REPUBLIC OF KENYA
MINISTRY OF EDUCATION

DIPLOMA IN EDUCATION LEADERSHIP AND MANAGEMENT
MODULE 5: LEADERSHIP AND MANAGEMENT OF ICT INTEGRATION IN EDUCATION

KENYA EDUCATION MANAGEMENT INSTITUTE

ICT INFRASTRUCTURE

UNIT 7





- Effective integration of ICT requires careful planning, budgeting and procurement of ICT infrastructure. I
- n the 4-in_Balance Model that we looked at in the previous unit, we learnt the ICT infrastructure is one of the pillars that support ICT integration.
- In this unit, we will learn about the process of acquiring ICT equipment and tools.
- We will also learn about safety and maintenance of the tools and equipment in order to ensure optimal use.

REPUBLIC OF KENYA
MINISTRY OF EDUCATION

KENYA EDUCATION MANAGEMENT INSTITUTE



Learning Outcomes

Upon completion of this unit, you will be able to:

a) Demonstrate understanding of the strategies for financing ICT equipment.
b) Apply prescribed guidelines for procuring ICT equipment.
c) Promote ICT safety and maintenance
d) Appreciate the importance of ICT safety and maintenance
e) Demonstrate understanding of initiatives in ICT integration in education

Financing ICT

- ICT implementation is highly dependent on the available budget.
- The more accurately you do your ICT budgeting, the more successful you are likely to be in a position to finance ICT in your education institution.
- A budget allocation should be made available for the purchase of the basic hardware and software, peripheral hardware, and add-on software.
- It is also important to set aside a budget for the maintenance of the equipment.

The following is a list of financing costs that you need to take into account:

- Hardware
- Software
- Investment in teacher training
- Repairs and maintenance
- Replacement fund
- Internet access, insurance and other incidentals
- ICT rooms
- Safety mechanism

Planning and budgeting

The following are planning and budgeting guidelines for acquisition of ICT equipment:

Define your needs: This can be done in three simple steps:

Step 1: Clarify your ICT objectives: You need to have a clear idea of what you need to purchase to achieve your ICT objectives.

Step 2: Check your institution's development or strategic plan: The second thing you need to do is to check the ICT elements of your school's development or strategic plan. This should give you information on the following:

- The budget available for ICT purchases.
- Timelines within which any new purchases of equipment should be in place
- The latest date by which the procurement process needs to start to achieve the timelines
- The latest date by which the procurement process needs to start to achieve the timelines

Step 3: Compile a functional specification: Compile a functional specification that sets out what the new equipment or service is expected to do.

- The functional specification outlines the minimum requirements guide potential suppliers in ensuring that they suggest the solution that best meets your needs.
- Your functional specification will be a working document and you should expect to keep changing and adding to as you research and cost-out your planned purchase in more details.
- Before you draw up the functional or technical specifications, be sure to refer to the governments guidelines which are available on the ICT Authority (ICTA) website or the ICT unit at the Ministry of Education.

Consider availability of funds

- It's important to check whether the requisition falls within the available budget and that funding is available. Consider the following questions:
- Is there enough funding for all your planned purchases?
- Do you need to reconsider your planned purchases in the light of available funding?
- Is there any additional funding available?
- Would alternative funding options be suitable, for example, sponsorship, leasing or rental, loan, and so on?

Prepare budget

- There are two major points to consider when preparing the budget. First, we need to budget for the maintenance of the technology that already exists at the school.
- This includes budgeting for the replacement and repair of equipment, service agreements, and the training of staff members.
- It does schools more harm than good to purchase new ICT equipment while the old equipment is not put to optimal use. You ought to consider maintenance of the of equipment and the training of ICT technical staff
- Second, you need to budget for new ICT technologies and programs.
- This should include; the buying of equipment, getting technical support, and conducting training so that staff members are able to utilize new technologies and programs.

Note it!

Funding sources:

- Identify potential funding sources including non-traditional sources and partnership that have resources that can defray critical costs.
- You may need to both identify and tap into development community partners for financial as well as technical (e.g., ICT, training, pedagogical) support for technology programs from the start.
- You also need to select a financing model that minimizes total costs and suits your particular initiative.

Acquisition of ICT equipment

- Public education institutions have to follow the Public Procurement and Asset Disposal Act, 2015 and regulations and guidelines.
- This will help you to decide on the appropriate procurement method to be used and action to be taken to ensure you get the equipment that meets the stipulated minimum technical specifications.
- We will discuss the methods of acquiring ICT equipment, factors to consider to procuring ICT hardware and software, objectives and guidelines of procuring ICT equipment.



Methods of acquiring ICT equipment

There are various ways of acquiring ICT equipment such as:

i. **Purchase**: The institution can buy ICT equipment from suppliers or manufacturers. Ensure that new equipment purchased should not be more than six years since the date of manufacture.

ii. **Donations:** An institution can also receive computers as a gift from another organization or from well-wishers. While receiving donations of ICT equipment, proper assessment of the usability of the equipment needs to be carried out in order to ensure that institutions do not become dumping ground for e-waste.

iii. **Hiring:** Institutions can also acquire ICT equipment for specified period of time and are expected to make a payment for their use. This is an expensive option and should only be used when the institution must urgently acquire computers such as when computers are required for examination practicals.

iv. **Government ICT programs**: The government has ongoing ICT programs which aim at equipping public institutions with ICT equipment. However, because of the cost implications, the programs are being implemented in a phased out way.

Activity

Discuss the challenges related to ICT infrastructure faced by education institutions

Factors to consider in choosing hardware

The following are the factors to consider in choosing hardware:

i. **Hardware configuration**: This requires you to consider the basic specifications for: CPU(central processing unit), RAM (random access memory), HD (hard disk), CD Drive, Printer, UPS (Uninterruptible power supply unit), Mouse, Monitors, Keyboard and Scanner.

ii. **Reliability:** This is determined by the rate of breakdown of the hardware. It may be assessed from those who are currently using that type of hardware.

iii. **Simplicity:** The architecture of the computer should be simple since simple systems are probably best for education institutions.

iv. **Ease of Communication**: The system i.e. both hardware and software should be able to communicate well with the users. The software should be user friendly and the hardware should be the right size and with good interface facilities.

v. Flexibility: Hardware should be able to meet new user requirements as they emerge. It should be powerful enough to be flexible.

vi. **Security:** It should be powerful enough to be able to keep out hackers and other unauthorized users.

vii. **Cost:** The hardware should be cost effective. It should offer value for money.

viii. **Networking**: The hardware should have networking capability. This will cater for future expandability requirements.

ix. **Software:** The hardware should be capable of running any software that has been chosen

Factors to consider in choosing software

i. **Consider availability of funds:** Check that this falls within the available budget and that funding is available.

ii. **Processing time:** This refers to the response time. If the response time is slow, the user might consider software or package as inappropriate for their use.

iii. **Documentation**: The software should be accompanied by a manual, which can be easily understood by a non-technical person. The manual should not contain technical jargon.

iv. **User friendliness:** The program should be easier to use with clear on screen prompts, menu driven and extensive on-screen help facility.

v. **Controls:** The software should have in-built controls which may include password options, validation checks, audit trail or trace facilities etc.

vi. **Up-to datedness:** The software should be up to date. It should have changes or corrections in line with business procedures.

vii. **Modification**: One should consider whether the software can freely be changed by the user without violating copyright.

viii. **Its success in the market**: One should consider how many users are using the software particularly an Operating System (OS) and how long it has to be in the market.

ix. **Compatibility with other software**: Consider how the software integrates with other software particularly the Operating System (OS) and the user programs.

x. **Portability:** One should consider how the software runs on the user computer and whether there will be need for the user to upgrade his/her hardware.

xi. **Cost**: Consider the school's financial position to establish whether it can afford the software required for efficient operations. The cheaper software available may not be the best option in times of efficiency.

xi. **Cost**: Consider the school's financial position to establish whether it can afford the software required for efficient operations. The cheaper software available may not be the best option in times of efficiency.

xii. **Software contracts:** Consider the issues in software contracts such as costs, purpose and capacity of the software including what it cannot do.

xiii. **Software licensing:** Consider what you are allowed to do as per the software licence. Note that the software license covers the number of users that can install and use the software legally, whether the software can be copied without infringing copyrights; whether it can be altered without the developer's consent; circumstances under which the licensing can be terminated; limitation of liability.

Activity

As the head of an educational institution you have a role in ensuring that you get quality ICT equipment for your institution.

i. Explain what steps you would take to ensure that you acquire quality ICT equipment for your institution.

REPUBLIC OF KENYA
MINISTRY OF EDUCATION

KENYA EDUCATION MANAGEMENT INSTITUTE

Procurement of ICT equipment

According to PPAD Act, 2015, the objectives for procuring ICT equipment are as follows:

i. **Procure the most cost-effective state of art ICT equipment and services that conform to the current technology:** The procurement system should achieve the lowest possible total cost, having regard to the following factors:
   - The actual purchase price;
   - Any hidden costs that arise from poor product quality, hidden defects, and poor supplier performance where a vendor is unable to meet adequately some or all post sales contractual commitments;
   - Optimal operating costs in the course of use of item or service; and
   - The most current and appropriate technology for the users.

ii. **Ensure timely settlement of supplier's bills as stipulated in the contract**:

The procuring entities must ensure that bills are settled in a timely manner to avoid payment of interest on overdue amounts, as provided in section 48 of the Public Procurement and Disposal Act, thereby discouraging the prevalent overprizing by suppliers to offset potential cost of delayed payments in the public sector.

iii. **Separate procurement functions and authorizations to enable checks and balances in the procurement process:** Procurement functions and responsibilities such as setting specifications, evaluation and award of tenders should be divided among different offices, committees and individuals, each with the appropriate expertise as provided for in PPD Act Section 26 (3) (c).

iv. **The suppliers' performance to be evaluated and measured and feedback given to the suppliers**: Systematic evaluation and measurement of a supplier's performance should be undertaken to ensure compliance with the terms and conditions of contract and to enhance remedial measures.

v. Communication to and from suppliers using telephones, emails, interactive website including tenders and procurement information sharing; Communicating with internal users on emails, telephones and electronic notice boards including diary and meetings management; Instituting process automation and simplification using ERP systems.

vi. **Observe ethical practices in procurement:** Procurement should be ethically and efficiently carried out as provided for in the provisions of the Public Procurement and Disposal Act, Public Procurement and Disposal Act Regulations, Public Procurement and Disposal Act General Manual, and this Public Procurement Manual. This will help obtain the best value for expenditure incurred by the procuring entities.

vii. **Maintain sound inter-departmental collaborations:** Collaboration within the departments and participation by relevant disciplines is required in order to encourage professionalism in ICT procurement.

viii. **Select reliable suppliers of high-quality ICT equipment and services:** Effective assessment and subsequent selection of capable suppliers is vital to the success of the procurement process for ICT needs. For providers of high value and sensitive ICT needs, the procuring entity may consider using a comprehensive supplier appraisal template and procedures found in the Public Procurement Manual.

Guidelines on software and licensing

- Licensing should form an integral part of software procurement since it generally forms a substantial portion of the total cost of ownership. Below are the guidelines on software and licensing (PPAD, 2015):

i. For licensed software the manufacturer normally sets out the conditions of usage. Failure to adhere to these may lead to revocation of use of the software at any time with or without specification of the cause.

ii. Each institution must ensure compliance to licensing requirements. Anything less than total compliance places the institution at risk of license revocation with attendant consequences.

iii. It is prudent to for the institution to discuss and agree with ICT vendors the licensing terms to be applicable in case of software upgrades.

iv. The institution must develop and issue a code of conduct for all users of its ICT equipment to ensure compliance with software licensing requirements and to avoid unauthorized loading of unlicensed software onto the institution's ICT equipment.

v. Each institution needs to control employees' and third parties' access to its ICT equipment to prevent licensing violation.

vi. Each institution needs to keep comprehensive and accurate records of it software licenses for any authorized inspection by copyright enforcement agencies.

vii. The institution must fully understand the terms of license, which can be very complex for larger institutions. Explanation of terms can be obtained from vendors or over the Internet from software developers' websites.

Outsourcing ICT services

- ICT outsourcing focuses on hiring a third- party company or service provider to do ICT-related activities such as hosting, applications management and development, data centre operations, or testing and quality assurance.
- Complex ICT solutions can be outsourced if in-house capability and capacity are inadequate.
- A number of ICT services within an institution's business processes may be outsourced subject to a sound business justification being developed and approved by the head of institution.
- Examples of ICT services that may be outsourced include:-
  - Systems infrastructure transformation or ICT architecture upgrade;
  - Application management and host services, data base services, firewall services (including intrusion detection), network monitoring and data back-up;
  - Data management services;
  - Web development and hosting;
  - Application support and administration;
  - Software development and software integration; and

Computer Safety and Maintenance

Computers, like any other piece of electronic equipment, need special care and attention

in order to perform properly and safely.



Threats to the computer

The following are the likely threats to the computer:-

i. **Weather challenge:** Extreme heat, cold, or humidity
ii. **Damage:** A damaged cable will prevent the computer from communicating with input or output devices.
iii. **Accidents:** Fire and the potential for flooding during firefighting operations.
iv. **Dust:** Dust can damage hard drives and floppy disk drives and can prevent computers from cooling properly.

v. **Malicious viruses/worms/malwares:** A **virus** is a computer program that can copy itself and infect a computer. Most viruses are malicious and can do significant harm to the computer's software and data. Viruses enter a computer in a number of ways: they can move from an infected computer to another when they are transferred physically by people (via a CD, floppy disk or USB drive) or transmitted over a network, such as the Internet, via email, file transfer or instant messaging. They are often sent as file attachments to emails and infect the computer when the user opens the file. These types of attached files frequently have extensions such as .com or .exe.

Conduct while in an ICT Room

In this section we will discuss the conduct expected of everyone while in the ICT room:

i. Computer components should be kept dust-free. Avoid smoking and exposing computers to dust.

ii. Keep all liquids and food items away from your computer. Liquids and food crumbs can cause rusting and electrical shock!

iii. Never use your computer during a storm. The computer is connected to electricity and that means that lightning could be conducted to the computer.

iv. Never use your computer during a storm as lightning could be conducted to the computer.

v. Avoid dropping hardware to the ground as this could cause delicate components to break or and stop working.

vi. Proper shut down of computers should be followed to avoid disk failure (avoid abrupt switching off)

vii. Be careful when using the internet. Do not accept downloads from Internet sites that you don't know and trust. It is the main transmission medium of Malicious software e.g. viruses.

viii. Avoid making hardware connections when the computer is on, a lot of drivers may not be loaded

ix. Avoid over bright and flickering computer monitors. The brightness of the computer monitors should be adjusted to avoid eye strain.

x. Always sit upright to avoid muscle pains and back aches caused by poor sitting posture.

How to manage the computer room

- After the establishment of the computer laboratory, a number of precautions should be observed to provide a safe conducive environment for teaching and learning .
- It is important to observe the following precautions in an ICT laboratory:-



i. **Avoid heat:** Avoid direct sunlight and high temperatures that may damage hardware components.

ii. **Always use surge protectors:** Uninterruptible Power supply or stabilizer to ensure steady power supply to safeguard their system.

iii. **Dust and dump control:** When setting up the computer laboratory, consider a location away from excessive dust. The room should have special curtains and computers should remain covered using dust covers when not in use.

iv. **Regulate humidity:** Humidity must be regulated in the computer laboratory to remain at an optimum 50%. Low humidity may cause static electricity to build and damage sensitive components. High Humidity of over 70% cause rusting of the metallic parts of the computer system.

v. **Well lit:** A computer room should be well lit to avoid eyestrain, and headaches. Radiation filter screens should be fitted to reduce the light that reaches the eye.

vi. **Standard furniture:** The table on which a computer is placed must be strong and wide enough to bear the weight and accommodate all the peripheral devices

vii. **Protection against fires:** A computer room should have fire extinguishers of carbon dioxide but not water or powder.

viii. **Proper cable installation and placement.** Cables should be preferably along walls, avoiding danger of exposing the use to electric shock

ix. **Burglar proofing avoid unauthorized access to computer room:** Fit strong locks, doors, windows and roofing. Security should be good around computer room to avoid thefts.

x. **Ventilation should be good**: Good aeration enables the computer to cool and hence avoids overheating

Safety and Security of ICT Data and Equipment

- Data security is a set of policies and practices which keeps data safe from being corrupted (made unusable) and protected from unauthorized access. It helps to protect privacy and ensures that the individual or organization which created the data will continue to have access to it.

i. **Back-up policies** are particularly important to an effective data security program. Backing-up means to make another copy of the data. One way to do this is to copy the data to a CD. However, simply making a back-up copy may not be enough, especially for particularly important data such as payroll or invoice information. A back-up must be kept **off-site** - in other words at some location other than the one in which the data was created. Some organizations put backups of their data in bank safety deposit boxes. Others back-up their data on cloud.

ii. **Firewalls** are security systems designed to prevent unauthorized electronic access to a computer network. They can consist of both hardware and software. They are frequently used to prevent unauthorized users from entering a computer network which is connected to the Internet such as an institution's LAN. Firewalls work by inspecting every message that attempts to enter or leave the network and stops those which do not meet certain security rules. Personal firewalls are available to protect individual computers. Like network firewalls they inspect all communication requests to the computer and determine if they should be allowed depending on the rules the computer user has established.

iii. **Data theft** is the term used to describe when information is stolen or copied from an institution or individual. It has become an increasingly significant problem as more staff members have access to network information through their office computers or can use portable devices such as USB memory sticks to copy information. The information commonly involves user data such as passwords, social security numbers, credit card information or other personal information. Protection from data theft involves implementing secure username and password systems which are available only to selected individuals. Other techniques involve locking the computers or physically attaching them to desks with a security cable. Security cables - steel cables with locks - are especially useful to prevent the theft of laptop computers. It's important to note that Data created by an institution or an individual working for that institution is considered as the institution's property. Data theft is punishable under the law.

iv. **Anti-virus programs:** The most effective way to ensure protection from viruses is to use an anti-virus program which is a computer program that identifies and removes (or incapacitates) viruses. This is done by trying to identify known viruses, monitoring the actions of programs on the computer for unusual behavior, or analyzing the code of programs to see if they include instructions which might cause virus-like activity. To ensure the effective operation, the anti-virus program it needs to be regularly updated by visiting the site which distributes it. Some programs, though, can be set up to automatically update themselves while the computer is attached to the Internet.

v. **Copyright/licenses:** Institutions should comply with copyright and software licences. Copyright refers to the legal right granted to the creator of a original work to have exclusive rights over that work for a certain period of time. The rights include publication, distribution and adaptation. The period of time has been set internationally as between 50 and 100 years after which the product is considered to be in the public domain. Licensed software refers to computer programs which can be used by end-users in particular ways defined in the software license. Almost all software is licensed for use instead of being sold and is therefore referred to as proprietary software - software which is owned by an individual or company.

vi. **Access and control policy:** It is important that your education institution develops and implements password policies to ensure that access to the computer systems is properly authorized and controlled. Internet security policies and guidelines shall be developed to ensure students safety and security while on internet. The policy should also provide guidelines to control junk sites as well as access to phonographic materials.

vii. **Security of equipment:** Ensure that ICT equipment is stored in a well- secured room/lab and ensure access to the resources is well-controlled. Maintain an inventory of all ICT equipment. With your staff, develop security of equipment guidelines and ensure that the institution's community is aware of these guidelines.

Computer maintenance

Computer maintenance involves the following:-

i. **Cleaning:** Computers require special cleaning even on the outside, including the hardware parts such as the mouse and keyboard, in order to perform correctly.

ii. **Antivirus:** Always use and regularly update antivirus software. Viruses and worms are computer-unfriendly programs that can crash your system and cause irreparable damage.

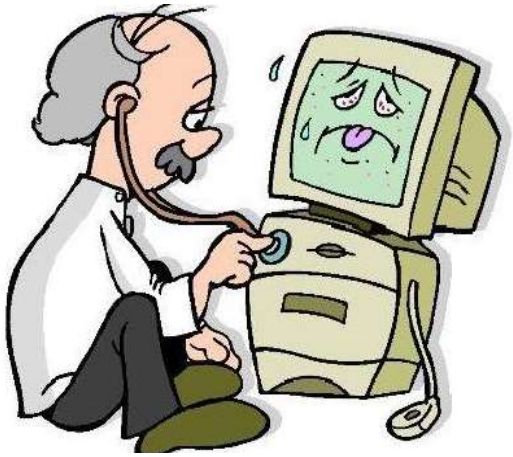
iii. **Optimizers:** Always use utilities like the optimizers that modify programs to make computers to run more quickly.

iv. **Avoid Installation Marathons:** Sometimes, installing a new program can cause conflicts within your system. These conflicts will need to be worked out or the program will have to be uninstalled so that your system works correctly. Use your computer long enough to see how your system responds to the installation before loading the next program.

v. **Defragment when necessary:** A computer is a storehouse for mass amounts of data, so you could say a computer is like a big bookcase. Like real bookcases, they can become disorganized, which can be frustrating when you're trying to find something. Having a disorganized computer also slows down the processing time for your normal every day functions. Defragmenting your computer will organize files in a way that the computer can easily access them.

Troubleshooting ICT equipment

- Troubleshooting is a form of problem solving, often applied to repair failed products or processes.
- It is a logical, systematic search for the source of a problem so that it can be solved, and so the product or process can be made operational again.
- We will look now at how to trouble shoot (resolve) problems that occur in ICT equipment.



Problem	Acton to take
Computer won't start	• Check that all the cables are securely plugged into the back of the machine and the monitor • Check that the power cables are plugged into a power socket and the socket has been turned on. • Try using a different power socket or, if you are using a power extension strip, plug the power cable directly into a power socket in the wall
Nothing appears on the monitor	• Make sure both the computer and monitor are on. • Make sure the monitor is securely plugged into the computer. • Make sure the power cable is firmly plugged into the monitor.

Problem	Action to take
Keyboard/ Mouse does not work	• Make sure the keyboard/mouse is firmly plugged into the back of the computer. • Try unplugging one or both, and then reinserting it into the back of the computer • Try plugging your USB keyboard/mouse into a different USB port • Replace the keyboard/mouse with one that you know works. • If you cannot see any lights on your keyboard when you press the Caps Lock or Num Lock key, it may be a dead keyboard. • Make sure there is no dirt or fluff clogging up either the optical laser or roller ball on the underside of your mouse. It may require a cleaning.
Computer is slow	• Close some of those programs. • Check the hard drive space and verify that you have adequate free space. • Update Anti-virus and scan your computer for viruses. • Delete unnecessary files and uninstall programs not being used

Problem	Action to take
Power button will not start the computer	• Check the power cord to confirm that it is plugged securely into the back of the computer case and the power outlet. • If it is plugged into an outlet, make sure it is a working outlet. To check your outlet, you can plug in another electrical device, such as a lamp or cell phone, and see if it receives electricity properly. • If the computer is plugged into a surge protector, verify that it is turned on. You may have to reset the surge protector by turning it off and then back on. You can also plug a lamp or other device into the surge protector to verify that it is on
Computer beeps twice during booting	• Lose connections inside the CPU • Switch off your computer and seek assistance to open up the CPU and fix any loose connections

An application is frozen (or has "hanged')	• Force quit the application. On a PC, you can press (and hold) Ctrl+Alt+Delete (the Control, Alt, and Delete keys) on your keyboard to open the Task Manager. You can then select the unresponsive application and click End task (or Force Quit on a Mac) to close it. • Press and hold the Power button. The Power button is usually located on the front or side of the computer. Press and hold the Power button for 5- 10 seconds to force the computer to shut down. • If the computer still won't shut down, you can unplug the power cable from the electrical outlet. If you're using a laptop, you may be able to remove the battery to force the computer to turn off. **Note:** This solution should be your last resort after trying the other suggestions above.

Activity

(a). The Head teacher of Upendo school is hesitant to accept ICT equipment from the Government after receiving reports that a neighbouring school was attacked by burglars who stole the ICT equipment after seriously injuring the school watchman.

(b) As a parent, I want to know that my children are safe in school, I want to know that they are empowered with the knowledge to be safe when they go online, and I want to know that staff have a good understanding of what safe means in any context to do with ICT technology.

(c). With the ever increasing development of computer technology and the increasing number of people who are computer literate, it is much more likely that our children will be victimized or exploited in a computer environment.

- ***Discuss each of these scenarios in the context of computer safety in educational institutions.***

E-Waste

- E-waste is a term used to cover almost all types of electrical and electronic equipment (EEE) that has or could enter the waste stream.
- E-waste comprises discarded electronic appliances of which computers and mobile phones make the great contribution due to their short life span.
- E-waste has damaging effects on the environment and to human health.
- E-waste is the most rapidly growing problem in the waste stream due to its quantity and toxicity.
- Often, the toxic material is improperly disposed and thus poses a threat to human health and the environment.

- Many elements of this waste contain poisonous substances such as lead, tin, mercury, cadmium and barium.
- The effects of e-waste to human health and well-being include:
  - respiratory problems,
  - oxidative stress,
  - DNA damage and the possibility of causing cancer.

- **Management of E-waste in Kenya**
- Kenya now has the E-Waste plants set up within Nairobi to recycle all types of e-waste and provide safe disposal. Some of these include, WEEE (www.weeecentre.com).
- They accept, dismantle separate all e-waste components, not just the valuable resources.
- Plastics, glass, batteries are all disposed in accordance with the highest international criteria

E-waste guidelines for schools

- Schools are recipients of electrical and electronic goods.
- Unfortunately, most of the second hand products are not inspected before they are donated.
- Coupled with poor handling and use, their lifespan becomes shorter resulting in huge amounts of e-waste in most schools. In order to manage e-waste, learning institutions need to:

i. create awareness and conduct sensitization campaigns on responsible e-waste management;
ii. develop Memorandums of Understandings (MOUs) with recycling companies for take-back, recycling and re-furbishing of e-waste; develop mechanisms to ensure that inspection certificates clearly specify end-of-life date and who bears responsibility thereafter;
iii. develop and mainstream e-waste education in the curricula;
iv. separate e-waste from other wastes to facilitate collection, treatment and recycling;
v. dispose e-waste generated to the e-waste collection centres;
vi. sell or donate e-waste to licensed re-furbishers;
vii. take back equipment to the manufacturer, importer or assembler, if they allow it;
viii. dump e-waste at the licensed dumping site specified for the e-waste;
ix. be responsible by following recommended disposal methods or procedures especially dates of expiry or end of usage period of the product.

Current ICT Integration in Education Initiatives

- The Government of Kenya initiated the Digital Literacy Programme to support ICT integration in education to address challenges of access, quality, relevance and equity in education.
- To achieve ICT integration in education, initiatives such as capacity building of teachers, and sensitization of the stakeholders has been ongoing across board.
- The various initiatives that the government, private sector and the Development partners have undertaken to entrench ICT integration in Education.

These incudes:

- Digital Literacy Programme Phase 1 & 2
- Computer for Schools Programme
- iMlango consortium
- Solar Powered Internet School (SPIS)
- Kenya Education Cloud (KEC)
- School Environmental Improvement and Capacity Building Project
- Primary Schools Digital Learning Project

Digital Literacy Programme Phase I

- The Digital Literacy Program was an ICT initiative which was implemented countrywide.
- The focus of the programme is to enhance learning in all Public Primary Schools in Kenya through the use of digital technologies.

Aims of Digital Literacy Programme

i. The government intends to support:-
ii. Development of innovation skills for a knowledge economy.
iii. Promoting Research and Development.
iv. Promoting locally assembled/manufactured goods and services.
v. Enhancing Job creation

REPUBLIC OF KENYA
MINISTRY OF EDUCATION

KEMI
KENYA EDUCATION MANAGEMENT INSTITUTE

Implementation Model

The Digital Literacy Program is implemented through a multi-agency approach that consists of:

AGENCY	ROLE
Ministry of Education (project owner)	Policy formulation, ICT infrastructure
The ICT Authority (lead implementing agency)	Procurement of Digital devices
Ministry of ICT, Innovation and Youth Affairs	Broadband Connectivity
Ministry of Industrialization & Enterprise Development	Establishment of ICT devices local assembly
Ministry of Energy and Petroleum	Power supply to schools
The National Treasury	Budget provision
Office of the Attorney General	Legal advise
The Teacher Service Commission (TSC),	Capacity building of teachers
Kenya Institute of Curriculum Development (KICD),	Digital content development
Rural Electrification and Renewable Energy Corporation (REREC).	Electrification of schools

The DLP programme is anchored on five key interventions:

- Provision of content for digital learning
- Provision of digital devices for both learners and teachers
- Capacity development for teachers and implementers
- Establishment of local assembly for digital devices and related accessories
- Broadband connectivity

Installation of Devices in Schools includes:

- Learner Digital Devices (LDD), Special Needs Learner Devices (SNLDD),Teacher Digital Devices (TDD), Content Access Point (CAP), Projectors.
- Capacity building of Teachers
- Electrification of public primary schools
- Development of digital content
- Establishment of ICT devices assembly plants at Moi University and Jomo Kenyatta University of Agriculture and Technology (JKUAT).

Challenges Facing Implementation of DLP I

i. Low teacher competences in ICT integration
ii. Inadequate Digital Content
iii. Technophobia amongst teachers
iv. Poor broadband connectivity
v. Theft of digital devices

REPUBLIC OF KENYA
MINISTRY OF EDUCATION

KENYA EDUCATION MANAGEMENT INSTITUTE

Digital Literacy Programme Phase II

The Digital Literacy Programme Phase II will run from 2020 to 2023 and targets learners in Grade 4 – 6. The components of DLP Phase II are: -

- Provision of advanced learner and teacher devices
- Provision of digital content for Grade 4 – 6.
- Capacity development for Teacher of upper grades
- Extension of power supply to the classroom
- Setup of smart classrooms for Competency Based Curriculum
- Broadband connectivity to schools

Other ICT Initiatives

- Beside the Digital Literacy program, there are other ICT initiatives in education institutions which include:

Computer Programme For Schools

- Launched during the 2009/10 budget cycle as an Economic Stimulus Programme
- Targeted mainstreaming of information technology in 20,000 public primary schools, 6,000 secondary schools, 22 Primary Teacher training Colleges(PTTCs), 2 diploma collages and 10 model e-learning centres for Adult and Continuing Education
- At the secondary level the programme entailed provision of comprehensive ICT infrastructure that included:
- Eleven desktop computers,
- Eleven UPSs, one laptop,
- One projector, one printer,
- Local area network, one year internet connectivity and
- Capacity building of principals and teacher
- To date over 2,800 secondary schools have benefited from this programme.

iMlango consortium

- The programme targets Girl Child Education in 4 counties (Uasin Gishu, Kajiado, Makueni and Kilifi).

Solar Powered Internet School (SPIS)

- Implemented in Kajiado County by the Republic of Korea.
- The package includes provision of a fabricated container with tablets, solar panels and batteries.
- Training of teachers in the benefiting school

Kenya Education Cloud (KEC):

- **This** is an innovation of KICD to facilitate online content curation and universal access to quality education content through cloud technology.

- **World Vision** is currently sponsoring ICT integration in Narok and Kakamega counties.

- **Elimika**: this is an online teacher orientation course on curriculum and teacher Capacity Building in ICT Integration by KICD.

- **School Environmental Improvement and Capacity Building Project**: Implemented by Korea International Cooperation Agency (KOICA) in partnership with the Ministry. The project is targeted at capacity building of teachers and learners in two primary schools; Uhuru Gardens Primary and Ngundu Primary in Nairobi County.

- **Primary Schools Digital Learning Project**: The Aga Khan Foundation (K) is providing digital learning devices in three primary schools in Mombasa and Kwale Counties.



- In this Unit we have looked at various aspects of ICT infrastructure in an education institution.
- We have examined the procurement process starting with planning and budgeting and the eventual acquisition of the equipment.
- We have also learnt the factors to consider while buying hardware and software.
- In addition, we have looked at various ways of financing ICT infrastructure and its maintenance.
- To end the unit, we looked at the concept of e-waste and the various ICT initiatives in education institutions.
- Its our hope that you now have better understanding of issues concerning ICT infrastructure and you would be in a better position to make informed decisions concerning ICT equipment .