

SECOND EDITION 2018

# Subsidiary ICT for Uganda



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# Subsidiary ICT

for Uganda

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## About the Author



THE AUTHOR of this book has taught ICT and computer studies since 2009, in schools like Rock High School Tororo, Jinja College and Kololo SSS. He emerged as the best graduate in science based disciplines during the 67th Graduation of Makerere University, having obtained a CGPA of 4.91 in Bachelor of Information Technology.

He is currently pursuing his masters in computer science.

**Other books by the same author include:**

- ★ Computer Studies for Uganda (6th Ed. 2018)
- ★ ICT Revision Questions and Answers for Uganda (2nd Ed. 2018)
- ★ Lab Activities for Computer Practical Applications. (5th Ed. 2018)

## Key Features of the Book

- ★ Based on A Level NCDC Subsidiary ICT Syllabus topic by topic.
- ★ Precise facts and clear brief explanations.
- ★ Has comprehensive teaching notes for both theory and practical topics.
- ★ Consists of revision questions and practice exercises at the end of the chapters.
- ★ A handy glossary of ICT terminologies at the end of the book.

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**Subsidiary ICT for Uganda  
2<sup>nd</sup> Edition 2018**

BY

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**SALES AND MARKETING:**

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**Based on NCDC Teaching Syllabus**

**S850/1-3**

**Term by Term, Topic by Topic**

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We also want to appreciate the National Curriculum Development Center (NCDC) for providing the Computer Studies Teaching Syllabus 840 and the Subsidiary Information and Communication Technology Teaching Syllabus S850, and Uganda National Examinations Board (UNEB) for additional guidelines and examination materials.

Above all we thank the Almighty God for having granted us the knowledge, strength and persistence that has enabled us to publish the book.

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## PREAMBLE

### Syllabus Guidelines Summary

The guidance provided in this section cuts across all topics in the curriculum.

- The teacher should define and analyse the specific tasks and skills to be learned, frequently assess student performance, and provide systematic feedback to the learner.
- Tailor the strategies and methods of instruction to provide for specific learners behaviours and learning disorders, mental retardation, physical disabilities, vision impairments, and hearing problems.
- The teacher is advised to move around the classroom and see what the students are doing.
- The teacher should encourage and practise the habit of previewing every document before printing.
- The teacher should make use of cyber or digital content to enhance learning.
- The teacher should employ the problem base learning strategy.

### Teaching Subsidiary ICT is aimed at:

1. Helping the learner develop and consolidate his/her knowledge of ICT and be aware of new and emerging technologies.
2. Encouraging the learner to develop as an independent user.
3. Encouraging the learner to develop ICT skills to enhance their work in a variety of subject areas.
4. Equipping the learner with skills for lifelong learning.

The ICT skills in the subject are directly applicable to the study of other subjects and schools are encouraged to provide opportunities for their learners to apply these skills to a range of learning areas (subjects).

### Time Allocation

The subject should be given **six periods** per week on the school's teaching timetable. This is to allow enough time for the learners to engage in practical activities for developing hands-on skills and get exposed to real life computing experiences. The teacher is advised to give the learners as many practical sessions as time can allow to enable them develop the computing skills that this syllabus stipulates. As much as possible, the learner should be allowed to explore the ICTs exposed to him/her for the benefit of developing new skills and knowledge.

### Teaching /Learning Strategies

These provide the teacher with guidance on the proposed activities and strategies that can be used in the teaching. The following are the suggested teaching /learning strategies;

1. *Hands on activities (Practical Sessions):* The learners work in pairs or individually to develop skills or put into practice the acquired knowledge. You will need to carefully plan a range of activities that clearly identify the purpose of the practical session. Where learners work in groups, every learner should have an opportunity to take part in the hands-on activity.

2. *Teacher guided research:* An instructional technique where you give students areas of research and as a result, the learner finds out more information in the given areas.
3. *Group discussion and peer presentation:* A technique where the students are divided into small manageable groups to share knowledge/ findings. Each group should be given an opportunity to present their findings to the rest of the class under your guidance.
4. *Brainstorming:* A technique used to gather ideas about a topic or learning area spontaneously contributed by the learners.
5. *Device identification:* An approach that requires the learner to identify and distinguish between devices.
6. *Teacher exposition:* An instructional technique where you put the topic into context for the learner to elicit his/her contributions. This approach is most appropriate when introducing a new topic.
7. *Use of simulations:* The use of computer systems (programmes) to imitate the operation of a real-world process or system.
8. *Collaborative tasks:* An approach that requires the learner to work with online groups in planning, collecting the request data and solving problems. For example discussion groups and forums.

#### **Mode of Assessment**

The assessment in this subject is software independent. Any hardware platform, operating system and application packages can be used for the examination, provided they have the capabilities to enable the learner fully demonstrate all the acquired skills, and meet the assessment objectives of this subject.

The application software needed for this subject are Word processors, spreadsheets, electronic presentation, Database applications, Web browsers, and electronic publishing. Use of other operating systems other than Windows is highly encouraged.

#### **Teaching Sequence**

The teaching sequence should follow the order in which the topics have been arranged in this teaching syllabus.

#### **Senior Five Term One**

<b>Topic</b>	<b>Sub topic</b>
Introduction to Computing	Introduction to Computers
	World of ICTs
	Implications of Using ICTs (Advantages and Disadvantages)
Computer Management	Booting Process
	File Management
	Common Utilities
	Print Management
Computer Laboratory Care and Maintenance	Computer Literacy
	Secure Laboratory Environment
	Servicing and Maintenance
Computer Processing I	Introduction to Word Processing
	Working with Word Processing Software

**Senior Five Term Two**

Computer Hardware	Input Devices
	Output Devices
	Storage Devices
	Processor Components
Computer Software	System Software
	Application Software
Electronic Spreadsheets I	Introduction to Spreadsheets
	Working with Spreadsheets
	Managing Spreadsheets
	Formulas and Functions
Internet and World Wide Web	Introduction to the Internet
	Internet Services
	World Wide Web

**Senior Five Term Three**

Computer Processing II	Word	Page Layout
		Date Tabulation
		Use of Objects
		Document Accuracy
		Mail Merge, Document Referencing and Printing
Electronic Presentation	Introduction to Electronic Presentation	
	Working with Presentation Software	
	Developing a Presentation	
	Charts	
	Graphical Objects	
	Presentation Output	
	Slide Show	

**Senior Six Term One**

Data Communication and Networking	Introduction to Data Communication
	Introduction to Computer Networks
Electronic Publication	Introduction to Electronic Publishing
	Publishing Basics
	Document Layout
	Document Enhancement
	Outputs
	Complete Publication
	Web Publishing

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**Senior Six Term Two**

Electronic Spreadsheets II	Working with Charts
	Worksheet Page Layout
	Printing a Worksheet
Databases	Introduction to Databases
	Database Objects

**Senior Six Term Three**

System Security, ICT Ethical Issues and Emerging Technologies	Computer System Security
	Privacy and ICT Ethical Issues
	Emerging Technologies
	ICT industry

**UNEB Examination Format**

Two papers will be used to assess the subject as follows:

Paper one (theory paper) set out of 100 and converted to 40% of final mark.

Paper two (Practical paper) set out of 60 and this constitutes 60% - to be added to the 40% obtained in paper one to get the total final mark out of 100. Being a subsidiary subject, the student's final mark has to earn at least a credit 6 (about 50%) in order to obtain a grade point.

**Subsidiary ICT Paper One: (2 ½ hours)**

- This paper will be based on basic ICT concepts and their application areas. The paper will cover the entire syllabus with emphasis on application of ICT knowledge in a variety of fields (Social, Economic, Political, Environmental, and Informational).
- This will be a written paper made up of 20 equally weighted compulsory questions. The duration of the examination paper will be **2 Hours 30 Minutes**.
- The questions shall be structured and semi-structured requiring a short response, a phrase or one or two sentences. Some of the semi-structured questions will require extended responses of about three sentences.
- All questions are to be answered in the spaces provided on the examination paper.
- This paper will be set basing on the table of Question Allocation below.

**Question Allocation**

Topic	Number of Questions
Introduction to Computers	2
Lab Care, Troubleshooting and Maintenance	1
File management	2
Computer Hardware	3
Computer Software	3
Internet and World Wide Web	3
Data Communication and Networking	2
Trends in Computing	2
Theory Qns on Practical Applications	2
<b>Total Number of Questions in paper)</b>	<b>20</b>

### Subsidiary ICT Paper Two (2 Hours)

This will be a practical paper *made up of five (5) equally weighted questions. Candidates will attempt any three questions. Any additional question(s) answered will not be marked.* Each candidate is provided with a blank Compact Disc Rewritable (CD-RW) or a flash disk. Each candidate must produce a hard copy for each of their work to accompany the flash disk or compact disc.

The duration of the paper shall be **2 hours**.

The questions will be drawn from the topics of word processing, electronic spreadsheet, electronic presentation, electronic publication and databases. The paper will emphasize application of ICT skills in the topics mentioned. Where applicable, **support files** will be provided to supplement the set questions.

### The Support Files Approach

'Support Files' are specimen files that are provided to students in softcopy for use during the practical examinations. The support files may include named word documents, spreadsheet files, text files, image files, etc., and are usually referred to in the question paper by their file names and file extensions, just like how specimen are referred to in other UNEB practical examination questions such as biology or chemistry practical examinations.

A candidate may be requested to open or load a given file from the support files folder and do certain tasks with it such as save as, copy and paste, format, etc. All the candidates are supposed to do is to ensure that they can locate the required support file and follow the instructions on the question paper.

However teachers are advised to teach their students the practical skills traditionally, so that the students can acquire the typing speed and all core skills even without the support files. The support files approach can be introduced to the learners after they grasp the basic skills or it can be incorporated into the training from the early stages.

### Getting Examination Support Files

Just like in other practical examinations in which specimen materials are used, the support files to be used in the subsidiary ICT exam are usually released atleast one week in advance so that they are loaded on the desktops in the computer lab before the examination time. There is a fear by some stakeholders that if the teachers get the the support files, they could cheat for their students, but this is not significant because there is very little that someone can do with the support files alone without the actual question papers, different unpredictable questions can be asked on the same support files. Teachers are cautioned against giving hints to students on the support files to be used because this confuses the students the more.

**UNEB Circular on support Files**

The circular below was issued by UNEB concerning the use of support files in subsidiary ICT examinations in 2016:

**UGANDA NATIONAL EXAMINATIONS BOARD**

P.O. Box 7066,

OUR REFERENCE: TD/GEN/1

Ntinda Tel: 0414 286635/6/7/8,

Fax: 0414 289397

YOUR REFERENCE:

Kyambogo Tel: 0312 260753, 0414 289399, 286173,  
Fax: 0312 260752E-mail: [uneb@africaonline.co.ug](mailto:uneb@africaonline.co.ug), [uneb@uneb.ac.ug](mailto:uneb@uneb.ac.ug)Website: [www.uneb.ac.ug](http://www.uneb.ac.ug)

KAMPALA, Uganda.

Date: 27<sup>th</sup> June 2016

**CIRCULAR TO ALL UACE SCHOOLS OFFERING  
SUBSIDIARY ICT (S850)**

**USE OF SUPPORT FILES IN THE SUBSIDIARY ICT PRACTICAL  
EXAMINATION PAPERS S850/2 & 3 AT UACE**

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This is to remind examination centres offering S850 that examining of the practical papers using support files will commence this year 2016.

**EXAMINATION FORMAT:**

- **PAPER 1 THEORY TEST (2 ½ HOURS)**

The paper consists of **twenty (20)** structured questions set from the entire syllabus. All the questions will be **compulsory**. Each question will carry **5 marks**. (**Format remains unchanged**)

- **PAPER 2&3 PRACTICAL TEST (2 HOURS)**

The paper consists of **five (5)** questions set from the topics *Word Processing, Electronic Spreadsheets, Electronic Presentation, Electronic Publication and Databases*. A candidate will be required to answer **any three (3)** questions. Each question will carry **20 marks**.

**(Where applicable, support files will be provided to supplement the set questions)**

**Assessment Weighting:**

Paper 1 (*Theory*)      **40%**

Paper 2/3 (*Practical*)      **60%**

**Procedure for Support Files:**

- a) The Support Files shall be uploaded on the UNEB portal **one week** before the practical examination.
- b) The uploaded files shall be in a folder that reflects the current year e.g. "**UNEB Support Files 2016**"
- c) The schools should download the files on a CD and test them to find out if they are running and opening.
- d) The computers in the laboratory should be checked and cleaned.
- e) The computer teachers should then put the Support Files on the Computer Desktops in the Computer laboratory.
- f) Candidates should not access the laboratory after the Support Files have been put on the Desktops until the time of the practical examination.
- g) After each shift and before the next shift of the examination, the Computer teacher should be allowed in the laboratory to make sure each Desktop has only the original Support Files.

**NOTE:**

1. All candidates should have **new** blank Compact Discs (CD) provided by the school. **Flash Disks will no longer be accepted.**
2. The CDs of the candidates should be packed in smaller boxes and the printed copies of the candidates work to be sealed in the return envelopes. These should then be sealed together in another properly labeled bigger box to avoid the separation and misplacement of the printed copies.

Please find attached the reviewed minimum requirements for teaching Subsidiary ICT.

  
**Dan N. Odongo**  
**EXECUTIVE SECRETARY**

Copy to: Permanent Secretary, MoES  
Director BSE  
Director NCDC  
Director DES

Enc.

## MINIMUM REQUIREMENTS FOR TEACHING SUBSIDIARY ICT

1. Desktop Personal Computers or laptops (*for students and teachers' use*)
  - Intel Pentium 4( 2.0 GHz +) or AMD processor (1.5 GHz+)
  - 512 MB RAM
  - 80 GB HDD
  - DVD/CD-RW Combo Drive
  - 17" / 19" CRT Monitor
  - Computer Speakers, keyboard and Mouse.
2. A closed and simple Computer Network with at least one network hub.
3. Fire Extinguisher.
4. Safe Electrical Installations (*provide a socket for each computer set*)
5. Uninterruptible Power Supply (UPS) Units and a stable power source.
6. Internet Connectivity
7. Printer accessible on a network.
8. Subsidiary ICT Teaching Syllabus.
9. Must have appropriate software for:
  - (a) Word Processing.
  - (b) Spreadsheet.
  - (c) Presentation.
  - (d) DBMS.
  - (e) Publication
10. Software versions should not be more than ten (10) years old from the year of examinations.

It is important to keep the ratio of computers to students as favourable as possible (*recommended for this subject is a ratio of 1 computer: 2 learners per stream*).

**NB:** *For more on the support files approach, practical questions, lab activities, and over twenty sets of standard full past papers and their support files, get a copy of our book entitled "LAB ACTIVITIES FOR COMPUTER PRACTICAL APPLICATIONS"*

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# Evaluation Copy

## LIST OF ACRONYMS

ALU - Arithmetic Logic Unit	ISP - Internet Service Provider
ASCII - American Standard Code for Information Interchange	JPEG - Joint Photographic Experts Group
BIOS - Basic Input Output System	Kb - Kilobyte
bps - Bits per Second Bps - Bytes per Second	KH - KiloHertz
CAD/M - Computer Aided Design/Manufacturing	LAN - Local area network
CAL - Computer Aided Learning	LCD - Liquid Crystal Display
CAT 5 - 'Category 5' cable	LED - Light Emitting Diode
CD - Compact Disc	LIFO - Last in First Out
CPU - Central Processing Unit	MAN - Metropolitan Area Network
CRT - Cathode Ray Tube	MICR - Magnetic Ink Character Recognition
DBMS - Data Base Management System	MP3 - MPEG Layer 3
DDR - Double Data Rate	NIC - Network Interface Card
DFD - Data Flow Diagrams	NOS - Network Operating System
DOS - Disc Operating System	OCR - Optical Character Recognition
DSL - Digital Subscriber Line	OMR - Optical Mark Recognition
DTP - Desktop publishing	OMR - Optical Mark Reader
DVD - Digital Versatile Disc	OOPL - Object Oriented Programming Language
EFT - Electronic Funds Transfer	OSI - Open Systems Interconnection
EULA - End User Licence Agreement	PCI - Peripheral Component Interconnect
FAQ - Frequently Asked Questions	PDA - Personal Data Assistant
FIFO - First in First Out	POS - Point of Sale
FNF - First Normal Form	PPM - Pages per Minute
FTP - File Transfer Protocol	RAM - Random Accesses Memory
Gb - Gigabyte	ROM - Read Only Memory.
GIF - Graphic Interchange Format	SCSI - Small Computer Systems Interface
GIGO - Garbage In Garbage Out	SQL - Structured Query Language
GPS - Global Positioning System	TCP - Transmission Control Protocol
GUI - Graphical User Interface	TFTP - Trivial File Transfer Protocol
HCI - Human Computer Interaction	TNF - Third Normal Form
HTML - Hyper Text Mark-up Language	URL - Uniform Resource Locator
HTTP - Hyper Text Transfer Protocol	USB - Universal Serial Bus
ICT - Information and Communication Technology	VGA - Video Graphics Array
IP - Internet Protocol	WAN - Wide Area Network
IRC - Internet Relay Chat	WAP - Wireless Application Protocol
ISDN - Integrated Services Digital Network	

# S5 Term I

Evaluation Copy

# Topic 1 INTRODUCTION TO COMPUTING

***Recommended Coverage Duration: 12 periods (2 weeks)***

## Guidance to the Teacher

- You are advised to introduce the topic using real parts of a computer where possible. In the event that such objects cannot be obtained, use their images which are readily available online.
- The implications of using ICTs should clearly look at the advantages and disadvantages of using ICTs in each of the areas that have been highlighted in the table above.
- Use of ICTs in business should focus on banking, mobile money transfers and Electronic Funds Transfer (EFT).
- You are encouraged to organise learners in groups to make presentations on the implications of ICT in society.

## Suggested Competences for Assessment

- Assess the learners' ability to distinguish the different parts of a computer and other ICT devices and their uses.
- Discuss the implication of using ICT in a variety of fields.

## Background

- The topic introduces the learner to computers, their use and implications of using them in a variety of fields. It is developed bearing in mind that most of the learners might be encountering the subject for the first time. They need to attain the background knowledge to the use of computer systems across a number of fields. The topic lays a foundation to the rest of the topics. It should be well handled to give the learners a solid foundation in the subject.
- **Learning Outcome:** The learner should be able to describe the application of Information and Communication Technologies (ICTs) in society.

## 1.1 Introduction to Computers

### Sub topic Objectives:

- Describing a computer.
- Identifying different parts of a computer and their uses.
- Making a distinction between information and data.
- Describing the information processing cycle.

#### 1.1.1 Describing a computer

A computer is an electronic device that accepts user input (data), processes it under special instructions (programs), to produce the desired meaningful output (information). Alternatively, a computer can be defined as a programmable machine that receives input, stores and manipulates data, and provides output in a useful format.

The origin of computing started with the early man who used fingers, stones, sticks, marks on walls, sand, etc. The word 'compute' was derived from two Latin words;

'com', which means 'together' and 'putare', which may mean 'add, calculate, count, or estimate'.

Over the centuries, people have developed an amazing variety of data processing tools and techniques. Examples of ancient counting and calculating devices include: The abacus, Napier's bones, the Slide rule, Blaise Pascal's Calculator, Charles Babbage's Analytical Engine which consisted of 4 parts: an input device, a mill (processing unit), a storage device, and an output device.

The following are the **common characteristics** associated with modern computers:

- **Speed** Computers operate at extremely high speeds. Their speed is measured in millions of instructions per second (MIPS).
- **Automatic (Spontaneous)** the computers are automatic. They do not need any supervision in order to do tasks when instructed.
- **Accuracy** Computers are very accurate. The errors in made computing are due to the users but not technological weakness. If a user enters wrong data, the computer gives wrong Information. This trend is described as GIGO (Garbage In, Garbage Out)
- **Versatility:** Modern Computers can perform different kinds of tasks at the same time. For example you can play music while typing a document at the same time. This is also known as **multi-tasking**.
- **Diligence (Endurance)** Computers have the ability to perform the same task for a long time without getting tired. This is because a computer is a machine, and so does not have human behaviors of tiredness and lack of concentration. For example: Computers which are used for controlling the satellites.
- **Artificial intelligence:** Computers are artificially intelligent i.e. they can be programmed to assume capabilities such as learning, reasoning, adaptation, and self-correction. For example computers can respond as if they were thinking by playing chess, recognize handwriting and speech. However, the computers themselves cannot think. The artificial intelligence is only supported by the power of the programs installed in them.
- **Storage:** For a computer to be able to work, it must have some form of work space where data is stored before being processed. All information is stored on a hard disk or in the Random Access Memory (RAM).
- **Communication:** Most computers today have the capability of communicating with other computers by sharing data, instructions, and information. When two or more computers are connected, they form a network.
- **Adaptability:** Modern Computers can be adapted to comply with different settings and environments. For example, they can be used as personal computers, for home use, banking, communication, entertainment, weather forecasting, space explorations, teaching, railways, medicine etc.
  - **Categories** of computers include analog, digital and hybrid computers.
  - **Analog computers** are computers in which data is represented by continuous values of physical variables, such as electrical voltage, temperature, which vary continuously. Almost all of the measuring devices like Thermometers, Voltmeters

and Ammeters, Speedometers, Barometers, Traditional automatic watches, etc. are “Analog computers”.

- **Digital computers** are computers that present data using discontinuous values of 0 and 1 (binary digits), the state of being on is represented by 1 and off is represented by 0. Examples of Digital Computers Include: all Personal computers (PCs), Laptops, Digital Watches
- **A hybrid computer** combines features of both analog and digital computers.
- Digital computers can be classified into Super Computers classes as follows:
- **Super Computers** have the highest processing capacities and the most expensive ones, used for applications which require intensive numerical computations such as weather forecasting.
- **Mainframe computers** are powerful computers used mainly by large organizations for bulk data processing such as census, and financial transaction processing, and are also called central processors because they process data centrally such as in banks.
- **Minicomputer** are similar to main frames but they are smaller in size, support a limited number of peripheral devices connected to them, have a lower speed, have lesser storage capacity, and support fewer numbers of users at the same time as compared to main frames. A microcomputer is a computer with a microprocessor as its central processing unit. They are single user (they support one person at a time) and are the most widely used computers in our everyday life, e.g. desktops, laptops and palmtops.

# Evaluation Copy

## 1.1.2 Parts of Computer a computer

A computer system basically consists of

- Hardware
- Software
- Data
- Users

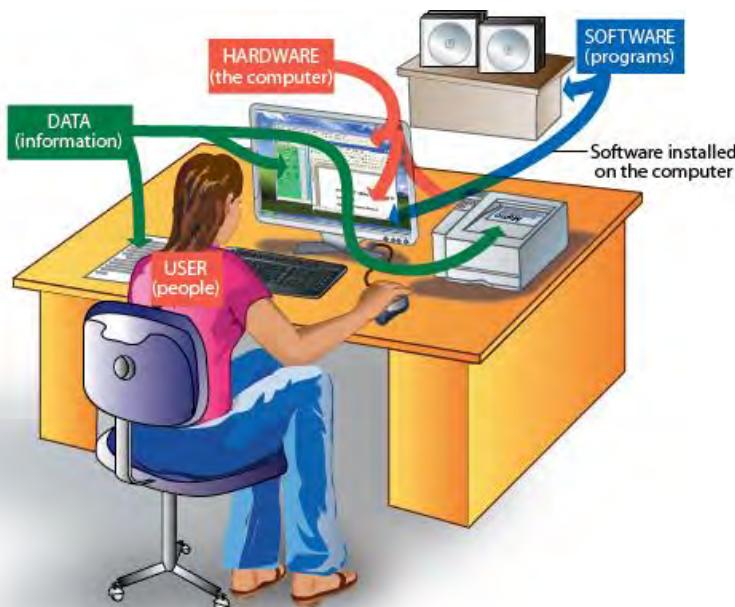


Figure 1: Computer System

### Computer Hardware

- This is a term used to describe all the various physical devices of a computer.
- Computer hardware components are tangible (they can be touched).
- Computer hardware includes.
  - Input devices like the keyboard and mouse,
  - Processing devices like the Microprocessor Chip,
  - Storage devices like the Hard disks and the CDs,
  - Output devices like the monitor and the printer.



**Can you name other devices that can work with a computer that were not listed?**

### Computer Software

- Software is a term for electronic instructions that tell the computer how to perform a task.
- These are a series of programs (instructions) that tell the computer what and how to work.
- Computer software can be grouped into System software and Application software.
- System software like the Operating system (such as Windows, Linux, UNIX, DOS, Mac Os etc.) are used to manage and coordinate all the computer resources and activities.
- Application software (such as Games, Calculator and Media Player, Word Processors, etc.) solve the specific or exact needs of the user.

### Computer Users

- Computer Users (Humanware) refers to the people who operate and initialize instructions to the computer system.
- They design and develop computer systems, operate the computer hardware, create the software, and establish procedures for carrying out tasks.
- There are two kinds of Computer Users:

- **Ordinary user** - is someone without much technical knowledge of computers but uses computers to produce information for professional or personal tasks, enhance learning, or have fun. Ordinary users include Computer students, Typists (Secretaries), etc.
- **Professional user** -is a person in a profession involving computers who has had formal education in the technical aspects of computers; Examples include Computer programmers, webmasters, etc.

### 1.1.3 Computer Data and Information

**Data** refers to raw facts and figures used to create information

- This is entered into the computer by the user via input devices, in a form suitable for processing.
- Data may consist of characters, symbols, sounds and graphics, videos etc.

**Information** refers to the processed data that makes meaning and is useful.

- For example the figure 10082006 may be input as data, but once this same figure is converted to the format 10/08/2006, you realize that it's a date.
- Computer Information is organized into **files**, which are collections of data grouped together and given a name
- A file that a user can open and use is often called a **document**

### 1.1.4 The Information Processing Cycle

- The **information processing cycle** is a series of steps the computer follows to receive data:
  - **Input:** The computer accepts data from some source
  - **Processing:** The computer's processing components perform actions on or with the data
  - **Output:** The computer provides the results of its processing
  - **Storage:** The computer stores the results of its processing.

**Question:** Looking at the parts of the computer that we looked at, in what stage do you think each computer part would be listed under?

## 1.2 World of ICTs

### Sub topic Objectives:

- Explaining the meaning of ICTs.
- Justifying the use of ICTs in society in..
  - business
  - education
  - health
  - security
  - politics and governance
  - art, leisure and entertainment
  - industrial, technical and scientific uses
- Searching the Internet.

### 1.2.1 The meaning of ICTs

**GENERAL DEFINITION:** Information and Communication Technologies (ICTs) refers to the broad range of hardware, software, network infrastructure and media that enable the processing, storage and sharing of information among humans and computers, locally and globally”

- ICT devices range from radio, television, cellular phones, compact disks, Fax machines, computers, biometric devices, internet and network hardware and software platforms, satellite systems and so on. It involves to all means which facilitate information or data capture processing storage and output.

### 1.2.2 The use of ICTs in society

- Today people use ICTs in almost every walk of life.
- However, along with these advancements of science there arises the dilemma of development of technology as it affects human individuals.
- They have come with both positive and negative impacts to our society.
- Computers are applied in the areas of
  - 1) Education,
  - 2) Business,
  - 3) Health,
  - 4) Security,
  - 5) Politics,
  - 6) Communication,
  - 7) Entertainment / leisure,
  - 8) Technical and scientific uses.

# Evaluation Copy

### Uses of ICTs In the Area of Education

- In education, we use Computer Assisted Instruction (CAI), Computer Aided Learning (CAL) and Computer Aided Assessment (CAA)
- Schools use computers to create school websites for sharing information with the public.
- Productivity tools like desktop publishing and presentation software are used in projects and other school activities.
- Computers are used for calculating mathematical arithmetic by students and teachers in class.
- With Use of School Administration and Management Systems. (SAMS) Records management is made easier because all details of learners can be held on computer, and easily retrieved, reducing administrative costs.
- Students' Progressive Report Cards can be produced electronically by use of computers instead of hand written ones.
- Distance learning through computer based training. People get award such as degrees without going to class.
- Teachers use simulation software to perform difficult or dangerous experiments in class.
- Use of special facilities for students with disabilities like text to speech and speech recognition to help blind students.

### Uses of ICTs in the Area of Business

- Computers enable people to Work from home, using a computer connected to the employer's network or via the Internet. This is known as Telecommuting.
- Computers have created more jobs such as Computer technicians, Computer teachers, etc.
- Buying and selling Computers and its components is a source of income to individuals, and companies.
- Through, Computer Aided Design (CAD), scale drawings, and excellent designs can be created easily.
- Computers are used for sending and receiving Mobile Money and making worldwide Electronic Funds Transfers (EFT).
- Banks use Computers to manage transactions and Automatic Teller Machines ATMs for 24 hours banking.
- Computers help in Business Advertisement through creating websites, internet, flyers, brochures and billboards.
- Computers are used in printing business for production of document printouts and publication of Books for sale.
- Computers are used for E-Commerce: the sale of goods and services over the internet.

### Uses of ICTs in the Area of Health

- Hospitals use computers for managing and storing Records electronically, rather than paper files.
- Hospital Administration is also aided by printing labels, allocating beds, make appointments, staff rotas, etc.
- Internet helps us get Web sites for information on health care, treatments, conditions, etc.
- Monitoring/Diagnosis such as Heart rate, blood pressure, etc. is aided by Computer Expert systems.
- Medical Training is facilitated by Simulation software and on-line data sources.

### Uses of ICTs in the Area of Security

- Computers aid monitoring security through cameras, Automatic number plate recognition, etc.
- Communication systems are widely used in the military to coordinate the personnel.
- Some computer systems can detect temperatures and alarm in case of danger of fire outbreaks.
- Computers are used for capturing data for Police National Computer Databases –, vehicle number plates, criminals fingerprints, etc.
- Computers are used to detect presence of illegal devices such as bombs.
- Computers are also used for controlling dangerous weapons such as missiles.

### Uses of ICTs in the Area of Politics

- Paying government tax online through a government website
- Online forms such as vehicle registration and passport forms

- Advertising government tenders and Applying for government tenders
- Public records - A maintained database of statistical information such as electoral register and census data can be availed online.
- Use of electronic voting during elections
- Government departments can use a computer based platform to get feedback from the citizens.
- Use of internet during election campaign to reach new voters through targeted messaging and social media.

#### **Uses of ICTs in the Area of Communication**

- E-mail: Electronic Mail sent from one person to another using connected computers helps a lot in the area of communication.
- Video Conferencing enables people in different locations to conduct meeting as if they are in the same location.
- Computers are used for Faxing: Sending an image of a document electronically.
- Computers enable people to send voice, image, text and data though telephones and mobile cell phones.
- Social Networks such as Facebook, and Twitter enable people to stay in touch with their relatives, friends and interests.

#### **Technical and Scientific Uses of ICTs**

- In Astronomy, Computers are essential tools to study the behavior of the complex systems in space as regards to their movements, interactions etc.
- Through Computer Aided Manufacture (CAM), computers can be used to control the production of goods in factories.
- Computers perform Telescope pointing and tracking (including error correction), Camera operation, image download and storage, Image reduction (the measurement of the image), and Data processing.
- Monitoring highway traffic
- Computers are used to tell schedules of water vessels, train, buses to their respective stations. You only need to use your PDA device or cello phone and check it out.
- Computers are used very extensively in design of roads. Roadways and bridges are designed using software programs like CAD etc.

#### **1.2.3 Searching the Internet.**

- The **internet** is a global connection of computer networks.
- The internet connects together billions of computers and other ICT devices, to exchange and share information all over the world.
- To find the information that we want, we search or '**browse**' or '**surf**' the **World Wide Web (WWW)**.
- The WWW is a service on the Internet that consists of **Websites**, containing **hyperlinked** electronic documents (**webpages**) with different kinds of information.
- You can open a Web page by entering a Web address in the Address bar of a web browser.

- A URL (Uniform Resource Locator) is another term for Web address. Web addresses uniquely identify websites on the www, for example <http://www.newvision.co.ug>
- Web browsers are software programs that are used for displaying Webpages on computers. **Examples Include:**
  - Mozilla Firefox,
  - Internet Explorer,
  - Safari,
  - Opera
  - Google Chrome, etc.
- If you don't know the URL of the website you want to visit, you can use a web **search engine**
- Search Engines are Software programs or systems that look through the www to locate sites matching a keyword entered by the user.
- **Keyword:** A string of letters or words that indicates the subject to be searched.
- Popular search engines include Yahoo, Bing and Google. ([www.google.com](http://www.google.com))



# Evaluation Copy

*Microsoft Internet Explorer web browser displaying the webpage for the Google search engine.*

*PRACTICAL ACTIVITY: Open a web browser and use the Google search engine to search about the various uses of ICTs in society today.*

## 1.3 Implications of Using ICTs

### Sub Topic Objectives:

- Discussing the implications of using ICTs.
  - social / ethical
  - economic
  - political
  - environmental (Green Computing)
  - security, reliability and resilience of computer systems

#### 1.3.1 Positive Implications of Using Computers to Society

- Created and widened employment opportunities e.g.; software engineers, computer teachers, technicians, etc.

- Improved education and research by simplifying teaching and learning. E.g. abstract content can be made real through cyber science technology - others are computer aided teaching and computer aided learning, presentations software, etc.
- Improved entertainment and leisure through computer games, music, etc for people to refresh and make-up.
- Improved communication and collaboration through computer networks.
- Improved health services where computers facilitate recording, monitoring, and diagnosis for patients.
- Improved security through computer managed gates and monitoring of commercial and domestic premises, detecting and controlling crime by police.
- Reduced production time and manufacturing processes through computer aided manufacturing and computer aided designing which have greatly improved the quantity and quality of life.
- Improved customer services delivery and care eg networked computers provide 24/7 on-line services like credit cards Improved business and investment opportunities.
- Improved data and document production, storage and manipulation.

### 1.3.2 Negative Implications of Using Computers to Society

- **Violation of Privacy:** In many instances, where personal and confidential records stored on computers were not protected properly, individuals have found their privacy violated and identities stolen.
- **Public Safety:** Adults, teens, and children around the world are using computers to share publicly their photos, videos, journals, music, and other personal information. Some of these unsuspecting, innocent computer users have fallen victim to crimes committed by dangerous strangers.
- **Impact on Labor Force:** Although computers have improved productivity and created an entire industry with hundreds of thousands of new jobs, the skills of millions of employees have been replaced by computers. Thus, it is crucial that workers keep their education up-to-date. A separate impact on the labor force is that some companies are outsourcing jobs to foreign countries instead of keeping their homeland labor force employed.
- **Health Risks:** Prolonged or improper computer use can lead to health injuries or disorders.
- **Impact on Environment:** Computer manufacturing processes and computer waste are depleting natural resources and polluting the environment.
- Computer related crime e.g. forgeries, cyberbullying, Piracy etc.
- Increased cost of production as computers are very expensive to buy and maintain. Computer experts can as well be expensive to hire.
- They are many health hazards e.g. can cause eye defects, Tendonitis, RSI, etc.
- Electronic fraud: Stealing money electronically through practices like Credit card cloning and illegal money transfers.

- Hacking: Unauthorized access into computers possibly to access information, compromising privacy. e.g. Wikileaks
- Virus threats which has made data storage and safety very unreliable.
- Loss of employment as they take over job assignments for semi and less skilled job functions.
- Deaths and accidents due to computer malfunctioning or explosion.
- Erosion of human integrity and creativity as even the smallest calculation is assigned to the computer. Other cases are Forgeries, GMFs, test tube children, etc.
- Loss of man-hours as some workers go for unproductive computer based leisure at the expense of their work. Cyber terrorism.
- Moral Decay: The internet has websites with content such as pornography, which have a bad impact on the users especially the young children.
- In politics, ICTs are being used for running new forms of political activism, for example mobilizing masses against to rebel against governments using social media channels like twitter.

### 1.3.3 Health concerns of computer use

Users are a key component in any information system. Thus, protecting users is just as important as protecting hardware, software, and data. The widespread use of computers has led to some important user health concerns.

A repetitive strain injury (RSI) is an injury or disorder of the muscles, nerves, tendons, ligaments, and joints. Computer-related RSIs include tendonitis and carpal tunnel syndrome.

**Tendonitis** is inflammation of a tendon due to some repeated motion or stress on that tendon.

**Carpal tunnel syndrome (CTS)** is inflammation of the nerve that connects the forearm to the palm of the wrist.

Repeated or forceful bending of the wrist can cause CTS or tendonitis of the wrist. Symptoms of tendonitis of the wrist include extreme pain that extends from the forearm to the hand, along with tingling in the fingers. Symptoms of CTS include burning pain when the nerve is compressed, along with numbness and tingling in the thumb and first two fingers.

Long-term computer work can lead to tendonitis or CTS. Factors that cause these disorders include prolonged typing, prolonged mouse usage, or continual shifting between the mouse and the keyboard. *If untreated, these disorders can lead to permanent physical damage.*

You can take many precautions to prevent these types of injuries. Take frequent breaks during the computer session to exercise your hands and arms. To prevent injury due to typing, place a wrist rest between the keyboard and the edge of your desk. To prevent injury while using a mouse, place the mouse at least six inches from the edge of the desk. In this position, your wrist is flat on the desk. Finally, minimize the number of times you switch between the mouse and the keyboard, and avoid using the heel of your hand as a pivot point while typing or using the mouse.

Another type of health-related condition due to computer usage is computer vision syndrome (CVS). You may have CVS if you have sore, tired, burning, itching, or dry eyes; blurred or double vision; distance blurred vision after prolonged staring at a display device; headache or sore neck; difficulty shifting focus between a display device and documents; difficulty focusing on the screen image; color fringes or after-images when you look away from the display device; and increased sensitivity to light. Eyestrain associated with CVS is not thought to have serious or long-term consequences.

People who spend their workday using the computer sometimes complain of lower back pain, muscle fatigue, and emotional fatigue. Lower back pain sometimes is caused from poor posture.

### Hand Exercises

- Spread fingers apart for several seconds while keeping wrists straight.
- Gently push back fingers and then thumb.
- Dangle arms loosely at sides and then shake arms and hands.



### Techniques to Ease Eye Strain



- Every 10 to 15 minutes, take an eye break.
  - Look into the distance and focus on an object for 20 to 30 seconds.
  - Roll your eyes in a complete circle.
  - Close your eyes and rest them for at least one minute.
- Blink your eyes every five seconds.
- Place your display device about an arm's length away from your eyes with the top of the screen at eye level or below.
- Use large fonts.
- If you wear glasses, ask your doctor about computer glasses.
- Adjust the lighting.

Computer users can protect themselves from health risks through proper workplace design, good posture while at the computer, and appropriately spaced work breaks.

### Ergonomics and Workplace Design

Ergonomics is an applied science devoted to incorporating comfort, efficiency, and safety into the design of items in the workplace. Ergonomic studies have shown that using the correct type and configuration of chair, keyboard, display device, and work surface helps users work comfortably and efficiently and helps protect their health. For the computer work



space, experts recommend an area of at least two feet by four feet. Figure below illustrates additional guidelines for setting up the work area.

### Computer Addiction

Computers can provide entertainment and enjoyment. Some computer users, however, become obsessed with the computer and the Internet. Computer addiction occurs when the computer consumes someone's entire social life. Computer addiction is a growing health problem but can be treated through therapy and support groups.

#### Symptoms of a user with computer addiction include the following:

- Craves computer time
- Irritable when not at the computer
- Overjoyed when at the computer
- Unable to stop computer activity
- Neglects family and friends
- Problems at work or school

#### 1.3.4 Green Computing

Green computing involves reducing the electricity and environmental waste while using a computer. People use, and often waste, resources such as electricity and paper while using a computer.

The United States government developed the ENERGY STAR program to help reduce the amount of electricity used by computers and related devices. This program encourages manufacturers to create energy-efficient devices that require little power when they are not in use. Computers and devices that meet the ENERGY STAR guidelines display an ENERGY STAR label.

Users should not store obsolete computers and devices in their basement, storage room, attic, warehouse, or any other location. Computers, monitors, and other equipment contain toxic materials and potentially dangerous elements including lead, mercury, and flame retardants. In a landfill, these materials release into the environment. Recycling and refurbishing old equipment are much safer alternatives for the environment.

### Green Computing Suggestions

1. Use computers and devices that comply with the ENERGY STAR program.
2. Do not leave the computer running overnight.
3. Turn off the monitor, printer, and other devices when not in use.
4. Use LCD monitors instead of CRT monitors.
5. Use paperless methods to communicate.
6. Recycle paper.
7. Buy recycled paper.
8. Recycle toner cartridges.
9. Recycle old computers, printers, and other devices.
10. Telecommute (saves gas).
11. Use video conferencing and VoIP for meetings.



#### **1.3.5 Security, reliability and resilience of computer systems**

Resilience is the fast recovery from a degraded system state. Computer networking community defines it as the combination of tolerance and trustworthiness (dependability, security, performance and survivability) of computer systems.

The electronic components in modern computers are dependable and reliable because they rarely break or fail.

Organizations today often have a chief security officer (CSO) who is responsible for the physical security of an organization's property and people and also is in charge of securing its computing resources. It is critical that the CSO is included in all system development projects to ensure that all projects adequately address information security. The CSO uses many of the techniques to maintain confidentiality or limited access to information, ensure integrity and reliability of systems and ensure uninterrupted availability of systems.

## Topic 2 COMPUTER MANAGEMENT

**Recommended Coverage Duration: 16 periods (2<sup>2/3</sup> weeks)**

### Guidance to the Teacher

- Demonstrate to the learners and allow them time to individually practise how to boot a computer and safely shut it down, customise a desktop, adjust settings to user preferences as well as create and delete directories using the GUI.
- Use of Ms DOS is not expected in this topic.

### Suggested Competences for Assessment

- Assess the learners' ability to customise the user desktop, create, delete a directory; locate a file or folder in a given directory

### Background

- Interacting with computers and other ICTs for the first time is one of the most challenging tasks. However, system developers invented storage media, system administrative tools, services and programmes, menus, graphics, commands and most interestingly voice recognition interfaces to facilitate the interaction and dialog between the system and the user.
- It is important that the learner is introduced to the general operating system environment, common files and folders plus their management, and basic utilities.

**Learning Outcome:** The learner should be able to demonstrate that he can efficiently manage files.

# Evaluation Copy

### 2.1 Booting Process

#### Sub topic Objectives:

##### a. Booting of a computer

- Describing the booting process.
- Identifying types of booting

##### b. Computer programmes

- Explaining the concept of a computer programme.
- Explaining various ways of starting a programme.

#### 2.1.1 Booting of a computer

- Booting (also known as booting up) is the initial set of operations that a computer system performs when electrical power is switched on.
- Booting is the process of starting up a computer. During Booting, the operating system (OS) loads from disk into working memory (RAM).
- The process begins when a computer is powered on and ends when the computer is ready to perform its normal operations.

### Steps involved in the Boot Process



1. The power supply sends a signal to the components in the system unit.
2. The processor finds the ROM chip(s) that contain the BIOS (Basic input/output system).
3. The BIOS performs the POST (Power-On Self Test) which checks components such as the mouse, keyboard and adapter cards. A series of messages may display.
4. The results of the POST are compared with data in a CMOS chip
5. The BIOS looks for system files on the boot device.
6. The system files and the kernel of the Operating System load into RAM from the boot device.
7. The OS loads configuration information and displays the welcome screen.

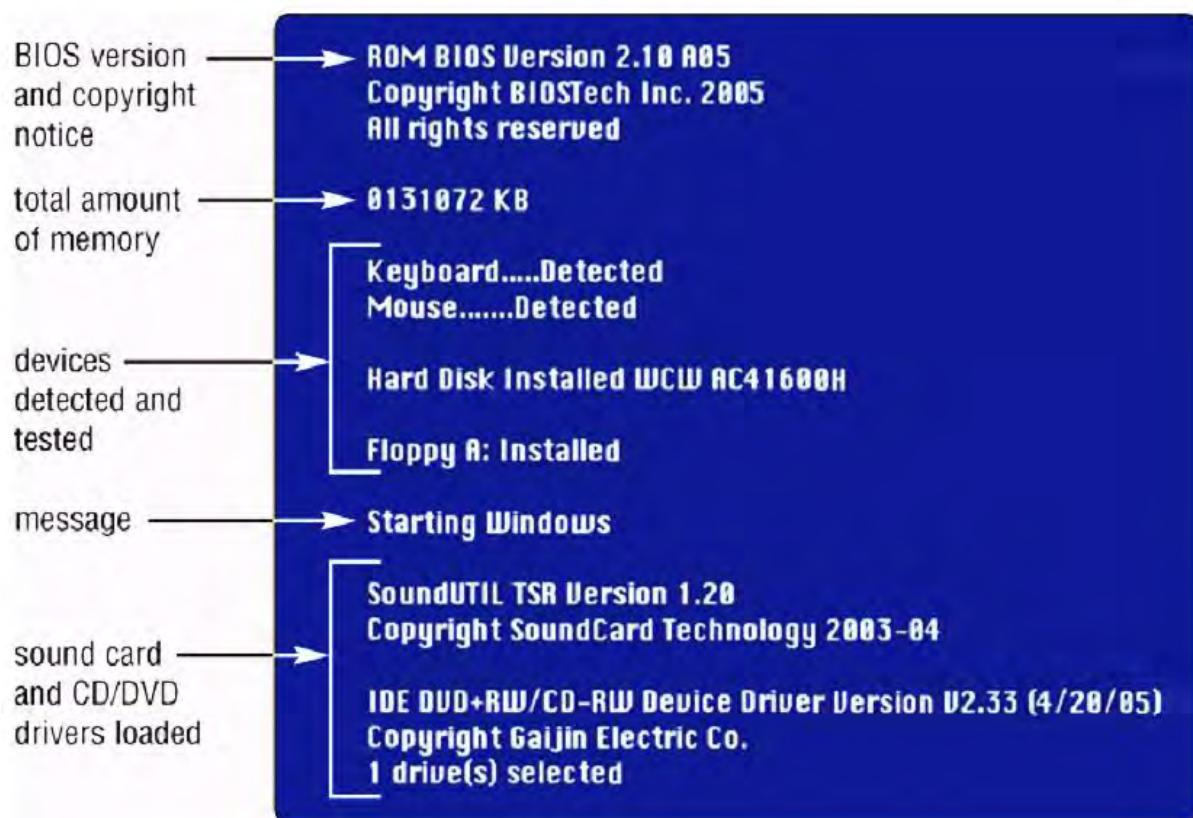


Figure 2: A series of beeps and messages may be displayed

- A **boot loader** is a computer program that loads the main operating system or runtime environment for the computer after completion of self-tests.
- Examples of boot loaders include NTLDR, BOOTMGR, GNU GRUB, Syslinux, e.t.c.
- **Boot Device / boot drive** is the device/drive from which the operating system is loaded.
- In most cases, drive C (the hard disk) is the boot drive.
- The computer BIOS (Basic Input/Output System) supports booting from various devices.
- These include the local hard disk drive, optical drive, floppy drive, a network interface card, and a USB device. The BIOS allows the user to configure a boot order.

### Types of Booting

- There are two types of booting: Cold booting and warm booting.
- **Cold booting** is the process of starting up a computer which has been completely off. Usually, it is initiated by switching on the power supply buttons on the monitor and system unit /box respectively.
- **Warm Booting** is the process of restarting a computer which is already running. It is also called rebooting.

### Reasons for warm booting

- **New software installations:** When you install new software, often an on-screen prompt instructs you to restart the computer.

- **New hardware installations:** When some hardware devices like disk drives and printers are attached, the computer might request for a reboot to reload them effectively.
- **After Updating Software:** Computer software and operating system can trigger a reboot as well; more specifically, Microsoft Windows operating systems are outfitted with automatic updates that can be scheduled to run at a certain time and date; therefore, a reboot necessary in this case.
- **During Troubleshooting:** Rebooting may be used by users, support staff or system administrators as a technique to work around bugs in software. A warm boot is sometimes necessary when a program encounters an error from which it cannot recover.
- **Switching operating systems:** On a multi-boot system without a hypervisor, a reboot is required to switch between installed operating systems.
- **When the computer is freezing:** A warm boot can be necessary when the computer is responding slowly especially when many programs have been loaded into memory.
- When a peripheral or hardware component has failed to function/work
- When application software fails to work normally
- During/After installation of operating system.
- After changing use control settings(CMOS/BIOS settings)
- When a user wants to clear a programs that are loaded in memory
- After uninstalling software
- After uninstalling hardware
- After malware/virus scanning
- When a deadlock occurs

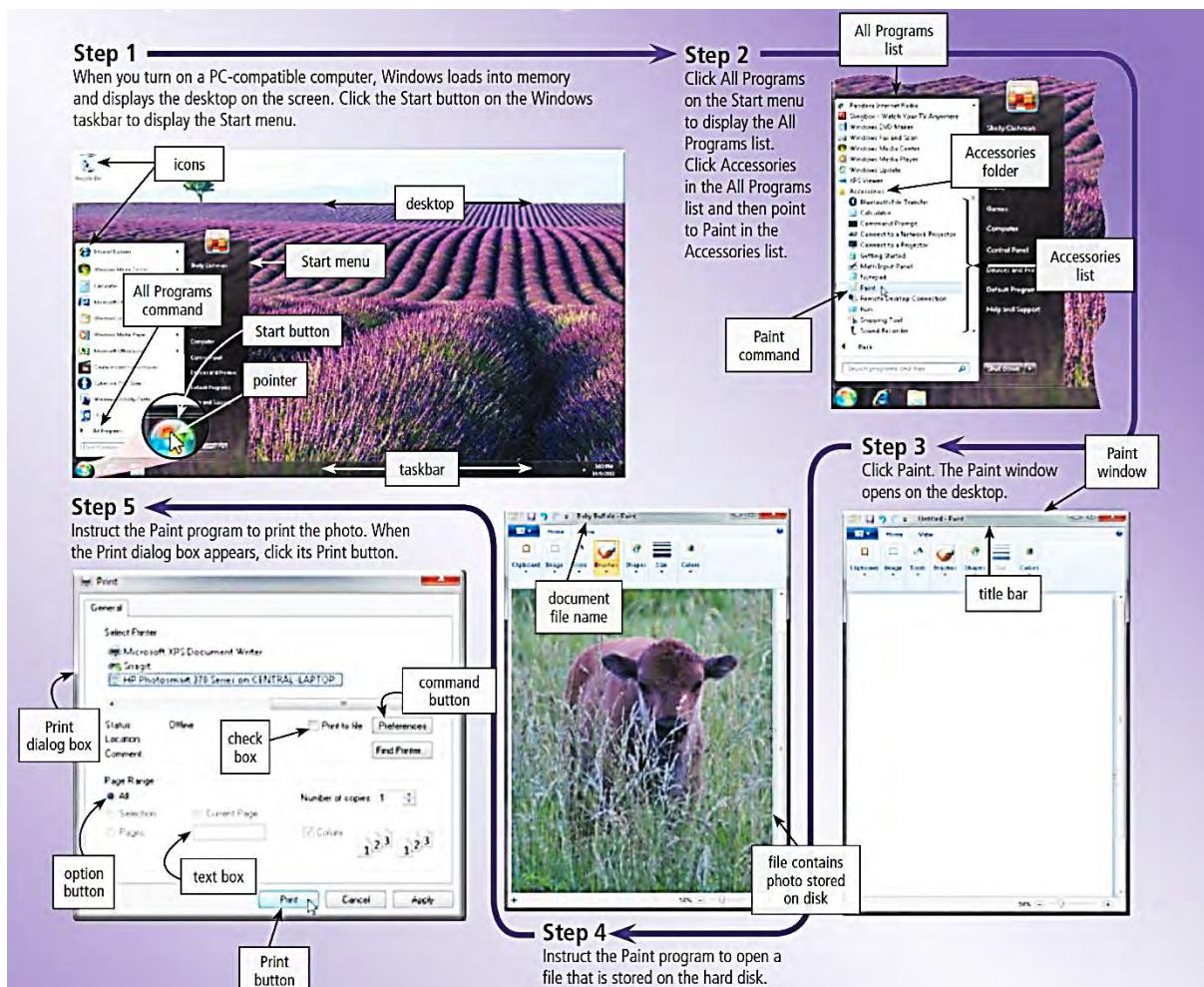
**Evaluation Copy**

### 2.1.2 Computer programmes

A computer program is a set of instructions that a computer uses to perform a specific task, such as word processing, accounting, or data management. Also called an application. Almost everything you do on your computer requires using a program. For example, if you want to draw a picture, you need to use a drawing or painting program. To write a letter, you use a word processing program. Thousands of programs are available for Windows.

#### Starting a program

The Start menu is the gateway to all of the programs on your computer. To open the Start menu, click the Start button. The left pane of the Start menu contains a small list of programs. To open a program, click it. A program can also be opened simply by double clicking its icon on the desktop. If you don't see the program you want to open, but you know its name, type all or part of the name into the search box at the bottom of the left pane. To browse a complete list of your programs, click the Start button, and then click All Programs.



More ways of how to open computer programmes will be discussed in the next chapters.

## 2.2 File Management

### Sub topic Objectives:

#### a. Folders

- defining a folder.
- Creating folder on a storage medium of a computer.
- moving a folder to a desired Location
- deleting a folder.

#### b. Files

- defining a file.
- creating a file.
- identifying file types.
- saving a file in a desired location.
- Using folders and sub folders to effectively categorise files.

#### c. Desktop

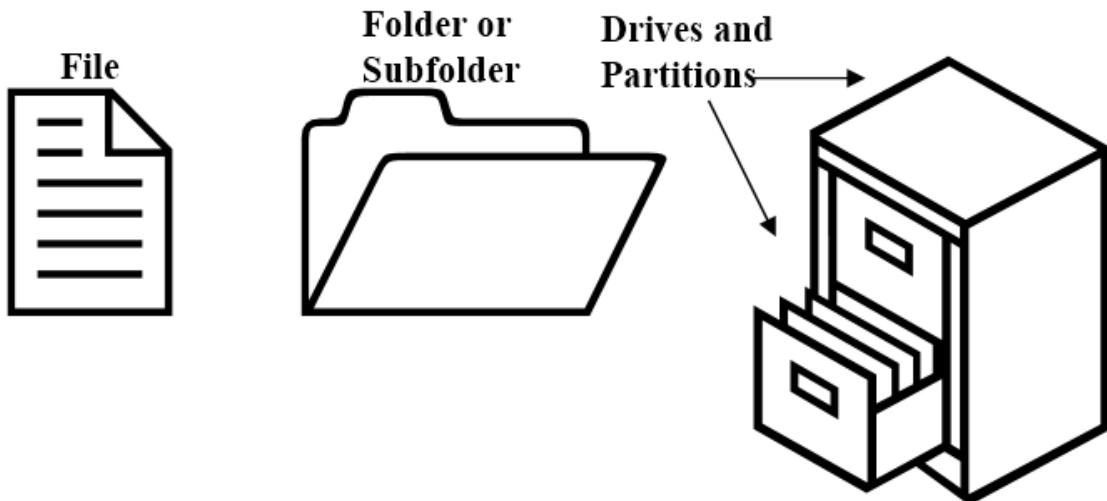
- describing how to customise the Desktop.
- explaining the major icons on the desktop.

### Introduction

- In a physical office filing system you store files within folders in a file cabinet which may have several drawers. If you organize the system well, it will be

easy to find files when you need them. Computer disk partitions are like filing cabinet drawers.

- Like drawers in a real filing cabinet, they may contain several labelled folders to keep other folders (subfolders) and your files organized. If you create an organized system of folders, it is easy to find your computer files when you need them.



All the data for documents and programs on your computer is stored in electronic files. These files are then arranged into a series of folders and subfolders— just as you'd arrange paper files in a series of file folders in a filing cabinet. In Windows 7, you use Windows Explorer to view and manage the folders and files on your system. You open Windows Explorer by clicking the Windows Explorer button on the Windows taskbar.

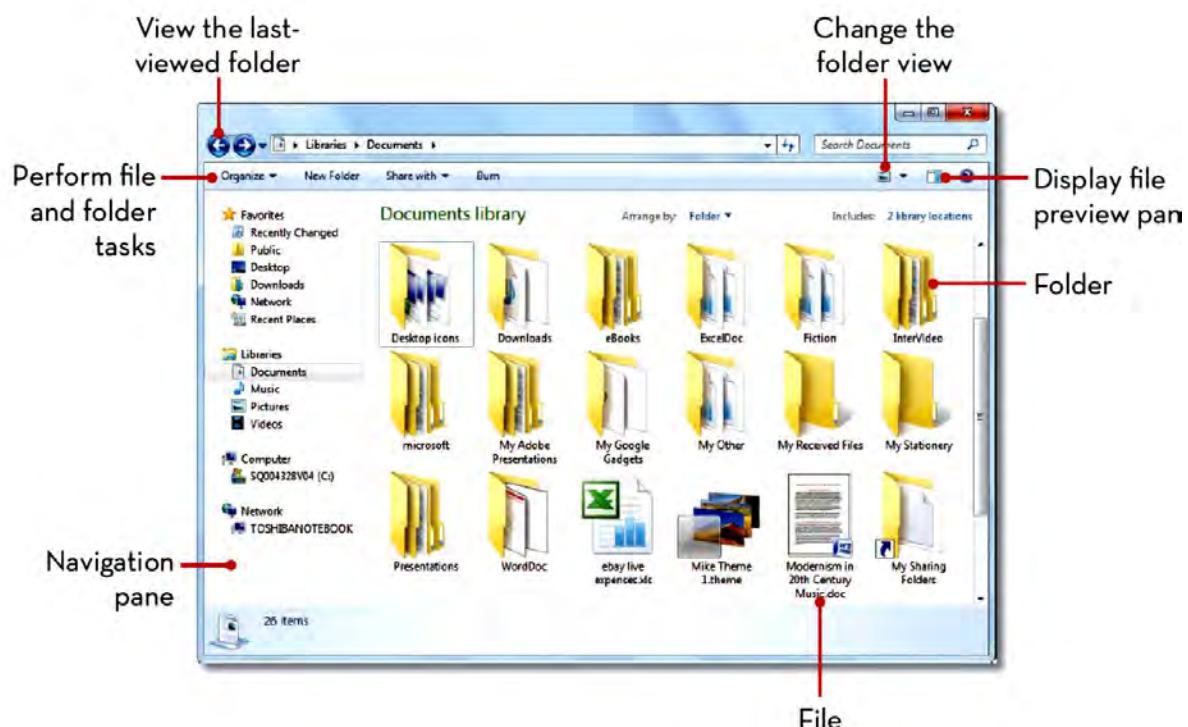


Figure 3: Windows Explorer

File management involves operations on files and folders on a computer's disks. File management operations include

- Creating files and folders
- Moving
- Copying
- Selecting single or multiple files (Ctrl+click / Shift+click)
- Renaming
- Searching and Sorting by name, date or file extension (type)
- Printing
- Deleting
- Restoring or emptying recycle bin etc.

### 2.2.1 Folders

- A folder is a named storage location where related files can be stored. In contrast, a file is a collection of related data saved with a given name on a storage medium.
- A folder is also known as a directory in some operating systems.
- All folders or directories originate from a special directory called root directory or folder. The root directory is represented by a back slash (\). A folder or directory may be created inside another folder or directory.
- Such a folder or directory is called a subfolder or a subdirectory.

#### **Creating a new folder**

To create a new folder, using my computer icon, on the folder tree on the left pane, select the location (desktop) in which you want to create a new folder.

1. On the File menu tab, Click new folder
2. Type a new name for the folder to Replace the temporary name, then press Enter key or click the icon once.

**Or** Right Click on the free space on the desktop, point to New, click folder. Type a new name for the folder.

#### **Renaming a folder or file**

- Renaming refers to changing the previous name to a new name. To rename a file or folder proceed as follows:
- Using My Computer icon, display the Explorer window.
- On the folder tree on the left pane, select the file or folder to be renamed.
- On the File menu, click Rename. Type the new name, and then press Enter key.
- **Or** Right Click on folder or file and choose Rename option from the pop up menu.
- **Or** Select the file or folder icon and Press F2 function key, Type the new name, and then press Enter key.

### **Deleting a folder or file**

- In Windows, when you delete an item from the hard disk, it is temporarily held in a special folder called the Recycle bin from where it can be restored if necessary.
- **Warning:** Items deleted from a removable storage are not held in the recycle bin and are completely lost.

### **To delete a file or folder proceed as follows:**

- Using My computer icon, display the Explorer window.
- On the folder tree on the left pane, select the item that is to be deleted. On the File menu, click Delete.
- A message appears on the screen asking whether you actually want to delete the item. Confirm by clicking Yes.

### **Restoring deleted files and folders**

- To restore a file or folder from the recycle bin to its original location proceed as follows:
- Double click the Recycle Bin icon.
- Select the deleted item(s) to be restored.
- Click File then Restore

### **Emptying the recycle bin**

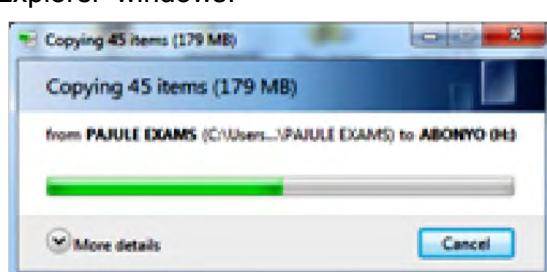
- To completely discard files and folders you deleted, you need to empty the Recycle Bin. To empty the Recycling Bin proceed as follows:
- Double click the recycle Bin icon on the desktop to open.
- Choose Empty Recycle Bin from File menu.
- Click Yes when prompted to confirm deletion of the files.

### **Copying files and folders**

- Cut or copy command are used to move or create a duplicate of an item respectively. When you cut or copy an item, it is temporarily held in a temporary storage location known as the clipboard. To copy a file or folder:
- Using my computer icon, display the Explorer window.
- Select the file or folder to be copied.
- On the Edit menu, click copy.
- Select the drive or folder where you want the item to be copied.
- From the edit menu, click paste. Information or item is pasted to a new location.

### **To move a file or folder proceeds as follows:**

- Using My computer icon, display the Explorer windows.
- On the Edit menu, click Cut.
- Select the drive or folder where you want the item moved.
- From the Edit menu, click paste.
- Move progress dialog will be displayed on the screen.



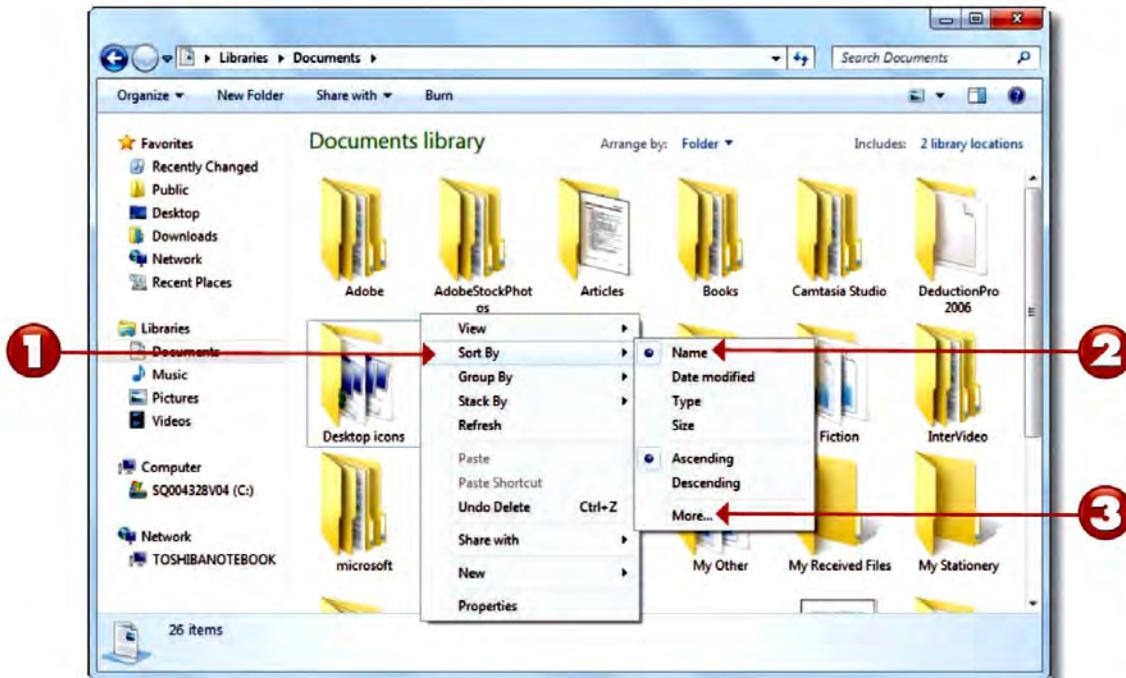
To move a folder to a desired location:

- Click the folder and hold

- Drag and drop to the desired location

To sort files and folders,

1. Right-click any open space within Windows Explorer and select Sort By.
2. Choose to sort by Name, Date modified, Type, or Size.
3. To view more sorting options, click More.

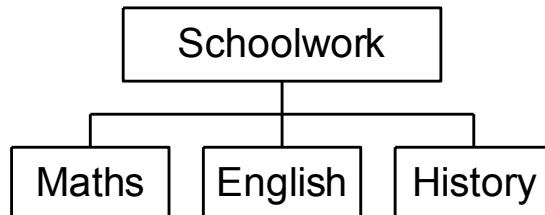


*Figure 4: Sorting Files and Folders*

**More Sorting Options** When you opt to view More sorting options, you can sort by dozens of different parameters, all of which change based on what type of file you're viewing. For example, if you're viewing music files, you can sort by Album, Artists, Bit Rate, Composers, Genre, and the like

#### Practice Activity: Folder Structures

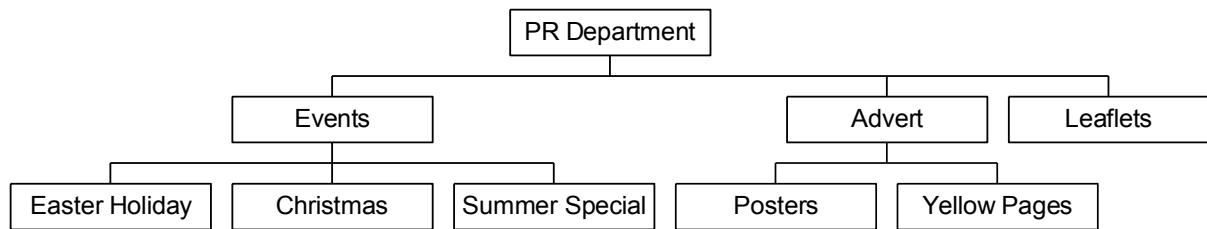
1. In your user space create the folder structure shown below.



2. The History folder needs to be further subdivided into two folders Notes and Past Exams. Create these folders in the History subfolder.
3. Rename the folder Schoolwork to Classwork.
4. Delete the Maths Folder and update the diagram by drawing in your activity book the current folder structure.

#### Practice Activity 2: Folder Structures

1. In your user space create the folder structure shown below.



2. Rename the Folder YellowPages to Fliers
3. Copy all the three subfolders inside the Events folder to the Leaflets folder
4. Delete Summer Special subfolder under Leaflets

### Practice Activity 3: Folder Structures

- You are creating a folder structure for a small business with three departments: Accounts, Personnel, and Marketing
- The personnel department wants to sort its files into three groups: Wages, Contracts, and Disciplinary
- The marketing department want to sort their fields into two groups: Clients and Images
- Sketch a suitable folder structure for the above organisation and create the folder structure as shown in your sketch.
- Open the Folders Pane at the left of Windows Explorer and expand all folders to show the structure. Take a screenshot of this window and use any appropriate program to save your screenshot under the Images folder.

# Evaluation Copy

## 2.2.2. Files

- Every document, picture, sound or video saved on a computer's storage is a file.
- A file is associated with the program that is used to read it, so if you double-click a file that was created in Notepad, the Notepad program starts and displays the file.
- For example, you can edit the text in a document or change the colors in a picture.
- All files have names, and all file names consist of two parts—the name and the extension—separated by a period. The type of file or the program in which it was created is indicated by the extension. The **extension** is a short abbreviation of the file type. It is usually three letters, but can be one eg .c or more e.g .accdb.
- By default, Windows hides file common extensions.
- If you would prefer to see your file extensions, open My Documents (or any folder) in Windows Explorer, and on the Tools menu, click Folder Options, and display the View tab. Clear the *Hide extensions for known file types* check box, and then click OK to close the dialog box and apply your settings.
- Files also have icons, which are graphic representations of the file type. Depending on the way you're looking at your files, you might see a large icon, or a small icon.

### Creating a new file

Depending on the programs installed in your computer, you can create different types of files such as drawings, text document etc. To create a new text document:

- On the free space on the desktop, right click.
- Point **new**, click Text Document. From the list available on application.
- Type a new name for the new file to replace the temporary name and press **Enter** key. NB: In windows, file name can contain up to 255 characters, including spaces but, with no special symbols such as \/:\*?"<>.

### Practice Activity 4: Creating Files and Folders

1. Create a folder by right-clicking a blank area on the Desktop, pointing to New on the shortcut menu, and clicking Folder.
2. A new folder named *New Folder* appears. Type **Works**, and press Enter.
3. Double-click the Works folder. The folder is empty.
4. On the File menu, point to New, and then click Text Document.
5. A new file named New Text Document appears in the window.
6. Type **Adventure Works Mystery Weekends.txt**, and press Enter.
7. The new file is named.
8. Click a blank area in the folder to deselect the file.
9. Now create another file named **Fall Canoe Trips.txt**.
10. The Works folder now has two empty text files in it.
11. Double-click Fall Canoe Trips.txt.
12. The document is opened in Notepad.
13. Type **Watch for our upcoming schedule of guided canoe trips.**
14. Click the Close button in the upper-right corner of the Notepad window, and click Yes to save the changes to the file.

### Selecting Multiple Files

Sometimes, though, you'll want to select more than one file at a time. For example, you might need to move a group of files, or copy several files at once.

There are many ways to select multiple files:

- **Shift+Click** If the files you want to select are listed one after another, click the first file in the group, hold down Shift, and then click the last file in the group.
- **Ctrl+Click** If the files you want to select are not listed together, hold down Ctrl while you click each file. If you select a file that you don't want to include in the group, hold down Ctrl, and click the file again to deselect it.

### Types of files

There are three types of files namely: i). System files ii). Application files iii).

Data files

- **System files:** contain information that is critical for the operation of the computer.

- **Application files:** holds programs and are executable.
- **Data files:** contains user specific data
- **File Attributes:** Every file has the following details:
- A file name and an optional extension. The name and extension are separated by a period (.) e.g. Jeff.doc. In this case, the file name is Jeff and the extension is doc.
- The size in bytes, date, and time the file was created.
- Table below shows some file extension and whether it is a system, application or a data file.

Extension	File type	Description
.doc, .docx	Data	Microsoft Word document file.
.xls, .xlsx	Data	Microsoft Excel document file.
.csv	Data	Comma Separated Values
.rtf	Data	Rich text format Word Document
.ppt, .pptx	Data	Microsoft PowerPoint document file.
.pub	Data	Microsoft Publisher document file.
.accdb, .mdb	Data	Microsoft Access document file.
.txt	Data	A plain text file created using note pad editor
.mp3, .wma	Data	An Audio file
.mp4, .mpg, .mov	Data	A video file.
.jpg, .png, .bmp	Data	An Image file
.exe	Application files	The file that launches a particular application, e.g. winword.exe
.bat	System files	Files containing a series of commands loaded during boot up.
.sys	System files	System files that perform fundamental operations in a computer.

### Saving a file

After typing the content of the file in the work area, click file and then click save.

Otherwise, the file will be saved with a different name or location then:

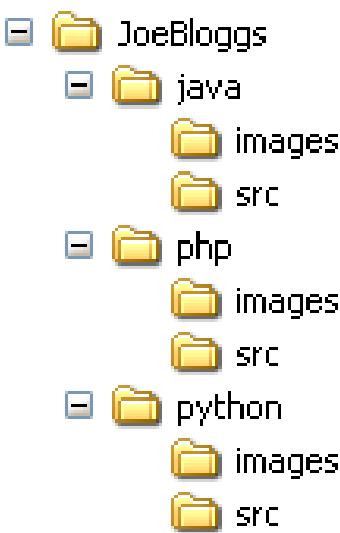
### Save As

1. Click File menu and then
2. From the Save As dialog box, select where the document is to be saved then type its name.
3. Click the save button

### Practice Activity 4: Creating Files and Folders

1. In your X drive create a folder and name it with your first and last name.

2. Within this folder create three subfolders called java, python and php.
3. Within each of the three new folders create two subfolders - src and images. By now you should have created ten folders shown below:-
4. Create a new text file document called java in the java/src folder.
5. Create a new Microsoft Word document called Java in the python/src folder.
6. Create a new Microsoft Paint document called Image in the java/images folder.
7. Try to place a Shortcut file to the new image file created into both the python/images and php/images folders.
8. Rename the short cut in the php/images folder to "My Shortcut to image"
9. Edit the text file java in the java/src folder, type your name and save the file.
10. Place a copy of the file java into the python/src folder.
11. Rename the copied file python.
12. Move the file java from the python/src folder into the java/src folder.
13. Find out the size (in bytes) of the java/src/java document. Create a new text file called fileSize in the java/src folder, type the size of the file and save it.
14. Try to create a compressed zip file for the folder you created in step 1.



# Evaluation Copy

## File Specification and File path

- A **file specification** is the name given to identify a file. The path is the first part of the file specification. The **file name** and **extension** make up the remainder of the file specification. Also, In Windows, the folder containing information specific to one user, including the My Documents, Desktop and the like is commonly known as the Profile.
- For example, the file specification

**C:\Users\Rogers\Desktop\Music\Gospel\Worship.mp3**

identifies the file **named Worship.mp3** in the **Gospel subfolder** under **Music folder** on the **Desktop (Location)** under **Rogers' Profile** in the **Users directory** on **Disk Drive C**. The **file extension .mp3** denotes that Worship.mp3 is an audio file.

A path is a designation that specifies how to find a file on a disk that has more than one directory. In Windows, paths have either of two forms. For example, \AAA\BBB\CCC

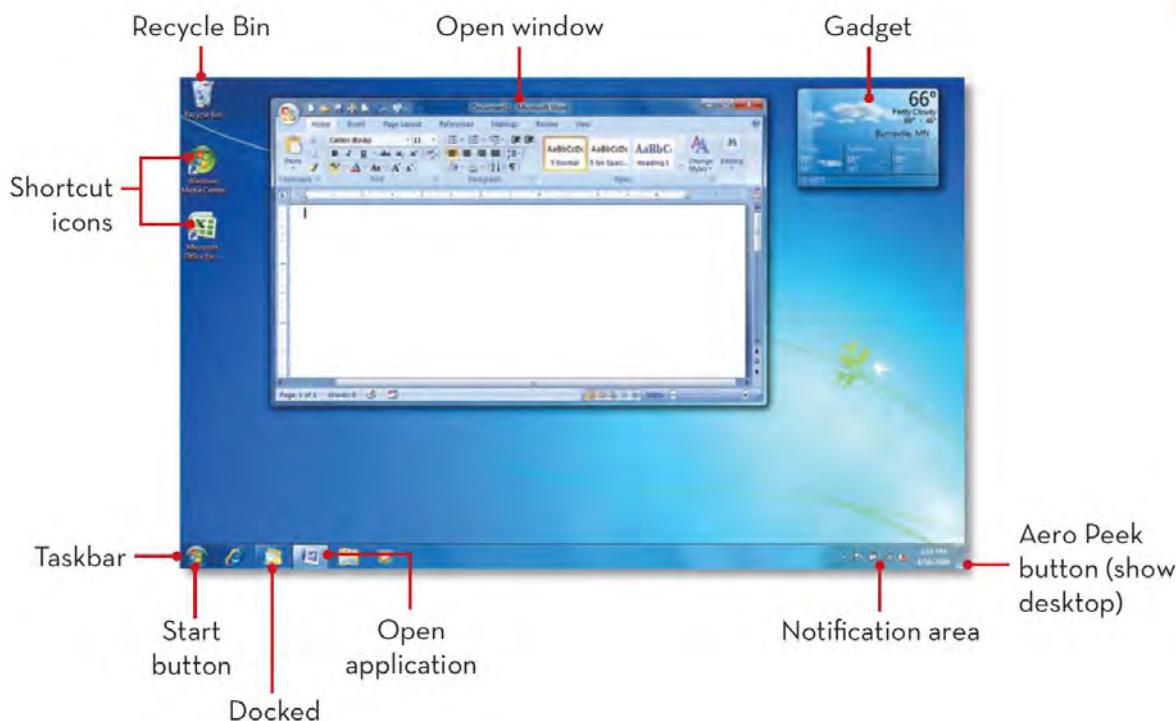
means, "In the root directory there is a directory called AAA. In AAA there is a directory called BBB. In BBB there is a directory or file called CCC."

If the initial backslash is left out, the path starts at the directory currently in use rather than at the root directory. For example, the path  
AAA\BBB\CCC

means, "In the current directory there is a directory called AAA. In AAA there is a directory called BBB. In BBB there is a directory or file called CCC." Paths in UNIX are written the same way but with forward slashes (/ rather than \). The symbol (/ or \) that separates one directory from another in a file path is at times known as a **Path Delimiter**.

### 2.2.3. Desktop

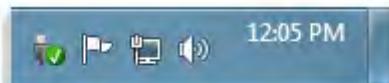
The desktop is the main screen area that you see after you turn on your computer and log on to Windows or other operating system with a GUI. Like the top of an actual desk, it serves as a surface for your work. When you open programs or folders, they appear on the desktop. You can also put things on the desktop, such as files and folders, and arrange them however you want.



#### Major features of a windows desktop.

- Desktop Background:** Windows lets the user to customize the desktop background by applying favorite themes, colors, pictures and wallpapers.
- Icons:** An icon is a graphical representation of a program on the screen. Icons are mostly manipulated using a pointing device e.g. the mouse.
- Taskbar:** The taskbar enables the user to easily switch between different programs and tasks that are currently running. Whenever the user starts a program or opens a file, its button appears on the taskbar and stays there until the user exits the program. Taskbar is the band where the buttons of currently open program windows are displayed. You can switch between various tasks by clicking their respective buttons on the taskbar.
- System tray/Notification area:** The notification area, on the far right side of the taskbar, includes a clock and a group of icons that communicate the

status of something on the computer or provide access to certain settings. It looks like this.

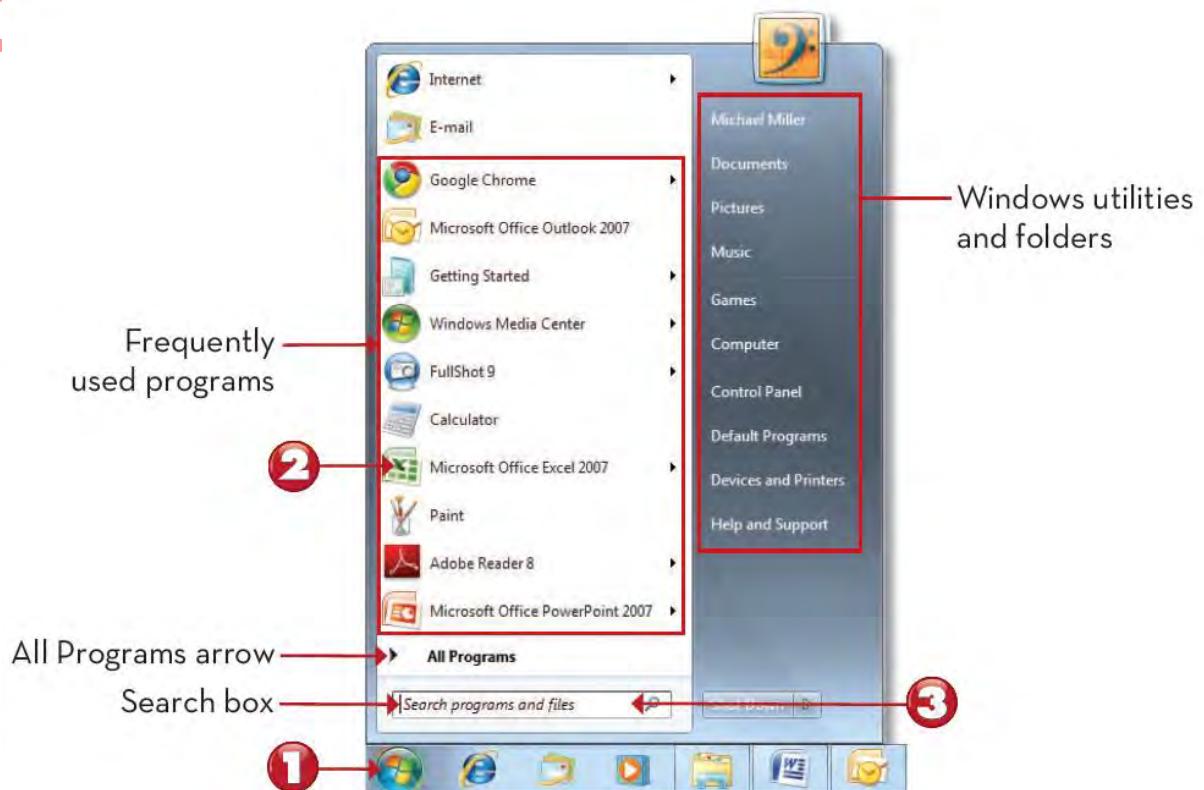


*The notification area of the taskbar*

The set of icons you see depends on which programs or services you have installed and how your computer manufacturer set up your computer. When you move your pointer to a particular icon, you will see that icon's name or the status of a setting. For example, pointing to the volume icon shows the current volume level of your computer. Pointing to the network icon displays information about whether you are connected to a network, the connection speed, and the signal strength. Double-clicking an icon in the notification area usually opens the program or setting associated with it. For example, double-clicking the volume icon opens the volume controls. Double-clicking the network icon opens Network and Sharing Center. Occasionally, an icon in the notification area will display a small pop-up window (called a notification) to notify you about something. For example, after adding a new hardware device to your computer, you might see this.

- v. **Start button:** The left most button on the toolbar that the user clicks to display the **start menu**.

## E - Start menu



1. Click the round Start button to open the Start menu.
2. Click any menu item to launch a program or open a folder.
3. Alternatively, you can enter a program name into the Search box to search for that program.

The start menu has a number of features including:

- **All programs menu** displays a list of programs installed in the computer. The menu has a small solid arrow. When you point the arrow, a submenu called a sidekick menu is displayed.
- **My recent documents:** List of the last fifteen recently accessed files. You can open any of the listed files from a storage device by clicking its name provided that the device is accessible.
- **Control panel:** Provides tools used to maintain and make changes to the computer setup and configuration.
- **Printers and faxes:** This shows installed printers and faxes and helps you to manage them.
- **The search box:** The search box is one of the most convenient ways to find things on your computer. The exact location of the items doesn't matter—the search box will scour your programs and all of the folders in your personal folder (which includes Documents, Pictures, Music, Desktop, and other common locations).
- **Help and Support.** Opens Windows Help and Support, where you can browse and search Help topics about using Windows and your computer.
- At the bottom of the right pane is the Shutdown button. Click the Shutdown button to turn off your computer. Clicking the arrow next to the Shutdown button displays a menu with additional options for switching users, logging off, restarting, hibernating or sleep mode.



#### **What's the difference between sleep, and hibernate, and log off?**

**Sleep** is a power-saving state that allows a computer to quickly resume full-power operation (typically within several seconds) when you want to start working again. Putting your computer into the sleep state is like pausing a DVD player: The computer immediately stops what it's doing and is ready to start again when you want to resume working.

**Hibernation** is a power-saving state designed primarily for laptops. While sleep puts your work and settings in memory and draws a small amount of power, hibernation puts your open documents and programs on your hard disk, and then turns off your

computer. Of all the power-saving states in Windows, hibernation uses the least amount of power.

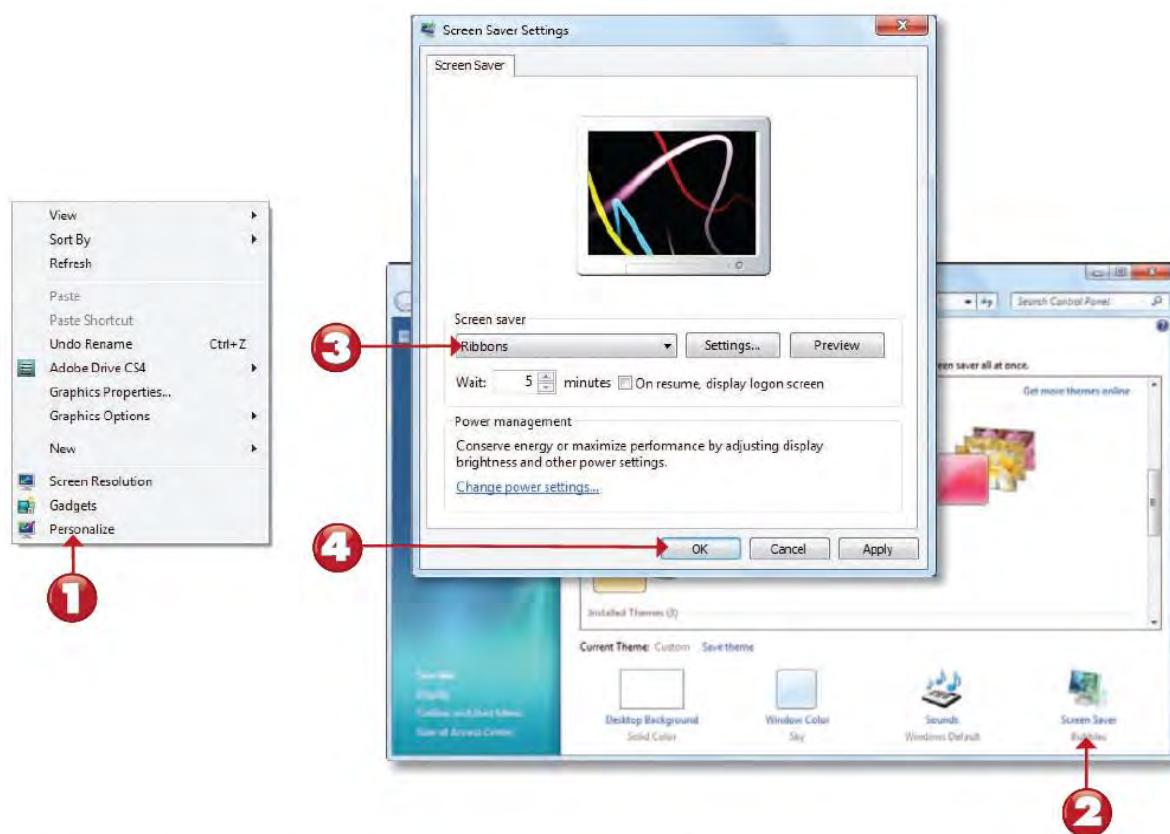
When you **log off** from Windows, all of the programs you were using are closed and your current session is ended but the computer is not turned off. After you log off, another user can log on without needing to restart the computer.

### Customizing the Desktop

- Windows lets the user change desktop appearance, background and resolution.
- To customize the desktop, right click the desktop to display properties dialog box.
- Make the appropriate changes by clicking each tab.

### Using screen savers

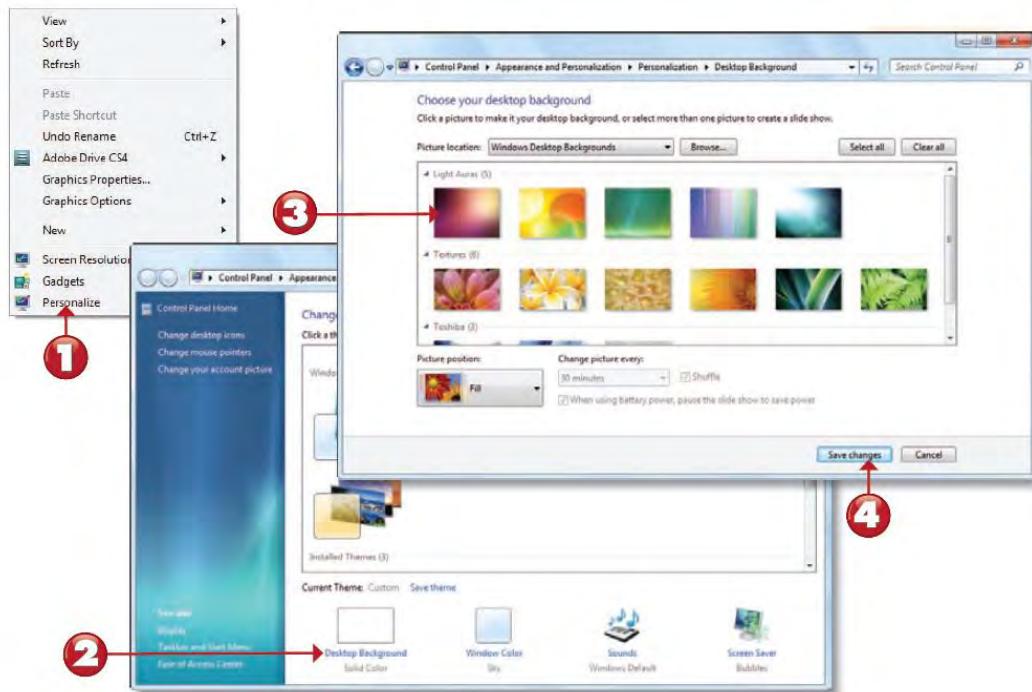
Screensavers display moving designs on your computer screen when you haven't typed or moved the mouse for a while. This provides some small degree of entertainment if you're bored at your desk.



To set a screen saver,

- Right-click anywhere on the desktop and click Personalize.
- Click Screen Saver at the bottom of the window.
- Select a screensaver from the Screen Saver drop-down list.
- Click OK when you're done.

## Theme and background



To apply a new theme or wallpaper

1. Right-click anywhere on the desktop and click Personalize.
2. Click Desktop Background at the bottom of the window.
3. When the next window opens, select one of Windows's built-in backgrounds from the list.
4. Click Save Changes.

## 2.3 Common Utilities

Sub topic Objectives:

a. **Utility programs:**

- defining a utility programme.
- listing utility programmes (search utility, file compression utility, disk defragmenter, antivirus).
- using search tools to locate files or folders.
- compressing and decompressing a folder.
- defragmenting a storage medium.
- defining an antivirus programme.
- identifying antivirus programmes.
- using anti-virus programmes.

### 2.3.1 Defining Utility programs

Utility program is a system software designed to enhance the working conditions of a computer. Utility a program assists in the operation of a computer but does not do the main work for which the computer was bought. For instance, programs that compress data or defragment disks are utilities. By contrast, word processors, financial programs, engineering programs, and other programs that do actual work for the user are called application programs.

### 2.3.2 List of common utility programs

- **Search utility:** used to locate a file or folder by name located on any of your hard drives in less than a second.
- **File compression utility:** reduces the amount of space used by files stored on that drive.
- **Disk defragmenter:** consolidates scattered file fragments so that each file occupies a single, contiguous space on a hard drive. Disk Defragmenter rearranges fragmented data so your disks and drives can work more efficiently.
- **Screen saver:** Takes over screen and displays graphics after some period of inactivity. Used primarily for entertainment or security. Prevents CRT from phosphor burn-in (ghosting).
- **Anti-virus program** is a utility used to prevent, detect, scan and remove computer viruses from storage devices and memory.

### 2.3.3 Using search tools to locate files or folders

When you are saving your work you must always be aware of:

1. The drive it is saved on.
2. The folder it is placed in.
3. The file name.

If you follow these simple rules it will make finding your files much easier. If you lose a file, you can use the Search utility in Windows Explorer to look for the file. The search feature is fairly sophisticated and will allow you to search on a number of different criteria such as: Name, Date, Type (Using the file extension), Size and Containing text

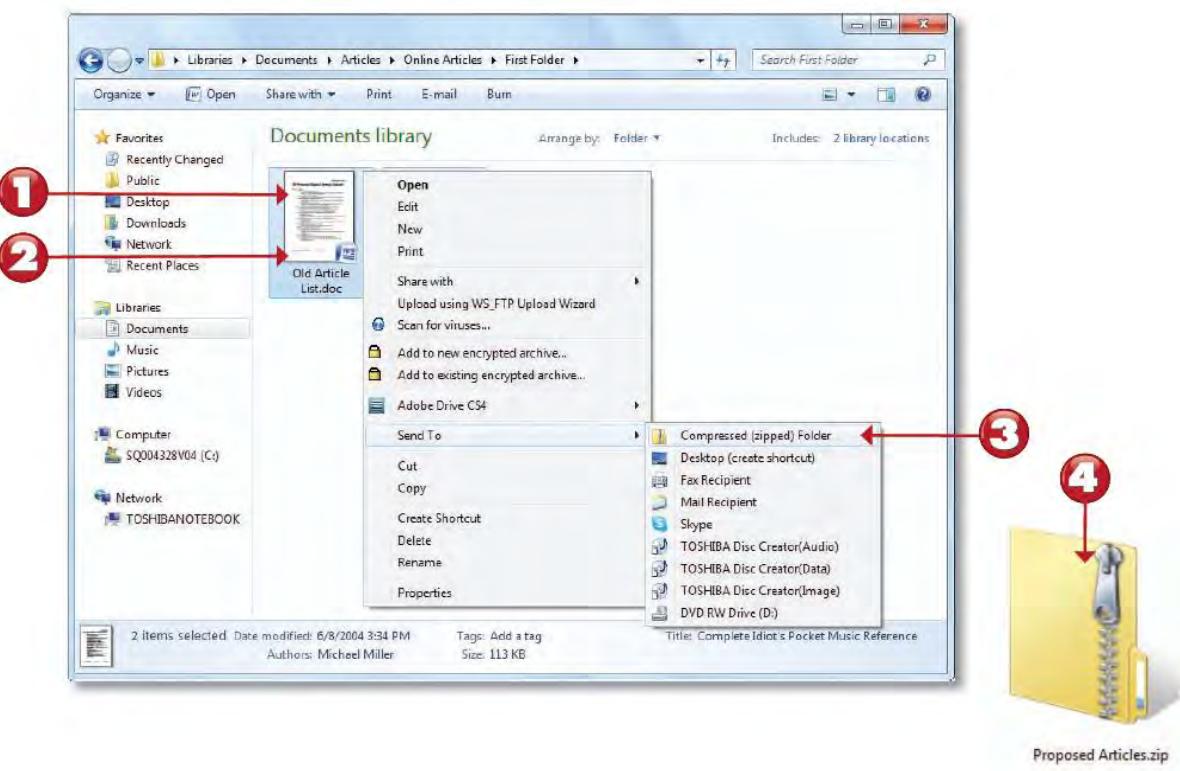


### 2.3.4 Compressing Files

Really big files can be difficult to copy or share. Fortunately, Windows lets you create compressed folders, which take big files and compress them in size (called a "zipped" file). After the file has been transferred, you can then uncompress the file back to its original state.

To compress files or folders,

1. Click the file(s) you want to compress. (To select more than one file, hold down the Ctrl key when clicking.)
2. Right-click the selected file(s) to display the pop-up menu.
3. Select Send To, Compressed (Zipped) Folder.
4. Windows creates a new zipped folder in this same folder that contains copies of the selected files.



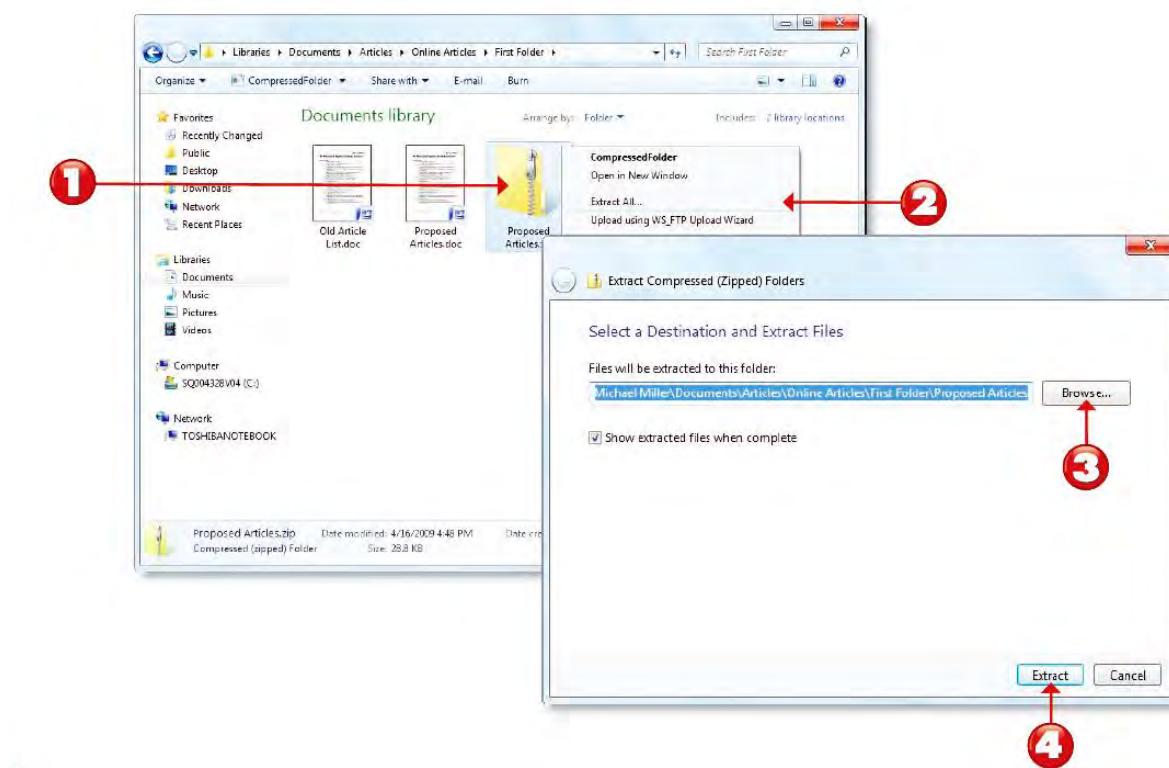
*Figure 5: Compressing a file*

#### **Extracting files from a compressed folder**

The process of decompressing a file is actually an extraction process. That's because you extract the original file(s) from the compressed folder. In Windows 7, this process is eased by the use of the Extraction Wizard.

To extract a compressed folder,

1. Right-click the compressed folder to display the pop-up menu.
2. Click Extract All.
3. Click Browse to select the folder to which you want to extract the files.
4. Click the Extract button. Windows now extracts the files to the location you selected.



*Figure 6: Extracting a compressed folder*

You can also install and use third party file compression utilities like WinRAR to manage compressed files of different types, such as .rar and .7z.

## Evaluation Copy

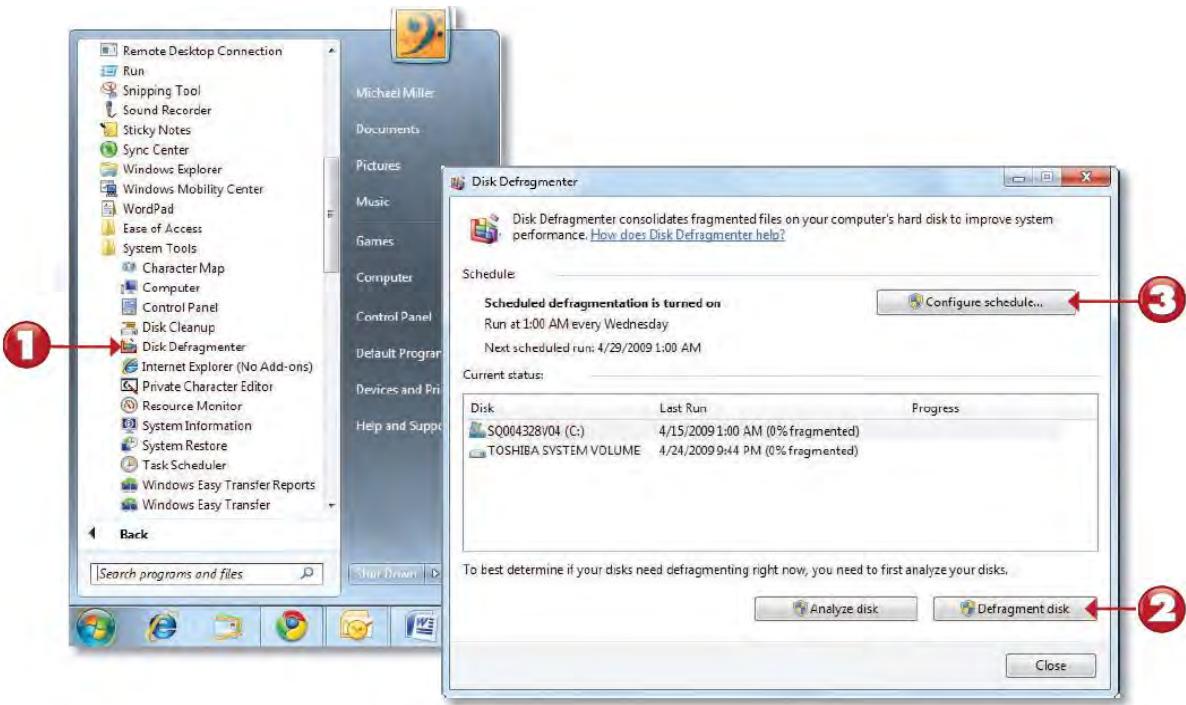
### 2.3.5 Defragmenting a storage medium.

If you notice that your system takes longer and longer to open and close files or run applications, it's probably because little fragments of files are spread all over your hard disk. You fix the problem when you put all the pieces of the puzzle back in the right boxes—which you do by defragmenting your disk.

To defragment disks on Windows,

1. Click the Start button and select All Programs, Accessories, System Tools, Disk Defragmenter.
2. To manually defragment your hard drive, click Defragment Disk.
3. To set up automatic disk defragmenting, click Configure Schedule.

NB: It Takes Time Defragmenting your drive can take an hour or more, especially if you have a large hard drive or your drive is highly fragmented.



### 2.3.6 Using Antivirus Programs

Computer viruses can be even very damaging, causing data loss and malfunctioning of the computer. For that reason, you should install on your PC an antivirus program. Examples of the antivirus programs include: as AVG Anti-Virus Free Edition ([free.avg.com](http://free.avg.com)), McAfee VirusScan Plus ([www.mcafee.com](http://www.mcafee.com)), Norton AntiVirus ([www.symantec.com](http://www.symantec.com)), or Zone-Alarm Antivirus ([www.zonealarm.com](http://www.zonealarm.com)), Kaspersky, Avast, Avira, BitDefender, F-Secure, Panda security, ESET nod32. etc.



Figure 7: Scheduling AVG Antivirus to scan the computer

1. One of the more popular antivirus programs is AVG Anti-Virus Free Edition, from [free.avg.com](http://free.avg.com). Click the Overview tab to view your current protection status.
2. Click the Computer Scanner tab and click the Edit Scan Schedule button to change when the program scans your computer.

3. You can also scan a storage device on-demand by right clicking on it and choosing the appropriate option from the shortcut menu.

## 2.4 Print Management

Sub topic Objectives:

a. **Printing:**

- Selecting a printer.
- Printing a document.

### 2.4.1 Selecting a printer

To create a hard copy of your work, you must add a printer to your system. The two most common types are laser printers and inkjet printers. Laser printers work much like copy machines, applying toner (powdered ink) to paper by using a small laser. Inkjet printers shoot jets of ink onto the paper's surface to create the printed image.

#### Installing a printer

There are several ways to connect a printer to your PC. Which option you choose depends on the device itself, and whether you're at home or at the office.

Always consult the information that came with your model for specific instructions.

- **Local printers:** The most common way to install a printer is to connect it directly to your computer. This is known as a local printer. If your printer is a universal serial bus (USB) model, Windows should automatically detect and install it when you plug it in. If it's an older model that connects using the serial or parallel port, you might have to install it manually.
- **Network printers:** In the workplace, many printers are network printers. These connect directly to a network as a stand-alone device.

#### To install a network, wireless, or Bluetooth printer

If you're trying to add a network printer at the office, you'll usually need the name of the printer. If you can't find it, contact your network administrator.

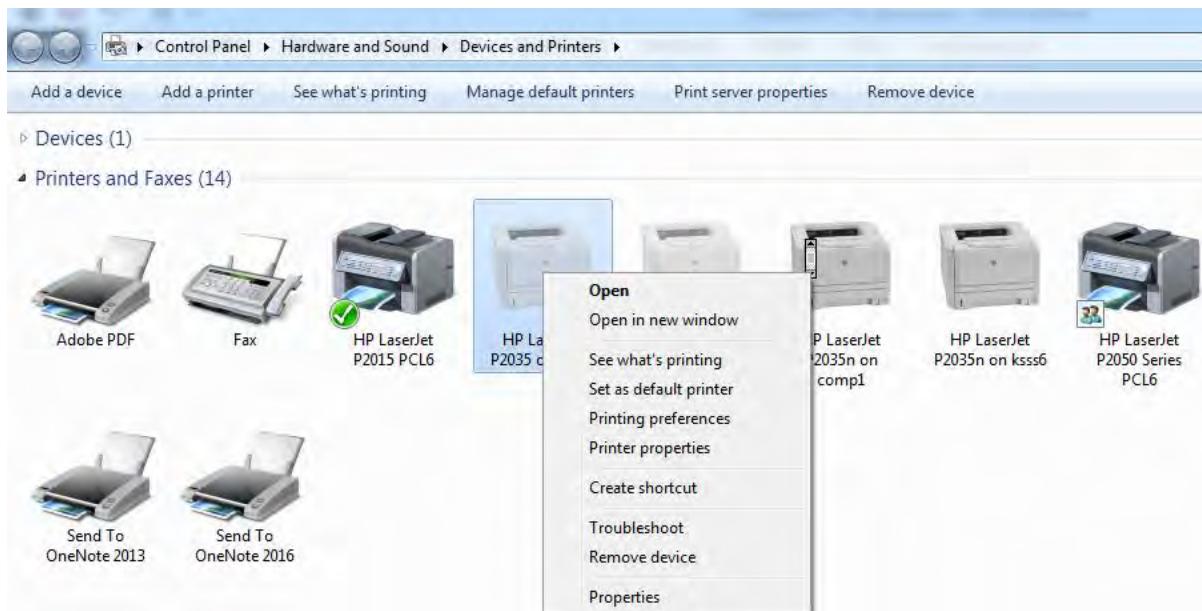
1. Click to open **Devices and Printers** from the start menu.
2. Click **Add a printer** button.
3. In the Add Printer wizard, click Add a network, wireless or Bluetooth printer.
4. In the list of available printers, select the one you want to use, and then click Next.
5. If prompted, install the printer driver on your computer by clicking Install driver. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.
6. Complete the additional steps in the wizard, and then click Finish.

**Tips:** Available printers can include all printers on a network, such as Bluetooth and wireless printers or printers that are plugged into another computer and shared on the network. You might need permission to install some printers. You can confirm the printer is working by printing a test page.

### To select a default printer

If you regularly use multiple printers, you can pick one as your default printer. Windows and other programs then automatically use that device whenever you print.

1. Click to open Devices and Printers on the start menu.

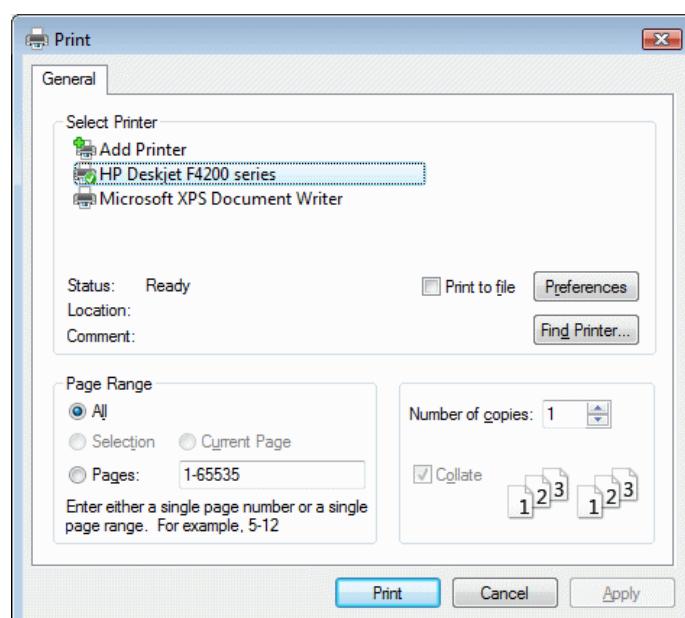


2. Right-click the printer you want to use, and then click Set as default printer.  
(You'll see a check mark on the printer's icon signifying that it's ready and now your default printer.)

**Tip:** A default printer doesn't have to be an actual physical device. Depending on your computer, you might have the option to send documents as faxes, or to save them as PDF or XPS files when you print.

#### 2.4.2 Printing a document

- To Print is to produce a hardcopy of a document.
  - When you're using a computer, you might want to keep a copy of what you can see on the screen. If you have a printer connected to your computer, or have access to a network printer, you can create a "hard copy" of your work
  - **To print a document;**
1. Click file menu of an application program
  2. Choose option print. This will bring the print dialog box
- Select the printer name i.e. HP Deskjet F4200 series.



And change the necessary preferences such as A4 paper size for advance setting by clicking on the preferences button.

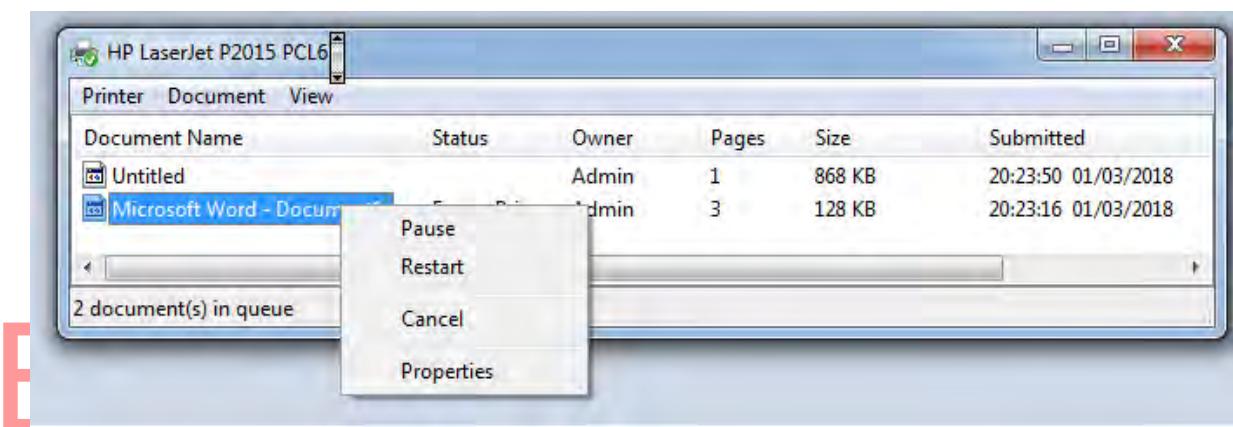
- Click Print button when done.

### View, pause, or cancel a print job

- Once your document or photo has started to print, you can pause or cancel it via the print queue.
- The print queue shows you what's printing or waiting to print. It also displays handy information such as job status, who's printing what, and how many unprinted pages remain.

You can see what's printing—or waiting to print—in the Windows print queue. Documents that are listed first will be the first to print.

- Click to open Devices and Printers from the start menu.
- Select your printer's icon and then click See what's printing on the command bar.



**Tip:** To quickly view the print queue, double-click the printer icon in the notification area.

### Practice Activity: Printing

- Start the WordPad program.
- Type the Uganda National Anthem and save it as **typing**.
- To print the file, select File and the Print. The Print dialog box appears.
- If it's not already selected, click on the name of the printer you want to use.
- Look at the options. You can print more than one copy, or certain pages or areas of a document.
- To print a single copy of the typing document, click Print,
- Close

NB: Ask for permission from your teacher before printing in the computer Laboratory.

## Topic 3 COMPUTER LABORATORY CARE AND MAINTENANCE

*Recommended Coverage Duration: 16 periods (2  $\frac{2}{3}$  weeks)*

### Guidance to the Teacher

- Provide some few computers where the learner can practise how to install and uninstall software on computer systems. This should be done for both application software and system software.
- Guide the learner to identify and correct simple practical problems encountered when using a computer. For example, simple troubleshooting software failures, boot failure, identifying loose power connection and many more.
- Where the word lab or laboratory has been used, it is exclusively referring to the computer laboratory.

### Suggested Competences for Assessment

- Assess the learners' ability to install application and system software; take care of a computer system and use it safely.

### Background

- The use of ICTs has a number of challenges for example, computers malfunction, laptops break down, servers go offline, networks become unavailable and computers slowdown with time, etc. All of these problems can be minimised by keeping up with regularly scheduled preventive maintenance activities.
- It is important for every user to have an idea on basic preventive maintenance in order to maintain the equipment in a good running condition. This topic will equip the learner with skills to maintain his/her computer systems in a good running condition and the safety measures to observe when working in a computer laboratory.

**Learning Outcomes:** The learner should be able to: take care of computer systems, maintain (service) computer systems, troubleshoot malfunctioning computer systems and restore them to a good running condition.

### 3.1 Computer Literacy

#### Sub topic Objectives:

- 3.1.1 Describing the booting process of a computer system.
- 3.1.2 Explaining the meaning of computer literacy.
- 3.1.3 System Startup.
- 3.1.4 Opening application programs.

#### 3.1.1 Booting process of a computer system

- Booting is the process of starting or restarting a computer.
- Booting is a series of operations that start and set a computer for use.

- To care for computers and maintain them in good working conditions, users have to be conscious of the booting process as outlined in the previous topic on computer management.
- For example, improper shutdown of the computer can cause it to fail to boot successfully next time it is switched on.

### 3.1.2 Explaining the meaning of computer literacy

- **Computer literacy** is the ability to use computers and related technology efficiently.
- It's the level of familiarity with the basic ICT concepts that allows one to easily use personal computers.
- To be considered computer literate, one needs to possess skills such as
  - turning on the computer and log in, opening and creating folders and files,
  - Word processing,
  - Spreadsheets skills,
  - Browser basics (Internet and Email),
  - Basic hardware terminology,
  - Virus and security awareness.

#### Advantages of Computer Literacy

- Profitable Skills: The ability to use programs such as Word Processors can aid one to make money or get hired for a higher-level job when other candidates do not have the skills.
- Leadership and Promotions: Computer literacy skills may get one promoted to a higher position within your workplace or be put in a leadership position in which you teach others how to use computers or certain computer programs.
- Work Performance: Knowing how to use a computer often allows you to get work done in a more organized, efficient and timely manner
- Communication: Knowledge of how to access the Internet on a computer opens up different possibilities for you to communicate with coworkers or supervisors.
- Being prepared For the Future; Computer technology is advancing faster, so if you are familiar well with computer skills now this will makes you ready for bright future.
- Ability to use New Media; traditional media like newspapers and television are being replaced by computer based media such as social media, and online blogs which require computer literacy skills to use.
- More job opportunities; since almost all workplaces use computers, the need for people having computer skills is really in great demand.

#### Digital divide

Digital divide is the inequality with regard to access to information and communication technologies (ICT).

- It is the lack of opportunities experienced by those with limited accessibility to technology, especially the Internet.

- It can be a result of having some societies one with very high levels of computer literacy and others lagging far behind.

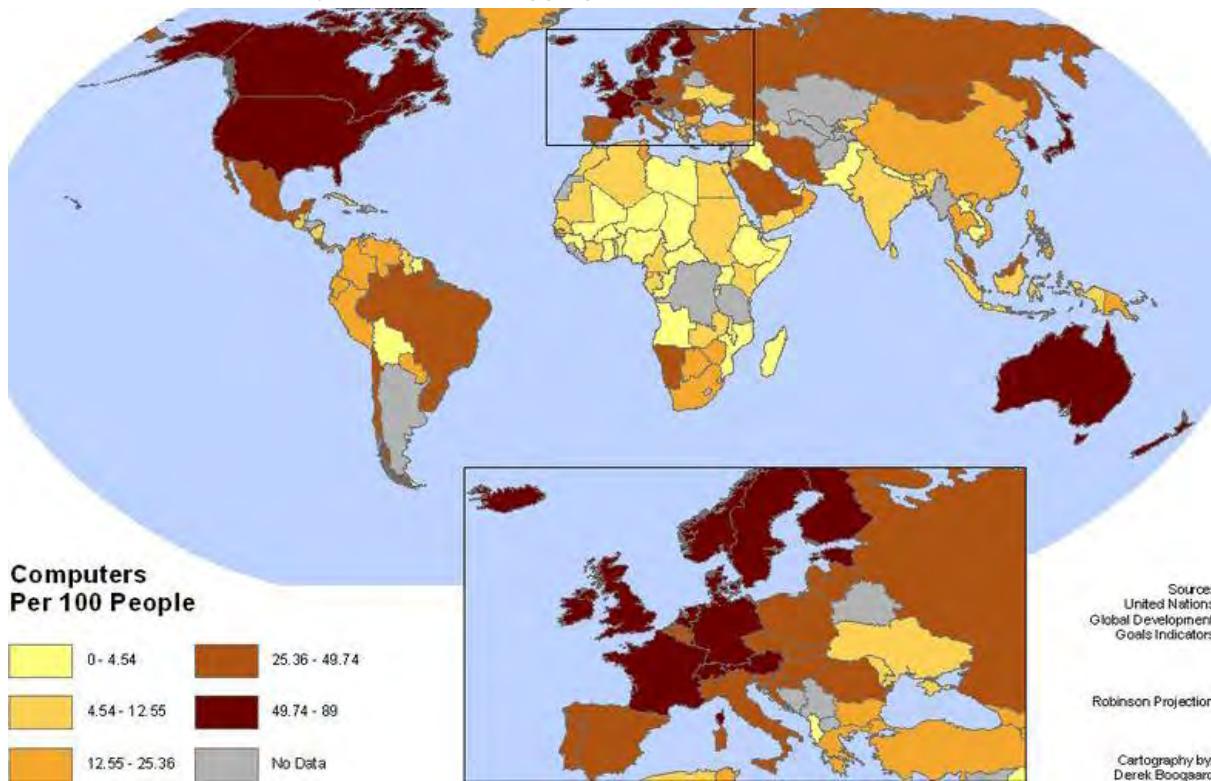


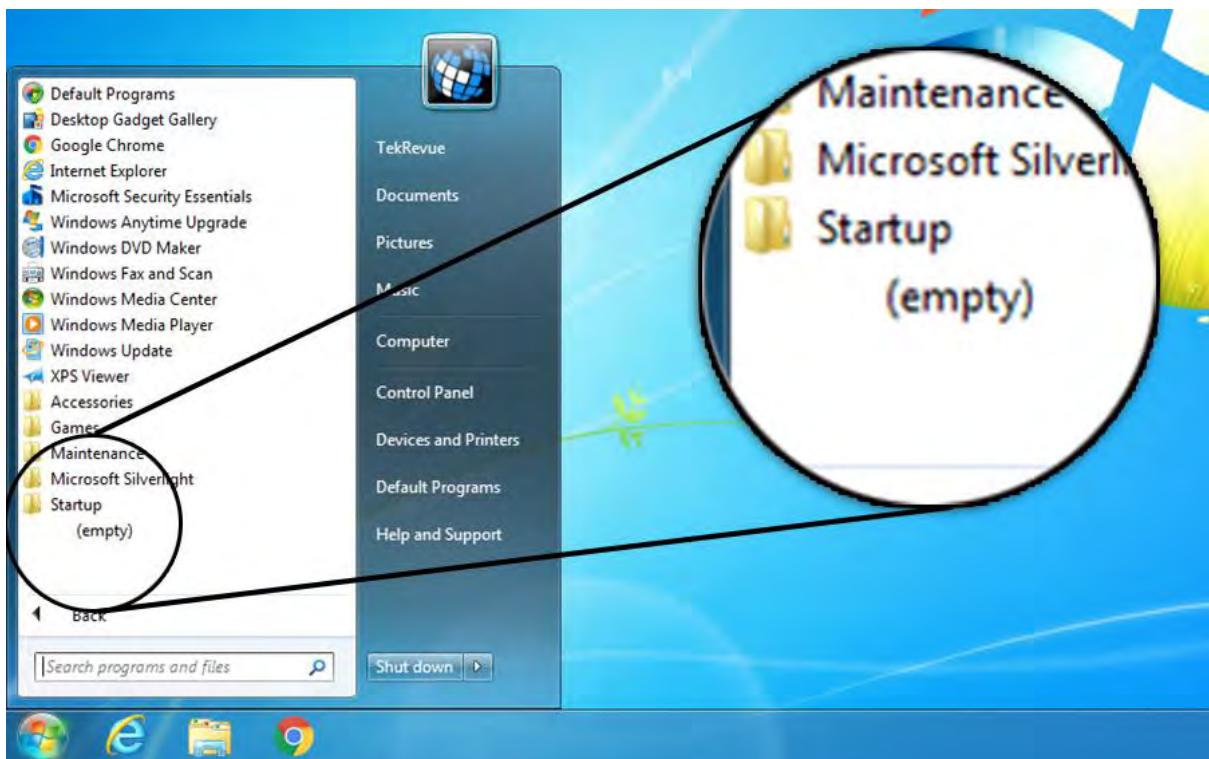
Figure 8: Map showing global distribution of computers per 100 people. An illustration of digital divide at the country level.

### 3.1.3 System Startup

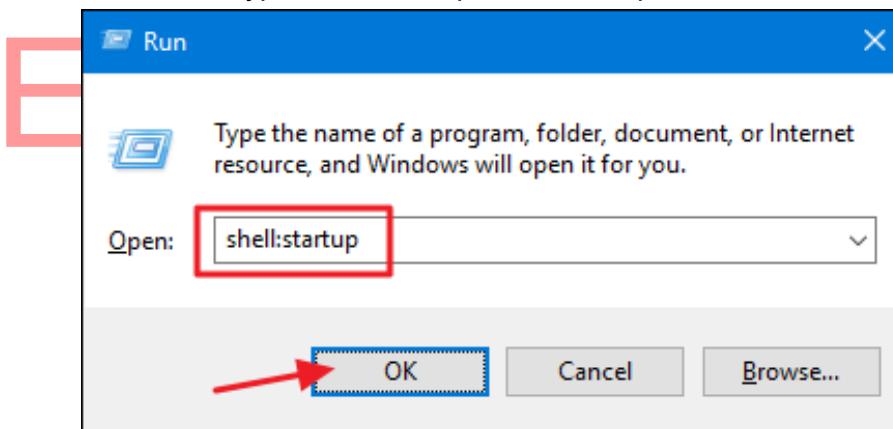
- On start up, the OS may verify that the person attempting to use the computer is a legitimate user through use of a password.
- After the user logs on, the desktop and icons are displayed on the screen.
- Finally, the operating system also executes programs in the Startup folder, which contains a list of programs that open automatically when you boot the computer.
- Microsoft Windows users can see each of the programs that startup each time their computer boots by using the msconfig utility.

#### The Startup Folder

- The Startup folder on Windows OS contains a list of shortcuts of those applications that start when Windows starts.
- On Windows 7, you could easily access the startup folder from Start Menu > Startup.



- To open the “Startup” folder the easy way, just hit Windows+R to open the “Run” box, type “shell:startup,” and then press Enter.

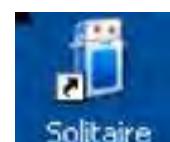


- To manage all startup programs (even those not listed in the startup folder), you can launch the msconfig by hitting Windows+R to open the “Run” box, and typing the “msconfig” command.

### 3.1.4 Opening application programs

- An application is defined as a computer program designed to help people perform a certain type of work. Examples of applications include word processing programs, spreadsheets, media players, and even games.
- You can open, or launch, a program by using any of the following methods:

- Double-click a program shortcut icon on the desktop.
- Click an item on the taskbar.



3. Choose Start→All Programs. Click the program name on the All Programs list that appears.
4. You can use the Start menu's search feature to launch a program.
5. On Windows 7, you can press the **Windows key along with a number** to quickly launch the corresponding application on your taskbar.

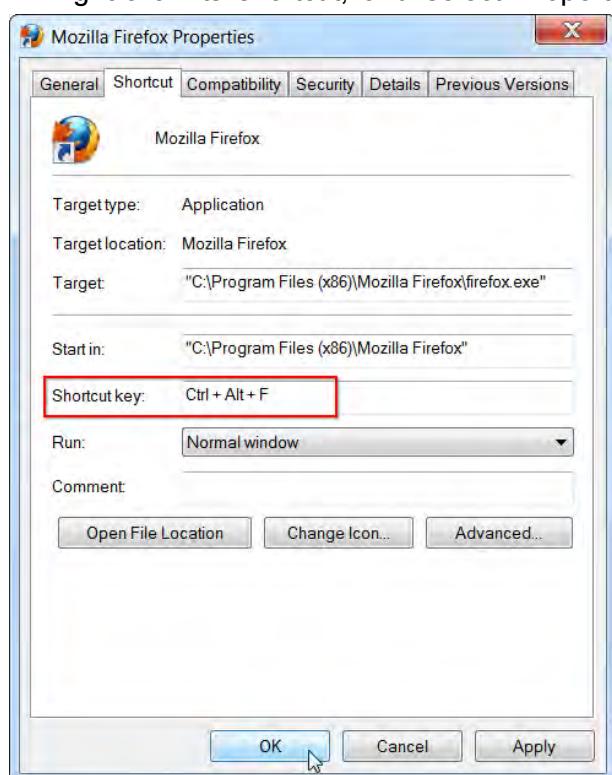


For example, WinKey+1 launches the first application pinned to your taskbar.

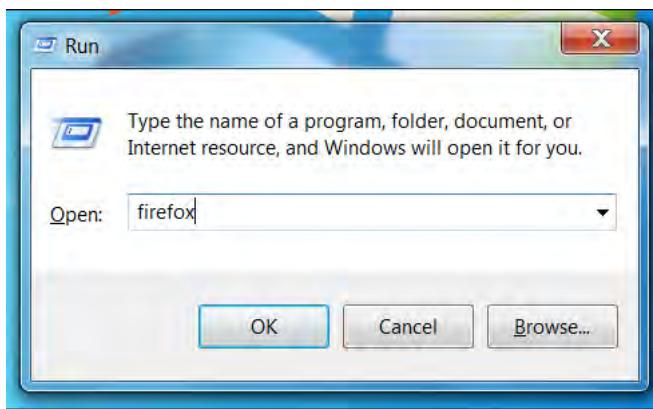
6. You can use the **Start menu's search** feature to launch a program with just a few key presses.



7. If you launch an application frequently, you can assign a **custom keyboard shortcut** to it. First, locate the application in your start menu or on your desktop, right-click its shortcut, and select Properties.



8. You can also use the **Run dialog** to quickly launch applications. Open it by pressing WinKey+R. In the Run dialog, type the name of a program's .exe file and press Enter to launch it.



### 3.2 Secure Laboratory Environment

#### Sub topic Objectives:

3.2.1 Identifying areas of laboratory security.

- a) physical security
- b) electric power security
- c) security cameras
- d) first aid boxes
- e) fire extinguisher
- f) air conditioning, etc.

3.2.2 Safe use of the computer laboratory.

3.2.3 Preparing laboratory rules and regulations

# Evaluation Copy

#### 3.2.1 Identifying areas of laboratory security

##### The Computer Laboratory

- A computer laboratory is a room that is specially designed and prepared to provide a safe and conducive environment for using computer systems.



#### **Factors to consider when setting up a computer laboratory**

- Security of computers, programs and other resources from theft
- Reliability and stability of the power source
- The number of computers to be installed and the available floor space
- The maximum number of users that the computer laboratory can accommodate
- Safety of users: eye strains, emissions and back problems control
- Temperature ranges in the area and Humidity in the atmosphere
- Amount of dust in the environment
- Protection against Lightening and Fire outbreaks

#### **Security Measures to ensure the safety**

Organizations, libraries, and schools running public computer labs face a variety of complex computer security challenges. These institutions take measures to ensure the safety of the equipment, software, data and users.

##### **(a) Physical security measures**

- Employ security guards to keep watch over data and information centers.
- **Fit strong locks**, doors, windows and roofing. Security should be good around computer room to avoid thefts.
- Burglar proofing avoid unauthorized access to computer room. Burglar proofing provides protection against any forced physical entry into the computer laboratory. Burglar proofing involves fitting metal grills in windows and doors.



- Apply burglar proof for the computer laboratory by reinforcing weak access points like windows, doors, roofing with metal grills and strong padlocks.
- Set up alarms to alert you in case of break-ins.
- Use system locks (locked key systems) to make it difficult to access internal components like hard disks and memory sticks.
- Fit strong metallic grills and locks on doors, windows and strengthen the roof incase the roofing is weak.
- Use cables to lock the equipment to desk, cabinet or floor.

## E~~quipment~~ Protection Copy



- Electronic locking mechanism with keys, swipe cards, finger print recognition.

### (b) Electric power security measures

- **Electric power security:** Place no more than two computers on each circuit. Do safe well insulated cabling.
- Keep the circuits for computer systems separate from all other equipment such as printers, copiers and coffee makers.
- Plug each computer into a surge protector or UPS (Un interruptible Power Supply Unit).
- **Stable power supply:** Protect computers from being damaged and data loss due to power instabilities by having:
  - Power stabilizers maintain power at required voltages.
  - A surge protector can be used to protect computer equipment against under voltage and over voltage.



- **UPS- Uninterruptible Power Supply**
- Computers need the time to shut down properly. Damage to devices and data can occur when there is sudden power loss or fluctuation.
- **UPS, or Uninterruptible Power Supply units**, keep backup power for devices in the event of a failure or other electrical problems.
- A UPS is essentially a small battery that keeps the power supply on for long enough for you to switch off the computer safely when there is a sudden blackout.

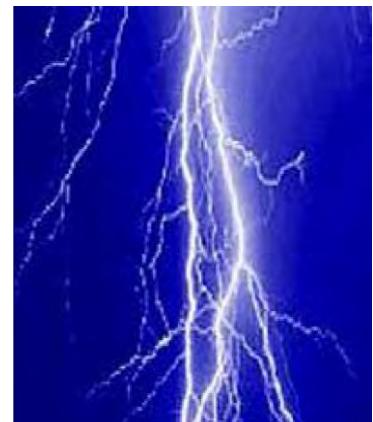


## Evaluation Copy

- **Cable insulation:** All power cables must be properly insulated and laid away from pathways in the room.
- Lay them along the walls in trunks. This prevents electric shock and power disconnections caused by stumbling on cables.
- Always install lightning conductors to the computer laboratory to protect the machines and the users of the computers.



- Always install lightning conductors to the computer laboratory to protect the machines and the users of the computers.
- Minimize Electrical noise / interferences in the computer environment. ELECTRICAL NOISE refers to externally radiated signals that cause undesirable additions to the current voltage.
- Electrical noise is commonly generated by devices like Fluorescent lights of high frequency, Motors, Battery Chargers, Inverters, Radios, television, and Cell phones.



# Evaluation Copy

## (c) Security Cameras

- Use Security Cameras to keep watch over computer systems and centres.



- Security cameras act as a deterrent to theft and other crimes in computer labs and data centers.
- Closed Circuit TeleVision (CCTV) surveillance cameras are used to record video which can be viewed in the monitoring room and played back in case of any investigations.

## (d) First aid kits and Toolkits

- First aid box:** A first aid kit is a box or bag that contains the necessary items for providing care in case of any emergency in the computer lab such as a electric shocks.



ADAM.

- **Tool kits** are also necessary for keeping *ICT repair and maintenance tools*.

#### (e) Fire extinguisher

- Fire extinguishers are a critical component of saving property and lives in the case of a fire emergency.
- Owning a fire extinguisher is a form of ensuring safety.
- All computer rooms need it just in case a fire starts.
- It can save our property from burning because the use of the device will help prevent it from spreading and can even stop the flame in no time.
- Have gaseous fire extinguishers like those filled with carbon dioxide. Water based or powder extinguishers should be avoided since they can cause damage/rusting to computer components.



#### (f) Heating, Ventilation and Air Conditioning (HVAC)

- Air conditioning units monitor and maintain the temperature, air distribution and humidity in a computer room.
- An Air conditioning unit is a device used for cooling and controlling the humidity and purity of the air circulating in a space.

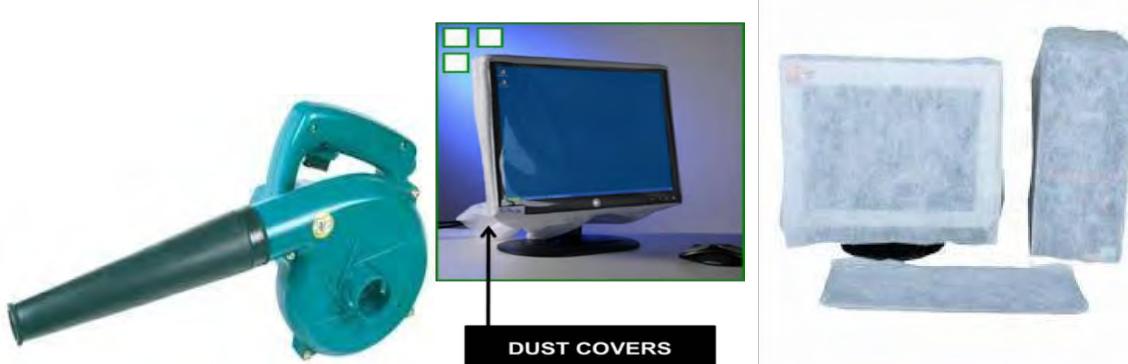


- Have good air circulation in the computer room since users and computers emit heat energy.
- This is possible through having enough ventilation points like windows, installing an air conditioning system.
- Avoid overcrowding of machines and users.
- All the above prevent suffocation and overheating.
- Avoid direct sunlight and high Temperatures that may damage hardware components.
- **Ventilation** should be good. Good aeration enables the computer to cool and hence avoids overheating
- **Damp Control:** 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% may cause rusting of the metallic parts of the computer system.

# Evaluation Copy

#### (g) Dust Control

- **Blowers:** Used to blow/remove dust that may have entered inside the computer
- **Dust and Water proof covers** Protect computers from moisture, water and liquids.
- 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.



**(h) Antiglare filter screens**

- This is used to avoid eye strain and fatigue caused by over bright CRT monitor
- Reduces electromagnetic rays from the CRT monitor
- Radiation filter screens should be fitted to reduce the light that reaches the eye.

**(h) Wool Carpet**

- *Absorbs dust*
- *Reduces effects on damage when light objects fall*
- *Minimizes effects of electric shocks*
- *Absorbs electrical radiations from computer devices.*

**(h) Software security measures**

- Computers should have updated antivirus software installed to prevent malware.
- Remote administration software should be considered with high number of computers in a computer center.
- Computer management software to monitor and limit web browsing should be installed for.
- Group policy or security software to prevent malicious software from being executed and installed.
- Assigning unique authorised log-in for authentication before granting network access.

**3.2.2 Safe use of the computer laboratory**

- Always Sit upright: to avoid muscle pains and back aches caused by poor sitting posture.



- A computer room should have enough light avoid eyestrain, and headaches.
- **Standard furniture:** Have standard furniture so that the tables are wide enough and strong to bear the weight of the computers and accommodate all peripherals.
- The seat for the user must be comfortable and have a straight backrest that allows someone to sit upright.

### 3.2.3 Laboratory rules and regulations

Preparing Laboratory rules and regulations is very essential like other security measures, because it is aimed at guiding the users on how to use the laboratory. Organisations usually draw the laboratory rules and regulations in line with the ICT policies passed by management. Below are some general rules and regulations aimed at safety of computer systems, data and the users.

- i. Avoid smoking and exposing computers to dust since they contain small abrasive particles that can damage computer components and cause wearing of moving parts.
- ii. Avoid carrying food and beverages to the computer room since these may fall into moving parts causing rusting or electrical faults.
- iii. Avoid unnecessary movements because you may accidentally knock down peripheral devices.
- iv. At all times follow the right procedures while starting and shutting down the computer therefore abrupt switching on and off the computer should be avoided since this can lead to damaging the computer.
- v. Do not open up the metallic covers of computers or peripherals without permission and particularly when the computer power is still on.
- vi. Any repairs to the computer should be done by someone who has knowledge regarding computer repairs.
- vii. Any connections (keyboard, mouse, printer and monitor) to the computer should be done when the computer power has been switched off.

- viii. Computers should be regularly serviced and keep a regular record of computer servicing and repair to establish maintenance costs and common problems to your computer.
- ix. Guard your computer against new users who might spoil the computer and data corruption by unauthorized parties.
- x. Cover the computers after using them or when not in use. Let the computers cool down before being covered to avoid trapping heat.
- xi. The computers should be cleaned on a regular basis to remove dust from the keyboard, mouse and other parts.
- xii. Keep computers away from excessive dust and fit special curtains that would reduce entry of dust particles and computers should not be exposed to direct sunshine.
- xiii. Computer components should be kept dust-free. Avoid smoking and exposing computers to dust.
- xiv. Never try to remove the cover on your computer or touch inside the system unit. There are many sensitive components. Instead, take it to a qualified technician.
- xv. Keep all liquids and food items away from your computer.
- xvi. Liquids and food crumbs can cause rusting and corrosion and damage electronic circuits. Also, mixing liquids and electronic components can cause serious electrical shock!
- xvii. Never use your computer during a storm. The computer is connected to electricity and that means that lightning could be conducted to the computer.
- xviii. Physically, be careful, avoid knocking and dropping any hardware to the ground as this could cause any of the delicate components to break or be damaged.
- xix. Proper shut down of computers should be followed to avoid disk and system failure (avoid abrupt switching off)
- xx. Be careful when using the internet. Do not accept downloads from websites that you don't know and trust.
- xxi. And never open an email attachment unless you know and trust the person who sent it.
- xxii. Avoid making hardware connections to the motherboard when the computer is on. Eg keyboard, monitor and mouse connections.
- xxiii. Don't bring magnetic devices to the lab. The computer has magnetic disks which can be spoilt if they come near other magnetic fields
- xxiv. Handle delicate storage devices with care. Don't touch the inner surface of Compact disks and Floppy disks. Safely remove Flash disks from the system.
- xxv. Avoid excessively bright and flickering computer monitors. The brightness of the computer monitors should be adjusted to avoid eye strain.

### 3.3: Servicing and Maintenance of Computer Systems

#### Sub topic Objectives:

1. Importance of servicing and maintaining a computer
2. Cleaning of computers
3. Installing and uninstalling system and application software.
4. Updating and Upgrading of software
5. Troubleshooting on computers (start-up errors, hanging applications and warm booting).
6. Fine-tuning the system

#### 3.3.1 Importance of servicing and maintaining a computer

Drivers perform routine servicing to make sure a vehicle stays in working condition, right? A vehicle can break down before its time without proper maintenance and then repairs can be painfully expensive. **Like a vehicle, a computer requires regular maintenance.** Also like a vehicle, when a computer stops working because of the lack of maintenance, it can be more costly to repair than regular maintenance. If you want to get the most out of your computer, you need to perform some regular maintenance for the following reasons:

- **Early Detection of Issues:** Having regular maintenance check done on your computer can eradicate small issues before they become big problems like disk failure.
- **Prevention against Viruses and Malware:** Keeping computers well-maintained can keep both viruses and malware away and keep your computer running in tip-top shape. Regular maintenance can also help you ensure your antivirus software is up-to-date and working properly.
- **Speeding up Computer performance:** Nothing can be more frustrating than a computer that processes too slowly. But, as most of us can attest, over time our computers get clogged up with files and everything gets disorganized and fragmented. The result is slow processing times. Computer maintenance techs are experts at running speed and optimization checks that can pinpoint issues and keep your computer running at an optimal speed.
- **Maximizing Software Efficiency for Productivity:** Having regularly scheduled maintenance on your computer will clean out any issues and have all software up to date and running perfectly.
- **Preventing Data Loss:** When your computer starts running slowly or begins having occasional hiccups, it can require a system reboot that can ultimately result in lost data. However, keeping your computer maintained will lessen the likelihood of these instances and keep your data safe and secure for when you need to access it.
- **Extending computer Life:** Maintaining hardware helps to extend the computer's lifespan. It helps to prevent wear and tear, and keeps the system functioning smoothly.

PC Preventive Maintenance Schedule		
Frequency	Component	Maintenance Description
Daily	System	Run a virus scan of the memory and hard disk.
	Hard Disk	Create a backup if you have updated important data or program files.
Monthly	Case	External cleaning.
	Hard Disk	Recover lost clusters and de-fragment.
	Keyboard	Clean and check for stuck keys.
	Mouse	Clean and check for wear.
	Monitor	Clean, degauss, and adjust.
	Printer	Clean and dust.
	System	Perform a diagnostics quick test.
	System	Install OS and software patches and updates.
On Failure	Floppy Disk	Clean floppy drive head.
	CDROM	Clean the pickup lens.
Yearly	Case	Open and dust.
	Mainboard	Check chips for chip lift and reseat if necessary.
	CMOS	Test the backup battery.
	Adapter Cards	Clean contacts with contact cleaner and reseat.
As Required	CMOS	Record and backup CMOS setup configuration.
	System	Keep written record of hardware and software configuration of PC system.

Figure 9: Sample preventive schedule

#### General practices for maintaining computers in good working conditions:

- Regular servicing should be done for hardware and software updates to ensure proper working conditions of the computers
- Computers require special cleaning even on the outside including hardware parts such as the mouse and keyboard to perform correctly.
- Always use optimizer utilities that modify programs to make computers to improve performance and make them to run more quickly.
- Always use and regularly updated antivirus software. Viruses and worms are horrible computer-unfriendly programs that can crash your system and cause damage.
- Avoid Installation Marathons (Installing many new programs at the same time). Sometimes, installing a new program can cause conflicts within your system. It is therefore advisable to use the computer long enough to see how your system responds to the installation before installing the next program.
- Carry out Disk Defragmentation when necessary. Disk Defragmentation is the process in which scattered pieces of individual files and free space are reorganized and stored in an adjacent manner (next to each other) on the disk.
- Defragmentation consolidates fragmented files which makes it easy to access and process them.

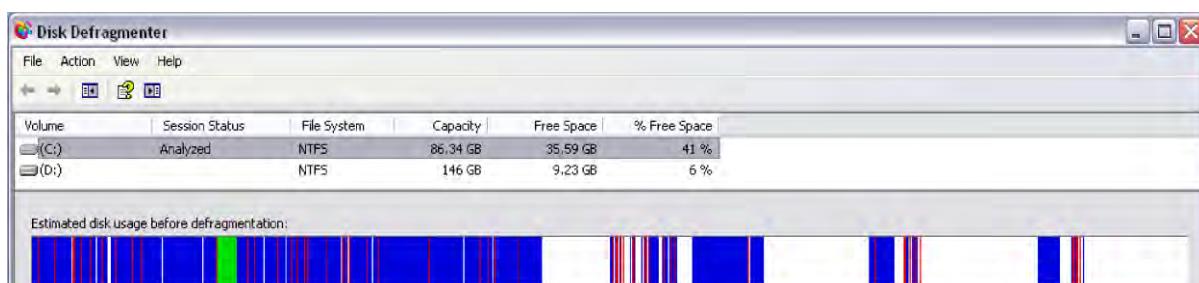


Figure 10 Status of a fragmented disk being defragmented

### 3.3.2 Cleaning of computers

Dust and debris are the PC's worst enemy. As dust builds up, caking your fans and components, the PC finds it harder and harder to aerate and stay cool. This puts an increased strain on the hardware, leading to a shorter lifespan. Regular cleaning can significantly increase the lifespan of the computer.

#### Cleaning the Case

- Setup an area where you can blow dust. You will be using compressed air and a vacuum cleaner or blower to remove the majority of the dust from the inside of your computer, so set up an area that you can blow dust out without worrying about getting other things dirty. A workbench near the window is a good choice. Try to set up a table so that you can easily access the computer without having to bend over or set it on the ground.



- Gather your supplies. You will need a screwdriver, compressed air (either in a can or via a blower), a small vacuum cleaner / blower that can fit in narrow crevices, a toothbrush, and 99% isopropyl alcohol liquid.
- Do not use an old vacuum cleaner / blower with a metal tip, as these are usually poorly grounded and can damage your components. The best option is a newer handheld vacuum cleaner / blower with an extendable plastic hose.



The toothbrush should have soft bristles, and should be new.

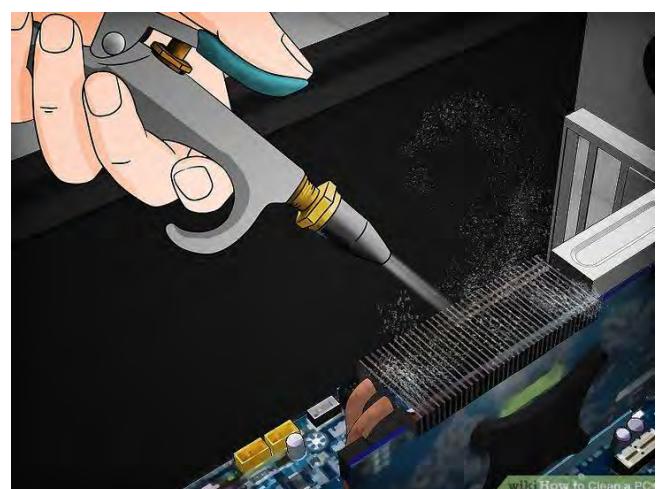
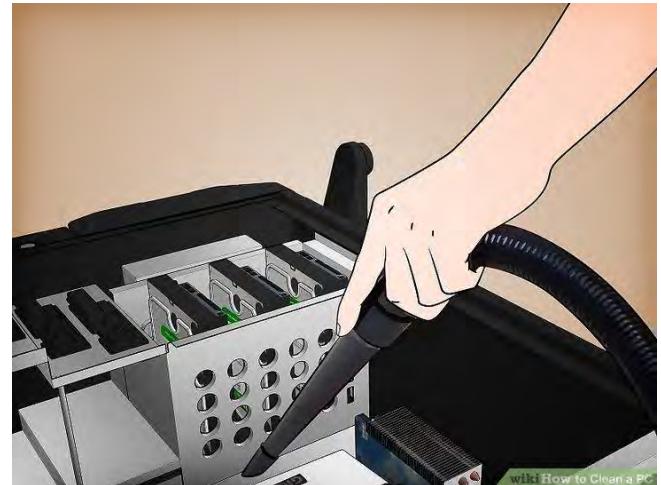
- Power down the computer and unplug all of the peripherals. Shut down your computer and disconnect all of the cables on the back. Make sure that the monitor is unplugged, and that any USB cables, Ethernet cables, speaker cables, or anything else is unplugged as well. Flip the switch on the power supply and then remove the power cable.



- Remove the side panel. Remove the screws that hold the side panel in place. These screws can be found along the back of the computer. Most modern cases have thumbscrews that you can remove without tools, though you may need to use the screwdriver for older cases or thumbscrews that are too tight.
- Set the screws aside so that you don't lose them.
- Do an initial vacuum cleaning / blowing. Depending on how long it's been and your environment, you could be greeted by a pretty gruesome sight. Dust has a tendency to collect and cake on your components, and the entire inside may be covered in a fine layer of gray. Use your vacuum cleaner / blower cleaner to do a pass over the interior, sucking up the large bits of dust from the components and crevices.

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- Be careful not to strike any of the components with the vacuum cleaner / blower tip as you move it across the interior. Many components inside are very fragile, and bent pins and connectors can render your hardware useless.
- Use the compressed air to blow dust out of crevices. Take your can of compressed air or air compressor and blow out the hard to reach crevices. Use the vacuum cleaner / blower to help reduce the amount of dust that scatters in puffs. Avoid long, sustained blasts, as this will make your can of compressed air too cold to hold. Don't blow compressed air on your fans. Blowing on the fans can make them spin faster than they are designed to, potentially damaging them.
- Remove components for deep cleaning. While a general vacuum cleaner / blower and dusting is usually sufficient for basic cleaning, you'll want to remove individual components to really get them sparkling again. Make sure that you



are properly grounded before touching any of the internal components. When you remove the components, set them on an antistatic surface, such as wood or rubber.

- You can remove the graphics card by removing the screws that secure it to the case, releasing the tab underneath, and then gently pulling it straight out. You may have to disconnect power cables in order to fully remove it.
- Removing the hard drive and any optical drives can make it easier to clean them, since they are often tucked away in hard-to-reach bays. Removing these drives typically involves opening both sides of the case so that you can reach the screws securing each side of the drive. Most optical drives are pulled out of the front of the case after the screws have been removed.
- Removing the CPU cooler will allow you to clean out the cracks in the heat sink, as well as brush the dust out of the fans. Heat sinks



attach in a variety of different ways, so make sure to consult your documentation before trying to remove it. Some require you to remove a bracket from the backside of the motherboard. If you remove the CPU cooler, you will need to apply a new layer of thermal paste to the CPU before reattaching it.

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## Cleaning the Keyboard

- Unplug the keyboard. Even if you're just planning on running a vacuum cleaner / blower over the keyboard, unplugging your keyboard first is probably a good idea. This will help reduce the chance of electrostatic discharge damage.



- Shake the keyboard upside down. Hold your keyboard upside down over a surface that's easy to clean or that you don't care about (such as outside). Run your hand over the keys while holding the keyboard upside down and shake it while you do so. You should see lots of debris shaking out.
- If you want to do a deep clean on your keyboard, you'll need to remove each of the keys so that they can be cleaned and you can access the innards of the keyboard. Removing keys is a little tedious, but can save you from needing to replace your keyboard when it gets bad.
- To remove a key, press the key in front of it down. Insert a flat object such as a car key or flathead screwdriver under the key you want to remove. Gently pry the key up until it pops off. Repeat this process until all of the keys have been removed.
- Space bars can be tricky, so you might want to leave the space bar attached.
- Take a photo of your keyboard before removing the keys so that you have an easy reference for where they're supposed to go back to.

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- Reassemble the keyboard. Once everything has been washed and been given plenty of time to dry, you can put everything back together. Rebuild your keyboard, ensuring that all of the components go back together the same way they came apart. Refer to the picture of your keyboard when reattaching the keys. You can reattach the keys by simply pressing them directly into their spot on the keyboard. Make sure that everything is completely dry and cool before putting everything back together. Any moisture can ruin the keyboard when it is plugged back in.



### Cleaning the Mouse

- Clean the buttons. Use a cloth or brush dipped in rubbing alcohol and gently scrub the buttons. Use a toothpick to run through the crevices between buttons and lift out the debris inside. Wipe down all the surfaces that get touched or rubbed during use.
- Clean the lens. Turn the mouse over and look at the lens underneath. Blow any excess debris off with compressed air, and then run a cotton swab dipped in rubbing alcohol around the lens once to remove stuck dust.



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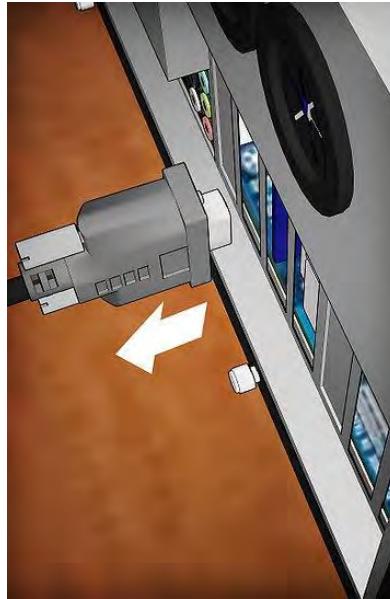
If you have a **mechanical mouse**, remove the **tracking ball** by turning the **ball-cover ring** counter-clockwise. Then clean the tracking ball and the inside of the mouse with a **cotton cloth** moistened with rubbing alcohol. **Allow all of the parts to dry** before reassembling and reconnecting the mouse. If you are connecting it to a PS/2 port, you will need to connect it **before** turning on the computer.

- Clean your mousepad. Depending on your pad, you may have accumulated a fine layer of dust and debris on the surface of the mousepad itself. Most mouse pads are safe to run through the dishwasher, though you can hand wash them as well.



### Cleaning the Monitor

- Power down the monitor. Make sure that the monitor is unplugged disconnected from the computer. This will help prevent any static buildup.
- Dust with a dry cloth. Use a microfiber or other soft cloth to very



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gently dust the screen. Do not pick at anything or try to scrub away debris. Simply run the cloth back and forth across the screen to pick up the dust. Don't use paper towels, toilet paper, or facial tissue as these are usually rough and could damage the screen.

- Make a cleaning solution. You can purchase specialized cleaning solutions, but you can quickly and cheaply make one at home by mixing distilled water and white vinegar in a 50/50 solution. Dab or spray this onto your cloth, and then gently run the cloth across the screen.
- Never spray cleaning solution directly onto the screen, as this could seep inside and damage the components. Avoid cleaning solutions with ammonia, like Windex, or ethyl alcohol.



[wikiHow to Clean a PC](#)

### 3.3.3 Installing and uninstalling system and application software

#### How to install system software

**System software** is the set of software programs that helps run the computer and coordinates instructions between application software and hardware devices. It consists of the operating system (OS) and utility programs. The operating system controls how your computer system functions. Utility programs are programs that perform general housekeeping tasks for the computer, such as system maintenance and file

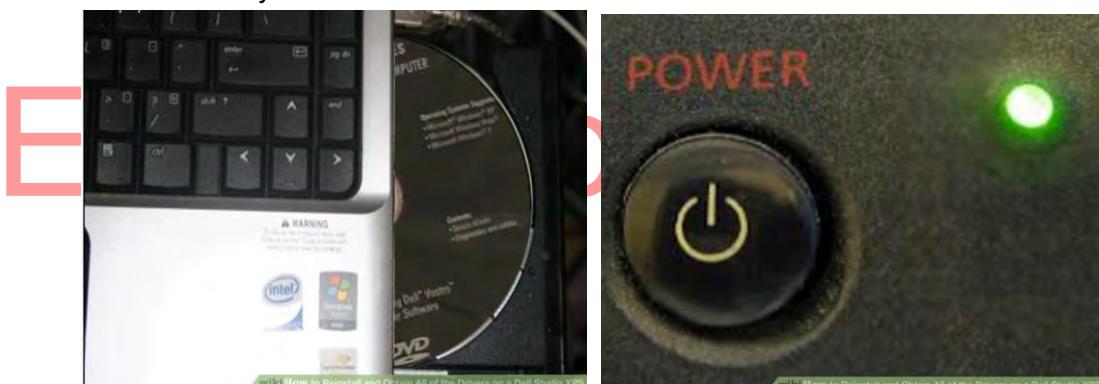
compression. Programs called **device drivers** facilitate the communication between devices attached to the computer and the OS. Device drivers translate the specialized commands of devices to commands that the OS can understand, and vice versa, enabling the OS to communicate with every device in the computer system. Device drivers for common devices are included in the OS software, whereas other devices come with a device driver you have to install or download off the internet.

This is the basic procedure for performing a clean uninstall of the Windows 7 operating system and reinstalling it via the Windows 7 DVD-ROM, and thereafter installing the drivers. Note that this is a clean format, which means that everything will be erased from your hard drive, resetting it to the factory settings.

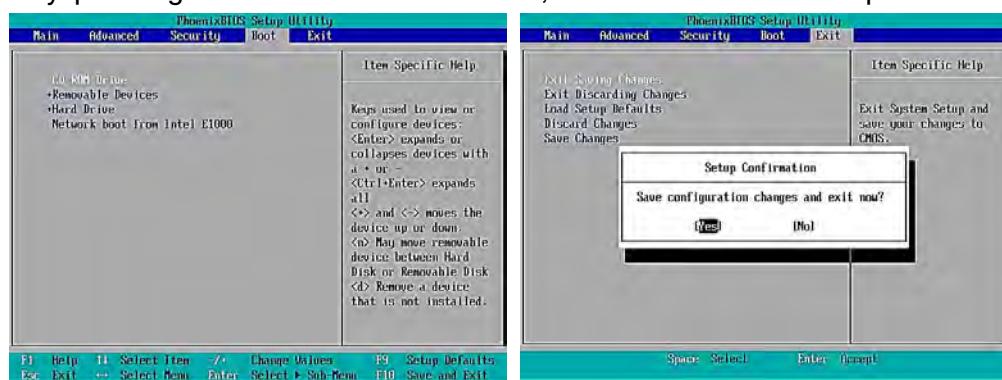
#### Materials Needed:

- Functioning Computer hardware well connected
- CD or DVD drive
- Installation discs for Operating system
- Computer Device drivers

1. Locate your Windows 7 install disc.
2. Insert it into your drive.

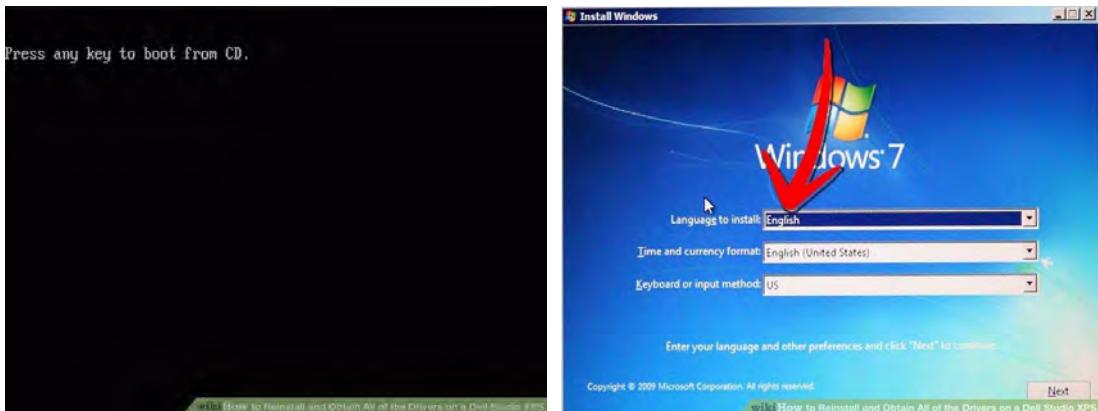


3. Turn your machine off.
4. Reboot your machine and immediately start tapping F2 which will take you to the bios setting screen.
5. Use the arrow keys to select the boot tab and press enter.
6. Use the arrow keys to go down and arrange the first option to CD-Rom/DVD-R by pressing - and +. For more details, see How to Boot Computer from CD.

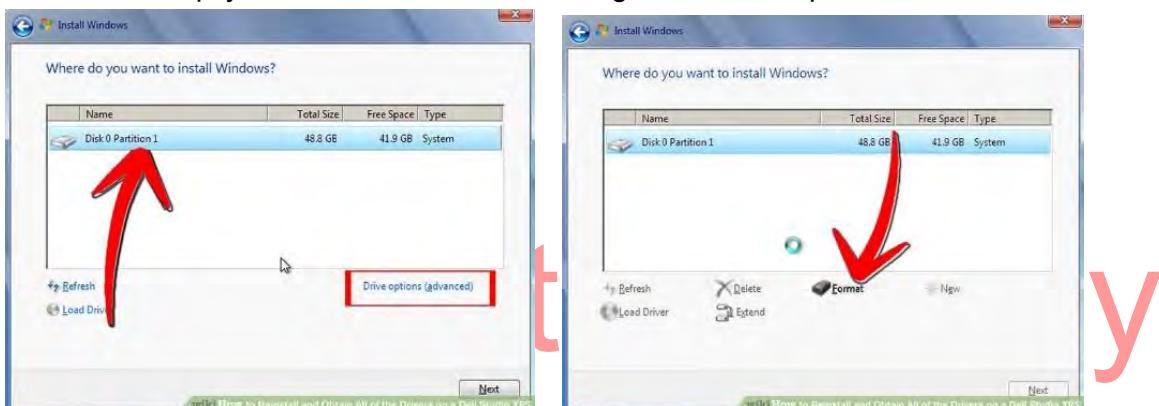


7. Press ESC and choose save settings and exit.
8. Reboot your computer with the windows 7 install disc in the drive. If you hear the disc spinning then you have done everything right up to this point.

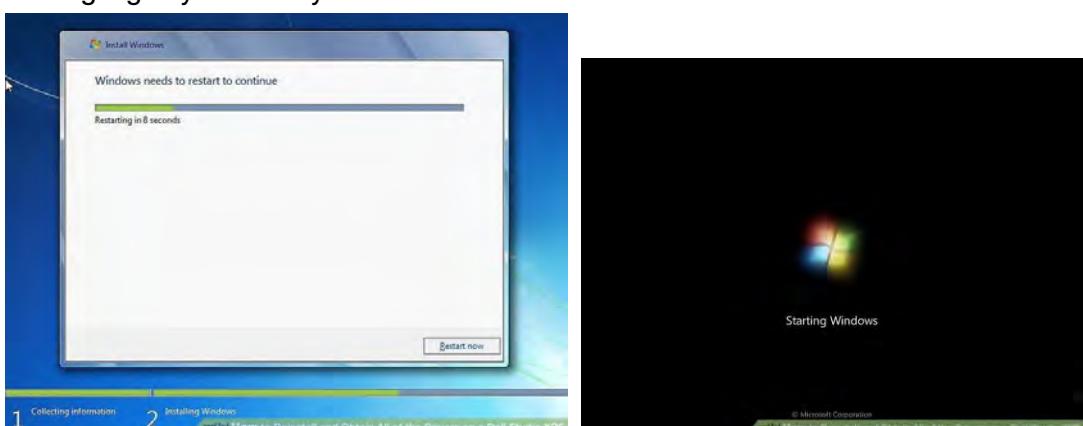
9. Wait for the underscore symbol on the top left of your screen to start flashing.
10. When it says "Press any key to boot from disc..." tap any key, a loading bar with the text "Windows is loading files" above it will appear, wait for it to load.



11. A windows 7 screen will popup with terms and conditions from the Installation Disc. Agree to all of these.
12. Back up your information before taking this next step.



13. Select the main hard drive of your computer and open the Drive options (advanced) text down the bottom of the installation.
14. Unplug all external hard drives from the USB ports. It's possible to make the mistake of erasing your backed up files in this step.
15. Select format on the main hard drive of your computer. Wait about 10 seconds, congratulations you have a new hard drive!
16. Highlight your newly formatted hard drive and click install.



17. Wait, your computer may restart several times during this installation, this is normal.
18. When it is done, restart your computer to be safe.

19. You now have a brand new computer. Setup all the files to the way you are used to.



20. Find the drivers CD that came with your computer. You can also find the drivers needed at the computer website.

21. Eject the Windows 7 Install disc and insert the Drivers disc.

22. Autorun the disc and select to install all the drivers. This may take a while but once they are completed.

23. You have successfully performed a full format and reinstall of a computer computer.

### How to install application Software

Materials Needed:

- Computer with an operating system software already installed
- CD or DVD drive
- Installation disc
- Internet connection
- Web browser

A software generally refers to any type of executable code that can be launched in a computer system. Software can be developed and distributed freely (freeware) by programmers in various communities and forums, or they can be sold commercially either online or in computer stores by software companies like Microsoft, Adobe, and Sony among others.

**Step 1:** The first most important step in software installation is to verify that the target system meets the general hardware requirements of the application. Beginning the installation in a computer machine which does not possess the minimum requirements can lead to either an unsuccessful installation or failure of the program to run after installing it.

**Step 2:** Since programs in general are written to be Operating System dependent, make sure that the version of the application you are installing corresponds to the Operating System platform running on your machine.

**Step 3:** Aside from the general hardware requirements, some computer programs also have software requirements prior to installation. Double check if you need to update or upgrade your Operating System or if there is a need to download other tools or utilities.

**Step 4:** Once all the initial requirements have been met, make sure that there are no unnecessary programs running before beginning the installation procedure. In some

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instances, applications may require that the antivirus programs be disabled. Make sure that you are installing a legitimate application before disabling your protection software.

**Step 5:** Software installation can be done either from the Internet (skip to step 8) or from an installation disc provided by the software manufacturer. To install from the disc, simply open the CD or DVD drive and insert the installer.

**Step 6:** A setup wizard window should be launched. In case there is none, open the Explorer and navigate to the optical drive. Double click on either the Autorun or Setup file.

**Step 7:** Once the wizard is running, simply follow the prompts until the installation process is completed. For novice users, accept the default values to minimize potential problems during the procedure. Jump to step 10.

**Step 8:** For installation from the Web, launch your browser application and download the setup file to your hard drive.

**Step 9:** After completion of the downloading process, run the setup program to execute the setup wizard that will handle the automatic installation of the software. Do step 7.

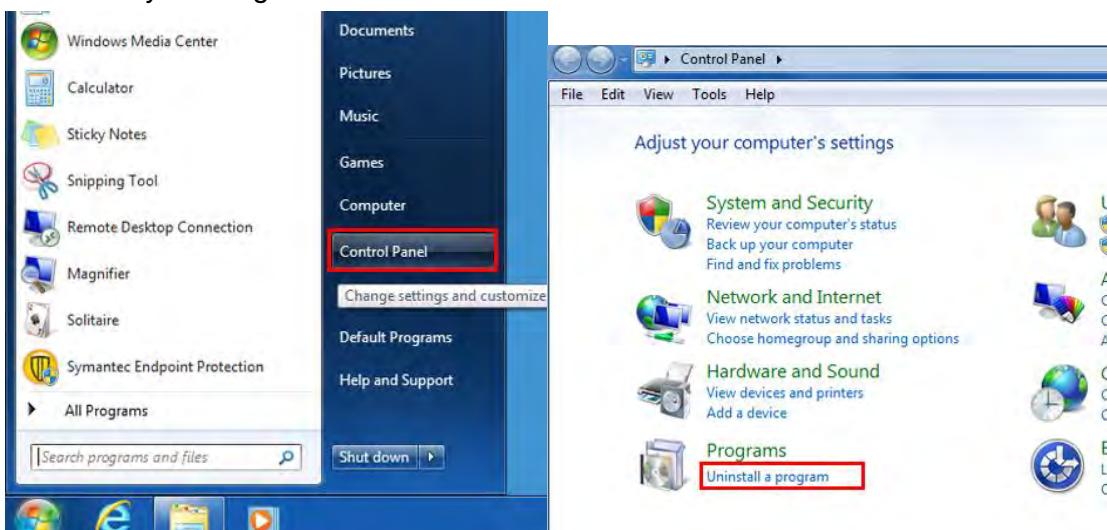
**Step 10:** After the installation procedure has been completed and the setup wizard has terminated, reboot your machine before launching the newly installed software.

### Uninstalling programs

An uninstaller is a utility that removes a program, as well as any associated entries in the system files. When you install a program, the operating system records the information it uses to run the software in the system files. The uninstaller deletes files and folders from the hard disk, as well as removes program entries from the registry. Windows Installer is an installation and configuration service for Windows. It also ensures that already installed programs can be easily removed from the system. Under no circumstances should you simply delete the program folder of the application to uninstall it, because this could leave numerous files and entries in the system, which could threaten the stability of the system.

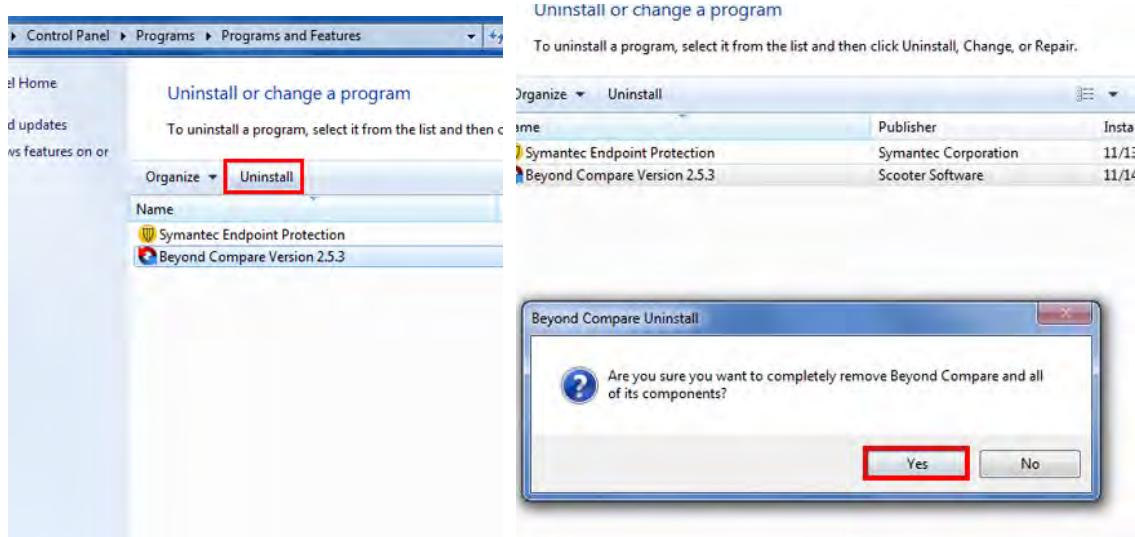
1. To uninstall an application, use the uninstall program provided by Windows 7.

Start by clicking on the Windows icon.

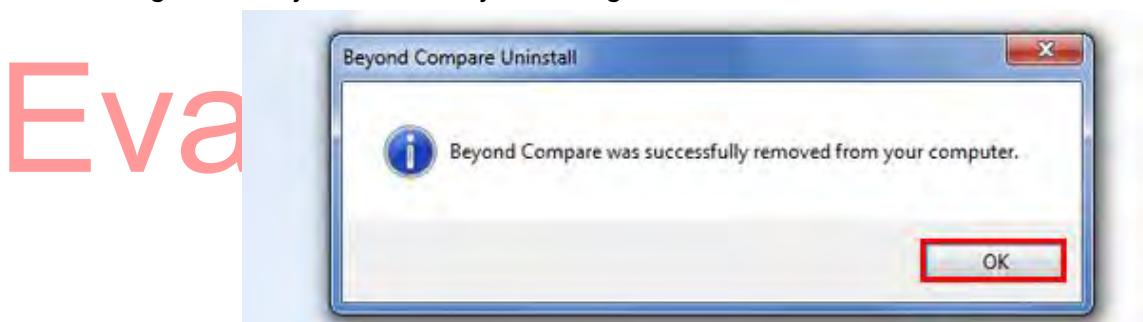


2. In the right pane, click on Control Panel.

3. Under Programs click on the item Uninstall a program.
4. Windows then lists all programs that were installed using Windows Installer.  
Select the program you want to uninstall by clicking on it.



5. Click at the top on Uninstall/Change.
6. In the next message box, confirm the uninstall process by clicking on Yes.
7. Windows now starts the uninstall process. After completion you'll receive a status message, which you confirm by selecting OK.



### 3.3.4 Updating and Upgrading of softwares

#### Software Updates vs Upgrades

Updates in computer hardware and software are patches of code that are released in order to address certain issues or to activate specific functionalities. The need to release an update stems from the fact that there are certain problems that are not apparent before the product is released. The manufacturer only discovers the problems once users report and request for help. An upgrade is the act of replacing your product with a newer, and often more superior, version or similar product. Therefore, an update modifies your current product while an upgrade totally replaces it.

When it comes to the frequency, upgrades happen a lot less often compared to updates. A necessary part of an upgrade is the addition of new features; the development of which takes time. Most respectable companies address problems quickly. Because of this, you are likely to find more than a few updates available as they come up with solutions for each problem.

For commercial software, there is also the issue of cost. Updates are always free as they are not distinct software but are only meant to modify a pre-existing installation. On the other hand, upgrades are distinct and do not need the older software to function. You can expect to pay full price for the upgrade, though some offer discounts for those who own the older version. This is not really applicable when it comes to free software as they do not cost anything to use in the first place.

When a new update is released, people are encouraged to download and install it to solve or prevent the problem. This is even more important when the update addresses a security flaw in the software that may be exploited. An upgrade only offers new features and most users who are satisfied with what they have or do not see the need to spend more, could refuse to buy the newer version. A lot of people often skip every other upgrade to minimize cost while still being able to catch-up every now and then.

**Summary:**

1. An update is a patch that is made available after the product has been released, often to solve problems or glitches, while an upgrade is the replacement of an older version of one product to a newer one
2. There could be many updates for a certain product but few upgrades
3. Updates are often free while an upgrade normally costs money
4. Updates are often mandatory / critical while upgrades are optional

**Discussion Qn:** *What are the major advantages of keeping software solutions up to date?*

### 3.3.5 Troubleshooting on computers

Troubleshooting means identifying, diagnosing and correcting hardware and software problems that may arise when operating a computer system. Troubleshooting computers can be a little frustrating and a little tricky. With so many parts and software installed, any number of things can go wrong.

There are many things that can go wrong with a computer, but the basic principle of troubleshooting computers is that always start with the simple checks. There's a tendency to assume that when something happens it's always due to a major problem, when all it could be is a loose cable or something else minor.

#### Basic Troubleshooting Steps

1. Close open programs and windows you are not currently using.
2. Make sure all of your cords are connected properly.
3. Try to repeat the sequence of commands you performed before the problem occurred. See if this causes the same response by your computer.
4. Press the F1 key to access the Help window. You can search for a solution to your problem once the Help window appears.

5. If there is an error message, record the full message for future reference.
6. Restart your computer to see if it clears the problem. To restart your computer, open the start window and select the Restart button instead of the Log Off button.
7. If restarting the computer does not clear the problem, shut down the computer and then start it back up again.
8. If the issue is still not resolved, check the common technology issues below or call your system administrator.

### Troubleshooting Common Technology Issues

Below we describe some of the most commonly encountered technology issues and troubleshooting tips.

#### **Issue: The printer is not working.**

- Check if the printer is turned on. If not, turn it on and try again.
- Check if the printer has paper. If not, put paper in the paper tray and try printing again.
- Check if the printer has a paper jam. If so, remove the paper, close the printer, and try printing again.
- Ensure that all printer cables are properly connected.
- Turn off the printer and turn on again.
- Check to see if a new printer driver is needed. Do this by going to the manufacturer's website to search for your printer model and checking for any updated driver. Seek assistance from your system administrator before installing any drivers.

#### **Issue: The computer is frozen. A program is not responding.**

- Push the Ctrl, Alt, and Delete keys at the same time. Then, start the Task Manager, highlight the program's name, and hit the End Task button.
- Perform a hard reboot by simply pressing the on/off button to turn off the computer manually. This action should only be done as a last resort if you have an unresponsive program or critical error. This process could cause data loss or corruption. Once the computer is responding again, run a virus check.

#### **Issue: The keyboard is not working.**

- Make sure the keyboard is connected to the computer. If not, connect it to the computer.
- If you are using a wireless keyboard, try changing the batteries.
- If one of the keys on your keyboard gets stuck, turn the computer off and clean with a damp cloth.
- Use the mouse to restart the computer.

#### **Issue: New hardware or software is working incorrectly.**

- Verify your computer meets the requirements of the program or utility.
- Uninstall and install the program.

- There could be a conflict with another installed program and you should contact your system administrator.

**Issue: The mouse is not working correctly.**

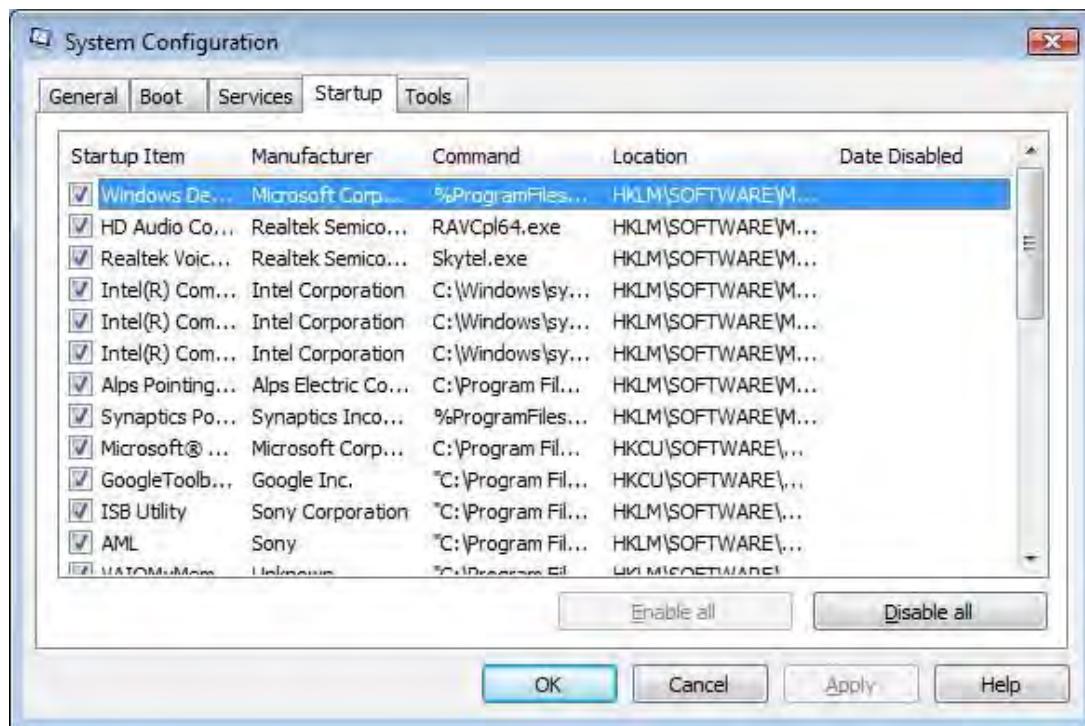
- Check if the mouse is securely plugged into the computer. If not, plug it in completely.
- Check to see if the cord has been damaged. If so, the mouse may need replacing.
- If you are using a cordless mouse, try pushing the connection button on the underside of the mouse to reestablish a connection.
- Clean the mouse, especially on the bottom.

**Issue: The computer is slow.**

- **Restart** your computer.
- Verify that there is at least 200-500 MB of free hard drive space. To do so, select Start and click on My Computer or Computer. Then highlight the local C drive by clicking on it once. Select the Properties button at the top left-hand corner of the window; this will display a window showing how much free and used space you have. If you need to recapture space:
  - **Empty your recycle bin** by right-clicking on the Recycle Bin icon (usually on the desktop), then selecting Empty Recycle Bin.
  - Check your **mail files**. Remove any large attachments and delete unused mail.
  - Images and videos take up a lot of space, so consider moving those to an **external drive**.
  - **Remove temporary files** from the Internet. To do so:
    - Click Start button | My Computer or Computer.
    - Click Open Control Panel at the top of the window.
    - Click Network | Internet |Internet Options.
    - Select the General tab and click Delete under Browsing History.
  - Perform a **disk cleanup**. To do so:
    - Click Start button | My Computer or Computer.
    - Highlight the local C drive by clicking on it once.
    - Select the properties button at the top left of the window.
    - Go to the General tab and select Disk Cleanup.
    - Once the Disk Cleanup finishes running, click on Clean up System Files; this will delete any unnecessary system-related files from your local disk.

- Information in computer files changes often, resulting in gaps or spaces within the file.
- Old or unused programs that aren't being used may still have components running behind the scenes when you start your computer, which can slow down the system. You can prevent these programs from running when you start your computer by removing unused shortcuts and turning off unused program services.
  - Remove unused shortcuts from Windows startup o Click Start button | Select All Programs | Click Startup o Right-click the shortcuts that you do not use and click delete
  - Disable unused program services o Click Start button | Control Panel | Administrative Tools | Services o For each program/service that you are certain that you do not need, click on the Service to highlight it, click the Stop link to stop the service from running, then double-click the service, choose Startup Type of Disabled, and click OK.
- Run a virus scan to remove potential viruses that can slow down your computer. A slow running computer is often due to viruses and spyware which are discussed below.
- Another cause can be programs running in the background. Many times when installing new software, by default they're designed to run when Windows starts. You can look in the tray at the bottom right of the screen to see all the installed software that's running. You can usually stop these from starting with Windows by either right-clicking on the program's icon in the tray and select its properties or options and choose not to have it begin at startup. Or open the entire program and go to the options/properties menu. Another way is to prevent programs from running at startup is to run msconfig. To open msconfig click start, search 'run', type msconfig. There you will see the same programs that are in your tray. You have the choice of disabling them all (not wise, there is certain software that needs to run when Windows starts such as anti-virus) or individually selecting the ones you don't want to start by unchecking the box next to them. After making your selection(s) click apply. Your choices will go into effect the next time you start your computer.

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Another common reason for a slow computer is not having enough RAM. Installing more can often help the problem.

#### Issue: The browser's homepage suddenly changed.

- This is a common symptom that a virus or browser hijacker may have infected the computer.
- Try re-setting the home page to the default:
  - o In Internet Explorer:
    - On the Tools menu, click Internet Options.
    - Click the General tab.
    - In the Address box, type the Web address you want for your home page. □ Click OK.
  - o In Mozilla Firefox:
    - Open the web site you want to set as your home page.
    - Click the icon to the left of the web address and drag it to the Home button.
    - Click Yes.

#### Issue: Limited Hard Drive Space:

After a long period of time, most of our hard drives contain data we no longer need or that is left over by software not completely uninstalled eventually leading to a messy drive. Given the size of modern hard drives, this is rarely an issue anymore. In any event, if you are a clean freak like me, you may want to periodically clean house. Windows built-in Disk Cleaner tool is a good way to get rid of unwanted files, although there's plenty of other software available too. And of course, you can always add an additional hard drive if you need more storage space.

**Issue: Problems after Installing New Software or Device Driver:**

Of course you should first uninstall the software or driver. Or use System Restore to return your system to a previous working state. To open System Restore or click Start -> Programs -> Accessories -> System Tools -> System Restore.

**Issue: No Power:**

The main culprit is usually the power supply unit. Make sure the power cord is securely plugged into the supply and the wall outlet. If so, you can buy a tester to see whether your Power Supply Unit is receiving and putting out enough voltage.

**Issue: Time Keeps Changing:**

If you constantly have to set the time/date clock, that's the main symptom of a bad CMOS battery. Replace it. But just like any other battery it has to be the same size. Look at the number on your battery and buy one with the same number.

**Issue: Computer fails to Boot:**

When you power on your system, the power supply sends a signal to the CPU, which receives instructions to go to the BIOS to start the boot process. Part of this process is the POST (Power On Self Test). Problems arising at this stage are almost always hardware. During the POST, devices are found and checked for errors. If everything is fine the motherboard speaker will usually sound a single, short beep and move on to loading the operating system. If something occurs you will hear some type of beep or see an error message on the screen. BIOS manufacturers have different beep codes so you will have to know which BIOS your system is using. Phoenix and AMI are the two primary makers. Award BIOS was bought out by Phoenix in 1998. You can find the type of BIOS you have by either turning on your computer (assuming of course it comes on) and looking at the top left of the screen, opening the case and looking at the BIOS chip, consulting the motherboard manufacturer or the company that built your computer.

Whichever BIOS you have, if the beep code indicates a memory or video card problem the usual solution is to check to see if they are fully seated in their slots or to replace the part. If using built-in video then it could be the motherboard. If it's a CPU beep code your processor might be overheating. Some BIOS setups are set to shut the computer down if the processor is too hot. A malfunctioning processor fan can be the culprit. Turn off the computer and remove the case door. Turn the computer back on and see if the fan is working or running slowly. If it's the fan, replace it. If not, remove the processor and see if there's any physical damage to it. Keep in mind that you will not always see physical damage on a bad CPU.

If you don't hear a beep at all, more than likely it's a failing power supply or motherboard.

Sound Codes made by a computer can help during troubleshooting:

**Double beep:** If the computer makes a double beep sound and starts/boots normally, then there is no hardware problem.

**Prolonged beep:** a continuous/ prolonged beep sound with no display means that memory is missing in the computer.

**CMOS BIOS errors:** The CMOS RAM powered by a battery stores the BIOS program which contains hardware parameters of the computer, namely: CPU speed, RAM size, HDD size, system date, boot order etc. If/when the battery loses its charge, the contents of the CMOS RAM are lost, and BIOS errors will be displayed every time you start your computer.

#### Common POST errors:

- Keyboard Failure: displayed when BIOS does not detect a keyboard on your computer during a POST.
- Incorrect system date and time.

Boot failure can be caused by

- Non-system disk placed in the USB or floppy drive, or
- Missing operating system or loosely connected hard disk

**LED (light Emitting Diode) lights:** Electronic devices including computers display lights of different colours to indicate hardware problems or a normal working state.

Computers of the Dell brand in particular, use LED lights to indicate different states/conditions in which the computer is operating as shown below.

#### Dell Diagnostic Indicator Quick Reference

##### Desktop Power Button LED Codes



Off

Blinking Amber

Solid Amber

Blinking Green

Solid Green

**Off** Check outlet and power connections.

**Blinking Amber** Power received, but not distributed correctly. Power short in component or failed power supply.

**Solid Amber** Power distributed, but data not processing.

**Blinking Green** S1 or S3 Standby ACPI State.

**Solid Green** System processing, P.O.S.T. tests have begun. Check diagnostic LEDs.

##### Diagnostic LEDS for No P.O.S.T./No Boot situations

Desktop and portable codes for models older than 2006  
(Desktop codes listed above portable codes)

Desktop and portable codes for 2006 and newer models  
(Desktop codes listed above portable codes)

	No memory modules are detected.	<ul style="list-style-type: none"> <li>If two or more memory modules are installed, remove the modules, then reinstall one module and restart the computer. If the computer starts normally, continue to install additional memory modules (one at a time) until you have identified a faulty module or reinstalled all modules without error.</li> <li>If available, install working memory of the same type into your computer.</li> <li>If the problem persists, contact Dell.</li> </ul>
	Memory modules are detected, but a memory configuration or compatibility error has occurred.	<ul style="list-style-type: none"> <li>Ensure that no special requirements for memory module/connector placement exist.</li> <li>Ensure that the memory you are using is supported by your computer (see the "Specifications" section for your computer).</li> <li>If the problem persists, contact Dell.</li> </ul>
	A possible expansion card failure has occurred.	<ul style="list-style-type: none"> <li>Determine if a conflict exists by removing an expansion card (not a graphics card) and restarting the computer.</li> <li>If the problem persists, reinstall the card you removed, then remove a different card and restart the computer.</li> <li>Repeat this process for each expansion card installed. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts.</li> <li>If the problem persists, contact Dell.</li> </ul>
	Another failure has occurred.	<ul style="list-style-type: none"> <li>Ensure that all hard drive and optical drive cables are properly connected to the system board .</li> <li>If there is an error message on the screen identifying a problem with a device (such as the floppy drive or hard drive), check the device to make sure it is functioning properly.</li> <li>If the operating system is attempting to boot from a device (such as the floppy drive or optical drive), check system setup to ensure the boot sequence is correct for the devices installed on your computer.</li> <li>If the problem persists, contact Dell.</li> </ul>

Figure 11: Diagnostic LED lights for DELL computers

Another cause for boot failure could be a malfunctioning device. Turn off the computer and disconnect all devices. Reinstall each device one by one, turning on the computer after each device. Should your system not come on after installing a particular component, replace it.

If your system doesn't come on after reinstalling every device, you may have a motherboard or CPU problem.

**NOTE:** Backing up your important computer files to another source will ensure that if your problem cannot be corrected, you will still have a safe copy of your information.

### 3.3.6 Fine-tuning the system

All computers eventually lose that day-one luster, becoming lethargic, unresponsive, and even unreliable. The operating system gets gunked up as apps are added and incompletely deleted, leaving behind drivers and all sorts of other system detritus. Their hard drives fill up with forgotten files we've abandoned in folders whose existence we've forgotten. Programs build up enormous caches behind the scenes that we don't even know about. Eventually, our full hard drives choke the OS as it tries to run. Outdated drivers cease to work correctly. Toolbars and other nasty plug-ins can precipitously slow our browsers to a crawl.

### Using Tune-up Utilities



A PC tune-up utility is an application that digs deep into your computer and fixes trouble areas. It performs several functions, including defragmenting your PC's hard drive, repairing the incredibly problematic Windows Registry, and freeing up disk space by deleting useless and duplicate files. Some tune-up utilities perform just those basic functions, while more elaborate ones add numerous features that improve your computer in interesting ways.

AVG TuneUp, for example, offers multi-platform protection with a suite that includes Android, Mac, and Windows tools. SlimWare Utilities SlimCleaner has Instant Alerts, tools that leverage community recommendations to notify you that unwanted software, such as a toolbar that came packaged with an application, tries to insert itself into the boot process. Other examples of Tuneup / Optimiser utilities include CCleaner, Ashampoo WinOptimizer and Comodo PC Tuneup.

In addition, many of the utilities automatically fetch new drivers so that your hardware runs at peak performance.

#### **Other measures one can do to tune-up the system include the following**

- Remove temporary files. Access the "Start" menu and select "All Programs." Click on "Accessories" and then "System Tools." Choose "Disk Cleanup" to scan the computer for unnecessary files that can be deleted. Select the files you would like to remove and click "Delete files."
- Run Check Disk. Click the "Start" button and then select "Computer." Right-click the the drive you would like to check and then select "Properties." click the "Tools" tab and then select "Check now" to check the disk for errors. Choose "Automatically fix file system errors" and "Scan for and attempt recovery of bad sectors" from the available options to check for both file errors and physical flaws in the disk.
- Using the Performance troubleshooter: The first thing that you can try is the Performance troubleshooter, which can automatically find and fix problems. Open the Performance troubleshooter by clicking the Start button The Start button , and then clicking Control Panel. In the search box, type troubleshooter, and then click Troubleshooting. Under System and Security, click Check for performance issues.

- Delete programs you never use
- Limit how many programs run at startup
- Defragment your hard disk
- Clean up your hard disk
- Restart regularly
- Add more memory
- Change the size of virtual memory

### 3.4 Review Questions

1. Define the term computer laboratory
2. Mention four factors to consider when preparing a computer laboratory.
3. Why must there be safety rules and precautions in a computer laboratory? List any three reasons.
4. List down two reasons as to why power cables in the computer laboratory need to be properly insulated.
5. Mention two reasons as to why computers need a stable power supply.
6. Suggest two ways through which good air circulation can be achieved in a computer laboratory.
7. Suggest two reasons why standard furniture must be provided for a computer laboratory.
8. Mention five ways through which computers can be kept safe.
9. Define the following terms
10. a) Computer literacy (b) Disk Defragmentation
11. Suggest any ten rules and regulations that must be followed when in a computer laboratory.
12. Your school headmaster wants to setup a new computer laboratory. Explain the requirements needed to setup the laboratory.
13. Suggest any five factors to be considered when buying computers.
14. Identify any five devices used in computer laboratory maintenance and safety.
15. How can physical security be achieved so that access to computers and data centers is regulated?
16. Explain any four software security measures that can be enforced in the computer laboratory.
17. A computer is running too slow. Mention any five troubleshooting steps you can undertake to identify and correct the problem.

## Topic 4 COMPUTER WORD PROCESSING

***Recommended Coverage Duration: 12 periods (2 weeks)***

### **Guidance to the Teacher**

- Although you are at liberty to decide on the word processor to use, make sure it has all the features required by this syllabus.
- Provide time for your learners to practise and develop skills in printing a variety of styles.
- Word processed documents involving equations should be considered to allow use of the equation editor.
- Proofreading a document includes consistent line spacing, consistent character spacing, re-pagination, removing blank pages, removing widows/ orphan tables and lists split over columns or pages.

### **Suggested Competences for Assessment**

- Assess the learners' ability to identify, open and close a Word processing software on computer systems.
- Choose appropriate word processing software basing on the features for a given task.

### **Background**

- Computer word processing encompasses production of professional looking documents like letters, memos and circulars. In a typical office where many documents are typeset, formatting and editing of such documents becomes a nightmare where manual modes of document production, filing and transmission are used.
- In order to minimise and eliminate such hassles, several electronic devices and services by computerised systems and electronic typewriters have been developed for more efficiency and effectiveness in document production.
- Computerised word processing systems have got easy to use document edit and format features capable of making documents look more and more business like if well mastered. Some people and organisations earn their living by producing documents for others using computerised systems.
- Therefore, it is important that our learners are introduced to the basic practical knowledge and skills of word processing in order to be able to produce, and communicate documents better.

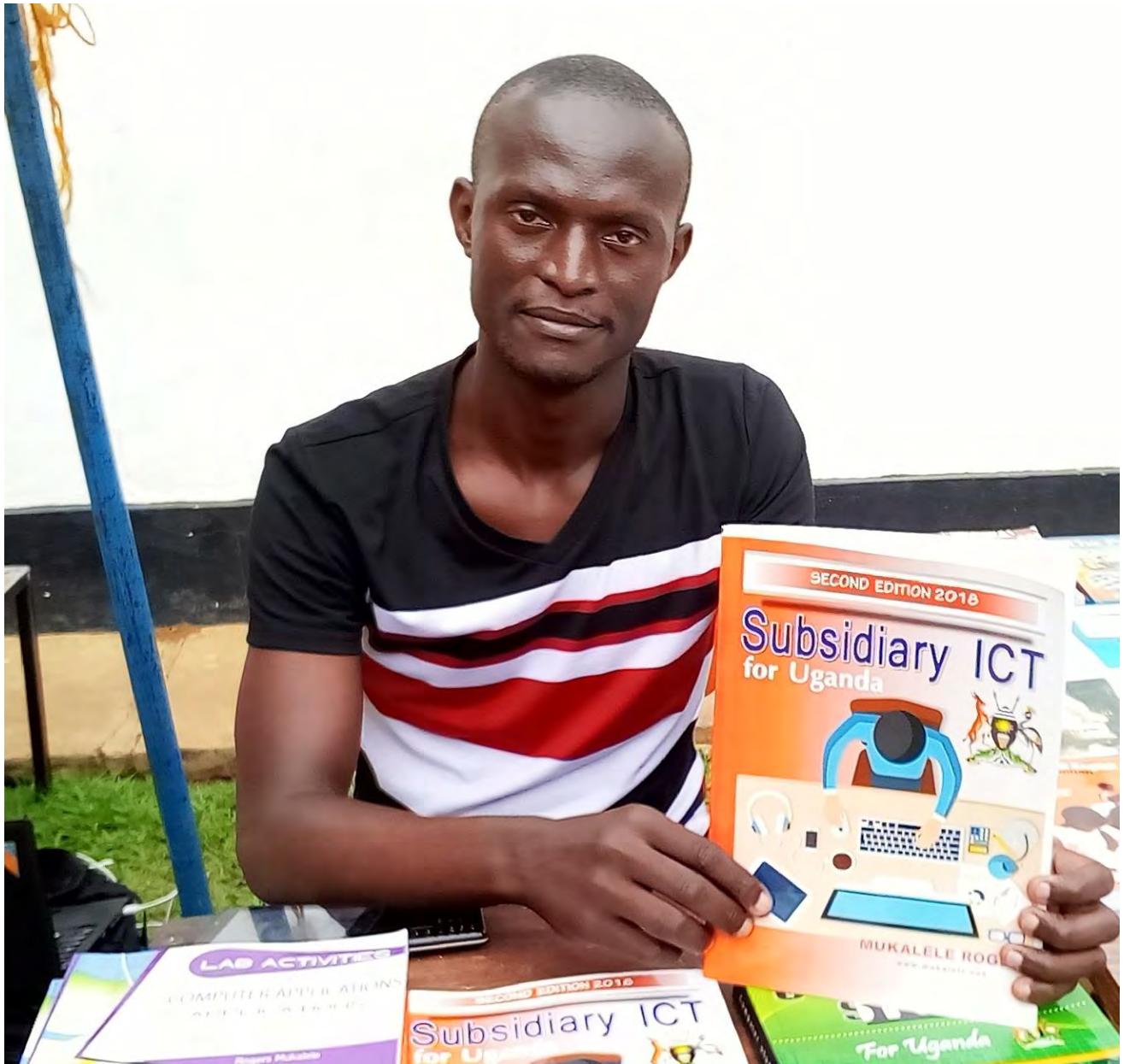
**Learning Outcome:** The learners should be able to demonstrate basic knowledge and skills in document production.

### **4.1 Introduction to Word Processing**

#### **Sub topic Objectives:**

1. Defining the concept of word processing.
2. Describing various examples of word processors (Ms. Word, Abiword, OpenOffice.Org Writer, Latex editor and Lyx).
3. Opening a word processor.

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### Wildcards for partial matching

Access allows the use of **wildcards** that represent one or more characters when specifying criteria. When using wildcards, the expression must be preceded by the keyword **Like**.

The asterisk symbol \* matches 1 or more characters:

- Like “ch\*” would return any names that begin with Ch such as Charles and Charlotte.
- Like “\*.co.uk” would return any email addresses that end with .co.uk.
- Like “\*Theory\*” would return ‘Quantum Theory for Beginners’ and “Thermodynamics Theory”.

A question mark ? will match a single character:

- Like “al?n” would return ‘Alan’ and ‘Alun’ but not ‘Allen’ Square brackets [] are used to match a list or range of values:
  - Like “[a,e,i,o,u]\*” returns any value beginning with a vowel.
  - Like “[a-d]\*” returns any value beginning with the letter a,b,c or d.

To exclude a character use the ! symbol:

- Like “[!a]\*” returns all values that do not begin with the letter a.

### Calculations in Queries

A query can carry out various operations, including calculations, on the data retrieved from tables and display it in a temporary field. In Access this is done by entering the details in an empty column in the QBE grid:

- The name of the temporary field must be followed by a colon
- Fields used in the expression must be present in the tables in the query and field names must be enclosed in square brackets
- Additional text must be enclosed in double quotes and the ampersand character (&) used to join items
- Further manipulation, including fields can be carried out in reports and forms

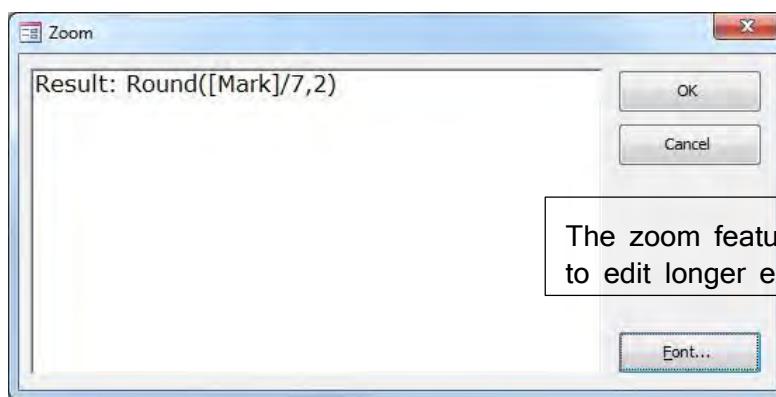
	Existing fields	Temporary, calculated field named 'Markup'
Field:	LoanID	
Table:	LoanItems	
Sort:	Title	
Show:	Artefacts	
Criteria:		[Value]*10/100

### Zoom feature

To help with editing expressions in the **Field** row you can zoom the contents:

- Right-click on existing contents in the Field row and choose **Zoom...** or whilst editing contents in the Field row use **SHIFT + f2**

The contents are shown in a pop-up dialogue and can be edited here. Use the Font... control to change the display in the zoom control (this doesn't affect the query display).



### Calculated fields with numeric data

- The common arithmetic operators can be included (+ - \* / ^)
- Brackets can be used to control the order of precedence or avoid ambiguity
- Numbers can be used but must not be enclosed in quotes
- Mathematical functions such as Sqr() or Round() can be used

Examples:

[Cost] \* [Quantity] \* 10%

[Price] - [Discount]

Round([Mark])/5,

2) Date() + 14

### Number format

If the result is of a query will be used to generate a report or form (see later) then you would probably want to decide on number formats at this later stage.

However, if you need to control the number format for the datasheet view of a query, you can do this via the query properties.

- 1 With the query in design view, select **Query Tools > Design > Show/Hide > Property Sheet** to view the properties sheet.
- 2 The property sheet will always show properties for the current object - click anywhere in the field to be formatted to show the property values for this field.
- 3 On the **General** tab, choose the appropriate format from the Format dropdown. If you choose **Fixed** decimal places, also enter the number of decimal places to display. Access will round values correctly when using this option.



The format of individual fields can be configured using the properties sheet

#### 14.2.4 Reports

Reports offer a way to view, format, and summarize the information in your Microsoft Access database. For example, you can create a simple report of phone numbers for all your contacts, or a summary report on the total sales across different regions and time periods.

##### Create a report in Access

You can create reports for your Access desktop database by following the steps below:

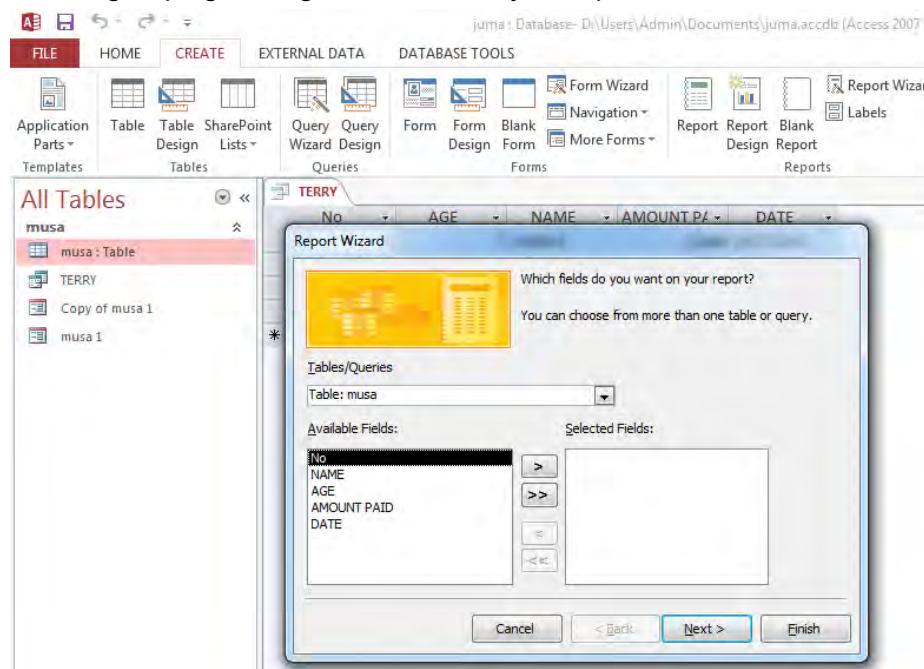
###### Step 1: Choose a record source

The record source of a report can be a table, a named query, or an embedded query. The record source must contain all of the rows and columns of data you want display on the report.

###### Step 2: Choose a report tool

The report tools are located on the Create tab of the ribbon, in the Reports group. Report tools include:

- Report - Creates a simple, tabular report containing all of the fields in the record source you selected in the Navigation Pane.
- Report Design - Opens a blank report in Design view, to which you can add the required fields and controls.
- Blank Report - Opens a blank report in Layout view, and displays the Field List from where you can add fields to the report
- Report Wizard - Displays a multiple-step wizard that lets you specify fields, grouping/sorting levels, and layout options.



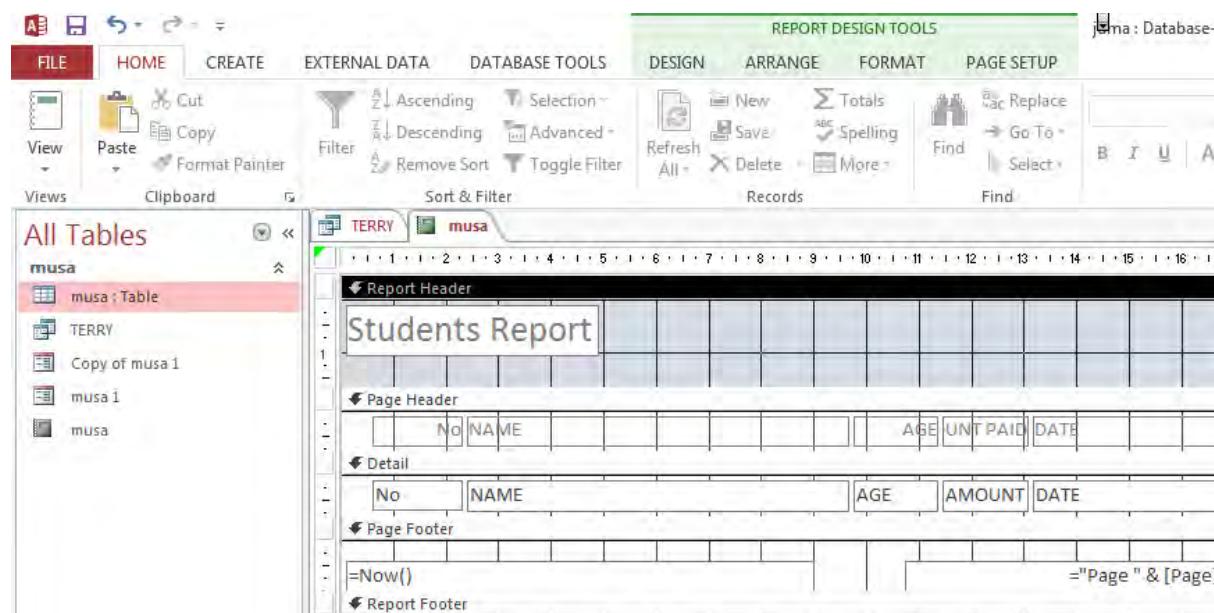
###### Step 3: Create the report

- Click the button for the tool you want to use. If a wizard appears, follow the steps in the wizard and click Finish on the last page.
- Access displays the report in Layout view.

- Format the report to achieve the looks that you want:
- Resize fields and labels by selecting them and then dragging the edges until they are the size you want.
- Move a field by selecting it (and its label, if present), and then dragging it to the new location.
- Right-click a field and use the commands on the shortcut menu to merge or split cells, delete or select fields, and perform other formatting tasks.

### Add a logo or background image

- You can add a logo or background image to a report and If you update the image, the update is automatically made wherever the image is used in the database.
- To add or remove an image:
- In the Navigation Pane, right-click the report and click Layout View.
- In the report, click the position where you want to add the image and on the Design tab, in the Header/Footer group, click Logo.
- Navigate to the image, and click Open. Access adds the image to the report.
- To remove the image, right-click the image and click Delete from the shortcut menu.



### Preview and print a report

#### Preview a report

- Right-click the report in the Navigation Pane and click Print Preview. You can use the commands on the Print Preview tab to do any of the following:
  - Print the report
  - Adjust page size or layout
  - Zoom in or out, or view multiple pages at a time
  - Refresh the data on the report
- Export the report to another file format.
- Click Close Print Preview.

### Print a report

- To print a report without previewing it:
- Right-click the report in the Navigation Pane and click Print. The report is sent to your default printer.
- Note: If you select the report in the Navigation Pane and select Print from the File tab, you can select additional printing options such as number of pages and copies and specify a printer.
- To open a dialog box where you can select a printer, specify the number of copies, and so on, click Print.

## 14.3 Practical Database Project and Exercises

### Project Objectives:

- Create a sample school database
- Create related students and results tables
- Create data entry forms
- Generate queries for results, totals, age and average
- Design students' reports.

The syllabus advises teachers to prepare a project activity for learners to keep adding on to their skills as they progress with the topic. A suitable project would be creating a simple student admission and academic report making system for a School such a primary school.

To do such a project, students will have to first learn how to create relationships between tables in a database.

### 14.3.1 Understanding Table Relationships

**Linking Tables** tells Access how two tables are related to each other. The fields that you use to link two tables must contain the same concept in two different tables. *Primary key and foreign* fields are often used when linking tables.

- **Primary Key:** Is a field which uniquely identifies each record in a table. It stores unique record identification numbers different from one another eg social security number, Reg No., etc.
- **Foreign Key:** A field in one table that acts as a primary key of another related table.
- **Relationship:** A relationship is defined an association or link among entities i.e how data in one table are related to data in another table.
- **Candidate Key:** - It is a field with unique values that can act as a primary key though it is not set as a primary key.

### To create relationships:

1. Click the **Data Tools** tab on the Ribbon and click the **Relationships** button in the Relationships group.

2. If necessary, click the **Show Table** button in the Relationships group on the Design tab. In the Show Table window, select a table you want to link, click the **Add** button, and repeat for each table. Click **Close**.
3. Drag a field from one table and drop it on the related field in the second table. (Optional) Check the **Enforce Referential Integrity** box. Click **Create**.

### Types of Relationships

There are three types of relationships namely;

- One-to-one (1:1),
- One-to-many (1:M) and
- Many-to-many (M:N).

(a) **One-to-one:** where a particular field in one table has only one matching record in the other table and vice-versa. E.g One Office is occupied by only one manager who is placed there.

Examples of One-to-one (1:1) relationships include;

- One office manager heads one office
- One vehicle ID number is assigned to one vehicle
- One driver drives one delivery truck.
- One faculty member is chairperson of one department

(b) **One-to-many Relationship:** Means that for one field in one table, there are several matching records in the other table. Examples of one-to-many (1:M) relationships include;

- Sex /gender (F/M) is shared by many persons.
- One book publisher can publish many books.
- One lecturer / teacher teaches many students.
- One doctor attends to many patients.

(c)**Many-to-many:** Where a field in one table contains many records that have many other matching records in the other table. This type of relationship is rare and difficult to process.

- A student enrolls in one or more classes, and each class has one or more students registered
- A passenger buys tickets for one or more flights, and each flight has one or more passengers
- An order lists one or more products, and each product is listed on one or more orders

### 14.3.2 Guidelines for school marks database project

- The students should brain storm and design a database with at least two related tables, such as the Students and Marks table.
- Possible attributes for student table would be Admission No, (Primary Key), Name, Class, Sex, Date of Birth and House.

- Possible attributes for the Marks table would be Admission No (Foreign Key but also Primary Key for a 1-1 relationship), Math Mark, English Mark, Science Mark and SST Mark.
- Students would then create a mark entry form for entering the marks, linked to the students table.
- A query can be used to calculate totals and average of the four marks fields.
- A report card can then be designed, based on the queries, and the school logo can be included in the design to give the students the recommended project-based hands-on practice for this topic.

### 14.3.3 Additional Practical Exercises

Students should practice by doing lots of exercises to master this topic. Below are some exercises.

#### Exercise 1

(a) Create a database structure (table) using appropriate data types in relation to the table given below. Set staff No. as the primary .Save the table as staff table.

Staff NO.	Surname	First Name	Sex	Department	Salary
UTS523	Natukunda	Halima	F	Physics	275,000
UTS452	Kawuma	Musa	M	Chemistry	265,000
UTS105	Kavuma	Jamil	M	Economics	500,000
UTS358	Namuli	Mariam	F	Physics	275,000
UTS465	Biriggwa	Imran	M	Economics	490,000
UTS256	Namagembe	Nhuru	F	Chemistry	310,000
UTS145	Kalungi	Badru	M	Economics	850,000
UTS107	Mwesigwa	Johnan	M	Physics	290,000
UTS397	Kakaire	Ibrahim	M	Chemistry	540,000

- (b) Create a form using the staff table in (a) above and use it to input the records above. Save the form as staff form.
- (c) Create a query showing staff no, surname and department to filter out only staff in physics department. Save it as query 1.
- (d) Create a report-using query 1 table.
- (e) Create another report, which will produce a list of staff that are in Economics department earning a salary of less than Sh.600, 000.

#### Exercise 2

Jinja Movie Library (JML) keeps a database of members who have taken movies on a computer system as shown below:

CODE	NAME	GENRE	CHARGE	CLEARED?	PHONE NO	BIRTH
M1001	Muwanguzi	Nigerian	Shs. 3000	<input type="checkbox"/>	0773294625	11/Dec/97
M1011	Kitamirike	Horror	Shs. 2000	<input type="checkbox"/>	0712453674	04/Jan/88
M1025	Mukasa	Horror	Shs. 1000	<input type="checkbox"/>	0772756484	15/May/86
M1037	Olietho	Action	Shs. 1500	<input type="checkbox"/>	0782759815	18/Feb/96

M1057	Matende	Action	Shs. 4500	□	0702456785	21/Jul/90
M1073	Ochieng	Nigerian	Shs. 1500	□	0753297684	09/Feb/98
M1096	Musasizi	Action	Shs. 2500	□	0712765492	03/Sep/87
M1102	Onyayo	Horror	Shs. 4000	□	0792451843	22/Apr/95
M1124	Ashaba	Nigerian	Shs. 1500	□	0773298746	14/Apr/99
M1139	Dramani	Horror	Shs. 1000	□	0702768798	09/Jan/94

(a) Create a table called 'Members' to store the above data. (7 mks)

(b) Create a data entry form. Save it as **MemberCard** and use it to populate the above table. (5 mks)

(c) Using paint program or otherwise, create a graphic logo with the initials **JML** and insert it into the **MemberCard** form design. Add your name as form footer and print out a hardcopy. (6 mks)

(d) Create a query called **ChargeOver2k** that will filter the members who have taken movies for charges greater than Shs. 2000 and have not yet cleared. (3 mks)

(d) Create a query called **Adults** to filter out members of 18 years and older. (3 mks)

(e) Create a report of all the members grouped according to GENRE and sorted by their phone numbers in ascending order. Save it as **Customer Report**. (3 mks)

(f) Add your name and index number as footer to the report in (e) above and print it.

(g) Save your database as "jml DATABASE" (1 mk)

Create a report for the table.

### Exercise 3

The table below gives the information about some employee members of "Kamukamu Enterprises"

No.	Employee Name	Gender	District of Origin	Date of birth	Amount paid
C001	Kainza Moses	Male	Wakiso	23/11/1988	25,000
C002	Aine James	Male	Kampala	03/07/1979	70,000
C003	Agero Jalia	Female	Mpigi	12/02/1990	32,000
C004	Sarah Fayi	Female	Wakiso	28/12/1975	25,000
C005	Nanono Jane	Female	Kampala	18/11/1991	20,000
C006	Mansa John	Male	Mpigi	20/07/1990	84,000
C007	Muhire Mary	Female	Wakiso	03/04/1980	40,000
C008	Opio Mark	Male	Kampala	17/09/1975	24,000
C009	Sempa George	Male	Mpigi	12/05/1990	15,000
C010	Nakito Agram	Female	Wakiso	09/08/1979	38,000

i) You are required to design a suitable database to manage the above information.

Name your table as Employee table and the database as "**employee Database**" (10 mks)

ii) Create a query to find all male employees who were paid less than 30,000. (05 mks)

iii) Create a query to show all the employees who were born in the year 1990. (05 mks)

iv) Create a form in design view to show all the employees in a company. (05 mks)

v) Create a report showing employees names, gender, district of origin and amount paid.

**Exercise 4**

Carefully study the information given below.

StudentID	Surname	FirstName	Sex	Club	Donation
BCM652	Kamusime	Edwin	M	Interact	5000
BCM441	Moreri	Juliana	F	Debating	6300
BCM102	Mugerwa	Ronald	M	Writers	5500
BCM333	Akena	Kennedy	M	Interact	2200
BCM459	Kakaire	Musa	M	Writers	3600
BCM245	Ssentongo	David	M	Debating	9900
BCM134	Babibye	Lonah	F	Writers	5500
BCM101	Namulondo	Mary	F	Interact	6600
BCM376	Kafuko	Ivan	M	Debating	4700

**Required**

- (i)Design a suitable database to manage the above information, name the Database BCM DATABASE. (02 mks)
- (ii)Create a table using Design View, and name it STUDENTS TABLE. (08 mks)
- (iii)Create a form called Students Entry Form and enter the above records. (06 mks)
- (iv)Create a query displaying all the fields in the above table to filter out only students who are females. Save it as Females. Print the query and its output. (03 mks)
- (v)Create another query displaying all the fields of students with donations 5000 and above. Name it 5000 Plus. Print the query and its output. (03 mks)
- (vi)Create a query displaying all the fields in the above table to filter out only students whose donations are between 2200 and 9900. Name it Donations between 2200 and 9900. (02 mks)
- (vii)Create a query to filter out the students who donated at least 5000 in Interact and Writers clubs. Name it Interact and Writers. Print the query and its output. (03 mks)
- (viii)Create a report using Donations between 2200 and 9900 query. Name it **Report Between**. Print the report. (03 mks)

**Exercise 5**

The database manager of Hiltop dairy farm provides the following data relating to farm animals. From the data below, create a database with a file name 'Hiltopdiaryfarm' (04 )

Animalid	Name	Average	water	Milk	letdown	per
HDF/00	Sandra		23		54	
HDF/00	Immaculat		45		32	
HDF/00	Diana		67		36	
HDF/00	Africa		65		11	
HDF/00	Uganda		43		34	
HDF/00	Moreen		43		54	
HDF/00	Amina		21		33	
HDF/00	Agnes		12		12	
HDF/00	Deborah		32		34	
HDF/01	Lilian		42		54	
HDF/01	Hope		34		32	

**Instructions:**

- a) Create a table with a file name 'hiltopdf'. (02 mks)
- b) Insert a primary key using a relevant field name. (02 mks)
- c) Generate a form in design view for use while entering data into the table. Save it as 'hiltopdf'. (04 mks)
- d) Create a new field on your form for amount and label it Gross Amount and save it as 'hiltopdf'. (02 mks)
- e) Given that each litre is sold at shs. 800; create a formula that will return total milk sales expected from each animal. (04 mks)
- f) Enable the ',000' (separators) to be returned on your form. (02 mks)
- g) Insert a header of your form 'Milk summary'. (02 mks)
- h) Create a query to return animals whose average milk letdown per week is greater than 32 litres. Save it as 'letdown'. (03 mks)
- i) Create a query to return animals whose names begin with letter A. Save as 'letterA' (02 mks)
- j) Print all your work.

**Exercise 6**

The table below shows records of a District Health Centre in terms of:

Registration Number of the Patients, name of the patient, Sex, Date Admitted, Ward allocated and Diagnosis results of the Patient.

Reg. No	Name	SEX	DATE IN	DIAGNOSIS	WARD
1000	Nansimbe Joanita	F	14 May 02	Malaria	2A
1001	Kikomeko Juliet	M	14 May 02	Pregnant	5B
1002	Wandera Noah	M	15 June 02	Pneumonia	4C
1003	Suuna Abdu	M	17 June 02	TB	4C
1004	Kiwoola Sheila	F	20Jun02	Malaria	2A
1005	Lubega Fatuma	F	14 May 02	Pregnant	5B
1006	Acheng Florence	F	14 Apr 02	Malaria	2A
1007	Mugisha John	M	22 May 02	Cholera	2B
1008	Lubega Boaz	M	17Jun 02	Bronchitis	4C
1009	Nyacheng Jovana	M	13 Aug 02	Malaria	2A

- i. Using any Data base management program, create a table called "In Patients" with the following fields: Reg. No, Name, Sex, Date In, Diagnosis and Ward. Use appropriate data type.
- ii. Using a data sheet, enter the data above in the table you have created.
- iii. Create a Query for FEMALE patients who were allocated WARD 5B.
- iv. Create a report showing MALE patients who were diagnosed with MALARIA and allocated WARD 2A.
- v. Create a Query for the patients whose first names begin with F and J, then name it "FJ" together with their Diagnosis and Wards.
- vi. Save your work as "In Patients" and make a print out

### **Exercise 7**

The table below gives information about a small home business in Kampala. Study the tables carefully to answer their related questions.

**Table (1): Transaction table**

TransID	Qty Sold	Trans Date	Price	CustID	ProdID	Total Amount
T1120	500	20-01-13	200	C2240	P3200	
T1121	325	21-01-13	400	C2241	P3201	
T1122	425	22-01-13	450	C2242	P3202	
T1123	150	23-01-13	120	C2243	P3203	
T1124	85	24-01-13	250	C2244	P3204	
T1125	450	25-01-13	800	C2245	P3205	
T1126	512	25-01-13	500	C2246	P3206	

**NB:** Total Amount is a product of “*Price*” and “*Qty Sold*”

**Table (2): Customer Table:**

CustID	CustName	Gender	CustPhone	CustLocation
C2243	Titus	M	+254 147 258	Kisumu
C2240	Timothy	M	+256 441 312	Kampala
C2242	Theresa	F	+256 143 100	Mbarara
C2241	Joweria	F	+250 190 654	Kigali
C2245	Teddy	F	+255 329 220	Dar es salam
C2244	Tobias	M	+254 198 909	Nairobi

You are required to:

- i) Create a database and save it as “HomeInventory” in the folder you created.
- ii) Design table 1 assigning appropriate data types, and using a look up wizard for the “Gender” field.

- iii) Design table 2 assigning appropriate data types
- iv) Create a simple one to many relationship between the two tables.
- v) Create a query for Kampala and Kisoro customers, and save it as “Royals” with fields of; CustID, CustNames, CustPhone, CustLocation, and Qty bought.
- vi) Create a calculated query to return the “Total Amount” of the products sold. Save it as “Calc Query”.
- vii) Query table 1 and get out those transactions that took place between 21st January and 25th January. Save it as “Early bird”.
- viii) Create a report using table1 (Register) and save it as “My Report”.

### **Exercise 8**

The table below shows details of employee designations for Busoga College Mwiri.

<b>Emp No.</b>	<b>Surname</b>	<b>Sex</b>	<b>Title</b>	<b>Department</b>	<b>Salary</b>	<b>D.o.B</b>
	Aduwo	F	Deputy	Administration	620,000	17-06-36
	Holowo	F	Teacher	Business	510,000	06-08-77
	Wapakabulo	M	Teacher	Business	600,000	05-06-70
	Nakumusana	F	Secretary	Information	275,000	20-07-36
	Komakech	M	Teacher	Business	500,000	15-06-63
	Mutebi	M	Director	Administration	1,000,000	17-07-66
	Ndaula	M	Cashier	Administration	600,000	14-04-68
	Okello	M	Driver	Administration	265,000	16-05-63
	Aliyo	F	Secretary	Computing	275,000	20-08-70
	Nasuuna	F	librarian	information	310,000	07-11-74

**Note:**

Emp No. Represents Employee Number, which should be automatically generated as a random auto number in the format of MC001; D.O.B Represents Date of Birth. Salary is in UGX.

- a) You are required to design a suitable database to manage the above information, name the database **EMPLOYEE DATABASE**.
- b) Create a table using Design view, and name it **EMPLOYEE TABLE**.
- c) Create a form called **Employee Form** and enter the above records.
- d) Create a new table **EMPLOYEE LOAN PAYMENTS** and enter the data below.

<b>Emp No.</b>	<b>Payments</b>
001	25000
003	15000
001	45000
004	40000
001	20000
002	150000
004	35000

**Required:**

- (i) Create a one-to-one relationship between the two tables.
- (ii) Create a query displaying all fields in the above table to filter out only employees from the department of information. Save it as INFORMATION DEPARTMENT.

- (iii) Print the query and its output.
- (iv) Create another query displaying all the fields of employees with salary less than 300,000. Name it “salary scale 300K”.
- (v) Print the query and its output.
- (vi) The academic retirement age is 55 years. Calculate a query to filter out the employees whose ages are above 55 years. Name it “RETIREMENT AGE”.
- (vii) Print the query and its output.
- (viii) Create a report using the Employee table and group the records by department and Name it “DEPARTMENTS REPORT”.
- (ix) Print the report and the query.

### **Exercise 8**

The table below gives information about a small home business in Kampala. Study the tables carefully to answer their related questions.

Table 1: Activity Table

Activity ID	Qty Bought	Activity Date	Price	Client ID	Prod ID	Total Amount
T1120	500	20-01-13	200	C2245	P3200	
T1121	325	21-01-13	400	C2241	P3201	
T1122	425	22-01-13	450	C2244	P3202	
T1123	150.	23-01-13	120	C2243	P3203	
T1124	85	24-01-13	250	C2242	P3204	
T1125	450	25-01-13	800	C2240	P3205	

Table 2: Clients Table.

Client ID	Client Name	Gender	Client Phone	Client Location
C2240	Lutokomoi	Male	+254 400 000	Nakapiripirt
C2241	Byaruhanga	Male	+254 100000	Gulu
C2242	Barigye	Female	+254 200000	Mubende
C2243	Musungu	Female	+254 500000	Arua
C2244	Oitangol	Male	+254 300 000	Luwero
C2245	Bamulanzeiki	Female	+254 700 000	Nakasongola

***You are required to:***

Create a database called '***Clients***' and use it for the following activities

- (i) Create the activity table with appropriate primary key and data types.
- (ii) Create the client's table with appropriate design. Use the lookup wizard for the gender field.
- (iii) Create a one-to-one relationship between the client's table and activities table
- (iv) Create a query for all those clients whose locations begin with 'N'. The query should have the following fields; Client Names, client phone, Client Location and Qty Bought. Name it '***Naka Query' NB:*** (*Total Amount is a product of "Price" and "Qty Bought"*)

- (v) Create a calculated query to return the total amount value in the activity table. Save it as “Activity *Calc Query*”.
- (vi) Create another query to pick out all those activities that took place after 22<sup>nd</sup> January 2013. Save it as “*Late comers*”.
- (vii) Create a report of the calc. query, and save it as “*Activity report*”.

### **Exercise 9**

Using any database software do the following

Create a database and save it as “Students” (1 mks)

In the students database enter the data below and save your table as “status” (5 mks)

Index	Name	Class	District	snap	Dateofbirth
201	Ali	2	Kampala		15/Jun/1988
202	Mark	3	Mukono		23Jan/1988
206	Salva	4	Mukono		01/Dec/1988
204	Philipe	2	Mukono		12/Aug/1988
203	Chriss	3	Kampala		24/Jul/1988

In the students database create another table for the following as save it as “fees”

Index	Total_Fees	Paid	Balance
201	£100000	£5000	
202	£100000	£100000	
206	£100000	£75000	
204	£100000	£0	
203	£100000	£75000	

- (a) Relate the two tables. (3 mks)
- (b) Create query to :
- (i) Display names of people from Mukono who have paid more than £ 50000 and save it as “paid” (3 mks)
  - (ii) Display Names of people born between 1/may/1988 and 30/Sep/1988 and save it “age” (3 mks)
  - (iii) Calculate balances and save it as “balance” (2 mks)
- (c) Design a form for fees to enter paid, balance and index and save it as “formx” it should have tour name as the footer. (4 mks)
- (d) Create a report which displays balance, names and index number with your name as the header. And save it as “report” (4 mks)

### **Exercise 10**

Mukwano industries deals in manufacturing of cooking oil and other products. It has provided you with the following records.

Using any database management application of your choice, create a database and save as MukwanoDB.

- (a) Create a table in design view with the following data types and field properties below. Save the table as staff record. (16 mks)

Field Name	Data Type	Field size	Input Mask	Validation Rule	Validation Text
Staff No	Text	10	"STF"000\00		
Staff Name	Text	20			
Job	Text	20		Accept only HRM, Manager Salesman, Clerk and Analyst	Invalid job description
Depart No	Number	Longer Integer		Less than 8000	Should be less than 8000
HireDate	Date/Time				
Salary	Currency			Less than 5001	The salary you have entered is too much
Commission	Currency				
Department	Text			Acceptable departments are Accounting, Research, Sales and Operations	You have entered an invalid department.

Staff No.	Staff Name	Job	Dept No.	Hire Date	Salary	Commision	Department
STF 783-99	Peter Cain	HRM	7839	17 Nov 99	\$5000	0	Accounting
STF 783-98	Mary Joy	Manager	7839	01 May 03	\$2850	0	Sales
STF 783-97	John Clark	Manager	7839	09 June 99	\$2450	0	Accounting
STF 783-96	Jack Mat	Salesman	7698	28 Sept 99	\$1250	1400	Sales
STF 783-95	Mary Allen	Salesman	7698	20 Feb 99	\$1600	300	Sales
STF 783-94	Tom Hank	Clerk	7698	03 Dec 99	\$950	0	Sales
STF 783-93	Judy wood	Analyst	7566	03 Dec 98	\$3000	0	Research
STF 783-92	Joy Ward	Salesman	7698	22 Feb 03	\$1250	500	Sales
STF 783-91	Roy Blake	Analyst	7566	15 May 02	\$2500	600	Research
STF 783-90	Mull Clark	Salesman	7698	06 Aug 01	\$3200	350	Accounting

- (c) Choose an appropriate field and make it the primary key. (2 mks)
- (d) Create a query to display the Staff Name, Department, hire date and with a salary more than 2300. (5 mks)
- (e) Sort the records so that the most highly paid person appears fist. (2 mks)
- (f) Create a report for the above query in (d) above. (4 mk)

NB: For more on the support files approach, practical questions, lab activities, and over twenty sets of standard full past papers and their support files, get a copy of our book entitled "LAB ACTIVITIES FOR COMPUTER PRACTICAL APPLICATIONS"

**S6 Term III**

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## Topic 15 SYSTEM SECURITY, ICT ETHICAL ISSUES AND EMERGING TECHNOLOGIES

***Recommended Coverage Duration: 24 periods (4 weeks)***

### **Guidance to the Teacher**

It is important for the learners to interact with all the data communication tools mentioned in this topic for them to appreciate and clearly make a distinction between their usage. You are advised to use physical network devices as visual aids for the learners to visualise and learn from. Prepare activities that allow learners to work individually or in groups to identify and list the components of a computer network and their uses, to identify and list the implications of a computer network. **Suggested Competences for Assessment** Assess the learners' ability to effectively communicate using data communication tools and explain the types of computer networks.

### **Background**

As computers get involved in almost all aspects of our lives, there are quite a number of emerging issues that need extra attention. Such emerging issues range from computer system features, environmental concerns, legal and ethical issues, system security and users of computer applications. Therefore, it is increasingly becoming important that students of ICT learn how to safeguard their computer systems, uphold ethical values while using ICT systems as they explore emerging technologies.

**Learning Outcome:** The learner should be able to explain and discuss the emerging issues, computer security and privacy issues.

### **15.1 Computer System Security**

#### **Sub topic Objectives:**

1. **Computer security**
  - i. Explaining the various forms of computer security (data and physical security).
  - ii. Identifying security threats for (hardware and software).
  - iii. Explaining the meaning of a computer virus.
  - iv. Explaining how viruses are spread on standalone and networked computers.
2. **Internet and network attacks**
  - i. Explaining the concept of hacking.
  - ii. Explaining how denial of service attacks, backdoors, spoofing are carried out.
3. **Data protection in computer systems**
  1. Identifying appropriate ways of protecting data in computer systems.
4. **Computer crime**
  - i. Identifying types of computer crimes

### 15.1.1 Computer security

#### i Forms of computer security (data and physical security)

**Data Security** refers to protective measures that are applied to ensure integrity, availability and confidentiality of data or information.

- **Integrity** means prevention of unauthorized modification of data and data corruption. **Data corruption** refers to errors in data that may occur during reading, writing, processing, storage or transmission of said data which may introduce unintended/unwanted changes to the original data.
- **Availability** means prevention of unauthorized withholding of data access (Intended users can access whenever they need to access).
- **Confidentiality** means to avoid unauthorized disclosure of data third parties.

**Physical Security** refers to the measures put in place by protect computer systems from physical damage and mitigate physical security risks. Physical security includes:

- Locked doors.
- Burglar proofs.
- Parameter fences.
- Security guards.
- Server room environmental protection, optimisation.
- Concrete walls.
- Lightening conductors.
- Fire extinguishers.
- Strategic server and storage placement, etc.

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#### ii Security threats for (hardware and software)

- A computer security risk is an Action that causes loss of or damage to computer system.



- Security threats to computer-based information systems, private or confidential data include:
  1. System Failure
  2. Information Theft
  3. Hardware Theft
  4. Software Theft
  5. Internet And Network Attacks Such Us Hackers
  6. Malicious Programs (Computer Viruses, Worms And Trojan Horses)
  7. Unauthorised Access and Use
  8. Unauthorized Alteration,
  9. Malicious Destruction of hardware, software, data or network resources, as well as sabotage.

### **System failure**

Some of the causes of computerized information system failure include

- Hardware failure due to improper use.
- Unstable power supply as result of brownout or blackout and vandalism. Network breakdown.
- Natural disaster
- Program failure

### **Control measures against hardware failure**

- Protect computers against brownout or blackout which may cause physical damages or data loss by using surge protectors and Uninterruptible power supply (UPS).
- For critical systems, most organizations have put into place fault tolerant systems. A **fault tolerant system** has redundant or duplicate storage, peripherals devices and software that provide a fail-over capability to backup components in the event of system failure.
- **Disaster recovery plans.** Disaster recovery plan involves establishing offsite storage of an organization's databases so that in case of disaster or fire accidents, the company would have backup copies to reconstruct lost data.

### **Hardware theft and hardware vandalism**

➤ **Hardware theft is act of stealing computer equipment**

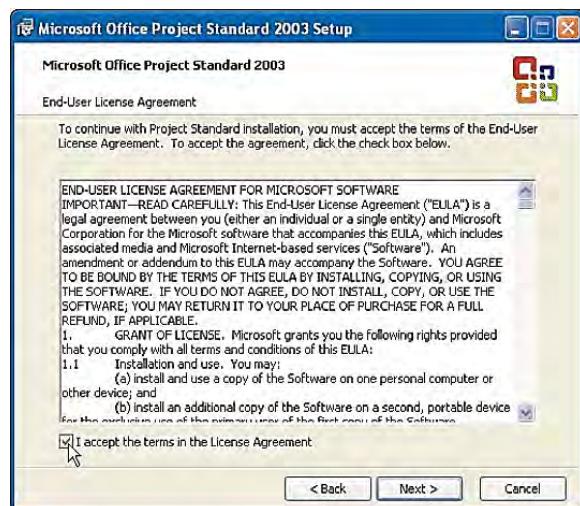
- Cables sometimes used to lock equipment
- Some notebook computers use passwords, possessed objects, and biometrics as security methods
- For PDAs, you can password-protect the device



➤ **Hardware vandalism** is the act of defacing or destroying computer equipment  
**Software theft**

**Software theft** is the act of stealing or illegally copying software or intentionally erasing programs.

- **Software piracy** is illegal duplication of copyrighted software.
- To guard against software theft and piracy, product activation is used.
- **Product activation** allows user to input product identification number online or by phone and receive unique installation identification number.
- A **license agreement** gives the right to use software. Single-user license agreement allows user to install software on one computer, make backup copy, and sell software after removing from computer.



### Unauthorized access and Use

- **Unauthorized access** is the use of a computer or network without permission. **Unauthorized use** is the use of a computer or its data for unapproved or possibly illegal activities.
- Unauthorized use includes a variety of activities: an employee using an organization's computer to send personal e-mail messages, or someone gaining access to a bank computer and performing an unauthorized transfer.

### Information theft

- Information theft is yet another type of computer security risk. **Information theft** occurs when someone steals personal or confidential information. An unethical company executive may steal or buy stolen information to learn about a competitor. A corrupt individual may steal credit card numbers to make fraudulent purchases.
- **Safeguards against Information Theft:** Most companies attempt to prevent information theft by implementing the user identification and authentication controls.
- To protect information on the Internet and networks, companies and individuals use a variety of encryption techniques.

#### 15.1.2 Internet and network attacks

Information transmitted over networks has a higher degree of security risk than information kept on an organization's premises. In an organization, network administrators usually take measures to protect a network from security risks. On the Internet, where no central administrator is present, the security risk is greater.

Internet and network attacks that jeopardize security include computer viruses, worms, Trojan horses, and rootkits; botnets; denial of service attacks; hackers, back doors; and spoofing.

### Explaining the meaning of a computer virus.

- A computer virus is a potentially damaging computer program that affects, or infects, a computer negatively by altering the way the computer works without the user's knowledge or permission. Once the virus infects the computer, it can spread throughout and may damage files and system software, including the operating system.
- Computer viruses, worms, Trojan horses, and rootkits are classified as **malware** (short for malicious software)
- Unscrupulous programmers write malware and then test it to ensure it can deliver its payload. The **payload** is the destructive event or prank the program is intended to deliver.

What is the difference between viruses, worms, and rootkit and Trojan horses?

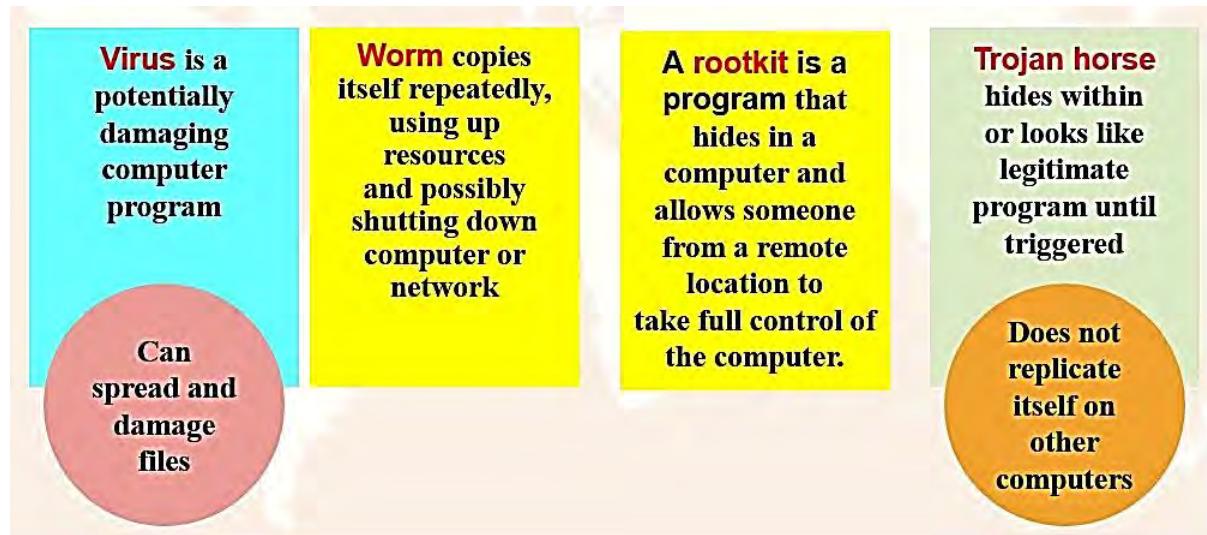


Figure 27: The difference between viruses, worms, rootkit and Trojan horses

- Macros Viruses are malicious procedures / instructions saved in an application, such as word processing or spreadsheet program. To protect the system from a macro viruses: Set macro security level in applications that displays warning that opened document contains macro.

### Symptoms of computer infected by viruses

- Operating system runs much slower than usual
- Available memory is less than expected
- Files become corrupted
- Screen displays unusual message or image
- Unknown programs or files mysteriously appear
- Music or unusual sound plays randomly
- Existing programs and files disappear
- Programs or files do not work properly
- System properties change
- Operating system does not start up
- Operating system shuts down unexpectedly

A **Virus signature** is specific pattern of virus code, also called a virus definition. Antivirus programs look for virus signatures.

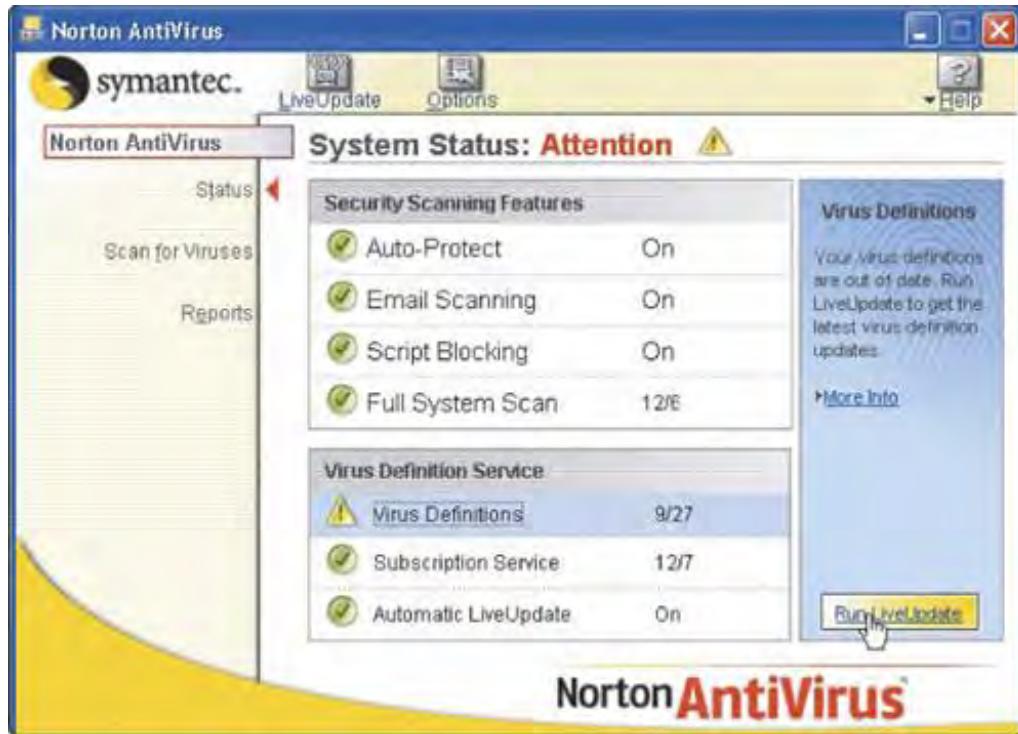


Figure 28: An antivirus program Identifies and removes computer viruses Most also protect against worms and Trojan horses.

When an antivirus program identifies an infected file, it attempts to remove any detected virus, quarantines infected files that it cannot remove (keeps file in a special area on hard disk) so that it does not spread the virus to other files.

### Control measures against viruses

- To protect an information system against viruses:
- Install the latest versions of anti-virus software on the computers. Make sure that you continuously update the anti-virus software with new virus definition to counter the new viruses.
- Always scan removable storage media for viruses before using them.
- Scan mail attachments for viruses before opening or downloading an attachment.
- Always keep a **Recovery Disk**: A removable disk that contains uninfected copy of key operating system commands that enables computer to restart. Also called rescue disk

### Some tips for preventing virus, worm, and Trojan horse infections

- Install an antivirus program on all of your computers and keep it updated.
- Set the macro security in programs so you can enable or disable macros
- Never open an e-mail attachment unless you are expecting it and it is from a trusted source.

- If the antivirus program flags an e-mail attachment as infected, delete the attachment immediately.
- Check all downloaded programs for viruses, worms, or Trojan horses
- Install a personal firewall program.

**iv. How viruses are spread on standalone and networked computers.**

- Standalone computer is one which is not connected to any other computer. However networked computer is the one which is connected to any other computer for the purpose of exchanging data, information or resources. The table below shows how virus spread on standalone and networked computer

Standalone computer	Networked computer
1.Distributed through flash disks	1.Through downloading email attachments
2.By using floppy diskettes	2.Playing games on internet
3.Through opening infected programs or documents on CR/DVD discs	3.Downloading infected files from internet

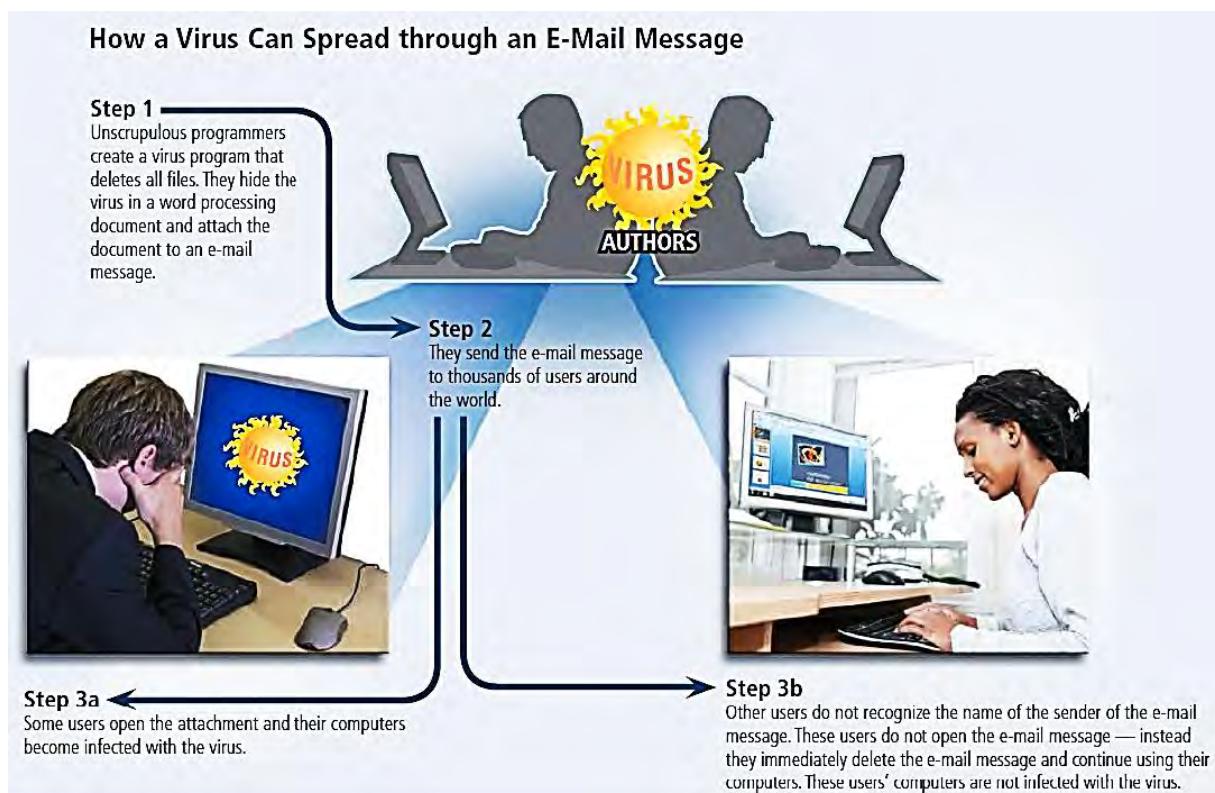


Figure 29: How viruses spread through e-mail

### Hacking

- The term hacker refers to someone who accesses a computer or network illegally. Originally it was a complimentary word for a computer enthusiast.
- A **cracker** also is someone who accesses a computer or network illegally but has the intent of destroying data, stealing information, or other malicious action.
- Both hackers and crackers have advanced computer and network skills.

- Some hackers claim the intent of their security breaches is to improve security, and may be hired by software companies to test the security of new software systems.
- A **script kiddie** has the same intent as a cracker but does not have the technical skills and knowledge. Script kiddies often use prewritten hacking and cracking programs to break into computers.
- A **cyberextortionist** is someone who uses e-mail as a vehicle for extortion.
- A **cyberterrorist** is someone who uses the Internet or network to destroy or damage computers for political reasons. The cyberterrorist might target the nation's air traffic control system, electricity-generating companies, or a telecommunications infrastructure.

#### **Explaining how denial of service attacks, backdoors, spoofing are carried out.**

- A **denial of service attack**, or **DoS attack**, is an assault whose purpose is to disrupt computer access to a network service.
- The attackers may use an unsuspecting computer to send an influx of confusing data messages or useless traffic to a computer network. The victim computer network slows down considerably and eventually becomes unresponsive or unavailable, blocking legitimate visitors from accessing the network.
- Perpetrators have a variety of motives for carrying out a DoS attack. Those who disagree with the beliefs or actions of a particular organization claim political anger motivates their attacks. Some perpetrators use the attack as a vehicle for extortion. Others simply want the recognition.
- A **botnet** is a group of compromised computers connected to a network such as the Internet that are used as part of a network that attacks other networks, usually for nefarious purposes.
- A compromised computer, known as a **zombie**, is one whose owner is unaware the computer is being controlled remotely by an outsider. Cybercriminals use botnets to send spam via e-mail, spread viruses and other malware, or commit a denial of service attack.
- A **back door** is a program or set of instructions in a program that allow users to bypass security controls when accessing a program, computer, or network.
- Once perpetrators gain access to unsecure computers, they often install a back door or modify an existing program to include a back door, which allows them to continue to access the computer remotely without the user's knowledge.
- **Spoofing** is a technique intruders use to make their network or Internet transmission appear legitimate to a victim computer or network.
- E-mail spoofing occurs when the sender's address or other components of the e-mail header are altered so that it appears the e-mail originated from a different sender. E-mail spoofing commonly is used for virus hoaxes, spam, and phishing scams.

- IP spoofing occurs when an intruder computer fools a network into believing its IP address is associated with a trusted source. Perpetrators of IP spoofing trick their victims into interacting with a deceptive Web site.

### 15.1.3 Data protection in computer systems

#### Appropriate ways of protecting data in computer systems

1. Data Encryption. Data on transit over the network faces many dangers of being tapped, listened to or copied to unauthorized destinations. Such data can be protected by mixing up into a form that only the sender and receiver is able to understand. This is by reconstructing the original message from the mix which is called data encryption.

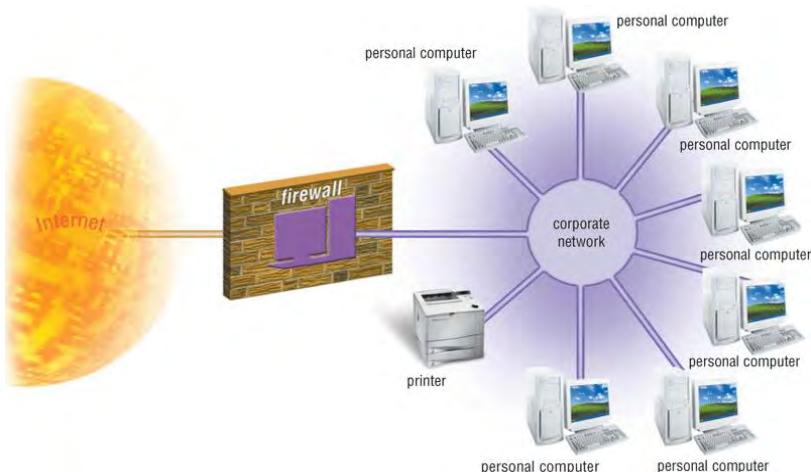
#### What is Data encryption?

- Process of converting plaintext (readable data) into ciphertext (unreadable characters)
  - Safeguards against information theft
  - Encryption key (formula) often uses more than one method
  - To read the data, the recipient must decrypt, or decipher, the data
2. Surge protectors: Protect computers and equipment from electrical power disturbances. Uninterruptible power supply (UPS) is surge protector that provides power during power loss



3. Backups - the ultimate safeguard. Backups - the ultimate safeguard
  - Full backup - all files in computer
  - Selective backup select which files to back up
  - Three-generation backup preserves three copies of important files
  - In case of system failure or corrupted files, restore files by copying to original location.
4. Firewall
  - **Firewall is a security system consisting of hardware and/or software that prevents unauthorized network access**
  - A firewall is a device or software system that filters the data and information exchanged between different networks by enforcing the host networks

access control policy. The main aim of a firewall is to monitor and control access to or from protected networks. People who do not have permission (remote requests) cannot access firewall restricted sites outside their network.



#### 5. Use of acceptable use policy (AUP)

- The AUP outlines the computer activities for which the computer and network may and may not be used.
- An organization's AUP should specify the acceptable use of computers by employees for personal reasons.
- Some organizations prohibit such use entirely. Others allow personal use on the employee's own time such as a lunch hour.

#### 6. Intrusion Detection Software

- To provide extra protection against hackers and other intruders, large organizations sometimes use intrusion detection software to identify possible security breaches. **Intrusion detection software** automatically analyzes all network traffic, assesses system vulnerabilities, identifies any unauthorized access (intrusions), and notifies network administrators of suspicious behavior patterns or system breaches.
- To utilize intrusion detection software requires the expertise of a network administrator because the programs are complex and difficult to use and interpret. These programs also are quite expensive.

#### 7. Identifying and Authenticating Users

- Many organizations use access controls to minimize the chance that a perpetrator intentionally may access or an employee accidentally may access confidential information on a computer.
- An **access control** is a security measure that defines who can access a computer, when they can access it, and what actions they can take while accessing the computer. In addition, the computer should maintain an **audit trail** that records in a file both successful and unsuccessful access attempts.
- An unsuccessful access attempt could result from a user mistyping his or her password, or it could result from a hacker trying thousands of passwords.

# Evaluation Copy

Organizations should investigate unsuccessful access attempts immediately to ensure they are not intentional breaches of security

### 8. User Names and Passwords

- A username is Unique combination of characters that identifies user
- Password is private combination of characters associated with the user name that allows access to computer resources.

How can you make your password more secure? How can you make your password more secure?

**Returning Customers...**

Login:	<input type="text" value="mreeves"/>
Password:	<input type="password" value="*****"/>
<a href="#">Forgot your password?</a>	
<input type="button" value="Submit"/>	

#### PASSWORD PROTECTION

Number of Characters	Possible Combinations	AVERAGE TIME TO DISCOVER	
		Human	Computer
1	36	3 minutes	.000018 second
2	1,300	2 hours	.00065 second
3	47,000	3 days	.02 second
4	1,700,000	3 months	1 second
5	60,000,000	10 years	30 seconds
10	3,700,000,000,000,000	580 million years	59 years

- Possible characters include the letters A-Z and numbers 0-9
- Human discovery assumes 1 try every 10 seconds
- Computer discovery assumes 1 million tries per second
- Average time assumes the password would be discovered in approximately half the time it would take to try all possible combinations

### 9. Possessed objects

- Items that you must carry to gain access to computer or facility, e.g badges, cards, smart cards, and keys. Often used with numeric password called personal identification number (PIN) e.g ATM pin.
- Access control can be enhanced by implementing multilevel authentication policies such as assigning users log on accounts, use of smart cards and a personal identification number (PIN).

### 10. Security monitors

are programs that monitor and keep a log file or record of computer systems and protect them from unauthorized access.

## 11. Biometric devices

- **Authenticate people's identity using a human characteristic** like Fingerprint, hand geometry, voice, signature, or iris.
- Biometric security is a growing form of unauthorized control measure that takes the user's attributes such as voice, fingerprints and facial recognition. For example, you can log on swap a finger on a finger print swap windows.

## 12. Callback systems

- User connects to computer only after the computer calls that user back at a previously established telephone number.
- Some networks utilize callback systems as an access control method to authenticate remote or mobile users.
- Callback systems work best for users who regularly work at the same remote location, such as at home or branch office.



## 13. Secure web data transmission using HTTPS

Users apply for SSL certificate from a certificate authority (CA). A CA is an Authorized person or company that issues and verifies SSL certificates.



The following are some examples of crimes perpetuated by use of computers.

### 15.1.4 Computer crime

#### Identifying types of computer crimes

- **Physical theft** - The physical theft of computer hardware and software is the most widespread related crime especially in developing countries.
- The most common issues now, we here cases of people breaking into an office or firm and stealing computers, hard disks and other valuable computer accessories. In most cases such theft can be done by untrustworthy employees of firm or by outsiders. The reason behind an act may be commercial, destruction to sensitive information or sabotage.

#### Control measures against theft

- Employ security agents to keep watch over information centers and restricted backup sites.
- Reinforce weak access points like windows, door and roofing with metallic grills and strong padlocks.

- Motivate workers so that they feel a sense of belonging in order to make them proud and trusted custodians of the company resources.
- Insure the hardware resources with a reputable insurance firm.

**Piracy** - Piracy is a form of intellectual property theft which means illegal copying of software, information or data. Software, information and data are protected by copyright and patent laws.

- **Control measures against piracy** - There are several ways of reducing piracy
- Enforce laws that protect the owners of data and information against piracy.
- Make software cheap enough to increase affordability.
- Use licenses and certificates to identify original software.
- Set installation passwords that deter illegal installation of software.
- **Fraud** - Fraud is stealing by false pretense. Fraudsters can be either employees in a company, non-existent company that purports to offer internet services such as selling vehicles etc. other form of fraud may also involve computerized production and use of counterfeit documents. This is due to the dynamic growth of internet and mobile computing, sophisticated cybercrimes.
- **Sabotage** - Sabotage refers to illegal destruction of data and information with the aim of crippling services delivery, or causing great loss to an organization. Sabotage is usually carried out by disgruntled employees or competitors with the intention of causing harm to an organization.

• **Eavesdropping** - Eavesdropping refers to tapping into communication channels to get information. Hackers mainly use eavesdropping to access private or confidential information from internet users or from poorly secured information system.

- **Surveillance (monitoring)** - Surveillance refers to monitoring use of computer system and networks using background programs such as spyware and cookies. The information gathered may be used for one reason or the other e.g. spreading sabotage.
- **Industrial espionage** - Industrial espionage involves spying on a competitor to get information that can be used to cripple the competitor.
- **Accidental access** - Threats to data and information come from peoples unknowingly giving out information to strangers or unauthorized persons.
- **Alteration** - Alteration is the illegal modification of private or confidential data and information with the aim of misinforming users. Alteration is usually done by people who wish to cancel the truth or sabotage certain operations.
- Alteration comprises the integrity of data and information making it unreliable.

## 15.2 Privacy and ICT Ethical Issues

### Sub topic Objectives:

1. ICT ethics and society
  - define and describe ethical issues in ICT.
  - describe information accuracy.

2. Intellectual property - explain the concept of intellectual property rights
3. Information privacy - explain the different aspects of information privacy and violation.

#### **15.2.1 ICT ethics and society**

- What are ICT ethics? - Moral guidelines that govern use of computers and information systems.
- Ethics is knowing and understanding what is right and what is wrong, and then doing the right thing right. In simple terms, ethics are standards of moral conduct.
- Quite often, people in society do the wrong things either out of ignorance or deliberately to achieve selfish interests.
- In today's society, computers are involved to some extent in almost every aspect of life and sometimes they often perform life-critical tasks.
- This makes it very important to carefully consider the issues of ethics in use of computers and software.
- Ethical principles are important because they help us navigate through difficult situations and reflect the way to relate with our friends and community.

#### **Three useful ethical principles:**

- An act is ethical if society benefits from the act.
- An act is ethical if people are treated as an end and not as a means to an end.
- An act is ethical if it is fair to all parties involved.

**Computer ethics** involves use of computers & software in morally acceptable way.

- Standards or guidelines are important in this industry, because technology changes are outstripping the legal system's ability to keep up.

#### **Computer Ethics for Computer Professionals**

- According to the Association for Computing Machinery (ACM) code, a computing professional:
- Contributes to society and human well-being.
- Always avoids harm to others.
- Should be honest and trustworthy.
- Should exercise fairness and takes action not to discriminate.
- Honors property rights, including copyrights and patents
- Gives proper credit when using the intellectual property of others.
- Respects other individuals' rights to privacy.
- Honors confidentiality.

<b>IT CODE OF CONDUCT</b>
1. Computers may not be used to harm other people.
2. Employees may not interfere with others' computer work.
3. Employees may not meddle in others' computer files.
4. Computers may not be used to steal.
5. Computers may not be used to bear false witness.
6. Employees may not copy or use software illegally.
7. Employees may not use others' computer resources without authorization.
8. Employees may not use others' intellectual property as their own.
9. Employees shall consider the social impact of programs and systems they design.
10. Employees always should use computers in a way that demonstrates consideration and respect for fellow humans.

### **Code of Conduct**

- A **code of conduct** is a written guideline that helps determine whether a specific action is ethical or unethical.

### **15.2.2 Intellectual property**

- Intellectual property (IP) refers to a creation on one's mind and innovativeness, such as work created by inventors, authors, and artists.
- Intellectual property rights—rights to which creators are entitled for their work
- A copyright gives authors and artists exclusive rights to duplicate, publish, and sell their materials.
- A common infringement of copyright is software piracy.
- A trademark protects a company's logos and brand names.

### **15.2.3 Information privacy**

Information privacy refers to the right of individuals and companies to deny or restrict the collection and use of information about them. In the past, information privacy was easier to maintain because information was kept in separate locations. Each retail store had its own credit files. Each government agency maintained separate records. Doctors had their own patient files.

Today, huge databases store this data online. Much of the data is personal and confidential and should be accessible only to authorized users. Many individuals and organizations, however, question whether this data really is private.

**Concerns related to collection and use of private data are:**

- Data should not be disclosed to other people without the owner's permission.
- Data and information should be kept secured against loss or exposure
- Data and information should be kept longer than necessary
- Data and information should be accurate and up to date.
- Data and information should be collected, used and kept for specified lawful purposes.

**What are some ways to safeguard personal information?**

- Limit the amount of information you provide to Web sites; fill in only required information
- Inform merchants that you do not want them to distribute your personal information
- Set up a free e-mail account; use this e-mail address for merchant forms
- Sign up for e-mail filtering through your Internet service provider or use an antispam program.
- Do not reply to spam for any reason
- Install a personal firewall
- Turn off file and print sharing on your Internet connection
- Surf the Web anonymously with a program such as Freedom Web Secure or through an anonymous Web site such as Anonymizer.com
- Install a cookie manager to filter cookies

- Clear your history file when you are finished browsing.

### What is an electronic profile?

- Data collected when you fill out form on Web, e.g. on Amazon or Facebook profile.
- Merchants may sell the contents of their databases to national marketing firms and Internet advertising firms.
- Many companies today allow people to specify whether they want their personal information distributed.

### Cookies

- E-commerce and other Web applications often rely on cookies to identify users. A **cookie** is a small text file that a Web server stores on your computer. Cookie files typically contain data about you, such as your user name or viewing preferences.
- Many commercial Web sites send a cookie to your browser, and then your computer's hard disk stores the cookie.
- The next time you visit the Web site, your browser retrieves the cookie from your hard disk and sends the data in the cookie to the Web site.

### Web sites use cookies for a variety of purposes:

- Most Web sites use cookies to track user preferences.
- Some Web sites use cookies to store users' passwords, so that they do not need to enter it every time they log in to the Web site.
- Online shopping sites generally use a session cookie to keep track of items in a user's shopping cart. This way, users can start an order during one Web session and finish it on another day in another session. Session cookies usually expire after a certain time, such as a week or a month.
- Some Web sites use cookies to track how often users visit a site and the Web pages they visit while at the site.
- Web sites may use cookies to target advertisements. These sites store a user's interests and browsing habits in the cookie.

For privacy purposes, You can set a browser to accept **cookies** automatically, prompt you if you want to accept a cookie, or disable cookie use altogether. Keep in mind if you disable cookie use, you will not be able to use many of the e-commerce Web sites.

### Spyware and Adware

**Spyware** is a program placed on a computer without the user's knowledge that secretly collects information about the user. Some vendors or employers use spyware to collect information about program usage or employees. Internet advertising firms often collect information about users' Web browsing habits by hiding spyware in adware.

**Adware** is a program that displays an online advertisement in a banner or pop-up window on Web pages, e-mail messages, or other Internet services. To remove spyware and adware, you can obtain a spyware and adware remover that can detect

and delete spyware and adware. Some operating systems and Web browsers include spyware removers.



Figure 30: Example of spam

### Spam

- Spam is an unsolicited e-mail message sent to multiple recipients at once. Spam is Internet junk mail. The content of spam ranges from selling a product or service, to promoting a business opportunity, to advertising offensive material.
- Users can reduce the amount of spam they receive with a number of techniques. Some e-mail programs have built-in settings that allow users to delete spam automatically. Users also can sign up for e-mail filtering from their Internet access provider.
- **E-mail filtering** is a service that blocks e-mail messages from designated sources. An alternative to e-mail filtering is to purchase an anti-spam program that attempts to remove spam before it reaches your inbox. The disadvantage of e-mail filters and anti-spam programs is that sometimes they remove valid e-mail messages. Thus, users should review the contents of the spam messages periodically to ensure they do not contain valid messages.

## Phishing

- Phishing is a scam in which a perpetrator sends an official looking e-mail message that attempts to obtain your personal and financial information. Some phishing e-mail messages ask you to reply with your information; others direct you to a phony Web site, or a pop-up window that looks like a Web site, that collects the information.
- If you receive an e-mail that looks legitimate and requests you update credit card numbers, Social Security numbers, bank account numbers, passwords, or other private information, it is recommended that you visit the Web site directly to determine if the request is valid. Never click a link in an e-mail message; instead retype the Web address in your browser.
- A **phishing filter** is a program that warns or blocks you from potentially fraudulent or suspicious Web sites. Some Web browsers include phishing filters.
- Pharming is a scam, similar to phishing, where a perpetrator attempts to obtain your personal and financial information, except they do so via spoofing. That is, when you type a Web address in the Web browser, you are redirected to a phony Web site that looks legitimate. The phony Web site requests you enter confidential information.
- **Clickjacking** is yet another similar scam. With clickjacking, an object that can be clicked on a Web site, such as a button, image, or link, contains a malicious program. When users click the disguised object, for example, they may be redirected to a phony Web site that requests personal information, or a virus may download to their computer.

Evaluation Copy

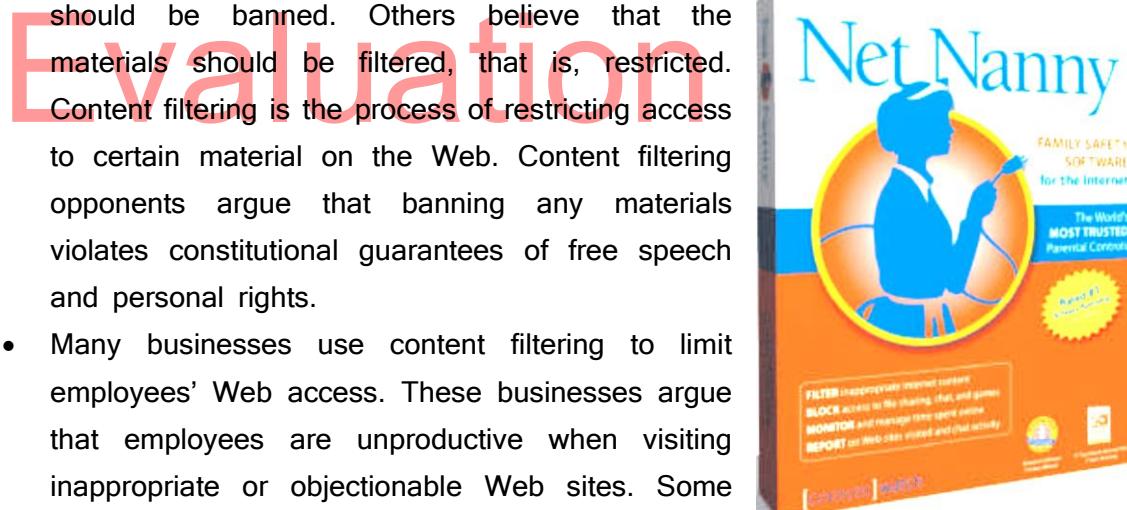
## Social Engineering

- As related to the use of computers, social engineering is defined as obtaining confidential information by taking advantage of the trusting human nature of some victims. Some social engineers trick their victims into revealing confidential information such as user names and passwords on the telephone, in person, or on the Internet.
- Techniques they use include pretending to be an administrator or other authoritative figure, feigning an emergency situation, or impersonating an acquaintance. Social engineers also obtain information from users who do not destroy or conceal information properly. These perpetrators sift through company dumpsters, watch or film people dialling telephone numbers or using ATMs, and snoop around computers looking for openly displayed confidential information.

## Privacy Laws

- The concern about privacy has led to the enactment of state laws regarding the storage and disclosure of personal data in several countries world over. In Uganda, we have the Computer Misuse Act 2011 which has a number of clauses on information privacy.

- **Employee Monitoring:** Employee monitoring involves the use of computers to observe, record, and review an employee's use of a computer, including communications such as e-mail messages, keyboard activity (used to measure productivity), and Web sites visited. Many programs exist that easily allow employers to monitor employees. Further, it is legal for employers to use these programs.
- A frequently debated issue is whether an employer has the right to read employee e-mail messages. Actual policies vary widely. Some companies declare that they will review e-mail messages regularly, and others state that e-mail is private. In some states, if an organization does not have a formal e-mail policy, it can read e-mail messages without employee notification. Several lawsuits have been filed against employers because many believe that such internal communications should be private. Another controversial issue relates to the use of cameras to monitor employees, customers, and the public. Many people feel that this use of video cameras is a violation of privacy.
- **Content Filtering**
- One of the more controversial issues that surround the Internet is its widespread availability of objectionable material, such as racist literature, violence, and pornography. Some believe that such materials should be banned. Others believe that the materials should be filtered, that is, restricted. Content filtering is the process of restricting access to certain material on the Web. Content filtering opponents argue that banning any materials violates constitutional guarantees of free speech and personal rights.
- Many businesses use content filtering to limit employees' Web access. These businesses argue that employees are unproductive when visiting inappropriate or objectionable Web sites. Some schools, libraries, and parents use content filtering to restrict access to minors.
- **Web filtering** software is a program that restricts access to specified Web sites. Some also filter sites that use specific words. Others allow you to filter e-mail messages, chat rooms, and programs. An example of a web filtering program is Net Nanny. Many Internet security programs include a firewall, antivirus program, and filtering capabilities combined.



### 15.3 Emerging Technologies

Sub topic Objectives:

- Emerging technologies - explain the concept of emerging technologies (artificial intelligence, digital forensics, among others).
- Application areas of specific emerging technologies - explain how specific technologies are applied in problem-solving in society.
- Implications of emerging technologies - explain advantages and disadvantages.

Definition: **Emerging technologies** are those that are currently being developed or will be developed in the next 5 to 10 years, and which will alter the business and social environment.

ICT is always improving and changing and new technologies are being developed all of the time. Developments in technology will, by nature, impact on our everyday lives and these include:

- a) Artificial Intelligence (AI)
- b) Digital forensics
- c) Biometrics
- d) Robotics
- e) Quantum Cryptography
- f) Computer Assisted Translation (CAT)
- g) 3D and Holographic Imaging (aka holograms)
- h) Virtual Reality

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## Artificial Intelligence (AI)

This is a computer science that is focused on creating computer systems that simulate human intelligence. The term was first used in 1956 by a computer scientist at the Massachusetts Institute of Technology (MIT) who was focused on trying to make computers behave like humans.

### AI is being developed in the following application areas:

- **Expert Systems** - These are computers that have been programmed to make decisions based on information they are given. For example: Medical expert systems can diagnose patient's illnesses based on symptoms entered.
- **Languages** - This type of AI involves computers that can understand different human languages as they are spoken to them.
- **Robotics** - Robotic artificial intelligence is where machines are programmed to imitate a human.
- **Game Playing** - Computers developed to play games against human players. For example: In 1997 a computer named 'Deep-Blue' defeated a world champion in the game of chess.

### Impacts of AI on everyday life:

Some of the impacts that artificial intelligence can have on everyday life are discussed in the table below:

- **Accurate prediction of weather** - AI software will soon be used to sift through weather data more accurately than humans can and will be used to predict approaching storms and automatically issue warnings.
- **Increased leisure time** - Robotic vacuum cleaners are becoming more and more popular. These can detect walls and other objects in order to vacuum around them. People can leave them running whilst they enjoy extra spare time.
- **Safer transport** - Self driving cars already exist will drastically reduce road accidents. Driverless trains too already exist in some countries!
- **Increased Personal safety** - Modern home alarm systems use artificial intelligence software that can tell the difference between the home owners and intruders. The software automatically alerts the police when intruders are detected.
- **Improved medical care** - Robotic surgery assistants are being used to quickly and accurately pass the correct surgical tools to doctors. The few seconds saved in getting the correct tool to the doctor can save patient's lives.

### Digital forensics

Digital forensics, also called computer forensics, network forensics, or cyberforensics, is the discovery, collection, and analysis of evidence found on computers and networks.

Digital forensics involves the examination of computer media, programs, data and log files on computers, servers, and networks.

Many areas use digital forensics, including

- law enforcement,
- criminal prosecutors,
- military intelligence,
- insurance agencies,
- Tax investigations and
- information security departments in the private sector.

A digital forensics examiner must have knowledge of the law, technical experience with many types of hardware and software products, superior communication skills, familiarity with corporate structures and policies, a willingness to learn and update skills, and a knack for problem solving.

### Impact of Digital Forensics on everyday life:

Forensics is changing in the digital age, and the legal system is still catching up when it comes to properly employing digital evidence.

- Broadly speaking, digital evidence is information found on a wide range of electronic devices that is useful in court because of its probative value. It's like the digital equivalent of a fingerprint or a muddy boot. However, digital evidence tendered in court often fails to meet the same high standards expected of more established forensics practices, particularly in ensuring the evidence is what it purports to be.
- Technology changes evidence. This is not the first time that technology has impacted the way evidence is gathered and presented in courts. And it's not the first time that there have been problems in the way new evidence is used. There is still a vigorous debate in the legal world over the usage and reliability of DNA evidence, for example. This is now being mirrored in more recent court challenges over the use of digital evidence.
- Cyber evidence: It is increasingly common for criminal trials to rely on digital evidence. And, regrettably, it is not uncommon for innocents to be convicted and guilty people acquitted because of digital evidence.

## Biometrics

Biometrics is where parts of a person's body are used for identification purposes. Examples include:

- **Fingerprints** - These are impressions embedded at the end of human fingers and thumbs. Fingerprints kept in a database can be matched to those left at crime-scenes to help identify the culprit.
- **Eye recognition** - Eye scans analyse the iris which is the coloured ring that surrounds the pupil.
- **Face recognition** - This is where the shapes of individual's faces are analysed.
- **Voice recognition** - Pitch, tone and frequency of voices are unique and can be analysed to identify people.

All of these parts of the human body are unique from person to person and can be used to authenticate identity.

Note: Even identical twins have slightly different fingerprints and voices etc.

- Before biometric methods can be useful, people have to perform a process known as 'biometric enrolment'.
- This is where body-part data such as fingerprints or voice patterns are captured and stored within the system so that they can be used to identify the person later on.
- Biometrics are beginning to be used in place of passwords and physical locks as a means of security.
- Biometrics have advantages over these older methods as body parts cannot be lost, forgotten or stolen as can be the case with passwords and keys.

### Impacts of Biometrics on everyday life:

Some impacts of biometrics are discussed below:

- **Better airport security** Iris recognition is already in use in some airports.
- Travelers have their eyes and iris scanned into a system and this data is later matched up when the person is performing airport checks.
- **Increased building security** Fingerprint access to buildings have been replacing the older methods of locks and keys.
- This method ensures that only authorised people can enter restricted buildings or rooms.
- **Reduced car theft** Cars already exist that use fingerprints to only unlock their doors or start the engine for the fingerprint that is registered. This means that the doors will not unlock for a print that is not recognised and makes the car harder to steal.
- **More secure mobile phones** Mobile phones contain our lives. We use our phones for everything from social media to shopping online. They need to be as secure as possible in order to protect the valuable data that they contain. Apple recently released an iPhone model that uses a fingerprint reader to identify the true owner of the phone. It will not unlock for a fingerprint that it does not recognise.

# Evaluation Copy

## Robotics

Robots are used to perform a wide range of physical tasks.

# They are either automated (controlled by a computer chip) or manually controlled by a human.

# There are 4 different types of robots:

- Manufacturing robots (used to perform repetitive tasks such as welding)
- Carrier robots (used by the military to carry heavy loads over dangerous terrain)
- Domestic robots (used in homes to perform cleaning tasks such as vacuuming)
- Exploration robots (used to visit and send images from places such as Mars)

# Some more typical tasks that robots can be used for are described in the table below:

- **Dangerous jobs** - E.g. disposing of bombs, spray painting or cleaning up nuclear waste. Note: these are all jobs that could harm or kill a human.
- **Exploring extreme environments**- E.g. inside volcanoes, planets or the depths of the ocean. Note: humans cannot visit these environments due to lack of oxygen and high pressure / heat levels.
- **Repetitive manufacturing jobs** - E.g. production lines, packing and welding etc.
- Note: these jobs can also be performed by humans but robots can do them much faster and more efficiently.

- **Moving heavy objects** - E.g. installing large engines, moving pallets of items etc.

Robots are increasingly being used in manufacturing due to their proven increase in productivity. Think about it! Robots can work 24/7 and never need to take breaks. They also do not require wages like humans do. This means that robots can produce more at a lower cost.

#### **Impacts of Robotics on everyday life:**

# Some impacts of robotics are discussed below:

- **Increased personal time** - If robots can carry out domestic chores, this frees up more time for us to spend as we wish.
- This could mean more time spent at work or for more enjoyable activities such as socialising.
- **More efficient manufacturing** Robots can manufacturer products such as cars much faster and cheaper than humans can. This means that companies can make more products at less cost and this means greater business profits.
- **Loss of jobs** Due to higher and cheaper productivity, robots are taking over the manufacturing jobs that used to be carried out by humans. This means that humans are missing out on employment on assembly lines and factory work.
- **Safer working environments** - Robots can safely carry out tasks that are too dangerous for humans. For example: spraying cars with toxic paint, defusing bombs on battlefields and search and rescue operations in buildings destroyed by earthquakes.

#### **Quantum Cryptography**

# Quantum cryptography (encryption) is an emerging technology that allows messages and data to be sent with complete privacy.

Note: Encryption is where digital data and files are scrambled so that only authorised people are allowed to read it.

Unauthorised people attempting to read the data would see illegible nonsense instead of the real information. Older methods of encryption were based around mathematics but quantum cryptography uses physics instead.

This makes the encryption impossible to break.

In quantum cryptography, messages are encrypted using photons.

These are tiny packets of light.

#### **Impacts of Quantum Encryption on everyday life:**

Some impacts of quantum cryptography are discussed below:

- **Completely secure voting** Citizens of countries have the right to vote-in new governments but history is littered with examples of where these votes have been tampered with in order to influence election outcomes. Securing votes with quantum encryption methods ensures that they cannot be tampered with or changed.
- **Completely secure communication** - Messages sent by the military often include the locations of squadrons or special op's teams. If enemy forces intercepted these messages it could have severe consequences. Using quantum cryptography to secure the messages would eliminate the risk of them being read or heard by unauthorised ears.
- **Completely secure bank transfers** - Any electronic transfer of money, such as at ATM's or buying goods online, will be completely secure. Some banks are already using quantum cryptography for the purposes of securing money transfers.
- **Completely secure personal information** - Health records, bank details and other types of personal information will be absolutely secure from hackers and other people wishing to commit identity theft crimes.

### **Computer Assisted Translation (CAT)**

CAT is where a human translator uses computer software to help in the translation process. CAT software can reduce the amount of time that the translation takes. Current CAT tools are not always 100% accurate. They need a human to check for errors.

Examples of different types of CAT tools include:

- **Spell checkers** - These are usually built-into word processing software and can automatically flag-up spelling errors and suggest translations of miss-spelt words.
- NOTE: Most word-processors allow the user to select the language in which to spell-check.
- **Translation memory software** - Translation memory software are databases which store translated text as the human translator works through it in order to be reused in the future. Translated text is built-up in the database's memory and can be accessed by other translators in order to speed up their translation jobs.
- **Language search-engine software** - These are Internet based systems which allow translators to enter any text that they want translating and also to select which language they want the text translating into. The software will then search through a large collection of translation memory databases to try and find a match with the text entered into the search engine.

If a match is found, translated text will be shown on-screen.

### Impacts of Computer Aided Translation on everyday life:

Some impacts of CAT are discussed below:

- **More accurate documents** Spell checkers can quickly scan your word processed documents and automatically find spelling errors. Miss-spelt words can be quickly corrected to produce an error-free document.
- **A more multilingual society** Anyone with an Internet connection can access tools such as Google Translate and the vast collection of language databases that the tools can search through. This makes accessing other languages much easier than in the past and makes it easier for people to learn these new languages.
- NOTE: Google's new 'Voice Search' facility allows users to actually speak into a tablet or mobile phone and Google will automatically translate (and speak) the words or phrase in almost any language.
- **Quicker and more efficient translations** Foreign visitors to countries can be communicated with much easier through these CAT tools. They are especially useful in places like embassies where a wide-range of foreign visitors may need to communicate with local officials about problems or ask for advice etc.

### 3D and Holographic Imaging (aka holograms)

This is a technique where images are made to appear three-dimensional and to actually have depth. Holograms work by taking two regular two-dimensional images of the same object and laying one on top of the other.

The two-dimensional images need to have been shot at different angles.

Two different types of laser beams are used to record the two-dimensional images onto a single photographic plate. This creates one single image that incorporates the angles of the original two-dimensional images. This produces a 3D effect. When viewing the image, human eyes see it from slightly different angles. The brain combines them into a three-dimensional image.

### Impacts of 3D imaging on everyday life:

Some impacts of 3D imaging are discussed below:

- **Improved security** - Credit cards, ID cards, software and some bank notes include holograms as a way of trying to prevent forged duplicates being created.  
NOTE: Forgeries don't usually include a hologram as they are difficult and expensive to reproduce.
- **Better movie experiences** -Hollywood have been using 3D imaging within the production of movies for many years. These provide the viewer with a much more immersive experience. NOTE: 3D movies require the viewer to wear special glasses for the effect to take place. The glasses project two images

shot at different angles (one in each eye) and your brain puts them together as one 3D image.

- **Greater data storage** - It is thought that the technology behind holograms will eventually be used to provide the means to store large amounts of data. Companies have already produced discs that use holographic layers that each have the potential to hold a massive 3.9 terabytes. NOTE: This is the equivalent of over 150 standard Blu-ray discs.

### **Virtual Reality**

Virtual reality is where computers are used to create an artificial environment that users can interact with as if it were real. Virtual reality is not really meant for gaming purposes. It is used for more serious purposes such as:

- Allowing architects to walk around a virtual version of their design (this gives a better idea of what the finished building will look like)
- Training soldiers in combat (flight simulation, battlefield simulation)
- Training surgeons (virtual patients can be operated on to provide experience to trainee surgeons).

# As they walk around the virtual environment users will experience things in a similar way to the real world. For example:

- Objects get smaller as you walk away from them (and bigger as you move closer)
- The direction of sounds change as you move around
- Objects in the virtual world appear the same dimensions as they would in the real world (for example dogs are smaller than us but elephants are bigger).

**Equipment needed to create the virtual reality experience includes the following:**

- **Eye Goggles** - These produce the 3D images that make up the artificial world.
- The goggles project slightly different views into each eye and this fools your brain into thinking that the scene is 3D. Virtual chairs look solid and so on.
- **Special Gloves** - The gloves detect your hand and finger movements which are input into a computer and processed. As users touch or use items in the virtual world, the computer can carry out these commands and make them happen. This allows the user to interact with the virtual world and perform tasks such as moving objects or switching on lights etc.
- **Headphones** - These control what users hear in the virtual world. For example: Distant sounds will be quieter than sounds that are close by.
- **Powerful Computer** - A very powerful computer is needed to create the virtual environment and to process/output data sent into the system by the user's actions. For example: The computer produces graphics that appear as walls, outdoor scenes and objects such as trees.

Virtual reality is still a developing technology and graphics produced are not very realistic yet. However, experiences in the virtual environment can seem very real.

### **Impacts of Virtual Reality on everyday life:**

Some impacts of virtual reality are discussed below:

- **Improved medical surgeons** - Surgeons can be trained using virtual patients. This allows them to practice over and over until they have perfected a particular surgery without risk to a real patient. For example: Imagine a new surgeon performing surgery on you and accidentally cutting off your leg!!.
- **Larger and stronger buildings** - Virtual buildings allow architects to walk around to experience what the building would look like when completed and check for potential errors before the actual building is constructed. Virtual buildings will also be able to be tested against factors such as earthquakes to see what effects they would have on the current design. This allows architects to modify designs quickly and cheaply and will, potentially, allow for the development of much larger and safer buildings than we currently have.
- **More effective treatment of phobias** - VR is being used to help patients overcome phobias and anxieties. People can experience a tame, controlled version of what they are afraid of. Slowly the person becomes used to the situation and can relax. For example: Someone might be terrified of spiders and so they could be gradually introduced to larger and larger virtual spiders (the virtual spiders would be controlled by the therapy team as well).
- **Training in dangerous situations** - VR can be used for training in dangerous situations where it is impossible to practice the real thing. For example: A large fire in an office building could never be set up in reality, but it could in a virtual environment. This will allow workers to practice emergency evacuation in a safe environment.
- **More realistic education** - VR can give students the opportunity to learn in a much more interactive way. For example: Astronomy students can learn about the solar system by engaging with the objects in the virtual environment. They could look around stars, move planets and track the orbits of comets. This approach is likely to allow students to retain knowledge much better than reading text out of a book.

### **Review Questions:**

1. List 5 technologies that are currently being developed or are emerging.
- 2a. Describe 3 areas where artificial intelligence is being developed.
- 2b. Describe 3 impacts that artificial intelligence can have on everyday life.
- 3a. Explain what 'Biometrics' is
- 3b. Describe 3 areas where biometric technology is being used.
- 3c. Describe 3 impacts that biometrics can have on everyday life.

- 4a. State 3 different types of robot
- 4b. Describe 3 areas where robots are being used.
- 4c. Describe 3 impacts that robots can have on everyday life.
- 5a. Explain what 'Quantum Cryptography' is.
- 5b. Describe 3 impacts that quantum cryptography can have on everyday life.
- 6a. Explain what 'Computer Aided Translation' is.
- 6b. Describe 3 different examples of computer aided translation tools.
- 6c. Describe 3 impacts that computer aided translation can have on everyday life.#
- 7a. Explain what '3D Imaging' is.
- 7b. Describe 3 impacts that 3D imaging can have on everyday life.
- 8a. Explain what 'Virtual Reality' is:
- 8b. Describe 3 purposes for which virtual reality is being used.
- 8c. Describe 3 impacts that virtual reality can have on everyday life.
- 9a. Discuss the reliability of digital forensic evidence in courts of law.

## 15.4 ICT Industry

Information and communication technology (ICT) has created new job titles such as computer operators, computer technicians, system analyst, computer programmers, software engineer, information systems manager, data base administrator, computer trainer, web administrator, computer graphics designers, system administrators and network administrator.

### 15.4.1 Careers in the ICT industry

#### System analyst

- This a person who is responsible for analyzing a company's needs or problems then designs and develops a computer based information system.

#### Some of the responsibilities of a system analyst include:

- Reviewing the current manual or redundant information system and making recommendations on how to replace it with a more efficient one.
- Working with programmers to construct and test the system.
- Coordinating training for users of the new system.

#### A good system analyst is one who has at least the following attributes;

- Good problem solving skills and creativity, ie. Must have wide experience in solving problems.
- Good communication skills: The analyst must be able to communicate clearly and precisely both in writing and in speech. He/she must be able to talk to different groups of people e.g managers, operators, attendant and general public.
- Must have business knowledge: the analyst must clearly understand the environment for which the system is being developed.
- Technical knowledge: A system analyst must be well trained in relevant areas of computer science such as hardware, software programming knowledge.

#### Computer operator

- Some of the responsibilities of a computer operator include;
- Entering data into the computer for processing.
- Keeping up-to-date records (log files) of all information processing activities.

#### **Computer technician**

- Given that computers require regular maintenance, upgrading as well as emergency repairs, demand for computer technicians continues to grow as more people computerize their workplaces and homes.
- Some of the responsibilities of a computer technician are;
  - Troubleshooting computer hardware and software related problems.
  - Assembling and upgrading computers and their components.
  - Ensuring that all computer related accessories such as printers modems, storage media devices are in good working condition.

#### **Computer engineer**

- Computer and electronic engineers are coming up with new and more efficient technologies in information and communication technology almost daily. Since computers are electronic devices, hardware designers must be good in electronic engineering in order to be able to:
- Design and develop computer components such as storage devices, motherboards and other electronic components.
- Determine the electrical power requirement of each component.
- Re-engineer computer components to enhance its functionality and efficiency.
- Design and develop engineering and manufacturing computer controlled devices such as robots.

#### **Computer programmer**

- Large organizations such as insurance companies, banks, manufacturing firms and government agents hire programmers to work together with system analysts in order to:
- Develop in house application programs or system programs.
- Customize commercial application packages to suite the organization needs.
- Install, test, debug, and maintain programs developed or customized for the organization.

#### **Web administrator/webmaster**

- **A web administrator is responsible for:**
- Developing and testing websites.
- Maintaining, updating and modifying information on the website to meet new demands by the users.
- **Software engineers:** Most Software engineers analyses user needs and create application software. Software engineers usually have experience in programming, but focus on the design and development of programs using the principles of mathematics and engineering.

- **Computer Trainers:** Computer trainers typically teach new users how to use the computer software and hardware.

#### **Network administrator**

- A network administrator is a specialist whose responsibilities are to:
- Set-up a computer network.
- Maintain and enforce security measures on the network.
- Monitor the use of network resources.
- Maintain and troubleshoot network related problems.

**Graphic designers:** A graphic designer is a professional within the graphic design and graphic arts industry who assembles together images, typography, or motion graphics to create a piece of design.

#### **System Administrators**

- *A system administrator, or sysadmin, is a person who is responsible for the upkeep, configuration, and reliable operation of computer systems; especially multi-user computers, such as servers.*
- *Other responsibilities of an information system administrator include;* The system administrator seeks to ensure that the uptime, performance, resources, and security of the computers he or she manages meet the needs of the users, without exceeding the budget.
- A system administrator may acquire, install, or upgrade computer components and software; provide routine automation; maintain security policies; troubleshoot; train or supervise staff; or offer technical support for projects.

#### **15.4.2 ICT in SMEs**

Small and medium enterprises (SMEs) are independent firms and companies which tend to have fewer employees and lower sales volume compared to large firms and companies. Different definitions are given from different organizations and countries. For example, the Organisation for European Economic Cooperation (OECD) and European Union (EU) designate the upper limit of employees for SME as 200 employees.

Information and communications technology (ICT) offers enormous opportunities for individuals, businesses and society. The application of ICT is equally important to economic and non-economic activities. Researchers have increasingly focused on the adoption and use of ICT by small and medium enterprises (SMEs) as the economic development of a country is largely dependent on them. Following the success of ICT utilisation in SMEs in developed countries, many developing countries are looking to utilise the potential of the technology to develop SMEs. Past studies have shown that the contribution of ICT to the performance of SMEs is not clear and certain. Thus, it is crucial to determine the effectiveness of ICT in generating firm performance since this has implications for SMEs' expenditure on the technology.

## Role of ICT in SMEs

- **Innovation and productivity.** ICT promotes and effects innovation and productivity of firms. It implements the new product to the ultimate users and integrates the capabilities to the internal research and development functions.
- **Open and closed innovation.** SMEs survive the competitive environment based on the innovation. Product initiation or development can no longer be solely determined by internal functions, but rather depends on the contributions of a broad range of external players. External players might include suppliers, customers and research institutes.
- Therefore the open and closed innovations are vital factors in business.
- **Economic role.** ICT in economics plays two important tasks, which are strategic management and cost reduction. The organisation using ICT changes the investment policy, business processes and work practices and creates flexible or new environment.
- **Entrepreneurship role.** SMEs vary internationally based on many factors including the ease of access to sources of funding, the skills base in the locale and characteristics of regional markets. ICT enables closer links between businesses, suppliers, customers and collaborative partners. By enabling closer communication and collaboration, ICT assists businesses to be more responsive to innovation opportunities and provides significant efficiency gains.

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## Policies regarding adoption of ICT in SMEs

The organisations should consider these factors for adoption of ICT in SMEs.

- **E-commerce / E-business:** Shift to a wider view of e-commerce integration of internal and external processes. Business and sector associations to provide tools to assess ecommerce/ e-business opportunities, benefits and costs and the development of niche products and services.
- **Staff ICT training.** Training programmes for SME managers and employees focussing on both ICT and managerial skills need to be provided in cooperation with business and sector organisations, training institution and commercial training services.
- **Privacy issues.** Address security, trust and confidence through broad policy frameworks, regulatory and self-regulatory tools, trustworthy technologies and affordable redress mechanisms.
- **E-governance.** Use e-government initiatives to provide incentives for SMEs to go on-line by simplifying administrative procedures, reducing costs and allowing them to enter new markets.
- **Growth analysis.** Expand collection and analysis of increasingly available statistics on e-business and e-commerce to monitor progress and improve cross-country analysis.

### Challenges of ICT adoption

- **Supporting challenges.** SMEs do not take advantage of ICT vary widely across sectors and nations. In developing countries in India, SMEs often lack the human technological resources needed for ICT implementation.
- **Lack of awareness,** uncertainty of ICT benefits, set-up costs and pricing issues and security concerns are the most visible barriers to ICT
- **Technical challenges.** From technological perspective, a firm should have at least someone within it who has a reasonable amount of knowledge for technology in general.
- Therefore, without internal technological capabilities, utilisation of ICT applications might be difficult and sometimes dangerous in terms of system maintenance and failures.
- The opposite is to seek advice and support from IT professionals, but most SMEs do not simply afford to do that because of the relatively high cost.
- **Managerial challenges.** From managerial perspective, SMEs may also lack the managerial understanding and skills. A small and medium-sized enterprise needs to entirely reshape its current systems because ICT adoption projects are complex in nature. Undertaking such changes cannot be successfully implemented without relevant skills and a visionary mindset.
- **Administrative challenges.**
- More precisely, very often, managers of SMEs set their decisions on current needs and situation. The decision-making process of the managers is rather intuitive, based on instinctive decisions and is less dependent on formal models of decision making. They tend not to pass on information and do not delegate decision-making powers to their inferiors. They are often the only people in the company who have the authority, responsibility and access to the information necessary for identifying business opportunities including utilisation of information technologies for strategic and competitive purposes.

### Principle reason for non-adoption of ICT

SMEs are largely dependent on the environmental surroundings of the companies. SMEs are negatively affected by the following factors:

1. Low economic power compared to large companies.
2. Difficultly gaining access to capital with a consequently limited ability to finance development activities.
3. Worse access to specialised training and education compared to larger companies.
4. Lower access to necessary information and consultancy services.
5. Unfair competition from large companies and dumping prices of imported products.
6. Limited sale of finished products in the domestic market and increased cost of export.
7. Competition of retail organisations managed by financially strong companies.

8. Weak position in public tenders.
9. Failure to and delay in receiving payments resulting in secondary financial insolvency.
10. High administrative demands from government bodies and agencies.

### **Case Study: SMEs in Uganda**

In Uganda SMEs account for a significant share of production and employment and are therefore directly connected to poverty alleviation. While in many respects the Ugandan economy is different to that of other countries in the continent, for the poor population in the rural areas SMEs are also very relevant for employment and as an income source. Especially in developing countries like Uganda, SMEs are challenged by the globalisation of production and the shift in the importance of the various determinants of competitiveness.

Through the rapid spread of information and communication technologies (ICT) and ever decreasing prices for communication, markets in different parts of the world become more integrated. Therefore, one basic question of this study is whether the use of ICT (as a production technology, as information processing technology or as information communication technology) can help them to cope with these new challenges. The spread of ICT has led several commentators to argue that these technologies are creating a new economy - an information economy - in which information is the critical resource and basis for competition in all sectors - manufacturing and probably even more in services. Generally, from the performance perspective, the competitiveness effect of ICTs derives from the impact that ICTs have upon the productivity of the factor inputs. In this regard, ICTs can improve efficiency and increase productivity by different ways including, improving efficiency in resource allocation, reducing transaction costs, and technical improvement, leading to the outward shifting of the production function.

### **Why government encourage SME access to and use of ICTS?**

The SME play a key role in national economic development strategies by facilitating flows of information, capital, ideas, people and products.

The contributions of SMEs to employment and the countries' gross domestic product (GDP) are by no means trivial. These contributions can further be enhanced and strengthened through the use of ICTs that are increasingly transforming modern businesses by enabling the rapid, reliable and efficient exchange of large amounts of information. Access to and the use of ICTs by SMEs, particularly as a collective sector, will lead to greater job creation, increased public revenue and a general rise in the standard of living.

### **The problem at hand in Uganda**

Most SMEs in Uganda, do not appreciate the importance of using ICTs and e-business in the performance of their businesses. There is therefore need to establish the factors

that have led to this reluctance towards the application of ICTs in the business processes of SMEs in order to exploit the benefits of these modern technologies which can be easily implemented for improved performance, cost reduction, competitive advantage and many others.

Comparatively, medium-sized enterprises have made attempts to put ICT strategies in place. The medium-sized enterprises attach great value to information compared to small-sized enterprises perhaps because they have significant investments.

### **ICTs commonly used by SMEs in Uganda**

The ICTs most commonly used by SMEs in Uganda include:

- Microsoft Office applications;
- computers;
- internet access;
- e-mail communications;
- telephones;
- photocopiers;
- printers; and
- Websites.

However, unlike SMEs in developed countries, those in Uganda are not fully exploiting the potential of ICT to compete effectively in the international markets. This is because of the following factors:

- lack of e-business / e-commerce infrastructure;
- lack of skills to develop and maintain interactive websites; and
- the use of obsolete technologies.
- high cost of internet connectivity;
- security issues concerning payments; and
- Shortage of skills.

### **Information needs of SMEs in the ICT sector**

There is a great diversity of information demands that need to be fulfilled, which include, among others, information on:

- |                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• enhancing business growth;</li> <li>• licensing, tenders;</li> <li>• taxation and tariffs;</li> <li>• productivity;</li> <li>• sales;</li> <li>• marketing;</li> <li>• distribution;</li> </ul> | <ul style="list-style-type: none"> <li>• training opportunities;</li> <li>• potential investment opportunities;</li> <li>• new products;</li> <li>• viable business projects;</li> <li>• supplier prices;</li> <li>• customers;</li> <li>• consumer needs;</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **Sources of information used by SMEs**

SMEs in general obtain information from various sources, including:

- the internet;
- head offices;
- heads of department;
- brochures;
- other ICT companies;
- consultants;
- training seminars;
- trade catalogues;
- visits to relevant offices;

### Means of disseminating information by SMEs

SMEs disseminate information through a combination of methods, such as:

- |                                                                                                                                                                                     |                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• e-mail;</li><li>• memos;</li><li>• staff meetings;</li><li>• departmental heads;</li><li>• newsletters;</li><li>• annual reports;</li></ul> | <ul style="list-style-type: none"><li>• websites;</li><li>• intranets;</li><li>• workshops;</li><li>• trade catalogues; and</li><li>• personal visits.</li></ul> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The reliance on various means of disseminating information could be attributed to the fact that no single method is considered sufficient, perhaps due to the diversity of information needs.

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### Information sharing among SMEs

Some of the SMEs have LANs, suggesting that they recognise the importance of information sharing. However, most applications implemented on the LANs are basic, such as e-mail applications, small databases, Microsoft applications, and product information that are largely for in-house use.

### Compliance by SMEs with information security procedures

Both small and medium-sized enterprises employ mainly antivirus programmes and regular backups to ensure the security of information. However, medium-sized enterprises in addition use sophisticated information security measures such as:

- firewalls;
- regular software updates;
- offsite storage;
- authentication;
- encryption; and
- audit trails for diagnostics.

This suggests that medium-sized enterprises are more concerned with security than small-sized enterprises, probably because they have generally made significant investments in their businesses.

#### **Barriers to adoption of ICTs by SMEs in Uganda**

Most of the current and potential clients for SMEs in Uganda are not connected to the internet, largely because of high costs and a lack of awareness. Furthermore, the government has not put in place an e-commerce friendly environment, which would build consumer trust and business confidence.

Firms in Uganda, are generally at a competitive disadvantage in comparison with foreign controlled ones because of lack of capital. Moreover, the ICT market is not yet mature and people are yet to develop confidence in using ICTs, as is evident with the use of automated teller machines (ATM) across the country. Some people still tend to prefer going to the teller in the bank instead of querying and accessing their accounts through an ATM. Furthermore, telecommunication cost is high, quality sometimes poor and a barrier to transacting business on the web. Other barriers include:

- limited and poor-quality bandwidth;
- lack of security guarantees;
- inadequate legislative framework;
- frequent internet downtime;
- slow internet access;
- high taxation; and
- inadequate technical support.

**Past exam Qn** Mention ways in which you will use the subsidiary ICT knowledge and skills you've acquired to earn income during your S6 vacation. (5 mks)

- Typesetting documents and printing business
- Taking on Data Entry jobs
- CD/ DVD writing and selling
- Provision of internet services
- Networking computers for organizations
- Desktop Publishing
- Computer Software Installation
- Computer Hardware Maintenance
- Image editing and graphic design
- Web page or website development
- Blogging
- Social Media marketing
- Computer Training

## GLOSSARY OF TECHNOLOGY TERMS

**Adobe Acrobat Reader:** Acrobat Reader is software that allows you to view a PDF document (a document that can be seen but not changed). It can be downloaded free of charge from Adobe.

**ADSL:** Asymmetric digital subscriber line (ADSL) is a type of digital subscriber line (DSL) broadband technology that is used to connect to the Internet. It uses standard telephone lines to deliver high-speed data communications (up to 24 megabytes per second).

**Analogue:** Analogue is a conventional method of transmitting data. Standard landline telephones use analogue technology. It is distinct from digital technology, which provides for greater quality and speed of data transmission.

**Assistive technology:** Assistive technology refers to any software or hardware that acts to assist and improve the functional capabilities of people with disabilities. Examples include wheelchairs, prosthetics, voice-to-text technology and text-to-speech technology.

**Attachment:** An attachment is a document sent with an email message. Many types of files can be sent this way (e.g. Word documents, PDFs, Excel files, JPEGs). Be wary of attaching large files because these can take a lot of time for the recipient to download. If you have a large file, it is considered good practice to compress the file using software such as Winzip before attaching it.

**Back-end:** Back-end refers to the part of an application that performs an essential task not apparent to the user.

**Backward compatible:** If software is backward compatible, it is compatible with

earlier (superseded) versions of the same software. For example, the Microsoft word-processing program Word 2010 can read files created in the 2003 version of the same program, so it is backward compatible.

**Bandwidth:** Bandwidth refers to the maximum amount of data that can travel a communications path in a given time, usually measured in seconds.

**Bit:** A bit (short for binary digit) is the smallest unit of measurement in computing. 8 bits make up 1 byte.

**Bluetooth:** Bluetooth is a wireless communications technology that uses radio waves to establish short-range connections between compatible devices such as mobile phones, tablets, headsets or medical equipment.

**Bookmark:** A bookmark is a saved link to a particular Web page. Microsoft Internet Explorer denotes bookmarks as "favourites."

**Boolean operators:** Most search engines (e.g. Google) allow you to limit your search or make it more specific by using words such as "and", "or" and "not". These words are known as boolean operators because of their origin as terms in logic.

**Boot (re-boot):** To boot (or re-boot) is to load and initialise the operating system on a computer. Think of it as starting up your computer. In Windows you can use the key combination CTRL and ALT and DEL as a "soft" boot. This means restarting the computer rather than turning it completely off and on again, which could cause damage to your computer's hard disk under some circumstances.

**Bounce back:** An email message that cannot be delivered and returns an error

notification to the sender is said to "bounce back". If you receive such an error notification, check that you have typed the address correctly.

**Broadband:** Broadband is a type of communications technology whereby a single wire can carry more than one type of signal at once; for example, audio and video. Cable TV is one technology that uses broadband data transmission.

**Browser:** A software program that allows you to surf the web. Popular web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge and Internet Explorer.

**Cache:** When you download (read) a web page, the data is "cached," meaning it is temporarily stored on your computer. The next time you want that page, instead of requesting the file from the web server, your web browser just accesses it from the cache, so the page loads quickly. The downside to this is that if the cached web page is often updated, you may miss the latest version. If you suspect that the web page you're seeing is not the latest version, use the "refresh" button on your browser.

**CAD:** Computer-aided design (CAD) is a type of software that allows users to create 2D and 3D design and modelling. CAD is used by architects, engineers, artists and other professionals to create precise technical drawings.

**Chip:** A chip is a microprocessor that performs many functions and calculations that make your computer run. Your computer's chip is also referred to as the CPU (Central Processing Unit) or the processor.

**Cloud computing:** Cloud computing refers to the storing and accessing of data and programs over the Internet instead of on

another type of hard drive. Examples of Cloud services include iCloud, Google Cloud and Dropbox.

**Compression:** Compression is the reduction of the size of a file. Compressed files take up less memory and can be downloaded or sent over the Internet more quickly.

**Content:** Content refers to a website's text and information, as opposed to its design and structure.

**Cookie:** A piece of code or data created by a web server and stored on a user's computer. It is used to keep track of the user's usage patterns and preferences.

**CPU:** The central processing unit (CPU) is the brains behind your computer. The CPU is responsible for performing calculations and tasks that make programs work. The higher the speed of a CPU, the faster the CPU undertakes the calculations and tasks.

**Cybercrime:** Cybercrime is any type of illegal activity that is undertaken (or relies heavily) on a computer. There are thousands of types of cybercrime, including network intrusions, identity theft and the spreading of computer viruses.

**Cybersecurity:** Cybersecurity refers to measures designed to protect your computer, device or network from cybercrime. This involves preventing unintended and unauthorised access, change and damage.

**Device driver:** A device driver is a small program that allows a peripheral device such as a printer or scanner to connect to your PC.

**Domain:** A domain is a set of computers on a network that are managed as a unit.

**Download:** Downloading is the method by which users access and save or "pull down" software or other files to their own

computers from a remote computer via the Internet.

**DV:** DV stands for digital video.

**Email:** Email or electronic mail is a way of sending messages over the internet. Popular email programs include Outlook, Mozilla Thunderbird, Gmail and Yahoo Mail.

**Encryption:** Encryption is the process of converting electronic data to an unrecognisable or encrypted form, one that cannot be easily understood by unauthorised parties.

**Ethernet:** Ethernet is the most common way of connecting computers on a network with a wired connection. It is a type of local area network (LAN) technology, providing a simple interface for connecting multiple devices.

**Firewall:** A firewall is a barrier that acts as a security system to protect trusted computer systems and networks from outside connections and untrusted networks, such as the Internet.

**FTP:** File transfer protocol (FTP) is a common method of transferring files via the internet from one host to another host.

**Gateway:** A point within a network that interconnects with other networks.

**GIF:** Graphics interchange format (GIF) is a graphics file format. Because GIF files are compressed, they can be quickly and easily transmitted over a network. GIF is one of the main graphics formats on the Internet.

**Hard disk:** The physical place where a computer stores information - applications and files - is known as its hard disk drive (HDD). The bigger the HDD, the more data it can store.

**Home page:** The page that an Internet browser first opens up to. It is usually the

starting point of an organisation's or individual's website.

**HTML:** Hyper-text markup language (HTML) is a set of symbols inserted into files intended for display on the world wide web. The symbols tell web browsers how to display words and images - e.g. which colour, font and type size to use - and they direct it to link to other pages on the world wide web via hyperlinks.

**Internet:** A set of interconnected networks that allow computers in different locations to exchange information. The Internet includes services such as the world wide web, electronic mail, file transfer protocol (FTP), chat and remote access to networks and computers.

**ISP:** An internet service provider (ISP) is a company that provides access to the Internet. In Australia, widely used ISPs include Bigpond, iiNet and Dodo.

**Intranet:** An intranet is basically a private, internal internet specific to an organisation or group.

**Java:** Java is a programming language that is commonly used in the development of client-server web applications.

**JPEG:** JPEG stands for Joint Photographic Experts Group, which was the committee that created the file format known as JPEG. The format is commonly used for photos displayed on the world wide web.

**LAN:** A local area network (LAN) is a system that connects computers and other devices that share a common communications line and wireless link, generally within a limited geographical area such as a home or office building.

**Malware:** "Malware" is short for malicious software. It refers to a software program that has been developed to do harm to

other computers. Types of malware include viruses, worms and spyware.

**Megabyte:** A measure of computer processor storage and real and virtual memory. A megabyte (Mb) is 2 to the 20th power bytes, or 1,048,576 bytes in decimal notation.

**Megahertz:** Megahertz is the unit used to measure the speed of a computer's processor (e.g. 2.8Ghz)

**Modem:** A modem is a device that allows computers to transmit information to each other via ordinary telephone lines.

**Online:** If a computer (or computer user) is online, it is currently connected to a network or to the Internet. Online also refers to resources and services available on the Internet - e.g. online banking, online dictionary.

**Operating system:** An operating system (OS) is the software that manages all of a computer's processes and allows programs and applications to run. The most prominent operating system is Microsoft Windows. Others include Mac OS X and Linux.

**PDF:** Portable document format (PDF) is a file type created by Adobe Systems Inc. PDFs can be read using free software called Adobe Acrobat Reader or another PDF reader.

**Phishing:** Phishing is a type of email fraud in which the perpetrator sends out emails that appear to come from a legitimate service or reputable company, such as a bank or an email service provider. These emails aim to lure recipients to reveal confidential information that the perpetrator can use for their financial advantage - for example, online banking log-in details and passwords.

**Plug-in:** A software plug-in is a component that adds to a software program's functionality.

**POP:** A Post office protocol (POP) is an Internet protocol used by your Internet service provider (ISP) to handle email. A POP account is an email account.

**PPM:** Pages per minute (PPM) generally refers to the speed of a printer.

**Processor:** The processor is the brains of your computer. It is responsible for performing calculations and tasks that make programs work. The faster the processor, the faster the computer works.

**Protocol:** A protocol is a standard or set of rules that computers and other devices use when communicating with one another.

**RAM:** Random access memory (RAM) is usually referred to as a computer's "memory" - it stores information used by programs. Generally, the larger your computer's RAM, the more programs it can run at once without slowing down.

**Read-only:** A read-only file cannot be edited, modified or deleted.

**Resolution:** Resolution refers to the number of distinct pixels that make up the display on a computer monitor. It is denoted in DPI (dots per inch). The higher the resolution, the finer and smoother the images appear when displayed at a given size.

**ROM:** ROM stands for read-only memory. It is the part of a computer's memory that cannot be changed by a user. The contents of ROM remain even when the computer is turned off.

**SaaS:** SaaS stands for software as a service. It is a software distribution model whereby software applications are centrally hosted and licensed on a subscription basis.

**Search engine:** A search engine enables a computer user to search information on the Internet. It is a type of software that creates indexes of databases or Internet sites based on the titles of files, keywords, or the full text of files. The most popular search engines are Google.com, Yahoo.com and Bing.com.

**SSL:** SSL, or secure sockets layer, is a protocol that allows Internet users to send encrypted messages across the Internet. It is generally used when transmitting confidential information (e.g. personal data or credit card details). A web address that begins with "https" indicates that an SSL connection is in use.

**SEO:** SEO, or search engine optimisation, is the practice of making adjustments to certain aspects of a website in an effort to improve its ranking on search engines.

**Server:** A server is a computer that handles requests for data, email, file transfers, and other network services from other computers.

**Spam:** Spam refers to unsolicited email messages sent for marketing purposes.

**Unzip:** To unzip a zip file is to extract and decompress compressed files from it. If you are sent a zip file via email, you will need to unzip it before you can access the files inside it.

**URL:** A URL (unique resource locator) or web address is the string of characters you type into a browser to access a particular website or other resource on the Internet.  
(eg. <http://www.ourcommunity.com> )

**Viral:** If an online video, photo or article "goes viral", it experiences a sudden spike in popularity in a short period of time.

**Virus:** A virus is a piece of programming code inserted into other programming to cause damage. Viruses can be sent in many forms but are often transmitted via email messages that, when opened, may erase data or cause damage to your hard disk. Some viruses are able to enter your email system and send themselves to other people in your list of contacts.

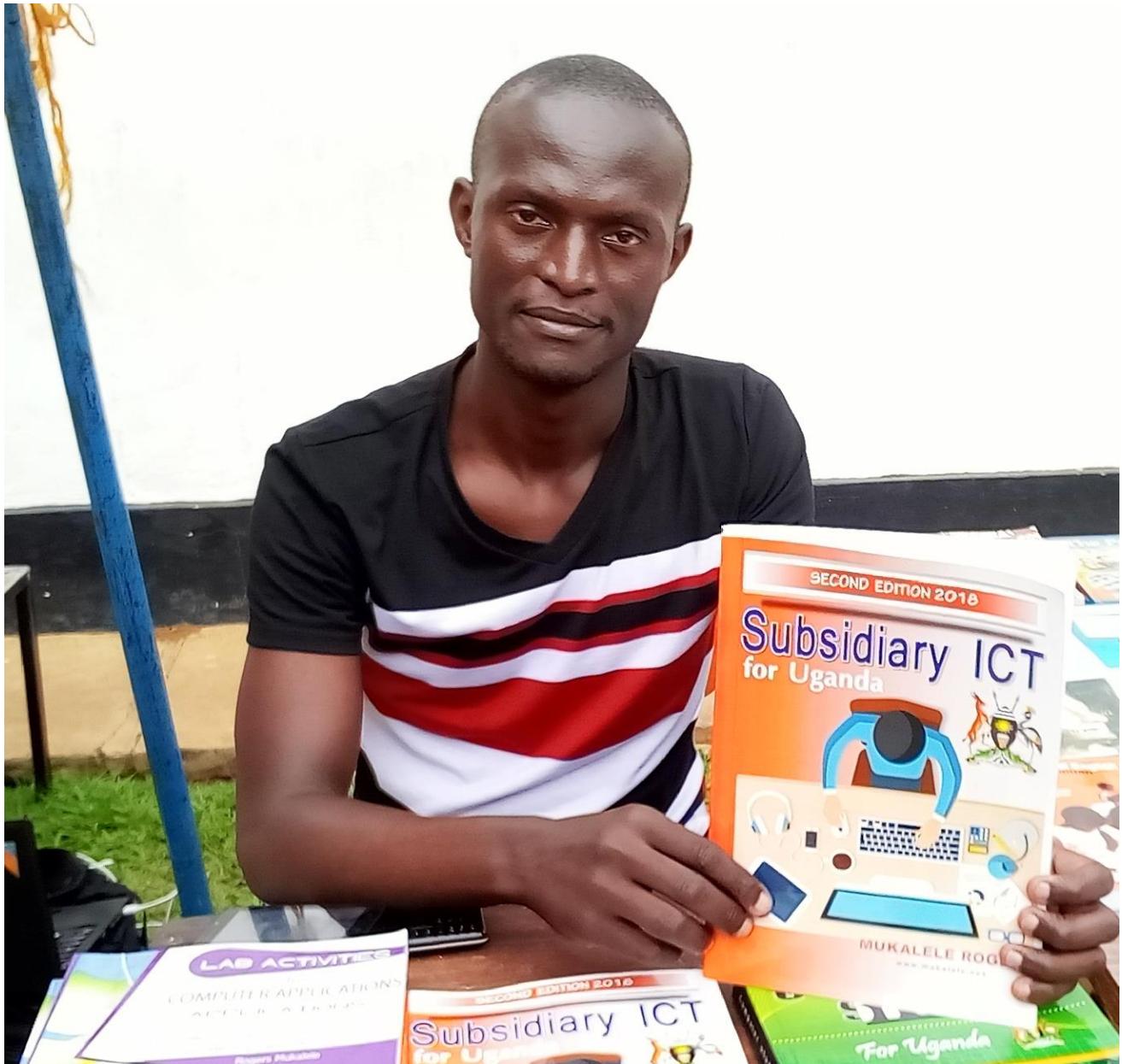
**WEP:** Wired equivalent privacy (WEP) is a security protocol used in wi-fi networks. It is designed to provide a wireless local area network (LAN) with a level of security similar to that of a regular wired LAN. WEP-secured networks are usually protected by passwords. (See also WAP.)

**Wi-Fi:** Wi-Fi is a technology that allows computers and other devices to communicate via a wireless signal. Essentially, it means you can browse the internet without tripping over phone cords.

**WPA:** Wi-Fi protected access (WPA) is a security protocol used in wi-fi networks. It is an improvement on WEP because it offers greater protection through more sophisticated data encryption.

**Zip:** To zip files is to archive and compress them into one file of smaller size using a program such as WinZip. It's a handy way to make files smaller before sending them via email.

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