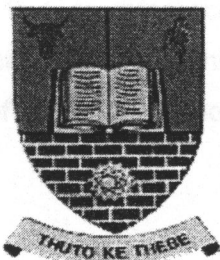


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FACULTY OF HUMANITIES

DEPARTMENT OF LIBRARY AND INFORMATION STUDIES

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AN ASSESSMENT OF THE SUSTAINABILITY OF INFORMATION TECHNOLOGY AT THE UNIVERSITY OF ZAMBIA LIBRARY

A dissertation submitted in partial fulfilment of the award of a Master of Library and
Information Studies of the Department of Library and Information Studies, University of
Botswana

By

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Supervisor: Mr S. A. Katuu

August, 2002

DECLARATION

Unless otherwise indicated in the text or references, this dissertation is entirely the scholarly work of the author. The work contained in this dissertation was carried out at the University of Botswana. This piece of work has not been submitted, either in whole or part at any university or any institution.

Date:.....August 2002.....

Author's signature..........

F. Makondo

Supervisor's signature.....

Mr. S. A. Katuu

DEDICATION

This dissertation is dedicated to the memory of my late dad, Mr R. Liswaniso Simataa, who passed away during the course of my study; and to my dear husband and kids.

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ABSTRACT

The aim of this study was to examine the extent to which the University of Zambia (UNZA) Library is addressing the Information Technology (IT) sustainability challenges, with the objective of establishing a feasible IT sustainability model of approach that can be adopted by the Library.

Using the case study methodology, multiple sources of data, including document review, semi-structured interviews and questionnaires were used to collect data from students, lecturers, librarians, computer centre management and a donor representative. The findings of the study show that most of the IT acquired since 1992 is no longer functioning. More than 50% of the computers are not functioning, 80% of the printers are not working, and all the photocopiers are not functioning, while the other auxiliary equipment is in a state of disrepair. This state of affairs is caused by several factors, including poor funding and lack of support from university administration. Because of poor state of equipment in the Library, the intended benefits of users have not been realised. For instance, 78% of the lecturers do not use the Library for a variety of reasons one of which is that they are unsatisfied with the services provided in the Library. The study also revealed that the non-commitment of lecturers to the sustainability of IT could be attributed to their non-involvement in the initial planning of the computerisation project. The findings further show that UNZA Library does not have technical capacity to sustain its IT resources because it does not have its own qualified software and hardware technician since the Library is facing a critical staffing situation. There are no concrete strategies put in place to ensure sustainability of IT in the Library and the university as a whole. Using the sustainability index adopted from the World Bank Sustainability Index, a sustainability score is calculated to show the extent to which the Library is sustaining its IT resources.

The study came up with a number of recommendations that will ensure sustainability of IT in the Library, such as reconstituting the Library automation Committee, coming up with a comprehensive information policy, and coming up with a strategy to allocate and reallocate

funds to support hardware and software upgrades in order to provide and support additional information services. A further recommendation was to amortise the placement costs of technology over a period, in addition to making IT a line item in the Library budget and build indigenous capacity to make the complete withdrawal of funds less disruptive of the ongoing activities. It is further recommended to keep benefit evaluation in perspective of with the Library function. In conclusion, the problem of sustainability of IT is an issue that requires concerted effort in order to make sure that the present problems are resolved such as the reduction of prices, easing conditions of procurement, making IT more human-advancement oriented. There is also need to ensure efficient and effective resource allocation, organisational responsibility and commitment, appropriately scaled technology, cooperation and genuine assistance from donor agencies.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAAS	American Association for Academic Advancement
ADONIS	Article Delivery Over Network Information Systems
AUC	American University in Cairo
CBU	Copperbelt University
CD-ROM	Compact Disc- Read Only Memory
DANNIDA	Danish Development Agency
DIFD	The Department for International Development
ERR	Economic Rate of Return
ESSP	Educational Sector Support Programme
FINNIDA	The Finnish International Development Agency
IDRC	International Development Research Centre
ILL	Inter-Library Loan
INNOPAC	Innovative Interfaces
IT	Information Technology
ICT	Information Communication Technology
IUCN	International Union for Conservation of Nature and Natural Resources
LAN	Local Area Network
NUFFIC	Netherlands Organisation for International Cooperation In Higher Education
OCLC	Online Computer Library Centre
OED	Operations Evaluation Department (The World Bank)
OPAC	Online Public Access Catalogue
SCECSAL	Standing Conference for Eastern Central and Southern Africa
SIDA	Swedish Agency for Development Cooperation
UB	University of Botswana
UD	University of Dakar
UNZA	University of Zambia
UZ	University of Zimbabwe

UTH University Teaching Hospital
WCED World Commission on Environment and Development
ZLA Zambia Library Association

DEFINITION OF TERMS

Information Technology:

Technology that merges computing with high speed communication links carrying data, sound and video (Williams, 1997).

Systems and devices that are used in the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information (Hipgrave, 1985).

Sustainability:

Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (WCED, 1987, as quoted by Morse et al, 2000: 5).

The ability of a project to maintain an acceptable level of benefits flow through its economic life. (OED, 1986 as quoted by Valadez, J and Bamberger, M (1994)

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Today, Information Technology (IT) is affecting all areas of human activity, making more services and operations increasingly dependent on it. So central is the use of IT that Lim (1983:294), in the context of a university library's operations, states "all university libraries, whether in the developing or developed world are faced with a multitude of problems associated with information explosion, increased demands for services and the availability of new types of materials which cannot be treated by conventional methods."

In response to increased demand for IT related information services brought about by information explosion, libraries and information centres have joined the bandwagon of computer enthusiasts in introducing IT to improve their services. However, it has long been realised that installing IT is not an end in itself. As Montviloff, (1995: 443) states, "the application of ITs alone does not automatically provide the whole solution to the library information system problem of improving the content of and access to information." More critical is the development of long-term strategies that will positively forge a sustainable plan for the use of IT in libraries.

For most African academic libraries which find themselves having to thrive in harsh social, economic and political conditions, access to IT and ensuring its sustainability is becoming increasingly critical. Being caught up in the vicious circle of declining resources on the one hand and the demand to provide information services for teaching and research on the other, libraries in Africa have had no other viable option but to accept whatever assistance is accorded to them (Katundu, 1998). Consequently, this has caused libraries to become increasingly dependent on donor funding for their IT development. A research report on university libraries in Africa by Rosenberg (1998) revealed that, with the exception of the University of Botswana, other libraries were heavily dependent on donor support for their IT projects.

Due to poor funding, lack of support from administration, to some extent lack of local expertise and the constant reliance on foreign aid in the developing countries, the adoption of Information Technology hardware and software has been based on a limited vision. As a result, of the foregoing, there is a lack of overall strategic plan or coherent legislative framework that could provide sustainability and create a solid foundation for their harmonious development (Montviloff, 1995). Many of the installed IT projects either have collapsed, or are not functioning efficiently due to poor maintenance. The adverse effect of the poorly functioning equipment has been so large that over the past years there has been a growing awareness among academic libraries in Africa of a need to develop indigenous capacity for providing and sustaining IT resources. There are, however, very few critical evaluations made of IT projects undertaken in Africa and those that exist according to Rosenberg (1998), are often internal documents and not widely distributed. This study is undertaken bearing in mind the efforts by management of the University of Zambia (UNZA) Library in addressing the challenges they face in sustaining IT resources. As members of the Standing Conference for Eastern Central and Southern Africa (SCECSAL), there have been calls for the university libraries to devise strategies that address sustainability of large-scale library services. This work is in partial response to this call.

1.1.1 TECHNOLOGY DEPENDENCY SYNDROME IN AFRICA

Describing the dependence dilemma in developing countries Adeyemi, (1983:245) correctly observes, "developing countries operate on a low income, commodity export dependent economies." This has left university libraries in a situation where they have to constantly depend on donor funding to survive in this information technology age. Illustrating the extent of this dependability, Rosenberg's (1997: 43) report reveals that,

"It is not only in the realm of (books and journal) acquisition that libraries in Africa are donor dependent. Virtually all new initiatives...whether the acquisitions of photocopiers, computers, staff training, new buildings or the development of new services, like CD-ROM searching, E-Mail; establishment of networks and databases... are the result of outside (donor) assistance."

Concerned with the non-commitment and lack of attention to the establishment and maintenance of IT resources from university administration, donor organisations have had to introduce conditions that sometimes have left no room for libraries to automate at their own pace. The idea, as Mwinyimbegu (1993: 28) sees it, "is to make transferred

technologies remain dependent on the countries of origins for spares, know-how and other intermediaries." This has brought about a new form of imperialism known as technological dependency.

1.1.2 INFORMATION TECHNOLOGY IN ZAMBIAN UNIVERSITY LIBRARIES

According to Chisenga (1995), the use of technology in Zambia goes as far back as the early 1960's when the technology was used mainly for numerical processing. Since then, IT usage has developed and increasingly been applied in other forms of information processing like database management and information storage and dissemination. In order to encourage the use of IT in information management in libraries and the country as a whole, information professionals presented to government a draft National Information Policy. It was recommended to government to introduce a policy that will encourage the adoption of application of IT in processing and management of information (Chisenga, 1995).

Although the use of IT in libraries has been most prevalent in special libraries, in the past recent years academic libraries have significantly adopted a range of ITs in their libraries. According to the Zambia Library Association (ZLA) draft national information policy proposal of 1986, most of the school libraries, except for private schools, and city council libraries did not use computers (Chisenga, 1995). The relative heavy use of ITs in special libraries as compared to academic libraries, which include the only two university libraries in the country, can be attributed to the fact that funds are relatively more available for purchase of the equipment. Furthermore, the two university libraries, Copperbelt University (CBU) Library and the University of Zambia (UNZA) Library are dependent on government funding for their operations. With great cut backs on the budgets to the universities the libraries have had to struggle to remain operational.

UNZA Library has had to introduce IT in its operations not only to improve the services due to its demonstrated benefits, but also to deliver a positive image of libraries in Zambia. As Rosenberg, (1997: 28) states, "IT - in the form of PCs, CD-ROM and e-mail - is a norm rather than the exception in this information age." To-date however, the challenge facing IT adoption in libraries transcends beyond mere acquisition challenges to those of maintenance and sustainability. UNZA Library is caught up in the same challenge.

1.1.3 DEVELOPMENT AND USE OF ICT AT UNZA LIBRARY

The University of Zambia was established in 1966 by an Act of Parliament as a centre of production of trained manpower who will contribute to national development. It has a population of over 5,000 undergraduates and 200 postgraduates. Its mission is to "contribute to national development by producing trained manpower to the nation through teaching, learning and research" (University of Zambia , 2000).

Besides the UNZA Library being designed to serve the learning, teaching and research needs of its students, teaching staff, research affiliates and researchers, its facilities may also be used for reference or borrowing purposes by members of the public.

The University Library is located in three separate locations; The Main Library located at the centre of the Great East Road Campus. The Medical Library is based within the University Teaching Hospital (UTH) complex and serves the information needs of the School of Medicine, UTH and Post Basic Nursing. The Samora Machel Veterinary Library is located in the School of Veterinary Medicine at the Great East Road Campus.

The Main Library moved into the present building at the main campus in August 1969. The building is designed to hold 300,000 volumes and seat 1,600 readers. At present the collection has over 300,000 volumes, receives about 100 current periodical titles and 29 CD-ROM database titles (University of Zambia, 2000). The Library is divided into four main divisions, namely, the Technical Services Division, Reader Services Division, Serials Division and the Special Collections Division. The Special Collection area houses a variety of research materials ranging from official documents from the Zambian government and neighbouring countries, theses, staff publications, students projects and United Nations publications. The Technical Services division deals with the acquisition and cataloguing of library materials, while the Reader Services division is the one responsible for providing reference, lending services, Internet services, CD-ROM searches and other matters dealing with the needs of users. The Library has a staffing capacity of about 73 as at January 2000, out of which 15 are senior staff comprising of all those with Bachelor's degree and above, 27 junior staff, 2 administrative staff and 8 secretarial staff, as shown in the following table:

Table 1.1 Staffing at UNZA Library

Title of Post	Establishment	Filled
University Librarian	1	1
Deputy Librarian	1	0
Senior Librarian (Masters and above)	5	0
Librarian I (Masters and above)	5	0
Librarian II (Masters and above)	4	2
Librarian III (Masters and above)	5	2
Assistant Librarians (B. A degree)	16	11
Hardware Engineer	1	0
Senior Library Assistant I (Diploma)	5	0
Senior Library Assistant II (Diploma)	5	3
Library Assistant I (Certificate)	9	4
Library Assistant II	13	9
Library Attendant	12	11
27 Junior staff		
Administrative Assistant to the Librarian	1	1
Senior Administrative Officer	1	0
Administrative Officer	1	1
2 Administrative staff		
Management Secretary	1	1
Secretaries and Stenographers	2	1
Copy clerk typists	9	6
8 Secretarial staff		
Binding staff	11	3
Photographic staff	5	0
Cleaning staff	24	17
Total	141	73

Source: UNZA Library annual report, 2000

Although the vision to computerise the UNZA Library operations goes back to the early 1970s (Yumba, 1998), it only took root in 1990/91 with the creation of in-house databases using database management software called Dbase III. This was facilitated by computers borrowed from other departments of the University. Computerization in the Library was introduced with the objective of improving the efficiency and effectiveness of the UNZA Library operations in the provision of information services to students, researchers and lecturers.

Over ten years Zambia has suffered from a serious collapse of library and information services. A fact-finding study led by Coombe (1991) was instituted in 1990 in order to find

ways in which the quality of teaching, learning and research in the tertiary sector in Zambia could be improved. According to the findings of this study, lack of materials, equipment and qualified manpower combined with poor facilities and low level of cooperation and management had led to a situation, where other measures to support the education sector were likely to fail if measures to develop libraries were not resorted to. Basic information about libraries for this document was collected by visiting tertiary institutions, in discussions with librarians, Vice Chancellors and Principals and with a questionnaire, which was distributed to all Teacher Training Colleges. According to the report, dominant constraints for library services were lack of acquisition funds, lack of shelf space, deteriorated books, facilities and furniture, lack of necessary equipment, in many cases also shortage of library staff (Coombe, 1991). Because UNZA Library has the responsibility to function as a national reference library of Zambia, it was the leading target of the Library Support. The report proposed support funding for the following:

1. Information materials, like books, periodicals, CD ROMs and audiovisual materials published in Zambia and abroad.
2. Equipment supporting processing of these materials, like typewriters, computers, photocopying machines, binding tools, audiovisual equipment.
3. Furniture for storing library materials and catalogues.
4. Stationary and other materials, like book binding and mending materials.

Through careful articulation of UNZA Library's needs before the Trevor Coombe Fact Finding Mission of 1990, it became possible for UNZA Library to be one of the first beneficiaries of the Educational Sector Support Programme (ESSP) funding, through the Finnish International Development Agency (FINNIDA) (Mwacalimba, 1999). A Library Automation Committee was created whose terms of reference were to plan for the automation of the Library and come up with pre-installation procedures which included: project planning and management, definition of the new systems requirements and a detailed design specifications suitable for the Library. The Computer Centre of UNZA carried out the needs assessment for the automation of the Library.

The ESSP project document of 1991-1994 states that PCs, CD-Rom readers, photocopiers among other items were to be funded under the programme (Mwacalimba, 1999). In 1992, FINNIDA donated five (5) PCs through the ESSP, which gave impetus to the computerisation program. With further help from FINNIDA, the Library was able to

procure 1 file server, 18 PCs and 26 terminals and other network peripheral equipment necessary for automation. By mid-June 1995, the Dynix Library Automated Library System (Release 142) was installed for the automation of the acquisitions, cataloguing, circulations, serials control, and short loan collection operations. Since then much progress has been achieved, with the cabling of the library network and conversion of the library catalogue into MARC format in March 1996. The retrospective conversion was done and completed by Retro Link Associates, a subsidiary of the Ameritech Library Services of USA, which carried out an on-site imaging of the official shelf list cards. The library network has expanded and additional equipment has been acquired.

Apart from automating its traditional operations of cataloguing, acquisitions, serials and circulations, the Library also provides Internet services and CD-Rom services, since UNZA was one of the first Southern African universities, besides South Africa to have Internet connection in 1990. The Library has its own website which includes a list of latest additions to the Library, a link to the special collections, the OPAC, a link to some virtual libraries and other sites of interest to its users.

1.2 STATEMENT OF THE PROBLEM

While the introduction of IT, derived mainly from donor funding, holds great promise for the University of Zambia Library in the provision of the much needed high quality and up-to-date information to its users, IT adoption also brings with it additional cost burden to the Library. Sustaining the benefits of aid is major practical challenge facing the UNZA Library in a situation where maintaining and updating hardware and software is a constant problem.

This state of affairs is not peculiar to UNZA Library alone but has been a matter of great concern to many university libraries in Africa. While a number of resolutions have been reached at different forums such as the SCESCAL of 1996 and a series of workshops commissioned in 1987 by IDRC to address this problem, there is little evidence on their level of success, which therefore leads one to conclude that the root cause of the problem of sustainability still awaits attention. The poor physical status and use of IT, observed at the UNZA Library, is an indication of the fact that IT sustainability challenges are still persistent. Even when the problem of sustainability is known, there is little evidence of the steps that the Library is taking to manage its finances, efficiency and

cost effectiveness of resources to ensure sustainability and how successful these steps have been.

In this study, the researcher is primarily interested in examining why UNZA Library has failed to sustain its IT infrastructure and the extent to which it is addressing the challenges of sustaining IT, with the objective of coming up with suggestions that will help redress the situation. Specifically, this study seeks to determine the major factors that are necessary for sustaining IT infrastructure in academic libraries using UNZA as a case study.

1.3 AIM OF THE STUDY

The aim of this study was to examine the extent to which the UNZA Library is addressing the IT sustainability challenges, with the objective of establishing a feasible IT sustainability model of approach that can be adopted by the Library.

1.4 OBJECTIVES OF THE STUDY

The specific objectives of this study were:

1. To determine the present physical condition of IT resources at UNZA Library;
2. To assess the range and form of sustainability challenges faced by the Library and what efforts are in place to meet the challenges;
3. Examine the role of the IT project stakeholders in the computerisation of the UNZA Library;
4. To examine the long-term capacity of UNZA Library in terms of staffing and technical support to sustain the IT resources;
5. To propose strategies and mechanisms that may be adopted by the UNZA Library in sustaining its IT resources;

1.5 RESEARCH QUESTIONS

The study sought to answer the following questions:

1. What is the status of the IT in the UNZA Library?
2. What funding mechanisms are in existence to support the sustainability of IT?
3. What is the level of user satisfaction in relation to the current IT services?

4. Were there any steps taken to involve all the stakeholders in the initial planning of the automation project?
5. What support has the UNZA administration given towards the computerisation project?
6. What strategies are employed by external/donor agencies in implementing and supporting IT projects at UNZA Library?
7. Does UNZA Library have technical and staffing capacity to sustain its IT resources?
8. Are there any policies governing the use of IT in the Library?
9. Are there any policies that govern the selection and procurement procedures of IT in the Library to sufficiently address the long-term use of IT?
10. What strategies have been put in place to ensure sustainability of IT resources in UNZA Library?

1.6 SCOPE AND LIMITATIONS

The study was confined to the UNZA Library and its two branch libraries, the School of Veterinary Medicine and School of Medicine. UNZA Library was chosen because of the current relatively higher deployment of IT in their services and routine operations compared to other academic libraries in the country. UNZA Library has had donor funded IT related projects and is in a situation of declining IT resources.

For a number of questions dealing with physical condition of IT resources, a limiting factor concerned the fact that there is no standard way of quantifying or measuring physical condition of IT resources. Measurement was based on individual observation or assessments, which can be highly subjective. To counter-check on the effect of this, multiple respondents were being asked to make an assessment as well as the researcher's own observation.

Another limiting factor was the decision to study UNZA Library as opposed to studying the two public universities (Copperbelt University and UNZA). Both universities may face similar "external" challenges such as political, economic, staffing levels etc. by virtue of operating within the same socio-political and economic climate. Whilst each has its own unique "internal" challenges, certain lessons learnt or models used may be adaptable from one to the other. Time limitations, played a part in the decision making, this study therefore

directed its attention to a single case, UNZA, striving to identify both “external” and “internal” challenges.

1.7' SIGNIFICANCE OF THE STUDY

1. This study is significant for various reasons. Firstly, the study hopes to contribute to the subject of sustainability of ITs in African libraries. While there is a definite awareness of the critical need to address sustainability challenges, there are comparatively few success stories among SCECSAL member libraries. This study hopes to come up with strategies that may serve as a model for other libraries in the region. Furthermore, it is hoped that the findings of this study will be beneficial in sensitising donor and other IT agencies on the need to define clearly IT sustainability issues before embarking on big projects that may otherwise turn out to be ‘white elephants’.
2. Second, the value of any technology lies in its ability to assist people in finding solutions to their problems in a quick and more efficient manner. Society will only see the justification of huge investments in IT if they can see benefits accruing to them from it. The benefit will only be seen when continued availability and use of IT resources is assured and guaranteed in order to facilitate the institutional goal of meeting the users’ information needs for educational, political and social maturity. Through this study, the researcher wishes to come up with practical suggestions and strategies that will ensure continued accessibility and sustainability of IT resources at the UNZA Library.
3. Finally, with the help of donors such as FINNIDA, the UNZA Library has made a number of impressive developments towards providing a variety of ICT related services to the users. Now that the grant has ended, there is a danger of slowing down the tempo of computerization due to non-availability of funds for the maintenance and sustainability of these services. By revealing the problems faced by the Library, solutions could be found to alleviate these problems and try to avoid similar ones in the future.

LITERATURE REVIEW

2.0 INTRODUCTION

Information Technology (IT) is spearheading the information revolution and it is recognized in Africa and the entire world as a vital tool to increase the efficiency and effectiveness of organisations such as libraries. Despite the fact that a number of libraries in developing countries are embarking on computerisation of their operations, little attention has been given to the sustainability of the projects after the initial funding. The issue of sustainability is of great concern to donors who are the main financiers of these projects. Despite good intentions, we need to question whether real benefits are being realized from the application of IT. In tackling the issue of sustainability of IT in libraries and information, this study will enlist the help of literature on sustainability of projects in other areas.

Following a definition of sustainability in the context of other projects this chapter looks at the historical progression of the use of IT resources in African libraries, as well as examining 5 case studies of IT projects in libraries from East, Southern, West and North Africa to assess their successes and failures towards sustaining IT resources. The chapter further reviews literature on the concept and historical progression of sustainability, its importance to developing countries and the factors that affect sustainability in donor funded projects in general. Suitable benchmarks (indicators) will be identified that will aid the researcher to measure sustainability of IT. In trying to examine the factors that affect sustainability in developing countries one hopes to come up with strategies that can counter the negative effects of these factors in order to sustain IT and other donor funded projects in libraries.

2.1 TRENDS IN INFORMATION TECHNOLOGY IN LIBRARIES

The growth of IT has left its mark on societies all over the world. In the context of information management, the impact has greatly enhanced the methodologies and techniques for controlling, managing and manipulating information (Agha and Akhtar 1992). The operational definition of IT will be adopted from Hipgrave's (1985: 58)

definition, which is, "systems and devices that are used in the acquisition, processing, storage and dissemination of vocal, pictorial, textual, and numerical information". In its broader context, IT includes computers, the various telecommunication devices and media, and publishing media including broadcasting, micro graphics, audiovisuals etc. (Zulu, 1994). The impact of IT on libraries has been in activities concerned with storage and retrieval of information, especially so on activities concerned with in-house keeping routines such as acquisition, cataloguing, serials control and circulation of library materials.

The use of IT in Africa goes as far back as the early sixties and was initially confined to its traditional use, the processing of numerical data (Chisenga, 1995). While computer technology enjoys a unique place in information processing operation, and to some extent has come to be known synonymously with the term IT, there are other forms of IT resources that have had considerable effect on library processes. It is common to find definitions of ICTs that are synonymous with those of information technology (IT). For example, Drew (1994) defines IT as "the group of technologies that is revolutionizing the handling of information" and embodies a convergence of interest between electronics, computing and communication. Duncombe and Heeks (1999) simplify the definition by describing ICTs as an electronic means of capturing, processing, storing and disseminating information'. Therefore, in this study, the terms IT and ICTs will be used nearly synonymously and in a somewhat broad sense. In most if not all IT applications, the delivery channel or conveyance between user and the information machinery itself involve data communication (Ford, 1991). Abifarin (1993) groups the various IT resources into four distinct categories namely, processing technologies, distribution technologies, output technologies and miniaturization technologies.

The first group of technologies as termed processing technologies includes computers, and word processing machines. A word processing machine is defined by Tech Encyclopaedia, (2001) as, "a computer that is specialized for only word processing functions." Until the late 1970s, word processors were always dedicated machines." Today, personal computers have replaced almost all dedicated word processors.

Computer technology is perhaps one of the highest used processing technologies in libraries. Bishop, as quoted by Abifarin (1993) describes the computer as "an information-processing machine". The author describes information processing to include performing calculations, sorting, selecting data items, combining information in various ways and

making decisions based on the information. Personal computers have had an immense impact on libraries. Initially, simply a tool to help meet the changing needs in libraries; this technology according to Main (1991) has become a driving force in itself in the information age. PCs have been used for word processing, spreadsheets, desktop publishing, and computer graphics and for database management.

The second group of technologies, known as distribution technologies, includes e-mail, networks, teleconferencing, teletyping machines, telefax machines, and telephones. One of the earliest technologies to be used in libraries is the teletypewriter and telex. It is "some form of telegraph machine equipped with a keyboard on which messages are typed, creating electrical impulses that are transmitted through telegraph wire" (: 44) The fax machine on the other has supplanted the teletypewriter. Telefax also known as fax (Facsimile) is the transmission of image from a sending machine to a receiving machine in a remote location using telecommunication (Ford, 1991). Facsimile originally called "telecopying," is the communication of a printed page between remote locations. Fax machines scan a paper form and transmit a coded image over the telephone system. The receiving machine prints a facsimile of the original. A fax machine is made up of a scanner; printer and modem with fax signalling. The fax was developed in the 1960's when the fax standards were developed starting in 1968 (Tech Encyclopaedia, 2001 [online]). From the mid 1960s through to the early 1970's a number of academic libraries and public libraries experimented with fax transmission, primarily as a high speed document delivery alternative in Inter-Library loan application (Saffady, 1994). It was not until the early 1980's, however that digital fax machines sufficiently improved their copying quality and transmission speed.

Medical libraries are recorded as the earliest to apply fax to their operations (Lee, 1991). Sending Inter-Library Loan (ILL) requests and photocopied journal articles was the library application as early as mid 1960. Ford (1991) gives an example of the UMI Article Clearing house, a service introduced in 1983 by University Microfilms for supply of hard copy article, as one of the libraries that begun offering a fax option for delivery of articles ordered by clients. In African university libraries, the fax has proved to be one of the dependable technologies for sending articles and general communication especially with book suppliers.

Telephone; derived from the words 'tele' and 'phonics', meaning long distance plus sound was developed in 1876 by Alexander Graham Bell (Tech Encyclopaedia, 2001). The telephone is one of the most highly used technologies in libraries.

The convergence of the computer technology and the telecommunications has brought about the use of development and use of e-mail. E-mail works through the transmission of messages between correspondents using telecommunication connections through a computer system. (Lee, 1991: 41). He further states that the application of E-mail in the libraries for purposes of Inter-Library Loan (ILL) began to appear in the late 1970's and early 1980's among medical libraries. This is a service whereby a library obtains its patrons' materials that it does not own or have available. Transmitting the ILL request by e-mail is instant as opposed to sending requests by "snail mail" in which extended periods may pass between the various mailings or requests, responses and delays.

Another distribution technology used in libraries is the Local Area Networks (LANs). LANs have developed since the 1970's as a way of providing computing resources to a number of users within an organization in an economical manner (Webb, 1991). A LAN may contain a number of processors, each operating a range of software, such as an integrated library management system, database systems, and spreadsheets. The most common service offered by bibliographic networks is shared cataloguing. OCLC is one of the examples of a successful bibliographic network.

Teleconferencing is also used in libraries for communication of information. Tech Encyclopaedia (2001) defines teleconferencing ("long distance" conferencing) as an interactive communications session between three or more users that are geographically separated. Teleconferencing involves the use of telecommunications for interactive group communication. This computer-mediated communication system for dispersed human groups was first designed and implemented in 1970 at the Office of Emergency Preparedness (OEP) at the Executive office of the President of the United States (Turoff, and Hiltz, 1979: 396). Since then, a number of computerized conferencing and mediated systems have been designed and implemented in the libraries.

The third technology is what is known as output technologies. These include printers and photocopiers. Photocopiers are one of the output technologies that are heavily used in libraries for copying articles, and reports for redistribution. They are defined by

infoplease.com (online) as "any electrically operated machine using a photographic method, as the electrostatic process, for making instant copies of written, drawn, or printed material. They are also called copier, copy machine, photocopying machine". Although photocopy technology has not changed radically since the introduction of xerography and its subsequent refinement during the 1960 and 1970s, copying and duplicating machines continue to acquire new operating capabilities (Saffady, 1994). While most of the attention given to library automation is focused on computer technologies as the most powerful, versatile, and complex information processing machines, copiers could be said to be historically the most important category of automated equipment in library application. Conventional and coin-operated copiers are indispensable devices in libraries of all types and sizes (Saffady, 1994).

Another highly used output technology in libraries is the printer. During the past several decades, a succession of developments has replaced many mechanical information technology components like the typewriter by electronic components. The modified electronic typewriter, which was introduced in 1951, was displaced by the line printer in 1955, which were in turn succeeded by ink jet printers and now by the laser printers (Hayes, 1986).

Fourthly, there are technologies called miniaturization technologies, which are those devices, which use miniature photography to condense, store and retrieve graphic information, pictorial information, text and sound. These include such technologies as microfilms, microfiche, cartridges and aperture cards. The birth of micro graphics, according to MacKenzie and Link (1991), probably occurred in 1839 in Manchester. Microfilming became a commercial reality in 1928. There are several formats of micrographic technologies, such as microfilms, 16 mm roll films, cartridges, aperture cards and microfiche. Despite their inferior usage today in libraries as compared to computers, micro graphics have remained a dynamic management tool in libraries. Some examples of microform application in libraries include newspapers, out-of-print books, union lists and so on. The ability to fill the economic gap makes micro graphics a good choice especially in libraries that have reduced budgets. Micro graphics are still the cheapest information medium in relation to creating, storage and retrieval of information compared to computer technology.

The optical disc was initially introduced in the late 1970's in the form of videodiscs. Compact disc which offer a high quality alternative to LP records for storing music have become a successful technology that has been employed by the computer industry to store computer-readable data (MacKenzie and Link, 1991). Hence, compact disc-read only memory CD-ROM was developed. Library application of the optical disc technology is in archival purposes. Entire encyclopaedias are now available on CD-ROM. According to Antonakos and Mansfield (2000), CD-ROM typically stores more than 650 MB of data. This is equivalent to more than 430 1.44 MB floppies.

Magnetic tapes are also used for information backup, but are not suitable for longer-term storage mainly because of their susceptibility to magnetic fields, temperature and humidity. Magnetic tapes are used in libraries for back-up databases. Under the category of magnetic tapes, the video is one of the highly used technologies in libraries. Although often considered synonymous with the development of television, videotape technology was not introduced until 1956 by the Apex Corporation. As Chisholm and Malone(1991) explains, many libraries and information professional have proven to be enthusiastic adapters of videotape technology. "Although controversial in the beginning, library video collection quickly became common place" (Chisholm and Malone, 1991: 101).

Information technology in all its various forms is widely used in African university libraries. Thus, the computer, telecommunications, micro graphics and videotext technologies are a common feature in the information-processing environment in most developed countries. A number of libraries in African especially university libraries have embarked on IT projects to automate their operations.

While the above-mentioned technologies hold great promise, adequate preparation, sufficient workload and real urgency for information alone should prompt the adoption of technology. Modern technology should be viable in terms of cost and benefits; otherwise, it may prove to be a white elephant (Kamaruddin, 1988).

2.2 IT PROJECTS IN AFRICAN UNIVERSITY LIBRARIES

"As far back as 1978, developing countries were being urged to seize on the new technologies and leapfrog to electronic libraries, by-passing the books" (Rosenberg, 1998). There have been disputes concerning this vision. Some people have expressed trepidation about library automation; many more have expressed qualms about it. Some

assert that introduction of automated library systems would not save libraries but rather cost more (Ogunleye, 1997). They do not see the reason to adopt IT in Africa when it cannot be sustained, while the other school of thought believes that it is not a matter of affordability but necessity if Africa is not to remain behind in this information age. Recent discussions on university education, such as Zulu (1997) have stressed the need to adopt IT as a way of solving some of the problems faced by libraries. "Computing in Africa may appear presumptive: in areas of drought or malnutrition it is hard to persuade some people that IT is something on which money should be spent. But IT is needed to allow Africa to find its own ways forward" (Odedra, 2001). A 1994 World Bank report for example promoted the idea of adopting CD-ROM and electronic networks as a cost effective way of accessing information.

Computerisation is a relatively recent phenomenon in libraries of the developing countries, normally having occurred during the late 1980's (Saint, 1992). The years since 1989 have seen tremendous progress in the introduction and use of IT in African university libraries. Before then the use of computer for any purpose was seen as, something of a novelty and the use of telecommunications for information access was unheard of (Rosenberg, 1997).

A survey of 18 African university libraries by Diana Rosenberg (1997) shows the efforts by various university libraries in Africa at introducing IT to their operations. The study reveals that most, either wholly or in part, derive their IT from donor-provided support, University of Botswana being an exception. It is possible that the successes and achievements of some libraries will provide examples to be followed by others (Rosenberg, 1998).

The following section evaluates 5 case studies from East, West, Southern and North Africa in order to see their different experiences in adopting IT and what strategies have been used to move the libraries towards sustainability. By examining their experiences, some lessons will be got on how university libraries, through their own or donor funds may move towards sustainability. The level of IT adoption and use that is made of the new technologies differ from library to library based on the respective economic, social and political conditions in their countries.

2.2.1 UNIVERSITY OF DAR ES SALAAM LIBRARY.

Interest in automation at the University of Dar es Salaam Library started in the mid-1980s with the use of computers for word processing. During this period, e-mail was also

introduced, but mainly for office use only (Nawe, 1998). It took about 3 years for the introduction of full-scale library automation. Internet connection was achieved in 1998.

CD-ROM services were introduced in 1993 through a generous grant from Carnegie Corporation of New York, and enhanced by The American Association for Academic Advancement (AAAS), which provided CD-ROM databases at several other universities. The Library used this opportunity to expand its databases by acquiring 20 more databases. The University of Dar es Salaam Library started by implementing small and limited database projects, which concentrated on bibliographical activities such as a union list of serials, the East African collection catalogue. The automation of the Library's housekeeping operations has been done with the help of donor funding. Apart from searching through CD-ROM, IT has been used for other bibliographical activities such as the production of union lists.

The survey by Rosenberg demonstrates that the introduction and exploitation of IT at the University of Dar es Salaam Library was viewed by library staff as their greatest achievements over the past five years. At the time of the survey, the Library had 12 microcomputers and 3 CD-ROM workstations with 6 drives. The Library is attached to the university's e-mail system, which is mostly used for the request of photocopies of journal articles from other libraries inside and outside the country. The Library also offers Internet searching services. The PCs are in a separate computer laboratory and those with CD-ROM drives in the Reference Librarian's office, forming a separate searching room.

The costs that come with IT are so huge that the Library is frightened by the figure and the sustainability of these services is seriously threatened. For instance, according to Rosenberg (1998), it was calculated that if the CD-ROM service were to continue at its present level, it would require an annual levy on every student of the equivalent of US\$55, which was not considered feasible given the economic conditions under which most students were living. Given the sorry state of affairs, it is no wonder that the Library has had to heavily depend on donor funding for its survival.

2.2.2 UNIVERSITY OF ZIMBABWE (UZ) LIBRARY

UZ Library started looking at computerization in 1980. The Library started by automating the catalogue of its branch library. The introduction of IT was possible through generous donations from such international organizations as the Anglo American Corporation. The

Anglo American Corporation continues to be in the centre of developments in the Library as evidenced by their donation of Z\$1.5 million of worth of equipment and software in 1996. The provisions for Internet connectivity and the setting up their Web page, was also made possible through Anglo American Corporation. This project, which is still going on, will facilitate the Library catalogue to go online such that our readers and researchers will be able to search the catalogue. All this was facilitated through the purchase of the OPAC (online public access catalogue) system (University of Zimbabwe Library, 2002).

The University of Zimbabwe like many other libraries uses its PCs for desktop publishing of journals and bibliographies such as the Current Health Information Zimbabwe, a quarterly journal, which downloads relevant abstracts from MEDLINE. Rosenberg's 1998 report shows that from two CD-ROM drives in 1990, there were 4 dedicated CD-ROM workstations and 27 CD-ROM drives. All the medical libraries surveyed offer MEDLINE as well as other medical databases. The Medical Library has successful networks with health professional throughout the country.

The Zimbabwe case no doubt show demonstrable benefits that have been brought about through the adoption of IT, especially with the MEDLINE project that has revolutionised the pattern of library use. Undergraduates, postgraduates and academics indicate that they are happy with its services. According to Rosenberg's report, the demand for the MEDLINE service exceeds the capacity of the existing workstations and drives. It is also reports that the MEDLINE service has actually compensated for the declining acquisitions of journals and monographs.

Aside from the benefits, there are additional costs caused by IT whose services do not come free. The maintenance and updating of hardware has presented an ever-present problem for the University of Zimbabwe. Like most libraries, the University of Zimbabwe Library can hardly meet the cost for service contracts, while no money is budgeted for updating technology.

2.2.3 UNIVERSITY OF DAKAR (UD) LIBRARY

The UD's policy of computerization began in 1986. The Library is now relatively well endowed with computer hardware, software and connectivity. At the time of a survey by Diana Rosenberg (1997), the Library had ten PCs, four CD-ROM drives, fax, e-mail and a number of Minitels with online access to remote French databases. Access to ADONIS,

an electronic journal service in the biomedical, pharmaceutical and chemical area, began in 1996, with the aim of improving document delivery and save on future English-language journal subscriptions. More PCs and CD-ROM drives ordered were to be paid for by the University using UNESCO coupons. The Library has its own computer section, headed by a dually qualified computer-librarian. The Chief librarian identified what he termed "professional leap forward" the availability of a qualified person as one of the greatest achievements of the Library, along with recognition of the Library's central role in the university structure.

The main computerization project has been the CANAPE union catalogue of periodical holdings in Senegalese libraries. CANAPE is complete and updated regularly by UD. Within the Library, a number of pilot computerization projects have been successfully executed, with manual systems running parallel.

Full-scale automation of internal systems has not yet taken place, mainly because of lack of appropriate software and shortage of hardware. The Library's e-mail connection is via France's RIO system, but UD has been designated to host the Senegalese notch when it is created.

2.2.4 UNIVERSITY OF BOTSWANA (UB) LIBRARY

Efforts to computerize activities at the UB Library have been pursued since the 1980's. Not much was achieved at the outset due to a number of factors, among which was the absence of local expertise in systems work. The computerization efforts only got off the ground in May 1991 when TINLIB library software was installed. Several automated training programmes have taken place at the Library. In January and February 1991, a familiarization with TINLIB course was run. This exercise involved both senior and para-professional staff. More training took place from 12 June to 2 July 1991. The first part of this training was undertaken at UB Library. Further training was carried out at the Information Management and Engineering (IME) offices in London

The Library is now fully automated. All the library procedures, namely cataloguing, circulation, serials management, and acquisitions are automated. Due to teething problems with TINLIB (Adeniran, 1997), the system was replaced in 2000 by INNOPAC. INNOPAC is an integrated library system, which supports the cataloguing, acquisitions, and serials management and circulations modules. Since the UBL migrated from TINLIB

to INNOPAC, there has not been any major problem encountered with the new system as far as processing is concerned. The system has a capacity of sixty simultaneous users for staff and a limited number of dumb terminals for OPAC.

CD-ROM containing several bibliographic databases in different subjects was introduced in 1992/93 when a CD ROM network, consisting of a CD-ROM server started operating in 1995 (Rosenberg, 1997). The CD-ROM can also be accessed on the university's intranet. The examination questions are also provided online. The Library has full Internet connection with access to various other online databases on the Internet.

The Library has had its own share of problems, especially concerning the recruitment and retention of a system librarian. This problem resulted in the Library not being able to properly articulate its needs at the onset (Adeniran, 1997). The second problem was to do with technical support from the supplier of the TINLIB software, IME, whose response to technical queries from the Library was unsatisfactory. This eventually led to a total breakdown of some of the modules of the library database in 1993/94 (Adeniran, 1997).

2.2.5 THE AMERICAN UNIVERSITY IN CAIRO (AUC) LIBRARY

The AUC Libraries, which include the Main Library, the Rare Books and Special Collections Library, and the Media Services Centre, provide the academic community with the largest English language research collection in Egypt. In addition to the other services, the Libraries also provide access to over 50 electronic databases, many of which contain full-text periodical articles. The Library has a department dedicated to library automation. The Automated Systems department manages the Innovative Interfaces Inc. INNOPAC library system, supports over 150 PCs (both public and staff) and their related peripherals. It also manages a DEC Alpha Server, NT Server, and Sun Server, and provides support to library staff in the use of computer hardware and software. It is responsible for coordinating the purchase, installation, and maintenance of all computers, software, and related equipment in the Main and Rare Books & Special Collections Libraries (The American University in Cairo, 2002).

In essence, the Library Automated Systems Department exists to provide direction and support to the computing needs of the AUC Libraries. In order to facilitate electronic access to its users the Library, its long-range plans, has planned to expand the Library LAN to all computers in the Library.

As technology changes, the library management is committed to maintain currency of computer equipment, wiring, maintenance, and printing supplies to provide the high level of electronic resources needed by students and faculty. As one of the initiatives put in place to sustain its IT resources the Library has planned to work with University planning for the inclusion of the Library as a high priority in the campus master plan. It has also put in place a strategy to allocate and reallocate funds to support hardware and software upgrades in order to provide and support additional information services. The Library has planned to establish a budget strategy for library funding in the electronic environment.

2.2.6 LESSONS LEARNT FROM THE CASE STUDIES

Literature reviewed shows that most of the libraries, apart from the American University in Cairo Library and UBL have not made any practical proposals as to how the considerable maintenance and development costs will be met. One of the major challenges facing these libraries, apart from University of Botswana, is how to generate funds in the provision for sustainable information services.

Second, one lesson learnt is that of the University of Dakar Library where recognition of the Library's central role in the university structure has had some positive effect in terms of the seriousness shown to the development in the Library and hence contributed to sustainable IT. The American University in Cairo for instance has planned to work with University planning for the inclusion of the Library as a high priority in the campus master plan. Unlike the case of the University of Dar es Salaam Library, lack of enthusiasm from the university administration may have led to a situation where the Library is constantly dependent on donor. This can be attributed to attitudinal problems on the part of university administration. The administration has had no practical input into the IT developments taking place in the Library.

Third, money is required to maintain and upgrade the equipment and software, pay software license fees, pay for Internet connections etc. The American University in Cairo has come up with a strategy to allocate and reallocate funds to support hardware and software upgrades in order to provide and support additional information services. The Library has planned to establish a budget strategy for library funding in the electronic environment, which will ensure that its IT resources are sustained.

In the case of the University of Zimbabwe where no money is budgeted for upgrading the technology, the capacity of the Library to sustain the IT resources is seriously threatened. If administration does not see the importance of financially supporting these projects, then the libraries will be perpetually dependent on donors for their survival. Introducing fees for the use of these resources has been an alternative to generate funds to maintain IT resources. This venture is not very viable because the students would not be able to afford it. Even if they did, the funds generated would be too little to meet the expense of updating of software and hardware. The only possibility now is to look for more donor funding. This can eventually lead to what is called donor fatigue. It is no doubt that there would be more problems in the future sustainability of these projects unless money is provided to organize properly and support automation.

Fourth, there are very few critical evaluations made of IT projects undertaken in Africa and those that exist according to Rosenberg (1998), are often internal documents and not widely distributed. Therefore, it is difficult to establish what factors lead to success and what should be avoided. The survey reveals that most of the libraries could not even reveal the actual figures for service contracts on hardware or software. Maintenance and updating these technologies, which are changing at a very fast rate, is very expensive and poses a great challenge to university libraries that in most cases do not get the expected support from the government. For a long time computers installed in these libraries have not been evaluated both in terms of the systems and in terms of the library users to see if computerization has had any impact on services provided by the libraries. Without such information, it will be difficult for libraries to convince administration to continue funding these IT projects if they cannot see the benefits accruing from them.

Fifth, the problem of software and hardware not being able to meet the demands of library users needs has had some effect on the success or failure of some IT projects in these case studies. The UB is a case in point, where TINLIB had to be abandoned for another software. Usually this is caused by the lack of expertise that can be able to properly articulate the needs of the Library. Due to lack of proper technical know-how, wrong software can be acquired which will eventually lead to problems such as the system not being able to sustain the number of users like in the case of the TINLIB software. Most libraries apart from the University of Botswana and the University of Dakar, have no permanent computer programmers or systems administrators to help solve certain problems. The case of the Dakar University Library which has its own computer section,

headed by a dually qualified computer-librarian, can be cited as a success story in sustaining IT resources.

Finally, if the stakeholders are not involved from the on-set, it will be difficult to get their full participation in the sustainability of IT since they will not have the sense of ownership of the resources. The example from the University of Dar-es-Salaam attests to that. The students were not too willing to contribute financially towards sustaining IT resources.

Rosenberg (1994) paints a gloomy picture of the African libraries situation in general, when she concludes, "libraries in Africa barely exist anymore. They don't need sustaining, but kick-starting into life again". This brings in the issue of whether it is worthwhile to pursue the feasibility of sustaining IT resource in African libraries or take a different direction all together. It seems most of the writings on Africa "are about planning and proposing, it is rare to find an article that examines an activity that has been taking place over a number of years and assesses its value and contribution" (Rosenberg, 1994).

2.2.7 OTHER INITIATIVES TOWARDS SUSTAINABILITY

According to Newa (1994) including projects in a library's own annual budgets and strongly defending this position at the university's planning and finance committee will help achieve sustainability. An example of a sustained IT is the University of Swaziland Library where the equipment in the Library is still sustained. Largely, because the donors had requested that the beneficiary too gets financially involved in the IT project. The Library was responsible for installing the cabling for the Library network. In addition, PCs, server and other accessories were paid for from the University of Swaziland budget. This gives the institutional management a sense of ownership and therefore a commitment to its success and continued existence and use. Funds for maintenance of the technology and the license for EURICA, the software on which the Library database runs has been provided for in the library budget.

In a study on sustainability of NGO mediated projects in Bangladesh, Buckland (1998) argues that the majority of NGOs have opted for the minimalist notion of participation, seeking beneficiary input and assistance in implementing projects that are largely designed, funded and managed externally. However, this approach has failed to sufficiently mobilize indigenous social and political capital that would build, or re-build, community capacity that ensure sustainability of impact. Another success story is that of

the British Educational Communications and Technology agency (BECTa), a government's lead agency on the use of ICT in education, where as part of their ICT strategic approach on sustainability, the project implementers informed the stakeholders about the ICT financial plan. They made it a point to keep schools informed of available funding and offer them opportunities to discuss alternative forms of funding. BECTa now has a strategic approach to ICT that will be part of the education development plan. BECTa also realized that the key to sustainability was to use the infrastructure that they had developed as shared tools for the county council, which will use it for effective communication. The idea is that if you do things collectively, it becomes more cost effective.

The benefits of IT adoption in libraries will not be guaranteed if no serious attention is given, from the on-set to addressing sustainability. A number of authors such as Rosenberg (1994) and Agha and Akhtar (1992) have addressed the need for sustainability in libraries. Rosenberg (1998) in her research on the current situation and future prospects of nineteen university libraries in twelve African countries wonders what will happen when the aid ceases because no library had made any practical proposals to cover maintenance and development costs. Furthermore, there was the additional problem of a lack of knowledge-able and practically experienced people on the ground. The proceeding section therefore demonstrates the need to pay attention to sustainability issues at all stages of IT adoption and management.

2.3 IMPORTANCE OF SUSTAINABILITY

Although the importance of IT is well recognized in the developing countries, its availability cannot be taken for granted. Despite the benefits that IT has brought about, there have been problems faced by libraries. IT, despite its benefits, causes an additional cost burden on libraries who are already undergoing great cut backs in their budgets. University of Nairobi for example, like many libraries in Africa is faced with the problem of lack of institutional funding (Mutula, 2000).

As mentioned in the preceding section, ICT initiatives in Africa have in most cases been started by donors or international organizations. From available literature, once handed over, these initiatives have not reached reasonable levels of sustainability. Montviloff, (1995) states that, "the application of ITs alone does not automatically provide the whole solution to the library information system problem of improving the content of and access

to information.” Valadez and Bamberger (1994) laments the lack of attention to monitoring sustainability especially in the view of the large numbers of projects that have clearly been unable to continue delivering their intended services over the intended lifetime of the project.

Bamberger and Cheema, (1990) outline a number of consequences that arise due to low priority attached to sustainability as follows:

- a) Increased maintenance cost and rapid deterioration of infrastructure. The lack of routine maintenance procedures makes necessary more emergency maintenance operation when infrastructure has deteriorated to a crisis level. The life of IT, resources for example will be significantly reduced by inadequate maintenance.
- b) Reduction in the level and duration of project benefits. The deterioration of infrastructure such as computer hardware and software often mean that services may cease operation many years before the expiration of their intended life.
- c) Reduced quality of services. Even when services continue to operate, their quality is often affected. The quality of services is often affected by the deterioration in the condition of equipment.
- d) Reduced accessibility of certain groups to project benefits. When the volume of benefits is reduced the flow of benefits to certain groups of beneficiaries may be reduced and in some cases reduce some outreach services to people who may not be considered as critical beneficiaries.
- e) Low priority of long-term institutional development objectives. More critical is the development of long-term strategies that will positively forge a sustainable plan for the use of IT in libraries. African countries therefore need to develop clear strategies for sustainability beyond donor aid. Referring to the importance of reviewing sustainability of any project, Valadez and Bamberger (1994: 184), states, “when sustainability is ignored, the life of roads, schools, irrigation, and similar infrastructure projects is significantly reduced, the quality of services declines, and fewer project staff are assigned to extension and other support services.”

Therefore, indigenous capacity building is vital for this sustainability. Swantz as quoted by Mwinyimbegu (1993) argues that “transfer of technology should develop self-reliance, which means at least a relatively developed capacity to plan, operate, manage, maintain and service specific technology projects; and that in the continuity and culmination of actual transfer of technology there must be an ability to reproduce the particular technological process or operating system.” Therefore, in adopting IT in libraries, serious attention should be given to ensuring that the sustainability of these resources is made a major goal right at implementation.

2.4 SUSTAINABILITY: ITS ORIGINS

If sustainability in IT is so vital as a goal in libraries, some idea of what it is, together with some means of knowing when it has been achieved are necessary (Morse, 2000). Literature provides many definitions of sustainable development or sustainability, which has become one of the buzzwords of the 21st century in the environmental, economic and social circles. The definition of the word has been extended to include all sorts of things that various interest groups find valuable.

Sustainability, which is rooted in environmentalism, has been broadened and has been embraced by an array of economic development policies, projects, and sociological studies. However, the concept of sustainability as we know it emerged in a series of meetings and reports during the 1970s and 1980s. It was first promoted widely with the publication of the *World Conservation Strategy* in 1980 (The Sustainability Report, 2000). In 1987, the UN-sponsored Brundtland Commission released *Our Common Future*, a report that captured widespread concerns about the environment and poverty in many parts of the world. One of the two frequently used definitions in recent years are those in *Our Common Future* which states that “sustainable development is that which meets the needs of the present without compromising the ability of the future generations to meet their own needs.” (The Sustainability Report, 2000). *Caring for the Earth* defines sustainable development as “improving the quality of human life while living the carrying capacity of supporting ecosystems.” (The Sustainability Report, 2000).

Efforts have been made in recent years to clarify the operational meaning of the term. Sustainability of IT resources will be confined to the definition of sustainability in the context of projects as forwarded by OED which defines sustainability as, “the ability of a project to maintain an acceptable level of benefits flow through its economic life.”

"The principle idea of this definition and many other definitions for sustainability is that any project, irrespective of what it is, is designed to produce a continuous flow of benefits or services throughout its intended lifetime" (Bamberger and Cheema, 1990). A 1990 World Bank report quoted by Valadez and Bamberger (1994), reports that sustainability depends on whether a balance can be achieved in the use of the principal forms of capital- namely, human, natural, cultural, institutional, physical and financial. According to Saasa and Carlsson (1996), sustainability entails the project's ability, both real and potential, to realize positive benefits through the use of the most cost-effective, yet socially and politically acceptable, means for an extended period that goes beyond the time major financial, managerial and technical/technological support from sources external to the country is terminated or considerably reduced. Most of these definitions have been met with questions about the measurement of the concept and the translation of the concept into action at different levels of implementation (International Union for Conservation of Nature and Natural Resources, 1995).

Sustainability is a relative term, which must be assessed in terms of a set of indicators which combine different quantitative and qualitative aspects of project performance as shall be discussed in the following section.

2.5 SUSTAINABILITY INDICATORS

The purpose of an indicator according to Hart (2000) is to show how well a system is working. If there is a problem, an indicator can help determine what direction to take to address the issue. Sustainability research intrinsically cuts across traditional boundaries and concerns of disciplines and therefore, development of sustainability indicators is an interdisciplinary endeavour. The challenge of sustainability research is to identify meaningful parameters or indicators, qualitative or quantitative, by which the overall sustainability of IT can be assessed and procedures to allow the gathering of relevant data.

Communities in different parts of the world have attempted to design conceptual frameworks for indicators that would enable them to monitor progress toward community goals. Regardless of the manner in which frameworks of indicators are developed, they have been used for a variety of purposes. These according to Gallopín (1997) include;

- To assess conditions and trends
- To compare across places and situations
- To assess conditions and trends in relation to goals and targets
- To provide early warning information
- To anticipate future conditions and trends.

These theoretical concepts related to indicators and sustainability will influence this study. Some of the more prominent efforts for designing these benchmarks are described below.

Morse (2000), in measuring sustainability gives three groups of sustainability indicators namely, state sustainability indicators, driving force indicators, and response sustainability indicators, depending on what dimension of sustainability is being measured.

First are state sustainability indicators, which describe the state of a variable. For example, one may determine the physical state of IT in a university library.

Then the driving force sustainability indicators, which measure a process or pattern that in turn influences a state of sustainability indicator. State and force indicators are related, but state sustainability indicators alone do not necessarily provide information as to the causes of change. For example, the poor state of IT may be influenced by a number of factors, and information on this required before the actual state can be explained.

Lastly are the response sustainability indicators, which gauge policy options and other responses to change and focuses on what governments and other regulatory bodies do as a response to the first two indicators.

Dahl (1996) on the other hand argues that sustainability is fundamentally a question of balance, maintained over time. It thus cannot easily be scaled and measured, since it is a quality of motion rather than a fixed point. This is why most indicators are in fact measures of unsustainability, of the amount or extent of imbalances. The concept of sustainability, as a process of balance, according to Dahl (1996), can also help to determine the relative weight given to different indicators. In order to express the concept of sustainability without falling into value judgment he produces what he terms 'vector' indicators, showing the direction and speed of movement towards or away from a goal. Similarly, Menou (1993)

argues that the frequent use of the concept 'sustainability' seems to imply that some information projects or activities may not be sustainable. He believes that it is important to examine the conditions for achieving sustainability and the eventual limits of the concept.

On the other hand, Morse (2000) gives a more elaborate approach to measuring sustainability in a technique, which he calls 'Weight Goal Programming' (WGP). The WGP is applied to a set of sustainability indicators developed for a given system. The indicators are listed and for each, a required value is calculated (which is the reference condition). WGP calculates on an aggregation of deviation from what is observed in the system and what is required. The following formula is used to calculate WGP:

$$Z = \sum \alpha X \text{ deviation of observed from the required.}$$

Where α is a weighting factor that reflects the importance of the SI and $\sum$ indicates that the above has to be calculated for all SIs (Sustainability Indicators) and X is the deviation of the observed from the required. The less the deviation, the nearer the value of Z is to zero and the more sustainable the system. Valadez and Bamberger (1994) on the other hand argues that of the various benefits a project is expected to produce, some are easily quantified but others are more difficult to measure because they are of qualitative nature. If a project delivers only some of these benefits, it must be assessed by attaching relative weights.

Another alternative approach for assessing sustainability is the use of Economic Rate of Return (ERR) developed by Operations Evaluation Department, World Bank (OED). This is an approach where comparisons between projects in different sectors, countries or at different times are made. If the re-estimated ERR after the project has been operating for several years is greater than or equal to the ERR at the time the project became operational, project is defined as sustained (Bamberger and Cheema, 1990).

The World Bank looks at sustainability as a multidimensional concept that cannot be assessed in terms of a single variable. The World Bank (1985), as quoted by Valadez and Bamberger (1994), in proposing a sustainability checklist for most of social development projects provides four groups of indicators. Group A consists of five indicators relating to the ability of the project to continue delivering the intended benefits, group B pertains to the maintenance of physical infrastructure and includes the condition of physical

infrastructure. Group C indicators reflect the long-term institutional capacity of the executing agencies to sustain the project, while group D indicators reflect the support from key stakeholders, as shown in appendix I.

The twenty indicators can be converted into simple sustainability index. A five-point rating scale (1=very poor; 2=poor; 3=average; 4=good; and 5= very good) is used to assess the degree of sustainability of the project in terms of each indicator (Valadez, 1994). The five ratings are accumulated as one moves from the lowest scale with five points to the highest, with twenty-five points. The ratings of each item are added to calculate a sustainability score for the project. The maximum and minimum scores for each component are shown:

Table 2.1 Sustainability index ratings

	Minimum	Maximum
Continued delivery of services and benefits	5	25
Maintenance of physical infrastructure	5	25
Long-term institutional capacity	5	25
Political support	5	25

The index however has some potential problems with which it is associated. For instance, there is the issue of subjectivity. The ratings of each indicator are based on personal judgment of the researcher, which reflects on reliability (Bamberger and Cheema, 1990). Another weakness is validity. Are the scores valid in representing the issues being studied? What does it mean for example, to say that a 60% rate was given to the first category of indicators. According to Bamberger and Cheema (1990), once the index has been applied to a number of projects it becomes impossible to compare a particular project with scores obtained on other similar projects.

On the other hand, the World Bank indicator proves better assessment as compared to the others since it looks at sustainability as a multidimensional concept that cannot be assessed in terms of a single variable as will be discussed in the following section. Used with other analytical tools the weaknesses can be overcome. Furthermore, it appears to interpret sustainability in a manner that is meaningful to stakeholders.

2.6 FACTORS AFFECTING SUSTAINABILITY OF IT

This section examines the major factors that are necessary for sustaining IT adoption in academic libraries. The idea is to come up with strategies that will reverse the negative effects of these factors. The factors will provide this study with key issues and parameters upon which to base the investigation on the sustainability of IT in libraries. These would help in fine-tuning the research instruments on key factor affecting sustainability. Literature shows that for IT in libraries to be sustainable in the long run, it would depend on the following factors:

2.6.1 POLICY FACTORS

This subsection emphasizes the importance and likely implication of the lack of policies on the sustainability of IT. There is need to put in place an effective information policy that will ensure effective planning of information systems. Policies provide the standards, which helps to guide the consistency and sustainable implementation of information programmes (Montviloff, 1995).

a. National

Some authors believe many problems of library and information services in developing countries probably stem from management and policy issues. A national informational policy helps determine the availability of funds, how funds are to be allocated and spent. According to Agha and Akhtar (1992), the sustainability of information systems in developing countries depends on the success one has in promoting national information agendas that are necessary for local support and which in turn enhance sustainability. "A national information policy must facilitate the formation of a country's knowledge and information base and use by fostering and sustaining, by appropriate means, information activities within the country" (Mwinyimbegu, 1993).

According to Montviloff (1995), as a result of lack of IT and national policies and the consistent reliance of foreign aid in developing countries, the implementation of information systems is based on limited vision, with no overall strategic plan and no coherent legislative framework that could provide sustainability and create a solid foundation for their harmonious development. The lack of adequate policies to govern the procurement and process of information related technology make sustainability unachievable.

b. Donor

There is need for donor policies that will be appropriately tuned towards sustainability. One of the greatest problems advanced in literature is the lack of information policies on the part of the funding agencies. Menou, (1993) argues that donors seem to rely on rules of the thumb in choosing objectives and priorities for information projects. According to Valadez and Bamberger (1994: 426), donor aid normally covers only the implementation phase of a project and do not continue during project operation. Thus, no attempt is made to assess sustainability.

Furthermore, there is the issue of conditions prescribed by donor agencies on recipient organisations. As Adeyemi (1983) observes with reference to conditions prescribed by donor support, the question of transfer of technology vis-a vis appropriate technology or the development of indigenous technology as a major step towards self-reliance in developing countries needs redress. Priestly (1997) reveals that during the 1970s and 1980s and to some extent 1990s much of the disbursement of bilateral agency funds was 'tied aid' in that the recipient's choice was limited to purchase of items only through the funding country. This is criticized by many authors who view this type of aid as only a method to increase the commercial impact of the aid programmes. They argue that the most effective way to give aid is through untied programme support. However, Svensson (1997) suggests that in principle, conditionality could partly solve the problem of sustainability, but this requires strong commitment ability by the donor, without which there will be low effort on the part of the recipient government to alleviate the problem.

2.6.2 INSTITUTIONAL FACTORS

There are several institutional factors that will have an effect on the sustainability of IT in academic libraries. First, the lack of establishment of user needs assessment and satisfaction in relation to the introduced technology is likely to have an effect on sustainability of the technology. There is need to establish the existence of effective demand on the part of the recipient of the intended technology.

Second, the need and importance of involving recipients in the design, formulation, planning and implementation of IT projects in libraries in order to accommodate their needs and raise the management capacity necessary for the future sustainability of such projects. Community responses to the project, assessments of community needs, the efficacy of different service delivery systems, and the short- and long-term effects of the

provision of certain service, will have an effect on the sustainability of IT. If little attention is given to the institutional arrangements needed to give beneficiaries a role in the planning and implementation of the project, there will be no commitment from the beneficiaries to the sustainability of the service. Studies (Adams and Rietbergen-McCracken, 1994) indicate that the potential benefits of increased commitment by stakeholder participation include an increased commitment by stakeholders to policies and projects, a willingness to share the costs and an interest in sustaining the benefits, and a check on the relevance. For instance, the network project at the University of Ghana, Balme Library that is under DANNIDA funding, demonstrates the importance of involving the stakeholders in the implementation of the project, whose funding comes to an end in December 2001 (Martey, 2001).

Third, the availability of good and effective management, which in turn has to be a result of, specialized training in technical skills. Agha and Akthar (1992) believe that in order to understand this issue of sustainability, one needs to look at factors that govern strategic thinking and managerial action of Africa's university libraries and their effort on sustainability of Information technology resources. The lack of effective management of IT and use will lead to the absence of a viable implementation framework supported by the necessary managerial and technical expertise.

Fourth, poor recognition by government and institutional leaders of the importance of information and the central role the library plays in the institution will indirectly lead to inadequate provision of needed investment and financial support to information systems hence their non-sustainability. In Africa, a number of decision makers in government and other public institutions do not appreciate the importance of information. Since government, through the university administration, is the prime mover of any academic library, "its support or apathy over the library development will chart a path for the library, for better or for worse" (Nwalo, 2000).

Fifth, institutional cost recovery/cost sharing mechanisms will affect the sustainability of IT. The inability to ensure the existence of the project's own source of financial support can negatively affect its sustainability. Rosenberg (1997) feels that demanding a contribution or at least the very least a commitment from the university to sustain benefits seems not a feasible proposition due to the fact that the overall budgets of the universities have declined. Kanamugire, (1993) argues however, that libraries without adequate financial

resources cannot purchase equipment such as photocopiers, computer hardware and software or ensure their sustainability.

2.6'3 ECONOMIC AND FINANCIAL FACTORS

Mwinyimbegu (1993) cites the lack of finance as the most acute obstacle to sustainability. According to Lishan (1995), "technical plans should be planned on available financial resources". Agha and Akhtar, (1992) emphasize, "in order to better appreciate the issue of the sustainability of information systems in developing countries, it is necessary to understand the general socio-political and economic context in which these systems operate." Apart from catering for the basic needs of the population, appropriate allocations need to be made to infrastructural, scientific, agricultural, industrial and commercial development. Hence, lack of attention to sustainability efforts. Contrary to popular belief, most decision-makers in developing countries, and the population at large, understand the importance of accessing and managing information and knowledge (Menou, 1993); however, when resources are scarce, choices between infrastructure and serving the poor are often in favour of the former.

"If the primary function of a project is to achieve precisely defined economic objectives, the emphasis will be on speedy and cost-effective implementation, and not on institutional development or the creation of structures that can ensure the project will continue operating" (Valadez and Bamberger, 1994). Therefore, the projects will tend to be of ad hoc nature with no provision for long-term sustainability.

Another factor that will have an effect of sustainability is the inclusion or lack thereof, of IT as a line item in subsequent library annual budgets. This means there will be continuity within the stable source of funding for IT. The parent bodies of libraries, whether government or institutions like universities, are not willing to allocate a portion of their expenditure for the purchase of library materials and equipment.

Dependency on donor aid too has an effect on sustainability. One of the main drawbacks with donor aid is the lack of sustainability and tendencies to create dependency. Referring to this problem, James (1993) argues that many countries are comparatively generous in sending funds, providing training and supplying equipment; but there can still be an element of cultural, technological or economic imperialism at least underlying some of these efforts. Such dependency, Lishan (1995) argues, "limits the type and scope of use

of the equipment and is frequently controlled by consultants preaching their own approaches." Mwinyimbegu (1993) too confirms this when he asserts that the aim is always to make transferred technologies remain dependent on the countries of origin for spares, known-how and other intermediaries. Saasa and Carlsson (1993) add that the aid relation is particularly conflict prone since it involves a relationship between unequal partners. "One party possesses a lot of resources while the other has very few and to a large extent, actually depends on the stronger for its operations" (Saasa and Carlsson, 1993: 22).

2.6.4 TECHNICAL FACTORS

Many sustainability problems have been traced to procurement. Delays in obtaining equipment, approving contractors and so on can lead to implementation delays (Valadez and Bamberger, 1994). Bamberger and Cheema (1990) gives procurement as one of the serious problems faced by a Bangladesh rural development project where the very precise and inflexible procurement procedures made it difficult to change specifications when it became apparent that a particular kind of equipment was no longer appropriate. London (1993), in a study of a Trinidad and Tobago Third Education Project attributed its failure to the principle of planning and implementation that were engaged.

If too ambitious targets are chosen, and even if a good start is made, its scope of effort is apt to be squeezed or everything reduced, after some time, due to a limitation in human resources and budget". (Nakamura, 1983: 273). The case of the first integrated rural development in Bangladesh, serve to illustrate what could have been over ambitious targets. The number of components should have been reduced as to simplify organization and coordination and ensure sustainability (Bamberger and Cheema, 1990). The problems experienced by an Educational project in Trinidad, as assessed by London (1993), was saddled with some additional tasks too cumbersome for the Unit's already limited human and technical resources. He calls this 'project overload'. This inevitably had an effect of the project's ability to sustain itself.

Issues concerning, who oversees a project can also affect sustainability of a project. Valadez and Bamberger (1994) argues that because high priority is given to project implementation, a special management team will be given the responsibility to oversee and speed up the implementation, but will be disbanded soon after the project has been

implemented. Therefore, there will not be adequate organizational arrangements made for the period of the project operation.

Lack of trained technical staff is often cited as one of the major constraints on achieving sustainability. The very nature of technology projects requires that end users have quick and dependable access to technical staff that can provide ongoing training, maintain the equipment, resolve problems, and identify new and useful products. In today's economy, technology projects are vulnerable to losing their technical staff to organizations that offer higher benefits. Staff turnover can cripple a project's ability to keep pace with end users' demands. In a Water Supply and Sanitation Programme in Zambia it was felt that "the programme's achievement in localizing human resources, would make the complete withdrawal of funding less disruptive of the ongoing activities"(Saasa and Carlsson, 1996:102) to ensure its sustainability. The lack of technical expertise, according to Mwinyimbegu (1993), may mean misuse, damage or under utilized technology. The importance of trained information staff cannot be overemphasized in research systems in developing countries to make effective use of their information resources and be able to build a capacity for sustainability of IT (Thompson, 1993).

Finally, technological obsolescence is another factor that has an effect on sustainability of IT in libraries. Computer hardware capabilities continue to escalate at an amazing pace, which drives demand for faster, more robust services. All too soon, the state-of-the-art equipment purchased two or three years ago cannot meet libraries' internal needs or users' expectations. How long a library is expected to be content with its new system before changes in computer technology and functionality will render it "obsolete" is a constant source of concern to libraries that are financially constrained.

The rush to adopt information technology has been so sudden that university libraries in developing countries, that do not want to lag behind in the technological advancements, have barely had time to work out how they can consider the questions necessary to ensure the durability of the present installed technology. Nor have they had time to reflect on the stability and durability of the hardware and software. According to Mutula (2000: 321), "many university libraries in the region rely on donated foreign equipment, which is old." As newer technologies appear, older ones cease to be used. Newer versions of software constantly render older versions obsolete and the hardware required by this software also changes over time. Old PCs do not have the processing speed, memory or

storage capacity to run current operating systems. Normally a life cycle of five years is considered acceptable for computer system before some significant upgrade or replacement is necessary. According to Technology Recycling [online], "the design and architecture of old computers makes economical conversion impossible". For example, a pre-Pentium computer cannot run software programs made for Windows '95, '98, NT and 2000.

In Africa many libraries have received donated computers, which after a few years of operation need to be replaced because they have outlived their life span. In a situation where financial resources are limited, this problem is a constant concern for most university libraries in Africa. The increasing rate of technological obsolescence, plus the many "heritage" computers made inoperative by Y2K are piling up in the libraries. It makes sad reading to note, "most computers are sold overseas based on their weight, not on their capabilities. The industrialized countries of the United Nations have overruled the wishes of Third World countries by forcing them to accept their solid and hazardous wastes (including computers and monitors from the US) against their express wishes" (Technology Recycling, [online]). Due to limited financial resources, the libraries are forced to keep maintaining the obsolete equipment in order to meet the expectations of their clients. Maintenance costs rise with the age of the equipment and manufacturers drop maintenance contracts in the fifth or sixth year of a products life leaving us with the expensive proposition of paying for repairs on a time and material basis (Elmwood Park Primary School, 2002).

While maintaining obsolete technologies might be the only option in limited circumstances, because of the associated need to keep every version of every piece of software and hardware, operating systems and manuals as well as personnel with relevant skills, it is not generally considered to be a feasible alternative (The National Library of Australia's Preserving Access to Digital Information (PADI), [online]). The cost of upgrading just some of the needed components or parts is higher than the price for a new, warranted machine. In cases of libraries that depend on donor assistance, the issue of technological obsolescence is of great concern since as seen elsewhere in the literature, this assistance is of ad hoc nature. This therefore means that after a period of 5 years, which is also normally the length of the support, libraries have had to start looking for further assistance due to help upgrade the technology they inherited from the donors. This therefore means

the libraries are engaged in a vicious cycle of donor dependency to sustain their IT resources.

2.7⁴ SUMMARY

The literature reviewed shows that while IT has been introduced in university libraries in Africa, there are a number of sustainability challenges faced by these libraries that need attention. In reviewing literature, one comes up with a number of challenges faced by libraries and other institutions in sustaining IT.

One of the challenges is the lack of adequate policies to govern the procurement and process of information related technology make sustainability unachievable. One of the greatest problems advanced in literature is the lack of information policies on the part of the funding agencies. The literature shows the likely implication of the lack of policies on the sustainability of IT.

Several institutional factors will have an effect on the sustainability of IT in academic libraries. Firstly, the lack of establishment of user needs assessment and satisfaction in relation to the introduced technology is likely to have an effect on sustainability of the technology. Little attention given to the institutional arrangements needed to give beneficiaries a role in the planning and implementation of the project, will mean that there will be no commitment from the beneficiaries to the sustainability of the service. Literature also reveals that poor recognition by government and institutional leaders of the importance of information and the central role of the library plays in the institution will indirectly lead to inadequate provision of needed investment and financial support to information systems hence their non-sustainability. Many libraries are unable to ensure the existence of the project's own source of financial support hence negatively affecting its sustainability.

The lack of finance is one of the most acute obstacles to sustainability. Due to the fact that resources are scarce, priorities have to be set and libraries have often been pushed to the peripheral. The lack of support from the parent institutions therefore, leads to Libraries being dependent on donor funding for their survival. Dependency on donor aid too has an effect on sustainability. One of the main drawbacks with donor aid is the lack of sustainability and tendencies to create dependency.

Finally, lack of trained technical staff is often cited as one of the major constraints on achieving sustainability. In today's economy, technology projects are vulnerable to losing their technical staff to organizations that offer higher benefits. If too ambitious targets are chosen, and even if a good start is made, its scope of effort is apt to be squeezed or everything reduced, after some time, due to a limitation in human resources and budget. Technological obsolescence continues to be a constant problem in many African university libraries that have to depend on donations to survive.

The implicit objective of this study was to come up with a set of indicators that will be understood by the people who play a vital role in use and sustainability of IT in libraries and can see how their own activities and decisions can influence the trends illustrated by the indicators. The challenge was to identify meaningful parameters or indicators, qualitative or quantitative, by which the overall sustainability of IT can be assessed and procedures to allow the gathering of relevant data. In other words, operationalising and quantifying sustainability is of foremost importance. While different organization may share similar approaches towards sustainability, each community will have its own priorities among a set of common goals. Serious efforts have been made to construct relevant and usable tools for measuring the rate and direction of change towards an institution's goals.

While there are different indicators given for measuring sustainability, some have deficiencies that make them unsuitable for use in this study. The sustainability indicators given by Morse (2000) tend to be one-dimensional where sustainability is measured in terms of a single variable; state alone, driving force or response without considering relationships between these factors. While the OED's economic rate of return is convenient comparison of project in the same sector, it suffers from a number of limitations, which can make it unreliable or misleading indicator of sustainability. The method requires that all benefits be assigned a monetary value. It is difficult to monetize benefits such as increased access to quality information or satisfaction with an IT related service provided in a library. Moreover the ERR approach tends to be more biased towards the field of economics and therefore would be quite difficult to use in other disciplines like social development disciplines like information.

For the purpose of this study, the framework from the World Bank was chosen over others since it depicts the elements that comprise sustainability and relationships between them. First, it can be used in the assessment of most kinds of social development projects, in

this case Information Technology. It appears to interpret sustainability in a manner that is meaningful to stakeholders. It does this by addressing sustainability not only as a state of maintaining conditions necessary but also as a complex of activities and processes that challenge the ability of an institution to adapt to dynamic internal and external conditions. The World Bank index is a goal-based framework, which permits the evaluation of whether indicators are showing movement towards or away from sustainability. Sustainability is a relative concept, which must be accessed in terms of a set of indicators, which combine different quantitative and qualitative aspects of performance of IT adoption. In fact, literature indicates that one cannot define sustainability without outlining indicators of sustainability. The study, in using the World Bank Indicators was able to identify the various factors that will have an effect on sustainability of IT in the UNZA Library, thereby finding strategies that will reverse the negative effects of these factors.

METHODOLOGY

3.0 INTRODUCTION

Powell (1997: 239) refers to research methodology as “the strategies surrounding the use of multiple methods of data collection as required by different types of attempts to achieve higher degrees of reliability and validity.” The purpose therefore is to use multiple methods that will enable the researcher to come up with results that will be as valid and as reliable as possible. In discussing the research design, this chapter outlines the instruments that were used to collect data, and discusses the population and sample of the study. The administration of the research instruments is presented after which methods of data analysis are finally discussed.

3.1 RESEARCH DESIGN

“A research design is the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately to its conclusions.” (Yin, 1989: 28) In this study, the researcher was primarily interested in examining the extent to which the UNZA Library is addressing the IT sustainability challenges, with the objective of establishing a feasible IT sustainability model of approach that can be adopted by the Library. The researcher began by reviewing literature to determine what prior studies have been conducted on this issue and uses the literature to define the research questions. In trying to place this work in perspective of the studies of others, such as that of Katundu (1998) and Rosenberg (1997), this study is intended to contribute to such studies and bring more awareness of the need to address the issue of sustainability.

According to Valadez and Bamberger (1994), there are two main types of sustainability studies. The first one is an in-depth study of the current sustainability of a single project (case study). Its purpose is to identify factors likely to affect future sustainability and to ensure corrective measures are taken to keep services flowing to the intended population. The second is a comparative analysis, which draws some general lessons from different

projects (multiple case study) that can be used to improve the sustainability of future projects. For the purpose of this study lessons have been drawn from the 5 case studies of IT projects in university libraries discussed in the review of literature in order to make a comparative analysis of the study.

Case study research, according to Denscombe (1998: 39) is beneficial in that "the focus on one or a few instances allows the researcher to deal with the subtleties and intricacies of complex social situations." According to him, the case study research enables the researcher to deal with relationships and social processes in a way that is denied to the survey approach. The disadvantages associated with case study approach are the possibility of bias on the researcher whose experience and background can influence data collection, which in turn may limit validity of findings and its incapability to provide a generalizing conclusion. Another disadvantage advanced by Denscombe (1998: 40) is that because "the case study tends to involve protracted involvement over a period of time, there is a possibility that the presence of research can lead to the 'observer effect'. Those being researched on might behave differently from normally due to the fact that they are being observed." Furthermore, negotiating access to a case study setting can be a demanding part of the research process, where research can flounder if permission is withheld.

The researcher selected the case study methodology so as to maximize what could be learnt, in the period of time available for the study. One of the greatest advantages of a case study method is that it allows the researcher to concentrate on a specific instance, (in this case the University of Zambia Library) or situation and to identify, or attempt to identify the various interactive processes at work (Bell, 1999). These processes could be peculiar to a particular case under investigation. While quantitative research methods are suited for identifying general trends in populations, the case study method is ideally suited to investigate outliers and other unusual phenomena. While the quantitative research methods are difficult to change when they are set in motion, a case study researcher can change the case on which the study will focus, adopt new data-collection methods or frame new research question as they get an insight into a particular phenomenon.

This study, therefore, concentrated on UNZA Library as the primary unit of analysis in order to maximize on the experience of this library and its users and thus to focus on the real situation. Multiple sources of data such as document review of institutional reports,

minutes, newsletters, etc, and semi-structured interviews with key stakeholders were used. To remedy the weakness of bias and difficulty in generalization associated with the case study approach, the researcher also surveyed all the professional library staff, academic members of staff and students using a questionnaire as the third data-gathering tool. An additional benefit of the use of multiple research instruments is the opportunity it affords for "triangulation" of the collected data in order to test validity. The survey, which was cross-sectional, was therefore, able to help the researcher generalize the findings to the entire institution.

3.2 POPULATION OF THE STUDY

The stakeholders in this study included all the people who are in some way or another affected by the use and sustainability of IT in the UNZA Library. The researcher identified the following stakeholders:

- ☐ Library Staff
- ☐ Students
- ☐ Academic members of staff
- ☐ University management
- ☐ Computer centre management
- ☐ Donor representatives

The above list therefore constituted the population of the study. The other users such as the external users and other staff of the university were excluded due to time limitations and the fact that they were the minority group of users of the Library. According to the UNZA 2000 Annual Report, the university has a total of 5,000 (undergraduate and postgraduate) students, 389 academic members of staff. Due to limited resources, only the Library was used as the unit of analysis. The Library has a staffing capacity of 73, out of which 4 are Librarians (excluding the Chief Librarian) with a minimum of a Masters degree and 10 are Assistant Librarians with a minimum of a Bachelor of Arts Degree. In order to determine the population of the study, the following sampling frames were used:

- ☐ The Registrar's office for the staffing levels at UNZA.
- ☐ The Computer centre students' records.
- ☐ The UNZA departmental web pages for lists of members of staff.

3.3 SAMPLING METHOD

A sample is defined by Reaves (1992: 94) as "the smaller group of examples chosen from the population that you actually measure." A census of the 13 senior library staff (all the staff with a bachelors degree and above) from the Main Library and its two branch libraries was taken. The researcher used purposive sampling to select one member from administration, the Director of the Computer Centre and the representative of the main donor agency, FINNIDA. The students were stratified according to their different schools and programmes, out of which a sample of 200 was proportionately picked. 191 Lecturers were randomly sampled using the stratified sampling technique where proportionate samples of lecturers were picked from each department. Stratification was chosen because it is more efficient in UNZA case where the strata are heterogeneous and therefore helped to select the proper proportions of different types of elements in the population of study.

3.4 DATA COLLECTION INSTRUMENTS

In order to establish internal validity, the study used multiple sources of evidence. The data collection instruments used in this study, included questionnaires, interviews, and documentary evidence and, to a small extent, observation. The data collection was triangulated so that different instruments were able to overcome weaknesses inherent in some methods. One of the strategies chosen for collection of data was that of structured questionnaires which, was used to collect data from larger numbers of respondents. Documentary evidence was also reviewed. This involved evidence from such documents as letters, annual reports and memoranda related to the issue of IT and sustainability in the Library. According to Tellis (1997), documents serve to corroborate the evidence from other sources and are also useful for making inferences about events. The interview was also used, to enable the researcher to get enough insight into the phenomenon being studied and avoid the problems the questionnaires are associated with of low response rate and sometimes unreliable and incomplete answers.

The research instruments were deliberately applied in a systematic way, complementing one another in such a way that each would enhance the depth of information gathered. The researcher made personal visits to the institutions for the purpose of interviewing the University Librarian, the Director of the Computer Centre, and also interview representatives of the main donor agencies based at their respective embassies to solicit

information on their policies on aid. The data was collected between February and April 2002.

3.4.1 The questionnaire

Three sets of questionnaires were administered to elicit data from library staff (appendix II) and students (appendix III) and lecturers (appendix IV). The questionnaire was found to be the most speedy and effective way of collecting data from students, lecturers and library staff due their large numbers.

Information obtained from students and lecturers was used to rate the group A sustainability indicators from the World Bank sustainability index (appendix I), dealing with continued delivery of service and benefits. Furthermore, information from lecturers and students was aimed at measuring the context of teaching and research needs and perceptions of the relevance of library IT resources to these needs.

The group B indicators, which deal with issues to do with maintenance of physical infrastructure, were answered by the information obtained from library staff and the computer centre. The questionnaire for librarians was also aimed at eliciting information on the current situation in the libraries mainly focusing on issues pertaining to perceived benefits and problems of IT use.

3.4.2 The Interview schedule

Since the answers from questionnaires are sometimes narrow, the interview was used to supplement and elicit discursive information or allow the interviewees to express and discuss their viewpoints. The interview was aimed at eliciting information from Library management (appendix V), donor representatives (appendix VI), University management (appendix VII) and management of the Computer Centre (appendix VIII). The purpose was to get information related to policy issues and management, which might have an affect on the future sustainability of IT in the Library. The information was used to assess the degree of sustainability of IT in terms of group C and D indicators from the sustainability index, dealing with long-term institutional capacity and support from stakeholders issues respectively.

3.5 DATA ANALYSIS

In order to ensure that the research instruments effectively met all the objectives in the study, a table was designed to graphically show how this could be done. The following table illustrates how the research instruments were designed to meet the objectives of the study:

Table 3.1 Meeting objectives

Objective	Research question	Sustainability indicator
1 – Status of IT	1	B
2 - Sustainability challenges	2, 3, 5, 6, 8	A
3 – Role of stakeholders	4	D
4 – Long-term capacity	7, 8, 9	C
5 - Propose strategies	10	

Table 3.2 Variables to be measured

Variable	Instrument						
	Librarians	Students	Lecturers	Library Mgt.	University Management	C. C.	FINNIDA
1 Status				1, 2			
2 Funding				3, 4, 5, 6, 13, 14, 15	3, 5	1	
3 User satisfaction	5, 6, 7, 8, 9	3, 4, 5, 6, 7, 8, 11	4, 5, 6, 7, 11	9			
4 Involvement			13	10, 11	4	4	
5 Support		13, 14		8, 12	2		
6 Donor strategies	15			24, 25, 26,			1, 2, 3, 4, 5
7 Tech, capacity	11, 12,			16, 17, 18, 19, 20			
8 Use policy	3			7, 22, 23	1	2, 3	
09 Strategies	13, 14, 16			27	6	5	

Table 3.2 above shows how the various instruments met the variables. For instance, questions 1 and 2 from the Librarian's interview provided information on the physical status of IT in the Library.

The type of data collected, determined the methods of data analysis. Both quantitative and qualitative data were translated into numbers using a coding system, which, was developed for the purpose. The data was analysed using descriptive and inferential statistics. Since much of the data collected by the research instruments was open-ended or unstructured, content analysis was used in which the responses (sentences) will be broken up into information (content) bearing units for coding (unit of analysis) and then classified into mutually exclusive categories for subsequent analysis. Through content analysis, it was possible to go through the research questions and interview responses and come up with common themes relating to each of the questions. The different categories corresponded to the four groups of sustainability indicators provided by the World Bank Index. The categorized data was then analysed and presented in form of descriptive statistics. Through the use of various descriptive statistics presentations, including tables and graphs, data was organized into meaningful formats. The values computed were fed into the five-point rating scale from the Sustainability Index in order to assess the degree of sustainability of the IT in UNZA Library in terms of each indicator.

DATA ANALYSIS AND INTERPRETATION

4.0 INTRODUCTION

This chapter presents the findings from the data analysed from the questionnaires distributed to library staff (appendix II), students (appendix III), and lecturers (appendix IV), as well as the interviews with the University Librarian, Director of Computer Centre, and FINNIDA representative. Three types of questionnaires were designed, one for lecturers, one for students and one for librarians. Three different interview schedules were designed for the chief librarian, the director of computer centre and the representative of the main donors of the IT project in the Library. Furthermore, the data collected from the review of documentary evidence has been used to supplement information from questionnaires and interviews. The research instruments were pre-tested before being administered to students, lectures and Library staff. The researcher had initially targeted to include one of the principal officers of the University of Zambia but this proved to be difficult due to their busy schedule. The researcher was able to meet with the FINNIDA local counterpart but the interview was not able to yield satisfactory information especially pertaining to policy issues since the key FINNIDA officials at the Finnish Embassy were no longer in the country.

The aim of the research was to assess the sustainability of Information Technology at the University of Zambia Library. To achieve this, the study sought to find out what mechanisms and conditions are in place in the Library to ensure sustainability of IT. The extent of sustainability is shown by the data collected, which is fed into the World Bank sustainability index, in order to score the sustainability of IT at the UNZA Library.

The data was analysed bearing in mind the objectives of the study and the research questions and the sustainability indicators. The data analysed is presented in form of percentages, which are translated into tables and graphs. Information from the findings are translated and used in the scoring of the sustainability indicators to calculate the average sustainability score for the IT at UNZA Library.

4.1 RESPONDENTS

Questionnaires (Appendix II, Appendix III and Appendix IV) were distributed to Library staff, students and lecturers respectively. The response rate from each of these groups is shown in table 4.1 below.

Table 4.1 Response rate

Respondents	Questionnaires given out	Questionnaires received	Return rate (percentage)
Lecturers	190	108	57%
Students	200	86	43%
Librarians	12	10	83%

From the above table, it can be observed that the response rate from a sample size of 190 lecturers was 57%, while that of students was 43% and librarians 83%. The distribution of respondents as shown by table 4.2 indicates that the respondents were equally distributed to a wide spectrum, which included lecturers in all the schools. The questionnaire was distributed to every department in all the schools. However, the response in some of the schools like Law and Medicine was quite low as can be seen in table 4.2 below.

Table 4.2 Distribution of Lecturers per school.

School	Count	%
Agriculture	11	10.2%
Education	17	15.7%
Engineering/Mechanical	17	15.7%
Humanities and Social Sciences	12	11.1%
Law	1	.9%
Medicine	4	3.7%
Mines	12	11.1%
Natural Sciences	21	19.4%
Veterinary Medicine	13	12.0%
Total	108	100.0%

Out of a sample of 200, only 86 students responded to the questionnaire giving a 43% return rate. The questionnaire for students was equally distributed across all schools and year of study as can be seen in table 4.3 below. The response rate of students was not as good as that of lecturers. Although, the questionnaire is a speedy and effective way of collecting data, a number of factors affect its response rate. For instance, a situation where persons are less opinionated regarding the subject of a questionnaire will be less likely motivated to return the questionnaire (Powell, 1997). In addition, the response rate

will be low in a situation where the respondents become weary of filling in such forms (Rosenberg, 1998). The poor response rate among students in this study could be attributed to the respondents being weary of filling questionnaires from many researches carried out on the student population.

Table 4.3 Distribution of Student respondents

School	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Total
Agriculture		1			1			2
Education	3	3	1	4				11
Engineering		1		2				3
Humanities & Social Sciences	5	3	3	1				12
Law			3	2				5
Medicine		1	3	10	1	4	9	29
Mines				1				1
Natural Sciences	3	2	4	2				11
Post graduate (Dip., Masters, PhD)	5	3	1					9
Veterinary Medicine			1	1	1	1		4
Total	16	14	16	23	3	5	9	86

As for librarians, the sample included all the 4 Librarians and 9 Assistant Librarians distributed in all the sections of the Library and 10 responded to the questionnaire giving a response rate of 83%.

In addition to the questionnaires, out of the four interviews planned only three were successful which included an interview with Library management, the Director of Computer Centre and FINNIDA representative. Efforts to interview UNZA administration were not successful due to the busy schedules of the Vice Chancellor and his deputy.

4.2 PHYSICAL CONDITION OF EQUIPMENT

This sub-section aims at meeting objective number 1 which is *to determine the present physical condition of IT resources in the Library*. Research question 1 was used to meet this objective. The data collected aimed at providing information on the different types of computers, their models/makes, numbers and current physical status. The aim was to establish what plans are in place for hardware and software maintenance and procurement.

4.2.1 STATUS OF IT HARDWARE

The purpose of getting information on the status of IT in the Library was that it would help one to have a clear picture of the physical condition of IT resources in the Library so as to

determine the extent to which the resources have been sustained. Secondly, the information would enable one to ascertain whether the variations in makes of computers would have an effect on their maintenance and sustainability.

4.2.1.1 IT HARDWARE FOR LIBRARIANS

The findings obtained from the interview with Library management and documentary evidence indicate the variations in the makes of computers, printers and other equipment as can be seen in the following tables:

Table 4.4 Computer hardware used by librarians

Make/Model	No. Acquired	Status
AST Bravo LC5100	8	5 defective
Compaq Prolinea	18	8 defective
Compaq Presario	8	All defective

Table 4.4 shows that more than 50% of the equipment is defective. Even though the Computer Centre has carried out some repairs, the condition of the equipment has continued to worsen since they were acquired between 1992 and 1999.

Y2K COMPLIANCE

This study further sought to establish whether the computers at UNZA Library are Y2K compliant. According to (Yumba,1999), "except for some recently acquired computers and accessories, including software, much of the stock in the Library are not Y2K compliant. The UNZA Computer Centre carried out a survey and discovered that 95% of the equipment was not Y2K compliant." This therefore meant that the Library had to look for funds to replace the affected equipment on the system. However, Dynix Library System was Y2K by the time the report was produced.

4.2.1.2 IT FOR LIBRARY USERS

Another aspect this study sought to determine was to what extent the Library was able to maintain its IT services to library users. Due to security reasons, inadequacy and age, the few functional computers are no longer accessible to students and are now located only in the working areas for librarians. Previously some of the computers were located in a

designated area for CD-ROM and Internet searches for library users. This therefore, leaves only dumb terminals for students to use in accessing information from the OPAC. Internet and CD-ROM services have been suspended until such a time that the security situation is improved in the Library. Below is a table showing the dumb terminal acquired and their physical status. This therefore shows that out of the 34 dumb terminals acquired, only 22 are available for use by a student population of over 4,000 giving a ratio of 1 terminal against 182 students.

Table 4.5 Status of Dumb terminals available to students

IT	Number	Status
Wyse 150	26	11 defective
DEC WT 510	8	1 defective

4.2.1.3 OTHER AUXILIARY EQUIPMENT

Table 4.6 indicates the physical condition of the rest of the equipment acquired for the Library, which indicates that more than 50% of the equipment, is no longer functional.

Table 4.6 Other IT and their physical status

Equipment	Make	No.	Condition
Typewriters	Xerox 575	3	2 defective
Photocopiers	Sharp	1	Defective
Scanners	HP Deskscan	1	Defective
Servers	Compaq Proliant 4000	1	Defective
Security gate		1	Defective
Printer	Epson FX 1170 dot Matrix	4	Defective
Printer	Epson LQ 2170 Dot Matrix	2	Defective
Printer	Hewlett Packard Laserjet III	1	Defective
Printer	HP Deskjet 320	1	Defective
Printer	HP Laserjet 4 Plus	2	Defective
Printer	Data Card II printer	2	Good
Printer	Fujitsu DL 1250 Dot Matrix	9	Not used (Ribbon not locally available)
Printer	HP Laserjet 5 MP	1	Perfect
Video players	Philips VCR	1	Working
Fax machines	Panasonic	1	Working
Panaboard	KX8520	1	Working
Light pens		12	Working

4.2.2 SOFTWARE

Assessing the status of IT also involved obtaining information on the operating and application software available in the Library so as to determine the performance of the software in booting and use of computers. The researcher intended to find out what software is installed on computers but actually not used by the users. Table 4.7 below provides a summary of the system software obtained through donor support and how they are used. Due to the fact that most of the computers are no longer accessible to the library users, most of the software is used by librarians to facilitate their work in providing services to library users. Table 4.7 below indicates that Windows for workgroups, which has been updated to Windows 95, 98 and 2000, and Unix are the most used software in the Library. Table 4.7 below further shows an estimate of utilization as indicated by information provided by the systems administrator.

Table 4.7 Operating software

Software	Use
Windows for workgroups	50%
SCO Unix 3.3 (updated to SCO Open Server 5.05)	40%
JSB Multiview	20%

As regards software availability and usage in the Library, table 4.8 shows the software available in the Library, though MS-Word, Word Perfect, and Dynix Library management System were the most used by librarians. This could be attributed to the fact that some of the librarians were not competent enough to use the other software or the software is too outdated due to the fact that the Library has failed to acquire updated versions. Interviews also reveal that the Library has not been able to pay for the user licence for Dynix Library management System, since FINNIDA withdrew its support in 1999. Table 4.8 show the percentage of utilisation of software as revealed by the Chief cataloguer, who is acting as systems administrator.

Table 4.8 Percentage of utilization of application software in the Library

Software	Purpose of use	Utilization(%)
Digicard	ID card production	70%-
Microsoft Excel	Producing Spreadsheets	2%
PC tools	Utilities	0%
Laptop link Pro4	File transfer	1%
Dbase IV	Database management	5%
CD/ISIS and WINISIS	Database management	3%
Microsoft Publisher	Desktop publishing	2%
Omnipage	Scanning	35%
Dynix Library software	Housekeeping,	40%
Infoware CD/HD	Networking	0%
Pegasus	E- communication	2%
Ms Word 6.0, Word Perfect 5.0	Word processing	78%
Internet explorer	Online searches	3%

This study further sought to investigate the purposes for which IT is used in the Library. Table 4.9 below shows the various areas in which the different software are utilised.

Table 4.9 Purposes for which IT is used by librarians

(Percents and totals based on responses, 10 valid cases; 0 missing cases)

	Count	%of responses	% of cases
Word processing	10	19.6	100*
Literature searches	10	19.6	100*
Electronic communication	9	17.6	90
Networking	8	15.7	80
House-keeping	8	15.7	80
Online searches	3	5.9	30
Desktop publishing	3	5.9	30
Total	51	100	510

The multiple response table above shows that 10 (100%) librarians use software for word processing and literature searches as indicated by the asterisk in the table, while 9 (90%) of them indicated that they use the software for electronic communication and word processing. This therefore shows that Ms Word and Dynix are most utilized software.

4.3 FUNDING

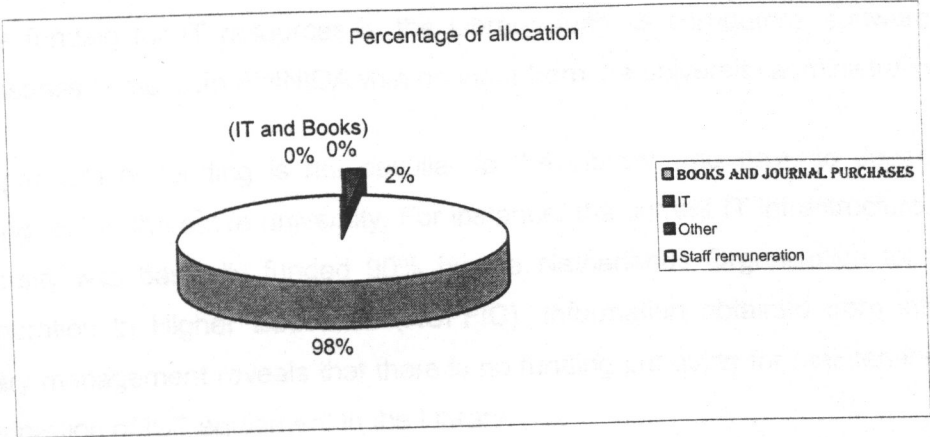
This sub-section aims at partially meeting objective 2, which seeks to assess the range and forms of sustainability challenges faced by the Library. In addition to research question number 2 that looks at funding, this objective is also met by research question

number 3, 5, 6, 8 that examine user satisfaction, support, donor policies and policies on selection and use. The information obtained will be used to score indicator B.

4.3.1 ADEQUACY OF OPERATING BUDGET

One other aspect this study sought to explore was the kind of funding available to UNZA Library. Information obtained from Library management reveals that out of the approved annual budget for the Library, no funds from central administration are allocated to the maintenance or purchase of IT as can be seen in figure 4.1 In fact, 98% is dedicated only to staff remuneration.

Figure 4.1 Annual budget allocations



The amount recommended in the 1999 Systems Technical Appraisal Report by the Library Automation Committee for the purchase of replacement computers in the Library is \$30,000 per year. Asked to comment on whether the budget was enough for IT, the librarian responded that there has been no annual budget for IT. Out of the annual budget of \$100,000 presented to management, only \$ 2,000 is released to meet all the operational needs of the Library including book purchases, which is inadequate. In order to sustain the systems, the Library requires large sums of money. For instance, it is estimated that for the year 2001 alone, the sum of \$54,000 will be needed. According to the Systems Technical Appraisal Report, funds will be needed to meet the requirement as shown in table 4.10 below.

Table 4.10 Funds required for IT

Activity	Funds required (\$)	Funding support
Upgrading Dynix software	20,000.00	UNZA/ Donors
Procurement of 10 replacement PCs	30,000.00	UNZA/ Donors
Procurement of replacement laser printers	12,000.00	UNZA/Donors
Procurement of 4 replacement Dot Matrix printers	2,000.00	UNZA/Donor

The question further sought to find out what sources of funding the Library had in order to establish the stability of such funding. From the responses got, UNZA Library has got no steady source of funding. The budget allocations to the Library are always fluctuating, due to poor funding from the government, which is the main financier of the University. Almost all the funding for IT resources in the Library such as computers, software, and other accessories came from FINNIDA with no input from the university administration.

The problem of funding is not peculiar to the Library who have to depend on donor funding, but to the entire university. For instance, the current IT infrastructure in the entire university was basically funded 90% by the Netherlands Organisation for International Cooperation In Higher Education (NUFFIC). Information obtained from interviews with Library management reveals that there is no funding put aside for maintenance hence the deterioration of ICT equipment in the Library.

4.3.2 INCOME GENERATION

Moreover, this study sought to establish whether the Library is in a position to supplement the budget allocation from central administration to help sustain its IT, through income generation activities. Information obtained from interviews reveals that the Library does generate its own income largely from bindery services, Xerox and ID card production. However, there were no services, which were maintained on cost recovery basis. This, therefore, implies that there is not enough income generated to sustain the IT services. However, the little income generated is used to meet service backup for the maintenance of IT.

Lecturers had a number of suggestions on where they thought IT funding could come from. Apart from the 83.5% who thought funding should be left to institutional funding, 50.5% of the lecturers thought that the Library should engage in some income generation activities to supplement their budget allocations. The lecturers' responses are summed up

in table 4.11 of multiple responses. This means that the lecturers did not feel obliged to give any suggestions to help the Library sustain the IT resources.

Table 4.11 Lecturers' opinion on IT funding

5 missing cases and 103 valid cases

	Count	% of responses	% of cases
Central funding from the university	86	38.1	83.5
Direct payment of services by library users	40	17.7	38.8
Income generation by library	52	23.0	50.5
Donor funding	48	21.2	46.6
Total	226	100	219.4

In the interview, the Computer Centre management felt it was the duty of university to start funding IT by including funds in the budget, so that every year they could buy a number of computers instead of waiting for donor funding.

4.4 USER SATISFACTION

This section aims at partly meeting objective number 2, which looks at the challenges faced by UNZA Library in trying to sustain the IT services to its users. This section mainly answers research question 3 that looks at the level of user satisfaction in relation to the current IT services.

4.4.1 EFFICIENCY OF SERVICE DELIVERY

Another area of this study was to discover the extent to which the Library was efficiently providing IT services to the users. From information obtained on satisfaction, one of the reasons for their dissatisfaction is the poor delivery of service. For instance, 17.6% of lecturers said that they did not use the IT resources in the Library because services elsewhere were better, while one lecturer said that the procedure was too cumbersome and time wasting, while another said the OPAC was not working. Students who do not use IT resources, too gave several reasons which ranged from inadequacy of equipment (15%), to better services elsewhere (9.3%).

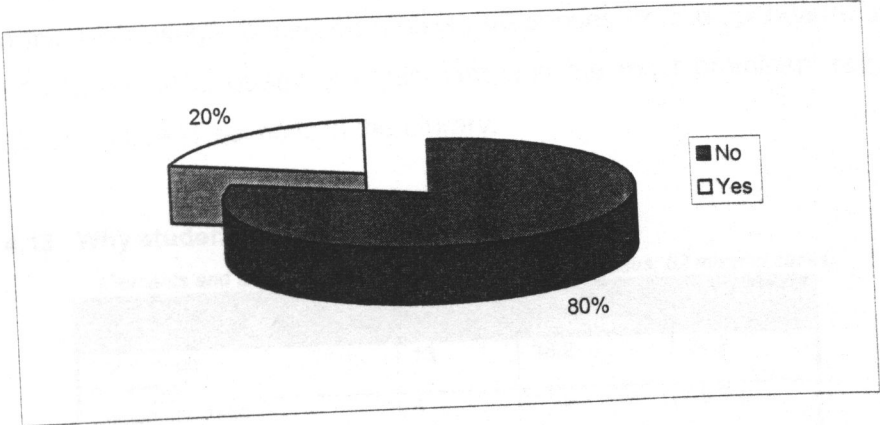
The lecturers' responses on the issue of efficiency of services are given in table 4.12 below.

Table 4.12 Reasons Lecturers give for not using IT in the Library

	Count	Table %
Not enough equipment	25	23.1%
Better services elsewhere	25	23.1%
Not applicable (These use IT)	22	20.4%
Not competent to use equipment	15	13.9%
Equipment is too outdated	11	10.2%
Unaware of their existence	6	5.6%
Tried to in few occasions but not pleased with the results	1	.9%
Procedure is cumbersome, no time	1	.9%
Too far away from the Library	1	.9%
OPAC for example does not work	1	.9%
Total	108	100.0%

As can be seen in figure 4.2 below 80% of the lectures did not use the IT resources in the Library, the reasons being the ones summarised in table 4.12 above.

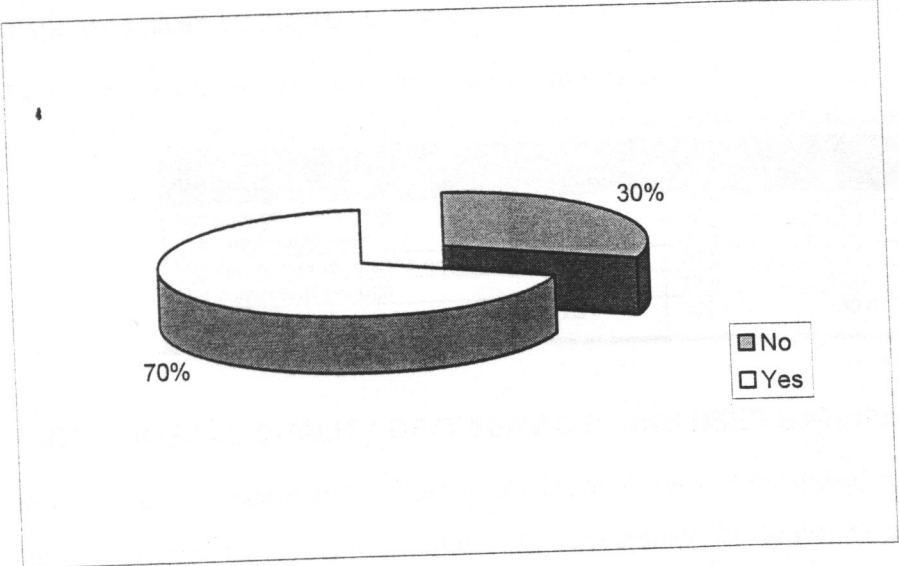
Figure 4.2 Lecturers' use of IT in the Library



From the above table and figure, it is evident that the staff (Lecturers) are dissatisfied with the IT services provided by the Library. If equipment is not enough and outdated, services therefore will not be efficiently delivered to clients.

Of the students who use the Library, 70% said they use the IT services in the Library while 30% said they did not use the IT resources in the Library. The responses from students are given in figure 4.3 below.

Figure 4.3 IT use by Students



These results show that there was high usage of IT by students as compared to lecturers. Despite this high usage, based on multiple responses from respondents as presented in table 4.13 below, inadequacy of equipment was the most prominent reason why some students do not use IT services in the Library.

Table 4.13 Why students do not use IT in the Library

(Percents and totals based on respondents 24 valid cases; 62 missing cases)

	Count	% of responses	% of cases
Not enough equipment	13	38.2	54.2
Equipment is too outdated	4	11.8	16.7
Not competent to use the equipment	9	26.5	37.5
Better services available elsewhere	8	23.5	33.3
Total	34	100	141.7

The study further sought to establish what problems, if any, library staff faced in discharging services to library users. This information was aimed at establishing what effects sustainability challenges had on service provision. Much as 85.7% of the librarians say that the introduction of IT had improved the process of issuing materials to library clients, delivery of these services, they give a number of reasons why it was difficult to continue providing services efficiently as table 4.14 shows. 90% give outdated equipment, while all of them indicated inadequacy of equipment as having had a negative effect on the

effective delivery of service to library users. These percentages are based on multiple responses given by the 10 librarians.

Table 4.14 Problems faced by librarians with use of IT

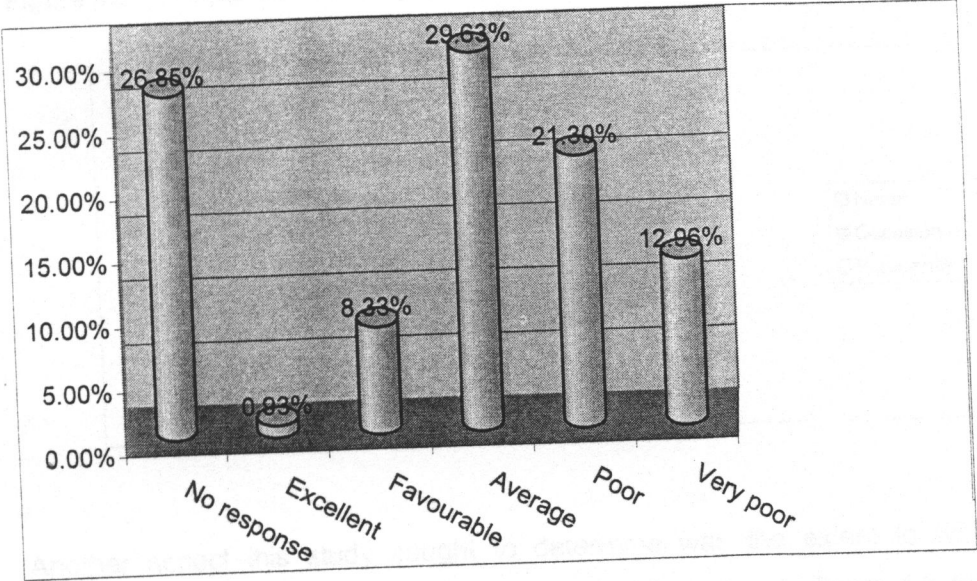
Percents and totals based on respondents (10 valid cases; 0 missing cases)

	Count	% of responses	% of cases
Not enough equipment	10	43.5	100.0
Outdated equipment	9	39.1	90.0
Not competent to use the equipment	9	26.5	37.5
Not competent enough	4	17.4	40.0
Total	23	100	230.0

4.4.1 OVERALL QUALITY OF IT SERVICES AND USER SATISFACTION

In order to help score the sustainability index in terms of quality, the quality of services were assessed in the light of what users' perception of quality of services. The results obtained in this study are presented in figure 4.4 below.

Figure 4.4 Quality of IT services compared with other libraries

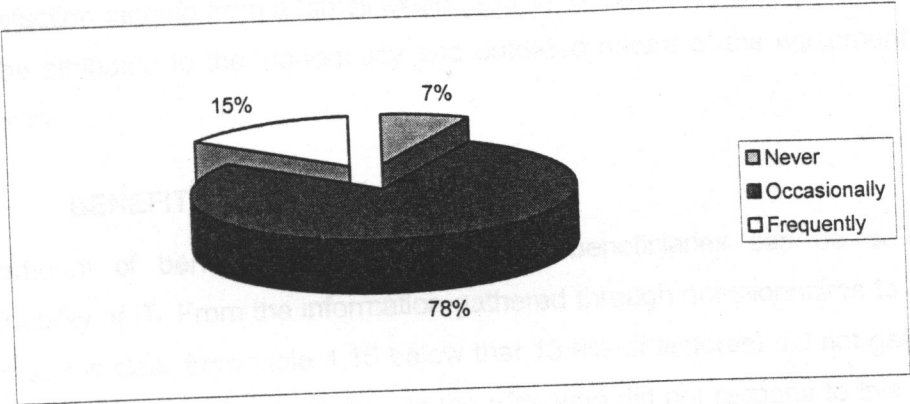


Based on lectures' perception of the IT services at UNZA Library, compared to other libraries, both inside and outside the country, figure 4.4 above indicates that 30 % of the lecturers thought that the quality of IT services at the UNZA Library were average, while 34% thought the services were poor to very poor. 27% of the respondents did not indicate their opinion partly because they did not use the facilities in the Library and could not give an informed opinion concerning the quality of services by UNZA Library.

In order to establish the extent to which the library users were satisfied with the IT services provided by the UNZA Library, lecturers and students where required to answer questions on how satisfied they were. This was verified with the opinion of librarians as to what they thought was the situation with the library users in terms of satisfaction. Figure 4.5 and figure 4.6, below show the responses of both lecturers and students respectively.

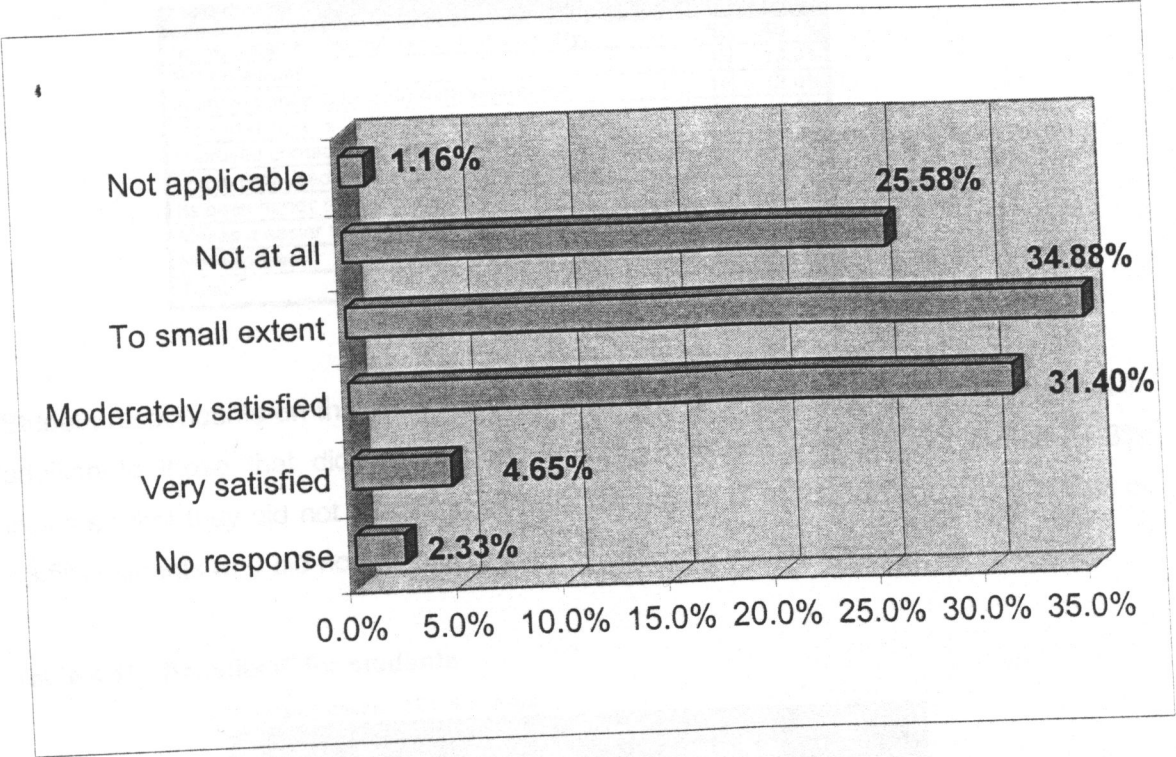
Figure 4.5 shows the frequency of use of the Library by Lecturers, which gives a general picture of dissatisfaction hence low usage of the Library as indicated by Lecturers.

Figure 4.5 Frequency of library use by Lecturers



Another aspect this study sought to determine was the extent to which users were satisfied with the IT services in the Library. Information in figure 4.6 below shows the extent to which students are satisfied with the IT services in the Library.

Figure 4.6 Extent to which students are satisfied with IT services



It is clear that the satisfaction is not favourable since 60% of the respondents express dissatisfaction ranging from a “small extent” (35%) to “not at all” (25%). This dissatisfaction could be attributed to the inadequacy and outdated nature of the equipment provided in the Library.

4.4.2 BENEFITS OF IT

The amount of benefits derived from IT by beneficiaries can be an indicator of sustainability of IT. From the information gathered through questionnaires to students and lecturers, it is clear from table 4.15 below that 13.9% of lecturers did not get any benefits from the IT in the Library in addition to the 52% who did not respond to this question due to the fact that they did not use the IT for various reasons. This therefore shows that a total of 65.9% of the lecturers did not benefit from the IT in the Library.

Table 4.15 Benefits of IT for lecturers

How beneficial	Count	Table %
Not applicable (Did not use IT in the Library)	52	48.1%
Not beneficial	15	13.9%
Improved access to up-to-date information	14	13.0%
Improved access to library information	14	13.0%
Improved contact with peers	3	2.8%
I have only used once and benefit was access	3	2.8%
Its been handy for my students	3	2.8%
Makes it easier to find information source	2	1.9%
No response	2	1.9%
Total	108	100.0%

Student respondents on the other hand as table 4.16 (multiple responses) indicate that in addition to those that did not respond (44.2%) because they did not benefit, 4.3% indicated that they did not benefit at all from the use of IT in the Library, giving a total of 48.5% students who did not benefit.

Table 4.16 Benefits IT for students

24 missing cases; 62 valid cases

	Count	% of responses	% of cases
Better research	32	34.8	51.6
Access to wider up to date infor.	40	43.5	64.5
Better comm. with lecturers	8	8.7	12.9
Communicating with peers	5	5.4	8.1
Locating books	2	2.2	3.2
Entertainment	1	1.1	1.6
Not beneficial	4	4.3	6.5
Total	92	100	148.4

4.5 STAKEHOLDER SUPPORT/INVOLVEMENT

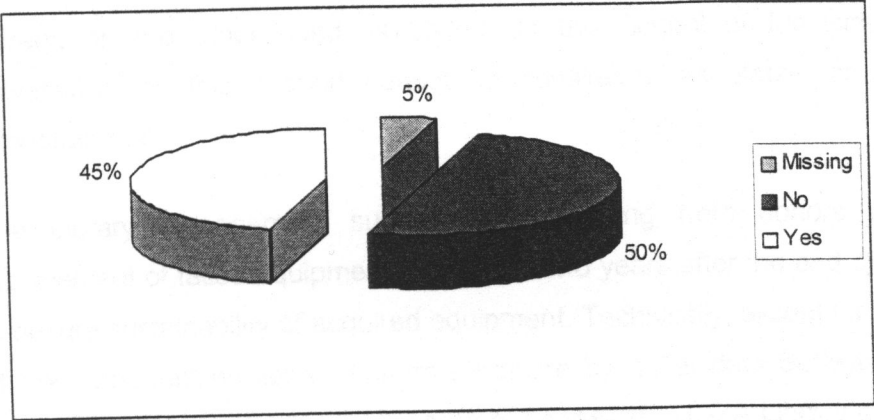
This section answers objective 3, which seeks to examine the role of stakeholders in the computerization of the Library, namely central administration, library users and donors. It also aims to answer the research question, which deals with stakeholder involvement in the project.

4.5.1 SUPPORT FROM BENEFICIARIES

In order for any venture to be successful, it partly depends on how much support it gets from its beneficiaries. The purpose of this question was to establish how much support lecturers and students had towards the IT project in the Library. Opinions were sought from both categories of respondents on how they thought the Library IT would be financed

in order to determine whether they would be willing to contribute to its sustainability. This way the researcher would unearth any other ways the users would be able to support the Library. In table 4.11, only 10% of the lecturers thought they would pay for the services if requested to. On the other hand, 50% of the students were not willing to pay for the IT services, while 45% said they would pay and 4% did not indicate their opinion as can be seen in figure 4.7. Some students said that they would pay for the service only if they saw some improvement in the quality of service.

Figure 4.7 Students willing to pay for IT



4.5.2 INSTITUTIONAL SUPPORT

Yet, another area this study sought to discover was the type of support provided by UNZA in sustaining IT in the Library. This study has established that although university administration is supportive, it is constrained by lack of funding from government. According to interview with Library management, funding from the government was very unsatisfactory even after a condition was given by FINNIDA for government to provide counterpart funding. The lack of support from administration is seen in the fact that there is no concurrent support for additional funding to allow the Library to expand the IT services as evidenced by the poor budget allocations. Another constraint to better support from the institutional management is in the lack of policies to help manage IT.

4.5.3 STABILITY OF SUPPORT FROM DONOR AGENCIES

The 1999 Programme Completion Report (Mwacalimba, 1999) indicates that support from donor agencies has not as stable as expected. Apart from FINNIDA, some to the donor agencies that have supported UNZA Library in IT developments include;

1. SIDA of Sweden
2. DFID of the UK
3. HealthNet of USA

Of all the donors, FINNIDA has been the largest donor to the Library with a longest period of support from 1992 to 1999. In the case of the FINNIDA funded project, the donor decided mid-way through the computerization project that they would withdraw their funding to tertiary institutions in 1999 due to the fact that their emphasis was on Basic education. The Department for International Development (DFID) support to the Medical Library, on the other hand, is based on the School of Medicine linkage with UK universities, so this support cannot be considered as stable, as it is sporadic and uncoordinated.

The Library management suggests that funding from donors should provide for replacement of failed equipment for at least two years after the end of the project in order to ensure sustainability of acquired equipment. Technically, except for the initial installation of the computerized library system hardware by a Facidata Software engineer (Finnish company that supplied the library system hardware), UNZA Library executed its activities using its own personnel with the help of the Computer Centre (Mwacalimba, 1999).

4.5.3.1 DONOR POLICIES

FINNIDA's policy of support to libraries is such that it deals directly with the beneficiary department within institutions. Unfortunately, this policy was not made available to the researcher. All the information was through interviews. According to the Library management, FINNIDA's policy to deal directly with beneficiaries, has enabled UNZA Library to benefit directly from Educational Sector Support Programme (ESSP). To ensure sustainability of IT in the Library and other projects it supported, FINNIDA gave a precondition to government to provide 10% counterpart funding. This is to ensure ownership and commitment. The policy stresses sustainability, ownership and partnership. However due to inadequate information obtained from the donors, one can see an evidence of instability in funding. For instance, FINNIDA was only providing support in short term. There is no provision in the funding, for sustainability of IT in the long run.

According to the interview with the FINNIDA local counterpart, it was the policy of the donor not to impose on what was to be procured by the Library. UNZA Library decided what was to be procured. However, from the interview with the University Librarian and from documentary evidence, this seemed to be a problem as the Programme Completion Report states, "one negative experience we wish could be avoided in future is for the donor not to insist on supplying particular equipment or discouraging the use of local supplier..."

4.6 LONG-TERM INSTITUTIONAL CAPACITY

This sub-section seeks to meet objective 4 which examines the long-term staffing and technical capacity of UNZA Library to sustain the IT resources thereby answer research question number 7, which looks at the technical and staffing capacity of the Library and 9 which looks at policies that govern the selection and procurement procedures. Here issues such as the selection and use policies, as well as competence of staff in the use of IT will be examined.

4.6.1 IT POLICIES

The information obtained here was to answer research question number 8 which seeks to find out if there are any policies that govern the use of IT and as well as research question number 9 which examines the selection policies that ensure the long-term use of IT.

Zambia lacks comprehensive policies on information in general and information communication technologies in particular. According to Simui (2001) in an article she contributed in the UNZA Library newsletter, "efforts towards development of policies on information related fields are fragmented and lack coordination".

Information obtained from interviews with the Computer Centre management revealed that there is a policy on the selection of IT in the university, which states that, for any department to acquire IT, the Computer Centre has to be consulted to give technical advice on what is best and what can be maintained. However, from the researcher's observations, it is obvious that not many departments are aware of its existence or even follow it. The policy has not been implemented since it was drafted in 1994. The number of variations in IT hardware in the university is evidence to this. For instance, the department of Mass Communication has adopted the use of Macintosh computer instead of IBM computer, which makes maintenance a little difficult. Likewise, the Library management

revealed that the Library has its own policy on selection and use of IT. However, this policy was not made available to the research because it could not be located. The terms of reference of this policy are said to be determined by the Library administration itself.

The draft Computer Centre IT policy plan outlines some guidelines on how IT is to be used in the university though there is not much co-ordination from different stakeholders. However, the policy itself is still in a draft form, an indication that the University is operating without an IT policy plan. Therefore, this shows clearly that there is no co-ordination between the Computer Centre and the rest of the departments in the university. This is why each department can come up with its own policy, which does not put into consideration the needs of the rest of the university departments and units. The departments venture into IT related developments, without putting into consideration the impact of such developments to the university network.

4.6.2 TECHNICAL CAPACITY AND STAFF EXPERTISE

The librarians were asked to rate themselves according to how competent they thought they were in use and troubleshooting of IT. All the respondents in the Library said that they had received training in the use of IT and 60% of them rated their competence as very good as shown by table 4.17 below:

Table 4.17 Competence of Librarians in IT use

Librarians' competence in the use of IT	Count	%
Reasonably competent	4	40.0%
Very competent	6	60.0%

According to the information obtained from the interview with library management, the library staff are well versed in IT. All the maintenance work of IT however is not done by the library staff but by the computer centre staff that have the technical know-how for troubleshooting the IT. Only 20% considered themselves technically competent to do some trouble-shooting of IT, while the rest were not competent as table 4.18 below shows.

Table 4.18 Librarians' self assessment in IT troubleshooting

Librarians' self-assessment in troubleshooting	%
Reasonably competent	10.0%
Very competent	10.0%
Not competent	80.0%

The Systems Technical Appraisal Report for 1999 (Yumba, 1999), states that the absence of a qualified systems administrator poses great challenges in sustaining the system. By 1999, the task of hardware and software management was performed by the Library Automation Coordinator with the help of the computer centre. The report recommends that for the library system to function efficiently and effectively there is need for a systems administrator and database administrator who will be answerable to the University Librarian.

4.6.3 MAINTENANCE PROCEDURES

In order to establish what maintenance procedures are in place to ensure sustainability of IT in the Library, questions were posed to the library management and the Computer Centre management who are key informants in the matter. According to the library management, occasionally the Computer Centre does some software upgrades. The University Librarian emphasises the importance of maintenance procedures when he states, "otherwise, we need to set up proper hardware maintenance procedures once we engage our own computer expert in the Library". The interview with the Director of Computer Centre confirms that the Computer Centre supports the Library in terms of maintenance work, which of course is only in terms of software upgrades as stated by the Librarian.

According to the UNZA Computer Centre ICT policy plan (which is still in draft form), the maintenance policy is yet to be finalised. Information obtained from other documentary evidence particularly the Library Automation System Technical Appraisal of 1999 (Yumba, 1999: p 11), whose aim was to appraise the equipment and software donated to the Library by FINNIDA from 1992 to 1999 with a view to indicate their status, indicate that there is no policy on preventive maintenance of the entire university IT equipment. This has adversely affected the efficient functioning and life span of computers and other accessories. Information from the Programme Completion Report (PCR) of 1999

(Mwacalimba, 1999), reveals that the Library experienced some difficulties with the donor insisting on supplying particular equipment or discouraging the use of local suppliers who can provide back-up service and, whenever appropriate, facilitate warranty claims when defects are detected in some of the equipment installed. The reason advanced by the donor for insisting on dealing with a Finnish supplier was that it would be easier and cheaper for them to use their local (i.e. Finnish) supplier from whom they could procure equipment using an LPO (local purchase order).

According to the PCR (Mwacalimba, 1999), the lack of provision for equipment maintenance during the lifetime of the project, has caused the Library to be faced with a situation where more than half of the PCs and monitors procured in the late 1994 have stopped functioning. Furthermore, none of the Fujitsu DL 1250 dot matrix printers are usable because there are no local suppliers for the consumables used by these printers.

4.6.4 STABILITY OF STAFFING

Staffing at UNZA Library is one of the problems sighted from interviews with library management, attributing the high staff turn over to the institution's uncompetitive conditions of service. Makwakwa (2001) reports that from an establishment of 141, only 91 positions are filled, leaving a shortfall of 50. 18 of these are on temporary contracts. The majority of these vacant slots, most of which are for senior positions, have not been filled for a long time due to difficulties in recruitment and retaining staff at high levels. For instance, the Library Automation Coordinator who was helping in the management of hardware and software in the Library had to leave the university for a more lucrative position elsewhere. The Library has experienced difficulties in retaining staff in recent years as the number of cases of staff leaving for greener pastures has continued to increase. At least one professional librarian leaves the institution each year. The table below gives a picture of the problem of staff turnover in the Library for the past 12 months:

Table 4.19 Staff turnover in UNZA Library in 2001

Cause	No.
Resignation	5
Retirement	3
Transfer	2
Dismissal	1
Death	1
Total	12

The staffing situation was perhaps best summarised by Makwakwa (2001), when he states, “the staffing situation in the Library has reached a very critical level, which might lead to a crisis if not urgently attended to. With such poor staffing it is difficult for the Library to provide quality services to our readers”.

4.6 SUGGESTIONS FOR SUSTAINABILITY FROM USERS

From interviews and questionnaire responses, it became evident that they are very interested in sustaining the IT system. Some of the strategies suggested by the respondents for sustaining the system include:

- ❑ Operational agreements with much wealthier Universities.
- ❑ Introduce minimal charges that are not prohibitive to frequent users of IT.
- ❑ Acquiring more hard and software which will be used in carrying out/conducting public workshops
- ❑ The University administration must address itself to issues of university development. Sustainability would only be ensured if there is commitment from the university central administration and government.
- ❑ Upgrading current computers to meet requirements of software.
- ❑ Should not rely on donors. We can sustain these IT through government intervention.
- ❑ Subscribe to online journals and increase the number of computers.
- ❑ CD-ROM software should be made available on all computers in the university in order for the CD-ROM services to be accessed anywhere in the university.
- ❑ Increase funding to buy/replace outdated equipment.
- ❑ Employ enough qualified library staff capable of managing IT. Capacity building/better planning.

- ❑ The library staff should work with lecturers to improve the service.
- ❑ Begin by finding more resources and a competent management. The Library needs well-trained computer technicians
- ❑ Partial commercialisation user-fees on patrons/clients. Subcontract the running of IT to private firms. Open IT facilities in faculties/departments to outsiders
- ❑ Servicing of the machines like computers on regular basis.
- ❑ Create awareness among the staff and students about the benefits of IT. Firstly, there should be training on the use of IT.
- ❑ To install C Compiler into many PCS
- ❑ Update the storage/search capacity of current system.
- ❑ Establish separate facilities for students and staff, this w
- ❑ Specific budget set aside for the running of the Library and IT.
- ❑ Current number of computer terminals is totally inadequate.
- ❑ The University authorities to put in place a clear policy on IT.
- ❑ Income generation/proper accountability

In conclusion, this chapter presented findings of the study carried out at the UNZA Library whose major findings indicate that most of the IT equipment are either out of date or are not functioning. Due to the obsolete state of the equipment, the findings also show that the intended benefits of computerisation in the Library have not been maintained. The findings of the data analysed in this chapter will be presented in chapter 6 where the recommendations will be given to alleviate some problems discovered in the findings.

DISCUSSION OF FINDINGS

5.0 INTRODUCTION

This chapter presents the discussion of the findings of the study and their implications for the present and the future sustainability of IT at the UNZA Library. This chapter is divided into 4 sections as follows; Maintenance of physical infrastructure, Continued delivery of services and benefits, Support of stakeholders, and Long-term institutional capacity. At the end of each section, using the sustainability index adopted from the World Bank Sustainability Index, a sustainability score is given on the indicator represented by the issues discussed in that section. Sustainability is a relative concept, which must be assessed in terms of a set of indicators, which combine different qualitative aspects of performance of IT. A five point rating scale (1=very poor, 2=poor, 3=average, 4=good and 5=very good) has been used to assess the degree of sustainability of IT in the Library. The ratings ranging from 5 to 25 for each category have been added to calculate the total sustainability score of IT. The ratings are arrived at by the researcher's opinion based on the findings of the study.

5.1 MAINTENANCE OF PHYSICAL INFRASTRUCTURE

Even though this section corresponds with indicator B on the sustainability index, it is discussed first due to the fact that it deals with issues that answer objective one in the study, which is to determine the present physical condition of IT resources in the Library.

5.1.1 CURRENT STATUS OF IT AT THE UNZA LIBRARY

Findings reveal that more than 50% of the equipment in the Library is not functioning. Almost all the printers acquired since 1992 when FINNIDA funded the computerization project, are non-functional. The software acquired together with the hardware is outdated. What is evident from observations is that there has been little effort both from library management and the university administration to put in place mechanisms that will ensure that broken down equipment are replaced. Older equipment usually fails more frequently and is therefore, more expensive to repair (Mayo and Nelson, 1999). New or upgraded

software require more processing power or memory than the current equipment in the Library can support because the equipment available is becoming expensive to maintain. In addition, this study revealed that the initial computers bought through FINNIDA were found not to be Y2K compliant. As Mutula (2000) confirms, many university libraries in the region rely on donated foreign equipment, which is old, as such, many of these computers could not be converted to conform to the year 2000. This situation therefore means more cost on the part of the recipient to upgrade the donated equipment. Some effort however, is made with the help of the Computer Centre in trying to update software. The current software on the market however, cannot run on the old computers available in the Library due to their low processing power. The Library also has no updated anti-virus software to protect computers from viruses. This has implications on the durability of software and to some extent hardware. The quality of services has therefore been affected by the deterioration in the condition of equipment. Even when services continue to operate, the quality is affected.

The variations in models of IT on the other hand, sometimes influence negatively the performance capabilities of IT in terms of compatibility and maintenance. As Long (1989) states, when a problem arises, vendors of the different models of IT have been known to point fingers at one another rather than cooperate to solve the problem. The incompatibility of some IT can pose challenges in installations, maintenance and use as in the case of the Fujitsu printers that can no longer be used because the ribbons are not locally available in Zambia. From observation, the Library is grappling with the issue of managing multiple vendors and products. This also has implications especially if the Library does not have technical expertise to manage the system.

Over the past ten years, a few additional computers have been bought through the help of other donors such as SIDA of Sweden, DFID of the UK and HealthNet of USA. Even though the situation at the Medical Library is slightly better due to the support the Library is getting from the School of Medicine, overall, the situation in the Library is very critical. The situation is compounded by the security problems faced by the Library. In the past two years, the Library has experienced some break-ins in which 6 computers were lost. The university administration has not responded promptly to requests by library management to secure the Library building through burglar proofing or some other electronic security means. The lack of security has negative implications on future donations since the donors would like to have assurance that the equipment they will donate will be secure before

they can commit themselves. Therefore, efforts to replace the lost and outdated equipment, through further donor assistance, are threatened by the poor security situation in the Library.

The findings also reveal that most of the software installed in the Library is under-utilised, with MS-Word being 78% utilised, while the Dynix system uses about 40% of the system resources. The under utilization of the system could be attributed either to the fact that some of the librarians were not competent enough to use the other software or that the software is too outdated due to the fact that the Library has failed to acquire updated versions. Another reason for under utilization would be attributed to the fact that the majority of these resources are used by staff mostly for word processing, as no computers are specifically available for end users. The non-availability of IT to library users has brought about dissatisfaction, as they do not see any benefits of IT installations in the Library accruing down to them.

5.1.2 MAINTENANCE PROCEDURES

Findings indicate that there are no proper maintenance procedures in place to ensure sustainability. In the words of the University Librarian, "we need to set up proper hardware maintenance procedures once we engage our own computer expert in the Library". The absence of policy on preventive maintenance of the entire university IT equipment has adversely affected the efficient functioning and life span of computers and other accessories. The lack of routine maintenance procedures makes necessary more emergency maintenance operations when equipment has deteriorated to a crisis level, making it even more costly. This means therefore that the life span of IT will be reduced significantly by inadequate maintenance. Related to the above issue, the Library experienced some procurement difficulties, with the donor insisting on supplying particular equipment or discouraging the use of local suppliers who can provide back-up service and, whenever appropriate, facilitate warranty claims when defects are detected in some of the equipment installed. In the absence of warranties, the Library finds itself in a situation where it cannot have service guarantees after equipment has been installed. As Nkereuwem (1996: 28) argues, "sometimes, when the equipment arrives, it cannot be maintained by the local vendor, or he or will accept to do so at exceptionally exorbitant prices."

The lack of provision for equipment maintenance during the life time of the project, has meant that the Library is faced with a situation where more than half of the PCs and monitors procured late 1994 have stopped functioning. Furthermore, none of the Fujitsu DL 1250 dot matrix printers are usable because there are no local suppliers for the consumables used by these printers. The lack of provision for equipment maintenance has negative implication on the level and duration of the computerisation project benefits since the computers will have ceased to operate many years before the expiration of their intended life. This in turn has affected the Library's ability to continue delivering quality service.

5.1.3 FUNDING

The research findings reveal that lack of commitment both from University central administration and government threatens the sustainability of IT in the Library. The budget allocations to the Library are not enough to buy replacement equipment or for maintenance. None of the previous budgets presented to management for IT has ever been approved. From the amount allocated to the Library, 98% is committed to staff remuneration, while the rest is directed towards other operations in the Library, leaving no funds for maintenance or replacement of IT. This means therefore that with no stable source of funding for IT, there will be no continuity. The situation is so critical that the Library has not been able to pay for the annual licence fee of \$20,000 for Dynix Library management System, which is the backbone for most of services provided by the Library. The Library faces a possibility of legal action from the vendors for abrogating licence agreement. As seen in the literature review in chapter 2, the lack of inclusion of IT as a line item in subsequent Library annual budgets has affected its sustainability. Clearly, IT is an ongoing expense just as materials budget or staff budget costs are. There is need to work with the bursar's department to establish a new or expanded technology category in the operating budget if the Library is to sustain the IT.

This lack of financial commitment from authority could be attributed to the poor recognition given to libraries and information in general. As Mutula (2000: 328) points out, "university libraries have tended to be relegated to the periphery when competing for funds with other departments." This lack of commitment was perhaps best demonstrated by the government's inability to meet its financial obligation of providing matching funding during the FINNIDA project, which prompted the donor to slash its funding as a penalty. The

UNZA Library situation confirms the findings in the literature reviewed in this study, which state that lack of funding is the most acute obstacle to sustainability. Whatever plans the Library has can only be executed on available financial resources. Therefore, due to limited funding, the primary objective of the FINNIDA funded computerization project was to achieve precisely defined economic objectives. The emphasis therefore was on speedy and cost-effective implementation, and not on institutional development or the creation of structures that can ensure the project will continue operating.

In addition to poor funding from administration, the Library does not have viable mechanisms of generating funds. The funds that are made from such ventures as photocopying and card production are not steady due to the fact that the equipment themselves used in generating funding are constantly out of order. The inability by the Library to ensure the existence of computerization project's own source of financial support has negatively affected its sustainability. The UNZA Library situation is confirmed by Kanamugire's (1993) argument that libraries without financial resources cannot purchase equipment such as photocopiers, computer hardware and software or ensure their sustainability. According to the UNZA Library Project Completion Report of 1999, the major obstacle to the accomplishment of some of the objectives was the inability of the institution to allocate funds to the Library from the university's annual budgetary allocation. The case studies of university libraries in Africa as reviewed in chapter 2 confirm that libraries such as the American University in Cairo and University of Botswana, who had some practical proposals on how to generate funds for IT developments were better sustained than those libraries that had nothing.

SCORING INDICATOR B - Maintenance of physical infrastructure

From the discussions of the preceding sections, the sustainability index has been scored as follows: The *condition of equipment* (B-1) has seriously deteriorated for both computers and software and would be rated as 2 (poor). Due to lack of funding from government, there are no regular *maintenance procedures* (B-3), and therefore this component will receive a rating of 1 (very poor). Similarly, the adequacy of operating budget, would receive a rating of 1. *Adequacy of operating budget* (B-2) will be give a rating of 1 (very poor), since the Library does not have any funds in the annual budget allocated to maintain IT, even though there is a little of funds generated from other services in the Library.

5.2 USER SATISFACTION

The aim of assessing user satisfaction was for the purpose of gauging the extent to which the Library had succeeded in meeting the objective set during the initial computerization project in 1992. The objectives set out in the computerization project included:

- ❑ Improved access to information resources through the use of ICT
- ❑ Improved physical infrastructure for library staff
- ❑ Improved quality of library service to the Library users
- ❑ Continued functionality of equipment supplied through the project.

The levels of dissatisfaction with the services by the intended beneficiaries shows that the Library has failed to meet the objectives in the long run because the situation at the moment shows a different picture from what was set out to be achieved. Responses indicate a higher rate of dissatisfaction among the lecturers where 79.6% say they do not use the IT services, as compared to 69.8% of the students who use the IT resources in the Library. The findings in this study are that the levels of satisfaction in lecturers are quite low due to a number of factors. Firstly, there is a serious shortage of equipment to cater for both students and lecturers as could be seen in the statistics in the previous chapter. Currently students have to share 22 terminals since the rest of the equipment are either not functioning or stolen. When the volume of benefits is reduced, the flow of benefits to certain groups of beneficiaries, in this case lecturers, may be reduced. IT is not an end in itself; the potential benefits to be derived from information depends on its applicability, timeliness and level of use (Agha and Akhtar1992).

Due to the security problems faced by the Library, the rest of the PCs are no longer accessible to students whose needs they were purchased to meet in the first place. While in 1992, the students were able to search the Internet and CD-ROM from the Library; today the service can only be sought from other sources. Furthermore, the few functional PCs being used by library staff are still not enough to go round all the professional staff that are forced to share them. Lecturers on the other hand are forced to seek better services elsewhere.

SCORING INDICATOR A - Continued delivery of services and benefits

With respect to the *efficiency of service delivery* (A-1), while most of the librarians say that the introduction of IT has improved the issuing of library material to users, the lack of adequate equipment and its obsolescence makes providing efficient services a challenge. The library users themselves confirm the above problem. A rating of 2 (poor) has been assigned. The *quality of services /benefits of IT* (A-2) has been rated 2 (poor) as much of the IT has deteriorated rapidly and are not productive due to age. 34% (lecturers) and 27% (students) are not satisfied with the quality of service when compared with other services elsewhere. With respect to *benefits of IT*, the IT was largely accessible only to library staff and not the intended beneficiaries due to security problems and inadequacy. *User satisfaction* (A-3), would receive a rating of 2 (poor) since 76.6% of lecturers and 59% of the students were not satisfied with the IT service.

5.3 STAKEHOLDER SUPPORT AND INVOLVEMENT

As seen in literature reviewed, the potential benefits of increased commitment by stakeholder participation include an increased commitment by stakeholders to policies and project and a willingness to share costs and an interest in sustaining the benefits, and a check on their relevance. The findings of this study show that lecturers are not very keen on sharing costs and show very little interest in sustaining the IT resources in the Library. This seems to indicate that lecturers have not seen the benefits of IT services accruing to their work, hence the use of other services elsewhere. Lack of user education on the benefits of IT to the academic activities of the institution is another explanatory factor in this aspect. 76% of the lecturers do not use IT in the Library due to a number of reasons ranging from not being aware of the existence of these services to not being competent to use the resources.

The unwillingness by students, on the other hand, as can be seen in table 4.20, could be attributed to the fact that they did not feel a sense of ownership and they did not have a sense of genuine stake in the outcome of any efforts to sustain the resources in the Library. The lack of commitment from the beneficiaries to the sustainability of IT in the Library is due to the fact that little attention was given to the institutional arrangements needed to give beneficiaries a role in the planning and implementation of the project. This means the Library is unable to bring together relevant information from a number of different sources or departments in a coherent form to bear on the problems to which they

are relevant. Lack of support can impede the use of services, reduce the sustainability of intended benefits, and limit the cost recovery of the IT project. This also brings about a sense of indifference and dependence on the government by the beneficiaries who see they have little to say or no say in the developments in the Library.

Central administration on the other hand, shows very little support towards the IT developments in the Library. This is evidenced by the lack of priority given to the added cost of IT in the Library. The lack of priority given to the Library by university authorities directly leads to inadequate provision of needed investment and financial support to IT hence their non-sustainability. The cases examined in the review of literature show that where there is recognition of the Library's central role in the university structure, there were some positive effects in terms of the seriousness shown to the IT developments in the Library. In the case of University of Dar es Salaam, the university administration lacked enthusiasm making the Library perpetually dependent on donors. The poor support from central administration poses great challenges on the Library's ability to maintain and update IT which are changing at a very fast rate and therefore quite expensive to maintain.

Findings also reveal a lack of commitment on the part of donors. From the interview carried out by the local counterpart for FINNIDA, one deduces that there has not been any deliberate move by the donor to carry out a serious evaluation of the automation project. This therefore shows that the donor was not entirely committed to the sustainability of the automation project at UNZA Library. The lack of seriousness in this regard is evidenced by the donor's reliance on the evaluation reports from the recipients, instead of carrying out the evaluations themselves.

5.3.1 DONOR SUPPORT AND POLICIES

The findings of this study reveal that donor support has been sporadic. One of the greatest problems advanced in the literature is the lack of information policies on the part of the funding agencies. In the case of FINNIDA, the lack of information policies seem to suggest that the computerisation project was of ad hoc nature without any coherent legislative framework that could ensure sustainability. It is evident from this study that the donor's objectives had been clearly delineated, to allow for precise evaluations. Since IT was and continues to be acquired under different schemes of assistance, from different sources, on sporadic basis, with no other purpose than to service a specific need at a given time; there

is clearly no plan for their maintenance and further improvement. This caused serious problems for the Library in terms of compatibility of hardware and supply of spare parts.

Due to lack of information policies, support from FINNIDA for instance, covered only the implementation phase of the project and have not continued during the operation of the project. FINNIDA support lasted for ten years during which annual assessments were made of the impact of the two phases of the project implementation. The assessments revealed that the projects were highly successful, gauging on the set targets (availability of IT, photocopying facilities and human resource development) and the participation rate (the elimination of the feeling of project being run from outside). However the unreasonable time constraints may have prevented the development of strategies for dealing with the real-world situation found at UNZA, which may not have been apparent from the brief visits made by FINNIDA personnel at the initial planning stage.

In addition to lack of policy, there is evidence of strings attached to the aid given to the Library by the donor. Just as a number of other studies carried out confirm, the UNZA Library too is faced with a situation where the donor gives conditions that have negative consequences to the recipient. A problem, which was discovered during interviews with Library management, was that FINNIDA insisted on the Library getting its equipment from a prescribed supplier from Finland. Much as assistance is appreciated, this type of donor aid tends to promote dependency, especially when spares cannot be obtained locally. This issue was aptly expressed by the University Librarian in the following statement; "FINNIDA's reason for their decision was that because a large sum of money was involved, it would be easier and cheaper for them to use their local (i.e. Finnish) supplier. This would enable them could procure equipment using an LPO (local purchase order) -- and pay cash later instead of a foreign supplier who would require cash before delivery. The foregoing explanation makes sense from their economic point of view. Otherwise it was one way of ensuring that a Finnish company benefited from the Finnish tax payer's money, much like the British Council used to insist on purchasing British published books from their donated funds". This therefore has made the Library be perpetually technologically dependent on the donor's country for supplies of spare parts.

SCORING INDICATOR D - Stakeholder support

From the preceding discussion of the results, the researcher came up with the following ratings: *Institutional support* (D-1) was lacking due to the fact that there was no concurrent support for additional funding to allow for expansion of IT services in the Library. D-1 therefore has been given a 2 (poor) rating. With respect to *support from beneficiaries* (D-2), there were varied responses showing that 57% of the students and 10% of the lecturers were willing to financially support the IT developments in the Library. A rating of 3 (average) has been given. *Donor support* (D-3) on the other hand continues to be reasonably strong but because it is not stable, a rating of 2 (poor) would be given.

5.4 LONG-TERM INSTITUTIONAL CAPACITY

In dealing with long-term institutional capacity such issues as policies, technical and staffing capacity were looked at in order to help indicate the extent to which the Library is capable of sustaining its IT resources. If policies are not in place to ensure sustainability, then the long-term capacity of the Library to sustain its resources would be threatened. The same applies to its technical capacity in terms of staffing, procurement procedures and project targets.

5.4.1 POLICIES

From documentary evidence and literature, it is clear that there are no proper policies in the country as a whole; put in place to coordinate information related issues such as information technology. The problems faced by the Library are as a result of lack of attention to the developments of IT, how it is used, and how it contributes to the institutional objectives. Its potential therefore will go unrealised. The research findings show that there is no co-ordination between the Computer Centre and the rest of the departments in the university. This is why each department can come up with its own policy, without putting into consideration the needs of the rest of the university departments and units and the impact of such developments to the university network. Without a comprehensive technology policy in the university and the Library in particular, staff can become very confused about where the Library is going and how they fit into the picture. The absence of an IT policy, makes it hard for library management to explain their needs to the university authorities or funding bodies if they find themselves preparing budget requests for two years from the present. A policy will give library management,

staff, university authorities, donors and the university community a common understanding of how technology will be used to enhance and expand the services and programmes offered by the Library. Furthermore, the findings show that the technology investments were pursued without a strategy. And lack of strategy makes the implementation of the IT project based on limited vision, with no overall strategic plan and no coherent legislative framework that can provide sustainability and create a solid foundation for the harmonious development of IT resources (Montviloff, 1995).

On selection policies, the findings indicate that some efforts have been made especially by the Computer Centre to come up with selection guidelines that can ensure sustainability of IT resources in the whole university. However, these efforts have not received adequate financial support from university administration and therefore still remain in draft form, and not known to most of the departments in the university. The uncoordinated policies on selection of IT, puts a strain on computer centre personnel who have to battle with such issues as incompatibility of hardware on the university system. With regard to policy on use, observation shows that there are no stringent measures to ensure the resources are used for the purposes for which they were procured. There was evidence of misuse of equipment by staff in the Library. This can be attributed to non-availability of policy on use. These policies, however are urgently needed to ensure that IT selection, acquisition and application in the Library are cost effective, respond to the requirements of the users and are in line with the future development of the University.

5.4.2 TECHNICAL AND STAFFING CAPACITY

The findings of this study indicate that UNZA Library does not have technical capacity to sustain its IT resources. This is due to the fact that, the Library does not have its own qualified software and hardware experts who can concentrate on making sure the equipment is constantly in working order. If the Library has no technical expertise among its staff, it becomes difficult to manage the network of the integration of multi vendor products that the Library has.

Findings further show that the Library faces a critical shortage of staff. As was seen in table 4.23 in the previous chapter, the Library had a staff turnover of 12 in 2000 only. The problem of staffing is confirmed by library management who attribute the sustainability challenges faced in the Library to the absence of qualified staff in the administration of IT. The lack of expert staff is compounded by the Library's vulnerability to losing its technical

staff to organizations that offer higher benefits. This has put training for and the use of IT in jeopardy, as the trained staff produced in the Library would be expected to coordinate the use of IT in the Library. The lack of technical expertise may also mean misuse, damage or under utilization. This is evident in the findings from the acting systems administrator who rates utilization of the system to 48% only. The lack of technical expertise may also have an implication on the Library's ability to control activities by people who have by the nature of their professional background, a limited understanding and a restricted conception of what IT and for what information should be used. It is for this reason that software most beneficial to library users are not being used as much as word processing is used.

Staff turnover has crippled the Library's ability in keeping pace with the demands of the Library since there is no continuity. The Library does not have a department committed to the enabling users have quick and dependable access to technical staff that can provide ongoing training, maintain the equipment, resolve problems and identify new and useful products for the Library.

Many sustainability problems have been traced to procurement. Inflexible procurement procedures can make it difficult to change specifications when it becomes apparent that a particular kind of equipment is no longer appropriate. In the case of UNZA Library, the specifications given by the donor to purchase certain equipment from their recommended supplier brought about some problems of functionality after the equipment was discovered to be inappropriate.

Furthermore, the findings seem to suggest that project targets set could have been over ambitious. Due to limitations in human resources and the budget, the Library's scope of effort was apt to be squeezed or some things reduced. For instance, the Zambia ESSP II Annual Progress Report of 1998 of the Library alludes to the fact that some of the targets had to be diverted or abandoned due to financial constraints. This inevitably could have had an effect on the sustainability of the project.

SCORING INDICATOR C - Long-Term institutional capacity

The lack of *implementation of policy* (C-1) due to poor funding from government, the capacity of UNZA and the Library is seriously weakened. A rate of 2 (poor) will be given. *Stability of staffing and funding* (C-2) is significantly weakened by the above budgetary

constraints, hence the failure by the Library to retain its qualified staff. A rating of 2 (poor) will be given. The *technical capacity* (C-3) of staff is not very impressive, given that the only two staff that are competent to trouble shoot IT, do not have formal training in software and hardware engineering. A rate of 2 (poor) would therefore be given, especially that there is some support coming from Computer Centre.

The following table therefore summarises and show graphically how the ratings have been scored in this study on the sustainability index.

Table 5.1 Scoring the sustainability index

	Rating				
	1	2	3	4	5
A. Continue delivery of services and benefits					
A- 1 Efficiency of service delivery		X			
A- 2 Quality of services/benefits		X			
A- 3 Satisfaction of beneficiaries		X			
<i>Subtotal</i>		6			
B. Maintenance of physical infrastructure					
B-1 Condition of equipment		X			
B-2 Adequacy of maintenance procedures	x				
B-3 Adequacy of operating budget	x				
<i>Subtotal</i>		4			
C. Long-term institutional capacity					
C-1 Technical capacity of UNZA Library staff		X			
C-2 Stability of staff and budget of Library		X			
C-3 IT policy implementation		X			
<i>Subtotal</i>		6			
Support from stakeholders					
D-1 Stability and strength of support from government		X			
D-2 Stability and strength of support from library users			x		
D-3 Stability and strength of support from donors		X			
<i>Subtotal</i>			7		
<i>Total Score</i>				23	

From the above table, the sustainability score comes to a total of 29 points. Which is 38% of the total sustainability score of 60 points. Given that:

1% to 20% is very poor,
 21% to 40% is poor,
 41% to 60% is average,

61% to 80% is good and
81% to 100% is excellent,

the sustainability score of 38% means that sustainability at UNZA Library is poor. The sustainability problem at the UNZA Library needs serious consideration if the IT resources in the Library are to continue meeting the needs of the users. If strategies to sustain the benefits are not seriously put in place, it will lead to a situation where as Rosenberg (1994: 247) puts it, "the situation does not need sustaining but kick-starting into life again.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.0 INTRODUCTION

This chapter gives a summary of the findings of this study. The aim of the study was to examine the extent to which UNZA Library was addressing the IT sustainability challenges with the objective of establishing a feasible IT sustainability model of approach. The specific objectives of the study were:

1. To determine the present physical condition of IT resources at UNZA Library;
2. To assess the range and form of sustainability challenges faced by the Library and what efforts are in place to meet the challenges;
3. Examine the role of the IT project stakeholders in the computerisation of the UNZA Library;
4. To examine the long-term capacity of UNZA Library in terms of staffing and technical support to sustain the IT resources;
5. To propose strategies and mechanisms that may be adopted by the UNZA Library in sustaining its IT resources;

The chapter ends by giving recommendations of how sustainability can be ensured at the UNZA Library and other African libraries that could be in similar situations.

6.1 SUMMARY OF FINDINGS

Data collected from documents such as annual reports as well as from the IT inventory in the Library shows that most of the IT acquired since 1992 is no longer functioning. More than 50% of the computers are not functioning, 80% of the printers are not working, no photocopiers are functioning, while the other auxiliary equipment are in a state of disrepair. Most of the computers do not have the processing power to support the latest software, which needs higher processing capability. In addition to outdated equipment, the software too is too outdated. For instance, the Library has not acquired the latest anti-virus software to protect the data from damage.

Second, there are several challenges faced by the UNZA Library in its effort to sustain the IT resources. These include the challenge of inadequate funding from the university administration and government. This is seen in the annual budgetary allocations of only 2% of the entire university budget to the Library without regard to the added costs brought about by the introduction of IT.

Third, most of the library users are not very satisfied with the IT services provided by the Library. For instance, 35% of the students are only satisfied to a small extent, 24% are not satisfied at all, as compared with the 7% who say they are very satisfied. A similar, and to some extent worse pattern, is evident with the lecturers, where 78% do not use the Library for a variety of reasons most of which could be attributed to the fact that they are not happy with the services provided in the Library.

Fourth, the findings revealed that not all the stakeholders in the Library IT project were involved in the initial planning of the computerisation project. For instance, as the beneficiaries were not involved in the Library's initial planning process of the project, they do not have a sense of ownership to the facilities in the Library. For instance 82% of lecturers believe that it is the responsibility of central administration as opposed to only 28% who think the user can pay for the services to make sure the IT services are sustained.

There is little evidence of support from government and UNZA central administration in terms of policy guidelines. In terms of support from the beneficiaries, there is some support from students who indicated that they would be willing to pay for the services in order to help sustain the IT services. However, the lecturers showed a sense of disassociation from the developments in the Library. This could be due to the fact that they have not been educated on the benefits of IT or have not seen any benefits since the IT was installed in the Library and therefore do not see the need to contribute anything.

Most donor policies are such that their support are usually ad-hoc in nature, thereby affecting the recipient library's ability to continue after funding has been withdrawn. The UNZA Library situation is similar, in that after FINNIDA decided to withdraw their support, the Library could not continue with the expansions started by the donor. This made the Library reach a point where at the end of the project, more than 50% of the equipment procured are no longer working.

The findings of this study also indicate that UNZA Library does not have technical capacity to sustain its IT resources. At the moment, the Library depends on the equally understaffed Computer Centre, which has to cater for the entire university. This is due to the fact, the Library does not have its own qualified software and hardware technician who can concentrate on making sure the equipment is constantly in operation in the Library. The findings also revealed that the Library was facing a critical shortage of staff where the institution is unable to retain staff due to unattractive conditions of service. This negatively affects the continuity of projects since the Library does not have incentives to retain staff.

Finally, on selection policies, the study discovered that there were some efforts especially from the Computer Centre to come up with policy guidelines that could ensure sustainability of IT resources in the whole university. However, these efforts have not had enough support from central administration and therefore still remain in draft forms and not known to most of the departments in the university. The study also discovered that the departments have uncoordinated policies on selection of IT, putting a strain on computer centre personnel, who are already understaffed. On use, the library administration decides what the IT resources will be used for though from observation, there are no stringent measures to ensure the resources are used for the purposes for which they were procured. There was evidence of misuse of equipment by staff in the Library. In conclusion the overall situation suggests that , there are no concrete strategies put in place to ensure sustainability of IT in the Library and the university as a whole. The suggestions in the Computer Centre draft ICT policy could be helpful if implemented.

As was seen in the previous chapter, following the findings of the study, UNZA Library had a total score of 23 points on the sustainability index, giving a total of 38% of the sustainability score. This score therefore indicates that the sustainability of IT at UNZA Library is poor.

6.2 RECOMMENDATIONS

Following the findings of this study, the researcher came up with the following recommendations that would help to redress the sustainability situation at UNZA Library and other university libraries in similar situations. The recommendations have been presented in the order of their priority.

- ✱ • Revive the Library Automation Committee, which stopped operating years ago.

- Come up a comprehensive information policy that will ensure that the Library's technology decisions are made in the context of the service priorities.
- Initiate policies related to donors. There is need to review the sustainability of donor funded projects in order to maintain the level and duration of project benefits and ensure the quality of services is maintained.
- Allocate and reallocate funds to support hardware and software upgrades in order to provide and support additional information services
- Build indigenous capacity in order to make the complete withdrawal of funds less disruptive of the ongoing activities.
- Provide in the organisational structure of the university, someone who will be responsible for the coordination of IT related issues with all the departments.
- Keep benefit evaluation in perspective with the library function of which it is supposed to be part.
- Careful planning to avoid functional obsolescence of equipment.

First and for most, before the Library ventures into future computerisation projects, the Library Automation Committee, similar to the one constituted in 1992, needs to be revived as a matter of urgency. The committee, which will be headed by the Systems Librarian, will be responsible for brain storming on issues concerning sustainability of IT and ownership. This committee should be charged with the responsibility of coming up with a technology policy or plan for the Library and get suggestions from all the stakeholders in the University on how the various stakeholders can get involved in the IT sustainability efforts of the Library.

Second, there is need to include in the organisational structure of the university a position for someone who will be responsible for the coordination of IT related issues in the entire University. This person will be accountable to the Director of the Computer Centre. Meanwhile, the Library needs to set up an IT section which will be headed by a dually qualified computer librarian or Systems Librarian, who will be assisted by two computer technicians, seconded from the Computer Centre, as is the case at the University of

Botswana Library. The Systems Librarian will be a liaison officer between the Library and the Computer Centre. The staff in this section will ensure that routine maintenance procedures are in place to help reduce increased maintenance cost and more rapid deterioration of infrastructure in the Library. The lack of routine maintenance procedures makes necessary more emergency maintenance operations when infrastructure has deteriorated to a crisis level. Periodic maintenance of equipment will ensure that the life span of IT resources in the Library will be prolonged. This system seems to be working well for University of Botswana Library.

Third, in order to facilitate the work of the IT section to be established in the Library, there is need to come up with a comprehensive information policy that will ensure that the Library's technological decisions are made in the context of the Library's service priorities as established in the overall library plan. Policies will provide the administrative framework, which will help guide the consistent and sustainable implementation of information programmes. An information policy makes the basis for sound decision about investment in IT, because it allows the technology options to be evaluated in relation to the institution's key objectives, and its human resources (Orna, 1990).

Fourth, as learnt from University of Botswana and the American University in Cairo, there is need to come up with a strategy to allocate and reallocate funds to support hardware and software upgrades in order to provide and support additional information services. In addition to making IT as a line item in the library budget, amortising the placement costs of technology over a period of five years would help ensure sustainability. This means that a percentage of the purchase price of the hardware and software is set aside each year for five years in a fund that will be used to replace the equipment at the end of the amortisation period. The Chairman of the Library Automation Committee will be a signatory to the separate account that shall be opened for this purpose.

Fifth, there is also need to build indigenous capacity in order to make the complete withdrawal of funds less disruptive of the ongoing activities. This could be done through the use of local consultants to carry out projects requiring the use of IT in the Library. This would afford the members of staff of the Library to learn from the experience of the consultants. To enhance local capacity building, either training can be incorporated into the contract or an understudy is attached to the consultant. To maintain IT services, the Library could develop marketing strategies in order to generate revenue from the

information products and services they have to offer. The Library could engage in revenue-generating ventures such as web-design business.

Sixth, it is also important to keep benefit evaluation in perspective of the Library function. Benefits to be derived from an IT investment should be assessed a number of times during a project's lifetime. The obvious and sometimes not-so obvious benefits of using state-of-the-art technology should be supported. Central administration should be made to understand the consequences of using outdated equipment and inefficient procedures in the university. Inevitably, a low quality product is produced at an inordinarily high cost. When this happens, central administration must confront the alternatives to shut down or upgrade. Sometimes management have to be reminded of the benefits of progress and consequences of inactivity.

Seventh, policy makers in government and university have a fundamental responsibility in supporting information technology in view of the important role that information plays in the development process. They should play a crucial role in initiating the establishment of and financially supporting information systems and investing in the development of a national information infrastructure. The university administration in particular is urged to stop relegating the needs of the Library to the periphery and find ways of providing a sustained source of funding. The UNZA administration could learn from the American University Cairo and University of Botswana, where a budget strategy for library funding is established to ensure its IT resources are sustained.

Eighth, there is need to review the sustainability of donor funded projects in order to maintain the level and duration of project benefits and ensure the quality of services is maintained. The development of long-term institutional development objectives and strategies will positively forge a sustainable plan for the use of IT in the Library. UNZA, like many other African universities, needs to develop clear strategies for sustainability beyond donor aid. One strategy for sustaining future donor related projects would be to initiate policies related to donors. The relevant governmental, educational and professional bodies in the country must be encouraged to identify and apply appropriate IT policies to the international development assistance agencies offering financial aid for IT related projects. Such policies must be put in place to ensure that the correct infrastructure precedes acquisition of equipment and that local personnel are trained and put in place to implement and maintain the donated facilities.

Ninth, most IT projects in Africa fold up as soon as the donor withdraws its support. Hence, it is important to devise strategies to sustain the projects, which can be used to inculcate the use of IT in Africa. One of the possible keys to sustainability in the use of IT is to charge fees for the use of IT services. Innovative marketing and promotion schemes have to be undertaken to convince the users of the need to continue paying for a service once donor support is reduced or withdrawn, and that project funds should be used to generate new products and services. The participation of UNZA Library in the PERI project (Simui, 2001), whose aim is to provide access to and facilitate the dissemination of scientific and scholarly information in developing countries, could be one way of ensuring that the Library sustains its operations. The Programme for the Enhancement of Research Information (PERI) managed by the International Network for the Availability of Scientific Publications (INASP) can be a good way to help open up the possibility of cost sharing. Because using IT in this way meets an expressed user need, the possibility is also opened of sharing costs with or even recovering them from users, thereby assisting the Library to sustain its operations (Rosenberg, 1998).

Tenth, according to the Information Systems of Florida (2002), equipment does not need to be discarded just because it is not the latest. Avoiding technological obsolescence is almost impossible, but careful planning can avoid functional obsolescence. Older equipment, according to the Information System of Florida, has a purpose. In addition to countering technological obsolescence with a plan for regular equipment amortization and replacement, one of the solution would be to explore the potential of using open-source software on old computers that were obtained during the initial period of computerisation. The key to selecting computer equipment still depends on the use or uses of the equipment. Since the utility of computer hardware is critically related to the choice of propriety, the Library can consider the exploring the potential of using the existing equipment to utilising open-source operating systems and application software as opposed to the expensive proprietary software. This would allow a much longer useful life for the old equipment in the Library. Linux is often considered an excellent, low-cost alternative to other more expensive operating systems. Linux is a software that can be downloaded from the Internet free of charge or purchased at a small fee from software vendors. "Because it is free, reliable, compactly designed, and capable of running on many different hardware platforms" (Laudon and Laudon, 2000: 202), it can be used on specialised servers providing Web, e-mail, or printing services in the Library.

In conclusion, therefore, the whole problem of sustainability of IT is an issue that requires concerted effort in order to make sure that the present problems are resolved. There is need to devise ways which will make technology affordable to the third world. Hence, the reduction of prices, and easing conditions of procurement. There is also need to ensure efficient and effective resource allocation, organisational responsibility and commitment, appropriately scaled technology, cooperation and genuine assistance from donor agencies. Policy makers must also realise that advances in computer and IT require an ongoing commitment to keep pace with the changing and evolving world of IT.

6.3 AREAS FOR FURTHER RESEARCH

There are a number of areas that this research was not able to deal with. One such area would be to carry out a survey of all the tertiary institutions in Zambia in order to make comparative study of the IT sustainability situations in these institutions. The sustainability index could be adopted for a larger scale than one case study, in order to gauge its validity. There is need to carry out a comparative study of sustainability efforts of academic libraries in the Southern African sub-region. This study could be replicated in other academic libraries in the country in order to ascertain whether the problems discovered in this study are peculiar to UNZA Library.

There is also need to carry out a study of attitudes and perceptions of university administrators about IT. From an organizational behaviour perspective, there are cultural issues to be addressed such as resistance to change and negative attitudes about the practical use of IT for teaching and learning. Africa has only just begun to exploit the potential of ICT and that we must plan for the future. Such planning must include ways to overcome the institutional and attitudinal barriers to effective ICT adoption and use.

Furthermore, there is need to carry out a study of the practices and risk factors in information systems development in university libraries that have an effect on the sustainability of IT in the severely constrained context of African countries. It would help to carry out a study on managing the introduction of technology in the delivery and administration of higher education in order to identify the best models for the introduction of IT in African university libraries to ensure sustainability.

Another possible areas of further research would be to carry out a study on the effectiveness of the Library Automation Committee at UNZA Library. Further research

could be done to investigate the effects of the organisational structure at the University of Zambia on the sustainability process.

At a wider scale, there is need to carry out a comparative study of sustainability efforts of libraries in different institutions in the Southern African sub-regions. A comparative study would assess the factors that affect sustainability of IT in academic institutions in Africa, a study on the perceptions of students on the automation of libraries and an investigation to the effect of Y2k on sustainability of IT in financially constrained libraries.

The use of the World Bank Sustainability index is one of the weaknesses of this study that could be remedied by further research. The fact that the index is subjective therefore undermines validity of the instrument as a measure of the IT sustainability at UNZA Library. What is considered to be a low or high rate of an indicator depends on an individual's opinion, which is subjective and therefore unscientific. Furthermore, since the number of indicators to be included in a particular component is determined by the priority given to a particular component in a given study, uniformity becomes a problem. For instance, a study on sustainability of IT would possibly give priority to component B on maintenance of physical infrastructure, while a study on a community project would probably put more emphasis on component A on continued delivery of services and benefits. This therefore affects the reliability of the index as a tool for assessing sustainability. These methodological issues make the interpretation of the sustainability index difficult and hence the need for it to be refined through further research.

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APPENDICES

APPENDIX I

Table 6.0 World Bank Sustainability index

	Rating				
	1	2	3	4	5
A. Continue delivery of services and benefits					
A- 1 Volume/stability of actual and intended benefits					
A- 2 Efficiency of service delivery					
A- 3 Quality of services/benefits					
A- 4 Satisfaction of beneficiaries					
<i>Subtotal</i>					
B. Maintenance of physical infrastructure					
B- 1 Condition of physical infrastructure					
B- 2 Condition of equipment					
B- 3 Adequacy of maintenance procedures					
B- 4 Efficiency of cost-recovery/adequacy of operating budge					
<i>Subtotal</i>					
C. Long-term institutional capacity					
C-1 Technical capacity and mandate of operating institution					
C-2 Stability of staff and budget of Library					
C-3 Adequacy of inter agency coordination					
C-4 Flexibility and capacity to adapt to project design					
<i>Subtotal</i>					
D. Support from stakeholders					
D-1 Stability and strength of support from international					
D-2 Stability and strength of support from national					
D-3 Stability and strength of support from beneficiaries					
D-4 Stability and strength at community level					
<i>Subtotal</i>					
Total Score					

Note: Rating code: 1= very poor; 2= poor; 3=average ; 4= good; 5= very good.
 (Source: World Bank (1985) in Bamberger, M. and Cheema, S (1990).

APPENDIX II
QUESTIONNAIRE FOR LIBRARIANS

Dear respondent,

You are kindly requested to provide information and opinion regarding Information Technology (IT) in the Library. The aim of this study is to assess the sustainability of IT resources in the Library and what can be done to ensure that users get the full benefit of computerization of the Library. The results of this research will be used strictly for academic purposes. I will be grateful for your cooperation and assure you that the information provided will be kept confidential.

1. Indicate the Department or Branch of the Library you operate from
.....

2. Please indicate your position by ticking in one of the spaces provided below:

- ☐ Senior Librarian ☐ Librarian I ☐ Librarian II
☐ Librarian III ☐ Assistant Librarian

IT USE

3. Please tick **all** the purposes for which IT is used by staff in the Library.

- ☐ Word processing
☐ Online searches and document delivery
☐ Literature searches
☐ Desktop publishing
☐ Networking
☐ Union list creation

- ☐ Electronic communication
- ☐ House-keeping functions (Cataloguing, Serials management, Circulation etc.)
- ☐ Any other, specify

4. Which of the above purposes do library clients mostly use the Library IT for? Tick as many as apply;

Students	Lecturers
☐ Word processing ☐ Online searches /document delivery ☐ Literature searches ☐ Electronic communication ☐ Any other, specify	☐ Word processing ☐ Online searches ☐ Literature searches ☐ Electronic communication ☐ Any other, specify

5. In what ways has the introduction of IT affected library services?

- ☐ Faster processing of library materials (No backlogs)
- ☐ Faster issuing of materials to students
- ☐ Better and quicker searches
- ☐ Better management of databases
- ☐ Other, please specify.....

USER SATISFACTION

6. How do you rate the student usage of IT resources in the Library?

- ☐ Heavy

☐ Average

☐ Low

☐ Very low

7. If your answer to question 6 is "Low" or "Very low", what would you attribute to this very low usage? Please tick as many as appropriate.

☐ Not enough equipment

☐ Outdated equipment

☐ Not competent enough

☐ Too many restrictions from library management

☐ Other, specify.....

8. How do you rate the lecturer usage of IT resources in the Library?

☐ Heavy

☐ Average

☐ Low

☐ Very low

9. If your answer to question 8 is "Low" or "Very low", what would you attribute this to? Please tick as many as appropriate.

☐ Not enough equipment

☐ Outdated equipment

☐ Not competent enough

☐ Too many restrictions from library management

10. What bottlenecks do you encounter in the use of IT? Please tick as many as apply.

☐ Not enough equipment

☐ Outdated equipment

☐ Not competent enough

☐ Other, please specify

TRAINING

11. Have you received any training in the handling and use of IT in the Library?

☐ No

☐ Yes

If your answer is Yes, how do you rate yourself in terms of competence to handle and use these IT resources?

☐ Not competent

☐ Reasonably competent

☐ Very competent

12. Do you have any training in the troubleshooting of IT resources in the Library?

☐ No

☐ Yes

If your answer is Yes, how competent are you in troubleshooting the IT resources in the Library?

☐ Not competent

☐ Reasonably competent

☐ Very competent

SUSTAINABILITY

13. Do you think the Library is able to sustain its IT resources?

☐ No

☐ Yes

What are the reasons for your answer?

.....
.....
.....

14. How do you think sustainability of the IT resources can be ensured? Please tick as many as apply.

- ☐ Include the update and maintenance of IT in the annual budget
- ☐ Continue sourcing for more donor funding
- ☐ Income generation
- ☐ Other, specify.....

15. What is your opinion concerning dependency on donor aid in sustaining IT in the Library?

.....
.....
.....

16. Please give suggestions on how IT can be sustained in the Library?

.....
.....
.....
.....

APPENDIX III

QUESTIONNAIRE FOR STUDENTS

Dear respondent,

You are kindly requested to provide information and opinion regarding Information Technology (IT) in the Library. The aim of this study is to assess the sustainability of these resources in the Library and what can be done to ensure that users get the full benefit of computerisation of the Library. The results of this research will be used strictly for academic purposes. I will be grateful for your cooperation and assure you that the information provided will be kept confidential.

GENERAL INFORMATION

1. Please indicate the programme and year of your study (e.g. , B.A. Ed, Second year, M.A, PhD)

.....

2. How often do you use the Library? Please tick.

- ☐ More than 7 times a week
☐ 3- 7 times a week
☐ Once or twice in a week
☐ Never

3. Do you use any of the IT resources (e.g. E-mail, Internet, OPAC, CD-ROM) provided in the Library? Please tick.

- ☐ No ☐ Yes

4. Which IT resources available in the Library do you mostly use? Tick as many as apply.

- ☐ CD-ROM

- ☐ E-mail
- ☐ Internet
- ☐ OPAC (Online Public Access Catalogue)
- ☐ Other, please specify.....

5. For what purpose do you use the IT resources in the Library?

- ☐ To find information for assignments or to study
- ☐ Communication with peers, lecturers etc.
- ☐ Career advancements
- ☐ For leisure
- ☐ Other, specify

USER SATISFACTION/ BENEFITS

6. If your answer to question 3 is Yes, how beneficial has the introduction of IT been to you?

- ☐ Better research
- ☐ Access to a wider range of up-to-date information
- ☐ Better communication with lecturers
- ☐ Others, please specify.....

7. If your answer to question 3 is No, give reasons.

- ☐ Not enough equipment
- ☐ Equipment is too outdated
- ☐ Not competent to use the equipment
- ☐ Better services available elsewhere
- ☐ Other, please specify.....
-
-

8. To what extent are you satisfied with the IT resources in the Library? Please tick.

- ☐ Very satisfied
- ☐ Moderately satisfied
- ☐ To a small extent
- ☐ Not at all

9. Where else apart from the Library do you get IT services?

- ☐ Departmental computer lab
- ☐ Computer centre
- ☐ Internet cafes
- ☐ Other, please specify

10. What type of IT services do you get from these alternative sources? Tick as many as apply.

- ☐ E-mail
- ☐ Internet
- ☐ CD-ROM
- ☐ Word processing
- ☐ Other, please specify.....

11. What are the reasons for your preference of the alternative sources above?

- ☐ Services are better
- ☐ Better equipment
- ☐ Other, specify.....

12. What IT services would you like introduced in the Library?

.....

.....

.....

FUNDING

13.⁴ Would you be willing to pay for the IT-related services in the Library?

- ☐ No
- ☐ Yes

What are the reasons for your answer?.....
.....
.....

14. How do you think that the IT resources in the Library should be financed?

Please indicate as many as you think?

- ☐ Central funding from University Administration
- ☐ Direct payment for services by users
- ☐ Donor funding
- ☐ Income generation
- ☐ Other, please specify.....

.....
.....
.....

APPENDIX IV
QUESTIONNAIRE FOR LECTURERS

Dear respondent,

You are kindly requested to provide information and opinion regarding Information Technology (IT) in the Library. The aim of this study is to assess the sustainability of IT resources in the University of Zambia Library and what can be done to ensure the sustainability of these resources. The results of this research will be used strictly for academic purposes. I will be grateful for your cooperation and assure you that the information provided will be kept confidential.

GENERAL INFORMATION

1. Please indicate your faculty and department

.....

2. What is your designation (e.g. Lecturer, Senior Lecturer, etc)?

.....

3. How often do you use the Library? Please tick.

☐ Never ☐ Occasionally ☐ Frequently

USER SATISFACTION

4. If your answer to question 3 is 'Never', do you use other facilities outside the Library for your teaching and research, and why?

.....
.....
.....

5. Do you use the IT resources available in the Library?

☐ No ☐ Yes

If your answer is 'No', why?

- ☐ Not enough equipment
- ☐ Equipment is too outdated
- ☐ Not competent to use equipment
- ☐ Better services elsewhere
- ☐ Other, please enumerate?

.....

.....

6. If your answer to question 5 is Yes, please indicate which ones;

- ☐ Word processing
- ☐ CD-ROM searches
- ☐ Electronic communication
- ☐ Internet searches
- ☐ Other

7. How beneficial have the IT resources in the Library been to you and your work?

- ☐ Improved access to up-to-date information
- ☐ Improved contact with peers
- ☐ Other

.....

.....

8. How do the IT services in the UNZA Library compare with any library you have used in terms of, please tick as appropriate,

	Quality	Quantity	Availability
Excellent			
Favourable			
Average			
Poor			
Very poor			

9. What aspects of IT resources would you like to see introduced in this Library?

.....
.....
.....

SUSTAINABILITY

10. In your opinion, how should the IT related services in the Library should be financed?

- ☐ Central funding from the university
- ☐ Direct payment of services by library users
- ☐ Income generation by the Library
- ☐ Donor funding
- ☐ Any other

11. Please give suggestions on how IT can be sustained in the Library and the University as a whole.

.....
.....
.....
.....
.....

APPENDIX V

INTERVIEW SCHEDULE FOR LIBRARY MANAGEMENT

1. Please indicate the IT resources you have in the Library, showing the make, numbers acquired and who funded their purchase:

IT	Make/Model	Number	Funded by
Computers			
CD-ROM drives			
Photocopiers			
Scanners			
Video players			
Type writers			
Fax machines			
Printers			
Other			

2. List the names of application software available in the Library

a.....

b.....

c.....

d.....

e.....

f.....

g.....

h.....

3. Who contributed the largest amount of funds for the purchase of IT resources in the Library?
4. How were the operating and applications software acquired?
5. Who funded the accessories used in the networking of the Library?
6. Who funded the actual networking?
7. Who determines the functions for which IT resources are used in the Library?
8. Who funds and maintains the IT equipment in the Library?
9. How has the introduction of IT services may have improved the services provided in the Library?

STAKEHOLDERS

10. Has any impact assessment studies been carried out concerning the use of IT, in order to determine cost benefit of the resources or to determine user satisfaction?
11. Were the stakeholders in the automation project (Students, Lecturers, Management) involved in any way in the initial planning and implementation process?, If Yes, specify how.
12. Were the university authorities willing to become supportive of library activities? What are the reasons for your answer?

FUNDING

13. Has the introduction of IT affected the funding of the Library and its services?

Approximately what percentage of your approved annual budget is used for:

- a. Staff remuneration.....% b. Books and journal purchases%
- c. Human resource development.....% d. IT.....%

14. In your opinion do you think the approved annual budget used for (d) in question 13 is enough? Why?

15. Does the Library generate any income?

- a. Are there any services maintained on a cost recovery basis?
- b. Do you generate income by any other means?

Please specify

TECHNICAL CAPACITY

16. What maintenance procedures are in place to ensure sustainability of IT resources in the Library?

17. Was the technical aspect considered during the acquisition of IT?

18. Where does your library have get service back up for maintenance of IT resources?

STAFFING

19. How stable is the staffing situation in the Library?

20. How do you rate the competence of staff in this department in terms of IT use and management

21. Please list the problems your library faces in acquiring, maintaining, and for continued use of IT your Library faces and how the Library hopes to overcome them

POLICY

22. Does the Library have a policy on :
- a. How to select the IT that needs to be acquired ? ☐ No ☐ Yes
 - b. How the IT is to be used? ☐ No ☐ Yes
23. If your answer is No to question 18 a or b, how does the absence of policy affect your Library in the selection and use of IT?

DONOR SUPPORT

24. Please give the names of the donors you can remember who have assisted your Library (either financially or otherwise) in acquiring IT equipment.
25. Has there been any change in the nature of donor support of the Library over the past 5 years.
26. In your opinion, which donor support has been most successful and why?
27. In what ways can donor support be targeted at sustainability

APPENDIX VI

INTERVIEW SCHEDULE FOR FINNIDA REPRESENTATIVE

1. What is your policy regarding support to University libraries

2. Specify support:

Equipment

Year	University	Type of equipment	Value (US \$)
1995			
1996			
1997			
1998			
1999			

Staff training

Year	University	Type of training	Value (US \$)
1995			
1996			
1997			
1998			
1999			
2000			
2001			
2002			

3. Do you regularly undertake evaluation of the projects you have supported? If so what criteria do you use to measure:

- Success of support?
- Sustainability of equipment?

4. Could you give any references and/ or documentation on specific evaluation?

5. What are your future policies for assistance based on experiences of past five years?

APPENDIX VII

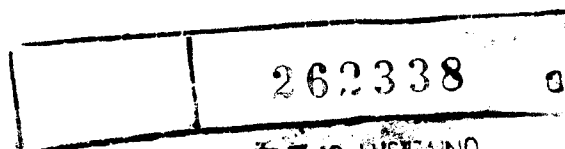
INTERVIEW SCHEDULE FOR UNIVERSITY PRINCIPAL OFFICERS

1. Are there policies governing the use of IT
 - a. in the University as a whole?
 - b. Are the respective departments allowed to come up with their own?
2. Does management have any plans of supporting the IT improvements in the Library?
3. What criteria is used to determine the percentage allocated to the Library in terms of University funding?
4. Was management involved in any way in the initial planning of the computerization of the Library? How?
5. What funding mechanisms are in existence to support sustainability of IT in the university as a whole and in the Library in particular?
6. Are there any strategies put in place to ensure sustainability in the University and Library in particular?

APPENDIX VIII

INTERVIEW SCHEDULE FOR COMPUTER CENTRE MANAGEMENT

1. Is there any policy that governs selection and procurement of IT in the University? Does this policy address the issue of sustainability?
2. Who and what criteria are used to determine who gets or uses IT resources procured for the university?
3. How was the Computer Centre involved in the initial computerization of the Library.
4. What strategies have been put in place to ensure sustainability of IT in the University as a whole and various departments in particular?
5. What type of support does the Computer Centre provide to the Library?



UNIVERSITY OF ZIMBABWE
LIBRARY