Types and Components of Computer Systems

The course syllabus states that you should be able to:

(a) Define hardware, giving examples

(b) Define software, giving examples

(c) Describe the difference between hardware and software

(d) Identify the main components of a general-purpose computer: central processing unit, main/internal memory (including ROM and RAM), input devices, output devices and secondary/backing storage

(e) Identify operating systems, including those which contain a graphical user interface, a command line interface

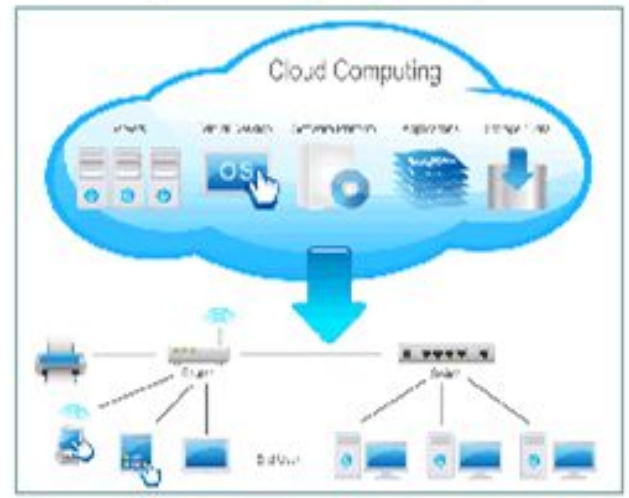
(f) Identify different types of computer including Personal Computer or desktop, mainframe, laptop, palmtop and Personal Digital Assistant

(g) Describe recent developments in ICT

This section is broken down into 2 parts

Part 1:
Operating Systems

Part 2:
Recent Developments



Operating Systems

This section will take a look at operating systems and their role in the computer system.

Operating systems are pieces of software that manage everything that happens in your computer and they instruct the hardware on what to do.

The operating system makes your system useful. Without it your computer would sit there and do nothing.

Learning objectives of this section:

- Know the **definition** of an operating system and **why** computer systems need them.
- Understand the **different tasks** that an operating system performs.
- Be able to **describe the different types** of operating systems and be able to **compare them** to each other.

Objectives

In this section you will:

- Know the purpose of an operating system.
- Understand the different operating system interfaces.
- Be able to describe the differences between the different interfaces.

What is an Operating System?

Definition: ***"An operating system is a software program that manages computer resources. Operating systems allow components to communicate with each other and enables the computer to run software applications."***

Key Words:

Operating System, Manage, Communicate, Resources, Inputs, Outputs.

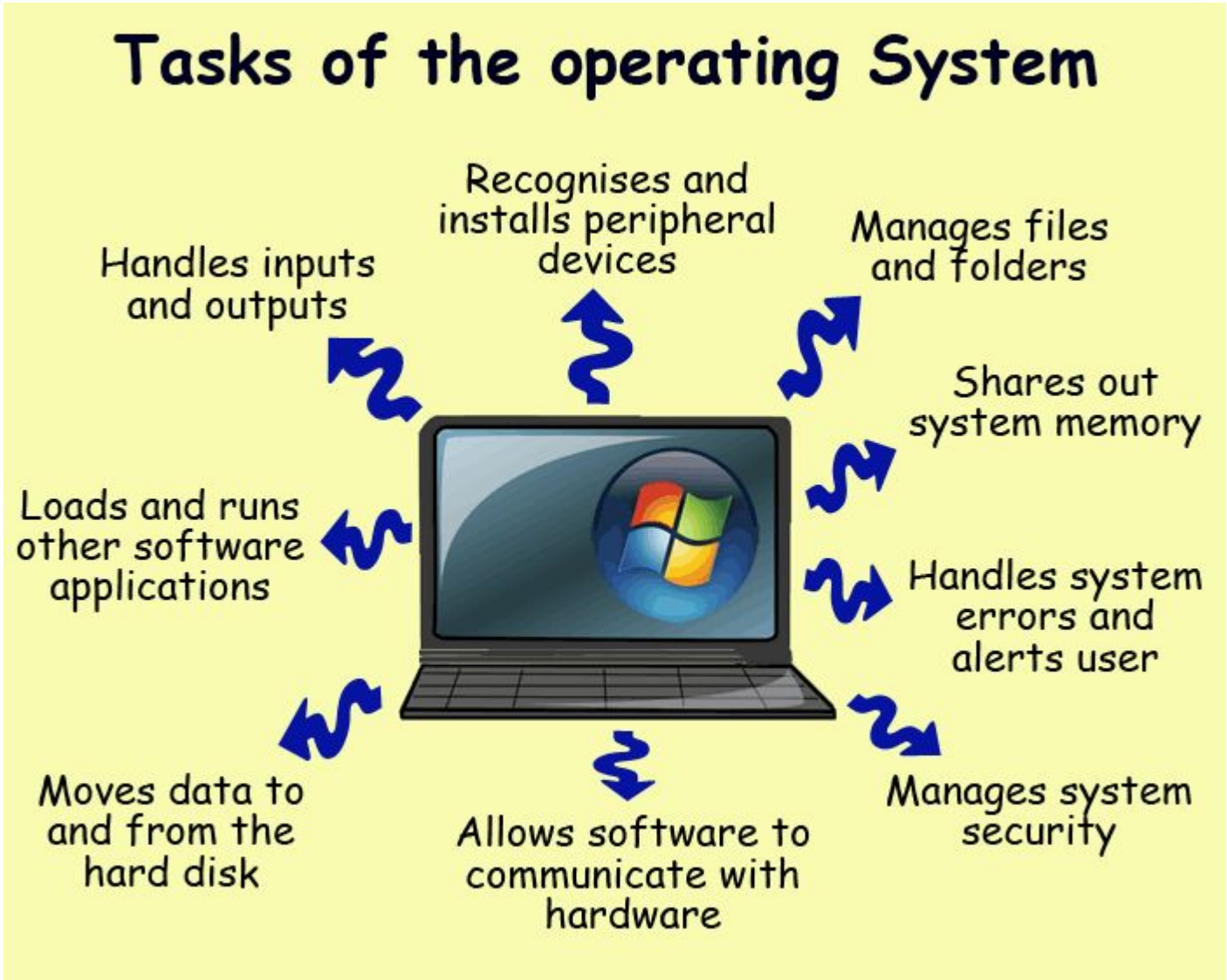
Tasks of the Operating System

Operating systems perform the following functions:

1. **Accepts inputs** from the mouse or keyboard.
2. Sends **outputs** to the **monitor or printer**.
3. **Recognises peripheral devices** such as external hard disks, pen drive, web cam etc and makes sure that **software** needed for the hardware to run **is installed**.
4. **Manages files and folders in the system** (Naming, Creating, Moving, Finding and Deleting folders etc).
5. Allows **applications software** (word-processing, spreadsheets etc) to **communicate with the system's hardware**.
6. **Shares out system memory efficiently**. The operating system will decide how much memory to assign to particular tasks. It also moves data in and out of memory.
7. **Loads** and **runs** software **applications**.
8. **Manages system security**. For example - allows passwords to be added / changed.
9. **Handles system problems and alerts the user**. For example if a printer is jammed and cannot printer, the operating system will stop the print job and alert the user with a warning message.
10. **Manages the moving of data** to and from a hard disk.

Click for Picture Example

Tasks of the operating System



Types of Operating System Interfaces

Key Words:
Graphical User Interface (GUI), Command Line Interface (CLI), Command Prompt, Windows, Icons, Menus, Pointers, Post WIMP.

The way in which users communicate with the computer is called an **'interface'**. The interface is what we use to give the computer commands. There are **three types** of operating system interfaces:

- **Command Line Interface** (CLI)
- **Graphical User Interface** (GUI)
- **Touchscreen Interface**

1 Command Line Interface (CLI)

General Information:

A command line interface is an older style operating system where users type in commands using keyboard.

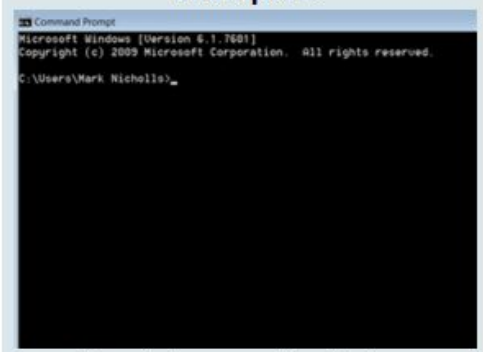
Command Line Interface's **do not make use of images, icons or graphics**. All the user is sees is a plain black screen like the one to the right.

Because they use no graphics they require **very little computer power**.

There are over **270 different commands** that can be entered at the command prompt. Commands have to be **entered precisely** without spelling mistakes or else the operating system will return an error.

Remembering commands and the exact way to enter them can be difficult and so Command Line Interface Operating Systems are **considered hard to use**.

Examples:



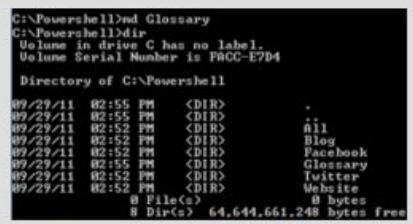
Example of a command line interface.
(click image to zoom to retrieve more information)

Key features of a Command Line Interface:

The main features of a CLI are that keyboards are used to type in a variety of different commands into a command prompt.

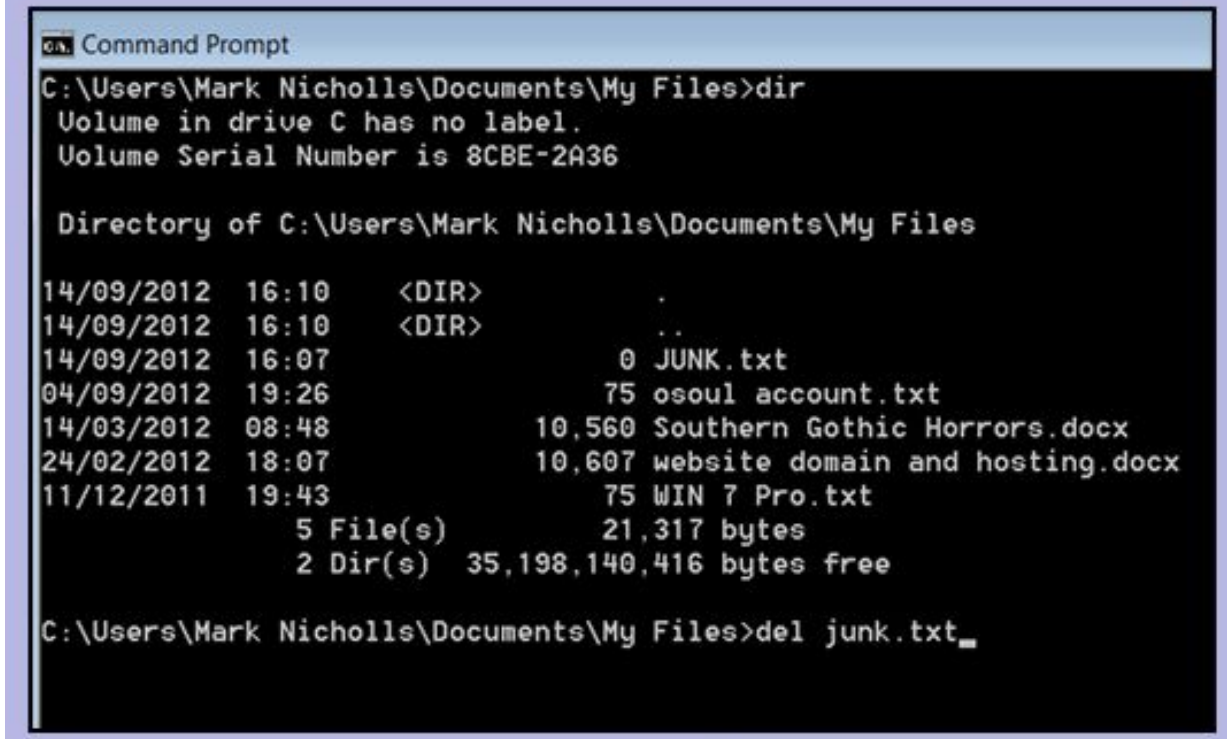
The sequence of images below will show this concept better:

Keyboard used to.....



Enter commands into.....

A command prompt



Command Line Interface

A Command Line Interface operating system works via the user entering **typed commands with a keyboard**. There is **no use for a mouse**.

Command Line Interfaces do not use windows, icons, menus or pointers.

There are over **270 commands** available for functions such as **delete**, **open**, **run** etc.

Commands must be entered precisely with no spelling mistakes. These commands can be difficult to remember and, as a result, this type of interface is considered **more difficult to use when compared to a GUI**.

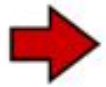
In the example on the left I am using a version of MSDOS to delete a file named ***JUNK.txt***

Examples of some commands:

- There are **many commands** that you can enter into a command line interface.

In fact, if you can think of something you want the operating system to do, there is a good chance that there is a command for it!

- The table to the right shows you some **common CLI commands** and also describes what they do.



Activity!

Do some research and **find 5 different commands** that have not been mentioned on this page.

Type the commands up, making sure to include the name of each command and a short description of what they do.

Command	What it does
copy	Copies files from to another location
del	deletes one or more files
format	Deletes all the data on a hard disk
md	Creates a new folder
rename	Renames a file or folder

Remember: there are over 270 of these commands.

2 Graphical User Interface (GUI)

General Information:

GUI's are visual (graphical) interfaces and they are more popular than CLI's because they are **very easy to use**. The graphics do need more computer power however.

Instead of typing in commands, the user can use a mouse to **point and click objects on the screen**.

For example: A user can **erase a file** by **right clicking** and then **selecting delete**.

Key features of a Graphical User Interface (GUI):

The main features of a GUI are **Windows**, **Icons**, **Menus** and **Pointers**.

This is often abbreviated to **WIMP**.

Graphical User Interface

The graphical user interface (or GUI) is a type of operating system that makes use of:

- **Windows**
- **Icons**
- **Menus**
- **Pointers.**

Icons and options on menus represent folders, applications and other commands which are activated when selected and clicked by the pointer.

A **mouse** is normally used to **direct the pointer around the screen**.

The table below describes these 4 features in more detail:

Windows

Click for more info

The user can divide the screen into **separate areas known as 'windows'**. These windows can be anything from folders to software applications.

Windows allow you to work on several tasks at the same time.

Icons

Click for more info

Icons are **'symbols'** or **small images / graphics** that are used to represent files and commands. Icons can be clicked to carry out a function or open a file etc. The user operates a mouse to move a pointer over the icon and then clicks it to activate the function.

Icons are also used to **represent folders**.

Menus

Click for more info

These allow users to **select functions from a list**. Each item in the list will perform a different function.

Menus usually either **'pop-up'** or **'drop-down'**. The navigation used at the top of this web site are examples of drop-down menus.

Pointers

Click for more info

Pointers are little arrows that you move across the screen by directing your mouse. Pointers can be used to:

- **Select and use icons**
- **Select options found in menus**
- **Reposition folders and icons on the screen.**

Key features of a GUI:

Mouse used to control and command a pointer

Icons can be clicked to open folders or activate commands

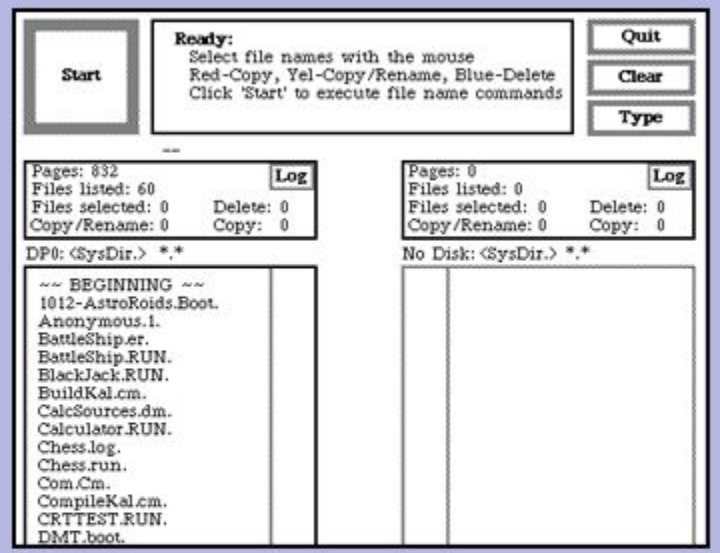
Menu items can be selected using the pointer.

NOTE!

GUI operating systems were first created by **Xerox** in **1973**. The idea was further developed by Apple on their Macintosh system.

Click for Picture Example

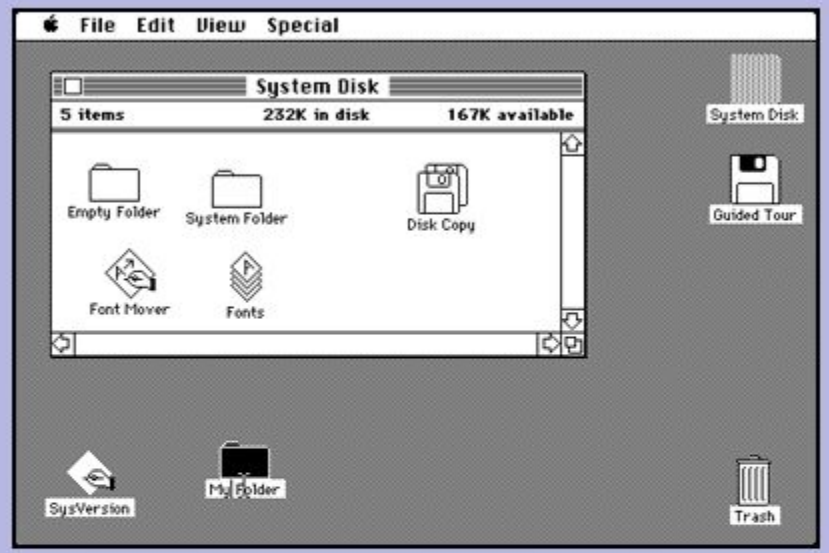
Xerox Alto GUI (1973)



The first modern GUI was developed at Xerox Palo Alto Research Centre (PARC) in the early 1970's.

The operating system was first found on the Xerox Alto which was used as a research computer in Universities.

Mac OS System 1.0 (1984)



System 1.0 was the first GUI style operating system developed for the Apple Macintosh.

System 1.0 was heavily influenced by the Xerox GUI and made use of, now familiar, mouse-driven WIMP features (Windows, Icons, Menus, Pointers).

3 Touchscreen Interfaces (aka Post-WIMP Interface)

General Information:

- Portable devices such as **mobile phones**, **PDA's** and **tablets** (e.g. IPad) use **interfaces similar to a GUI** (WIMP) where **icons and menus** are used to input commands.
- However, because these devices **don't have room for a mouse**, the way in which the icons and menus are used is different.
- **Touchscreen technology** allows people to **use their fingers** to select **icons** and **options** straight from the device's screen.

We call this type of interface **Post-WIMP**.

Key features of a Touchscreen Interface:

- Features available on POST-WIMP interfaces are highlighted in the table below:

Pinching — Click for Video Example

This is where you **pinch your fingers together** across a touchscreen to **zoom into** an image, application or document on your device.

You can also move your **fingers apart** to **zoom out**.

Rotating — Click for Video Example

This is where you use **two fingers** - one finger moves up while the other finger moves down the touch screen to **rotate an object**.

Swiping — Click for Video Example

Swiping is where you **swipe your finger** across the touchscreen to **scroll** through a document or turn the page.

Examples:

Example of a Post WIMP Interface.
(Click image to zoom)

Modern mobile phones often use

Post WIMP Interface

Post WIMP Interface's are found on operating systems used on mobile devices such as:

- # Mobile Phones
- # iPods
- # iPads
- # PDA's

These devices **do not have room for a mouse** and so they need different ways for the user to select icons and menus etc.

Touch screens are used so that the **user's finger** takes the place of the **mouse and pointer**. 'Fingers can be moved in different ways (called gestures) to interact with the operating system:

- # Zoom into images / documents / web pages
- # Rotate images
- # Select icons
- # etc

Comparing Command Line and GUI Operating Systems

Both command line and graphical user interface style operating systems have their **advantages** and **disadvantages**. The table below explains some of these:

Command Line Interface		Graphical User Interface	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
User **directly communicates** with the computer.	Users must remember **complex** commands.	**Quicker** to enter commands. (You just click icons etc)	**Smaller range** of commands can be used (Icons are pre-programmed to set tasks and users cannot change this)
A **wider range** of commands can be used.	**Lots of typing** needed for quite simple tasks.	**Easier** to enter commands (You don't need to remember anything)	
Needs **very little** computer power. (This operating system can be run on very old computers)	Higher **chance of errors** when typing in commands. (One spelling mistake means that the command will fail)	**Less chance** of users making errors (Just clicking icons)	Graphical user interfaces require **more computer power**.

How to remember the difference between Command Line and GUI operating systems.

1. Can you use a mouse to control a pointer? **YES**
2. Can you select and click icons and menu options? **YES**

Then you are using a **GUI**

1. Can you use a keyboard to enter typed commands? **YES**
2. Can you use a mouse to control a pointer? **NO**
3. Can you select and click icons and menu options? **NO**

Then you are using a **COMMAND LINE INTERFACE**

Activities!

Operating Systems - Task 1

Click the above task and fill it in to show your understanding of the two main types of operating systems.

Operating Systems - Task 2

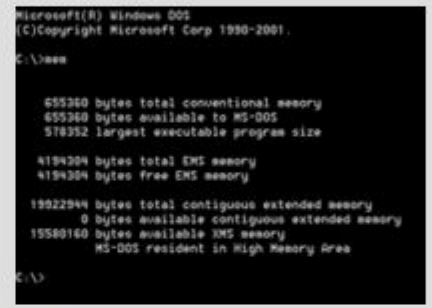
Fill in the above sheet using the links provided.

Examples of Command line Interfaces and GUI's

Command Line Interfaces

Unix

IBM DOS



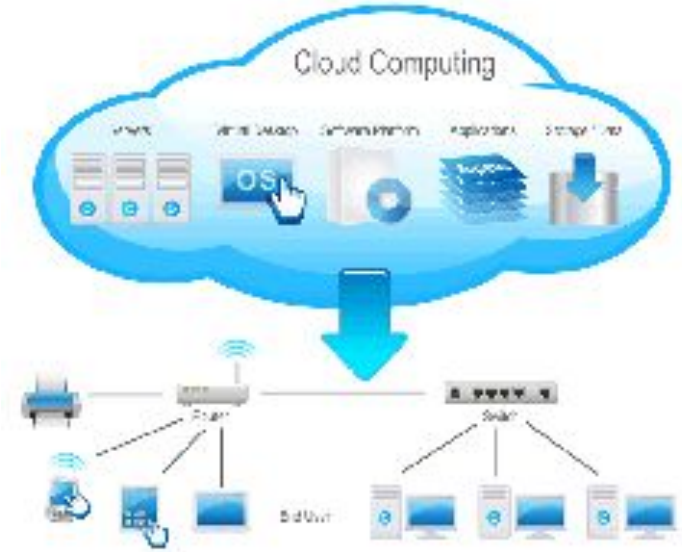
Graphical User Interfaces

Windows 7

Windows XP

Mac OS X

Linux



Recent Developments in ICT

ICT is constantly developing and expanding as new technologies become available. In this section we will look at some of the more recent developments in ICT.

Learning objectives of this section:

Be able to **describe** and discuss some of the recent developments within ICT.

Some recent developments.....

Key Words:

Cloud, E-book, E-book reader, Remote, Share, Streaming, Google Docs

The recent developments in ICT that we will discuss below will focus on two areas:

- **Cloud Computing**
- **E-books.**

Objectives

In this section you will:

- Know the uses of cloud computing and e-books.
- Be able to describe the uses of ‘streaming music’ and ‘Google Docs’.
- Be able to discuss the advantages/disadvantages of cloud computing and e-books.

1 Cloud Computing

Cloud computing is where users **store** their **documents**, **programs** and **data** on the **Internet** rather than on their own computers.

As long as the user has access to an Internet connection, they can **create**, **edit**, and **share ICT files** from almost **any location**.

Because the data and programs are **stored remotely**, on the Internet, the user will save space on their computer's storage drives.

Some uses of Cloud Computing

Streaming music

- Music is **stored remotely on an Internet server** and accessed via a website.
- Users can log onto the website and then listen to the music using **'Internet Streaming'**.

NOTE:
Streaming music is where users play the audio directly from the Internet server where it is stored.

- The music file is **not downloaded onto the users computer**.
- Streaming music is a little bit like listening to the radio where you listen to the music but do not actually own a copy. The only difference is that, with streaming, you get to pick which songs you listen to.
- Popular music streaming websites include:
  - Spotify
  - Jango
  - Pandora

Examples:

Cloud computing allows users to store and access documents and programs from the Internet.
(click image to zoom)

Google Docs

- Google docs offers users the ability to use **free software** such as **spreadsheets**, **word processors**, **presentation builders** and **drawing programs**.

- This software is stored on the Internet (in the Cloud) so users don't have to install it to their computers.

- Any documents created within Google Docs are also **stored remotely** in the cloud. This means that the documents can be **accessed from any location** as long as the user has an Internet connection.

NOTE:
Google Docs is very useful for group projects because all of the members of the group can work on the document without needing to be in the same room.

- You can see how Google Docs works for yourself by clicking on the link below:
  - docs.google.com

(click image to zoom)

Google docs allows you to use online programs to create a range of documents. These documents are stored and accessed (remotely) on the Internet.
(click image to zoom)

Advantages and Disadvantages of Cloud Computing

Advantages of cloud	Disadvantages of cloud
Lower costs: Many programs in the cloud are free to use.	**Security risks:** Data stored online is always vunerable to hackers and viruses.
Increased accessibility: Programs and documents are accessible no matter where you are as long as you have an Internet connection.	**Decreased accessibility:** If you do not have access to the Internet (your connection is down) then you cannot access your documents and programs.
Time saving: No need to spend time installing software onto your computer as you access it directly from the cloud.	**Quality of software:** Cloud programs (especially the free ones) don't usually have all of the features of a full version of the software. **For example:** cloud's version of a word processor may not allow you to edit a doucment as well as Microsoft Word does.
Increased storage space: Programs and documents are stored in the cloud so this frees up storage space on your computer.	
Backups: Documents in the cloud are automatically backed up for you so you don't have to remember to do it yourself.	**Potential increased costs:** Some cloud providers only allow you to use their programs after you have paid a subscription.
Sharing of data: Documents can be shared very easily which is useful for group work.	

2 E-books and Online-newspapers (electronic books and newspapers)

E-books and online newspapers are **digital versions of traditional printed publications**.

E-books and newspapers are readable on a variety of electronic devices such as:

- **Desktop PC's**
- **Laptops**
- **I-Pads**
- **Mobile Phones**
- **Amazon Kindles**

Amazon Kindles are specifically designed to allow users the ability to read E-books. These types of devices are known as **'e-book readers'** or **'e-readers'**.

E-books have already been created to **replace many of old printed books**. There are many advantages of doing this including **saving paper** and **storage space**.

NOTE:
Some new publications are created only as e-books with no printed versions at all.

E-books and newspapers are usually **downloaded from the Internet** onto the computer or e-reader.

Electronic books and newspapers tend to be **cheaper to buy** than their printed counterparts.

Examples:

Amazon Kindle's are the most well known example of an e-book reader.

An online newspaper being read on an IPad.

Advantages and Disadvantages of E-books and Online-newspapers

Advantages	Disadvantages
Storage benefits: Thousands of digital books can be stored on one computing device or e-book reader. The same number of printed paper books would require a very large room in which to store them.	**Health and Safety:** Computer screens (and some e-book readers) can reflect light which causes glare. This can cause headaches and eye strain. Printed pages do not have this problem.
Paperless: Digital books do not need to be printed onto paper. This is much more environmentally friendly.	**Piracy:** E-books are digital and so are very easy to copy and share.
Instant access to your book or newspaper: E-books/newspapers can be downloaded from the Internet almost instantly. If you want access to a printed book, you need to travel to the store to buy it or order online and then wait a few days for delivery.	**Usability:** E-books are hard to search through to find specific pages. The pages of printed books can can be flipped through quickly to find the page you want.
Cheaper to buy: E-books/newspapers generally cost less than printed publications.	**High initial costs:** Before you can read a digital e-book or newspaper you need either a computer or an e-book reader. These are not cheap.