

WJEC IT

2.1 Databases

2.2 Spreadsheets

2.3 Automated documents

2.4 Digital graphics

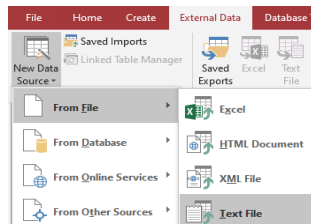
1. Introduction

Databases allow the entry storage, editing, processing and retrieval of data. Companies use them to store details of their customers, clients, stock details and so on. Databases can be used to store almost any type of data.

A database can be made up of just one table of records (**flat file database**) or it may hold many tables of records that are connected together by relationships (**a relational database**).

2. Importing Data

Import data from CSV files using the external data tab then selecting new data source.



4. Entity relationship modelling

Before a database is designed, it needs to consider how data might be related to each other and one method of doing this is known as an ERD – Entity relationship diagram and this is made up of three key concepts:

Entity – The person/object/event on which the data can be held.

Attribute – Each entity which include attributes (properties)

Relationship – Establishment of data from two different entities relate to each other.

One-to-one relationships



A patient is an entity and some of their attributes include age, weight, address etc.

One-to-many relationships



Many-to-many relationships



In this example, a patient may see more than one doctor.

2.1 Databases

Level 1/2 Vocational Award ICT (Technical Award)



ICT in Context

3. Table Design

Create your table column headings by selecting a field name and appropriate data type in design view. Apply a primary key and validation rules to your table. A data dictionary should be used to assist when creating a table.

Attribute name	Data type	Field size	Format	Key field	Validation
Customer ID	AutoNumber			Yes – Primary key for customers table. This will also be a foreign key in the delivery table.	
HolsBegin	Date	8	DD/MM/YYYY		Length check to ensure 6 characters have been used. Format check to ensure a valid day, month and year has been entered.

5. Data Interrogation

Databases can hold huge amounts of data. Queries find specific data based on set criteria and helps users narrow down their results to find specific information. Types of query:

Single criteria – Using one field to search for specific information.

Multiple criteria – Using more than one field to search for specific information.

Multiple tables – Using a query to find specific data in a relational database.

Wildcard – Using a specific character as part of the search criteria. (e.g. C*)

Parameter – Activating user input to run a specific query.

Calculation – Using a formula to calculate the results of a query if it includes integer data.

A report is a method used to output the data that has been added to the database. It's also a good way of outputting the results of a query in a more professional manner. (Picture example bottom left).

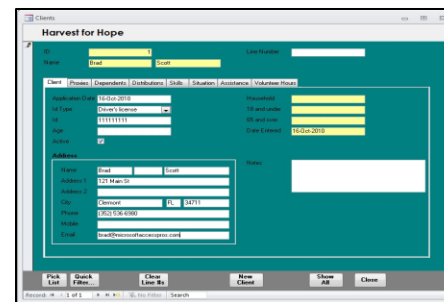
Albums by Artist		
AlbumName	Genre	ReleaseDate
Powerslave	Rock	03-Sep-84
Somewhere in Time	Rock	29-Sep-86
Piece of Mind	Rock	16-May-83
Killers	Rock	02-Feb-81
No Prayer for the Dying	Rock	01-Oct-90

6. Data Entry

A form is a user interface that allows the user to interact with a computerised database by creating an intuitive design which is easy to follow.

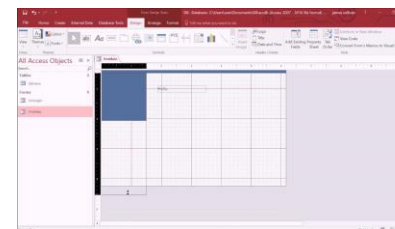
Form controls:

- Button – May be used to start an event.
- Check box – The user can make a selection by ticking a box.
- Option box – The user can select from a series of options.
- Combo box – A list of options are displayed in the form of a drop-down list.
- List box – Another option that can display values in the form a drop-down list.
- Spinner – Useful when increasing or decreasing a value on a form.
- Text box – Allows the user to enter a value.



7. Switchboard

A switchboard allows you to create a homepage for your database. You can add buttons linking to queries, forms, reports, as well as options to print or close parts of the database. A switchboard normally also includes a company logo and eye catching images.



Key Terms

Primary key: A primary key is a field used to uniquely identify every record in the database.

Foreign Key: A foreign key is a primary key from one table that appears in another table to link the two together.

Table: Contains data about 'things', for example students, customers, orders.

Record: A collection of data about a single item, such as single student or customer. Each record must be unique.

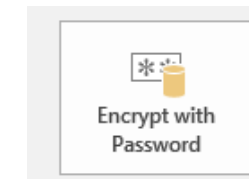
Field: An individual data item within a record. Each field has a unique name and contains a single data type.

Validation: Checks that the data being entered into a computer system is sensible and reasonable. Validation checks the data against preset rules.

Verification: A check to see whether the data being entered into a computer system is identical to the source from which it came from.

8. Security

Add a password to your database to ensure the data remains protected from unauthorised access.



1. Data Formatting

Data formatting

- Set appropriate data types (e.g. if it was price then it should be set to currency.)
- Conditional formatting – you can change the action of a cell based on a question.

Conditional formatting:

This allows the user to change the appearance of a cell or series of cells by setting a particular condition.

Formatting:

- Title
- Font size, style
- Colour scheme
- Borders/grids
- Merging cells – combining more than one cell together.
- Wrap text – Enclose all text within one cell.
- Cell alignment – The position of the text (left, centre or right)
- Worksheet tab – A spreadsheet is known as a workbook and it may contain separate sheets stored in tabs.
- Headers and footers – This is useful if you want to add a main title, authors name or page number to the document.
- Set print area – Define what data you want to be printed out.

2.2 Spreadsheets (1/2)

Level 1/2 Vocational Award ICT (Technical Award)

2. Quality of Data

What is data validation?

Data validation is a check performed by a computer to check that the data entered is reasonable and appropriate. It does not however, check the accuracy of the data – that is what data verification is for.

Format check

This checks that data entered has been done so using the correct format. For example, the format of a national insurance number is LL NN NN NN L.

Range check

This checks the data entered is within a certain set criteria. This could be entering a page on a web form for example.

Length check

This checks the length of the characters entered. It's possible to set a minimum or maximum number of characters. This is found on forms where passwords must be at least 8 characters in length for example.

Lookup table

This looks up acceptable values within a table. This is usually provides users with a pop up calendar to select the date and this removes the need for a manual entry and removes errors.

Presence check

This checks that data has been entered in that field. On forms you make a field a 'required field' which doesn't allow the user to go any further until they've completed that field.

3. Formulas-and-Functions

What is the purpose of a formula in Spreadsheets?

A formula is a set of instruction that tells the program what it should do with certain data. It can be used to perform many operations and tasks automatically. In addition to this, it can be copied and pasted to different cells and even to different worksheets.

Formulas

- Arithmetic operators (-, +, /, *)
- BIDMAS

Functions

- SUM – Total
- AVERAGE – Mean average
- MAX – Highest
- MIN – Lowest
- COUNT – Number of completed cells within a range.
- COUNTA – Number of cells with text within a range.
- COUNTIF – Number of cells that meet a specific condition.
- INT – Display a whole number.
- MOD – Display the remainder (if any)
- Relative and absolute cell referencing – Using specific cells to calculate an output.
- IF/ IF (AND), IF (OR), Nested IF SUM IF, AVERAGE IF, Goal seek – Used to predict outcomes.
- Pivot table – Used to deal with large sets of data.
- VLOOKUP – To use data from another part of the worksheet/different worksheet.

What is a spreadsheet?

A spreadsheet is a document that contains data that can be stored, organised and manipulated using formulas. It's can perform a number of calculations to predict current and future outcomes.

4. Form Controls

What is a form control?

Form Controls are objects which you can place onto an worksheet which give you the functionality to interact with your data.



Spinner:

This control is useful if a user needs to increase or decrease a value by clicking the up and down arrows on the spinner.

Buttons:

Buttons are useful as they can add extra functionality to your worksheet. This could be linking between sheets or setting up macros.

Button 4

Combo Box

This allows you to store a pre-defined list of items for a user to choose from.



Scroll bar

This is useful if a user has to navigate through hundreds of records which aren't all going to be visible at one time.

Check box

This is useful when an item or items need to be selected from a list options.



Macros

Macros are pre-defined actions that are designed to be re-used. You covered Macros in Databases.

Outputting data

- Sorting – arranging data into a particular order.
- Filter – using criteria to find specific information only.
- Charts – a visual representation of data.

Fred's Classic Movie Events

Venue	Fred's Movie Emporium	Today	13/12/2012		
Capacity	150				
Date	Movie	Tickets Sold	% of Capacity Sold	Tickets Remaining	% of Tickets to Sell
Wednesday 11 May 2011	Grease	50	33%	100	67%
Sunday 15 May 2011	Jaws	150	100%	0	0%
Monday 23 May 2011	Citizen Kane	105	70%	45	30%
Wednesday 01 Jun 2011	The Wizard of Oz	150	100%	0	0%
Friday 10 Jun 2011	Singin' in The Rain	85	57%	65	43%

5. Arrange, reduce and output data

How is data arranged?

Data can be arranged/re-arranged using a sort function in Excel.

How is data reduced?

Data can be reduced by using a filter to remove unnecessary/irrelevant data at the time.

What is a pivot table?

A pivot table enables you to handle large sets of data so it can become much easier to analyse.

Sort

- Data into ascending and descending order.
- Smallest to largest and vice versa with numbers.
- Single level sort which requires one field to be sorted.
- Multi-level sort which means you can sort more than one field at a time.

Filter

- Single filter by field.
- Filter by colour.
- Filter by number values in different ways as you can see on the right.

Characteristics

- It allows you to filter data based on specific criteria.
- This enables businesses to establish any patterns or trends.
- For example, July is a slow month for sales in a coffee shop – why?
- A new energy drink is only selling well in the United States – why?

2.2 Spreadsheets (2/2)

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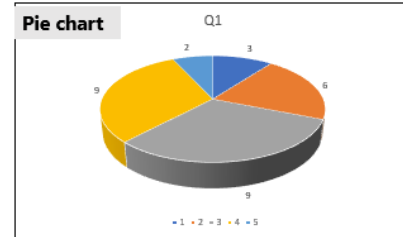
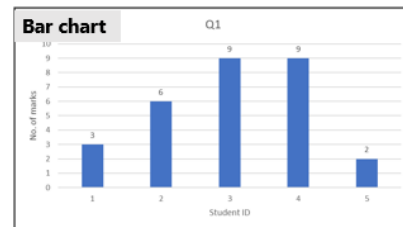
6. Charts and Graphs

What is a chart?

A chart, sometimes known as a graph is a graphical representation of numerical data.

Formatting a Chart

- Axis** – A bar chart will include two variables known as x (horizontal) and y (vertical) They may need to be labelled so users can see the relationship between the data. In this example, x refers to Student ID and y refers to the number of marks they achieved on question 1.
- Title** – This provides the user with some context to what the chart is representing.
- Legend** – This acts a key that uses colours to represent each data set. For example, the pie chart on the right uses colours to represent each student and the marks they achieved for Q1.
- Data labels** – Labels can be added to quantify the bars or slices used in a chart.



7. Complex Functions

What is the purpose of a function in a spreadsheet?

A function is a predefined formula that performs a specific calculation by using values a user input as arguments.

Function type	Syntax
IF – Uses a set of conditions to determine an outcome.	= IF()
Nested IF – An IF statement inside another IF statement.	= IF(IF())
IF (AND) – Checks all conditions are true.	= IF(AND())
IF (OR) – Checks if one of the conditions is true.	= IF(OR())
SUMIF – Uses to check if the sum of a value meets a condition.	= SUMIF()
AVERAGEIF – Uses to check if the average value meets a condition.	= AVERAGEIF()
VLOOKUP – Looks up a value in the leftmost column of a table and returns the corresponding value from a column to the right.	= VLOOKUP()
Goal Seek – A method of solving for a desired output by changing a value/outcome that drives it.	

What is a spreadsheet?

A spreadsheet is a document that contains data that can be stored, organised and manipulated using formulas. It's can perform a number of calculations to predict current and future outcomes.

8. Testing

What is testing and why is it important?

The purpose of testing to ensure a system works correctly and if errors are found that they can be fixed before problems arise later on.

Test data methods

Valid testing

This is using data that will definitely be accepted.

Extreme testing

This is testing data of the same data type but will definitely not be accepted by the system.

Erroneous testing

This is testing data of a completely different data type and will not work.

Example

A user enters a number between 1 and 100 into a computer system.

An example of a valid test would be...

An example of an extreme test would be...

An example of an erroneous test would be...

Any number comfortably within the range such as 22, 45 etc..

Any number comfortably outside of the range such as 300.

Any other data type like a word instead of a number.

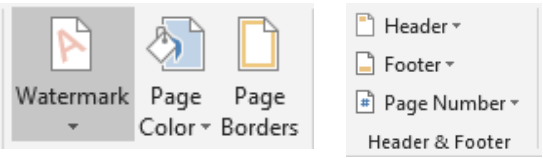


1. Headers, footers and watermarks

A **header** is separate section of page, placed above the main section of the text at the top of the page. Headers can contain any information that you wish. It will display on every page.

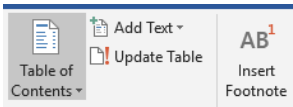
A **footer** like a header but is at the bottom of the page. Often contains page numbering.

Watermarks are patterns of light and dark shading used in documents and images. It is used to identify the owner, put restrictions or show the draft number of a document.



2. Headings and tables of contents

A table of content is a list at the front of a book or report showing what is in the book or report. Use the reference tab to inset a table of contents.



Key Terms

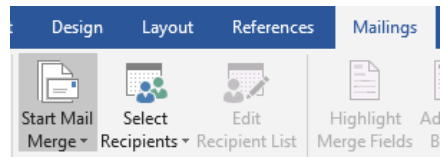
Footnote, Endnote, Caption, Content table, Index, Watermark, Section, Header, Footer, Track changes, Web browser, HTML, CSS, Security, House style, CSV file, Index, Resources, Integrated Document.

2.3 Automated Documents

Level 1/2 Vocational Award ICT (Technical Award)

3. Mail merge

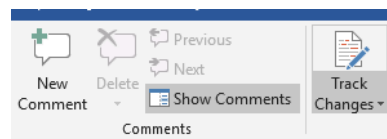
A mail merge can be used to create personalised documents that all have the same layout and formatting. Most sections remain the same but some sections are customised by including data from external sources. Sources can be **spreadsheets, databases** or text files. 3 documents are involved. The master (main) documents, the data source linked to the master document and the merged document.



4. Document reviewing

All documents should be reviewed to make sure they are free from errors. People usually review a document to make comments or suggest changes.

Track changes- A system of marking changes to text but retaining the original text so that changes can be seen and, if required, reversed.



5. Presentations

To create a slideshow to present information to an audience. PowerPoint presentations. Some useful tips include.

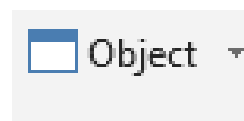
- Master slide- holds details that will appear on every slide of the presentation. (e.g. Company logo).
- Templates- Creates a consistent house style and layout.
- Speaker notes- Appear at bottom of each slide but are not visible to the audience.
- Linear presentation- in a pre set order, can be looped automatically using transitions and settings.
- Non Linear- using bottoms to navigate slides in a different order, similar to a website.

6. Embedding data

Often when presenting information and data to an audience it needs to be added (embedded) in another piece of software.

The data can be added in a number of ways: Copied and pasted Embedded.

To embed a whole document or link use the inset tab and then object option.



What is an automated document?

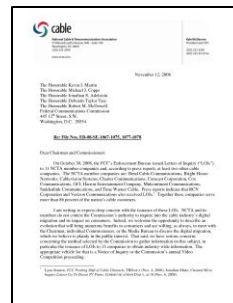
- An automated document is a document that is generated or updated automatically by a computer program, rather than being created or modified manually by a person.
- Automated documents can be generated based on specific criteria or inputs, and can be designed to automatically update and change over time as certain conditions are met.

Advantages to using an automated document:

- More efficient as they're quick and easy to generate.
- Data is more likely to be entered correctly.
- Documents are in a consistent format which makes it look more professional.
- Reduces costs.



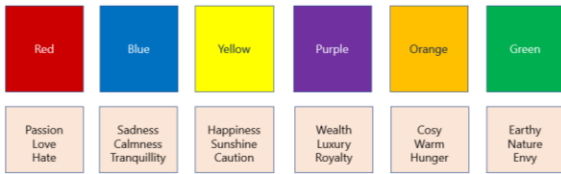
Examples: Financial reports, invoices, newsletters, business letters.



1. Elements of logo design

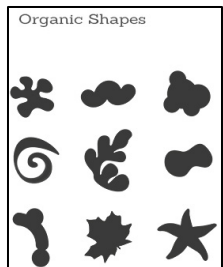
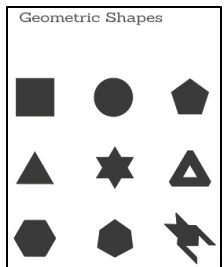
Colour Theory

When you see these colours, what do they represent? Do they represent a particular feeling? What is the first word that comes to your head when you see these colours?



Shapes

Many companies will use a graphic to further represent their visual identity. Even the shapes they use can represent their visual identity. Two common examples are geometric and organic.



Symbols

In the design world, a symbol is a combination of graphic elements that can be used to represent a brand's identity, communicating its story and influencing the way it is perceived by consumers.



Typography

Typography refers to the style/appearance of text. The choice of typography can depend on the material it's being written on whether the language is formal or informal.



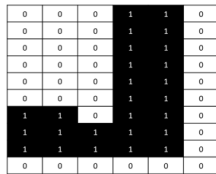
2.4 Digital Graphics

Level 1/2 Vocational Award ICT (Technical Award)

2. Image Properties

Bitmap images

A bitmap image is made up of a series of squares known as pixels that each represent a colour.



These are commonly used to store photographs and used on web pages.

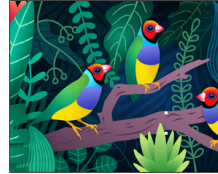
The number of pixels stored in a bitmap image is known as resolution. The resolution is measured as PPI (Pixels per inch) or DPI (Dots per inch)

Common bitmap image file formats

- JPG (Lossy)
- PNG (Lossless)
- TIFF (Lossless)

The pixel dimensions refer to how many pixels high and how many pixels wide an image is.

Vector graphics



A vector graphic is different to bitmap images as it's not made up of pixels, it uses lines and curves made up of mathematical equations

Commonly used to create logos as many of them are made up of shapes.

Common vector graphic file formats

- SVG (Lossless)
- PDF (Lossless)

They are not dependent on resolution and don't need to be compressed. However, they might need to be rasterised (converted to a bitmap image)

3. Visualisation

Diagram

Purpose

A visualisation diagram is a rough sketch/outline of what the final product will look like. This document is likely to be composed by an illustrator/graphics artist.

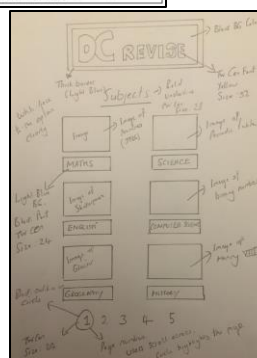


Layout

A visualisation diagram will follow a certain set of conventions (as seen in previous slide)

Although in industry, people will be employed to do this, not all students are blessed with artistic skills and therefore might go for a more abstract approach. This approach can be commonly referred to as a flat plan.

The downside with a flat plan is, without a true visual representation, there is a heavy reliance on detailed annotation.



4. Sourcing Assets

Sourcing assets means to collect information from which something originates or can be obtained. Assets can be in the form of: text, images, audio, video and animation. There are many different ways to source assets.

Internet – this is the most common way of sourcing assets. However, there are a few considerations to make such as: copyright, type of file and size.

Client images – the client may provide a library of company images that can be used in the project. One example could be the company logo.

Photographs – you can source your own assets by capturing images on a digital camera or even your smartphone.

Stock libraries – these contain high-quality images used by photographers and are made available to others for a small (royalty) fee. This payment allows the watermark to be removed from the image.

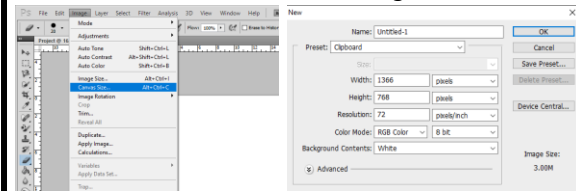
Free stock libraries – there are websites that can provide high-quality images free of charge through a public domain licence or creative commons.

No.	Filename	Description	Properties	Source	Legal issues	Use
1	Lion.jpg	A black and white image of a lion.	615 x 409 96 PPI	https://www.publicdomainpictures.com/en/view-image.php?image=294698&picture=1-lion	Public domain image free to use when registering an account.	This image will be used on the inside cover of the new leaflet to promote Zealand.

5. Logo Creation (Photoshop)

Image/Canvas size

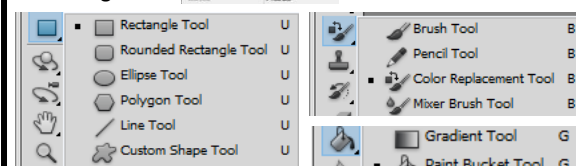
Image size and canvas size is not the same. The canvas is the area in which the image sits on.



Layout Tools

- Grid
- Guide
- Ruler

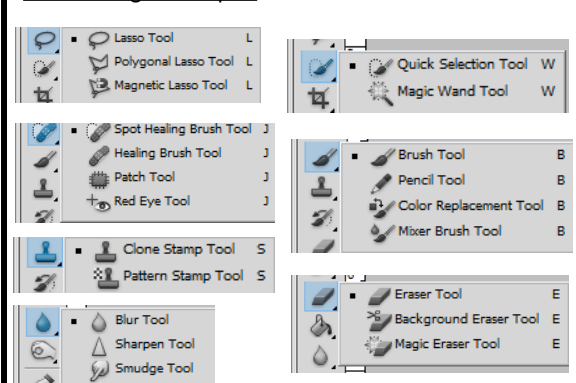
Drawing tools



Colour Adjustments

- Brightness/Contrast
- Levels
- Curves
- Exposure
- Vibrance
- Hue/Saturation
- Color Balance
- Black & White
- Photo Filter
- Channel Mixer
- Invert
- Posterize
- Threshold
- Gradient Map
- Selective Color
- Shadows/Highlights
- HDR Toning
- Variations
- Disrupt
- Match Color
- Replace Color
- Equalize

Retouching Techniques



Mapping of questions to specification content and assessment objectives:

Unit 2

TASK		Topic and Section																		Total Marks	AO1 Marks	AO2 Marks	AO3 Marks	
		2.1					2.2							2.3				2.4						
		2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.3.1	2.3.2	2.3.3	2.3.4	2.4.1	2.4.2					2.4.3
1	(a)	12																		12	4	4	4	
	(b)		10																	10	2	4	4	
	(c)			4																4		4		
	(d)				4															4		4		
	(e)					6														6		4	2	
2	(a)						6													6	2	2	2	
	(b)							6												6	2	4		
	(c)								4											4		4		
	(d)									4										4		4		
	(e)										4									4		4		
	(f)											4								4		4		
	(g)												8							8		4	4	
3	(a)													6						6	2	2	2	
	(b)														4					4		4		
	(c)															4				4		4		
	(d)																4			4		2	2	
4	(a)																12			12	8	2	2	
	(b)																	8		8		6	2	
	(c)																			10		4	6	
Total Section marks		12	10	4	4	6	6	6	4	4	4	4	8	6	4	4	4	12	8	10	120	20	70	30
Total Topic marks		36					36							18				30						

1.1 How IT can be used to fulfil the needs of organisations and individuals

Level 1/2 Vocational Award ICT (Technical Award)

Functionality of different hardware devices

What is an input device?

A piece of equipment that allows users to enter data into a computer. These devices are used to create a digital product.
Examples: Mouse, Keyboard, Scanner, Graphics tablet, Microphone.



What is an output device?

A piece of equipment that allows users to receive data from a computer. These devices are used to view a product in digital or hard copy form.
Examples: monitor, Projector, Printer, Speakers, Headphones.



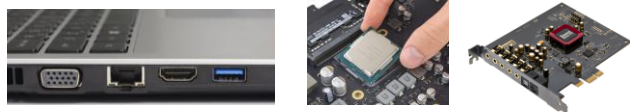
Storage devices

- Solid state storage: USB Flash Drive, Solid State Drive, SD Card.
- Magnetic storage: Hard drive, magnetic tape drive.
- Optical storage: CD, DVD, Blue ray.
- Cloud storage.



Key internal components

CPU (Central Processing Unit)
RAM (Random Access Memory)
Motherboard
Graphics/Video card
Sound card
Network interface card.



Computer ports

Ports are slots on the motherboard into which a cable of external device is plugged in.
Examples of external devices attached via ports are the mouse, keyboard, monitor, microphone, speakers, etc.

Functionality of different software

What is systems software?

Software that allows the user to interact with the computer. The Operating System is an example of systems software.
Proprietary – Windows and iOS.
Open source – Linux and Ubuntu



What is utility software?

Software that is responsible for maintaining and optimising the performance of a computer. It's designed to perform a number of housekeeping tasks such as; to keep data secure, to prevent data loss by creating duplicate copies, to improve the performance of the hard drive and its ability to manage files.

What is applications software?

Software that is designed to perform a specific task. Some applications are designed to handle information, communicate with others or perform a specific set of functions for one particular organisation. Examples

- **Communications software** could include video conferencing software (e.g. Teams, Zoom) and email software (e.g. Outlook, Gmail)
- **Information handling software** could include database software (e.g. Access) which can store data which can be edited, deleted and queried)
- Other example of information handling software could include spreadsheet software (e.g. Excel) which can hold numerical data which can be used for future analysis.)



Services provided by IT

A service that allows you to purchase goods and services over the internet. For example, shopping, booking, gaming, entertainment, banking and education.

Smart Technology- What does it mean by a smart device?

An electronic device, generally connected to other devices or networks via different wireless protocols.

A smartphone is an example of a smart device which provides messaging services, access to the Internet amongst other features. It goes beyond smartphones, other smart devices include smart TV's, tablet devices, wearable technologies and various control systems.

Control systems

A control system is a set of devices that work together to achieve set objectives such as to regulate an environment.
Examples include: motion-activated security cameras, Lighting, cooking appliances, pet feeders.



Wearable technologies

Heart rate monitors, Sleep monitors, Checking glucose levels, Smart watches, Fitness trackers (e.g. Fitbit), Smart jackets, Full body suits with sensors, Head cameras.

Artificial Intelligence?

A machine/algorithm that can interpret data, potentially learn from the data and use that knowledge to adapt and achieve specific goals.
Examples of AI, Siri, Amazon Alexa, Google Home, Netflix and other entertainment services, Facial recognition, GPS, Chatbots, Search engines.

Neural networks: It's a computing system made up of interconnected units that process information by responding to external inputs, relaying information between each unit.

Machine learning: Systems that have the ability to automatically learn and improve from experience without being explicitly programmed.

Deep learning: A system that closely tries to mimic how the human brain works.



Immersive technologies

- **Virtual reality (VR)** refers to a computer-generated simulation in which a person can interact within an artificial three-dimensional environment using electronic devices, such as special goggles with a screen or gloves fitted with sensors.
- **Augmented reality (AR)** applications are best suited for use cases where users need to be connected to and present in the real world. Examples of this include remote assistance, on-the-job training, remote collaboration, and computer-assisted tasks.



Social networking

Social networking is the creation of a website to set up an online community where people are linked together using their personal information.

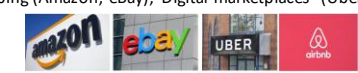


What is a management information system?

A management information system (MIS) is a computerised system that provides managers with the information they need to make informed business decisions.

E-commerce services

E-commerce refers to the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the Internet. Examples: Online retail shopping (Amazon, eBay), Digital marketplaces (Uber, Airbnb), Online banking and bill payments, Online ticket sales (movie theatres, concerts).



Assistive Technology

In the context of technology, accessibility refers to the ability of a device, application, or website to be used by individuals with disabilities. There are a number of ways to make computer systems accessible to a wide range of users such as:

Alternate text, Captions, Text readability, Contrasting colours, Flexible input, Mobile device accessibility, Screen size and orientation adjustments.



Emerging Technology

Emerging technology refers to any new or rapidly developing technology that is expected to have a significant impact on society, the economy, or a particular industry. Examples of emerging technology: Artificial intelligence (AI), Virtual reality (VR) and Augmented reality (AR), Blockchain technology, Internet of Things (IoT).

1.2 How data and information is used and transferred

Level 1/2 Vocational Award ICT (Technical Award)

Why data must be fit for purpose

Data consists of raw facts and figures. Information is data which has been processed by a computer. When data is processed and given context (rules) we can then understand it, it becomes knowledge.

Quality of data

The quality of information depends on the quality of data. For data to be valuable it must be accurate, up to date and complete.

File formats (types)

The file format is the structure of a file that tells a program how to display its contents.

It's also known as file types.

What is file compression?

The purpose of file compression is to reduce the size of a file in order to use less storage space or less bandwidth when being transmitted over a network. There are two compression methods: lossy and lossless.

Word processing software	.doc
Spreadsheet software	.xls
Database software	.db
Graphics software	.jpg, .png, .tiff, .pdf
Video editing software	.mp4, .mov, .avi
Audio editing software	.mp3, .flac, .wav
Desktop publishing software	.pub

How input data is checked for errors

General input error

- This could be a customer entering data on a form incorrectly.
- Forms mistakenly lost.
- Problems with automatic data collection devices such as bar code readers.

Transcription error

- This could occur when a data entry clerk enters incorrect data. In particular, when data is being copied down via a telephone conversation.
- Entering a date of birth of misspelling a surname or address name.

Processing error

- This could be down to the way the program is written. Some mathematical calculations might be incorrect which causes a logic error.
- This means the system will work, but not the way it's intended to.

Transmission error

- This could occur when data is being transferred from one computer to another over a network.
- It could be loss of, or poor connection.

What is data verification?

This checks the data entered is accurate and data can be checked in many different methods:

Traditional methods

Manual proofreading

This would involve somebody checking the data has been entered correctly. However, this manual process can be very time consuming.

Double entry

This requires data to be entered twice. However, this is a time consuming and costly process.

New methods

Enter password twice

The user might be encouraged to enter their password in twice to double check they entered it correctly in the first place.

CAPTCHA

This uses an image that users must identify. It helps to identify whether it's human or bot entering the data. Bots are unable to recognise images.

Two-factor authentication

When logging onto an account of making a payment. A text can be sent to your mobile phone with a passcode to enter.

Memorable information

For online banking, you need to log in by knowing the specific order of the characters in your memorable word. For example, what are the 2nd, 3rd and 9th character.

What is data validation?

Data validation is a check performed by a computer to check that the data entered is reasonable and appropriate. It does not however, check the accuracy of the data – that is what data verification is for.

Format check

This checks that data entered has been done so using the correct format. For example, the format of a national insurance number is LL NN NN NN L.

Length check

This checks the length of the characters entered. It's possible to set a minimum or maximum number of characters. This is found on forms where passwords must be at least 8 characters in length for example.

Range check

This checks the data entered is within a certain set criteria. This could be entering a page on a web form for example.

Lookup table

This looks up acceptable values within a table. This is usually provides users with a pop up calendar to select the date and this removes the need for a manual entry and removes errors.

Presence check

This checks that data has been entered in that field. On forms you make a field a 'required field' which doesn't allow the user to go any further until they've completed that field.

How data transfers over different types of network

A network is a group of interconnected devices that share an internet connection.

- Networks can be defined by their geographical coverage. Some networks are larger in scale than others. Two examples are LAN and WAN.
- Network models

Client-server

Where are files stored?
In a centralised location such as the server.

Backing up data
All data is backed up in a centralised location, (i.e. a server)

Updates/Installation
Upgrades can be done centrally and not on individual computers.

Hardware
File servers to store/retrieve files. Web servers to access the world wide web.

Peer-to-peer

Where are the files stored?
It's decentralised. Stored on the individuals computer.

Backing up data
Peer-to-peer may need to perform their own backups.

Updates/Installation
Upgrades would need to be performed on each computer.

Hardware
Router to connect to the network and access the internet.

LAN

What does it stand for?
Local Area Network

How does it work?
It's a network that covers a small geographical area.

Infrastructure
It uses network hardware and cables owned by the individual/organisation

Who uses a LAN?
Schools, homes and any business that works in a small building or site.

WAN

What does it stand for?
Wide Area Network

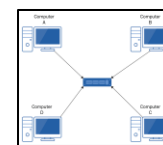
How does it work?
It's a network that covers a large geographical area.

Infrastructure
It uses additional transmission media owned by other companies such as telephone lines.

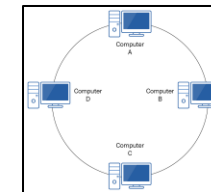
Who uses a WAN?
It can be a collection of different LAN's. The best example is the Internet.

Network topologies

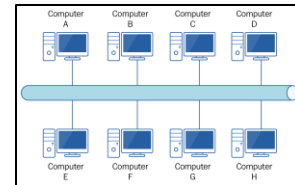
Star



Ring



Bus



What is the internet?

The internet is a global system in which different networks become interconnected and allow users to communicate. The internet can be classified in two ways: Intranet and Extranet.

What is a protocol?

A protocol is a set of rules that governs transmission of data. For example HTTPS or VOIP.

Emerging technologies

Virtual networks, 5G networks, Edge Computing, Artificial intelligence/Machine learning.

Different types of connectivity



Wi-Fi



Near field



Mobile data



Ethernet



Bluetooth



Radio frequency identification



Satellite



USB

1.3 Legal, moral, ethical, cultural and environmental impacts of IT and the need for cybersecurity

ICT in Society

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Risks to information held on computers

Accidental damage/loss

Accidental damage refers to unintentional attack on a network and/or computer system. Examples of accidental damage include: Overwriting a file/folder by mistake, Leave laptop on a train or another location which means it cannot be recovered. Natural disasters (e.g. fires/floods etc..)

Malicious damage/loss

Malicious damage refers to intentional attack on a network and/or computer system. Examples of malicious damage include: Disgruntled employees who delete data on purpose or Social engineering.

What is social engineering?

Social engineering refers to the use of manipulation by an individual or group to trick individuals into disclosing confidential information. Social engineering techniques:

Blagging - a form of social engineering that involves the use of deception or false pretences to obtain confidential information or access to restricted areas.

Phishing - a fake email or website that looks legitimate, but is used to steal personal information such as passwords or credit card numbers.

Shouldering - a type of social engineering technique that involves physically standing behind someone or looking over their shoulder in order to gain information.

Malware

Malware is a term used to describe any malicious software that is designed to harm or exploit a computer or network. Types of malware: Virus, Trojan, Worm, Ransomware, Bot, Rootkit, Adware, Spyware, Keylogging.

Hacking

A hacker is an individual or group of people that intend to gain unauthorised access to confidential information.

A **black hat hacker** is someone who takes a malicious approach such as stealing or deleting data.

White hat hacker. Also known as an ethical hacker. They hack computer systems and networks on behalf of organisations to test for vulnerabilities.

Grey hat hacker sit in between, they're not malicious and will tend to hack for fun.

What is an emerging threat?

As technology continues to evolve so do the nature of threats posed to the network. Hackers will take advantage of emerging technology to perform more sophisticated attacks.

Deepfake Attacks:

Deepfake technology uses artificial intelligence to create convincing fake videos or audio recordings to conduct social engineering attacks by impersonating someone else.

Quantum Computing Threats:

Quantum computers could potentially break encryption algorithms, compromising the confidentiality and integrity of sensitive data.

Cyber-Physical Attacks:

The use of digital and physical systems in critical infrastructure, such as power grids, transportation systems, and medical equipment and industrial control systems.

Synthetic Identity Fraud:

Synthetic identity fraud involves creating new identities by combining real and fake information to commit fraud and open accounts

The impact of data loss, theft or manipulation on individuals and businesses

Common impacts:

- Data theft
- Loss of access to files
- Decreased system performance:
- Spread of infection
- Disruption of normal system functions
- Unauthorised access



Implications:

- Financial implications such as: losing money through slow systems/website being down, fines from regulators and compensation from customers.
- Breach of GDPR/Data Protection Act
- Competitors lose their advantage because their idea is stolen.
- Blackmail
- Data manipulation
- Loss of service such as website being down.
- Loss of intellectual property which no longer makes their product unique and protected from copyright.
- Loss of reputation

Methods used to protect information

Prevention methods

- Keep your operating system and all software up to date.
- Use anti-virus software and keep it updated.
- Be cautious when opening email attachments or clicking on links.
- Don't download files from untrusted websites or peer-to-peer networks.
- Avoid running programs with admin privileges unless necessary.
- Use anti-spyware software and keep it updated.
- Be cautious when downloading free software.
- Don't click on pop-up ads or download files from untrusted websites.
- Regularly backup important files to an external hard drive or cloud service.
- Be cautious when visiting untrusted websites.
- Penetration testing
- Staff Training.



Logical Prevention

This is a computer-based method of protecting data which is normally implemented using software. E.G. Access levels, Authentication, Firewalls, Encryption, Password protection, Anti-malware software.

Physical Protection

This involves tangible ways of keeping data secure and safe. E.G. Locks, Biometrics, CCTV, Backup Systems, Security staff. Location of hardware.

Legal, moral and ethical issues

Moral is what is considered as right or wrong whereas Ethical is what is considered right by a group of people.

Privacy and security- The storage of data by organisations who are legally bound to keep it secure.

Cookies - Small text files designed to remember information such as certain items that are in your checkout.

Cookies - Small text files designed to remember information such as certain items that are in your checkout.

Impact of data loss or damage- The impact this has on the organisation's reputation or individuals' sales/revenue.

Legislation

Copyright, Designs and Patents Act- This act is designed to protect original creators and their ideas.

Computer Misuse Act- This act is to prevent unauthorised access to computer material.

Data Protection Act (GDPR)- This act is designed to protect users' data and ensure its accurate, relevant, up-to-date and secure.

The cultural, personal and environmental impact of ICT

Personal Impact
Automation
Hot-desking
Flexible working



Cultural issues

Digital divide	Social media
Cyberbullying	Fake news
Net neutrality	Addiction

Environmental Impact

Positive	Negative
Internet of Things (IoT)	E-Waste (Electronic Waste)
Green IT	Non-green IT
Digital downloads	Pollution

Digital footprint

The information about a particular person that exists on the internet as a result of their online activity.

Online identity?

Just as you build your own identity in person and develop a reputation in the physical world, the same applies to any online activity.