14.3	85.8
Planned/N.D.	6	1	14.3	14.3	100.0
	TOTAL	7	100.0	100.0	

Type of Computers to be Installed

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not Known	0	2	28.6	28.6	28.6
Microcomputers	3	5	71.4	71.4	100.0
	TOTAL	7	100.0	100.0	

Computers to be used for

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Not stated/N.A.	0	2	28.6	28.6	28.6
Biblio/Dbase Magt	1	3	42.9	42.9	71.5
Catalog & class	2	1	14.3	14.3	85.8
On-line searches	3	1	14.3	14.3	100.0
	TOTAL	7	100.0	100.0	

ANNEX EIGHT

QUESTIONNAIRE ON DIRECTORY OF EXPERTS

Main name .....
Other names .....
Initials .....
Permanent Mailing Address
.....
.....
.....

Telephone: Home: .....
Office: .....
Telex: .....
Fax:.....

ACADEMIC QUALIFICATIONS

1. Field of study .....
Degree .....Year Obtained:..... Name and place of institution .....

2. Field of study .....
Degree .....Year Obtained .....
Name and place of institution .....

3. Field of study .....
Degree .....Year Obtained .....
Name and place of institution..... .....

4. Field of Study .....
Degree .....Year Obtained .....

Name and filed of study.....

Main fields of specialization.....
.....

MAIN PUBLICATIONS

1.....
.....
2.....

.....
3.....
.....

Main working language.....

EMPLOYEMENT RECORD

1. Current employer.....
.....
Title of post.....
Duration from.....To:.....
Description of duties.....

2. Last employer .....
Title of post.....
Duration from:..... To:.....
Description of duties .....

3. First employer .....
Title of post .....
Duration from.....To:.....

Description of duties .....

MAIN CONSULTANCY OR EXPERT ASSIGNMENTS UNDERTAKEN DURING THE PAST THREE YEARS

1. Description of assignments.....
.....
Duration: .....From:.....To:
Place: .....

2. Description of assignments.....
.....
Duration:.....From:.....To:...Place
.....

3. Description of assignment.....
.....
Duration.....From:.....To:.....Place
.....

ANNEX NINE

QUESTIONNAIRE ON DIRECTORY OF INSTITUTIONS PLEASE TYPE OR PRINT AND SEND THE COMPLETED QUESTIONNAIRE TO:

VOTE D. SOMBA
UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE
P.O. BOX 280
ZOMBA

1.(a) Name of institution
.....
.....

(b) Parent body (if applicable)
.....
.....

2. Date of establishment.....

3. Address of institution
.....
.....
.....

Telephone.....
Fax.....

4. Country of location.....

5. (a) Principal
person/Director/Head.....
.....

6. Number of staff
Total.....
Professional.....
Administrative.....
Others.....

7. Objectives
.....
.....

8 Services/Activities/Products
.....
.....
.....

9. Associated entities/Branches/Units/agencies.
(Please metion their name and location)
.....
.....
.....
.....

10. Type of institution (Please tick)
- International
- International non governmental
- Private
- Commercial
- Parastatal
- government
- Trust
- Charitable institution
- Others (Please specify)

11. Courses offered (if educational institution)
.....
.....
.....

12. Fellowships offered
.....
.....

13. Geographical coverage
Local.....
National .....
Regional .....
International .....

14. Working language (s) .....

15. Member status (if international regional)

16. Source of funding
.....
.....
.....

17. Honours and awards (received)
.....
.....
.....

18. Patents (Taken)
.....
.....

19. Membership in societies

Name	Location
.....	.....
.....	.....
.....	.....
.....	.....

20. Specialized Equipment (s)

.....
.....
.....

21. Publications (periodical publications)

.....
.....
.....
.....
.....

22. Any remarks

.....
.....
.....
.....

ANNEX TEN

FILES OF ABNCD+

the ABNCD+ system consists of 44 files, which can be grouped in three major categories as shown in the table below.

Files defined for database ABNCD

1. PARTM	2. PARTS	3. ACQIS	4. CORP	5. SUPPL	6. SER
7. ABNCD	8. ABNEX	9. ABNRP	10. ABNIN	11. ABCOR	12. ABNIS

Display Formats

13. CAB	14. TAGS	15. CORP	16. SERIAL	17. SUPPL	18. SUPAF
19. ORDER	20. CLAIM	21. ABNCD	22. ABNCDA	23. ABNINP	24. ABNEXP

Field Select Table

27. XCHANG	28. RENUMB	29. SUPLS	30. CNAF	31 SAF
32. NEW	33. ABNCD	34. CONILC	35. CONAAU	36. CONPAD
37. CONLIB	38. CONEXP	39. IDMEXP	40. CONNDIC	41. CONINS
42. IDBINS	43. CONFAU	44. CONDBS		

Field Definition Table

All the fields/ data elements necessary to describe/catalogue documentary material, information system, project and expert are enumerated in a single FDT (Annex 12 PP. 395-397). Several of the fields may be common to two or more of these entitites. For example:

* "Name of person" occurs as name of personal author in bibliographical records, as name of Head of institution in institution records, as name of expert in records of experts, and as name of leader of Project in a project record.

* "Name of corporate body" occurs as a corporate author in a biliographical record, as Name of Institution in institution record, as Performing Institution in a project record and as affiliation in records of experts.

* " Descriptors" , "Description/Abstract","Notes", etc., occur in all types of records.

* "Objectives" occurs in institution record and project record.

* "Services Offered" occurs in institution record, information system records, and records on experts.

Workheets

Several worksheets have been prepared to facilitate data entry. Each type of record (describing a different entity) is identified by a notation in Field 999 Type of record.

Worksheets with Field 999

Worksheet	Contains Fields for Describing	ID: Field 999
ABNCD	Monographs and collections	B
PARTM	Part of a monograph	B
PARTS	Part of a serial (papers in a serial)	B
SERIAL	Whole serial	B
ABNEX	Expert	E
ABNIN	Institution	I
ABNRP	Project	P
ABNIS	Information system	S
ABCOR	Corporate body authority/code	C

ANNEX ELEVEN

SAMPLE RECORD OF PROFILE OF PROJECT
(Print format ABNCD)
** Research project**

PROJECT TITLE	Marketing of information in Malawi, Social Science Research Unit, Malawi
PROJECT NUMBER	MW/92/23
START DATE	1992
DURATION	1992-1994
ADDRESS	P.O. Box 278, Zomba, Malawi
TELEX	531-662
PHONE	562222
WORK LANGUAGE	Eng.
PERSONNEL	4
HEAD	Msiska A.W.C., College Librarian
GEOG. COVERAGE	Malawi
INSTITUTE TYPE	Parastatal
OBJECTIVES	To look at the status of information marketing and to improve the promotion and marketing skills of information in the country.
DESCRIPTORS	Market, information, Malawi.

SAMPLE PROFILE OF INFORMATION SYSTEM
(Print format ABNCD)
*** INFORMATION SYSTEM***

INSTITUTION	Centre for Social Research
START DATE	1978
ADDRESS	P.O. Box 280, Zomba, Malawi
TLX	
FAX	
PHONE	522222
WORK. LANGUAGE	Eng.
PERSONNEL	Professional personnel: 7
HEAD	Chilowa, Wycliff Dr.
INST. TYPE	University of Malawi, Centre for Social Research.
OBJECTIVES	Coordinate and assist in conducting socio-economic research in the University.
ACTIVITIES	Data collection and analysis, letters, phone calls in answer to requests
INFO. SERVICE	Databases and documentation
DATABASES	Ongoing research in the University
DESCRIPTORS	Research, university of Malawi, socio-economic

***** SAMPLE PROFILE OF EXPERT *****

NAME	NGWIRA MARGARET JUDITH THANDIWE
SEX	Female
NATIONALITY	Malawian
ADDRESS	Zomba, Malawi, Post Office Box No: 280, Phone No:522222, Telex No:4472
QUALIFIC.	Accounting. B.COM. The Polytechnic-Blantyre.
SPECIALIZATION	Accounting.
WORK. LANG.	English.
OTHER LANG.	Chichewa.

Employment Record

CURR. EMPLOY.	Head of Finance of Chancellor College, Chancellor College.
LAST EMPLOY.	Management, Malawi Hotels, 1980 to 1981, Management trainee/Training as a Hotel Manageress. Auditing, Graham Carr and Company, 1981 to 1984, Audit assistant/External auditing.

***** SAMPLE PROFILE OF EXPERT *****

NAME	NAMANGALE, JIMMY JOSEPH
BIRTH	
SEX	Male
NATIONALITY	MW
ADDRESS	Zomba, Malawi, Post Office Box No:280, Phone No:522222
QUALIFIC.	Mathematics. B.Sc. Chancellor College. July 1988. Statistics. M.Sc. Sheffield University,U.K. May 1990.
SPECIALIZATION	Statistics.
WORK. LANG.	English.
OTHER LANG.	Chichewa.

Employment Record

CURR. EMPLOY.	Teaching Statistics and Mathematics, Chancellor College.

***** SAMPLE PROFILE OF EXPERT *****

NAME	PHIRI, KINGS MBACHAZWA (DR)
BIRTH	
SEX	Male
NATIONALITY	MW
ADDRESS	Zomba, Malawi, Post Office Box No:280, Phone No:522222
QUALIFIC.	History and Sociology. B.Soc.Sc. University of Malawi,Chancellor College, 1971. History and Sociology. M.A. University of Wisconsin, Madison,USA. 1972. History. PH.D. University of Wisconsin,Madison,USA. 1975.
SPECIALIZATION	History.
WORK. LANG.	English.
OTHER LANG.	Tumbuka

Employment Record

CURR. EMPLOY.	Associate professor and Head of Department,History, Chancellor.
ASSIGNMENTS	Zambia,Swaziland,Lesotho and Kenya, Manzini in Swaziland,Roma in Lesotho,Lusaka in Zambia and Maseno in Kenya, 1989 to 1992, External examiner in History.

***** SAMPLE PROFILE OF EXPERT *****

NAME	KHONGA, ELENIMO B
BIRTH	
SEX	Male
NATIONALITY	MW
ADDRESS	Zomba, Malawi, Post Ofice Box No:280,Telephone No:522222
QUALIFIC.	Plant pathology/Microbiology. Bachelor of Science. Chancellor College,Malawi. 1978. Plant pathology/integrated pest management. Master of Science. University of Guelph,Canada. 1981. Plant pathlogy. PhD. University of Guelph,Canada. 1987.
SPECIALIZATION	Plant pathology and microbiology
WORK. LANG.	English.
OTHER LANG.	Chichewa

Employment Record

CURR. EMPLOY.	Senior lecturer in biology, Chancellor College,

***** PROFILE OF EXPERT *****

NAME	SOMBA, VOTE DUNCAN
BIRTH	1961
SEX	Male
NATIONALITY	MW
ADDRESS	Zomba, Malawi, Post Office Box No:280, Phone No:522222
QUALIFIC.	Statistics, Psychology and Sociology. B.Soc.Sc. 1985.
SPECIALIZATION	Information Science.
WORK. LANG.	English.
OTHER LANG.	Yao, French and Chichewa.

Employment Record

CURR. EMPLOY.	Heading the readers services department of the Chancellor college library. University of Malawi, Chancellor College, Eight and half hrs a day.
LAST EMPLOY.	Running of community projects, World Vision International, February 1986 to December 1986, Projects Coordionator.

***** PROFILE OF INSTITUTION *****

INSTITUTION	University of Malawi, Chancellor College, Malawi, Higher education
START DT	1965-07-24
LOCATION	Zomba
WORK.LANG.	EN
FINANCE	Malawi government
HEAD	Chikhula, Prainy, Principal
GEOG.COVERAGE	Zomba Malawi
INST. TYPE	Parastatal, University
OBJECTIVES	Provide higher education to the nation
INFO. SERVICE	Higher education
FINANCE	Malawi government

***** PROFILE OF INSTITUTION *****

INSTITUTION	Ngabu Agricultural Development Division, Ngabu Library Rivival Committee, Malawi
START DT	1979-02-06
LOCATION	Nsanje
WORK. LANG.	ENG
FINANCE	Agricultural Development Division;
PERSONNEL	2
HEAD	Project Manager
GEOG.COVERAGE	Nsanje, Malawi
INST. TYPE	Governmental, Agricultural Research Centre
ASSOC.ENTITIES	Malawi Library Association-Zomba, National Library Service-Blantyre
OBJECTIVES	To provide general education service and agricultural information, provide current awareness
ACTIVITIES	
INFO. SERVICE	Issuing books to readers,registration of readers catalogue and classification, minor book repairing
FINANCE	Agricultural Development Division Library co-operatives From donors mainly United Kingdom

***** PROFILE OF INSTITUTION *****

INSTITUTION	Multi-country Training Centre, Posts and Telecommunications Department, Malawi
START DT	1972-**-**
LOCATION	Blantyre
WORK.LANG.	Eng
FINANCE	The governments of Botswana,Lesotho,Malawi and Swaziland
PERSONNEL	Proffesional and paraprofessional, 100, 11 of which are professionals.
HEAD	Registrar
GEOG.COVERAGE	Blantyre, Malawi
INST. TYPE	Governmental, Training Centre
OBJECTIVES	Recognizing the need to train substantial numbers of practical technicians to implement their development plans in various disciplines

	of telecommunications and postal.
INFO. SERVICE	Management studies, radio and transmission, tele-traffic and postal
FINANCE	The governments of Botswana, Lesotho, Malawi and Swaziland. Training of their nationals
EQUIPMENT	Computers, telephones, telefax, photocopier, duplicating machines video players, camcoders, tele-printers overhead projectors and slide projectors

***** PROFILE OF INSTITUTION *****

INSTITUTION	American Embassy, United States Information Centre, Malawi, Dissemination of information
START DT	1961-**-**
LOCATION	Lilongwe
WORK.LANG.	Eng
FINANCE	United States Government
PERSONNEL	Professional, administraive and others, 15 9 professionals 2 administration the rest non-professionals.
HEAD	Director
GEOG.COVERAGE	Lilongwe Malawi
INST. TYPE	Non-Governmental, Embassy
ASSOC.ENTITIES	United States Information Agency Washington, D.C.
OBJECTIVES	To assist people in foreign countries learn about the United States, its people, history, culture and political and social processes.
INFO. SERVICE	Information dissemination through documents video, and TV
FINANCE	United States Government
EQUIPMENT	TV/VCR (this is specialized equipment only)

***** PROFILE OF INSTITUTION *****

INSTITUTION	Office of the President and Cabinet, Youth and MYP department, Malawi.
LOCATION	Chiradzulu
WORK.LANG.	ENG
FINANCE	Government
HEAD	Principal
GEOG.COVERAGE	Chiradzulu Malawi
INST. TYPE	Governmental, Training school
INFO. SERVICE	Repairing vehicles, building houses, making hoes and other tools, typing services by secretarial students
FINANCE	Government
EQUIPMENT	Lathe machines, engine mountings, typewritters

***** PROFILE OF COURSES *****

INSTITUTION	University of Malawi, Chancellor College, Malawi, Higher education
START DT	1965-07-24
LOCATION	Zomba
WORK.LANG.	Eng.
FINANCE	Malawi government
HEAD	Chikhula, Prainy, Principal
GEOG.COVERAGE	Zomba Malawi
INST. TYPE	Parastatal, University
OBJECTIVES	Provide higher education to the nation Higher education
PROG. OF STUDY	The College confers B.A., B.Soc., B.Sc., L.L.B M.A., and M.Sc. Bachelors degrees are offered in the following subjects: EDUCATION (early childhood, elementary, health, physical, industrial, special), Enlish (english), FINE AND PERFORMING ARTS (art, art education, music, music education) MATHEMATICS AND SCIENCES (biology, chemistry, mathematics, computer science, physics) SOCIAL SCIENCES (sociology, psychology, economics, public administration, government/political science, history, religious studies, geography) LAW (criminal justice, jurisprudence, international law)
DURATION	All undergraduates courses take four years while postgraduate courses like masters take two years with a thesis
ENVIRONMENT	The self contained campus, located in a small city covers 329 acres. The university sponsors residence halls, fratenity and sorority houses and married student housing.

ADMISSIONS REQ.	Applicants must have obtained a Malawi School Certificate of Education with 4 credits which include mathematics and english. There is no application fee.
MINIMUM AGE	None
LIBRARY	Contains over 190,000 volumes with over 1,000 journals
RESEARCH FAC.	Available at the Centre for Social Research, Zomba. Research and publications Committee of Senate makes grants from the University budget. Also collaborates with government ministries and departments, parastatal organizations, the private and Department of Research and Environmental Affairs
FINANCIAL AID	Ninety percent of the students receive financial loans from government to pursue their studies.
FOREIGN STUDENTS	About three percent of the students are foreign.

***** PROFILE OF COURSES *****

INSTITUTION	University of Malawi, Bunda College of Agriculture
START DT	1979-02-06
LOCATION	Lilongwe
WORK. LANG.	ENG
FINANCE	Malawi Government
HEAD	Dr. Kasomekera
GEOG.COVERAGE	Lilongwe, Malawi
INST. TYPE	Parastatal
OBJECTIVES	To provide higher education in agriculture and related areas
PROG. OF STUDY	The college confers diplomas B.Sc. in the following fields of agriculture (agriculture engineering, botany, agronomy, silviculture, agroforestry)

DURATION	Diploma progam takes 3 years while degree program takes 5 years
ENVIRONMENT	The campus is located at about 20KM from the capital city covers an area of about 300 acres. The agricultural station adds another 9546 acres. The university sponsors residence halls.
ADMISSIONS REQ.	Applicants must have obtained a Malawi School Certificate of Education with 4 credits which include mathematics and english. There is no application fee.
MINIMUM AGE	None
LIBRARY FAC.	Contains over 90,000 volumes and over 600 journals
RESEARCH FAC.	Research and publications Committee of Senate makes grants from the University budget. Also collaborates with the ministry of Agriculture and agriculture research centres in research.
FINANCIAL AID	Ninety percent of the students get financial loans from the government
FOREIGN STUDENTS	Five percent mainly from SADCC region

***** PROFILE OF COURSES *****

INSTITUTION	Multi-country Training Centre, Posts and Telecommunications Department, Malawi
START DT	1972-**-**
LOCATION	Blantyre
WORK.LANG.	Eng
FINANCE	The governments of Botswana, Lesotho, Malawi and Swaziland
HEAD	Registrar
GEOG.COVERAGE	Blantyre, Malawi
INST. TYPE	Governmental, Training Centre

OBJECTIVES	Recognizing the need to train substantial numbers of practical technicians to implement their development plans in various disciplines of telecommunications and postal.
PROG. OF STUDY	The centre confers diplomas and certificates in telecommunications. transmission, tele-traffic and postal.
DURATION	Usually 2 to 3 years
ENVIRONMENT	The centre is located in the heart of Blantyre city. It sponsors residence halls and houses for married students.
ADMISSIONS REQ.	MSCE with five years of working experience in Post and Telecommunications environment
MINIMUM AGE	None Malawi and Swaziland. Training of their nationals
LIBRARY FAC.	Over 60,200 volumes and 100 journals
FINANCIAL AID	The institutions from which the students come from are responsible for the fees
FOREIGN STUDENTS	A third of the total population are foreign students, mainly from SADCC.

***** PROFILE OF COURSES *****

INSTITUTION	University of Malawi, Polytechnic.
START DT	1965-**-**
LOCATION	Lilongwe
WORK.LANG.	Eng
FINANCE	United States Government
HEAD	Dr. Mhango
GEOG.COVERAGE	Blantyre, Malawi
INST. TYPE	Parastatal
OBJECTIVES	Provide higher education in the fields of technology and commerce

PROG.OF STUDY	The college confers B.Sc., B.Com., and Diplomas, these are offered in the following subjects BUSINESS (accounting, business administration, business education, computer science) ENGINEERING (mechanical, electric and civil) various courses in management.
DURATION	3 to 5 years
ENVIRONMENT	Located in Blantyre. The college sponsors residense halls, fraternity and sorority houses and married student housing
ADMISSIONS REQ.	Applicants must have obtained an MSCE with 4 credits which include mathematics and english
MINIMUM AGE	None
LIBRARY FAC.	It contains over 100,000 vols and 500 journals
RESEARCH FAC.	Research and Publications Committee of Senate makes grants from the University budget. Also collaborates with industries on research matters
FINANCIAL AID	Ninety percent of the students receive financial aid from the government

ANNEX TWELVE

Field Definition Table (FDT) Data Base:
ABNCD

	Tag.	Name	Len	Typ	Rep	Delimiters/Pattern
—	1	Participating centre acronym	10	X		
—	2	Participating centre record no	6	N		
—	3	Record status	1	P	A	
—	5	Data record entered	25	X		9999-99-99
—	6	Date record changed	10	P		9999-99-99
—	7	Bibliographic level	5	A		
—	8	Bibliographic level - parent	1	A		
—	9	Country of origin	2	P		
—	10	Record number of parent	6	N	R	
—	11	Record number(s) of part(s)	6	N	R	
—	12	Record no of other lang ver(s)	6	N		
—	20	Language of analysis	18	A		
—	21	Language(s) of text	2	A	R	
—	22	Language(s) of summaries	2	A	R	
—	25	Record of heading	50	X		
—	100	Title	500	X		
—	101	Parallel title(s)	500	X	R	
—	102	Translated title - English	500	X		
—	103	Translated title - French	500	X		
—	104	Translated title - Spanish	500	X		
—	105	Translated title - other	500	X		
—	110	Personal author(s)	80	X	R	ab
—	111	Corporate author(s)	500	X	R	abcdz
—	112	Affiliation	500	X		abcdz
—	113	Other associated inst(s)	500	X	R	abcdez
—	114	Meeting	500	X	R	abcde
—	115	Trans. name of instn	200	X		
—	120	Edition	25	X		
—	121	Publisher	250	X		abcd
—	122	Date of publ/issue - free form	30	X		
—	123	Date of publ/issue - ISO form	10	P		9999-99-99
—	130	Collation (M/C)	200	X		abcdefghij
—	131	Part statement	150	X		ab
—	140	Monographic series	200	X	R	abz
—	141	Thesis	200	X		abcd
—	142	Project	200	X	R	ab
—	150	Notes	700	X		
—	160	ISBN	13	X	R	
—	161	Document number	50	X	R	
—	162	Availability	100	X		
—	200	Title of serial	400	X		z

___	201	ISSN	9	P		9999-999X
___	202	Title of parent (M/C)	500	X		
___	210	Personal author(s) - parent	80	X	R	ab
___	211	Corporate author(s) - parent	500	X	R	abcdz
___	300	Primary descriptors	200	X		
___	301	Secondary descriptors	400	X		
___	302	Geographic descriptors	200	X		
___	303	Local descriptors	200	X		
___	304	Proposed descriptors	100	X		
___	310	Abstract	1000	X		
___	320	Broad subject heading	100	X		
___	400	Processing status	4	X		
___	410	Location	10	X	R	
___	411	Call number	40	X		
___	412	Number of copies	2	N		
___	420	Type of material	20	X		f
___	430	Documentalist	10	X	R	
___	500	Acquisition type	4	X		
___	508	Order number	25	X		
___	510	Date ordered	10	P		9999-99-99
___	511	Date claimed	10	P		9999-99-99
___	512	Date received	10	P		9999-99-99
___	513	Number of copies ordered	2	N		
___	514	Requester	25	X	R	
___	515	Supplier	200	X		abcdez
___	516	Price	20	X		ab
___	517	Acquisition notes	200	X	R	
___	901	Corporate body	500	X		abcd
___	901	See reference(s)	500	X	R	
___	903	Other language version(s)	500	X	R	
___	904	Former name(s)	500	X	R	
___	905	Later name(s)	500	X	R	
___	908	Reference code	20	X		
___	911	Serial title	400	X		
___	912	ISSN	9	P		9999-999X
___	913	See reference(s)	400	X	R	
___	914	See also other lang edition(s)	400	X	R	
___	915	Former name(s)	400	X	R	
___	916	Later name(s)	400	X	R	
___	921	Supplier authority code	4	X		
___	922	Supplier name and address	200	X		abcde
___	997	Authority record notes	200	X		
___	998	Authority record date	10	P		9999-99-99
___	390	Address/phone, etc.	400	X		abcdefghi
___	393	Sex	10	X		
___	441	Duration	50	X		
___	442	Date: proposal/approval	25	X		ab

___	443	Date: starting	10	X		
___	444	Date: expect. compl.	10	X	R	
___	445	Date: actual compl.	10	X		
___	446	Date: terminated	10	X		
___	447	Date of birth	100	X		
___	835	Marital status	100	X		
___	830	Nationality	100	X	R	
___	831	Qualifications	100	X	R	abcd
___	832	Specialization	100	X	R	
___	833	Work Experience (last)	200	X		abcde
___	834	Current work	200	X		abcde
___	855	Honours and awards	200	X	R	abc
___	856	Membership in societies	200	X	R	abcd
___	525	Language competence	100	X	R	abc
___	556	Assignments	200	X	R	abcd
___	900	Services offered	400	X	R	
___	895	Databases	300	X	R	ndrfa
___	896	Classification system	100	X	R	
___	897	Subject headings list	100	X	R	
___	898	Thesaurus	100	X	R	
___	898	Periodical publicat.	300	X	R	ij
___	890	Patents taken	200	X	R	abcdefgh
___	850	Recommended by	100	X	R	abcd
___	570	Personnel	100	X	R	ab
___	625	Objectives	500	X	R	
___	700	Financial aspects	200	X	R	sacp
___	950	Project status	50	X		
___	951	Related projects	200	X	R	
___	954	Project number	50	X	R	a
___	955	Contract number	50	X	R	
___	957	Resources (equipment...)	200	X	R	
___	960	Type of institution	100	X	R	
___	961	Type of Research	100	X	R	
___	998	Record type	1	P	A	
___	1000	File ID	2	X		

ANNEX THIRTEEN

1. Exactly what functions is your department responsible for?
2. What are your responsibilities within the department?
3. Where do you see yourself professionally 3 to 5 years from now?
4. In general how do you like your job in the university
5. Give an example of the major problem facing your department presently.How do you propose to solve this problem?
6. How are the planning and control activities of your department carried out?
7. In what ways do you come into contact with the employees of your department?
8. In general how do you become aware of the concerns of the employees of your department?
9. What percent of your subordinates activities are routine?
10. What percent of you time is spent on routine activities?
11. How are records kept in your office?
12. What opportunities for professional advancement are there for the employees of your department?
13. How do you go about expressing your concerns to your

immediate supervisor?

14. In general, how well do other departments of UOM cooperate with your department?
15. What types of opinions or concerns have been expressed by members of other departments about the performance of your department?To whom were these opinions expressed?
16. Which administrative area within the university do you believe is the greatest bottleneck for achieving greater overall efficiency in the university?
17. Are there any activities which your department is not able to perform for certain reasons?
18. What do you believe to be the major one or two administrative problems facing UOM at the present time? How would you approach solving these problems?

ANNEX FOURTEEN

Print out of the manpower requirements of the Academic Resource Centre

MANPOWER FOR LIBRARY / INFORMATION CENTRE

SECTION	SR.PROF	PROF	PARA PROF	SKILLED	UN-SKILLED
ACQUISITION		1	0.29	0.64	0.64
PERIODICALS		1.5	1.5	1.5	1.5
TECHNICAL		0.54	1.04	2.58	0.86
MAINTENANCE		0	1		32.58
CIRCULATION		1	1.53		1.26
REFERENCE		1.53			1.26
DOCUMENTATION		16.5		8.75	
SUPERVISION	1	0		1	1
TOTAL	4	22.07	5.36	14.47	39.1

ANNEX FIFTEEN

INFORMATION SERVICE TYPE	Dominant User Groups			
	TM	R&D	MM	TECH
Reference Services				
Reference service	x	x	x	x
Retrospective search	x	x	x	x
Technical enquiry service	x	x	x	x
Clearing house service	x	x	x	x
Current Awareness Services				
Current papers notification	x	x	x	x
Research in progress notification		x	x	
Selective dissemination (SDI)	x	x	x	x
Current events notification	x	x	x	x
Newsbriefs and bulletins	x		x	x
Patents notification	x	x	x	x
Standards information		x	x	x
Information Analysis & Consolidation				
Research abstracts		x	x	
Digest for managers	x		x	
Technical digest	x	x	x	
Digest for technicians				x
Numerical data service		x	x	
Statistical digest	x		x	
Executive information service	x		x	
Products/Process innovation info		x	x	x
Specialized Services				
Market research/intelligence	x		x	
Forecast/Trend reports	x	x	x	
Company profiles	x		x	
Contracts & tender notices	x		x	
Environmental scanning	x	x	x	
Technology transfer information	x	x	x	
Decision support system	x	x	x	
Expert systems	x	x	x	
Common Services				
Library service				
Document delivery				
Document reproduction				
Translation				
Editorial/Technical writing				
Publication Services				
Organization of seminars/exhibits				

(Note: TM = Top Managers; R & D = Research and Development Group
MM = Middle Managers; TECH = Technicians/Operators)

PROFESSIONAL STAFF

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
0	0	4	19.0	19.0	19.0
1	1	6	28.6	28.6	47.6
2	2	8	38.1	38.1	85.7
4	3	2	9.5	9.5	95.2
8	8	1	4.8	4.8	100.0
	TOTAL	21	100.0	100.0	

COMPUTER/DATA PROCESSING SPECIALISTS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
0	0	10	47.6	47.6	47.6
1	1	6	28.6	28.6	76.2
2	2	5	23.8	23.8	100.0
	TOTAL	21	100.0	100.0	

TOTAL PROFESSIONAL STAFF

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
0	0	4	19.0	19.0	19.0
1	1	6	28.6	28.6	47.6
2	2	6	28.6	28.6	76.2
4	4	3	14.3	14.3	90.5
6	6	1	4.8	4.8	95.3
8	8	1	4.8	4.8	100.0
	TOTAL	21	100.0	100.0	