The information in these mind maps is supposed to supplement the textbooks, not replace it.

Although every effort has been made to ensure that the information is correct, the CAPS document must still be consulted as the primary guideline.

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Information Processing Cycle

**Input**
- give input to the computer. Without it, the computer does not know what to do

**Processing**
- the internal process where the computer processes data so that what you requested can happen (e.g. sorting, searching for something on the computer)

**Output**
- what the computer gives back to you after the processing. Normally 'soft' output on the screen or 'hard' output on printout

**Storage**
- to store the output permanently, you store it on a hard drive or a flash disk

**Communication**
- many times you share the output you saved with other people through e-mail etc.

ICT: Information and Communication Technology
ICT refers to technologies that provide access to information through telecommunications (such as the Internet, wireless networks, mobile phones and other communication media)
Input devices

**Keyboard** (wired & wireless/bluetooth)
- Physical keyboard
- Touch screen's pop-up keyboard
- Disabilities:
  - For blind people: braille keyboards, microphone
  - For visually impaired/motor skills: keyboard with big buttons

**Pointing device**
- Mouse (wired & wireless)
- Touch pad
- Pointing stick
- Stylus
- Touch screen / multi touch screen
- For motor disabilities: trackball / footpedal / suction/blowing device

**Gaming devices**
- Joystick, Steering wheel, Controller (Xbox/Playstation)

**Scanners**
- Barcodes (uses light rays/optics)
- QR codes (QR=Quick Response)
- Card readers (bank card) - ATM
- Biometric - Face recognition, Fingerprint, Iris/Retina scanner
- RFID - wireless (uses radio waves)
- Office Flatbed & Feeder scanners
- Character recognition

**Video & sound**
- Webcam, Digital video camera
- Microphone (voice recognition, record music)

**Disadvantages**
- Wireless: Cables are not in the way, can work far from computer
- Barcodes: theft risk, needs batteries, more expensive to buy, interference of signals, weaker response time

**For motor disabilities**
- Trackball / footpedal / suction/blowing device

**QR codes**
- Quick link to weblink - does not need to type in URL manually

**Card readers**
- For security - much better than password, cannot forget it

**Biometric**
- Linked to one person's unique biometric features

**RFID**
- Disadvantage - you have to be there in person, can endanger you

**Scanners**
- OCR - scans to editable text

**Office Flatbed & Feeder scanners**
- Character recognition

**Video & sound**
- Webcam, Digital video camera

**Microphone** (voice recognition, record music)
**HARDWARE**

- **Motherboard**
  - Connects all components and parts of the computer with each other.
  - Also provides the electrical connections by which the other components of the system communicate.
  - Contains a couple of slots for additional cards like sound and graphics cards.

- **CPU** - does the processing/thinking
  - Speed measured in = GHz
  - Quad core = 4 "cores"
  - Cache memory - files are kept in super quick memory so that access to the CPU is faster (than to RAM)
  - Well-known make e.g. Intel / AMD
  - Function: loads current programs & documents when it is processed by the CPU
  - Feature: unstable/volatile; in other words; loses content without power (temporary)

- **RAM** (Primary Memory)
  - E.g. DIMMS, DDR3/DDR4
  - Measured in GB
  - Cheapest way to upgrade computer & improve performance
  - Small chip built-in on the motherboard

- **ROM** (Read only memory)
  - Helps computer 'boot' - startup process (e.g. tests if all components needed is there)
  - Software on RAM that contains basic instructions: BIOS - Basic Input Output System
  - Onboard/Integrated = built-in on computer; Dedicated = separate card (better graphics)

- **Graphics card**
  - Dedicated: Has its own RAM and GPU (Graphics processing unit) thus better performance since the system CPU & RAM is not used by graphics

- **PSU** - Power supply unit

**Biggest influence on performance/speed of computer**
Output devices

**Screen/monitor (soft copy - thus electronic on screen)**
- **Specifications**
  - Size measured in inch” diagonal over screen
  - Resolution measured in pixels e.g. 1920 x 1080 (also 720p, 1080p, 2K, 4K)
  - Aspect ratio e.g. 4:3, 16:9 relationship of length versus width
  - Response time e.g. 2ms (milliseconds) how quickly a pixel can change from one shade to another
  - Contrast ratio e.g. 1:1000000 number of variations between light and dark
  - Colour depth e.g. 8-bit, 32-bit Number of colours that a screen can display e.g. 24-bit=16.7 million colours
- Use VGA (old) or HDMI (new) cables
- HDMI for high resolution and can also transfer sound

**Data Projector**
- Measures brightness in lumens
- Specification: measures brightness in lumens
- Important for people that are blind

**Speakers & headphones**
- Important for people that are blind

**Printer (hard copy - printed page)**
- **Specifications**
  - Speed (ppm - pages per minute), resolution (dpi), workload (how many pages it can print in a month/lifetime), number of ink colours
  - Default printer - print to it automatically
  - Printing queue - where the print jobs wait in line
  - Spooling - the process of sending print jobs to the queue & the printer. Printer has a memory, called Buffer.
  - Printer itself is expensive
  - Toner is expensive but cost per page works out cheaper
  - Quick printing speed
- **Laser**
  - Advantage: saves cost & space because all the devices are in one. Disadvantage: if 1 breaks and is sent in for repairs, all the other functions are not available
- **Multifunction (print, scan, copy, fax, email)**
  - Advantage: saves cost & space because all the devices are in one. Disadvantage: if 1 breaks and is sent in for repairs, all the other functions are not available
- **Inkjet**
  - Ink is relatively cheap but cost per page is expensive
  - Slow printing speed
- **Dotmatrix (e.g. pharmacists)**
- **3D printer**
- **Braille printer (for blind people)**

**Fax**
- For deaf people - devices that vibrate
- **Important for people that are blind**
**Storage Devices**

**Memory cards**
- (needs card reader)
- Micro SD, Mini SD, SD

**Optical media**
- CD, DVD, Blu-Ray

**USB Hub for additional USB ports**

**Flash disks**
- (electronical - flash memory)
  - Ideal for portable storage - larger capacity than CD/DVD, fast read/write speed, does not damage easily, physical size is small.
  - Easy to lose or forget in computer

**Advantages**
- cheap storage media (ideal for archiving)

**Disadvantages**
- Damages easily, slow read/write speed, cannot store a lot of data

**Hard drives**
- (secondary memory)
  - SSD (Solid state drive) (Flash memory)
  - HDD (Hard disk drive)
  - Portable (USB powered)
  - External (simple power plug in)
  - Internal

**Types**

**Kinds**
- Portable (USB powered)
- External (simple power plug in)
- Internal

**Features**
- Permanent storage of programs & data
- Stable/non-volatile: keeps contents without power
- Slower read/write speed than RAM
- Can connect multiple HDD’s through a RAID system
- Serves as virtual memory
- Area on hard drive that serves as RAM (when RAM becomes full).
  - **Swop files** are files that swop between the HDD & RAM.
  - **Thrashing** is when the HDD is overloaded by the fast exchange of files between system memory (RAM) and virtual memory (on the HDD)

**Measurements of storage devices**
- 1KB = 1024 bytes
- 1MB = 1024KB
- 1GB = 1024MB
- 1TB = 1024GB
Types of Multi-purpose Devices

- **Portable**
  - Ultrabook
    - Usually contains SSD
    - Very high screen resolution
    - No optical (DVD) drive
  - Laptop/Notebook
    - Thin & light = expensive!
  - Tablet-PC
    - Laptop and tablet in one (screen can be taken off)
  - Netbook
    - (cheapest type of laptop)
    - Small screen (<13")
    - Minimum specs (slow)
    - No optical drive
  - Tablet
  - Phablet
    - Screen size between tablet & smartphone
  - Smartphone
    - Has GPS, camera, gyroscope, accelerometer

- **Mobile**
  - Portable (BYOD policy)
    - (bring your own device)
  - Not portable

- **Dedicated devices**
  - GPS (can also be built into smartphone/car)
    - Measures physical location with geographical coordinates with satellites
    - GPS regularly updated
    - Can plan routes automatically
    - Can keep your eyes on the road more than you could with a printed map
  - ATM (handles financial tasks)
  - Digital cameras
    - Resolution measured in Megapixels (MP)
    - The higher, the better, but takes more space
    - Optical - better quality - done with lenses
    - Digital - done with software
    - Geotagging - Places GPS coordinates in photo’s metadata

- **Desktop PC**
  - Entry level - basic computer with low specs
  - High-end - top specs

- **Server**
  - (in network)
  - Used by e.g. scientists / architects / video editors

- **Work station**
  - (very strong computer)

- **Mainframe computer**
  - Super size server - spans many rooms - MAIN computer in big organisation

- **Keep computers safe**
  - Lock room/office
  - Use cable lock
  - Activate alarm / movement sensor
  - Protect desktop computers against power failures and power spikes with a UPS – uninterruptable power supply

- **Protect computers**
  - • Lock room/office
  - • Use cable lock
  - • Activate alarm / movement sensor
  - Protect desktop computers against power failures and power spikes with a UPS – uninterruptable power supply

- **Protect workstations against power failures and power spikes with a UPS – uninterruptable power supply**
**Concepts**

**HARDWARE**

**Ergonomics**
- The design of devices/items to fit to humans' natural form
- E.g. Chair with good backrest/table with right height

**RSI - repetitive strain injury**
- Get different types e.g. Carpal Tunnel Syndrome (wrists) or Gamers thumb
- Suggestions to prevent:
  - Use ergonomically designed INPUT devices
  - Take regular breaks

**Green computing**
- Definition: Environmentally friendly use of computers
- Rather fix/re-use any devices
- Switch off when not in use
- Discard e-waste responsibly - with supplier or recycling company
- Save paper
- Save ink
- Print 2 per page, back to front, check print preview, proofread on screen
- Draft mode (lighter), less pictures
- E.g. Smartphone/Tablet/Smart TV and all their different features (GPS, camera etc)

**Convergence**
- Combining multiple devices/technologies into one device
- E.g. Smartphone/Tablet/Smart TV and all their different features (GPS, camera etc)

**Ethical use (right & wrong)**
- No piracy, respect privacy, no malware
- Digital divide is when people don’t have access to technology due to a lack in skill/knowledge or finances

**Types of users**
- Personal user
- SOHO - Small Office Home Office
- Mobile user
- Enterprise user (new term)
- Someone who uses computers for personal reasons (minimal for work)
- Business managed from a house
- Anyone using computer devices "on-the-go" thus anyone who owns a smartphone
- An enterprise is a company which hundreds or thousands of employees - each user in such company is an enterprise user

**Reasons for using ICT**
- More Effective, Accurate & Reliable than people
- Communication is so much easier & faster
- Economical
- More work in less time, do not make mistakes, do not get tired, doesn’t strike
- Always give examples in comparison with mail/letters
- Save paper, labour, communication costs etc.
System Software

**Operating system**
- Graphic user interface (graphical way for people to interact with the computer)
  - Menus, Icons, drop down lists
  - Control basic security (logins)
- File management (folders, file extensions etc.)
- Manage integration between software and hardware
- Drivers for devices (manage communication between device & OS - lets device be controlled)
- When devices are automatically installed, it is "Plug and Play"

**Functions**
- E.g. Windows 10 (paid)
- E.g. Linux (OSS)
- E.g. Android (smartphone)

**Utilities**
- **Backup**
  - Good habits - not in the same place, safe place etc.
- **Uninstaller**
  - Used to remove programs safely from computer
- **Compression (.zip / .rar)**
  - Like Winzip - makes it smaller & can then email folder, Can zip or unzip to use again (to edit)
  - Adds pieces of files that are spread/scattered over the whole HDD together again to improve SPEED
- **Defragmenter**
  - Can slow down computer speed (performance) while scanning
  - Scan & fix flash- and Hard drives
- **Disc Cleanup Wizard**
  - Search your computer for cached / temporary files or programs that you no longer use / recycle bin that is full and gives you the option to delete / remove.
- **Disc Scanner**
  - Scan & fix flash- and Hard drives

**Antivirus**
- **Update , update , update!** - Virus definitions so that it can be recognised!
- **Scan internal / external harddrives / flashsticks for viruses**
  - Examples: Kaspersky, McAfee, Norton EsetNOD32.
  - Free: Windows Defender, AVG Free Edition
  - Can slow down computer speed (performance) while scanning
- **Put potentially harmful / malicious software in quarantine**
  - Quarantine: Safe area on hard drive where virus cannot harm anything - allows you to choose or remove something

**System software manages resources on computer / allows computer to be used**

**Application software are programs for personal use / tasks**
SOFTWARE

Concepts

Updates

- Necessary due to software error / bug
- Specific problem made in software when created

Patch

- Software solution for one specific problem

Service Pack

- Collection of all previous patches & new features

If a program does not respond / hangs

- Press CTRL+ALT+DEL / Open Task Manager
- “End task” - Ends the program

Compatibility

- A problem between different versions of the same software
- 'Backwards compatibility' - New program can open old files, old program can not open new files

Minimum specifications

- Just enough so that program can install and work

Recommended specs

- Enough so that program works fully (excellent), smooth output

System compatibility - is the computer hardware sufficient for the software

Text-to-speech

- Computer reads to you what is on the screen (requires speakers - output)

Speech-to-text

- Computer can respond / type your voice commands (requires microphone - input)

Magnification

- Black background with white text for people who are struggling to see

High contrast theme

- File management (one of the functions of the OS)

File path e.g. C:\My Documents

Accessibility options (For people with disabilities/disabled): Find under Accessories

- Text-to-speech
- Speech-to-text
- Magnification
- High contrast theme
- Sticky Keys
- Folders within folders in logical order

Sticky Keys

- Help people to press shortcuts etc. 1 button at a time

Folder management

- Step-by-step indication in which folders a file is stored
**Features**

- Can share resources like printers and Internet access
- Data is kept in 1 central location / central storage
- Easy communication between users
- Share of software and / or updates
- Can make backups from 1 central location
- Viruses spread easily
- Must have a lot of knowledge to set up
- Requires good security (so unauthorised users can not access confidential information)

**Advantages**

- In school/work environment an AUP is signed
- Definition: Contract / agreement between user and institution
- Includes what may and may not be done on the network
- A virtual private network (VPN) is a technology that creates a safe and encrypted connection over a less secure network, such as the Internet
- The benefit of using a secure VPN is it ensures the appropriate level of security to the connected systems when the underlying network infrastructure alone cannot provide it

**Disadvantages**

- Virtual Private Network (VPN)
- PAN - Personal area network - can fit on 1 table
- HAN - Home area network - 2 or more rooms
- LAN - Local area network - more computers in 1 room or across a school campus
- WLAN - Wireless LAN
- WAN - Wide area network - E.g. Gauteng
- GAN - Global area network - e.g. Internet world wide

**Concepts**

- Types
  - PAN - Personal area network - can fit on 1 table
  - HAN - Home area network - 2 or more rooms
  - LAN - Local area network - more computers in 1 room or across a school campus
  - WLAN - Wireless LAN
  - WAN - Wide area network - E.g. Gauteng
  - GAN - Global area network - e.g. Internet world wide
### Hardware Needed

**Server:** Provides services/resources to computers in the network such as printers & Internet.

- **File server:** Controls which sites may be visited. Can monitor usage of individual people.
- **Proxy server (internet server):** Does central web storage (web caching) and save data.
- **E-mail server:** Controls the printers in the organisation.
- **Print server:** Must connect to network to work - basically just a screen, keyboard & mouse.
- **Thin client:** Can function as standalone computer.
- **Fat client:** Network Interface Card (NIC) to connect to network.

**Client:** Uses the services/resources provided by the server.

- **Thin client:** Must connect to network to work.
- **Fat client:** Can function as standalone computer.

**Switch:** A device that connect devices on the network (internally - many devices to each other).

**Modem:** Convert digital signals from your devices to signals that can be sent over your Internet connection and vice versa.

**Cables:**
- UTP (common network cable - cheaper) - uses RJ45 port or FIRE OPTIC (use light beam = fast data transfer)

**Router:** Connect a network to another one - eg. your home to the Internet.

**3G Dongle:** Looks like a flash disk in which a SIM card can be inserted to use cellular Internet on a computer/laptop.

**Wi-Fi access point:** A network device that allows a Wi-Fi device to connect to a wired network.

**Wi-Fi Repeater:** Used to extend the coverage area of your Wi-Fi network. It receives your existing WiFi signal, amplifies it and then transmits the boosted signal.

* In a standard ‘Modem/Router’ used in a home, these four devices are merged.
INTERNET is a global network that is publicly available

INTRANET is shared content that is only accessible to members of a single organization e.g. a university

EXTRANET is a private network that uses Internet technology and the public telecommunication system to securely share part of a business’s information or operations with suppliers, vendors, partners, customers, or other businesses. An extranet can be viewed as part of a company’s intranet that is extended to users outside the company.

VoIP = Voice over Internet Protocol e.g. Skype

Cheaper than regular calls (only uses data)

Can send video & audio

Available on different devices like computers & smartphones

Video usage can use a lot of data, especially with a high resolution webcam

Instant messaging (WhatsApp, Google Chat, Skype chat)

Use of programs through a web browser - runs and is installed on Internet servers instead of on own computer

Fax to email

No installation/update required. Pay an annual/monthly license fee

Grid computing: Using multiple computers’ processing power to solve 1 problem (as if it were 1)

The Internet can be so powerful because it works from the Internet server

FTP = File transfer protocol - share of large files over a long distance through the Internet

Cloud computing (web applications)

A lot of people can easily work together on a document

Cloud storage

Disadvantages: Internet access required, limited functionality versus installed software

Programs usually contain less features versus “desktop version”

Netiquette = Good manners on the Internet

Do not type in capital letters (shout)

Do not send large email attachments etc

Good spelling

Storing information/files on Internet servers

Can get information anywhere if you have Internet access

Can serve as a "Backup" for your data

Synchronises devices with the same content

The INTERNET is a global network of computers

The WWW is only one of the services on the Internet that displays web pages
E-mail

To: to whom the e-mail is addressed

CC: other people who are being copied to take note - everyone can see each other's email addresses

BCC: people who are copied but cannot see each other's addresses (Netiquette - BCC people when emailing a group)

RE: an email reply automatically gets this prefix in front of the subject

FW: an email sent to someone else automatically gets this in front of the subject

Subject line: the subject of the email

Reply to all: when there is more than 1 person in the To or CC field you can "reply to all" and send a message to the same big audience (use with consideration!)

Attachment: attach a file to email (size limited to a certain number of MB)

Mail rule: automatic actions in an e-mail program according to rules you specify

Social networks

Definition: Online service or technology that allows people with similar interests to communicate with each other regardless of time or distance

E.g. Facebook, Twitter, Instagram

Benefits: Allow groups to create virtual communities or pages for businesses/famous people, etc.
Huge audiences to share your life with
Can inform family members/friends about your life
Businesses can place cheap and targeted ads and interact with their customers

Disadvantages: Thinking that friends on social media are real friends
Danger of Cyber stalking/Cyberbullying
Danger of online predator/pedophiles
Someone who does not know you, may monitor your online habits to take advantage of it (to your detriment)
May be addicted to social networks

Protect yourself/your business:
Do not publish offensive content
Do not accept friend requests if you do not know the person

Podcast

Audio file downloaded from the Internet that can be played on computers or devices such as smartphones e.g. with radio programs/training etc. (Vodcast - when it includes video)

Webcast

One-way flow of information broadcasted over the Internet to a large audience that may consist of audio, video and/or presentation slides
Audience does not usually contribute to content

Webinar

Interactive meeting or seminar. The content is usually education-based.
The audience is usually smaller and takes part in the conversation through surveys, Q & A etc.
Webaddress = URL

E.g. www.hsrandburg.co.za

Portal - access point to many at www

Wiki - website where people work TOGETHER put it together

Content aggregator: Gather information from many websites - like RSS feeds

Services e.g. e-banking, e-commerce

Blog (like a online diary, chronological) (Vlog = video blog)

Good blog habits: Update regularly, use pictures/videos, respond to readers' comments

Home button (page on which your browser opens or you can go back to)

Back / Forward

Favourite / Bookmark - save the link to the website for future use

History - return to chronological history of previously visited addresses

Address bar - where the URL of the website shows (also search bar)

Tabbed browsing - so that many web pages can be open at once

Browser plug ins: To see multimedia e.g. Flash Player, Quicktime.

Use Search Engine like Google to search for information (like a library assistant)

Webcaching

Webpages that have previously been visited are stored on the "local pc" (faster access in future & saves data)

Program = web browser, eg. Chrome, Firefox, The program/application used to visit/view web pages

Search engine = eg. Google, Bing, Yahoo! A program or webpage that searches for information on the www using keywords

INTERNET
Safe usage

- Features of secure websites
  - URL starts with https
  - Address bar turns green
  - Lock icon shows

- Antivirus & operating system updates
- Do not click on pop-ups
- Do not open unknown attachments / programs
- Good passwords
  - Capital and lowercase letters, numbers, symbols, no patterns (passphrase - longer phrase is much safer), change regularly
- Firewall

Criminal

- Piracy
- Hacker
- Cracker
  - Identify security gaps in an ICT system
  - Identify security gaps and use it for criminal purposes

- Botnets
- Identity Theft
  - Many connected “bots” that include worms, trojans, spam, etc. Spread with other people’s computers over the Internet without them being aware of their computers being used for that purpose
  - Commonly used for a DDoS attack where masses of useless data or requests are sent to a network or computer. This can reduce the speed drastically or crash the entire network.

Malware (any malicious software)

- Spread through emails, internet, flash discs, pirated software etc.
- Prevent through antivirus software
- Types
  - Worms (spread easily without action - like field fire)
  - Trojan (looks good, but is bad - must be activated)
  - Spam - electronic junk mail
  - Hoax / fraud scheme
  - Phishing
  - Pharming - user is redirected to fake website, if he enter the correct URL
  - Spoofing - faking email header
  - Sniffer attack - Small program that can read data packets over a network
INFORMATION MANAGEMENT

Gather data

Research (published information on internet & books / newspapers, interviews)

Evaluate reliability

Printed media e.g. books

Electronic sources eg. Internet articles, e-encyclopedias

Copyright

Plagiarism

E.g. Questionnaires, surveys, interviews, votes

Closed questions: limited, possible answers

Open questions

Advantages of electronic / online questionnaire (vs printed questionnaire)

Is the author / organisation reliable

Date of creation / update of information (NB because it could have changed in the meantime)

Does it match other sources?

Is this objective?

Good language / no spelling mistakes

Already electronic / less typing time

More up to date

A legal right / ownership of your own intellectual material

To present someone’s work / intellectual material as your own (copy a source’s information just like that) without their permission

Faster to complete

Less errors when data is being captured

Easier to analyse / compare information

Online - Greater audience / more variety of people

Distributed easier / easier to get back

Data validation can be done

Already electronic - No need to retype

Data refers to raw facts in itself is not useful

Information is data that is useful / processed
Excel

- Graphs
  - Types: pie, column, line

- Pivot Tables
  - Made / focuses on calculations / functions / numerical data

Access

- Techniques like
  - Data validation
  - Input masks
  - Default values
  - Primary key
  - Lookup wizard / dropdown list
  - Query - to extract specific information
  - Report - to create neat reports with grouping
  - Form - easy format for people to enter data

Has objects like Queries, Forms and Reports

Presentation of data better than Excel: especially Report

Word

- Styles - can then create an automatic table of contents.
- Captions to create automatic Table of Figures
- Footnote - to give more information about something
- References:
- Can work together on documents with Track Changes
- Create interactive forms (for surveys) using Developer

Citations e.g. (Wikipedia, 2015) - shortened version of source

Automatic bibliography - full list of sources and all their information