



**University of Nairobi**

**School of Computing and Informatics**

**ICT-READINESS FOR E-LIBRARY  
(A CASE STUDY OF INSTITUTION OF HIGHER LEARNING)**

**By**

**NGEMU VASDINUS VAATI**

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**SUPERVISOR: MR. P. THEURI**

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University of NAIROBI Library



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# DEDICATION

To my loving daughter Grace Mawia who constantly encourage me in compiling this work.

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## List of Abbreviations

AAU	-Association for African Universities
ANU	- Africa Nazarene University
APEC	-Asian Pacific Economic Cooperation
CID	-Center for International Development
CSPP	-Computer Systems Policy Project
CUEA	-Catholic University of Eastern Africa
EFA	- Education for All
GUI	-Graphical User Interface
ICT	- Information and Communication Technology
I.L.L	-Interlibrary Loan
I.L.S	-Integrated library system
ISBN	-International Standard Book Number
KENET	-Kenya Education Network
KTTC	-Kenya Technical Teachers College
LANs	-Local Area Networks
LRI	-Library Readiness Index
MDG's	-Millenium Development Goals
NRI	-Network Readiness Index
OPAC	-Online Public Access Catalog
RBDMS	-Relational Database Management System
USIU	- United States International University
WANs	-Wide Area Networks
WITSA	-World Information Technology and Services Alliance



# DECLARATION

This research project is my original work and has not been presented for any award in any university.



Ngemu Vasdinus V.

13/8/09

Date

This research project has been submitted in partial fulfillment of requirements for the Master of Science in Information Systems of the University of Nairobi with my approval as the University supervisor.

Signature



Date

13.08.2009

P. Theuri

Lecturer SCI.

## ABSTRACT

Many countries in Africa are now struggling with the changing political, social and economic environment. It is evident from developed countries that the modern successful industrial economy is IT driven. This underscores the need for African countries to have an effective public sector. Key institutions like education need to formulate and implement strategies and policies that will facilitate the achievement of education for All (EFA) and the Millennium Development Goals (MDG's). These strategies and policies must embrace information and Communication Technology (ICT). There is a great need for institutions to have methods and framework for assessing their readiness and progress in adopting and embracing new technology. This study was aimed at finding out the ICT readiness for institution of higher learning in Kenya with a view of developing e-readiness assessment framework and a tool (program) for testing ICT readiness for e-library.

The study has established parameters that can be used to measure ICT indexes that will help the administrators to make appropriate decisions regarding ICT readiness in their institutional Libraries.

With a request through the project supervisor KENET granted the researcher permission to use raw data from their research on e-readiness survey of higher education institutions in Kenya(2007). SPSS software was used for data analysis; where the Chi square Asymptotic significance was used to measure the existence of relationships across variables and the Cramers V was used to gauge the strength of the relationship.

A LRI model was developed and it's composed of 5 factors and a total of 28 indicators. The model was able to measure ICT readiness for e-libraries for 3 institutions. As an integrated part of the model a tool/program was also developed and is able to compute both the sub-indices and the overall final index for a given library. The tool is also capable of generating several reports whose format may either be in tabular and/or graphical form.

# CHAPTER 1

## 1.0 INTRODUCTION

Computers are widely exploited in library management systems. Such systems control the activities that permit libraries to keep a record of their stock, and whereabouts and status of the stock (Rowley, 1993). Automation of library functions is associated with several benefits, among them speedy acquisition, processing and access to information materials top the list. Other benefits include user convenience and sharing of bibliographic and other information. Despite this, automation disparities exist between libraries in the developed and developing countries and even between libraries within a country. For instance, in the United Kingdom, Rowley (1993) reports that virtually all public libraries and most university and college libraries have computerized library management systems, although the extent of computerization varies in accordance with available resources and other factors. On the other hand, the literature points a gloom picture of the situation in Africa. In a study aimed at investigating digitization levels of University libraries in Sub-Saharan Anglo-Phone Africa, Rosenberg (2006) established that there was progress towards digitization. However, digitization was taking place at different speeds and levels, and that the libraries had different needs and ambitions. Kenyan academicians participated in the study. In one of the local studies, Bii and Wanyama (2001) argue that computerization of academic library operations is a relatively new practice. Lack of funding is decried as a major stumbling block towards library automation that can help narrow the digital divide between the developing and the developed world (Rosenberg, 2006; Okemwa-Ondari, 1999; Mutula, 2004; Kavulya, 2004).

The process of automating library operations can be piecemeal or integrated. Libraries adopt piecemeal automation (that is, computerization of one or two library functions at a time, sometimes till all the functions are integrated) because of various reasons: limited resources; it is easy to implement; it has an advantage of concentrating effort on the most urgent areas. The biggest drawback of piecemeal computerization is the likelihood of future incompatibility (Rowley, 1993).

An integrated library system is defined as one where the files of all the library functions are interlinked so that deletions, additions and other changes in one file automatically activate appropriate changes in related fields (Rowley, 1993; David, 2000 and MAHLAP, 2006). David (2000) adds that the adoption of an integrated library system (ILS) by most libraries the world over has come at the right time in the history of libraries where the users are computer literate and would expect to find computers also being used in libraries.

Garcha (1996) sums up the general benefits associated with library computerization by saying that technology offers libraries in the Third world no less than those in the industrialized world, an ideal solution to a number of problems of managing a modern library. It offers speed, accuracy and efficiency in the processing, presentation and retrieval of catalogue information. It is desirable for all key national, academic and research libraries.

In relation to the above, Rowley (1993) adds that the desire to share resources and thus enhance service to users has been responsible for the installation of many library management systems. To Bii and Wanyama (2001), automation emerged from a global need for effective and efficient ways of processing and sharing information.

Despite the dearth of literature decrying a myriad of factors hindering library automation in Africa in general and Kenya in particular, a preliminary investigation to the proposed study revealed that a number of academic libraries in Kenya have automated their operations. The United States International University (USIU) uses Erudite software; Catholic University of Eastern Africa (CUEA) has installed Inmagic; Kenyatta University uses CDS/ISIS while the Africa Nazarene University (ANU) and the Kenya Technical Teachers College (KTTC) use Mandarin 3 software. The Mombasa Polytechnic uses customized software called Ekatchware. However, despite these developments, there is a general lack of published information about the current automation status of middle level academic libraries as most studies are on university libraries (Rosenberg, 1996; Okemwa-Ondari, 1999; Bii and Wanyama, 2001; and Mutula, 2004 ) among others.

## **1.1 E-Library Concept**

E-libraries provide online access to large collections of digitized content drawn from a variety of sources, including books, journals and periodicals. In general, e-libraries obtain the rights to copyrighted material, paying publishers royalties based on how often the material is accessed.

### **1.1.1 Definition of E-Library**

An e-Library management system is a full featured, web-based library package which revolutionizes the library and makes it open 24 hours a day, 7 days a week and 365 days in a year.

## **1.2 Benefits of E-Library**

### **1.2.1 Benefits of E-Library to Library members**

1. Access anytime from anywhere on the intranet/internet
2. Apply for membership on-line and enjoy privacy and confidentiality through individual log-in ids and passwords
3. Browse through books by categories and sub-categories
4. Search for books by title, author, publisher, ISBN number, or other criteria
5. Reserve books for pick-up at the library or delivery to your home or office desk (and cancel a reservation if desired)
6. Join waiting lists for books currently unavailable
7. Schedule a book return for pick up from home or office desk
8. Check due dates of books borrowed and receive automatic due date and overdue reminders
9. Check details of all books and magazines borrowed any time in the past
10. Check credit rating and availability to see how many books can be borrowed
11. Change address and contact information through on-line forms
12. Recommend new books to the library

### **1.2.2 Benefits of E-Library to Librarian**

1. Enter book and magazine data on-line including author and publisher details, number of pages, type of cover, number of copies available, language, year of publication, edition, price and value of books, ISBN number, category, classification, etc.
2. Support for multiple copies of books (with reservation of books and check-out of specific copies)
3. Manage member data on-line
4. Automatic assignment of member numbers, book call numbers
5. Assign and manage member credit ratings and borrowing limits on-line
6. Powerful search and browsing interfaces (search by title, author, publisher, or ISBN browse by categories)
7. On-line Check-in and check-out processing with automatic due date assignment
8. Multiple book check-ins and check-outs on a single screen
9. Book reservation handling
10. Automatic processing of waiting lists and automatic on-line renewals
11. Screens for current status of book borrowings, reservations, waiting lists, and overdue books
12. Automatic fee due and late fee calculation,

### **1.2.3 Benefits of E-Library to Library Managers and Owners**

1. usage tracking and analysis,
2. Search log tracking and analysis
3. Snapshots of current members
4. Snapshots of current books checked out
5. Snapshots of overdue books

6. Snapshots of reserved books and waiting lists
7. Daily and monthly summary of book borrowings and fee revenues
8. Special security for owner/manager screens
9. Utilities for bulk uploading of member and catalog data
10. Support for individualized credit limits for book borrowings by members
11. Tracking of values of books
  
12. Support for sending reminders for due dates and overdue books

### **1.3 What is e-Readiness?**

E-readiness refers to a country's ability to take advantage of the Internet as an engine of economic growth and human development. E-readiness has several components, including telecommunications infrastructure, human resources, and legal and policy framework.

#### **1.3.1 Definition of E-Readiness**

For the purpose of this study e-readiness refers to an institutions ability to take advantage of the computer networks and the Internet as an engine of accessing and sharing of e-materials.

#### **1.3.2 The Concept of E-Readiness**

There is no standard definition for e-readiness that is perfect because e-readiness is a relatively new concept to provide a unified framework to evaluate the breadth and depth of the digital divide between and within countries, enterprises and societies. An e-readiness assessment gauges how ready a society or economy is to benefit from ICT and e-commerce. "The first efforts in defining e-readiness were undertaken in 1998 by the Computer Systems Policy Project (CSPP) when it developed the first e-readiness assessment tool known as Readiness Guide for Living in the Networked World. It defined e-readiness with respect to a community that had high-speed access in a competitive

market; with constant access and application of Its in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are favorable to promote connectedness and use of the network (Beig et al 2007).” However, there are various several assessment guides that have been developed including The Asian Pacific Economic Co-operation (APEC), The Centre for International Development at Harvard University, The Network World, McConnell International and World Economic Forum Consultation Report. Formally, e-readiness can, therefore, be defined as: *“The degree in which a country, business enterprises, community is prepared and qualified to participate in the networked world in their degree of relative knowledge and preparedness in most of the important areas for the adoption and use of ICTs and ICT applications”*

#### **1.4 Problem statement**

Although the Kenya government and the Ministry of Education have developed an ICT policy there is no framework for measuring e-readiness. There is no structural or policy for e-libraries in the national libraries of Kenya. In our tertiary institutions there is no framework for assessing e-readiness in the use of ICT in their libraries. It is therefore imperative to establish how ready these institutions are to use ICT in their libraries. There is also need to identify factors that can be used to measure readiness against a standard benchmark. There is also the need to develop a tool that can be used to measure ICT readiness and impacts that ICT have in our institutions over the time of implementation.

#### **1.5 Project objectives**

1. Identify the indicators that can be used to measure ICT –readiness for e-library.
2. Develop a model with which institutions can use to assess their ICT-readiness for e-library.
3. Develop a tool (program) to test the e-library model.



## **1.6 Research questions**

1. Which factors contribute to being e-library readiness in an institution ?
2. What are the indicators to be considered in calculating e-readiness index?
3. Which model can be used to assess e-readiness of an institution?

## **1.7 Problem justification**

It is expected that the results of the study will:

1. Serve as feedback information to the managers and other stakeholders involved with the automation of libraries in the institutions.
2. Serve as reference information upon which future decision-making by the stakeholders could be based.
3. Generate information upon which future research on ICT-readiness for e-library could be based.

## **1.8 Conceptual framework**

The conceptual framework of assessment of ICT employed in this study is based on the modified Center for International Development (CID) tool for assessment of higher education institutions in Kenya.

E-readiness assessment tools can be classified into two broad categories (Bridges, 2001), namely,

- a). E-economy readiness tools that focus on a nation's or communities readiness to exploit ICT for economic development (i.e., to take part in the digital economy).
- b). E-society readiness tools that measure the ability of the overall society to benefit from ICTs.

In general, e-society tools can also assess the readiness of a nation or community for participation in the digital economy. The CID e-readiness tool titled, "Readiness for the Networked World – A Guide for developing countries," is an example of an e-society tool (CID, 2001). It was developed by the Information Technology Group at the Center for International Development (CID), Harvard University. It is a diagnostic tool that had

also been used to conduct the first e-readiness assessment of Kenya in the year 2002 (Waema and Kashorda, 2002).

The CID Readiness for the Networked World tool monitors 19 indicators grouped into the following five categories:

**1. Network access** (six access indicators – information infrastructure, Internet availability, Internet affordability, network speed and quality, hardware and software, service and support)

**2. Networked learning** (three Internet usages in education indicators – schools access to ICTs, enhancing education with ICTs, developing the ICT workforce)

**3. Networked society** (four indicators – people and organizations online, locally relevant content, ICT in everyday life, ICTs in the workplace)

**4. Networked economy** (four indicators – ICT employment opportunities, B2C electronic Commerce, B2B electronic commerce, e-government)

**5. Network policy** (two indicators – telecommunications regulation, ICT trade policy)

Basically, the KENET framework is similar to the CID readiness assessment tool in that it is diagnostic and stages each of the indicators on a scale of 1 to 4 where 1 represents the lowest level of un-preparedness and 4 the highest degree of readiness.

## Chapter 2

### 2. Literature Review

#### 2.0 Overview

Library automation worldwide has had a steady evolutionary path. The first phase was experimental during the 1960s and was largely characterized by in-house developed systems. The second phase was in the 1970s when the off-the shelf turnkey systems were introduced. This second phase was enhanced by the development of the microcomputer technology, which propelled computing into public domain. The third phase started in the 1980s and saw the emergence of the off-the shelf integrated systems offering circulation, cataloguing, acquisitions, serials control and OPAC with all the modules sharing a common database (Rowley, 1993; Mutula, 2004).

Ebenezer (2002) defines an integrated library system as an interrelated group of computer programs that automates multiple library operations. To Cibarrelli (2002), it refers to the provision of integrated online access to the library's OPAC and to cataloguing, circulation, acquisitions and serials management functions. Deddens (1999) sums up the new innovations in ILS development by noting that one outstanding change that emerged in the 1990s is the linkage between bibliographic citations and the content they represent. The author further says that today's ILS is a multi-function Web-based multi-media content information management system generally built on a standard relational database structure. The modern systems have become vital in provision of information that is licensed by libraries but it does not exist in their physical collections. Rowley (1993) adds that more innovations have seen the move from proprietary database structures to integrated systems based on relational database structures that can run on a wider range of platforms for example UNIX and DOS-based; from command-based interfaces to user interfaces (GUI) features such as windows, icons, menus and direct manipulation.

## 2.1 General features of an Integrated Library System

Ebenezer (2002) gives two basic categories of ILS: those intended for larger academic or public libraries and those intended for smaller libraries such as school or special libraries; he however acknowledges that this division is not absolute.

According to David (2000) and Ebenezer (2002), the modern ILS vendors provide systems that have the following features:

- Functional modules - Most systems offer the basic modules including cataloguing, OPAC and circulation in a library software package; and the other functions such as acquisitions, serials control, interlibrary loan (ILL) and Web OPAC are usually provided as optional add-on modules or as part of a main module.
- Operating system – each system may work for a particular Operating System (OS) like Windows, Unix *et cetera*; or may work for both environments.
- Database systems – major systems normally make use of RDBMS offered by different vendors. Examples include Oracle and MS Access.
- Network architecture – major systems run on the client-server architecture and use TCP/IP to communicate across Local Area Networks (LANs) and Wide Area Networks (WANs). In addition, they have Web-based OPACs.
- User Interface – the use of graphical user interface (GUI) is the norm for current systems. This is because users find it easier to work with as it allows a wider range of tasks that could be accomplished with a click of a mouse.
- Library automation standards – provisions for library industry standards such as MARC and Z39.50 are normally integrated with major systems.

## 2.2 Benefits Of An Integrated Library System (ILS)

According to Rowley (1993), the reasons for opting for a computerized library are many and varied. This is reflected in the reviewed literature. In what she refers to as the stages of library automation, Borgman (1997) gives a summary of what general benefits such a system should bring to the library:

- Improving the efficiency of internal operations through improving internal workflow and sharing catalogue data.
- Providing access to resources outside the library
- Enhanced facilities for identifying, locating and obtaining documents; bibliographic data exchange and integrating local collections with other types of information resources
- Ensuring the interoperability of systems, with a related tendency towards modulization and fragmentation.

### **2.3 Benefits to the library staff**

Computers permit the reduction of the number of repetitive tasks. This is because in such a system, data will only be input once and thereafter, can be accessed and amended accordingly (Rowley, 1993). In agreement, Lopata (1996) says that duplication of effort to create and maintain multiple copies of bibliographic records for instance is eliminated; and opportunities for errors are reduced when records are entered only once and changes are automatically propagated throughout the system. All these lead to a conclusion that after installation, computerized systems are cheaper in terms of time and effort. In the context of library cooperation ILS enables the sharing of bibliographic data and to an extent, stock while retaining the ability to provide specialist service to the libraries own membership. The use of bibliographic utilities such as OCLC and LC authority lists contribute a lot to time and effort saving (Rowley 1993; David, 2000; Porat, (2001). Also, staff responsibilities have shifted so that professionals spend more time on management while all levels of staff have acquired more skills, as they are often cross-trained for a variety of jobs that require a similar knowledge base (Bills, 2000).

Other benefits include introduction of services not previously available for example control of over borrowing and trapping of reserved books on their return to the library. Besides, ICT also presents staff with new opportunities and challenges to enhance their existing services. With the use of an automated system, staff has added control over library functions that can be achieved with more comprehensive library management information, which makes it easier to justify a good cause and facilitate effective

decision-making (Rowley, 1993). To this end, the author argues that both library staff and patrons can have access to all pertinent information at one location. Bills (2000) explains that ILS have led to user groups and e-mail lists, both forms for previously isolated staff at all levels to test ideas, listen to the results of others experiments and get specific information about system capabilities and equipment; that the sharing of much more information about the status of library items has created the perceived, if not the actual, connection of technical service staff to the rest of the library. Reporting their findings of a study that sought to establish the relationship between automation and job satisfaction of staff at Moi university library, Bii and Wanyama (2001) conclude that, staff members viewed automation as an indispensable enrichment to their jobs. This is because the computerized system was a source of effectiveness, efficiency, prestige, recognition and additional services to the clientele.

## **2.4 Benefits to library users**

The benefits accrued by libraries and their staff as a result of automating their services such as speed, accuracy and efficiency in processing; presentation and retrieval of information (Garcha, 1996) are supposed to directly benefit the library users. Miido (1996) investigated the effect of automation on end-users and cautions that although automation increased the prestige of the library in their eyes, their adaptation to the system depended on such factors as previous exposure, need to use the system, ease in using the system, direct incentives and historical management tenets.

Manjunath (2007) explains that the library catalogue or index to the collection forms the base for most of the library activities such as acquisition, reference, bibliographic service, ILL *et cetra*. The users of the library card catalogue will appreciate how fast is the retrieval, search and printing in an automated environment is. Porat (2001) lists timeliness of service, price of service; convenience and user interaction with staff (through e-mail and user groups), as some of the benefits of automation to users.

## **2.5 Challenges Associated With Automation**

The most common challenges mentioned in the literature are: poor infrastructure, shortage of local expertise and dependence on donor initiated and funded ICT projects. Okemwa-Ondari (1999) laments that unlike the situation in the developed countries, automated library systems are not common place in Third World countries like Kenya. In relation to this, the author says that technical challenges arise because automation technology is not manufactured in Kenya; one has to therefore deal with importing the technology, expertise and hardware and software. Another major challenge is dependence of academic libraries on donor initiated and funded ICT projects; and lack of attention and support from the parent institution (Rosenberg, 1996; Bii and Wanyama, 2001; Mutula, 2004; Kavulya, 2004).

In her survey of university libraries, Rosenberg (2006) reports that lack of or failure to retain trained library staff has similar challenges to that of funding. Okemwa-Ondari's (1999) study supports this and adds that the few available library staff have negative attitudes towards automation to the extent that they could resist training; this is due to the fear of losing their jobs due to library automation. Bii and wanyama (2001) dispute this finding but however acknowledge lack of adequate and motivated staff. After installation of the system, Bii and Wanyama (2001) list an unattractive user interface and boredom (as a result of being exposed to the same screens, instructions and procedures daily) as some of the issues that affect its use by the library staff.

## **2.6 Definition of e-readiness**

A country's e-readiness is essentially a measure of its e-business environment, a collection of factors that indicate how amenable a market is to Internet-based opportunities. E-readiness is not simply a matter of the number of computer servers, websites and mobile phones in the country, but also things such as its citizen's ability to utilize technology skillfully, the transparency of its business and legal systems, and the extent to which governments encourage the use of digital technologies."

UNESCO regards e-readiness as an essential and integral part of any society that is attempting to organize itself to work towards a common goal.

## 2.7 Existing Frameworks for e-readiness

### 2.7.1 CSPP's E-Readiness Guide For Living in the Network World

The Computer System Policy Project (CSPP) developed an e-readiness tool published in 1998 designed to help individuals and communities determine how prepared they are to participate in the network world. The network measures the prevalence and integration of ICT in homes, schools, businesses, health care facilities and government offices with additional focus on competition among access providers speed of access and government policy. Measurement is divided into five dimensions or categories, namely-

- a). *The Network Infrastructure* – This focused on the backbone technologies and infrastructure that connect you to the network.
- b). *The Network Places* – Infrastructure alone does not ensure connectedness but the network must extend to the places where people spend time and access networks through wired access or mobile technologies.
- c). *Network Applications and Services* – This refers to how we use connectedness to make it meaningful and purposeful especially its ability to adopt and use ICT. The Network World is all about how we are able to adopt and use the Network to make our lives better, jobs more meaningful, time more well spent, people smarter and communications stronger, healthier and safer.
- d). *Network Economy* – The role of the Network in driving the economy and businesses. The internet has already revolutionized economies.
- e). *Network World Enablers* – This refers to the key factors or levers that expedite the Network World to enable users benefit more from the Network World.



The tool provides 23 structured questions for community to ask about itself with regard to the network world and for each question, the users choose from a set of answers, which represent four progressive stages of development. The questions are categorized into five categories or dimensions as listed above with several indicators. The assessment produces a rating that indicates the country or community's stage the community is at for each of the five categories. Furthermore, 'an overall score' for the community can be estimated by simply assigning weights and averaging the scores across the criteria.

### **2.7.2 APEC's E-Commerce Readiness Assessment Framework**

The Asian Pacific Economic Co-operation (APEC) Electronic Commerce Steering Group developed this tool/ guide that measures six categories for readiness for e-commerce, namely-

- a). Basic infrastructure and technology (speed, pricing, access, market competition, industry standards and foreign investment etc.)
- b). Access to network services (bandwidth, industry diversity, export controls, and credit card regulation, etc.)
- c). Use of the internet (use in business, government and homes, etc.)
- d). Promotion and facilitation (industry led standards)
- e). Skills and human resources (ICT education, workforce and skills etc.)
- f). Positioning for the digital economy (taxes and tariffs, industry self-regulation, government regulations, consumer trust, etc.)

The tool asked participants one hundred multiple choice questions grouped into the six categories and the responses indicate progressive levels of e-readiness for a country or

community. No overall scoring is used. The product of assessment is based on the answers to the 100 questions and countries are supposed to work on areas with less than optimal answers to reduce or eliminate impediments to the deployment of e-commerce.

### **2.7.3 McConnell International's Framework**

McConnel International prepared this assessment tool in collaboration with the World Information Technology and Services Alliance (WITSA) that measures five key areas, namely-

- a). Connectivity (infrastructure, access and pricing);
- b). E-leadership (government policies and regulations);
- c). Information security (intellectual property, privacy and electronic signatures);
- d). Human capital (ICT education, available skilled workforce); and
- e). E-business climate (competition, political and financial stability, foreign investment and financial infrastructure).

For each country and each category, the report performs a “dynamic evaluation of the relevance and accuracy of available quantitative data with an understanding of myriad cultural, institutional and historical factors”. These ratings and their narratives can be used as a starting point for further planning and analysis. Countries are rated in the five categories listed above on a scale of one to three (Blue, Amber and Red) and extensive analysis and recommendations are given.

### **2.7.4 KENET E-readiness Model**

This study is based on the modified CID tool for assessment of higher education institutions in Kenya.

The original CID tool specified 19 indicators. However, some of the indicators were not relevant for higher education. For example, ICT Trade Policy, Telecommunications Regulation and Networked Economy indicators defined in the CID tool were not relevant for higher education institutions.

Apart from eliminating some of the 19 indicators, KENET introduced six new indicators and renamed two of the categories. The two new networked learning indicators (i.e., ICT Research and Innovation and ICTs in Libraries) were motivated by the guidelines for institutional self-assessment developed for the Association for African Universities (AAU, 2000). The resulting set of 17 relevant indicators were grouped into five categories as follows:

- (i) Network Access (four indicators – information infrastructure, Internet availability, Internet affordability, network speed and quality)
- (ii) Networked Campus (two indicators – network environment, e-campus)
- (iii) Networked Learning (four indicators – enhancing education with ICTs, developing the ICT workforce, ICT research and innovation, ICTs in libraries)
- (iv) Networked Society (four indicators – people and organizations online, locally relevant content, ICTs in everyday life, ICTs in the workplace)
- (v) Institutional ICT Policy and Strategy (three indicators – ICT strategy, ICT financing, ICT human capacity)

Each of the indicators was staged on a scale of 1 (not ready) to 4 (completely ready) using both hard facts data (e.g. PCs per 100 employees, telephones per 100 employees, etc.) and perception or “soft” data collected using field-based surveys. Hard facts data was obtained from ICT professionals in each institution. Although the CID assessment tool provides a general basis for staging the different indicators, this survey modified the tool by introducing new categories of indicators and sub-indicators appropriate for higher education institutions in Kenya.

This research study looks at e-readiness in institutional libraries thus making some aspects of the modified CID model useful. In this study the indicators are staged on scale of 1 (lowest level of un-preparedness) to 4 (highest level of preparedness/readiness)

## **2.8 Necessity For ICT Measurement.**

### **2.8.1 ICT Readiness-Related Index Measures**

An example of an ICT readiness-related single-item index measure is the network readiness index (NRI). This was developed by the Center for International Development (Kirkman et al.,2002; Datta and Jain, 2004) at Harvard University, which reported on its estimation for 75 countries in 2002-2003, and 102 countries in 2003-2004. Network readiness is defined as a nation's or a community's degree of preparation to participate in and benefit from ICTs. The 2003-2004 version of NRI includes three components: environment, readiness and usage.

The EIU (2004) also uses another composite measure called e-learning readiness. It indicates a country's ability to produce, use and expand Internet-based learning—both informal and formal—at work, at school, in government and throughout society. The related measurement matrix includes nearly 150 qualitative and quantitative criteria divided into four categories: education, industry, government and society. Each of these categories is further divided into four components: connectivity (the quality and extent of Internet infrastructure), capability (a country's ability to deliver and consume e-learning, based on literacy rates, and trends in training and education), content (the quality and pervasiveness of online learning materials) and culture (behaviors, beliefs and institutions that support e-learning development within country). This index primarily targets the knowledge dimension of ICTs.

Another ICT readiness index measure, the digital access index (DAI), was developed by the ITU (2003), and measures the overall ability of individuals in a country to access and use new ICTs. It was estimated for 178 countries in 2003. This index is built around five main factors: infrastructure, affordability, knowledge, quality and usage

## 2.9 Measuring ICT Readiness

Measurement of value of ICT at the institution level is challenging in itself. As a result, a number of measurement approaches have been used for measuring ICTs at country level.

Most of the academic work in the area has been to measure economic factors, and adoption and diffusion-related factors. Relatively little attention has been given to measures for ICTs. As a result, unlike measures developed in other fields, such as public health, financial accounting, and corporate finance, measures for ICTs tend to be insufficiently grounded in theory. This provides important opportunities for academic research.

This research points out some gaps that exist related to measures for ICTs . Considering that impact measurement is of prime interest to policy makers, there is need to develop better measures for ICT readiness and impacts. Indeed, empirical validation of existing measures, development of scientifically rigorous metrics for ICT-impacts measurements, and estimating the predictive value of these index measures is important in assessing growth and development.

## Chapter 3

### 3. Methodology

#### 3.1 Introduction

In this chapter a brief description of the methods and procedure for the study is presented. It describes the research design, study location, target population, study sample and sampling, research instruments, source of data and data analysis.

#### 3.2 Research Design

Travers (1969) stated that surveys are conducted to establish the nature of existing conditions. Similarly Good (1963) stated that descriptive studies may include present facts, current conditions concerning the nature of a persons an number of objects or class or events and may involve the procedures of induction Analysis, classification, enumeration and measurement"

This study aimed at describing the status of the institutions of higher learning readiness in using ICT in their libraries. A survey method was used to establish factors and indicators that can be used to evaluate the e-library readiness.

Descriptive survey studies according to Robson 1993, provides a relatively simple and straight forward approach to the study of value, altitude beliefs and motives,

This research was designed to use content analysis of data obtained from KENET.

The "Kenya Education Network - KENET" is a national community of higher education institutions that facilitates the use of Internet technology in teaching, research and sharing of other information resources. Among its primary goals KENET intends to establish an appropriate high speed and affordable Internet infrastructure, to connect thirty tertiary institutions to a backbone and to expand to six hundred secondary and primary schools within the next two years. KENET is helping to develop human resources in information content development, information management and communication technology, as well as in capacities for e-Learning and the provision of online services.

According to the report given by e-readiness survey of higher education institutions in Kenya (2006) whose primary data is used in this research, the survey used both a hard facts questionnaire and a perceptions questionnaire. The hard facts questionnaire was completed by the institutional heads of ICT in consultation with other department heads (e.g. finance, registrar). Each hard facts questionnaire took an average of 1 month to complete, and for some universities it took over three months to obtain the data. Some of the hard facts data was obtained from secondary sources such as audited financial reports and institutional strategic plans submitted to the Ministry of Education.

This paper is designed to use data obtained from KENET research to establish factors and their indicators that can be used to evaluate the readiness of their institutions to use ICT in their libraries.

### **3.3 Sampling Method and Sample Sizes**

From the KENET report, the sample sizes for perceptions questionnaires took into account the student population, different categories of students (undergraduates, post-graduates), faculty and staff. In addition, the sample included students, faculty, and staff from eight broad categories as shown in Table 3.1. For each institution, the sample size was determined to be statistically significant. For the large universities, sample sizes also took into account different campuses (e.g., six campuses for University of Nairobi, three campuses for Moi University, etc.). Initially, the student enrollment data in the Economic Survey of 2005 was used to determine the overall sample sizes.

Table 3.2 shows the different categories of respondents. A total of 8,159 valid perception questionnaires were entered into the database and used for analysis (90% of the respondents were students). In sampling the students, there was an additional requirement for gender balance as shown in Table 3.1. Overall, 43% of the respondents were female, consistent with the gender distribution of students in higher education institutions in Kenya. The students' sample was also representative of students in different years of study as shown in Table 3.3.

**Table 3.1: Sample size for different academic departments**

Academic Departments	Gender		Total
	Male	Female	
Humanities, Social Sciences	780(54.1%)	661(45.9%)	1441
Languages, Communications, Journalism	100(40.5%)	147(59.5%)	247
Computing (IT, IS, Computer Science, Computer Engineering)	645(61.6%)	402(38.4%)	1047
Engineering (Electrical, Mechanical, Civil)	539(77.7%)	155(22.3%)	694
Biological Science, Physical Sciences	354(66.0%)	182(34.0%)	536
Education	641(50.8%)	622(49.2%)	1263
Medical Sciences	290(55.6%)	232(44.4%)	522
Other	655(51.2%)	625(48.8%)	1280
Total	4004(57.0%)	3026(43.0%)	7030

(Source: E-readiness survey of Kenya report by KENET)

**Table 3.2: Categories of respondents**

	Main occupation	Frequency	Valid Percent	Cumulative Percent
Valid	Professor/Associate	19	.2	.2
	Senior Lecturer/ Lecturer/ Assistant Professor	199	2.5	2.7
	Assistant Lecturer/ Tutorial Fellow/ Graduate Assistant	123	1.5	4.2
	Administrative Staff	402	4.9	9.1
	Student	7372	90.4	99.5
	Other	44	.5	100.0
	<b>Total</b>	<b>8159</b>	<b>100.0</b>	

(Source: E-readiness survey of Kenya report by KENET)



**Table 3.3: Students year of study**

	<b>Frequency</b>	<b>Percent</b>
First	1878	26.1
Second	1826	25.3
Third	1716	23.8
Fourth	1518	21.1
Fifth	144	2.0
Masters	104	1.4
Doctoral	5	0.1
Other (Pre-university, certificates)	18	0.2
<b>Total</b>	<b>7209</b>	<b>100</b>

(Source: E-readiness survey of Kenya report by KENET )

### **3.4 Data Collection Procedures**

Permission from the supervisor was granted and a letter was written to KENET to allow them give raw data from their research on e-readiness survey of higher education institutions in Kenya (2007). Data was availed to the research for analysis.

### **3.5 Data Analysis**

Data collected was given to the researcher when it was already in soft copy in the format of the program SPSS. The data was analyzed and was used to generate data summaries and graphs.

Results of the analysis and staging are contained in Section 4. The results are presented in tables and charts.

The staging framework developed in this research study was used to calculate the values of the different indicators. The staging framework was used by the researchers to assign a value of 1 to 4. For each of the questions, a cross tabulation analysis was used to establish relationships between indicators and Cramer's V values used to show the strengths of the relationships.

### 3.6 Methods used to identify factors and indicators

From the study, many factors were tested through the questionnaire all those that measure e-readiness for an institution. Among many those that focus on the library are analysed to be used by this research.

### 3.7 System Design

#### 3.7.1 Library E-readiness System Design Flow Chart

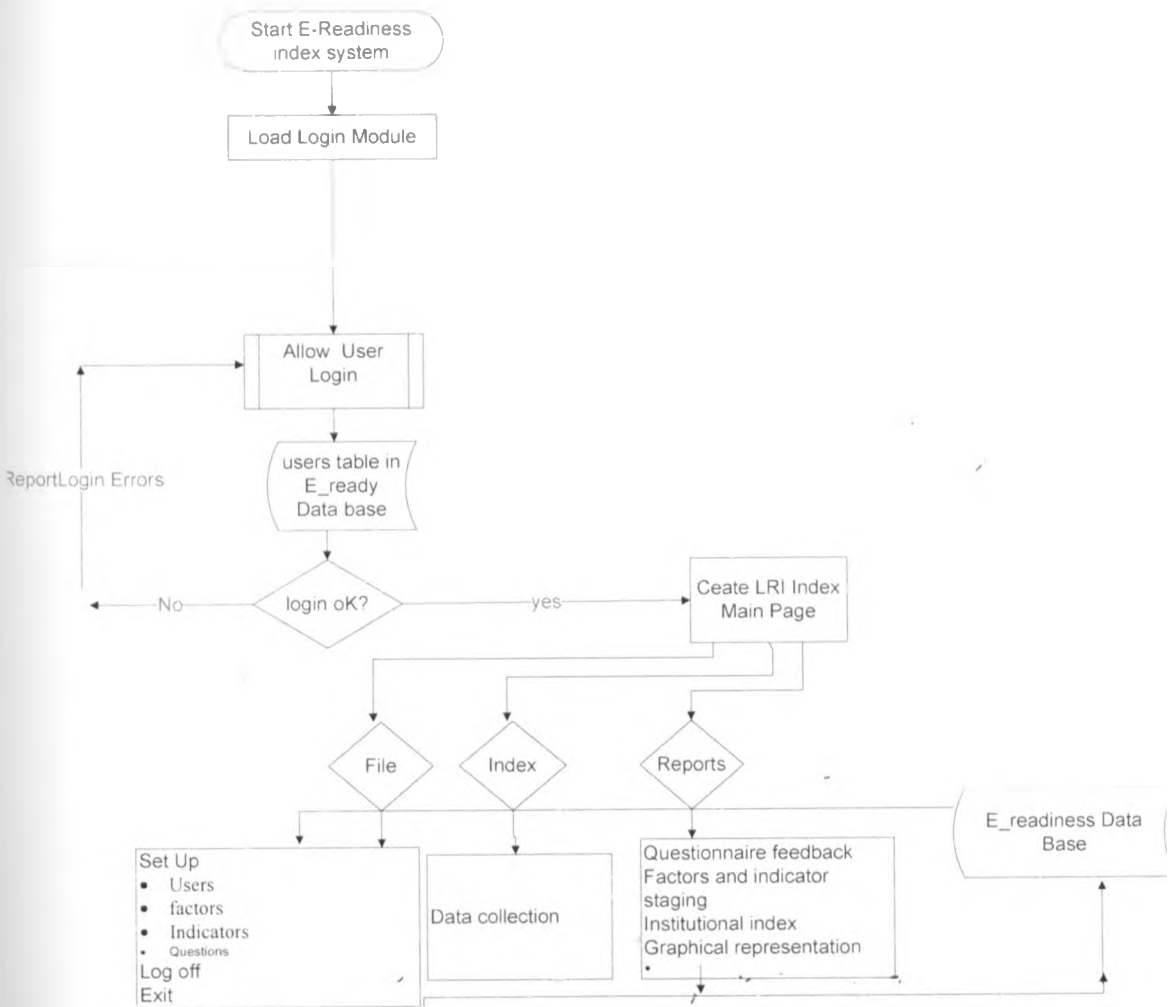


Figure 3.1 Library E-readiness System Design Flow Chart

### 3.7.2 Library E-readiness Index System Detailed Modular Design Specifications

#### Login Module

This module is used to authenticate the users. It only allows authorized users to login to the system.

#### Inputs

The user has to enter his or her username and Password.

#### Output

If the user is authorized the system Main page is created, else a login error message is generated by the system.

## Design Flowchart

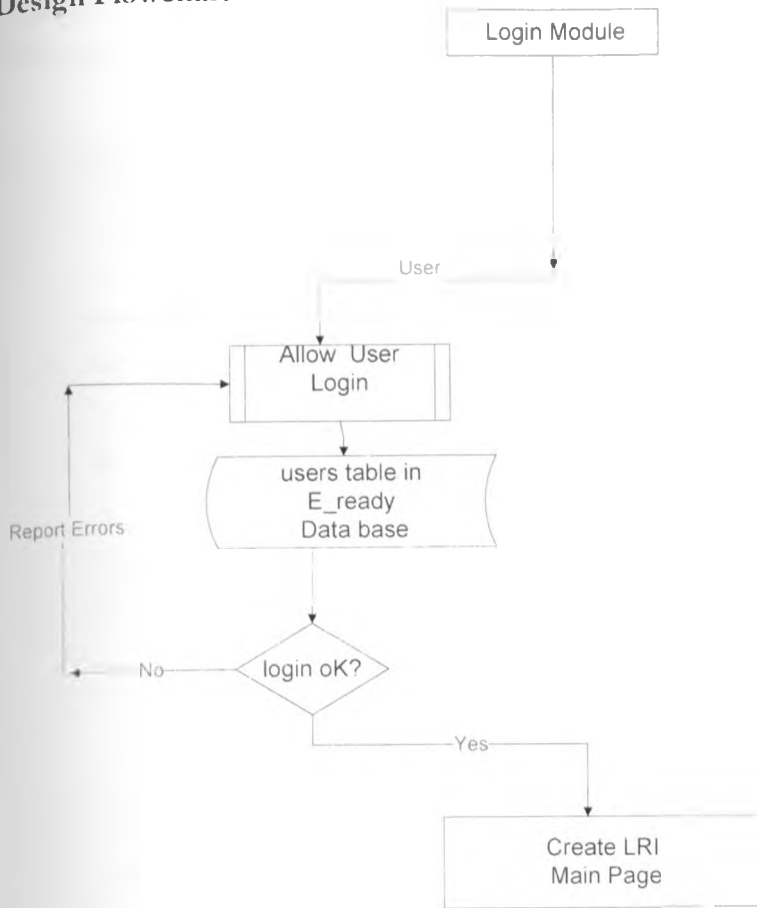


Figure 3.2: Login Module Design Flowchart

### 3.7.3 LRI Main Page

This module is designed in such a way that its menu driven, i.e. a user is able to choose which module of the system to access from the menu options.

One can access the following modules from the main page. Depending on ones user level

#### a) Set up

This module is only available to administrators.

This module contains four sub-modules; users, factors, indicators, questions.

#### Users

This module is used to assign users rights to access the system.

It's in this module that user levels are set.

#### Inputs.

The administrator enters the username, password, and assigns roles to Users.

## Outputs

The system generates error messages if the administrator tries to save blank fields.

## Design flowchart

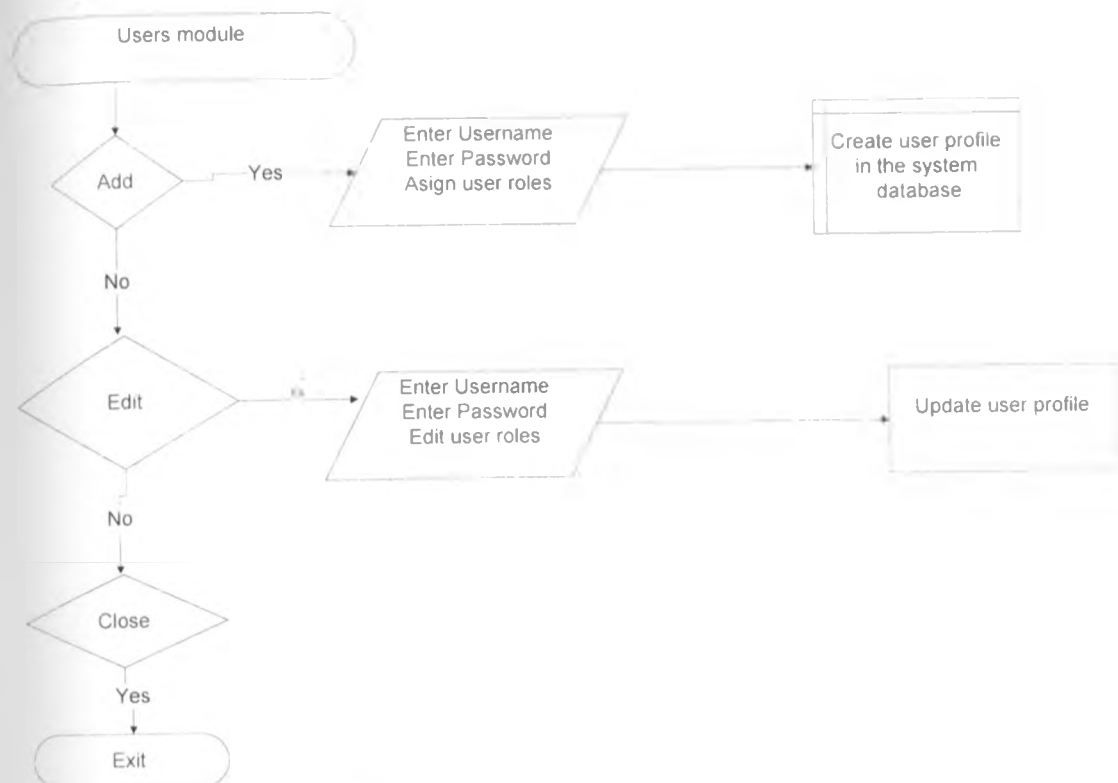


Figure 3.3 : Users Module Design Flowchart

## Factors.

This module is used by the administrator to register the factors being considered for the research, in to the system.

## Inputs

The system generates a code for each factor and one is only required to enter the factor name and the two are then stored in the E\_ready Database.

The administrator can also edit already registered factors.

## Outputs

This module has no outputs.

**Design flowchart**

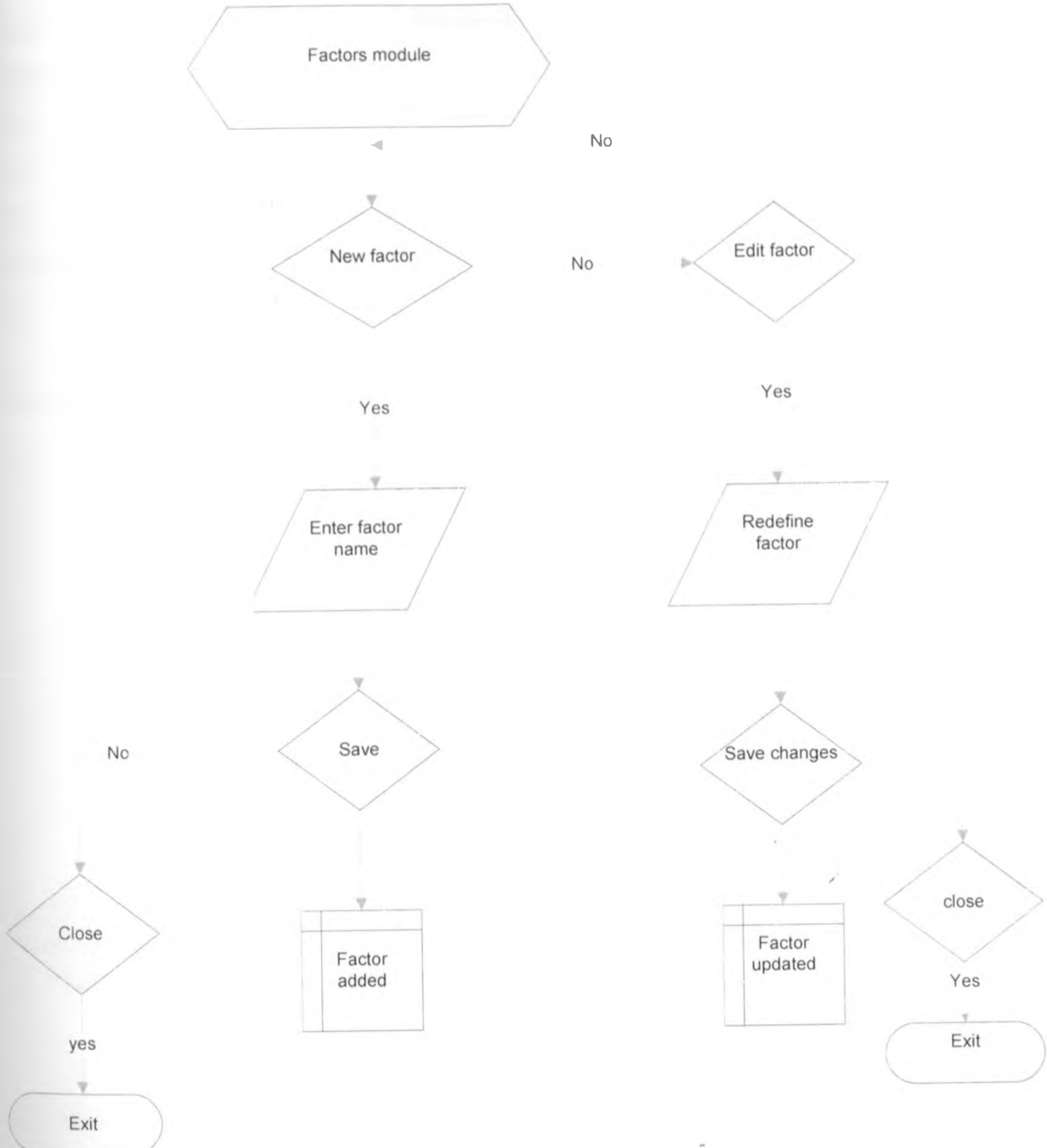


Figure3.4: Factors Module Design flowchart

**Indicators**

This sub-module is used to enter the indicators to be associated with the factors.

At the same time a table in the name of the institution is also created in the E\_Readiness Database by the system.

The administrator can also choose to delete or edit an institution from this module.

**Inputs**

The user first selects which factor to add an indicator.

If the user chooses to enter a new indicator then he/she is required to input the name of the Indicator.

**Outputs**

The module has no outputs

**Design flowchart**

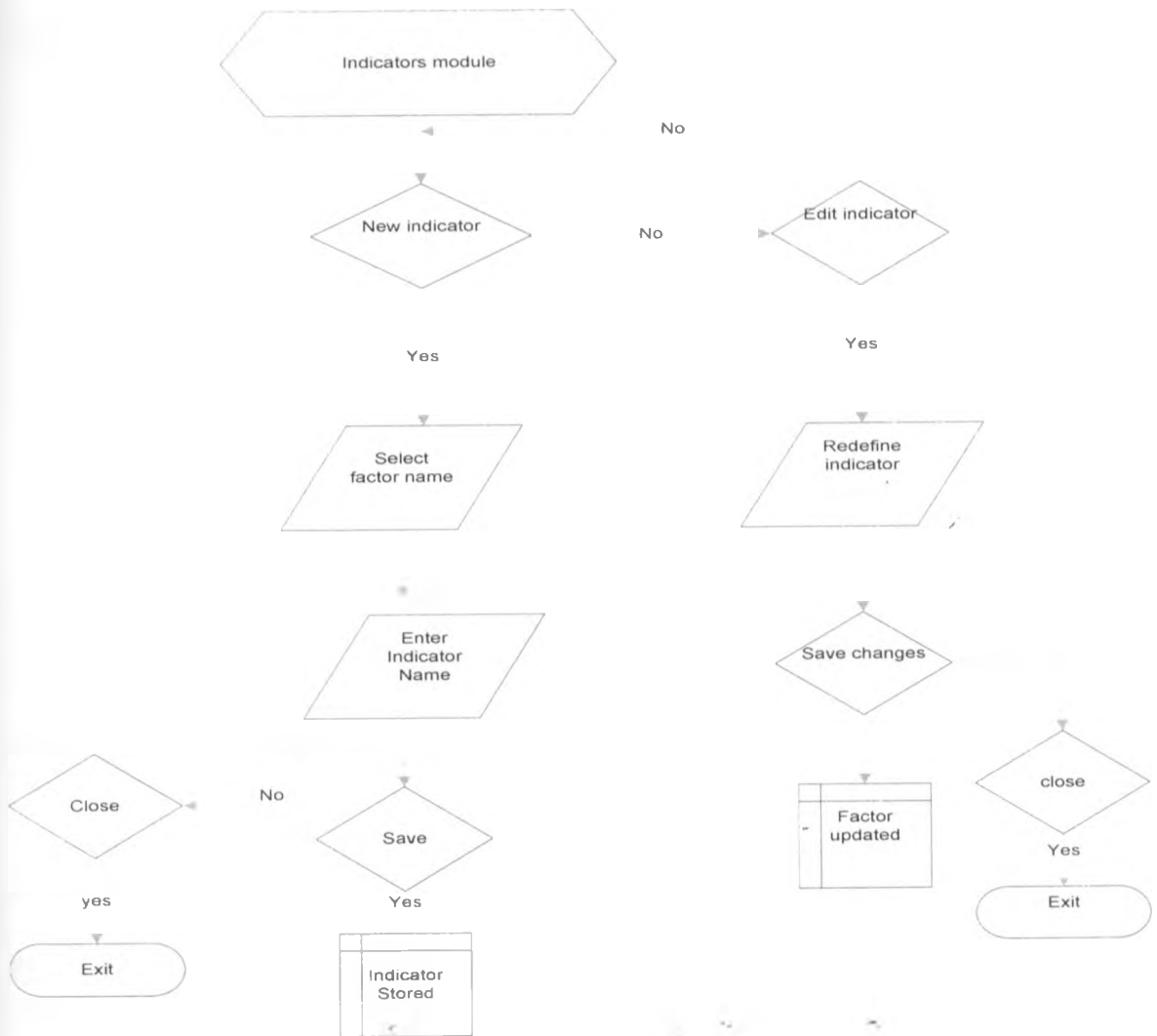


Figure3.5: Indicator Module Design flowchart

## Questions Module

This module is only available to administrators and is used to set up the questions for data collection.

### Inputs

The question

### Outputs

The module has no outputs

### Design flowchart

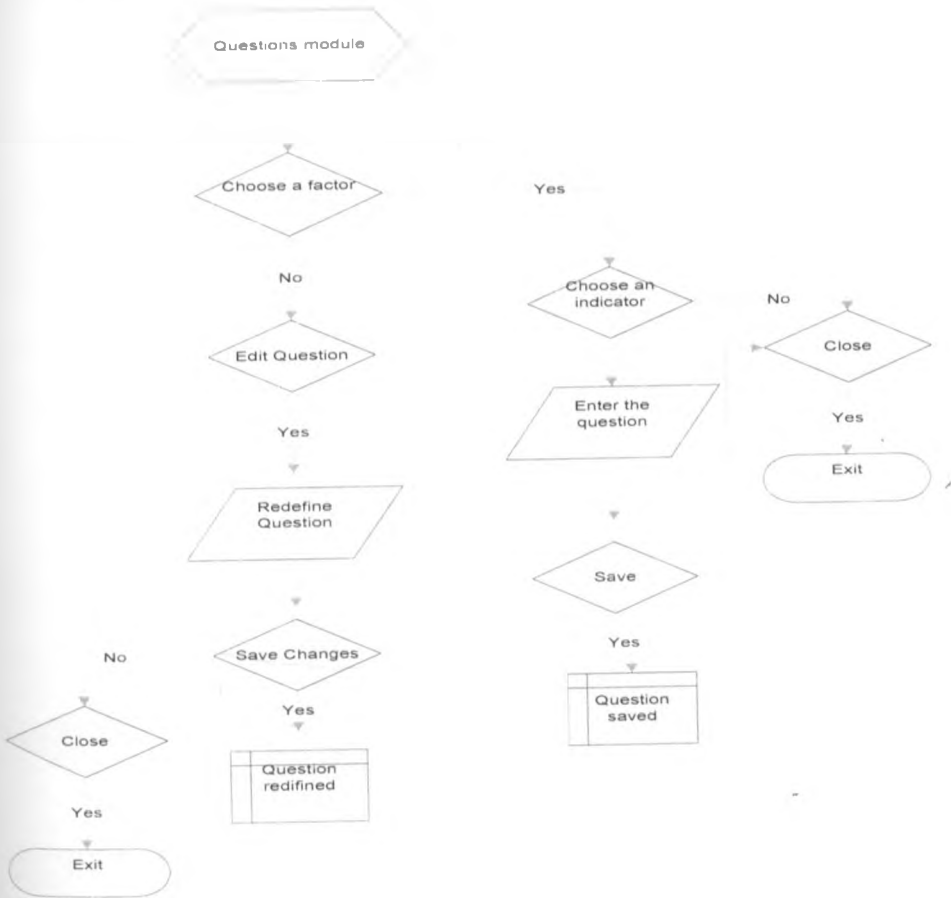


Figure 3.6: Questions Module Design flowchart



## b) Data Collection module

This module provides the user with an interface for answering the questions for a given institution.

The user selects a question to answer from a list. The values entered here are saved in the database.

### Inputs

The user enters his name, name of institution.

The user also inputs answers to the questions

### Design flowchart

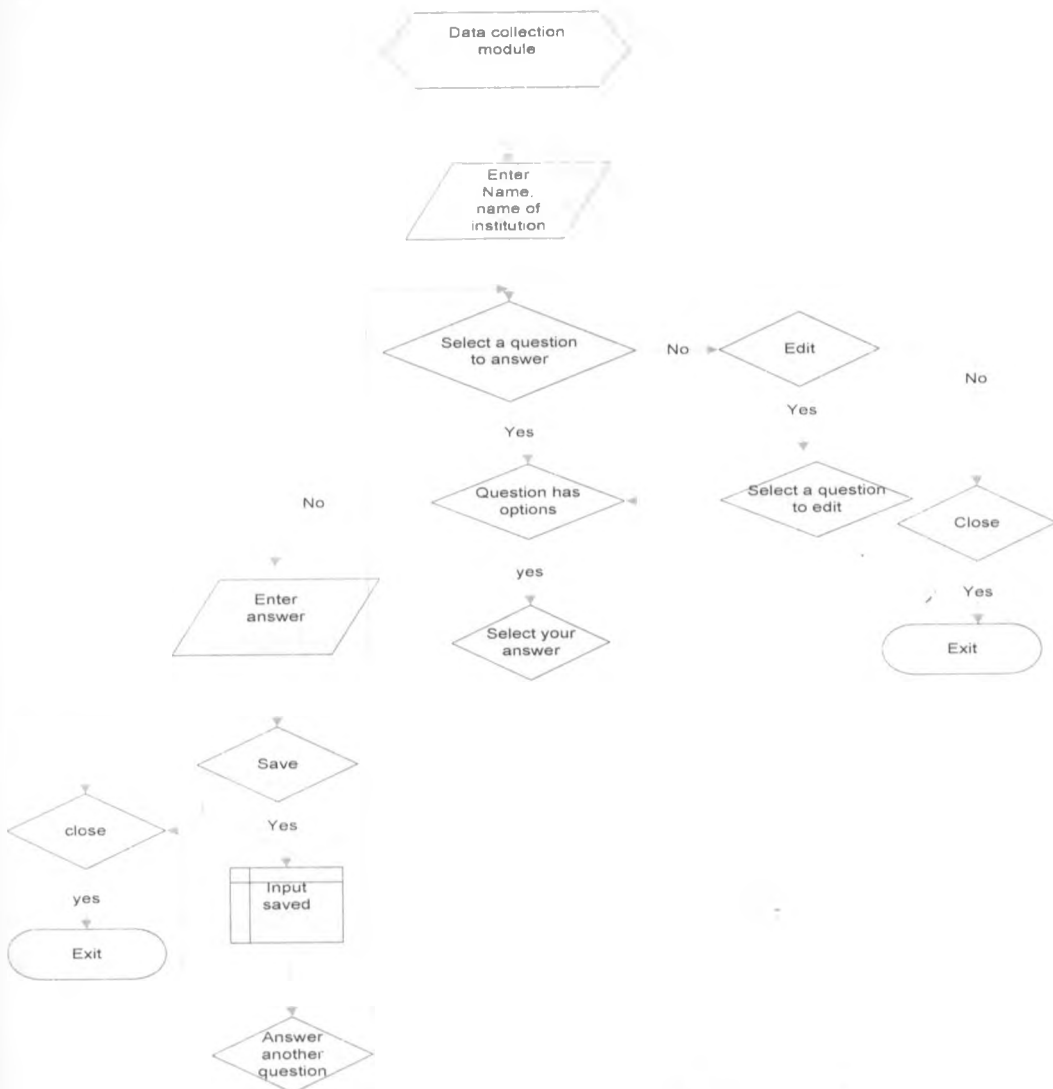


Figure 3.7 : Data Collection Module Design flowchart

### **Institutional Index Module.**

The user calculates the index of a particular institution for a particular year in this module.

The data saved by the user in the data collection module is accessed and used for computations.

#### **Inputs**

The user inputs the institution

#### **Out puts**

The system searches for values of data collected for the institution and calculates the index of the institution.

#### **Processing.**

The system checks the values of the individual indicators associated with each factor sums their weights and gets their mean which is assigned to be the factor weight. The system then sums the factors' weights and finds the mean; this is the institutional e\_library index.

Represented as;

$$I = \frac{\sum_{i=1}^n W_i}{n} \quad \text{OR} \quad X_i = \frac{\sum_{j=1}^n (X_{ij})}{j}$$

where i= 1 to 5  
j= 1 to the last indicator

#### **Where**

I=Library E-readiness Index

n=Number of factors

$W_i$ =Staged Factor weight

This formulae was derived by the researcher in chapter IV as part of data analysis and used to compute mean (I and  $X_i$ )

### 3.7.4 database design

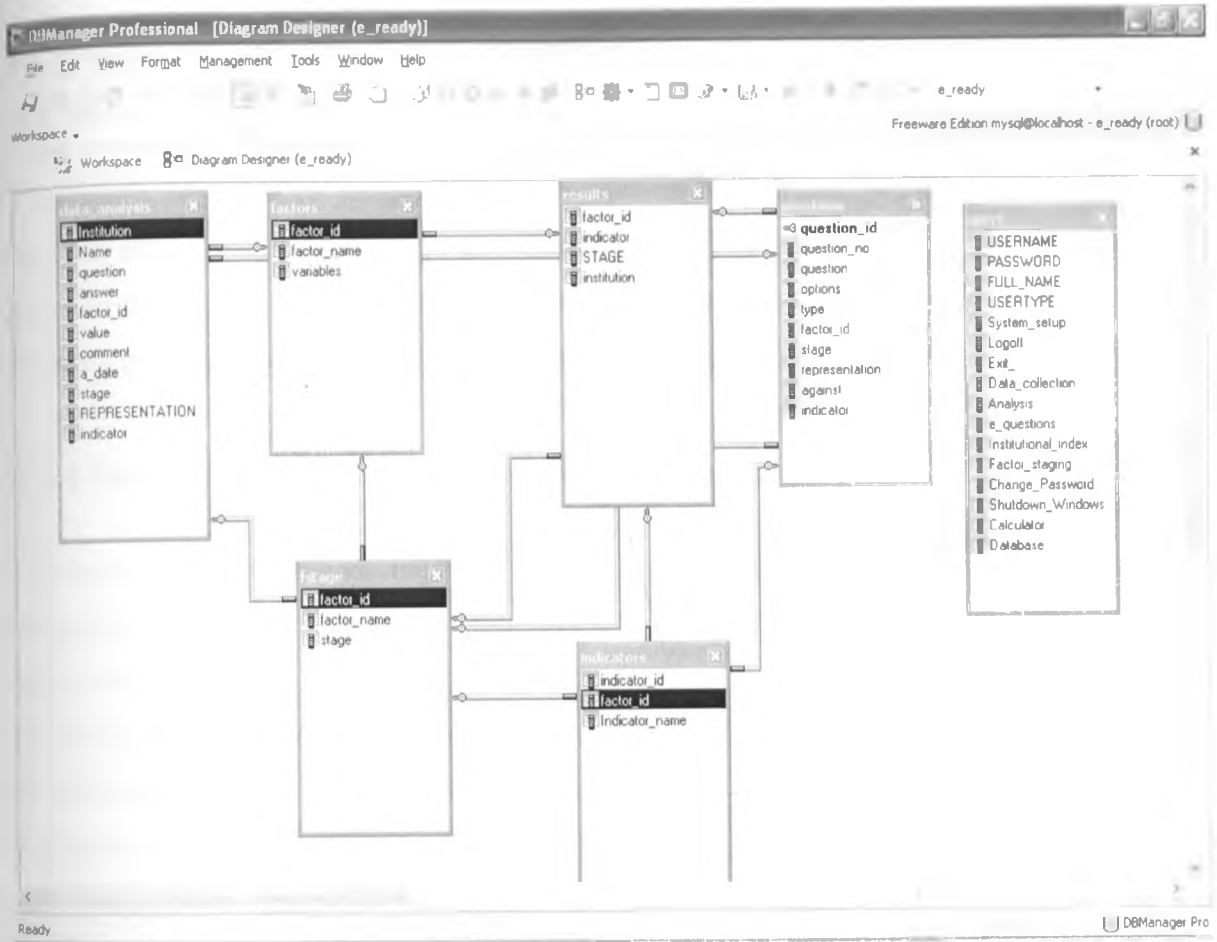


Figure3.8 Database Schema

### 3.8 Coding

Delphi version 8.0 was used to develop the tool for evaluating the e-readiness model. The MySQL server version 5 was used for the database.

## **Chapter 4**

### **4. Data Analysis**

#### **4.0 Results and Discussion**

##### **4.1 Introduction**

The results of statistical analyses are presented in this chapter. First of all reliability analysis of the measures used in this study will be presented for those questions that relate to the factors being studied, and then the rest of the chapter is organized that each research question is associated with a result and a short explanation.

##### **4.1.1 Internal Consistency Reliability Measures**

Cronbach alpha coefficient ( $\alpha$ ) was used to measure internal reliability of the data collection tools. Cronbach (1949) cautiously declared that the split-half method might give confusing results unless the two half-tests are just as equivalent as parallel forms of the identical test would be. Cronbach (1949) mentions about two underlying assumptions of split-half method: (a) the halves must have almost equal standard deviations and (b) the halves must be alike in content. It is for this reason the alpha scale was used and not split half method. Since the instrument was directly focusing on the ICT issues, it was assumed that all questions were almost identical with respect to content.

The Cronbach alpha ( $\alpha$ ), as Crocker and Algina (1986) stated, could be thought as the mean of all possible split-half coefficients and is generally applicable to any situation where the reliability of a composite is estimated. Since ICT Indicators score is gathered from seven factors ( infrastructure, internet access, personnel, ability to invest, ICT policy and perception ), it is more suitable to use Cronbach alpha as an internal consistency reliability measure.

**Table 4.1: Reliability Analysis of the data collection tool – Scale (Alpha)**

RELIABILITY ANALYSIS - SCALE (ALPHA)						
<u>Reliability Coefficients</u>						
N of Cases = 9.0						
Item Variances						
Mean	Minimum	Maximum	Range	Max/Min	Variance	
3.559E+12	.1111	5.339E+13	5.339E+13	4.805E+14	1.900E+26	
Reliability Coefficients 15 items						
Standardized item alpha = .8732						

From the table 4.1, the overall reliability ( $\alpha$ ) for the data collection tool is 0.8732 which indicated that at least 87% of the data collected was reliable, and only 13% had a measurement error.

Henerson et al. (1987) discusses on the adequate level of reliability coefficients and asserted that reliability coefficients of above 0.70 are definitely pleasing while where attitude type of measurements exist, lower coefficients are also tolerated.

## 4.2 Results

Question 1. Which factors contribute to being e-library readiness in an institution ?

### 4.2.1 Factor 1: Infrastructure

Using cross tabulation, various indicators have been cross-tabulated with the number of students in each institution respectively.

Using Pearson's Chi square statistics relationships were determined to establish whether there exist any or not. Cramer's V statistics were also used to establish the strength of the relationships.

**Table 4.2: A cross tabulation between Infrastructural Indicators and the Total Number of Student in various Universities and Colleges**

	Pearsons Chi Square		Cramer's V	Total number of students					Total
	X <sup>2</sup>	Asymp-totic signi-ficance		0-1000	1001- 5000	5001- 10000	10000- 20000	Above 20000	
Campus has an intranet	9.111	.539	.333	21.4%	28.6%	10.7%	10.7%	3.6%	75.0 %
Number of network access points	9.868	.274	.412	31.0%	41.4%	10.3%	10.3%	6.9%	100.0
Number of networked PC's	26.335	.110	.550	31.0%	41.4%	10.3%	10.3%	6.9%	100.0
Total number of PC's	24.483	.117	.530	31.0%	41.4%	10.3%	10.3%	6.9%	100.0
LAN connected to other networks	12.189	.116	.660	3.6%	3.6%	10.7%	3.6%	3.6%	25.0
Multi Media /conference facility	12.123	.120	.254	12.4%	22.6%	3.4%	3.6%	0%	42.0 %

From table 4.2, it is evident that there is a relationship between all infrastructural indicators and the total number of students in an institution. All have asymptotic significance values of Pearson's Chi are greater than 0.05. These relationships are very weak as shown by the Cramer's V statistics of less than .70. It means that though they can be used to measure e-readiness index none of them can be used alone and therefore they all must be combined to form one factor which is named Infrastructure.

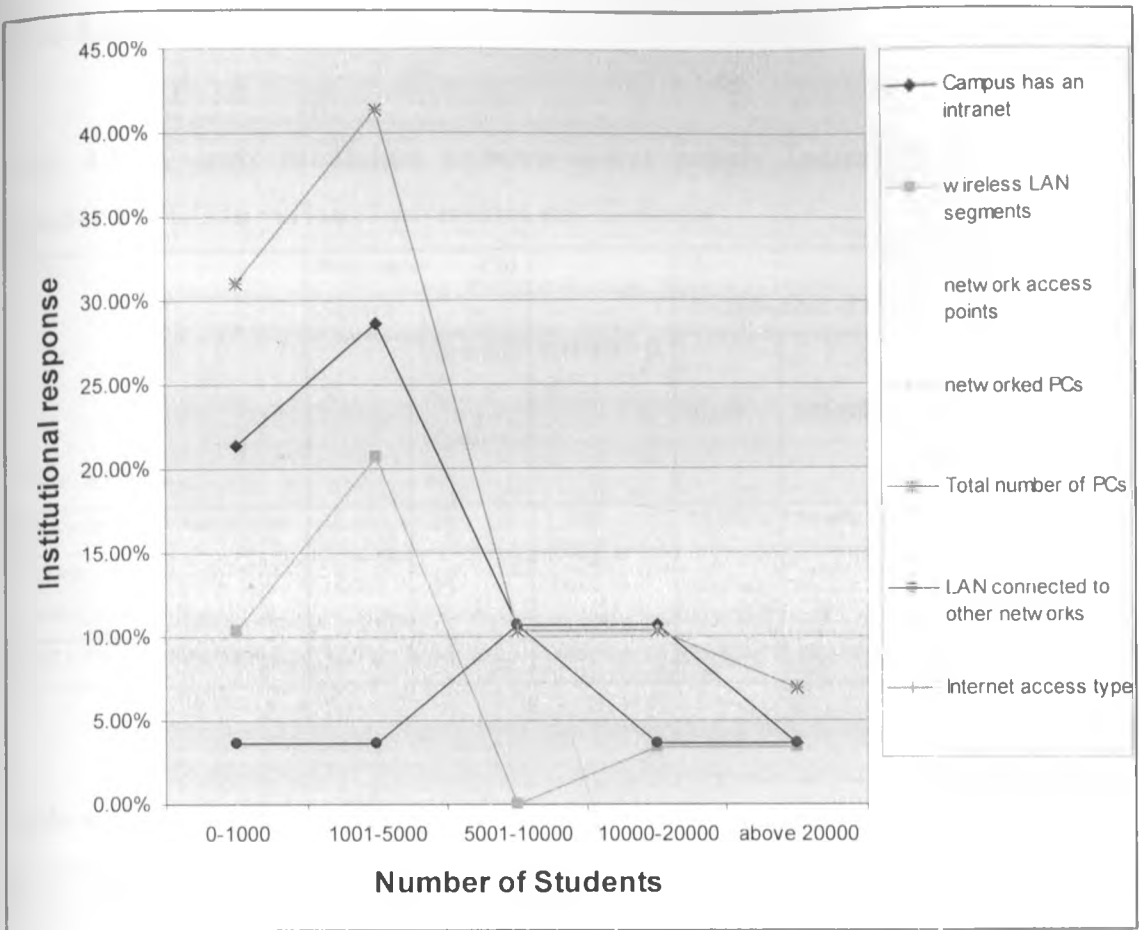


Figure 4.1: A figure of Universities and Colleges responses to various Infrastructural Indicators against the Total Number of Student in those institutions.

From the figure 4.1, though there is a relationship it is a negative relationship. The increase in students is not always a direct increase in the facilities tested by the indicators. For example the number of computers in the institutions does not increase with the student population. All indicators have registered an increase as the number of student increase from 0 to 5000 then any further increase of student is not proportional to the facilities. LAN connection to other networks seem to be constant for student population 0 to 5000 then increase.

## 4.2.2 Factor 2: Ability to Invest

Table 4.3: A cross tabulation between power supply Indicators and the Total Number of PC's in various Universities and Colleges

INDICATORS	Pearson's Chi Square		Cramer's V	Total number of PCs				
	X <sup>2</sup>	Asymptotic significance		0-100	101-500	501-1000	above 1000	Total
Electricity power annual cost	30.000	.18	1.000	30.0%	50.0%	10.0%	10.0%	100.0%
Backup diesel generator monthly cost	16.929	.15	.163	26.7%	46.7%	13.3%	13.3%	100.0%
Total UPS inventory cost	12.912	.16	.385	27.6%	48.3%	13.8%	10.3%	100.0%

Table 4.4: A cross tabulation between library Indicators and the Total ICT budget in various Universities and Colleges

INDICATORS	Pearson's Chi Square		Cramer's V	Total ICT Budget			
	X <sup>2</sup>	Asymptotic significance		0-5 millions	6-10 millions	11-20 millions	Totals
Automated all library operations	.929	.62	.267	38.5%	7.7%	7.7%	53.8%
Subscribe to e-journals	3.609	.16	.359	78.6%	3.6%	7.1%	89.3%
Library e-requisitions	1.447	.48	.227	35.7%	3.6%	.0%	39.3



Table 4.5: A cross tabulation between library Indicators and the Total ICT budget in various Universities and Colleges

INDICATORS	Pearson's Chi Square		Cramer's V	Total number of Employees						Total
	X <sup>2</sup>	Asymptotic significance		0 - 100	101 - 300	301 - 500	501 - 1000	1001 - 2000	ABOVE 2000	
Office applications training cost	8.702	.56	.409	15.4%	42.3%	11.5%	11.5%	3.8%	15.4%	100.0%
Organizational IS training cost	7.986	.63	.400	16.0%	48.0%	8.0%	8.0%	4.0%	16.0%	100.0%
ICT training budget	6.487	.77	.360	16.0%	44.0%	12.0%	8.0%	4.0%	16.0%	100.0%
ICT organizational networked apps training cost	8.944	.53	.432	16.7%	45.8%	12.5%	8.3%	4.2%	12.5%	100.0
Specialized ICT training cost	14.214	.50	.562	13.3%	46.7%	13.3%	6.7%	6.7%	13.3%	100.0

From the tables 4.3, 4.4 and 4.5, the following indicators have relationships but the relationships are weak. Their Pearson's Chi square asymptotic significance is greater than 0.05 and their Cramer's V values are less than 0.7. Therefore combining them is appropriate hence forming a factor. The indicators accepted to measure e-readiness for the factor of ability to invest are:-

- ICT training budget
- Subscribe to e-journals
- Library e-requisitions
- Total UPS inventory cost
- Backup diesel generator monthly cost
- Commercial power annual cost
- Automated all library operations

### 4.2.3 Factor 3: Access to Internet

Table 4.6: A cross tabulation between internet access Indicators and the Total number of students in various Universities and Colleges

INDICATORS		Pearson's Chi Square	Cramer's V	Total number of students					Total
				0-1000	1001-5000	5001-10000	10000-20000	above 20000	
Total ISP response time		.887	.284	29.6%	44.4%	7.4%	11.1%	7.4%	100.0%
Internet access type	Dial-up	.632		3.4%	.0%	.0%	.0%	.0%	3.4
	Dedicated 64Kbps			10.3%	13.8%	.0%	0%	.0%	24.1
	Dedicated over 128Kbps			17.2%	27.6%	10.3%	10.3%	6.9%	72.4
	Totals			.325	31.0%	41.4%	10.3%	10.3%	6.9%
Internet hours per week		.100	.857	42.1%	36.8%	10.5%	5.3%	5.3%	100.0
Employees using internet for their work		.167	1.00	29.4%	41.2%	11.8%	5.9%	11.8%	100.0
Internet for email communication		.954	.162	30.8%	38.5%	11.5%	7.7%	3.8%	92.3
Campus has wireless LAN segments		12.807	.101	.110	10.3%	20.7%	.0%	3.4%	37.9%

From the table all indicators shows that they can be used to measure e readiness because they all have relationships and the strength is relatively strong especially for internet for work which shows Cramer's V value of 1.00.

- ISP Response Time
- Internet Access Type
- Wireless LAN Segment
- Internet for Work/Assignments
- Internet for Mails

#### 4.2.4 Factor 4: Personnel

**Table 4.7 A cross tabulation between Human Resource Indicators against Employees with access to networked PCs**

INDICATORS	Pearson's		Cramer's V	Employees with access to networked PCs				
	R	X <sup>2</sup>		0-100	101-200	201-300	above 300	Totals
Academic staff have computers	-.131	.002	.013	12.5%	8.3%	12.5%	.0%	33.3
Computers for permanent staff	.636	.002	.005	50.0%	22.7%	22.7%	4.5%	100.0
Academic staff with basic ICT skills	.254	.725	.364	45.5%	27.3%	22.7%	4.5%	100.0
Lecturers access internet resources	-	-	-	45.8%	29.2%	20.8%	4.2%	100.0
System development trained personnel	-.125	.380	.905	61.1%	27.8%	5.6%	5.6%	100.0
Library staff trained on ICT	-.127	.458	.336	13.0%	17.4%	13.0%	.0%	43.5
Employees using internet for their work	.088	.240	.931	43.8%	18.8%	31.3%	6.3%	100.0
Employees with corporate emails	-.009	.009	.042	30.8%	30.8%	30.8%	7.7%	100.0
Employees using networked applications	.053	.002	.039	42.1%	26.3%	26.3%	5.3%	100.0
Lecturers with personal websites	.078	.099	.024	37.5%	25.0%	37.5%	-	100.0
Employees using transactional processing system	-.040	.074	.009	30.0%	30.0%	40.0%	-	100.0
Employees using office computer applications	.612	.0195	.556	50.0%	18.8%	25.0%	6.3%	100.0
Employees need to access internet	.352	.253	.560	46.2%	15.4%	30.8%	7.7%	100.0
ICT personnel number	.099	.395	.361	45.8%	29.2%	20.8%	4.2%	100.0
ICT employees with professional qualification	.053	.506	.332	45.8%	29.2%	20.8%	4.2%	100.0

From table 4.7, the following indicators were selected.

- Academic staff with basic ICT skills;
- System development trained personnel;
- Library staff trained on ICT;
- Employees using internet for their work;
- Employees using office computer applications;
- Employees access to internet;
- ICT personnel number

ICT personnel number and ICT employees with professional qualification; shows relationships between them and how employees in various institutions access networked computers. This is because their Pearson's Chi square significance values are greater than 0.05. The strengths of their relationships are not very strong since they are all less than 0.7 apart from System development trained personnel with .905 and Employees using internet for their work with .931 respectively.

Since a relationship exist for these indicators they can be used to measure e-readiness index and the others are rejected.

#### 4.2.5 Factor 5: Perception

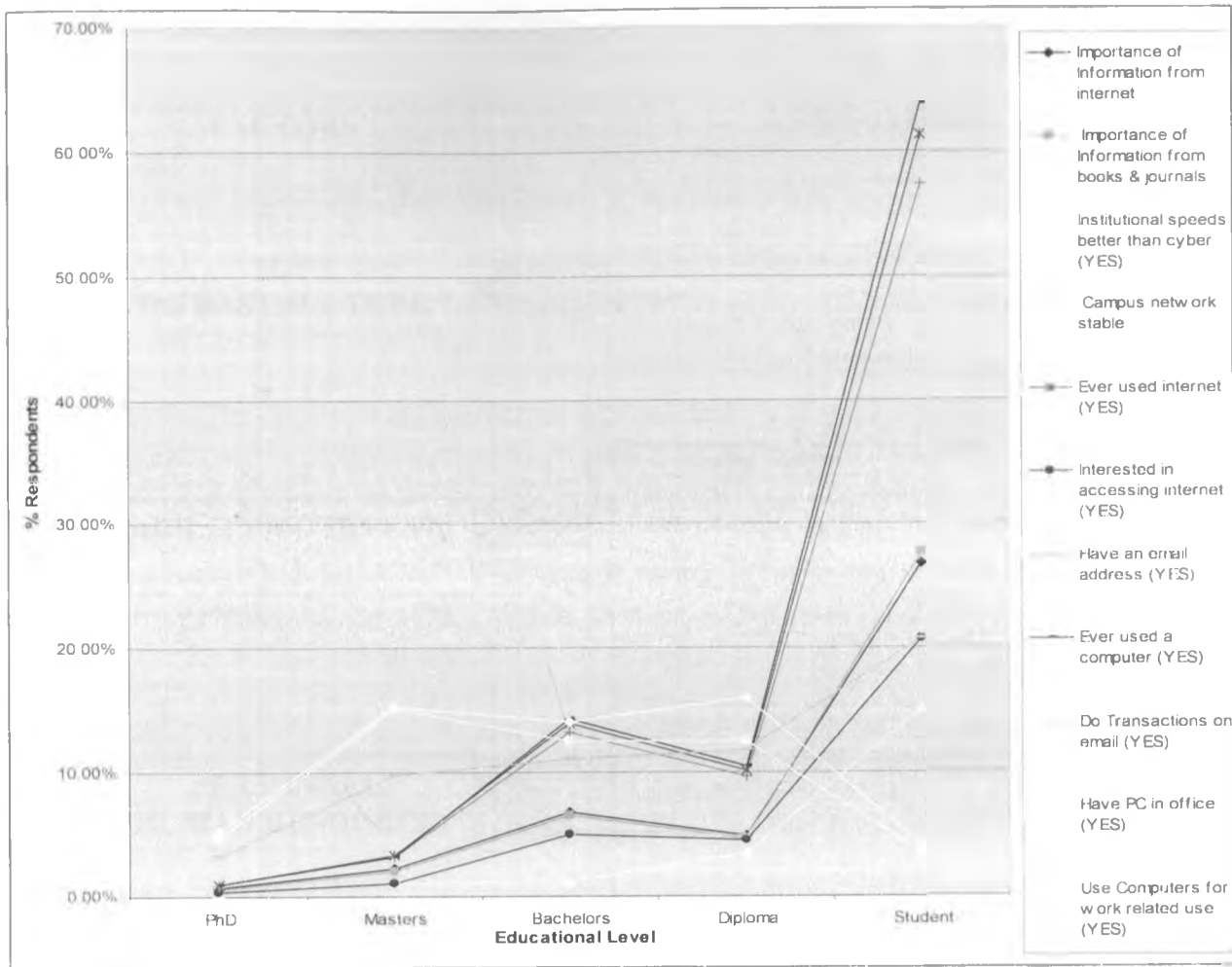
Table 4.8: A cross tabulation between Perception of various Indicators against Educational level of respondents and Gender

	Educational Level					Gender		Pearson's Chi ( X <sup>2</sup> )	Cramer's V
	PhD	Masters	Bachelors	Diploma	Student	Male	Female	Asymptotic significance	
Count	12	33	94	145	412	248	189		
Importance of Information from internet	0.7%	2.3%	6.8%	4.9%	26.8%	24.3%	17.7%	.015	.046
Importance of Information from books & journals	0.6%	2.0%	6.5%	4.6%	27.7%	24.9%	18.9%	.418	.029

Institutional speeds better than cyber (YES)	0.4%	1.1%	1.2%	3.4%	15.1%	14.3%	10.4%	.706	.009
Campus network stable (YES)	0.5%	1.6%	5.4%	4.9%	24.4%	21.5%	15.9%	.840	.107
Ever used internet (YES)	1.0%	3.3%	14.0%	10.1%	61.3%	52.5%	38.9%	.306	.117
Interested in accessing internet (YES)	0.3%	1.1%	5.0%	4.5%	20.8%	18.4%	13.9%	.772	.008
Have an email address (YES)	1.0%	3.2%	13.2%	9.6%	57.3%	49.4%	36.4%	.374	.116
Ever used a computer (YES)	1.0%	3.2%	14.3%	10.5%	63.8%	54.2%	40.3%	.915	.105
Do Transactions on email (YES)	3.2%	9.8%	11.1%	11.8%	20.7%	36.7%	23.0%	.441	.046
Have PC in office (YES)	5.3%	15.3%	14.1%	16.0%	4.0%	34.8%	23.9%	.199	.160
Use Computers for work related use (YES)	4.6%	15.1%	12.5%	12.5%	3.4%	31.1%	20.1%	.578	.047

From the table 4.8, the following indicators have a relationship that have strong relationships and hence have been selected to be used for measuring e-readiness index. Stability of campus network, ever used internet, have an email address, used a computer they have Pearson's Chi Square asymptotic significance of .840, .306, .374, .915 and Cramer's V .107, .117, .116, .105 respectively. Although the all relationships are weak these are relatively strong and a combination of them form a better perception that can be used to measure readiness.

- Stability of computer network
- Ever used internet
- Have an email address
- Regular use a computer



**Figure 4.2: A graph of Respondents against Educational Level for Various Indicators on Perceptions to ICT**

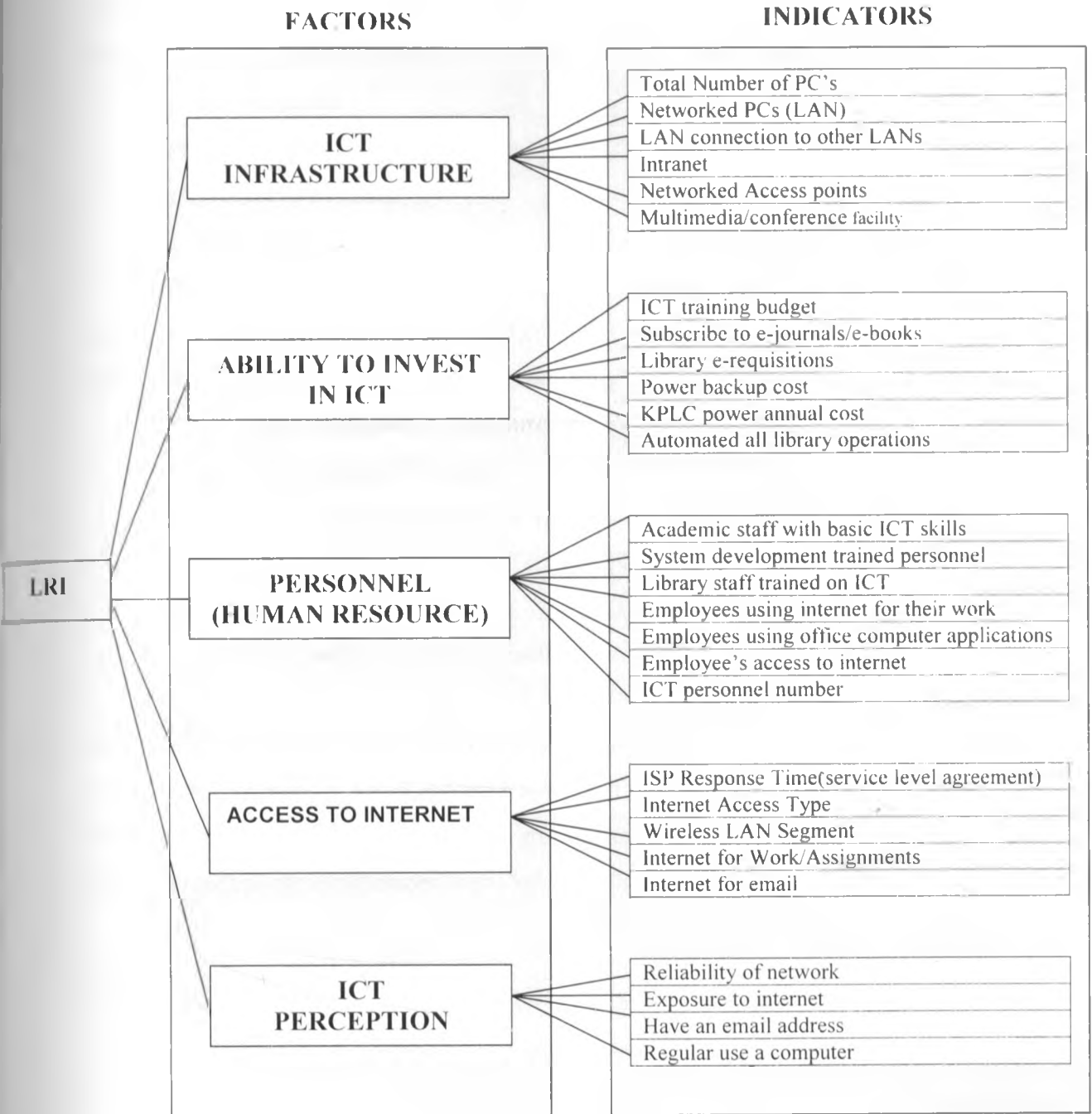
From the figure 4.2, the least educated attaches more importance to Internet and its usage.

There is a common trend for all indicators to educational level.

Majority of the students have used computer (63.8%) though very few (4.0%) of them have computers this is an indications that almost all students rely on institutional computers. The highly educated those with PHD and Masters have computers but least use them.

Question 2. Which model can be used to assess e-readiness of an institution's Library?

**THE LIBRARY E-READINESS INDEXER MODEL**



**Figure 4.3: The Library E-Readiness Indexer Model**

## 4.4 Computations of E- Library Readiness Index

Since there are six factors Infrastructure, Access to Internet, Personnel, Ability to Invest, ICT Policy and Perception. Each of the factors is assigned an index ( $X_i$ ).

Where  $i= 1,2,3,4,5,6$  and therefore:-

$X_1$ = Infrastructure

$X_2$ = Ability to Invest

$X_3$ = Access to Internet

$X_4$ = Personnel

$X_5$ = Perception

Each factor has indicators assigned indices ( $X_{ij}$ ) where  $i=1,2,3,4,5$  and  $j= 1,2..last$  indicator.e.g. The infrastructure indicators are assigned as follows:-

**$X_{11}$  Total Number of Computers (PCs)**

**$X_{12}$  Networked PCs (LAN)**

**$X_{13}$  LAN connection to other LANs**

**$X_{14}$  Intranet**

**$X_{15}$  Networked Access points**

**$X_{16}$  Multimedia/conference facility**

The e-Library Readiness Index is given by the average index of factors.

i.e.  $X_i = \sum(X_{ij})/j$  where  $i= 1$  to  $5$  and  $j= 1$  to the last indicator.

From the analysis there are 28 indicators grouped together to form factors. The following are the factors and their indicators.

ICT Infrastructure (6 indicators)

- Total Number of PC's
- Networked PCs (LAN)
- LAN connection to other LANs
- Intranet
- Networked Access points
- Multimedia/conference facility



#### Ability to invest in ICT (6 indicators)

- ICT training budget
- Subscribe to e-journals/e-books
- Library e-requisitions
- Power backup
- Commercial power annual cost
- Automated all library operations

#### Personnel (Human Resource) (7 indicators)

- Academic staff with basic ICT skills
- System development trained personnel
- Library staff trained on ICT
- Employees using internet for their work
- Employees using office computer applications
- Employee's access to internet
- ICT personnel number

#### Access to Internet (5 indicators)

- ISP Response Time(service level agreement)
- Internet Access Type
- Wireless LAN Segment
- Internet for Work/Assignments
- Internet for Mails

#### ICT Perception (4 indicators)

- Stability of computer network
- Exposure to internet
- Have an email address
- Regularly use a computer

In order to cover each indicator adequately, the e-questions are designed that an indicator can have one or more questions. Each question is assigned weight, based on a staging

method. The staging is ranging from 1 to 4. Every question is assigned a mark depending on the nature of the question and the mark is assigned the appropriate stage. The mean of these stages compose the factor's index. In this case the indexer uses averages to compute the final index.

Questions in the online indexer are designed to use this model. Each question is designed to cover a certain indicator. In some cases two or more questions are covering one indicator. However the average of all questions for one factor leads to a sub-index (factors index).

#### 4.5 Staging the model

Table 4.9 Staging the model

Factor I	Question		Weight Range	Stage (1,2,3,4)
INFRASTRUCTURE	INDICATOR	CHOICE		
	X11	Number of computer(A) $W=A/P*100$ Above 1000	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X12	Number of networked computers(B) $W=B/P*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X13	LANs connected to LANs(C) $W=C/L.*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X14	Yes		4
		No		1
	X15	Enter number of	0-25	1

		access points(D)	26-50	2
		$W=D/P*100$	51-75	3
			76-100	4
	X16	Yes		4
		No		1

Table 4.9 Staging the model continued

Factor 2	Question		Weight Range	Stage (1,2,3,4)
<b>Ability to Invest</b>	INDICATOR	CHOICE		
	X21	ICT training budget(F) $W=F/E*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X22	Yes		4
			No	1
	X23	Yes		4
			No	1
	X24	Yes		4
			No	1
	X25	Annual power bill(G) $W=G/E*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X26	Yes		4
No			1	

Table 4.9 Staging the model continued

Factor 3	Question		Weight Range	Stage (1,2,3,4)
Personnel ( Human Resource)	INDICATOR	CHOICE		
	X31	Number of staff with ICT skills(I) $W=I/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X32	Number of staff trained in system development(J) $W=J/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X33	Number of staff trained in system development in library(K) $W=K/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X34	Number of employee using internet on duty(M) $W=M/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X35	Number of employee using office computer applications(N) $W=N/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X36	Number of employee with access to	0-25	1
			26-50	2
			51-75	3

		internet(O) $W=O/H*100$	76-100	4
	X37	Number of ICT employees(Q) $W=Q/H*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4

Table 4.9 Staging the model continued

Factor 4	Question		Weight	Stage (1,2,3,4)
<b>Access to Internet</b>	INDICATOR	CHOICE	MARKS %	
	X41	Minutes		4
		Hours		3
		Days		2
		weeks		1
	X42	Dial Up		1
		Dedicated 64		2
		Dedicated 128		3
		Above 128		4
	X43	Yes		4
		No		1
	X44	Number of library clients using internet for assignments(R) $W=R/P*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X45	Yes		4
		No		1

Table 4.9 Staging the model continued

Factor 5	Question		Weight	Stage (1,2,3,4)
<b>Perception</b>	INDICATOR	CHOICE	MARKS %	
	X51	Very Stable		4
		Stable		3
		Fairly Stable		2
		Not Stable		1
	X52	Very Good		4
		Good		3
		Fair		2
		Poor		1
	X53	Number of library clients with e-mail address(S) $W=S/P*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4
	X54	How many clients make use of computers regularly(T) $W=T/P*100$	0-25	1
			26-50	2
			51-75	3
			76-100	4

## **4.6 Models Benchmark**

From the KENET report on ICT e-readiness 2006, the average index for all the institutions was 2.0. This research adopts the average mark for the range of the stages used in the model of 1 to 4 which is 2.5.

An institution that generates an index of 2.5 and above is considered to be ready and those that generate an index below 2.5 is considered not ready. The upper limit 4 is considered as the highest level of readiness while the lower limit 1 is considered as the lowest level of preparedness.

## Chapter 5

### 5. Discussion of the Framework

The tool developed was used to test the model and Two Universities and a teacher training college was used to test the model. Three institutions whose names are withheld were used for testing the model. The index generated is weight against the benchmark of index 2.5. Those institutions that get above 2.5 are considered ready and those that are below 2.5 are considered not ready. The reports generated also include what each factor contributes and also what each indicator contribute.

#### 5.1 E-Readiness Assessment and Staging Results

##### 5.1.1 Institution A ( College)

###### 5.1.1.1 Overall index

**Table 5.1 Overall index for institution A**

LIBRARY E-READINESS INDEX REPORT

INSTITUTION	INDEX	STATUS
A	2.51200008392334	Ready

###### 5.1.1.2 Factor index

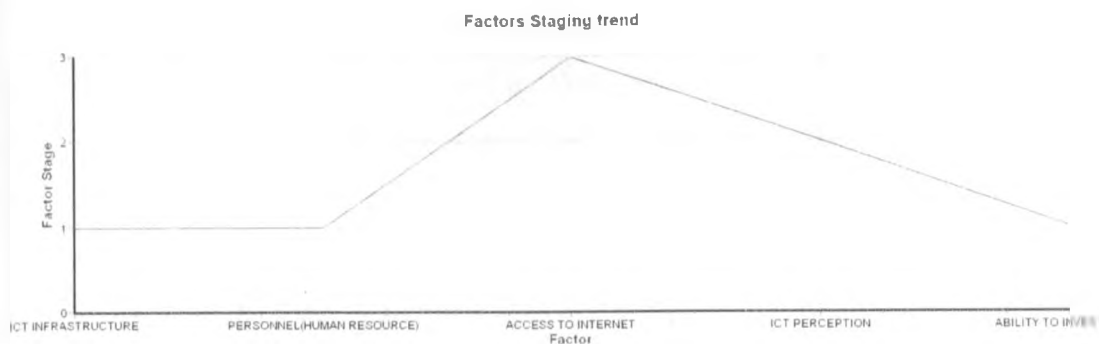
**Table 5.2 Factors index for institution A**

LIBRARY E-READINESS INDEX FACTOR STAGING REPORT

INSTITUTION: A

Factor ID	Factor Name:	STAGE	STATUS
1	ICT INFRASTRUCTURE	1.86	Not ready
2	ABILITY TO INVEST IN ICT	3.40	Ready
3	PERSONNEL(HUMAN RESOURCE)	1.50	Not ready
4	ACCESS TO INTERNET	2.80	Ready
5	ICT PERCEPTION	3.00	Ready





**Figure 5.1** Factor staging trend for institution A

From the table 5.1, Institution A is ready marginally because the final index is just slightly greater than 2.5. From table 5.2, the following factors need serious improvement. These are: ICT Infrastructure and Personnel because they are far below the benchmark of 2.5.

### 5.1.1.3 Indicators indices

**Table 5.3** Indicators index for institution A

LIBRARY E-READINESS INDEX INDICATOR STAGING REPORT  
INSTITUTION: A

INDICATOR	STAGE	STATUS
Total Number of PCs	1	Lowest level of Unpreparedness
Networked PCs	1	Lowest level of Unpreparedness
LAN connections to other Lans	1	Lowest level of Unpreparedness
LAN connections to other Lans	4	Highest Level of preparedness
Networked access points	1	Lowest level of Unpreparedness
Academic staff with basic IT skills	2	Not Ready
System development trained personnel	1	Lowest level of Unpreparedness
Library staff trained on ICT	1	Lowest level of Unpreparedness
Employees using internet for their work	2	Not Ready
Employees using office computer applications	2	Not Ready
ICT personnel number	1	Lowest level of Unpreparedness
Internet for work/assignment	3	Ready
Have an email adress	4	Highest Level of preparedness
Regular use a computer	1	Lowest level of Unpreparedness
ICT training budget	1	Lowest level of Unpreparedness
Multimedia confrence facility	1	Lowest level of preparedness
Subscribe to e-journals/e-books	4	Highest level of preparedness
power backup	4	Highest level of preparedness
power backup	4	Highest level of preparedness
Automated all library operations	4	Highest level of preparedness
ICT training budget	2	Not Ready
Internet access type	4	Highest level of preparedness
Wireless LAN segment	1	Lowest level of preparedness
Internet for mails	4	Highest level of preparedness
Stability of the network	3	Ready
Ever used internet	4	Highest level of preparedness
intranet	4	Highest level of preparedness

The indicators that need to be improved for this institution are those that have an index of two (2) and one (1). Those that are three (3) and four (4) contribute positively to the final index.

## 5.1.2 Institution B ( Private University)

### 5.1.2.1 Overall index

**Table 5.4 Overall index for institution B**

LIBRARY E-READINESS INDEX REPORT

INSTITUTION	INDEX	STATUS
B	2.82800006866455	Ready

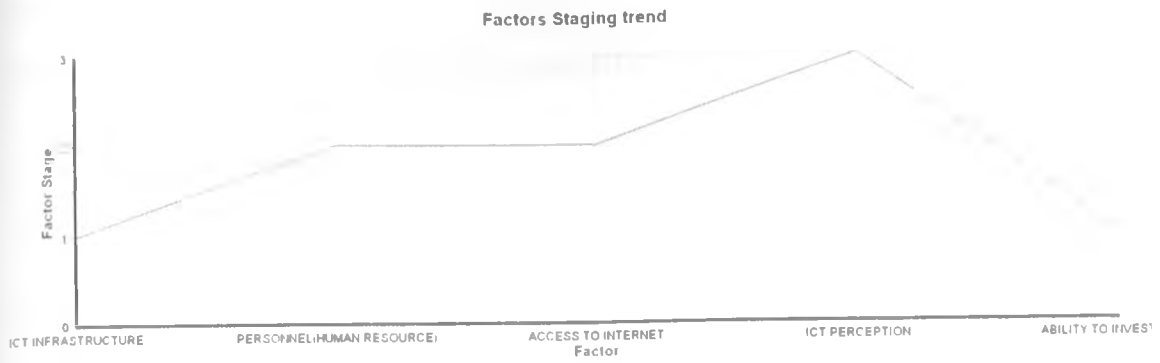
### 5.1.2.2 Factors sub-index

**Table 5.5: Factors indices for institution B**

LIBRARY E-READINESS INDEX FACTOR STAGING REPORT

INSTITUTION: B

Factor ID	Factor Name:	STAGE	STATUS
1	ICT INFRASTRUCTURE	2.00	Not ready
2	ABILITY TO INVEST IN ICT	3.40	Ready
3	PERSONNEL(HUMAN RESOURCE)	2.29	Not ready
4	ACCESS TO INTERNET	3.20	Ready
5	ICT PERCEPTION	3.25	Ready



**Figure 5.2 Factor staging trend for institution B**

From the table 5.4, Institution B is ready to use and adopt ICT because the final index is greater than 2.5. From the table 5.5, the following factors need to be improved:- ICT perception, and Infrastructure because they are below the benchmark of 2.5.

### 5.1.2.3 Indicators indices

**Table 5.6 Indicators I indices for institution B**

LIBRARY E-READINESS INDEX INDICATOR STAGING REPORT  
INSTITUTION: B

INDICATOR	STAGE	STATUS
Total Number of PCs	1	Lowest level of Unpreparedness
Networked PCs	1	Lowest level of Unpreparedness
LAN connections to other Lans	1	Lowest level of Unpreparedness
LAN connections to other Lans	4	Highest Level of preparedness
Networked access points	2	Not Ready
Academic staff with basic IT skills	3	Ready
System development trained personnel	1	Lowest level of Unpreparedness
Library staff trained on ICT	1	Lowest level of Unpreparedness
Employees using internet for their work	3	Ready
Employees using office computer applications	3	Ready
Employees access to internet	4	Highest Level of preparedness
ICT personnel number	1	Lowest level of Unpreparedness
Internet for work/assignment	2	Not Ready
Have an email adress	3	Ready
Regular use a computer	4	Highest Level of preparedness
ICT training budget	1	Lowest level of Unpreparedness
Multimedia confrence facility	1	Lowest level of preparedness
Subscribe to e-journals/e-books	4	Highest level of preparedness
power backup	4	Highest level of preparedness
power backup	4	Highest level of preparedness
Automated all library operations	4	Highest level of preparedness
ICT training budget	2	Not Ready
Internet access type	4	Highest level of preparedness
Wireless LAN segment	4	Highest level of preparedness
Internet for mails	4	Highest level of preparedness
Stability of the network	2	Not Ready
Ever used internet	4	Highest level of preparedness
Intranet	4	Highest level of preparedness

The indicators that need to be improved for this institution are those that have an index of two (2) and one (1). Those that are three (3) and four (4) contribute positively to the final index.

### 5.1.3 Institution C ( Public University)

#### 5.1.3.1 Overall index

**Table 5.7 Overall index for institution C**

LIBRARY E-READINESS INDEX REPORT

INSTITUTION	INDEX	STATUS
C	2 89800000190735	Ready

#### 5.1.3.2 Factor index

**Table 5.8 Factors indices for institution C**

LIBRARY E-READINESS INDEX FACTOR STAGING REPORT

INSTITUTION: C

Factor ID	Factor Name:	STAGE	STATUS
1	ICT INFRASTRUCTURE	2.43	Not ready
2	ABILITY TO INVEST IN ICT	2.20	Not ready
3	PERSONNEL(HUMAN RESOURCE)	2.71	Ready
4	ACCESS TO INTERNET	3.40	Ready
5	ICT PERCEPTION	3.75	Ready

Factors Staging trend

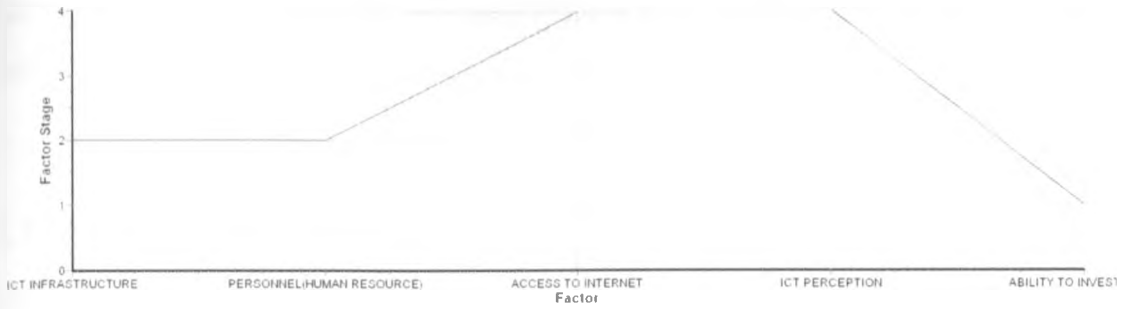


Figure 5.3 Factor staging trend for institution C

From the table 5.7, Institution C is ready to use and adopt ICT because the final index is greater than 2.5. From the table 5.8, the following factors need to be improved:- ICT Infrastructure and Ability to Invest because they are below the benchmark of 2.5.

5.1.3.3 Indicators indices

Table 5.9 Indicators indices for institution C

LIBRARY E-READINESS INDEX INDICATOR STAGING REPORT  
INSTITUTION: C

INDICATOR	STAGE	STATUS
Total Number of PCs	2	Not Ready
Networked PCs	2	Not Ready
LAN connections to other Lans	1	Lowest level of Unpreparedness
LAN connections to other Lans	4	Highest Level of preparedness
Networked access points	3	Ready
Academic staff with basic IT skills	4	Highest Level of preparedness
System development trained personnel	1	Lowest level of Unpreparedness
Library staff trained on ICT	1	Lowest level of Unpreparedness
Employees using internet for their work	4	Highest Level of preparedness
Employees using office computer applications	4	Highest Level of preparedness
Employees access to internet	4	Highest Level of preparedness
ICT personnel number	1	Lowest level of Unpreparedness
Internet for work/assignment	4	Highest Level of preparedness
Have an email address	4	Highest Level of preparedness
Regular use a computer	4	Highest Level of preparedness
ICT training budget	1	Lowest level of Unpreparedness
Multimedia conference facility	1	Lowest level of preparedness
Subscribe to e-journals/e-books	1	Lowest level of preparedness
power backup	4	Highest level of preparedness
power backup	4	Highest level of preparedness
Automated all library operations	1	Lowest level of preparedness
ICT training budget	4	Highest level of preparedness
Internet access type	4	Highest level of preparedness
Wireless LAN segment	1	Lowest level of preparedness
Internet for mails	4	Highest level of preparedness
Stability of the network	3	Ready
Ever used internet	4	Highest level of preparedness
Intranet	4	Highest level of preparedness

The indicators that need to be improved for this institution are those that have an index of two (2) and one (1). Those that are three (3) and four (4) contribute positively to the final index.

## **5.2 Uses of the Framework**

The library e-readiness model can be used to determine a library's ICT readiness for e-library by somebody feeding data onto the indexer tool(program).Users respond to the e-questions available in the data collection module of LRI /indexer. The indices for the indicators, factors and finally the entire library are computed. The user can get several reports either in tabular or graphical form.

## **5.3 Conclusion**

This research admit that the sample used for testing the model was too small for a general conclusion to be drawn on its basis. However ICT Infrastructure was identified as a common hindrance among all the institutions used. In addition personnel factor was also identified to be a problem in two (66.6%) of the three institutions used.

## Chapter 6

### 6. Conclusion and Recommendation

#### 6.1 Achievement

A LRI model was developed and it's composed of 5 factors and a total of 28 indicators. The model was able to measure ICT readiness for e-libraries for 3 institutions. As an integrated part of the model a tool/program was also developed and is able to compute both the sub-indices and the overall final index for a given library. The tool is also capable of generating several reports whose format may either be in tabular and/or graphical form.

#### 6.2 Recommendations

The LRI tool/program may be efficiently and effectively used by an officer (or team of officers) with adequate information concerning an institution ICT, library, and financial status inclusive.

Further the tool may be improved with a view of qualifying it to a web-based application to boost its accessibility and availability in global perspective.

#### 6.3 Challenges

**Data availability:** Most of the Institutions did not have readily available data. Though the institutions have installed MISs, the data/information required could not be retrieved from the system, with some necessitating manual gathering of the data( eg manual counting of the available computers)

**Time constraint:** The researcher conducted the research while on her full-time job official duties and obligations. This drastically reduced the time durations available for the research work and related activities.



## 6.4 Conclusion

The research identified the indicators and factors necessary for measuring e-readiness for a library. A model with Kenyan context was developed which can go along way in evaluating a library's ICT status. The model has 5 factors and a total of 28 indicators.

These are:

1. ICT Infrastructure (Total Number of PC's, Networked PCs (LAN), LAN connection to other LANs, Intranet, Networked Access points, Multimedia/conference facility)
2. Ability to invest in ICT (ICT training budget, Subscribe to e-journals/e-books, Library e-requisitions, Power backup, Commercial power annual cost. Automated all library operations)
3. Personnel/Human Resource (Academic staff with basic ICT skills, System development trained personnel, Library staff trained on ICT, Employees using internet for their work, Employees using office computer applications, Employee's access to internet, ICT personnel number)
4. Access to Internet (ISP Response Time (service level agreement), Internet Access Type, Wireless LAN Segment, Internet for Work/Assignments, Internet for Mails)
5. ICT Perception (Stability of computer network, Exposure to internet, Have an email address, Regularly use a computer)

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# Appendix A

## User manual

### LIBRARY E-READINESS INDEX SYSTEM

#### INTRODUCTION

Software organizations have exhibited significant shortcomings in their ability to capitalize on the experiences gained from completed projects. Software are primarily developed for users who are non programmers, thus they would not be termed complete without user manuals as one form of documentation. More so, user manuals are important tools to be used during user training to familiarize the user with the system.

Stand alone applications require more support and maintenance than web based applications. Administrators for such systems require accurate and precise manuals to reference while setting up or in cases of difficulties.

A properly written user manual is required to lower maintenance effort and costs. As we are aware, maintenance is the most costly phase of software engineering and not unless the manual has been written carefully, troubleshooting errors could be a major task for the administrator of such systems. The following tips will help any developer or administrator who could be charged with the responsibility of updating the system.

The user manual for LIBRARY E-READINESS INDEX SYSTEM is subdivided into the administrative and general user's subcategories. By an administrator we mean the person –or persons- responsible for maintaining and updating the system configurations.

## SECTION 1

### ADMINISTRATORS MANUAL

#### *What do you require to set up the System?*

The following hardware and software is required for installation and running of Library E-Readiness Index Information System.

#### *System requirements for Microsoft Windows:*

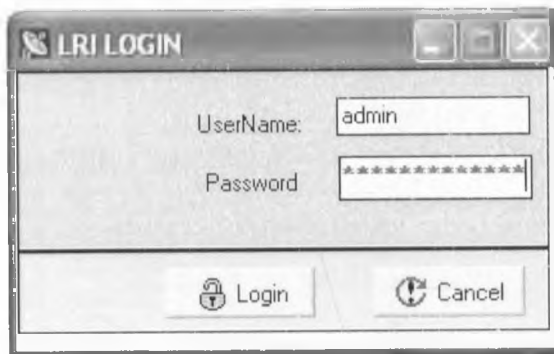
- An Intel Pentium III Processor or equivalent, 500 MHz or faster
- Windows 98, Windows 2000, Windows NT (with Service Pack 3 or later), Windows ME, or Windows XP
- 96 MB of available random-access memory (RAM) (128 MB recommended)
- 60 MB of available disk space
- A 256-color monitor capable of 800 x 600 pixel resolution (millions of colors and 1024 x 768 pixel resolution recommended)
- A CD-ROM drive
- MySQL 5.0. server database
- MyODBC 3.5.1 Connector

## INSTALLATION

1. These are the key steps as setup guide for Library E-READINESS Index (LRI) system for Windows. This will be done after the entire configuration has been done. Before installations ensure the following services are configured and properly running;
  - MySQL 5.0 Server.
  - Restore the E\_Ready database from the Mysql dump provided.
  - You are currently logged in as the administrator.
2. To install the system, complete the following set of tasks.

- a. Insert the ICT\_INDEX CD into the CD-ROM drive.
  - b. Open the CD icon if it is not open.
  - c. Copy the folder marked ICT\_INDEX to your hard disk in C:\Program files directory.
3. The folder with the system files has an executable called ICT\_INDEX.exe.
  4. Open the folder and double click ICT\_INDEX.exe to launch ICT\_READINESS INDEX System.
  5. The Login screen appears as shown in figure 1.0.

*Figure 1.0.*



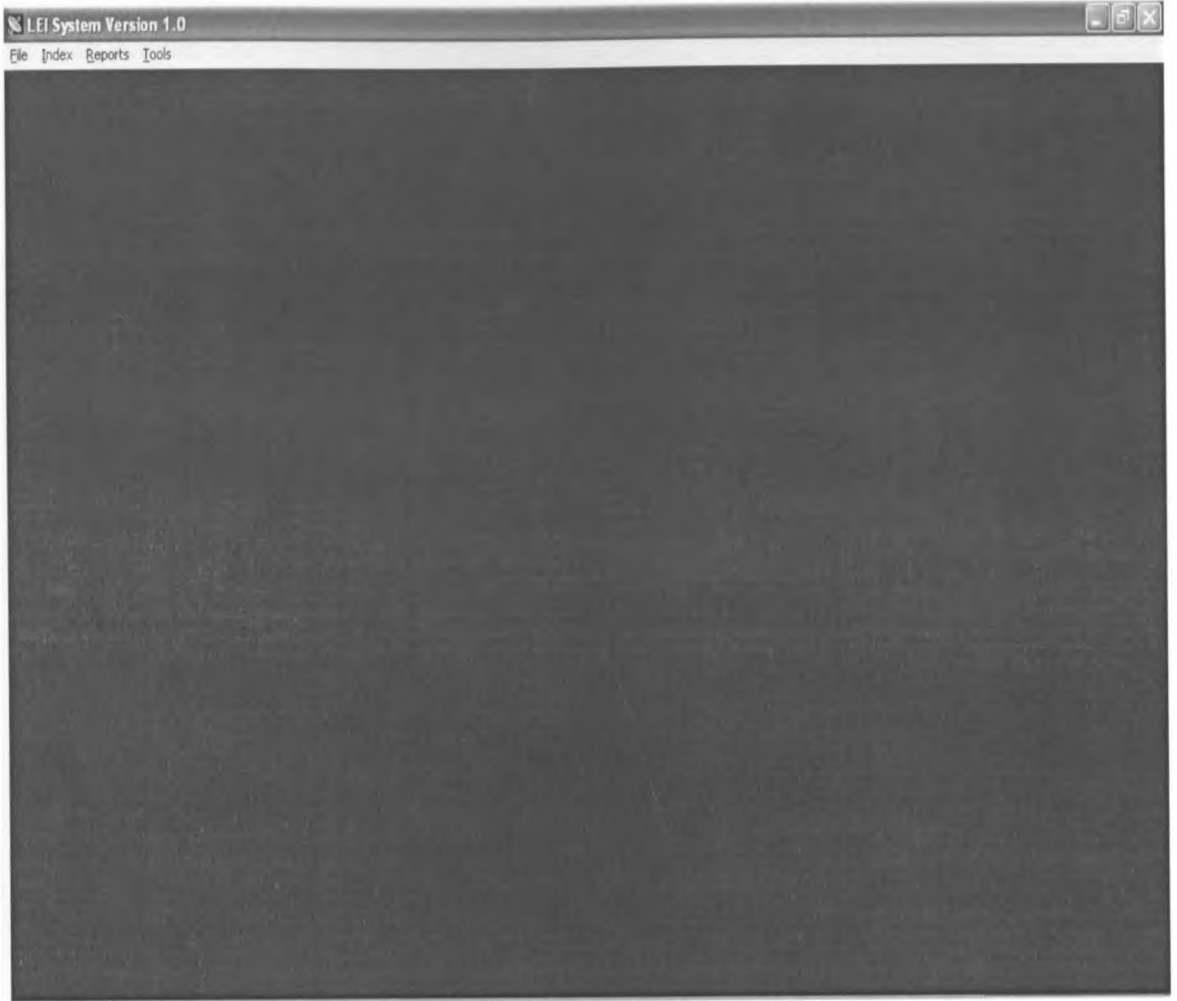
6. For first time use the system comes with a default username of admin and password administrator which can be changed after login by the administrator.

## THE COMPONENT FORMS

The application has various screens which have different requirements. The **login screen** requires that the user enter a username and password. Successful logon using an existing user account will link you to the system main window.

The **main form** will link to other system functionalities depending on the user. This is achieved through the use of menu driven user interface as seen in figure 2.0. The gist of all the others is self explanatory.

Figure 2.0 LEI system version 1.0



### *DATA ENTRY SCREENS*

These screens include: factors set-up module, Users set-up module, Questions Set-up module, Indicators Set-up module, Data Collection Module.

### **1.1.0. System Setup**

#### **1.1.1. Users**

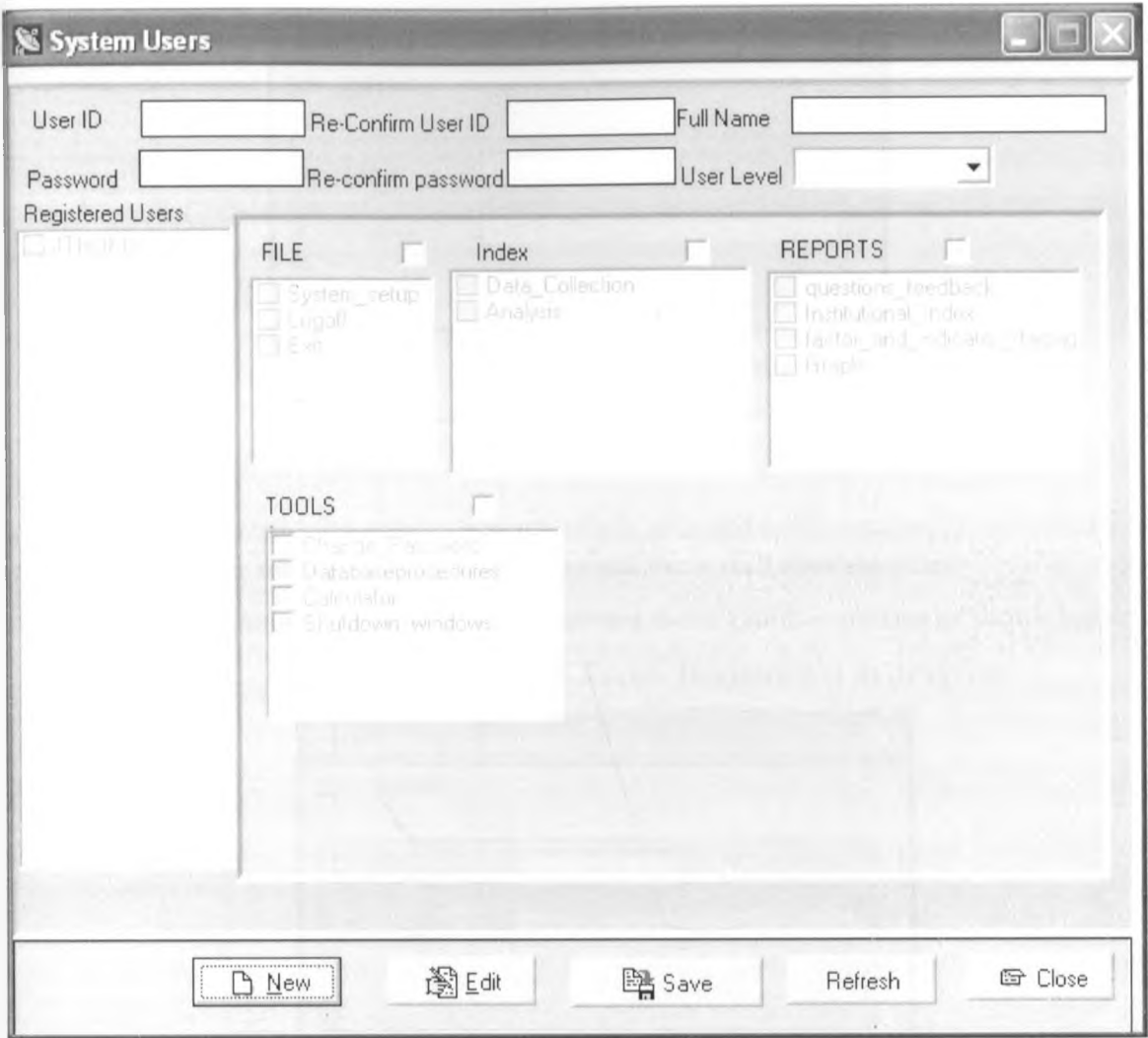
In this module the administrator will add users of the system and assign them roles or user access rights.

After providing the necessary user details and assigning user rights, click the save button to save them in the database.

The administrator can also modify the access rights of a user through this module.



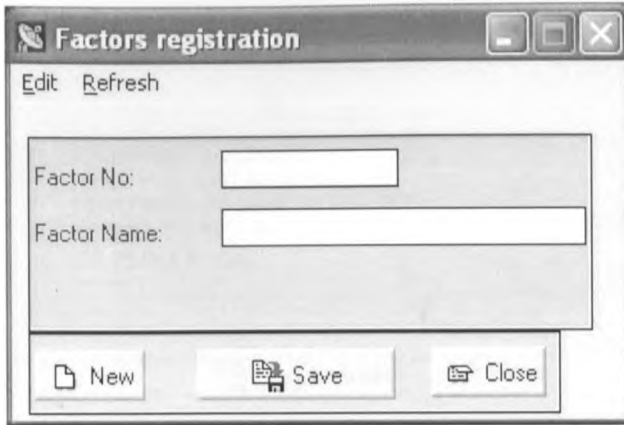
**Figure 3.0. System Users**



### 1.1.2. Factors Set-up Module

This module assists the administrator to add the factors to be considered during the research. The figure below demonstrates the steps to follow in adding the institutions

**Figure 4.0. Factor Registration**



- a. Click the file menu, go to system set-up and the screen above appears.
- b. Click the new button and a system generated factor number appears as shown below

**Figure 5.0. Factor Registration in progress**

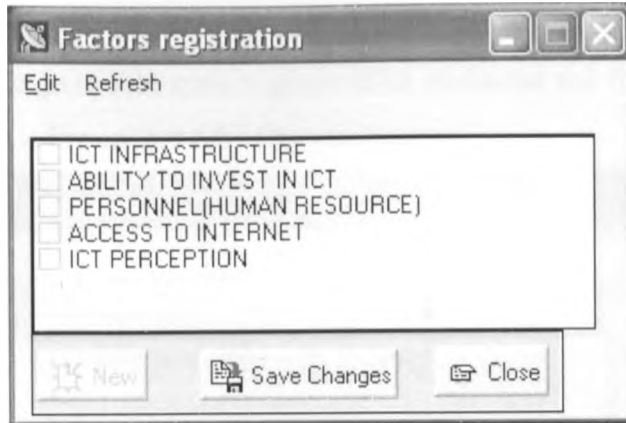


- c. Input the factor name then click the save button to register the factor in the system.

In this module, you can also edit, view already registered factors by clicking the edit factors menu item.

And selecting one of the factors.

**Figure 6.0 Factor Registration Complete**

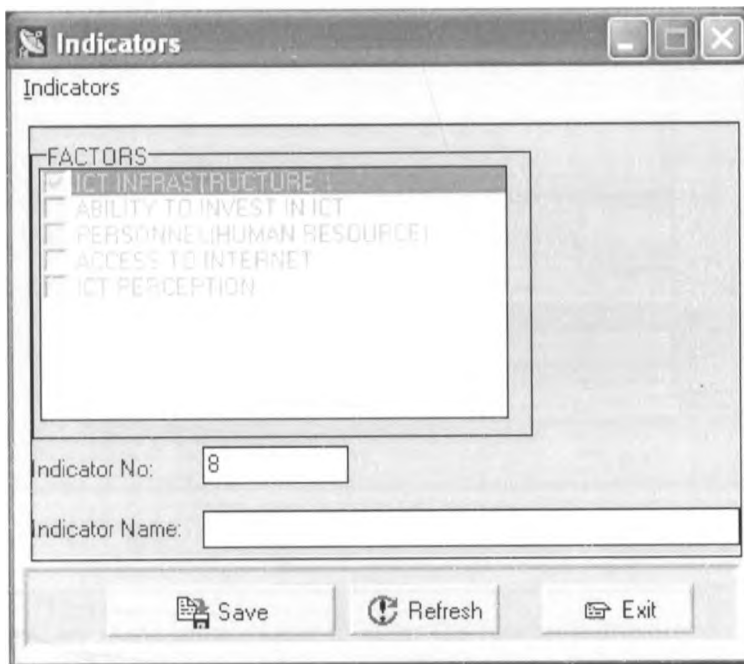


### 1.1.3. Indicators set up Module

To access this module go to file system set-up then click indicators.

The screen below is created by the system.

**Figure 7.0 Indicators**



Check an item in the checkbox and an the system generates a number for the indicator.

When all the details are entered as required click the save button to add the indicator in the system

The module also gives the administrator the option of editing already existing indicators.

## Questions Setup

To get to these module go to File-system setup- click questions and the form below appears

Figure 8.0 LEI Questionnaire

LEI Questionnaire

Edit

**Factors**

- ICT INFRASTRUCTURE
- ABILITY TO INVEST IN ICT
- PERSONNEL/HUMAN RESOURCE
- ACCESS TO INTERNET
- ICT PERCEPTION

**Indicators**

- Total number of pop
- Percentage of LAN
- Cost per user of the LAN
- Unwired Access Points
- Multimedia preference facility
- LAN connections to other LANs

Question #:  Represented by:  Divide by:

Question:

User Options:

- User Inputs a Value
- User given Options

Available Options:

Option Stage:

This module is used by the administrator to enter the research questions for the research purpose.

The admin is also able to modify registered questions through this module by selecting the edit-questions module all the available questions are displayed in a checklist box for the administrator to choose which to edit.

After this stage the system fully set up.

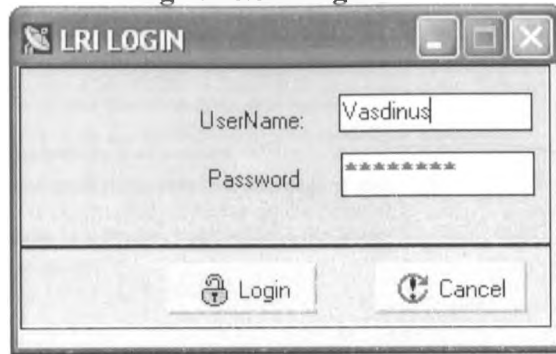
## SECTION 2

### GENERAL USERS MANUAL

General users are day today users of the system. This manual focuses on particular aspects of the system. The assumption made is that the others are self explanatory.

#### 2.0.0. How Do I Login?

**Fig 9.0 LEI Login**



The screenshot shows a standard Windows-style dialog box titled "LRI LOGIN". It features a title bar with a small icon on the left and minimize, maximize, and close buttons on the right. The main area contains two labels: "UserName:" and "Password:". The "UserName:" field is a text box containing the text "Vasdinus". The "Password:" field is a text box containing a series of asterisks "\*\*\*\*\*". At the bottom of the dialog, there are two buttons: "Login" with a key icon to its left, and "Cancel" with a red X icon to its left.

On the **Login** screen. Click the login tab; enter the username as well as the password you are assigned by the administrator. Click on Login. If both entries are valid then you will be logged into the system.

#### 2.0.1 Data input

Once logged in on the Main system form go to the Index menu and click the Data collection option.

The screen below is created by the system.

**Fig 10.0 Data Collection**

**Data Collection**

Date:

Name:

Name of Institution

**Questions**

- What is the Institutions total population?
- How many personal computers does the institution have
- How many personal computers are networked in your local area network?
- How many LANs are there in your institution?
- How many LANs are connected to other lans internally or externally?
- How many access points do you have that are on the network?
- Do you have a multimedia or a conference facility in the library?
- What is your institutional budget?
- Do you subscribe to any e-journals/e-books?
- Do you have UPS?
- Do you have a generator?
- What is your annual running power bill?
- Are all your library operations automated?
- How many of your staff are permanent?
- How many of your staff have basic ICT skills?
- How many are trained on system development?
- How many of the trained staff are in the library section?
- How many of your employees use internet in their duty
- How many of your employees use office computer applications e.g Word, Excel e t c ?
- How many of your employees have access to internet?
- How many are employed as ICT employees?
- How long does your ISP take to respond to your complains according tour service level agreement ?
- What type of internet access type are you connected to?
- Do you have a wireless LAN segment in your institution?
- How many clients of your library use internet to do their assignments?
- Do you allow access of emails via the internet?
- How reliable is your network?
- What is the level of internet usage. Rate it according to your judgment ?
- How many of your clients have email addresses?

Enter Value:  Choose an Option

Save Edit Refresh Close

- a) On this page the first thing to do is to enter your name and the name of the institution
- b) Check the question to answer from the list, if the question requires an input value from the user the input box will be enabled, on the other hand if the user needs to choose from the given options the selection box will be enabled and you will be able to pick an answer from the available options.
- c) After answering the question ensure you click the save button to save your answer.

Once this has been done the checked list box containing the questions in the system is enabled for you to continue answering the questions. Ensure you answer all the questions.

This module gives you an option of editing or altering already answered questions for the named institution.

You can achieve this by clicking the edit button and ensuring the institution edit box contains the name of an institution whose data has already been input.

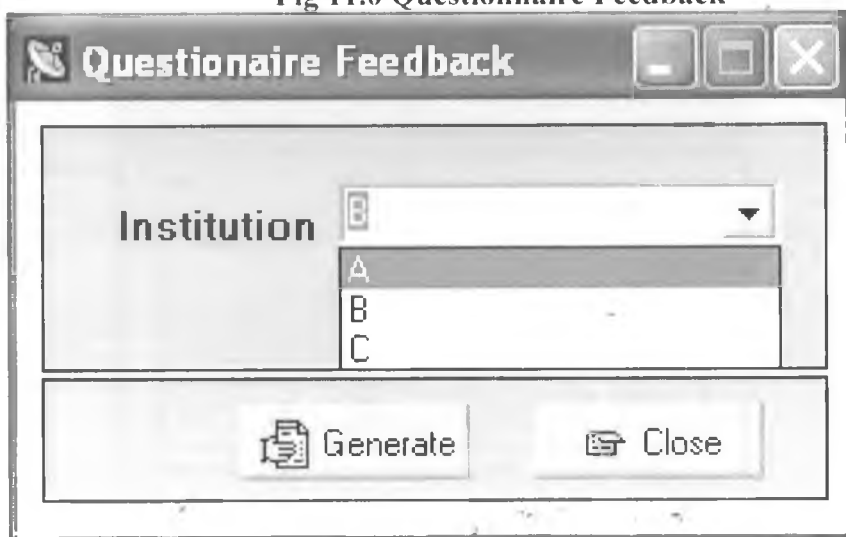
At this point if your administrator has given you the rights to view reports you can generate them

## 2.0.3 Reports

### 2.0.3.1 Questionnaire feedback

To access this module go to reports menu-click on questionnaire feedback and the form below appears.

**Fig 11.0 Questionnaire Feedback**



The screenshot shows a software window titled "Questionnaire Feedback". Inside the window, there is a label "Institution" next to a dropdown menu. The dropdown menu is open, displaying three options: "A", "B", and "C". Below the dropdown menu, there are two buttons: "Generate" (with a printer icon) and "Close" (with a close icon).

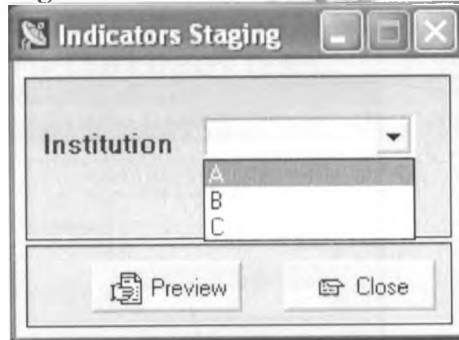
From the selection box select the name of the institution you want to preview the feedback, click the generate button print the report

### 2.0.3.2 Factors and Indicators staging

#### 2.0.3.2.1 Indicators staging

To access this module go to reports menu-click on factor and indicator staging- indicators and the form below appears.

**Fig 12.0 Indicator Staging**



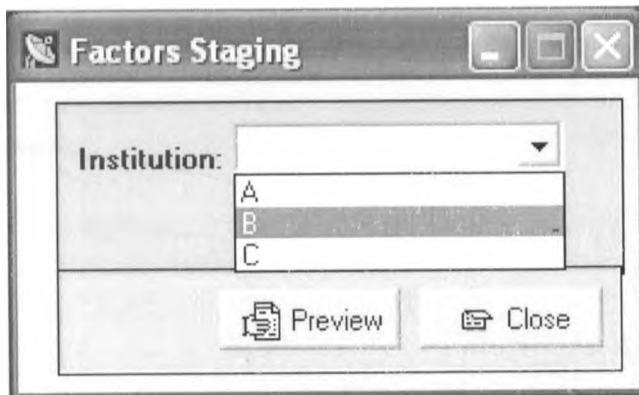
Select from the option box the institution you are reporting on.

Click the preview to generate and print the report

#### 2.0.3.2.2 Factors staging

To access this module, go to reports menu-click on factor and indicator staging- Factors and the form below appears.

**Fig 13.0 Factor Staging**



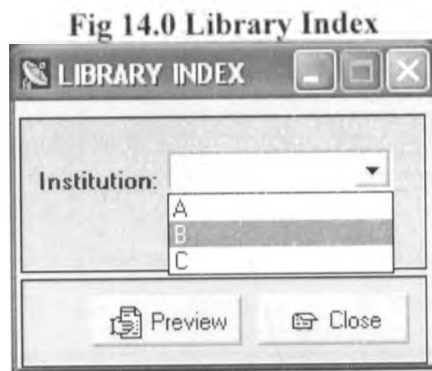


Select from the option box the institution you are reporting on.

Click the preview to generate and print the report

### 2.0.3.3. Institutional Index

To access this module go to reports menu-click on Institutional index and the form below appears.



### 2.0.3.3 Graphical representation

This menu will lead you to

- Indicator staging and
- Factor staging modules

Which will help you generate graphical trends of the factors and indicators from a given institution.

## 2.1. Tools

This menu leads to other several services offered by the system. This includes;

### 2.1.1. Change Password

**Figure 15.0.**

The image shows a standard Windows-style dialog box titled "Change Password". It features a title bar with a globe icon on the left and minimize, maximize, and close buttons on the right. The main area contains five text input fields, each preceded by a label: "User Name", "Full Name:", "Old Password", "New password", and "Confirm Password:". At the bottom of the dialog, there are three buttons: "Save" with a floppy disk icon, "Cancel" with a pencil icon, and "Close" with a window icon.

This module allows a user to change his/ her own password

### 2.2.3 Shutdown windows

This is an invocation of the windows system shutdown procedure

#### **NOTE:**

In case of any problem in operations of this software, you can contact your administrator who will in turn contact the system developer.

# Appendix B

## Questionnaire

### Questionnaire being considered for Testing the Model

#### ICT in the Libraries

#### General Demographic Data (not awarded any Weight)

1. Date: \_\_\_\_\_ ( Auto date)
2. Name: \_\_\_\_\_
3. Name of Institution/Campus/College \_\_\_\_\_

#### ICT Infrastructure ( $X_1$ ) (Factor 1)

4. Indicate the institutions population(P)

P

5. Indicator ( $X_{1,1}$ ) (Total Number of PC's)

How many Personal computers does your institution have?(A)

A

6. Indicator ( $X_{1,2}$ ) (Networked PCs (LAN))

How many personal computers are networked in your Local Area Network?(B)

B

7. How many LANs are there in your institution(L)

L

8. Indicator ( $X_{1,3}$ ) (LAN connection to other LANs)

How many LANS are connected to other LANS internally or externally?(C)

C

9. Indicator ( $X_{1,4}$ ) (Intranet)

Do you have an intranet?

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

Tick appropriately

10. Indicator ( $X_{1,5}$ ) (Networked Access points)

How many access points do you have that are on the network?(D)

D

11. Indicator( $X_{1,6}$ ) (Multimedia/conference facility)

**Do you have a multimedia or a conference facility in the library?**

Yes	No

Tick appropriately

**Ability to Invest in ICT( $X_2$ ) (Factor 2)**

**12. What is your institutional budget.(E)**

E

**13. Indicator ( $X_{2,1}$ ) (ICT training budget  $X_{2,1}$ )**

**What is your ICT training budget?(F)**

F

**14. Indicator ( $X_{2,2}$ ) (Subscribe to e-journals/e-books  $X_{2,2}$ )**

**Do you subscribe to any e-journal?**

Yes	No

Tick appropriately

**15. Indicator ( $X_{2,3}$ ) (Library e-requisitions  $X_{2,3}$ )**

**Do you do your requisition in the library electronically?**

Yes	No

Tick appropriately

**16. Indicator ( $X_{2,4}$ ) (Power backup  $X_{2,4}$ )**

**i) Do you have UPS?**

Yes	No

Tick appropriately

**ii) Do you have a generator?**

Yes	No

Tick appropriately

**17. Indicator ( $X_{2,5}$ ) (KPLC power annual cost  $X_{2,5}$ )**

What is your annual running power bill?(G)

G

18. Indicator ( $X_{2,6}$ ) (Automated all library operations  $X_{2,6}$ )

Are all your library operations automated?

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

Tick appropriately

**Personnel ( $X_3$ ) (Factor 3)**

19. How many of your staff are permanent?(H)

H

20. Indicator ( $X_{3,1}$ ) Academic staff with basic ICT skills  $X_{3,1}$

How many of your staff have basic ICT skills?(I)

I

21. Indicator ( $X_{3,2}$ ) System development trained personnel  $X_{3,2}$

How many are trained on system development?(J)

J

22. Indicator ( $X_{3,3}$ ) Library staff trained on ICT  $X_{3,3}$

How many of the trained staff are in the library section?(K)

K

23. Indicator ( $X_{3,4}$ ) Employees using internet for their work  $X_{3,4}$

How many of your employees use internet in their duty?(M)

M

24. Indicator ( $X_{3,5}$ ) Employees using office computer applications  $X_{3,5}$

How many of your employees use office computer applications e.g Word, Excel e.t.c ?(N)

N

25. Indicator ( $X_{3,6}$ ) Employee's access to internet  $X_{3,6}$

How many of your employees have access to internet?(O)

O



**26. Indicator ( $X_{3,7}$ ) ICT personnel number  $X_{3,7}$**

**How many are employed as ICT employees?(Q)**

Q

**Access to Internet ( $X_4$ ) (Factor 4)**

**27. Indicator ( $X_{4,1}$ ) ISP Response Time  $X_{4,1}$**

**How long does your ISP take to respond to your complains according tour service level agreement ?**

Minutes	Hours	Days	Weeks

Tick appropriately

**28. Indicator ( $X_{4,2}$ ) Internet Access Type  $X_{4,2}$**

**What type of internet access type are you connected to?**

Dial up	Dedicated 64Kbs	Dedicated 128Kbs	Dedicated above 128

Tick appropriately

**29. Indicator (X<sub>4,3</sub>) Wireless LAN Segment X<sub>4,3</sub>**

**Do you have a wireless LAN segment in your institution?**

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

Tick appropriately

**30. Indicator (X<sub>4,4</sub>) Internet for Work/Assignments X<sub>4,4</sub>**

**How many clients of your library use internet to do their assignments?(R)**

R

**31. Indicator (X<sub>4,5</sub>) Internet for Mails X<sub>4,5</sub>**

**Do you allow access of emails via the internet?**

Yes	No
<input type="checkbox"/>	<input type="checkbox"/>

Tick appropriately

**Perception (X<sub>5</sub>) (Factor 5)**

**32. Indicator (X<sub>5,1</sub>) Stability of computer network X<sub>5,1</sub>**

**How reliable is your network?**

Very reliable	reliable	Fairly reliable	Not reliable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tick appropriately

**33. Indicator ( $X_{5,2}$ ) Ever used internet  $X_{5,2}$**

**What is the level of internet usage. Rate it according to your judgment.**

Very Good	Good	Fair	Poor

Tick appropriately

**34. Indicator ( $X_{5,3}$ ) Have an email address  $X_{5,3}$**

**How many of you clients have email addresses?(S)**

S

**35. Indicator ( $X_{5,4}$ ) Regular use a computer  $X_{5,4}$**

**How many according to you make use of computers regularly?(T)**

T