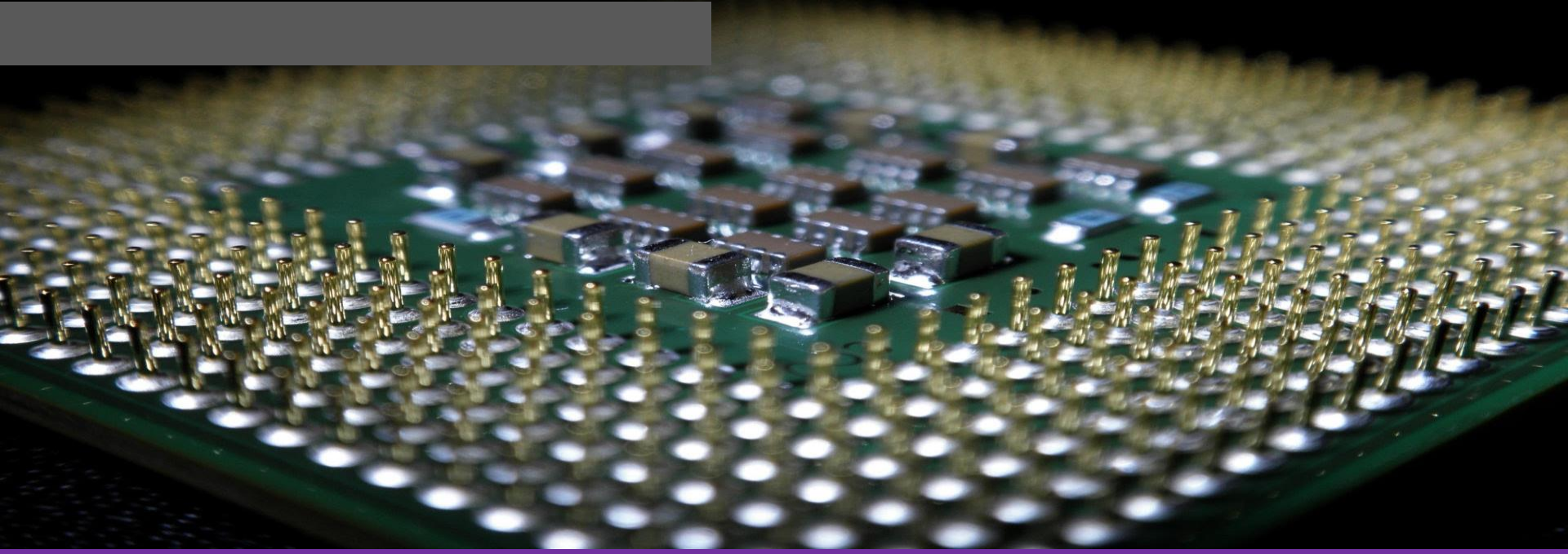

Chapter 1: *Types and components of computer systems*

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*

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Overview

- Define hardware as consisting of physical components of a computer system
- Identify internal hardware devices (e.g. processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives.
- Identify external hardware devices and peripherals (such as monitors, keyboards, mice, keyboards, printers as input and output devices and external storage devices in general)
- Define software as programs for controlling the operation of a computer or processing of electronic data
- Identify the two types of software – applications software and system software
- Define applications software (e.g. word processing, spreadsheet, database management systems, control software, measuring software, applets and apps, photo-editing software, video-editing software, graphics manipulation software)
- Define system software (e.g. compilers, linkers, device drivers, operating systems and utilities)

Define hardware as consisting of physical components of a computer system

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.









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1.01 Hardware and Software

Internal hardware devices

Central Processing Unit (CPU)

The **CPU** 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

Motherboard

The **motherboard** 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.

Memory

Any data or instructions that are to be processed by the CPU must be placed into main **memory**.

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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 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.

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1.01 Hardware and Software

Internal hardware devices

Network Card	
	A **network card** provides the computer with a network (internet connection) either through wireless signals or a physical cable connection.
Optical Disk Drive	
	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.
Power Supply	
	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.

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1.01 Hardware and Software

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



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**.

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1.01 Hardware and Software

Applications Software and System Software

Application Software

Examples
- Word Processor
- Spreadsheet
- Databases
- Presentations

Application software are designed to allow users to complete specific tasks. This may be to:
- Write a letter/Present information
- Browse the internet
- Manipulate data in a spreadsheet or database
- Manipulate graphics, sound or video.

System Software

Examples
- Operating Systems
- Device Drivers
- Utilities (antivirus)
- Linker
- Compiler

System software are normally involved in the running of the computer:
- Operating systems to provide a user interface
- Device drivers which allow hardware components to work.
- Utility software which maintain the computer performance.

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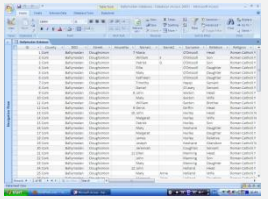
1.01 Hardware and Software

Application Software Examples

Word Processing	Spreadsheet	Database
Used to prepare reports, school essays etc. 	Use to create to organise and manipulate numeric data. 	Database is used to insert and organise data using fields and records. 

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

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1.01 Hardware and Software

Application Software Examples

Photo Editing	Graphics Manipulation	Video Editing
Used to edit digital images to either touch up or to apply various formatting techniques. 	Used to create and edit bitmap and vector graphics. 	Used to edit and format video using various tools and techniques. 

• Contrast/Brightness
• Use of layers
• Filter tools
• Lighting effects
• Liquify (change features of a face)
• Brush tools
• Clone/Stamp tool
	• Pixels in bitmap images can be changed to produce a different image.
	• Vector images use:
	  • Lines
	  • Curves
	  • Text
		• Split and Trim videos
		• Create split screens
		• Rearranging order of clips.
		• Transitions between clips (Fade)
		• Inserting Audio
		• Applying filters and using video enhancement techniques

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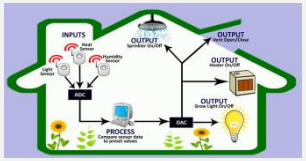
1.01 Hardware and Software

Application Software Examples

Apps (Phone Applications)	Measuring and Control Software
Apps are the software which runs on mobile phones. They usually come with the phone or can be downloaded and updated.  	Measuring and control software which are responsible for changing physical conditions in an environment.  
• Games (Angry Birds) • Video/Music Streaming (YouTube) • Social Media (Facebook, Twitter, Instagram) • Communication (Whats App, 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 green house.

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1.01 Hardware and Software

System Software Examples

System Software

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.

Utilities

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

Linkers

Combines object files produced by a complier into a A single program.

Compiler

Translates a program written In a specific language which Can be understood by the computer.

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1.01 Hardware and Software – Q&A Extension Activities

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.

Monitor	Projector	Digital Camera
Scanner	Touch Screen	Gamepad
Webcam	Modem	Joystick
Touchpad	Trackerball	Keyboard
Microphone	Cameras	MIDI Keyboard
Printer	Speakers	Mouse
Plotter	Bar code reader	Burglar alarm

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.

1.01 Hardware and Software – Q&A Extension Activities

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.