5. System Software

Managing resources

An operating system is software that manages a computer system. The operating system is loaded by the bootstrap loader. For more information see page 13. One of its primary functions is to manage resources. Here are some examples of how the operating system manages the computer systems resources:

Manages peripherals such as input and output devices

- Communicates with and sends data output to a printer/monitor/other valid output device
- Communicates with and receives data input to a keyboard/mouse/other valid input device

Manages printing using spooling

- Data is stored on hard disc/in memory/stored in a queue
- Document is printed when printer is free/in correct order
- Benefit of spooling – user can carry on working/log off when waiting for job to print

Manages backing store

- Ensures that data is stored and can be retrieved correctly from any disk drive
- Creates and maintains Filing system such as FAT or NTFS (accepted but not expected)
- Organise files in a hierarchical directory structure.

Manages memory (RAM)

- Ensures that programs/data do not corrupt each other
- Ensures that all programs and data including itself is stored in correct memory locations

Manages processes

- Ensures that different processes can utilise the CPU and do not interfere with each other or crash
- On a multi-tasking O/S ensure that all tasks appear to run simultaneously

Manages security

- Allows creation and deletion of user accounts
- Allows users to logon and change passwords

Providing user interface

Another function of the operating system is to provide a user interface. Here are some examples of how the operating system provides a user interface:

- allows copying/deleting/moving/sorting/searching of file or folders
- allows access to system settings such as hardware
- provides a command line interface
- allows users to have more than one window open
- provides a graphical user interface (Windows, Icons, Menus, Pointers)
- provides user with errors/help messages
- allows customisation of interface, e.g. change desktop background/layout
- allows user to switch between tasks (programs/windows)

Human-computer interaction (HCI) is the term used to describe the communication between people and computer systems. To allow a person and a computer system to communicate, an interface is required, often called a **human-computer interface**.

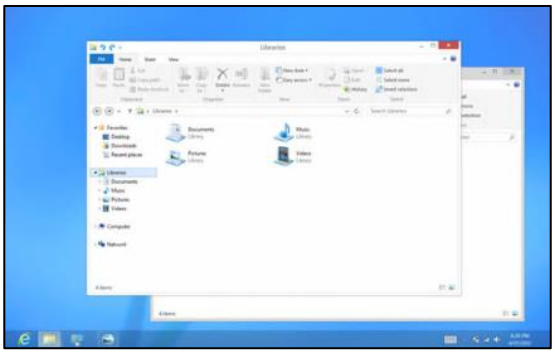
INTERESTING FACT
The original name for Microsoft's Windows GUI was **Interface Manager.**

Different interfaces are provided by the operating system and can be identified by the style of communication they use. Some are entirely text-based whereas others use images to represent different commands.

Graphical User Interface (GUI)

A GUI is a type of interface that allows users to interact with a computer system through graphical icons.

GUIs were introduced to help users, especially beginners, to use a computer systems as Command Line Interfaces (CLIs) were found to be difficult.



There are many different **features** of a graphical user interface. These include:

- windows
- icons
- menus
- pointers
- assistants/help files/tutorials
- favourite settings/change environment/customisation
- shortcuts/hot keys
- task bar/ribbon bar/tabs/customised toolbar

Here are some of the benefits and drawbacks of a graphical user interface:

Benefits	Drawbacks
• Intuitive • Easy to navigate • Uses Windows, Icons, Menus and Pointers • No complicated commands • Data between different software applications is easily exchanged	• Requires a large amount of memory • Is relatively processor intensive • Computing experts may find a GUI slower than a command line interface • GUIs take up a much larger amount of hard disk space than other interfaces

Menu driven

This type of interface allows people to interact with a computer system by presenting the user and allowing them to work through a series of menus. The *iPod Classic* is a perfect example of a device that uses a menu driven interface as users are presented with a menu that contains a list of artists. Having chosen an artist, another menu appears with a list of albums belonging to that artist. Following this, another menu is presented with a list of songs belonging to the chosen album.

Here are some of the benefits and drawbacks of a menu driven interface:

Benefits	Drawbacks
• No need to learn a lot of commands • Intuitive/easy to understand • Easy to navigate • Ideal for beginners – everything is in a logical place/order • No need of expert language to learn • Little processing power needed	• Irritating if there are too many menu screens to work through – users get annoyed or bored if it takes too long • Navigating can be a long process

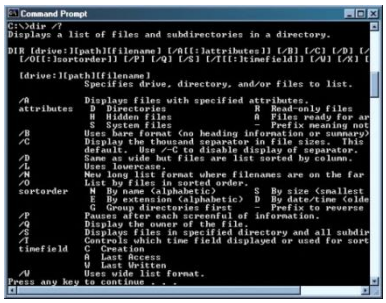
Voice-driven

Voice driven interfaces, also called voice recognition, can be used to issue commands to a computer system and enter data into it. Voice-driven interface is a popular interface as it is natural for people to communicate in this way.

Here are some of the benefits and drawbacks of a voice-driven interface:

Benefits	Drawbacks
• Speech input is much faster than keyboard input • No need to learn to type • Less danger of RSI • Reduces typing mistakes such as spelling/hitting wrong key • Keyboard takes up room on the desk • Users with a disability that prevents typing can use speech input • Hands-free advantages – can multitask • Users find talking more natural than typing.	• Background noise interferes with speech recognition • User when they have a speech impediment, sore throat, cold or a strong accent will not be understood • Users with a disability that prevents speech would need to find a different method for input • Difficult to keep data input private as people can hear what you are saying • Words that sound the same, such as 'too' and 'two' may not be recognised

Command Line Interface (CLI)

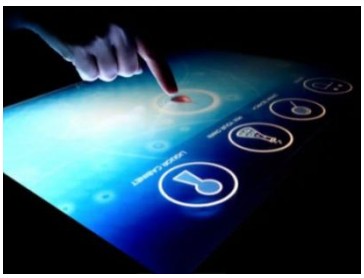


A Command Line Interface is an entirely text-based interface that allows a user to communicate with a computer system by typing in commands. However, computer systems will only execute specific commands that are predefined.
Before GUIs were developed, command line interfaces were the most widely used interface.

Here are some of the benefits and drawbacks of a command line interface:

Benefits	Drawbacks
• Quicker to type commands • Quicker to input commands as shortcut keys can be used • Little memory and processing power needed compared with other interfaces • Little storage space is required (no graphical images to store) • Experts who have memorised the commands find it very fast to use	• Very confusing for someone who has never used a command line interface • Commands have to be typed precisely. If there is a spelling error the command will fail • A large number of commands need to be learned • Instructions cannot be guessed • Not suitable for a novice

Touch Sensitive Interface



Touch sensitive interfaces are becoming more popular and are extensively used in mobile computing devices. Commands are issued or data is input by touching the screen with your finger or a stylus pen. As well as tapping the touch sensitive screen, the screen can interpret other actions made by the user, such as pinching and swiping.

Here are some of the benefits and drawbacks of a touch sensitive interface:

Benefits	Drawbacks
• Very intuitive • Easier to use as the user simply touches what is seen on the display • No keyboard or mouse is required • Touching a visual display of choices requires little thinking and is a form of direct manipulation that is easy to learn • Easier hand-eye coordination than mice or keyboards	• Screen can be easily damaged/scratched • Dirty screens are difficult to read • Users must be within arm's reach of the display • It is difficult to select small items • User's hand may obscure the screen • Screens need to be installed at a lower position and tilted to reduce arm fatigue • Some reduction in image brightness may occur

Disk organisation such as: file transfer, formatting, compression

File transfer

File transfer is the ability to transfer data from one location to another. This can be done by simply copying a file from one folder (directory) to another, or from one storage medium to another. You may wish to carry out either of these tasks in order to organise your files better, using subfolders or to back-up your work onto a secondary storage device, such as a flash memory stick.

Formatting

Formatting is the process of preparing a disk for use. During this process, a new file system is set out on disk and all data may be erased in readiness for new data to be stored.

INTERESTING FACT

Certain specialist software can be used to "unformat" a formatted disk and recover all the data originally stored on it.

Compressing

Compression is the process of making a file size smaller. This may be advantageous as it allows more data to be stored on the disk and files may also be transferred more quickly. There are two methods of achieving disk compression; one is software based and the other hardware based.

Software based disk compression is often included as a facility of an operating system and so it is readily available on most computer systems. The disadvantage of this is that it slows down the process of reading and writing to disk.

Hardware disk compression requires specialist hardware, which can be expensive. However, it does not affect the speed of access as much as software based disk compression.

Disk based compression is always lossless. For further discussion see page 54.

System restore (roll back), disk defragmentation, control panel, system maintenance tools.

Many different system maintenance tools are included with operating systems that allow users to maintain the upkeep of their computer systems. Here are some of the tools below.

System restore (roll back)

System restore is the process of replacing lost or corrupt data by replacing it with an earlier backup.

INTERESTING FACT

Some modern viruses exploit the system restore facility by deliberately seeking out back-ups and placing copies of themselves there.

Disk defragmentation

Files are stored on computer systems that can, over time, become fragmented. This means that they are split and stored on different parts of the disk. If a file is fragmented, it takes longer for the disk heads to move between parts of the file, which slows the process of loading it.

Defragmentation is the process where files are physically re-arranged on disk so that they are no longer fragmented and the parts of each file are stored together. This improves the speed of accessing data from disk.

Control panel

Many operating systems use a control panel to give the user control of software and hardware features. It enables the user to change settings, such as sound, device and display settings all from one convenient location.