Chapter 1: Types and components of computer systems

Learning Objectives – When you have finished this chapter you will be able to:

- Define the physical components of hardware for a computer system, including identifying internal hardware devices
- Identify external hardware devices and peripherals, define software as programs for controlling the operation of a computer
- Define applications software, define and describe system software and describe operating systems that contain a (CLI) or (GUI)
- Describe the central processing unit and its role, describe ROM and RAM and their differences
- Define input and output devices and describe their differences, as well as secondary/backing storage
- Describe and compare the characteristics used in personal/desktop computer and laptop computers as standalone/networked
- Describe the characteristics and uses of tablet and smartphones, including wireless technology or 3G/4G
- Describe how emerging technologies are having an impact on human lives
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define hardware as consisting of physical components of a computer system</td>
<td></td>
</tr>
<tr>
<td>Identify internal hardware devices (e.g. processor, motherboards, random access memory (RAM),</td>
<td>read-only memory (ROM), video cards, sound cards and internal hard disk drives.</td>
</tr>
<tr>
<td>Identify external hardware devices and peripherals (such as monitors, keyboards, mice, keyboards,</td>
<td>print as input and output devices and external storage devices in general)</td>
</tr>
<tr>
<td>Define software as programs for controlling the operation of a computer or processing of electronic data</td>
<td></td>
</tr>
<tr>
<td>Identify the two types of software – applications software and system software</td>
<td></td>
</tr>
<tr>
<td>Define applications software (e.g. word processing, spreadsheet, database management systems,</td>
<td>control software, measuring software, applets and apps, photo-editing software, video-editing software, graphics manipulation software)</td>
</tr>
<tr>
<td>Define system software (e.g. compilers, linkers, device drivers, operating systems and utilities)</td>
<td></td>
</tr>
</tbody>
</table>
What is Hardware?

- Hardware are the **physical components** which make up the computer system.
- Each item of hardware have their specific roles in a computer system.
- Hardware components can either be internal or external.
# ICT IGCSE Theory – Revision Presentation

## 1.01 Hardware and Software

### Internal hardware devices

<table>
<thead>
<tr>
<th>Central Processing Unit (CPU)</th>
<th>The <strong>CPU</strong> is the 'brain' of the computer. It is the device that carries out calculations to complete software instructions. Uses arithmetic logic unit (ALU), where the calculations occur: AND, OR, NOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motherboard</td>
<td>The <strong>motherboard</strong> a printed circuit board that allocates power to the CPU, RAM and other hardware components, and allows them to communicate with each other. A circuit board which connects to main components of the computer system.</td>
</tr>
<tr>
<td>Memory</td>
<td>Any data or instructions that are to be processed by the CPU must be placed into main <strong>memory</strong>.</td>
</tr>
</tbody>
</table>
## ICT IGCSE Theory – Revision Presentation

### 1.01 Hardware and Software

#### Internal hardware devices

**Graphic Video Cards**

A **graphics card** is a device that attaches to the motherboard to enable the computer to process and display graphics. Internal circuit board for displaying images from a computer onto a screen.

**Sound Card**

A **sound card** is a device that attaches to the motherboard to enable the computer to input, process, and deliver sound. Enables the computer to send audio information to an audio device, such as speakers or headphones.

**Internal Hard Disk**

A **hard disk** drive is a hardware device that's used to store information like software and files. The capacity of hard drive ranges from GB to Tera Bytes.
### 1.01 Hardware and Software

#### Internal hardware devices

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network Card</strong></td>
<td>A network card provides the computer with a network (internet connection) either through wireless signals or a physical cable connection.</td>
</tr>
<tr>
<td><strong>Optical Disk Drive</strong></td>
<td>The optical disk drive (CD/DVD/Blu-Ray) allows for optical disks to run on the computer. Also some optical disk drives are able to write “burn” data onto discs.</td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>The power supply is connected to main power sources to give power to the computer system. The power supply connects to all the main components of the computer system including the motherboard, hard drive, optical drives etc.</td>
</tr>
</tbody>
</table>
# External Hardware Devices

## Input Hardware Devices – Input data into a Computer

**Examples**
- Mouse
- Keyboard
- Microphone

## Output Hardware Devices – Outputs data from a computer

**Examples**
- Monitor
- Speakers
- Printers

## External Storage Devices – Provides external storage or backup solutions

**Examples**
- External Hard drive
1.01 Hardware and Software

Computer Software

What is Software?

Software is a collection of instructions that can be ‘run’ on a computer. These instructions tell the computer what to do.

Software is not a physical thing (but it can of course be stored on a physical medium such as a CD-ROM), it is just a bunch of codes.

For a computer system to be useful it has to consist of both hardware and software.
## Application Software

<table>
<thead>
<tr>
<th>Examples</th>
<th>Application software are designed to allow users to complete specific tasks. This may be to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Word Processor</td>
<td>• Write a letter/Present information</td>
</tr>
<tr>
<td>• Spreadsheet</td>
<td>• Browse the internet</td>
</tr>
<tr>
<td>• Databases</td>
<td>• Manipulate data in a spreadsheet or database</td>
</tr>
<tr>
<td>• Presentations</td>
<td>• Manipulate graphics, sound or video.</td>
</tr>
</tbody>
</table>

## System Software

<table>
<thead>
<tr>
<th>Examples</th>
<th>System software are normally involved in the running of the computer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operating Systems</td>
<td>• Operating systems to provide a user interface</td>
</tr>
<tr>
<td>• Device Drivers</td>
<td>• Device drivers which allow hardware components to work.</td>
</tr>
<tr>
<td>• Utilities (antivirus)</td>
<td>• Utility software which maintain the computer performance.</td>
</tr>
<tr>
<td>• Linker</td>
<td></td>
</tr>
<tr>
<td>• Compiler</td>
<td></td>
</tr>
</tbody>
</table>
# ICT IGCSE Theory – Revision Presentation

## 1.01 Hardware and Software

### Application Software Examples

<table>
<thead>
<tr>
<th>Word Processing</th>
<th>Spreadsheet</th>
<th>Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used to prepare reports, school essays etc.</td>
<td>Use to create to organise and manipulate numeric data.</td>
<td>Database is used to insert and organise data using fields and records.</td>
</tr>
</tbody>
</table>

#### Word Processing
- Create New or edit existing text documents.
- Formatting tools
- Create font styles
- Importing tables/images
- Spell Check
- Copy/Paste
- Find/Replace
- Page layout

#### Spreadsheet
- Use of various formulas to carry out set tasks:
  - Sum, Max, Min, Average
  - Count, CountA
  - CountIf & SumIF
  - Lookups
  - IF and Nested Ifs
- Apply various formatting to cells/
- Create graphs (Ba/Pie charts)

#### Database
- Create a table so that records can be inserted.
- Run queries using search criteria to find specific data.
- Create reports including labels from the search criteria.
## Application Software Examples

<table>
<thead>
<tr>
<th>Photo Editing</th>
<th>Graphics Manipulation</th>
<th>Video Editing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used to edit digital images to either touch up or to apply various formatting techniques.</td>
<td>Used to create and edit bitmap and vector graphics.</td>
<td>Used to edit and format video using various tools and techniques.</td>
</tr>
</tbody>
</table>

- **Photo Editing**
  - Contrast/Brightness
  - Use of layers
  - Filter tools
  - Lighting effects
  - Liquify (change features of a face)
  - Brush tools
  - Clone/Stamp tool

- **Graphics Manipulation**
  - Pixels in bitmap images can be changed to produce a different image.
  - Vector images use:
    - Lines
    - Curves
    - Text

- **Video Editing**
  - Split and Trim videos
  - Create split screens
  - Rearranging order of clips.
  - Transitions between clips (Fade)
  - Inserting Audio
  - Applying filters and using video enhancement techniques

- **Examples**
  - Photo Editing: Used to edit digital images to either touch up or apply various formatting techniques.
  - Graphics Manipulation: Used to create and edit bitmap and vector graphics.
  - Video Editing: Used to edit and format video using various tools and techniques.
# Chapter 1: Types and components of computer systems

## Application Software Examples

<table>
<thead>
<tr>
<th>Apps (Phone Applications)</th>
<th>Measuring and Control Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apps are the software which runs on mobile phones. They usually come with the phone or can be downloaded and updated.</td>
<td>Measuring and control software which are responsible for changing physical conditions in an environment.</td>
</tr>
</tbody>
</table>

- Games (Angry Birds)
- Video/Music Streaming (YouTube)
- Social Media (Facebook, Twitter, Instagram)
- Communication (WhatsApp, Viber)
- Camera (Editing images)
- GPS (Satellite navigation)
- Health/Fitness

### Measuring
- Sensors take readings which are processed by the computer or microprocessor.

### Control Software
- By comparing sensor readings to a pre-set level the control software will decide on an output (For example to increase or decrease the heat in a greenhouse.)
Operating Systems

Manages computers functions including hardware devices (input/output). Also provides users with a GUI interface.

Device Drivers

Allows hardware devices to run on the computer including printers, sound, graphics and network cards.

System Software

Utilities

Help to manage and maintain computer resources and performance by running specific tasks.

Compiler

Translates a program written in a specific language which can be understood by the computer.

Linkers

Combines object files produced by a compiler into a single program.
**Question 1.01**
Make a note of all the external hardware devices your group can think of.
Now explain what the devices on your list do, and make a note of whether they are input or output devices.

**Question 1.02**
a. When you are on the internet, you are using a specific type of software. What is its generic name?
b. Make a list of the advantages of custom-made software over off-the-shelf software.

**Question 1.03**
a. Create two columns with the labels “Input” and “Output”. Now enter each of the following devices into the appropriate column.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor</td>
<td>Projector</td>
</tr>
<tr>
<td>Scanner</td>
<td>Touch Screen</td>
</tr>
<tr>
<td>Webcam</td>
<td>Modem</td>
</tr>
<tr>
<td>Touchpad</td>
<td>Trackerball</td>
</tr>
<tr>
<td>Microphone</td>
<td>Cameras</td>
</tr>
<tr>
<td>Printer</td>
<td>Speakers</td>
</tr>
<tr>
<td>Plotter</td>
<td>Bar code reader</td>
</tr>
<tr>
<td></td>
<td>Gamepad</td>
</tr>
<tr>
<td></td>
<td>Joystick</td>
</tr>
<tr>
<td></td>
<td>Keyboard</td>
</tr>
<tr>
<td></td>
<td>MIDI Keyboard</td>
</tr>
<tr>
<td></td>
<td>Mouse</td>
</tr>
<tr>
<td></td>
<td>Burglar alarm</td>
</tr>
</tbody>
</table>

b. Now you have done that, draw a circle around two of the words that could be both input and output!
c. Try to list as many other devices with a microprocessor as you can.
d. Investigate the use of microprocessors in household devices. In what way do they help? What are the disadvantages?

**Question 1.04**
ROM and RAM are types of memory found in computers.
a. What does ROM stand for and what does it do?
b. What does RAM stand for and what does it do?
c. What is the main difference between ROM and RAM?
d. Write an explanation of the difference between volatile and non-volatile computer memory.
Question 1.05
Many other types of user interface can be used on computer systems.

a. Find out about menu-based interfaces and form-based interfaces. For a menu-based interface, find an information system at a local train station or bank. For a form-based interface, look at a typical website for booking a hotel room.
b. Write down what you have found for each one, explaining why they are used in that situation.
c. Discuss with members of the class what experience they may have of different user interfaces.
d. What types of user interfaces are used by different people in school? Discuss why they are needed.

Extension Activity

a. Try to find out about some more types of interface. What, for example, is a “natural language” interface?
b. Are the type of user and the job that is to be done the only factors dictating what a computer interface will look like?
c. A washing machine uses a computer processor to control the wash cycle. What does the user interface look like? Why is it not a GUI?
d. What kind of user interface does a camera have?

Extension Activity
Discuss in your class: “It may be worrying to trust your safety on the road to a computer, but do the benefits of a self-drive car outweigh the disadvantage? In your discussion, consider what it would mean for people with sensory or physical disabilities.”