Theory Book

COMPUTER APPLICATIONS TECHNOLOGY

12

basic education

Department:
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CAPS

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Contents

GENERAL CONCEPTS

CHAPTER OVERVIEW	
Unit 1.1	Computers and their uses
Unit 1.2	Data, information, knowledge and wisdom
Unit 1.3	Convergence
Unit 1.4	Social implications: Environmental

By the end of this chapter, you will be able to:

- Describe the various reasons for using computers.
- Describe the role and use of data, information, knowledge and wisdom as part of information management.
- Explain convergence.
- Explain the social implications of computer technology on the environment.

INTRODUCTION

To get a better understanding of the topics that will be discussed in this chapter, we will start with a quick review of what Information and Communications Technology (also known as ICT) is and how it is related to computers.

The term ICT refers to technology that gives access to information by using **telecommunication**. The information is obtained from either a telephone or a computer network. Users can access this information by using a computer, or a computing device, such as a smartphone. ICT also includes the most common and widely used network – i.e. the internet. Thanks to advances in technology, users can access the internet via desktop computers, laptops, tablets and smartphones.

In Grades 10 and 11, you learned about different types of computers, such as the following:

- **Server:** A server is a computer that has powerful processors, large hard drives and plenty of memory power. They are used in networks where large amounts of data need to be stored so that the computers on this network can access the data. Servers also make it possible for computers on the same network to share other devices, such as printers.
- **Workstation:** A workstation is a computer intended for individual use that is faster and more capable than a personal computer. It's intended for business or professional use (rather than home or recreational use). Workstations and applications designed for them are used by small engineering companies, architects and graphic designers.
- **Personal computers (microcomputers)/Desktop:** A personal computer, or more commonly known as a PC, was commonly referred to as a "microcomputer", because, when compared to the large systems that most businesses use, it is a compact computer with a complete system. They are the smallest, least expensive and most used type of computer. They are physically smaller, have a relatively small memory, have less processing power, and permit fewer peripherals than super and mainframe computers. Desktop PCs are *not* designed to be carried around because they are made up of separate components.
- **Laptops/Notebooks:** Laptops are also known as "notebooks". They are portable PCs that combine the display, keyboard, processor, memory, hard drive and cursor positioning device (a touchpad or trackpad) all in one package. Laptops are battery-operated and as a result, are completely portable.
- **Tablets:** Tablets are smaller than normal laptops and are ultra-portable (easy to carry). They are generally cheaper than brand new laptops, and their processors and other components are less powerful than that of regular laptops.
- **Smartphones:** Handheld-sized computers that use flash memory instead of a hard drive for storage. They have virtual keyboards and use touch-screen technology. Smartphones are lightweight and have a good battery life. (The battery life of smartphones varies, depending on the make.)
- **Embedded systems:** Embedded systems, or dedicated devices, are stand-alone electronic hardware that is designed to perform dedicated computing tasks, for example automatic teller machines (ATMs), MP3 players and so on.

In general, computers have certain economic benefits – for example, they save paper, labour, communication speed and cost, and so on.

Throughout history, there have been many inventions and discoveries that have changed the way in which we live our lives. One such invention is the computer.

Computers have enabled us to make technological and scientific advancements, such as exploring the deepest depths of the oceans and outer space. Most of all, however, they allow us to stay connected with people all over the world.
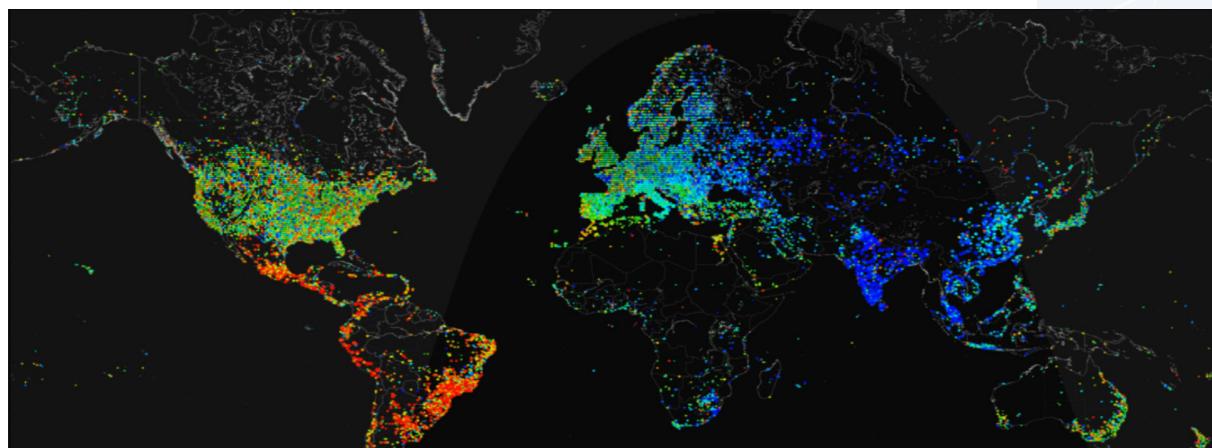
Figure 1.1: *Internet usage across the world over a 24-hour period*

In today's world, most people living in a city will interact with a computer in one way or another and on a daily basis. This can be a simple interaction, such as stopping at a traffic light, or a more direct interaction, such as using a smartphone or laptop. One thing is certain, however: Without computers, our lives would be very different!

WHAT IS A COMPUTER AND HOW DOES IT WORK?

All computers, whether they are the smartphone in your hand or large, powerful servers, operate on the same five basic principles. These are input, processing, storage, output and communication. Each component of a computer performs one of these functions, but they all work together to make the computer work.
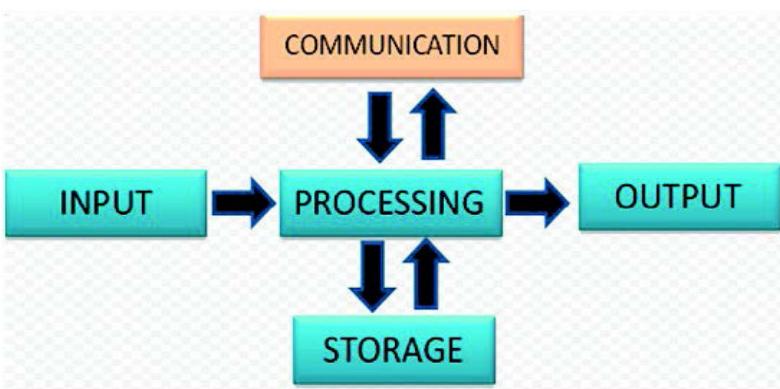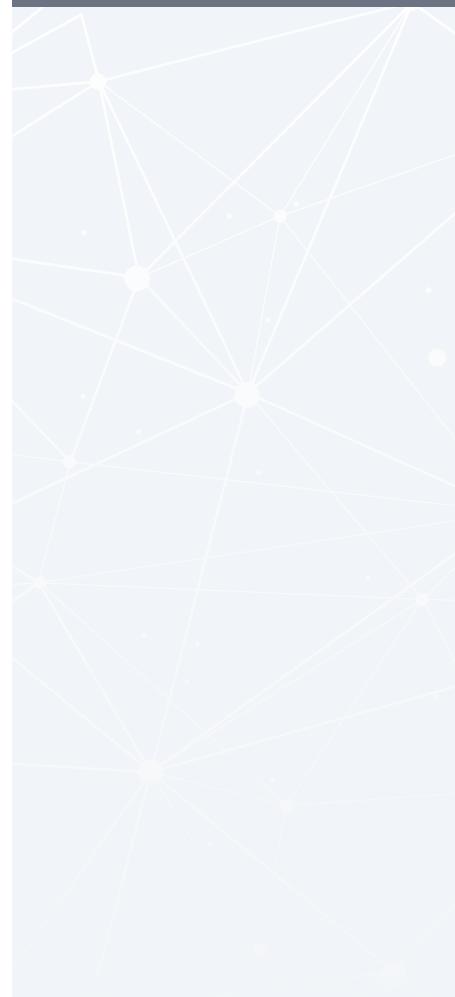
Figure 1.2: *The stages of the information processing cycle*

In this section we will look at each of these stages and how they work together. We will also look at how these processes can get one computer to communicate with users and other computers. The five main steps are input, processing, storage, output and communication.

INPUT

In the input stage, the data is entered into the computer. There are many ways to do this. In fact, there are as many ways to input data as there are input devices. You would have learned about input devices in Grade 10 but just to refresh your memory, input devices are things such as keyboards, touchscreens and microphones. The user inputs the data (for example, by typing on a keyboard or speaking into a microphone) into the computer. The device takes this data and converts it into a series of 1s and 0s (this is called binary code).

PROCESSING

The central processing unit (CPU) inside the computer then takes that binary code and does the calculations needed to get that data to display in a way that makes sense to the user. The CPU works with the computer's memory to get instructions on how to display the information from the input device and stores it as pixels in the computer's memory. This information is sent to the output device to be translated and displayed in a way that is useful. All of this takes a fraction of a second to do.

STORAGE

Storage is where the computer takes the input and stores it in its memory banks. There are many ways to store the data, but the basic process is as follows:

1. The CPU writes the data to the computer's temporary storage, or random access memory (RAM).
2. The computer then waits for the user's command to move the data from the RAM to more permanent storage. If that command is given, the computer writes the data to the disk drive.
3. Lastly, the computer saves the data in a location on the drive, either the default storage location or a location set by the user. The user can then recall this stored information at any time.

You can also store information using external storage devices (for example USB drives or external hard drives).

OUTPUT

Output is where the computer takes the pixels from the processing stage and displays them in a way that the user can see them. There are many kinds of output devices, such as printers, screens, video and audio devices.

These devices make the raw data usable and visible, allowing human users to interpret the data, turning it into information. This could be the sound waves of a song or the letters in a document.

WHY DO WE USE COMPUTERS?

Computers play a big role in our daily lives, because they can do the following:
- Help improve productivity
- Assist scientists to cure disease
- Help architects design and construct intricate new buildings
- Empower people from poor countries by opening opportunities across the world

In the following sections, we will take a brief look at some of the reasons why computers are used.

SAVING TIME

One of the major benefits of modern computers is that they can save us a lot of time and effort – from finding the quickest route to the mall using Google Maps, to sending an urgent email to a work colleague. Each activity is completed much faster and with much more ease; all thanks to the computer.

Let's take a look at some of the ways in which computer technology helps to save time:
- You can use an online shopping website so that you can do your grocery shopping from the convenience of your own home and have the groceries delivered to your home. By doing so, you save the time it would have taken to drive to the shop, do your shopping, drive back home and unpack your groceries from your car.
- You no longer need to go to your bank to do transactions. Instead, you can use your bank's online banking facilities to view your bank balance, pay your bills, or transfer money.
- Instead of standing in the queue at your favourite take-away restaurant, you can order your food from the restaurant's website.
- You can view online traffic cameras and maps with traffic information to find the quickest route to a specific location.
- You can do certain tasks, for example difficult calculations, much faster than if you had to do them manually.
- You can find information quickly by searching on the internet, or on a database.
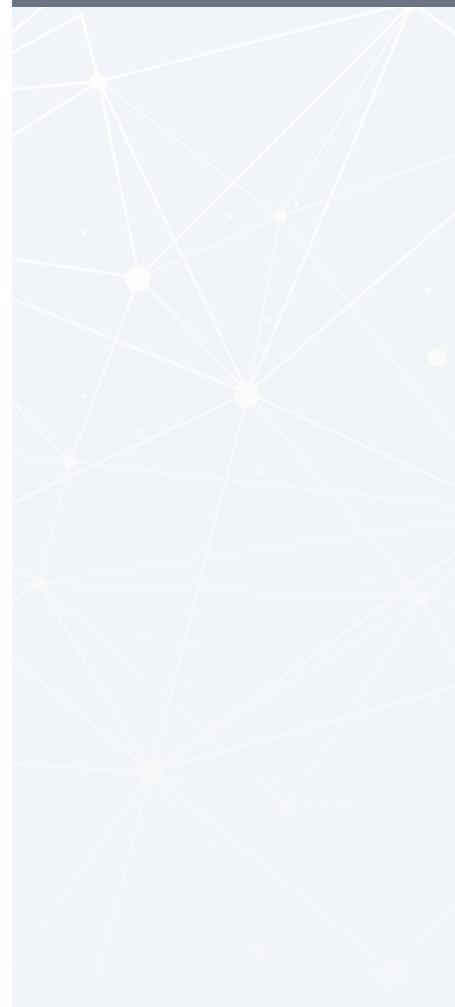
COMMUNICATION COSTS

Computers have greatly reduced the costs of communication with people across the world. Video conferencing is much cheaper that buying a plane ticket and flying to a meeting, and sending or sharing files over the internet.

EFFICIENCY

Computers made it possible to obtain, store and record data both quickly and efficiently. For example, you can research any topic on the internet in less than an hour. Many repetitive tasks performed by humans can be time consuming and there is always the risk of human error. Using computer technology can reduce the time it takes to complete the task and it can reduce or eliminate mistakes.

SAVING LABOUR

The automotive industry is an example of how computers and automation can help with saving labour. It would take a person roughly two months to two years to assemble a car by hand. This is significantly longer that it takes when using computers and automation, which can produce a fully assembled and painted car in about 8 hours.

Figure 1.3: *Robots welding in an automotive factory*

ACCURACY AND RELIABILITY

Humans are emotional beings and can be affected by a variety of internal and external factors. We get tired, we make mistakes and we complain about the work that we need to do. On the other hand, computers are programmed to perform a specific task, in a very specific way and for a set duration. They will perform the task accurately, efficiently and reliably.

In the healthcare industry, technological advancements have improved the accuracy and, therefore, the safety of various medical procedures. For example, laser technology, surgical robots and nano devices are used to increase surgeons' accuracy during operations.

In manufacturing industries, automated machines and robotics have increased the accuracy and reliability of manufactured products.

EFFECT ON TIME AND DISTANCE

The efficiency, accuracy and reliability of computers have changed the way in which we communicate with each other. They have allowed us to do the following:
- Have conversations with friends and family in other countries (VoIP)
- Have business meetings with colleagues in other cities (Skype)
- Send instant random messages to people across the world (email)
- Online banking, which allows customers to pay bills, view account balances, transfer funds from one account to another, pay friends and much more. Financial institutions have also given consumers control over their own security by adding features like the ability to freeze a missing credit card to avoid further charges. Over time, these

controls will only increase as technologies like biometrics and facial recognition keep accounts safe.

- Shopping has become a hassle-free task now and almost anybody can order products online after comparison with other websites. The boom and the resultant competition in the online shopping business are evident. Shopping sites are more interesting because of the huge discounts different companies are offering customers.
- The internet is a very important tool for educators. The internet and its application is user-friendly and make students' life easy. A teacher can use YouTube channels to teach students around the world. Teachers can use a blog in which they can share their career experiences with college graduates. There are various websites for teachers and students to use.

SAVING PAPER
Computers allow users to compile data using spreadsheets, write letters using word processors, send messages using email and complete forms using an online application. Each of these computer-related conveniences reduces the amount of time and effort required to perform these activities, but importantly, they reduce the amount of paper that gets used on a daily basis. This is very important as the trees from which paper is made, play a very important role in reducing the amount of carbon in the air.

GLOBAL COMMUNICATION, INCLUDING SOCIAL NETWORKS AND WEB TOOLS

One of the most-enjoyed attributes of computers is that they can be connected to form a network. This includes connecting the computers in a home, or an office, so that the users can share files. Networks can also span across a distance. The largest network is the internet, which consists of hundreds of thousands of computers across the world.

Computer networks have made it possible for users to use new and exciting ways to upload and share information. Examples of this include the following:

- **Social networks** are specialised computer networks that allow users to have social interactions with each other by sharing their personal information. This includes their likes and dislikes, videos and photos. Some examples of social networks include Facebook, Twitter, Snapchat and Instagram.
- Web tools:
  - **Blogs** are a form of an online diary that allows users to share their daily experiences with others. Examples of blogging websites include "Boing Boing" and "PlayStation Blog".
  - **Wikis** are specialised websites that allow users to share information. This includes all kinds of information; from the plot of a television show, to how photosynthesis works. The most famous example of a wiki is Wikipedia, but there are many other wiki websites dedicated to specific topics.
  - **Vlogs** (or video blogs) are a type of blog where nearly all the content is in video form.

d. Which of the following is NOT a reason why we use computers?
  A. Saving time
  B. Lower communication costs
  C. Higher efficiency
  D. Lower accuracy and reliability
e. Which of the following examples of computer uses does NOT help save time?
  A. Using an online site for grocery shopping
  B. Using online banking services
  C. Using a web browser to play flash games
  D. Using Google Maps to find a restaurant's location
2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 A computer	**A.** Time saving
2.2 A benefit of online shopping	**B.** Internet
2.3 Specialised computer networks that allow users to have social interactions with each other	**C.** The user
2.4 The largest network	**D.** Samsung Galaxy S6
2.5 The source of input	**E.** Intel Core 2 Duo
	F. Social networks
	G. Mark Zuckerberg

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
  a. Computers have made it possible to talk to people <u>face to face</u> while being in different cities across the world.
  b. The use of automation <u>increases</u> the amount of people needed in the production process.
  c. Humans are <u>more</u> accurate, efficient and reliable than computers.
  d. Computers <u>lower</u> the cost of communication.
4. Answer the following questions:
  a. What is the difference between wikis and blogs? Give an example of each.
  b. Explain what the storage and communication step in the information-processing cycle entails? Give two examples of storage in the information-processing cycle.
  c. How does a computer contribute to saving the environment?
  d. What are the negative implications of computers on society?

1.2   Data, information, knowledge and wisdom

Data is raw, unorganised numbers, signals, or facts. Without first organising or changing it, humans struggle to use data. For example, your school might have data on the names, surnames, addresses, contact details, as well as the results of every class test, assignment, test and exam of all current and past pupils stored on a computer somewhere. While this data is important to store, it could be hundreds, or even thousands of pages long and very difficult to interpret!

Information, in contrast to data, refers to facts and numbers that have been organised so that they are useful to people. For example, if your Mathematics teacher wanted to see how well your current class is performing compared to last year's class, she might ask your school's database to convert its data into averages for the two years. In this way, those thousands of pages of data will be converted into two numbers that can be compared easily. Similarly, the report you receive at the end of each school year takes all the data that the teachers collected throughout the year and turns that data into a single report that you can use to measure your performance.

Figure 1.4: *Data is raw facts; information is processed*

Activity 1.2

1. What type of web tool is Wikipedia?
    a. Blog
    b. Wiki
    c. RSS
2. What is the difference between data and information?
3. What software can be used to organise or interpret data in a school environment?
4. Explain to a fellow learner what each step in the DIKW pyramid means and then how it progresses from one step to the next.
5. You just received your CAT test results and comments. The averages of each question and of the test as a whole were given.
    Explain how you would use the data and information to learn from the test and the experience to further deepen your wisdom. For example, how can you and your teacher benefit from the information and how would you learn from your mistakes?

Convergence is a term used to describe a situation where multiple technologies are combined to deliver a new and more exciting product.

A smartphone incorporates various technologies that have been combined to deliver a product that can be used for a large variety of tasks. This not only saves you the hassle of having to carry multiple gadgets, but also saves money, as you only have to buy a single product.

To better illustrate this, let's take a look as some of the technologies that have been integrated into the smartphone:

- **Phone**: Like all other cell phones, the smartphone allows you to make and receive phone calls.
- **Camera**: The smartphone contains a camera, which makes it possible to take and view pictures.
- **Video**: You can use the camera on the smartphone to record videos.
- **GPS**: Smartphones come equipped with a global positioning system (GPS), which makes it possible to track your phone and get directions.
- **Music player**: You can use the speaker on your smartphone to listen to music.

Other examples of technological convergence include high-end luxury cars containing computers and video display for parking, smart televisions that allow you to play games and browse the internet, and smart refrigerators from which you can stream music, create a shopping list, and send messages.
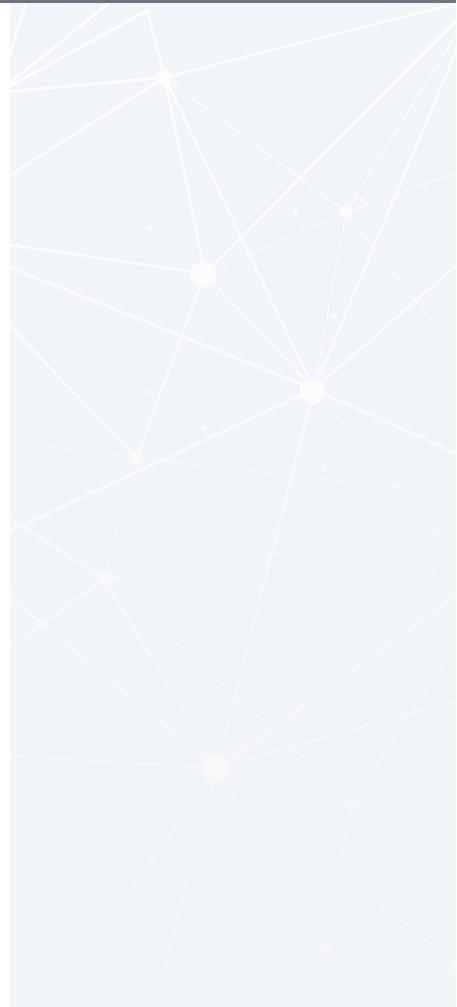
Figure 1.5: *Technological convergence*

Activity 1.3

1. Which ONE of the following devices is NOT an example of convergence?
   a. Phablet
   b. Tablet
   c. Standard computer mouse
   d. Smartphone
2. Explain what you understand about technological convergence and give four examples of it.
3. Explain how the convergence of devices benefits the user.
4. What technologies or components have been integrated into the following devices?
   a. Multi-functional printer
   b. A smart device, other than a television or fridge
   c. Virtual reality
   d. Google glass

1.4 Social implications: Environmental

There is little doubt that computers have had a massive effect on the world as we know it. Thanks to advances in technology, people all over the world have better access to food and water. They are better educated, more social and wealthier than ever before. However, this is not the only effect that computers have on the world around us.

The data centres used to host websites and the internet use more than 3% of all the electricity generated in the world, and this does not even include the electricity used by personal and work computers. Since most electricity is created by burning coal, computers are a large contributor to the greenhouse gases emitted by humans.

Other potential negative effects include the following:
- **Pollution:** The factories that produce the computers contribute to noise, air and water pollution.
- **E-waste:** This type of waste refers to discarded electronic devices that are thrown away and transported to landfills. Most of these devices contain non-biodegradable materials and heavy metals (lead, cadmium and mercury) that are toxic. The toxins can leak into the ground and contaminate the groundwater.
- **Health hazards:** To extract materials, such as copper, silver and gold from old electronic devices, the old devices are burned. This process releases toxic smoke into the air, which, if inhaled, might cause health problems, such as cancer and kidney disease.

THE WAY FORWARD: GREEN COMPUTING

Green computing is the study of designing, manufacturing, using and disposing of hardware, software and networks in a way that reduces their environmental impact. This is normally done by making computers more efficient and making sure that computers are built from biodegradable materials.

Other examples of green computing include the following:
- **Printing:** Using paper and ink in an environmentally friendly way by using recycled paper and printing on both sides of the paper.
- **Saving energy:** Enabling the "Sleep" function on your computer so that it will go into hibernation when your computer is not in use.
- **Disposal:** Properly disposing of and recycling old electronic devices.

Something to know

The Electronic Product Environmental Assessment Tool (EPEAT) is a system that was developed to help evaluate the impact of computer products on the environment. The method uses three classifications – i.e. gold, silver and bronze. These classifications are based on the materials selection, design for product longevity, reuse and recycling, energy conservation and end-of-life management to evaluate products. Companies, such as Dell and Apple, have started producing products with the aim of meeting EPEAT standards.

Activity 1.4

1. Which one of the following is a potential threat to the environment that is caused by the widespread use of technology?
   a. Increased power consumption
   b. A paperless office
   c. Refilling ink cartridges
   d. Repetitive strain injuries
2. What is meant by the term "e-waste"?
3. What other ways are there to save energy when you use your computer? List at least two.
4. Does the selection of the type of printer also have an impact on green computing? Explain your answer.
5. Do you think that green computing will have any effect on environmental problems? Give reasons for your answer.

PART 1: MULTIPLE CHOICE

1.1 Which of the following devices is NOT an example of a dedicated device? (1)
    A. Telephone
    B. Barcode scanner
    C. DVD player
    D. Microphone

1.2 Which of the following computers has the most processing power? (1)
    A. Workstation
    B. Desktop PC
    C. Server
    D. Smartphone

1.3 Which of the following computers is portable? (1)
    A. Mainframe computer
    B. Supercomputer
    C. Desktop PC
    D. Laptop

1.4 Which step in the information-processing cycle uses the computer's CPU? (1)
    A. Input
    B. Output
    C. Processing
    D. Storage

1.5 Which of the following devices uses convergence? (1)
    A. Smartphone
    B. Television
    C. Kettle
    D. Digital camera

        [5]

PART 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Correct the statement if it is false. Change the underlined word(s) to make the statement true.

2.1 A compact computer with a complete system is known as a <u>supercomputer</u>. (1)
2.2 Social networks have helped us to connect people to each other and have, therefore, <u>increased</u> the distance between people. (1)
2.3 <u>Wikis</u> allow us to share our daily experiences with our friends. (1)
2.4 An example of a <u>microcomputer</u> is a laptop. (1)
2.5 People can share their knowledge of the world on <u>social media</u>. (1)
        [5]

… continued

PART 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A.

COLUMN A	COLUMN B
3.1 Lowering the brightness of your computer's display screen	**A.** Greenhouse gas
3.2 Discarded electronic devices that are thrown away and transported to landfills	**B.** E-waste **C.** Wikis **D.** Convergence
3.3 Properly removing and recycling your old electronic devices	**E.** Disposal **F.** Blog **G.** Printing
3.4 Facts and numbers that have been organised in a way that people understand	**H.** Knowledge
3.5 A platform where people can share their personal information with others	

[5]

PART 4: SHORT AND MEDIUM QUESTIONS

4.1 How would you use a computer at each stage of the information processing cycle? (4)

4.2 How do you properly dispose of your old electronic devices? (2)

4.3 Describe what convergence is. (2)

4.4 As technology has evolved, computers have changed and, in some cases, improved our lives and ways of living.

    a. List five reasons as to why people use computers. (5)

    b. List five computing devices you use in your daily life and mention ONE way each of these devices has made your life easier. (10)

[23]

TOTAL: [38]

AT THE END OF THE CHAPTER

NO.	CAN YOU …	YES	NO
1.	Describe the various reasons for using computers?		
2.	Describe the role and use of data, information, knowledge and wisdom as part of information management?		
3.	Explain convergence?		
4.	Explain the social implications of computer technology on the environment?		

HARDWARE

CHAPTER OVERVIEW	
Unit 2.1	Buying the correct hardware
Unit 2.2	Input devices
Unit 2.3	Storage devices
Unit 2.4	Processing devices
Unit 2.5	Output and communication devices
Unit 2.6	Troubleshooting
Unit 2.7	New technologies
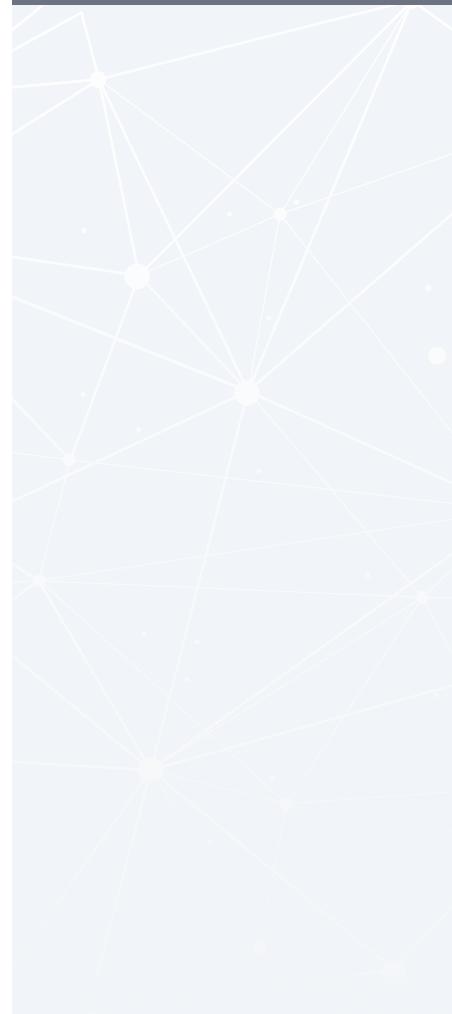
By the end of this chapter, you will be able to:

- Evaluate hardware devices.
- Suggest input, output, storage and communication devices, as well as CPU and RAM; including specifying basic specifications in terms of processor, memory and storage for:
  - home users
  - SOHO users
  - mobile users
  - power users
  - disabled users.
- Fix ordinary hardware problems.

INTRODUCTION

Computers and technology have come a very long way since the first computers were used to make advancements in space travel and landing on the moon. They no longer take up entire buildings and cost millions of Rands. Users do not special training either!

SUMMARY OF HARDWARE

The following table summarises the computer components you learned about in Grades 10 and 11, as well as their main functions.

Table 2.1: *Hardware and their purposes*

COMPONENT	TYPES	PURPOSE
INPUT DEVICES		
Keyboard	• Standard keyboard • Laptop keyboard • Gaming keyboard • Virtual keyboard	Enters information, such as letters, words, numbers and symbols into the computer
Pointing device	• Mouse • Touchpad • Touch screen • Trackball • Pen input devices • Joystick	Controls the movement of the cursor on the screen
Scanning and reading devices	• Scanners • Reading devices, such as RFID, QR, OCR and magnetic strip readers	Scans documents, such as photographs and pages of text, and converts them into a digital format – i.e. reading devices to read text, symbols, QR codes and magnetic strips
Video devices	• Video camera • Webcam • Digital camera	Captures media, such as pictures, videos and sound
Audio devices	• Microphones • Voice-recognition device	Communicates with your computer using your voice
Biometric devices	• Fingerprint scanner • Eye and iris scanners • Facial recognition	Measures a person's unique physical characteristics
Point-of-sale (POS) terminals and ATMs		Mainly in the retail and restaurant industry to keep an accurate track of stock and orders; ATMs are used exclusively in the banking industry
PROCESSING DEVICES		
Motherboard		Connects all the components of the computer
CPU		Completes the general processing tasks of the computer
GPU		Completes the graphics processing tasks of the computer
RAM		Very high-speed storage that temporarily stores data that the CPU uses
Read-only memory (ROM)		Non-volatile memory – i.e. when a computer starts up, it uses the information that is stored on the ROM to start up

… continued

COMPONENT	TYPES	PURPOSE
STORAGE DEVICES		
Hard-disk drive (HDD)	• Internal hard drive • External hard drive	Slow, long-term storage of data used on the computer
Solid-state drive (SSD)		Fast, long-term storage of data used on the computer
Flash disk		Very small, non-volatile and portable devices that connect to a computer using a USB port
Memory cards		Non-volatile storage devices used mainly for storing digital information
CD, DVD and Blu-ray disks		Portable storage devices to which data files from a computer can be copied, using the correct CD, DVD, or Blu-ray writer
OUTPUT DEVICES		
Display devices	• LCD monitors • Television monitor • Data projector/ DLP device	Displays the images generated by the computer
Printer	• Inkjet printer • Laser printer • Multi-function device • Ink tank printer	Generally used to convert electronic data into a hardcopy
Audio output devices	Headsets and speakers	Audio output devices convert data on a computer into sound
COMMUNICATION DEVICES		
Router		Organises and routes data on and between networks, which may include routing data from a home network to the internet (such as a modem) and connecting many computers to the same network (such as a switch)
Modems		Connects computers to a network and the internet
Switch		Connects many computers on the same internal network

👤 **Activity 2.1**

1. Write down the correct answer for each of the following questions.
    a. Which one of the following is a technology that is commonly used to connect a variety of different devices to a computer?
        A. OMR **B.** LCD
        C. USB **D.** SSD
    b. The _____ retains the data stored on it even if the power goes off.
        A. AM **B.** HDD
        C. LED **D.** CPU

Activity 2.1

c. Which hardware device can create electronic copies of documents by capturing an image?
   A. Printer
   B. Scanner
   C. Stylus
   D. Monitor

d. A(n) _____ is NOT an example of optical storage.
   A. CD
   B. DVD
   C. HDD
   D. Blu-ray disk

e. While editing videos on a mobile device, most of the battery life will be used by the _____.
   A. Microphone
   B. CPU
   C. Screen
   D. Speaker

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 A storage device used with a card reader	A. Keyboard
2.2 A camera that captures media, such as pictures and videos mostly on a laptop	B. Flash disk
2.3 Enters information, such as letters and numbers into a computer	C. Printer
2.4 Converts electronic data into a hardcopy	D. Fax machine
2.5 A commonly used portable storage device	E. SD card
	F. Webcam
	G. Scanner

3. Correct the underlined word(s) if the statement is FALSE.
   a. A scanner captures media, such as pictures, videos and sound.
   b. A fingerprint scanner scans documents, such as photographs and pages of text, and converts them into a digital format.
   c. A monitor displays or sends data from a computerised device to other users.
   d. Speakers convert data on a computer to sound.

4. Answer the following questions:
   a. What is hardware? Name at least three different types of hardware devices.
   b. What are the two memory components on a motherboard (state their acronyms) and what is the difference between the two?
   c. What is the difference between a modem, router and a switch?

2.1   Buying the correct hardware

When you want to buy a new computer, the most important thing to consider is *how* you will be using the computer. Each computer has different specifications, advantages and limitations, which are linked to each of the components that you will use. A person who uses a computer exclusively for games will have different requirements to a person who needs a computer to browse the internet and do word processing.

To make it easier for you to decide on which components will work for you, we will be taking a look throughout this chapter at some of the things that you have to take into consideration before your next computer purchase.

COMPUTER USERS

People use computers for many different purposes. In this section, we will look at some of the different computer users, by focusing on the following:
- Home users
- SOHO (small office or home office) users
- Mobile users
- Power users
- Disabled users

For each user, you will learn to identify what they are most likely to use the computer for, what components are important for their use and why certain components should be selected.
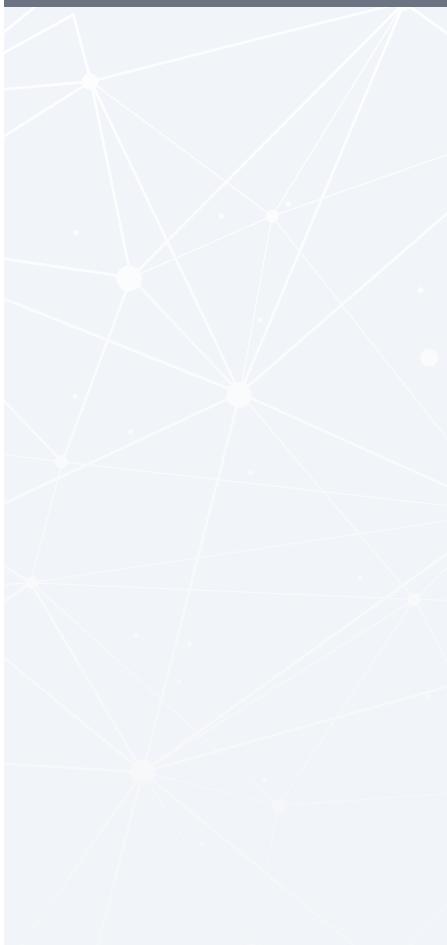
HOME USERS

As the name suggests, a home user is someone who buys a computer for personal use at home. He or she would usually use the computer to:
- browse the internet;
- post on social networks;
- send emails;
- do word-processing tasks;
- watch online and local videos; and
- listen to music.

However, categorising someone as an "average" home user has become a lot harder than it used to be. A study done in 2017 found that there were 2.2 billion gamers in the world, which is roughly 30% of the world's population. A separate study found that almost 50% of Germans played video games and the average age of gamers in Germany was 35 years old. Many home users also use their computers to do work from home, which makes the distinction between home users and office users, smaller.

Finally, most home-user computers are used by more than one person. This could mean that the children would prefer a gaming computer and the parents would prefer a work or home computer. Due to these complications, a computer that can only do basic tasks, such as browse the internet, or use a word processor, will not work for many households. Instead, households need a flexible computer that can meet the requirements of more than one user.

As a starting point, you can consider a desktop computer with a mid-range CPU and graphics card (for gaming). Most households will also benefit from having a small printer.

If there is only one user in the household and he or she plans to use the computer only for basic tasks, the user should then consider buying a mid-range notebook. Notebooks are more flexible; they can be used in different places in the home and are portable. While budget notebooks (under R5 000) exist, they should be avoided, because they will be slow and uncomfortable to use, even for basic tasks.

SOHO USERS

Small office or home office (SOHO) users use a variety of hardware and devices for their business activities. They may use computers for the following:

- Online research
- Sending emails and business communication
- Using word-processing and spreadsheet applications
- Note-taking
- Printing documents

Although none of these tasks require a very powerful computer, there are four factors that are particularly important to business users:

1. **Mobility** makes it possible to carry the computer around, for example when attending meetings.
2. **Battery life** determines for how long they can use their computers without access to a power source.
3. **Screen** resolution determines how much information they can view on a screen at a time and also affects the quality of the display.
4. **Speed** is an important factor to ensure good productivity.

Based on these requirements, an **ultrabook** is the ideal computer for most business users. Ultrabooks are small and very powerful notebooks with long battery lives. They are easy to carry around and powerful enough to run any business application without slowing it down. Unfortunately, Ultrabooks are very expensive and can cost anywhere between R15 000 and R30 000. As a compromise, most business users would be happy with a mid-range notebook, with emphasis on the factors mentioned above. Even though notebooks have a built-in monitor, mouse and keyboard, purchasing a large, stand-alone monitor with a more comfortable mouse and keyboard is a good investment for many business users and can help to improve productivity.

MOBILE USERS

Mobile users are people who travel a lot. These users require devices that are easy to use and easy to transport. Because of this, mobile users should look at mobile computing devices – such as, tablets, laptops and smartphones.

Mobile users require the following:

- **Mobility**, which allows them to take their devices with them wherever they go.
- **Battery life**, which allows them to use their devices for extended periods without access to a power source.
- At least a **3G connection** to access the internet on the mobile device.

Figure 2.1: *Young millennials using mobile devices*

POWER USERS

Power users need a computer with high processing capacity. They may need the capacity for work-related tasks, such as graphic design, or for personal activities, such as playing games that require high-definition graphics. A power user should buy a computer with a large amount of storage space, enough RAM and a high-end CPU.

Figure 2.2: *Power users often use more than one monitor for their work*

In most cases, power users use computers very similar to those used by gamers, although some power users who travel a lot prefer ultrabooks.
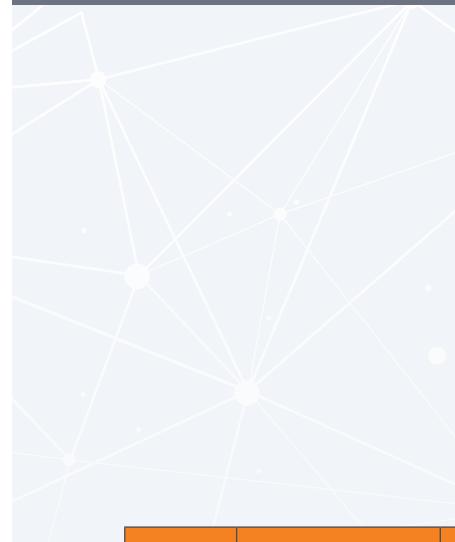
DISABLED USERS

The advances in modern technology have enabled people with disabilities to not only use computers, but to also use computers to make their daily lives easier. The type of computer and its requirements will depend largely on the type of disability and the needs of the user. It is, therefore, important to research the issue before buying a computer for a disabled user.

> **Something to know**
>
> An example of how computers have made people's lives easier is to look at the late physicist, Stephen Hawking. Professor Hawking was a world-renowned, award-winning scientist who suffered from a motor-neuron disease that left him unable to walk and talk. However, thanks to computer technology, he was able to communicate with others and continue to do his ground-breaking research.

BUYING RECOMMENDATIONS

With all of this in mind, we can see that each computer user is unique and has different computer needs. As such, they will require different computer hardware.

The following table lists some recommendations for computer hardware, based on the type of user.

Table 2.2: *Recommendations for computer hardware based on the type of user*

USER	INPUT	OUTPUT	STORAGE	COMMUNICATION DEVICE	CPU	RAM (GB)
Home	• Keyboard • Mouse	• Screen • Speakers • Printer	• Hard drive • CD/DVD drive	• Network card • Router	Entry level CPU	4–8
SOHO	• Keyboard • Mouse • Webcam • Microphone • Scanner	• Screen • Speakers • Printer • Multi function printers	• Hard drive • CD/DVD drive • External hard drive • Flash disk	• Network card • Router • Switch	• Mid-range CPU • Mid-range GPU	4–8
Mobile	• Keyboard • Mouse • Touchpad • Touch screen	• Screen • Speakers	• Hard drive • External hard drive • Flash disk • Memory card	• Wi-Fi card • 3G connection	• Mid-range CPU • Mid-range GPU • (depending on the device)	2–8 (depending on the device)
Power	• Keyboard • Mouse • Joystick • Microphone • Webcam • Scanner	• High-definition screen • Speakers • Headset	• Hard drive • SSD • CD/DVD drive • Flash disk	• Network card • Router	• Top-of-the line CPU • Top-of-the line GPU	8–16
Disabled	• Special design keyboard • Special design mouse • Joystick • Trackball • Eye typer	• Large screen • Speakers • Printer • Specially designed ○ Printer ○ Scanner	• Hard drive • CD/DVD drive	• Network card • Router • Specialised software	• Entry-level to top range CPU (depending on the condition) • Entry-level top range GPU (depending on the condition)	4–16 (depending on the condition)

In the chapters that follow, we will study the different devices in some more detail.

PRODUCTIVITY, EFFICIENCY, ACCURACY AND ACCESSIBILITY ISSUES

Computers are one of the greatest technological advances of the modern era. They bring a variety of advantages, such as helping to improve productivity and efficiency by enabling the completion of difficult and time-consuming tasks in a fraction of the time it would take a human to complete. An example of this can be seen when looking at a factory that produces

cars. It could take anything from two months to two years for a person to assemble a complete car. This same task can be completed within 8 hours by simply using a computer.

Computers can be programmed to perform a task in a very specific way. This not only ensures that the task is completed in the quickest way possible, but also that the task is completed as accurately as possible. Another example of computers helping with accuracy can be seen when looking at a database. The computer program allows you to use formulas and functions to do calculations. If you would have to complete these calculations on your own, it would take a significant amount of time and you could run the risk of making mistakes.
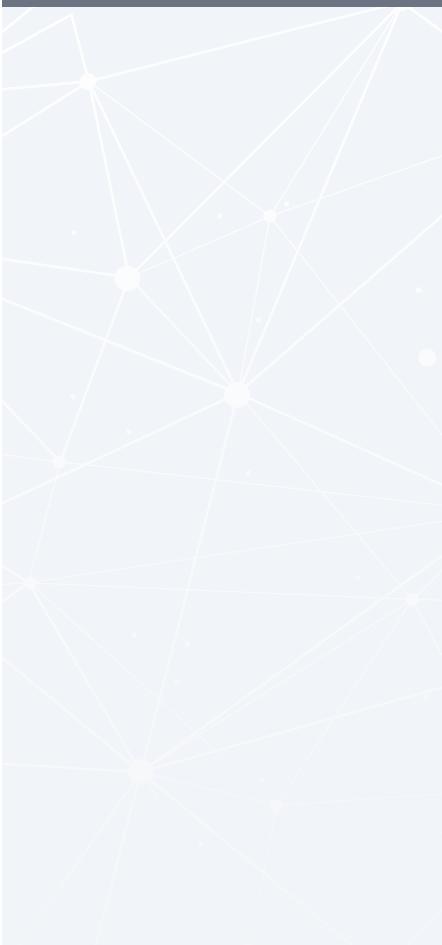
The last advantage of computers that we will be looking at is the increase in accessibility. In the past, people with disabilities were limited in the way that they could communicate and complete tasks. Fortunately, computers offer solutions to these problems. Computers not only allow disabled users to communicate with others (through the use of special input devices); they also enable them to perform basic functions, such as driving a car.

Activity 2.2

1. Write down the correct answer for each of the following questions.
   a. Which one of the following is the abbreviation for the largest unit used to measure storage?
      A. Gb
      B. Kb
      C. Mb
      D. Tb
   b. For which type of user is the following list of components intended: Core 2 Duo processor, 4 Gb memory, 500 Gb hard drive and a DVD reader?
      A. Power
      B. SOHO
      C. Home
      D. Disabled
   c. An ultrabook is a preference for which travelling users?
      A. Power
      B. SOHO
      C. Home
      D. Disabled
   d. Mobile users require a device that has which of the following features?
      A. A large amount of processing power
      B. A large amount of storage space
      C. A long battery life
      D. A high-definition display
   e. Which of the following is NOT an example of a computer user?
      A. Entitled
      B. Home
      C. Disabled
      D. Mobile

Activity 2.2

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 User type most likely to use an SSD	A. Mobility/3G connection
2.2 A computer with the lowest hardware specifications and is the most affordable in its category	B. Mobile user
2.3 Users most likely to use a computer with the lowest hardware specifications and one that is most affordable in its category	C. Gamer
2.4 The amount of these user types is constantly increasing	D. Power user
2.5 What mobile users require	E. SOHO user
	F. Entry level
	G. Exit level
	H. Home user

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
   a. The type of user that uses the most graphic processing power is a <u>home</u> user.
   b. Stephen Hawking was a <u>power</u> user.
   c. <u>Screen resolution</u> determines how much information you can view on a screen at a time.
4. Answer the following questions:
   a. What are the different types of users? Give an example of a hardware component that is most important to each type of user.
   b. What does the acronym SOHO stand for?
   c. Which type of user uses the most processing power?
   d. What is the difference between a SOHO user and a home user?
5. The following specifications appeared in an advertisement for a notebook computer. Study the specifications and answer the questions that follow.

> Operating system – Windows 8
>
> Processor – Intel 100 0M Celeron 1.8 GHz
>
> Display – 15.6" (1 366 × 768), 16:9
>
> Video graphics – Integrated Intel HD Graphics 4000
>
> Memory – 4 Gb DDR3, 1 600 MHz memory
>
> Hard disk – 160 Gb, 5 400 rpm
>
> Optical drive – Integrated DVD reader
>
> Sound – Integrated stereo speakers (2 × 1.5 W)
>
> Integrated communications – 802.11n Wi-Fi, 10/100M LAN
>
> Camera – 8 Mp webcam
>
> 1 × HDMI
>
> 1 × 12-in-1 card reader

   a. Would this computer be suitable for a power user, such as a video-editing professional? Substantiate your answer by giving two reasons to support your answer.
   b. Give two reasons as to why a notebook computer would be more suitable than a desktop computer for learners in a school.

To enable you to determine which hardware component suits your needs the best, we will focus on the main input, output, storage and processing devices; with special consideration of their uses, advantages and limitations, as well as other relevant characteristics.

To use your computer or cell phone, you will need an input device. An input device is a piece of hardware that enables a user to enter data into a computer, or interact with a computer. These devices allow you to interact directly with your computer (for example, a keyboard and mouse) and devices where the data is saved or transmitted to your computer (for example, scanners and cameras).

In the following sections, we will look at the keyboard and mouse, their advantages and limitations, as well as the risks associated with the devices. We will also give some advice on how to identify which device is best suited to your needs.

KEYBOARD

The keyboard is the most common and important input device for desktop computers. It consists of various keys that the user presses to give commands or type letters.

ADVANTAGES AND LIMITATIONS OF KEYBOARDS

Most modern computers come with a standard QWERTY keyboard. These keyboards have certain advantages and limitations, as described in the following table.

Table 2.3: *Advantages and limitations of keyboards*

ADVANTAGES	LIMITATIONS
Enables the user to enter information in an easy manner (very little training is needed)	Disabled users might find it difficult to enter information using a keyboard
Serves as a fast method in which to enter data	It is easy to make mistakes while typing in data
Keys can be programmed to serve a specific function	To program the keys of a keyboard for specific functions, it requires a specialised keyboard and knowledge on how to do it
Hotkeys can be used to increase the speed and efficiency of various tasks	The user needs to learn what the hotkeys are and how to use them

ERGONOMIC CONSIDERATIONS
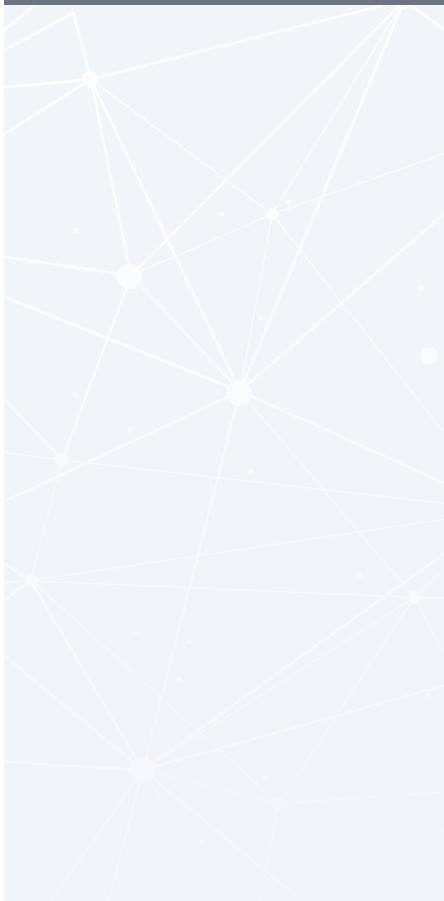
Any person who has worked with a computer for an extended period will know that most computer tasks require a keyboard and a mouse. It is, therefore, important to make sure that your keyboard and mouse are comfortable to use. Here are some factors to take into consideration regarding the ergonomic use of a keyboard:

- Make sure that your keyboard is at the correct height, just above the level of your lap. Your arms should be tilting downward when typing. In many cases, this may mean that you should get an adjustable keyboard tray so that your keyboard can be tilted down and away from you.

Something to know

Never use the kickstands underneath most keyboards.

- Keep your wrists in the neutral (straight) position. If you have to bend your wrist up and down the whole time, it compresses structures in your wrists, and causes pain and injuries, such as carpal tunnel syndrome and tendonitis.
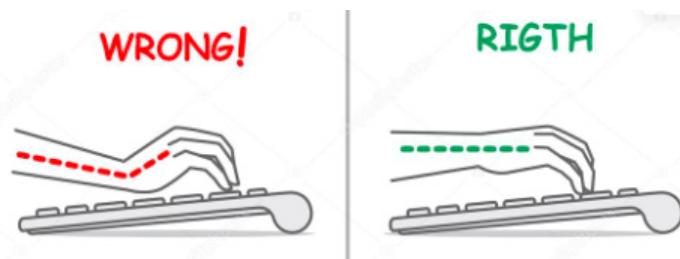
Figure 2.3: *Your wrist must be in a straight position, parallel to the desk*

- Adjust the height of your chair to make sure that your elbows are at a 90-degree angle, or more. Elbows that are bent at less than 90 degrees can cause arm and wrist pain.
- Keep your shoulders relaxed and your elbows at your side. This means that your shoulders should not be raised and your arms should be roughly parallel to the floor.
- Keep a light touch on your keys when typing, as the tendons in your fingers are connected near your elbow. Hitting the keys too hard may cause inflammation of the elbows.
- Align your body to the keyboard, depending on whether you use the letters or the numbers the most. If you use the letters the most, centre the keyboard so that the letter B is about in line with your belly button. However, if you use your **numeric** keypad (or numpad) the most, move the keyboard more to the left.
- Use keyboard shortcuts or macros for common, repetitive tasks to prevent overusing your hands and wrists.
- Buy an ergonomic keyboard if you already suffer from hand, wrist, arm or shoulder pains.

Figure 2.4: *An ergonomic keyboard*

MOUSE

The second most common input device to use with a computer is the mouse. A mouse is a pointing device. It allows the user to move the cursor on the computer screen, as well as point, click and select various programs and items. Although the *Oxford Dictionary* uses both "computer mice" and "computer mouses" as the correct plural forms of the term, we will be using the plural form "mice".

ADVANTAGES AND LIMITATIONS OF THE COMPUTER MOUSE

There are very few computer applications that do not require a mouse to work. As such, computers are generally sold with a mouse and a keyboard. It is, therefore, important to take a look at the advantages and limitations of the computer mouse.

Table 2.4: *Advantages and limitations of computer mice*

ADVANTAGES	LIMITATIONS
Easy to use and ideal for desktop and laptop computers	The mouse requires a flat space close to the computer in order to operate
A standard optical mouse is not very expensive	Uneven surfaces might affect the performance of the mouse
They are small and do not take much space	Disabled users might find it difficult to use both a keyboard and mouse
Enables the user to move the cursor and select options faster than using the keyboard	

ERGONOMIC CONSIDERATIONS
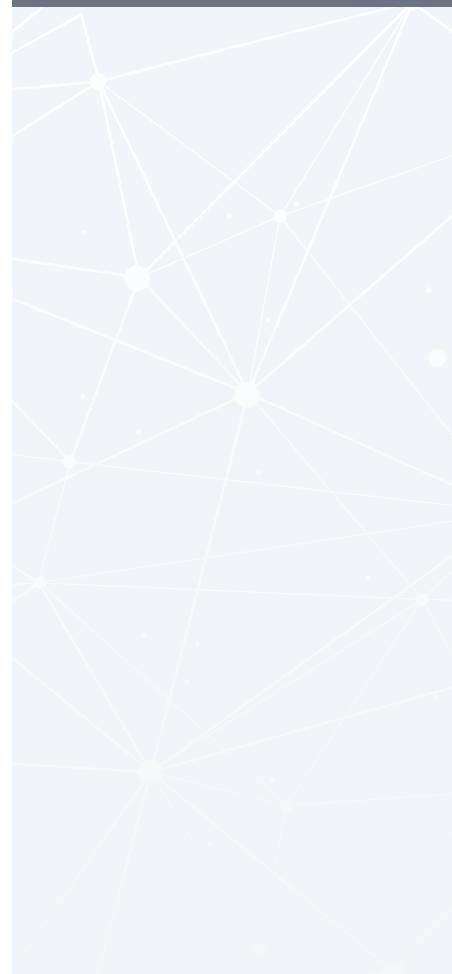
There are various health issues that can be caused by using a computer mouse, such as sore wrists, aching elbows and shoulders; all of which cause headaches. It is important to make sure that your mouse is correctly positioned and that you use it in the correct way.

Let's look at the following tips on how to use a mouse ergonomically:
- Computer mice come in different sizes and shapes; therefore, make sure that the mouse fits comfortably in your hand and is easy to use. Rather use a symmetrical shaped mouse than a curved one.
- Do not grip the mouse hard. Hold it loosely.
- Make sure that you are holding your mouse correctly – i.e. rest your hand over the mouse and place your index finger on the left button of the mouse. You can rest your thumb and pinkie on the sides of the mouse.
- Keep your mouse at the correct height and distance from your body, close to the keyboard.
- Make sure that your elbow is bent and close to your body.
- Use your whole forearm, not only your hand, to move the mouse. If you move only your hand, it will put strain on your wrist.
- Keep your wrist straight. This will prevent your wrist from bending in an unnatural position.
- Do not use a wrist rest, as that doubles the pressure inside the carpal tunnel.
- Do not click too hard; rather use a soft touch to manipulate the mouse.
- Adjust the speed at which your mouse moves, the time required between double-clicks, and the size of the cursor if you have problems controlling the mouse.

TOUCH SCREEN

Unlike the keyboard and mouse, the touch screen serves a dual role as both an input and an output device. The touch screen allows the user to use his or her fingers, or a **stylus**, to directly press buttons and select options that appear on the screen.

The most common example of a touch screen can be seen when looking at any of today's smartphones. From Apple to LG, each smartphone uses a touch screen to enable the user to easily navigate and use the various functions of the phone.

ADVANTAGES AND LIMITATIONS OF TOUCH SCREENS

While most modern smartphones rely exclusively on touch screens, there are also many notebooks and tablets that have touch screens.

Table 2.5: *Advantages and limitations of touch screens*

ADVANTAGES	LIMITATIONS
Options can be selected faster than would be possible with a keyboard and mouse	There are a limited number of options available when using a touch screen
The method of inputting data is very user friendly	It is not suited for entering large amounts of data
A touch screen allows for more space as a keyboard and mouse is not required	The screen can get damaged and dirty due to constant touching
The screen interface can be changed by updating the software	Touch screens for computers are more expensive than standard computer screens

TOUCHPAD

The touchpad is a small square or rectangular input device on a laptop. It has the same function as a mouse. You use it by moving your finger across the pad to move the cursor on the screen. Like the standard computer mouse, the touchpad also has two buttons. The left button is used to select objects and the right button is used to bring up a menu. It also has a function that allows the user to scroll up and down a page.

Figure 2.5: *An example of a laptop touchpad*

ADVANTAGES AND LIMITATIONS OF A TOUCHPAD

While touchpads are not an efficient way to move the mouse cursor, they make it possible to use notebooks without having to use any additional devices.

Table 2.6: *Advantages and limitations of touchpads*

ADVANTAGES	LIMITATIONS
Saves space in your laptop bag as you do not need to carry an additional mouse	People with hand or wrist injuries might find it difficult to use the touchpad
Usable when there is no flat surface for a mouse	Harder to control the pointer than with a mouse
Faster to select an option than using a keyboard	More difficult to do actions, such as drag and drop

DIGITAL CAMERAS

A digital camera is used to capture photographs and store them on a digital memory card instead of on film. Once the image is stored, you can transfer it to your computer. You can then manipulate (edit) the image, and print it or upload it to the internet. Some digital cameras can record video images with sound. An example of this is the camera in your smartphone.

ADVANTAGES AND LIMITATIONS OF DIGITAL CAMERAS

Digital cameras have a number of advantages over the older film-based cameras. The biggest advantage is that you can preview the photo you take and delete the ones you do not want to keep.

Table 2.7: *Advantages and limitations of digital cameras*

ADVANTAGES	LIMITATIONS
Easy to use and fast to upload your photos to the computer	Requires the user to be computer literate to make full use of the camera
There is no film that needs to be developed	With some cheaper digital cameras, the resolution might be slightly worse than pictures taken with a traditional camera
Easy to delete pictures that you do not like	Images might need to be compressed to reduce the amount of memory used, which reduces the picture quality
Several hundred images can be stored digitally	Due to being easy to use, the user might take several photos of one object leading to the memory being filled up quickly

RESOLUTION AND IMAGE QUALITY

As you have learned in Grade 11, resolution refers to the amount of detail that a camera can capture. The resolution is measured in megapixels. Generally, the higher the resolution, the clearer the photograph or video will be. A lower pixel count means that you can see the sharp edges of each pixel, which makes the image blurry (or pixelated).

Something to know

Digital cameras come packaged with software that allows you to edit photos by adjusting contrast and sharpness. The software can also be used to create and print photo albums. An example of digital camera software includes Digital Photo Professional and ZoomBrowser.

Something to know

It is important to remember that the more expensive digital cameras produce images with a high resolution and excellent quality.

Figure 2.6: *A very blurry and pixelated photo of a dog*

One of the biggest advantages of a digital camera is that it provides the user with a choice of camera resolution and image quality. Although the average user will most likely want to take pictures using the high-resolution setting, you should know that there are some advantages to taking lower-resolution pictures.

Figure 2.7: *A high-resolution photo of an owl*

Images with a lower resolution have a smaller file size and take up less space on a storage device. This saves time when you transfer images. It also saves money, as you can use devices with a smaller storage capacity. On the other hand, high-resolution photos have better image quality, allowing the user to crop the image as much as needed with little or no loss of quality.

WEBCAMS

A webcam is a type of digital camera that is connected directly to your computer. It makes it possible for the user to stream live videos to, or through the computer. The camera consists of a lens, image sensor and support electronics. Some webcams include a microphone, allowing you to record sound; others need a separate microphone. Laptops and notebooks have a built-in webcam and in most cases, a built-in microphone as well.

Once a video image is recorded on your computer, you can either save it on the same computer, or upload it to the internet (for example, to YouTube).

Figure 2.8: *An example of a webcam on a laptop*

ADVANTAGES AND LIMITATIONS OF WEBCAMS

Webcams serve a variety of the following important functions in today's society:
- They make it possible for a user to make and upload videos to YouTube and other social networks.
- They make it possible to have a face-to-face conversation with somebody who is far away. This feature is very helpful for business people, as they can have meetings with a group of people who are in different parts of the world. This is known as video conferencing.
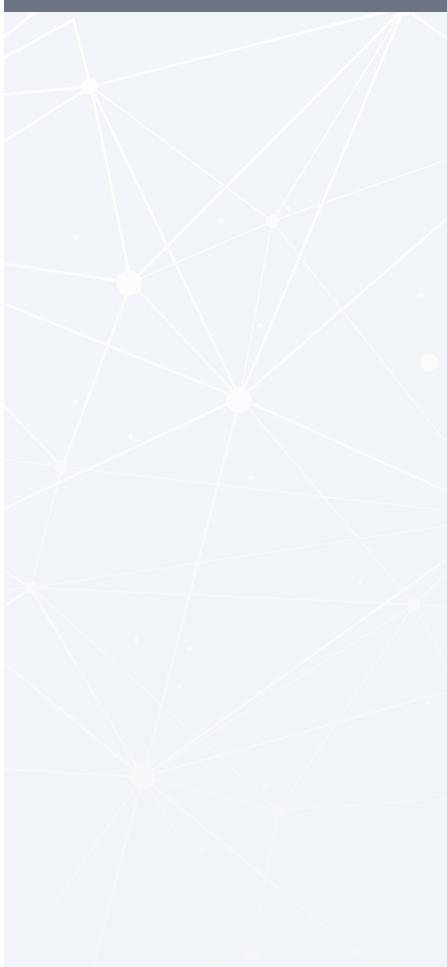
Table 2.8: *Advantages and limitations of webcams*

ADVANTAGES	LIMITATIONS
The camera can be left on constantly and activated when the user requires it	Most webcams produce poor-quality videos
Allows people to have face-to-face conversations without the need to travel	The webcam needs to be connected to the computer
Can take pictures without the need of film	Feed when video chatting can be choppy or pixelated
Low cost and high convenience	Webcam-based calls run a greater risk of technological failure due to dropped connections or incompatibility
Compatible with various platforms, such as Windows, Mac, Linux and even some gaming systems, such as Sony PlayStation	Hackers can activate your webcam and watch you without you even knowing it; security information can also be stolen

MICROPHONES

A microphone is an input device that makes it possible for the user to record sound, which is then stored on your computer. A variety of sounds can be recorded; including music, ambient sounds and your own voice.

You can use a microphone with a digital camera or webcam to make videos, to have a face-to-face meeting, or to have a discussion over a chat program, such as Skype.

ADVANTAGES AND LIMITATIONS OF MICROPHONES

While most notebooks and webcams have small built-in microphones, you should buy a specialised microphone if you plan to use your computer to communicate with your voice.

Table 2.9: *Advantages and limitations of microphones*

ADVANTAGES	LIMITATIONS
Makes it possible to communicate with other users over the internet in a fast and efficient manner	Requires an internet connection to communicate with other users
Sound can be manipulated with special software	Sound files can take up a lot of storage space on your computer
Makes it possible to use voice-activation software	Voice-activation software might not always be as accurate as typing on a keyboard

VOICE RECOGNITION

Voice-recognition (or voice-activation) software enables the computer to take verbal commands given by the user, and translate and interpret them. It does this by converting the audio received from the microphone to digital signals that the computer can interpret. The signals are then compared to a database containing words, phrases and actions that should be performed.

Over the last few years, voice recognition has become more common and part of our everyday lives. This can be seen by looking at the artificial assistants that can be found in your smartphone. Apple's *Siri* and Android's *Bixby* both work with voice recognition.

VOICE RECOGNITION FOR MARKETING
In 2017, Burger King in the USA made headlines when it began running a 15-second advertisement on television that specifically targeted Google home speakers and Android phones within earshot. The advertisement consisted of a Burger King employee looking directly into the camera, asking the question "OK Google, what is the Whopper burger?" This prompted nearby virtual assistants to start reading the burger's Wikipedia entry.
However, Google quickly managed to prevent its home speakers to respond to the advertisement by registering the sound clip and then disabling the trigger. Although voices on the television have been found to trigger smart speakers, this advertisement was the first attempt by a company to purposefully hijack users' devices for commercial gain.
Discuss the following questions in class: 1. Have you ever had your device's information "hijacked" for commercial gain? If not, do you know anyone else to whom this has happened? 2. What do you think are the main disadvantages and problems that can be caused by voice-recognition software? 3. What are the advantages? See if you can come up with other examples where voice-recognition software is used to make life easier.

Table 2.10: *Advantages and limitations of voice-recognition software*

ADVANTAGES	LIMITATIONS
Can learn to recognise your own unique speech pattern	Speech must be clear and distinct
Works well for people with physical disabilities	Some versions might require training and setup
Should catch most of the spelling and grammar mistakes	Background noise can influence performance
Can capture speech much faster than the average person can type	Alterations to your voice, such as a cold, might cause problems when using the software
Can be used for specialised voice commands	Programs do not understand the context of language the way humans do, which may lead to misinterpretation

SCANNERS

A scanner is an input device that works a lot like a photocopy machine. However, unlike a photocopy machine, a scanner does not produce a printed copy of the scanned document; it produces a digital copy that you can save on your computer. When the document is in digital format, it can be edited and manipulated before you print it. Examples of scanners include the traditional flatbed scanner, as well as the more modern mouse scanner. The mouse scanner looks almost identical to a traditional computer mouse, but has the advantage that it allows the user to have a scanner at hand when needed. When the scanner is not needed, the mouse scanner can be used as a traditional computer mouse.

Something to know

Scanners are often packaged with optical character recognition (OCR) software, which converts the text on the scanned document, called a portable document format (PDF), to text that can be used in a word-processing application. This makes it possible for the user to edit a scanned document.

It should be noted that the effectiveness of OCR depends on the quality of the scanned document. Poor-quality scans will make it difficult for the software to function properly.

Figure 2.9: *An example of a flatbed scanner*

ADVANTAGES AND LIMITATIONS OF SCANNERS

Scanners are an important part of any office and can also be very useful for private use.

Table 2.11: *Advantages and limitations of scanners*

ADVANTAGES	LIMITATIONS
Images and documents can be stored and printed later	The quality of the scanned document is limited by the resolution of the scanner, as well as the quality of the original document
Makes it possible for the user to edit stored documents	Unable to scan 3D objects
Document quality might be improved by using special editing software	Prone to wear and tear and, therefore, prone to technical difficulties

WIRELESS VERSUS CABLED DEVICES

Over the last 50 years, we have seen many advances in technology. Computers have gone from machines that take up whole rooms, to something the average person can afford and keep on their desk, or even in their pocket. Another advancement was made in the field of wireless technology.

Wireless devices, such as keyboards and mice, are similar to the standard wired versions. However, there are some factors to consider before you decide which type will work best for you.

Table 2.12: *Advantages and limitations of wired input devices*

ADVANTAGES	LIMITATIONS
Usually cheaper than wireless devices	Wires take up space and might get tangled
Requires no batteries to operate	Wires are not aesthetically pleasing to look at
Little to no delay in communication between the input device and the computer	The device is less portable

Wireless keyboards and mice use a receiver that is plugged into the USB slot on a computer. The input device then communicates with the computer, using a wireless transfer of data.

Table 2.13: *Advantages and limitations of wireless input devices*

ADVANTAGES	LIMITATIONS
Saves space as there are no wires	Battery life might be an issue causing the device to stop working
Aesthetically better than wired input devices	Potential interference of other Wi-Fi signals might cause a decrease in performance
Allows flexibility of use as you can use the device at a distance	There might be some security issues as it is easier to keylog a wireless device

Something to know

Wired input devices are connected via a wire to the computer, allowing information to travel between the two devices.

From these two tables, you can see that both wireless and wired devices are similar, with only a few minor differences. The decision of which to buy ultimately comes down to your own choice and circumstance. If you have limited space or need to be able to work from across the room, wireless will be better. If you are on a budget or want to play games, wired will be better.

RISKS ASSOCIATED WITH INPUT DEVICES

The main function of any input device is allowing the user to interact with the computer. Due to this and the fact that most users spend a large amount of time using many of the devices, it is important to note that there are certain risks that you should be aware of. These risks include the following:

- **Keystroke logging:** This is a method used by hackers to record your keystrokes on the computer. The keystrokes can be used to identify personal information, such as bank details and passwords. Keystroke logging, also known as keylogging, is normally done with malicious software (**malware**) that is installed on your computer.
- **Physical injury:** The extensive use of a keyboard, mouse, trackpad or touchpad might lead to physical injuries, such as carpal tunnel syndrome, or repetitive strain injury.
- **Pathogen transmission:** If the input devices attached to a computer are used by a large number of people, it might play a role in the transmission of germs and other pathogens.
- **Privacy issues:** If a webcam and microphone are connected to your computer, a hacker might be able to gain access to them. This will then allow the hacker to gain access to your private images and conversations. As with **keyloggers**, this is usually done by malware that is installed on your computer.

INTEGRATION OF INPUT MODES TO ENHANCE PRODUCTIVITY AND EFFICIENCY

The integration of input devices is a good way to enhance productivity and efficiency. This means that having multiple input methods in a single device can help you to become more productive and efficient with what you do. The mouse scanner is a good example of technology integration, as it combines the traditional computer mouse with scanner technology. The result is a specialised computer mouse that has the ability to scan any size document up to A4, as well as being used as a point-and-click device.

Smartphones use integrated input modes to make users' lives as easy as possible. These methods of input include the following:

- **Touch screen:** The touch screen can be used to play games, type messages and interact with programs.
- **Microphone:** The microphone can be used to talk to people, record messages and for voice recognition.
- **Camera:** The camera can be used to take pictures and videos, and to scan things like QR codes, as well as facial recognition.
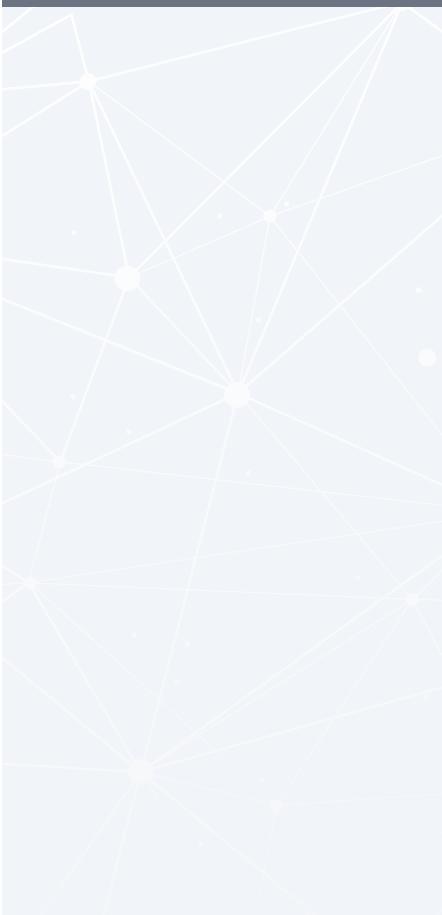
On their own, each of these input devices serves an important function. When you combine them into a single device, you get one of the most popular devices the world has ever seen.

Something to know

It is not only the integration of input devices that enhances productivity and efficiency, but also the integration of, for example:

- **Input/output devices:** A four-in-one printer, which you can use to print, copy, fax and scan using just the one hardware device, is a good example of increasing productivity and efficiency with the integration of devices.
- **Custom integrated software and input devices:** Integrating an input device, such as a barcode reader and OCR scanner with an administration system (software), will save time, accuracy and provide comprehensive data during stocktaking or auditing and surveying.

1. Write down the correct answer for each of the following questions.
    a. Which of the following components can be used as an integration medium?
        A. Keyboard   **B.** Camera   **C.** Touchpad   **D.** Standard computer mouse
    b. Carpal tunnel syndrome is caused by too much pressure on the wrists. Which of the following devices is most likely to give you CTS?
        A. Monitor   **B.** Printer   **C.** Mouse   **D.** Joystick
    c. Which of the following is a limitation of voice recognition?
        A. Can learn to recognise your own unique speech pattern
        B. Background noise can influence performance
        C. Should catch most spelling and grammar mistakes
        D. Can be used for specialised voice commands
    d. Which of the following is an advantage of the computer mouse?
        A. The mouse requires a flat space close to the computer to operate
        B. Uneven surfaces might affect the performance of the mouse
        C. Disabled users might find it difficult to use both a keyboard and mouse
        D. They are small and do not take much space
2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Risk associated with input devices	**A.** Touch screen
2.2 Smartphone's integration of input	**B.** Touchpad
2.3 Input device that enables recording of sound	**C.** Keystroke logging
2.4 Input for *Siri* and *Bixby*	**D.** Resolution
2.5 Measured in megapixels; the higher, the better the quality	**E.** Digital camera
	F. Voice recognition
	G. VoIP
	H. Microphone

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
    a. It is an <u>advantage</u> for disabled users who might find it difficult to enter information onto a keyboard.
    b. Your wrist must be in a <u>slanted</u> position to use the keyboard correctly.
    c. An optical mouse is very <u>expensive</u>.
    d. The user must be <u>computer literate</u> to make full use of a digital camera.
    e. A <u>touch screen</u> is an input and an output device.
4. Answer the following questions:
    a. What is the difference between a touch screen and a touchpad?
    b. What are two advantages of scanners?
    c. How do integrated systems work?
    d. How do wireless input devices work and what are two advantages of using them?
    e. Which type of user will benefit the least from wireless inputs and explain why?
5. Read through and understand the following scenarios to provide an appropriate solution:
    a. Since your father is technologically impaired, he came to you to explain to him what he must know before buying a webcam for work. List the advantages and limitations of a webcam.
    b. Your parents decide to buy an entry-level computer with internet so that your grandmother can order her clothes and food online, and have them delivered. Explain to your grandmother how to use the keyboard and mouse ergonomically so that she does not suffer from pains. Give her at least seven tips.

2.3 Storage devices

In the previous section, we looked at the various input devices that you can use to transfer data to your computer. To ensure that this data is not lost, your computer will need a storage device to store the data, which could either be an internal storage device, such as a standard hard drive, or an external storage device, such as a portable hard drive or flash drive.

To give you a better idea of which storage device is best suited for a specific situation, we will look at some of the most common storage devices, their advantages and limitations, as well as some of the risks associated with them.

Figure 2.10: *Storage devices from left to right: flash drive, SSD, laptop hard drive and internal hard drive*

Figure 2.11: *An external hard drive*

EVALUATING YOUR STORAGE DEVICE
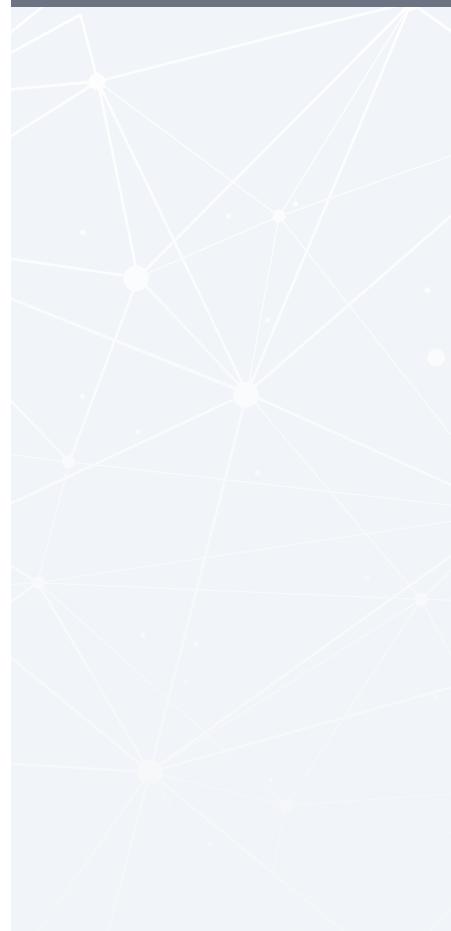
When deciding to buy a new storage device, there are certain things that you must take into consideration. This includes the following:
- Its **storage capacity**, which determines how much information you can save on the device.
- Its **storage speed**, which determines how quickly new information can be written to the device, or read from the device.

- Its **volatility**, which determines if the device will lose the data when turned off. You do not want a device that will lose all its data in case of a power outage.
- Its **reliability and durability**, which determines how likely the device is to break down. When you store thousands of hours' worth of work or years' worth of photos on a storage device, you do not want it to break unexpectedly.

For internal hard drives, a storage speed of 7 200 revolutions per minute (RPM) is a good starting point, while the capacity will depend on your needs. For most people, 1 Tb should be enough storage space, although you may need more if you plan to store a lot of media files, such as music and videos.

INTERNAL HARD DRIVES

A hard drive is a piece of hardware in a computer in which data is stored and from which you can retrieve data. It is used to store files for your operating system, your software and personal information. Every modern computer comes equipped with an internal hard drive.

ADVANTAGES AND LIMITATIONS OF INTERNAL HARD DRIVES

Modern hard drives have the potential to store up to 12 terabytes (12 Tb) of data. This is enough space to store 3 000 000 compressed songs (such as MP3s), or 17 000 uncompressed CDs. However, these devices are not without fault.

Table 2.14: *Advantages and limitations of internal hard drives*

ADVANTAGES	LIMITATIONS
Large capacity of storage space	Relies on moving parts and is, therefore, prone to wear and tear
Data can be retrieved and saved much faster than from DVDs or CDs	Can easily be damaged if not treated with care
Damaged drives can be easily replaced	Lacks portability, as they are fixed inside the computer
Permanent storage of data	Damage to the drive can cause a loss of data

EXTERNAL HARD DRIVES

Although most hard drives are located inside the computer, there are some that are used as portable storage devices. These are known as external hard drives. Unlike the internal hard drive, external hard drives are protected by a case that is designed to prevent damage to the drive and is connected to the computer by using a USB cable.

ADVANTAGES AND LIMITATIONS OF EXTERNAL HARD DRIVES

The small size and portability of external hard drives ensure that they can be quickly connected to different computers and are, therefore, ideal for transferring large amounts of data, or backing up data from your internal hard drive.

Something to know

When buying an external hard drive, make sure that you focus on the storage capacity. It is not worth buying a super-fast external drive if it contains a limited amount of storage. For the average user, a 1 Tb external drive will be sufficient. If you only want to back-up some documents and pictures, a flash drive might be a better choice.

Table 2.15: *Advantages and limitations of external hard drives*

ADVANTAGES	LIMITATIONS
Large capacity of storage space	Relies on moving parts and is prone to wear and tear
Data can be retrieved and saved much faster than using DVD/CDs	Can easily be damaged if not treated with care
Enables transfer of data between computers	Slightly slower than an internal hard drive
Can be used to back-up the data of your internal drive	Slightly less storage space than an internal hard drive

WHY IT IS IMPORTANT TO BACK-UP YOUR DATA

Tinu is a very busy guy with many social obligations. Due to this, he has been putting off writing his ten-page essay on "Why YouTube is amazing". He knows that he is more than capable of writing this essay in one day; so, he waited until the afternoon before his essay was due. Six hours into writing the essay, there was a minor power surge and Tinu's computer restarted. After the computer started up again, Tinu realised that he forgot to save and most importantly, back-up his work, and that he had to start all over again. Due to this, Tinu rushed his writing and barely finished in time, producing a very poorly written essay.

This example might seem like a minor inconvenience as Tinu still managed to finish his essay in time. Just imagine, however, you have been saving all your photos of family vacations and special moments on your computer, without backing them up on another storage device or medium. A big power surge hits your computer and causes your hard drive to stop working. You have now lost the reminders of all those precious moments. This can be prevented by simply backing up your data.

Backing up data is a simple process where you make a copy of important data on a separate storage device. This device can then be kept at a different location and used to restore any lost data. Traditionally, external hard drives, flash drives, CDs and DVDs are used to back up information.
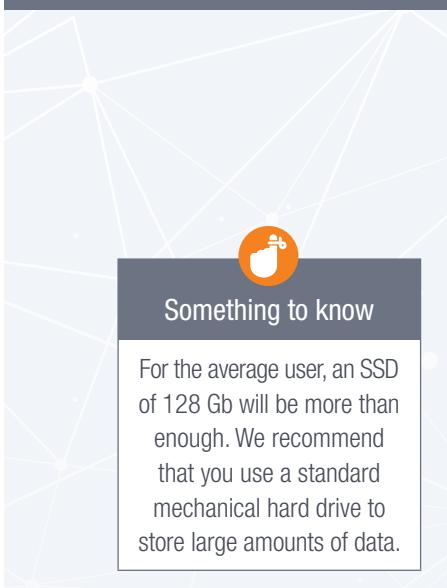
Discuss the following questions in class:
1. Have you lost important information due to not backing it up?
2. How did that make you feel and what was the impact of it on your life?
3. What could you have done differently?
4. Are you backing important information up? On which device and how do you keep that device safe?

SOLID-STATE DRIVES

The SSD is a storage device (like a hard drive) that does not use the traditional mechanical parts of standard hard drives. Instead, the drive consists of interconnected flash memory chips made of silicon. Due to this, an SSD functions more like a CPU that contains billions of small transistors; each storing one bit of data.

ADVANTAGES AND LIMITATIONS OF SOLID-STATE DRIVES

Solid-state drives, or more commonly referred to as SSDs, are generally many times faster than normal hard drives. However, since a separate transistor is needed for each bit of data stored, SSDs also usually have a much lower storage capacity and a much higher cost per gigabyte. It is, therefore, recommended that you use an SSD to improve the performance of certain programs and not as a primary storage device.
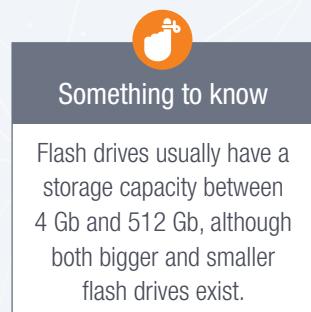
Table 2.16: *Advantages and limitations of SSDs*

ADVANTAGES	LIMITATIONS
Faster than a standard mechanical hard drive	More expensive than standard mechanical hard drives
Lower power consumption	Limited storage capacity due to high cost per gigabyte
More durable and compact due to the absence of mechanical parts	Shorter life span than standard hard drives or flash drives
No noise, as there are no moving parts	

FLASH DRIVES

A flash drive is a very small (physically) portable storage device. You can connect it to your computer via a USB port. Because it is so small and highly portable, a flash drive is the best way to transfer data quickly and efficiently between two computers. A flash drive is also an ideal storage device for documents and photos.

ADVANTAGES AND LIMITATIONS OF FLASH DRIVES

Flash drives have a very high cost per gigabyte. Due to this, we recommend that you base your purchase on the amount of data that you want to transfer or store.

Table 2.17: *Advantages and limitations of flash drives*

ADVANTAGES	LIMITATIONS
Very compact and portable	Easy to lose, due to its small physical size
More robust than other storage devices	High cost per gigabyte
Does not require a power source to be used	Shorter life span, as the flash memory in the drive can only be used a finite number of times

OPTICAL DISC DRIVES

An optical disc drive is a multi-purpose drive that makes it possible for the user to either read data from optical discs, such as compact discs (CDs), digital optical discs (DVDs) and Blu-ray discs (BDs), or to record data. This, as well as the fact that most movies and music are supplied commercially on these discs, an optical disc drive is one of the most popular storage devices.

ADVANTAGES AND LIMITATIONS OF OPTICAL DISC DRIVES

One of the major advantages of an optical disc drive is that it gives the user an affordable and time-efficient way of producing multiple copies of a disc that contains information. However, due to the limited storage space, this is restricted to small amounts of data.

Table 2.18: *Advantages and limitations of CDs/DVDs*

ADVANTAGES	LIMITATIONS
CDs and DVDs are less expensive than hard drives	Data transfer and access rates are slower than either a hard drive or flash drive
Certain CDs and DVDs can be used multiple times	To reuse the same disc, it requires special rewritable CDs and DVDs, which are more expensive
	Discs can easily be lost or damaged
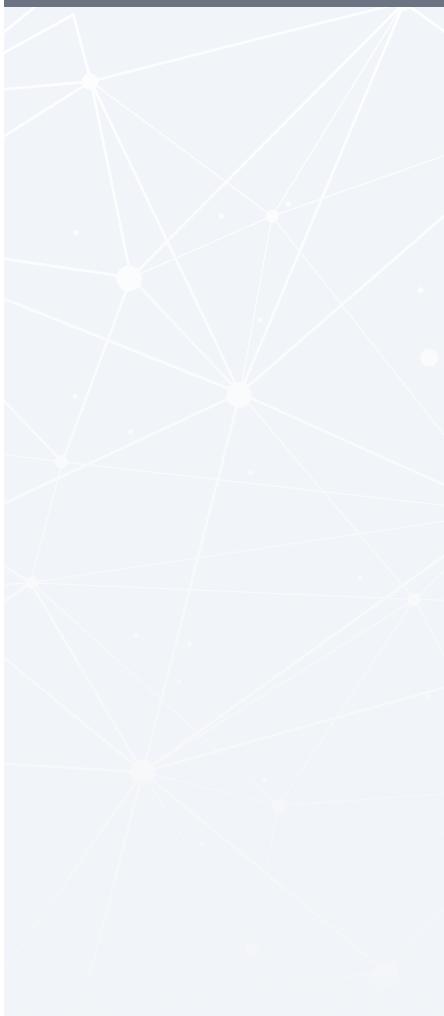
CAPACITY AND COST OF THE MOST COMMON STORAGE DEVICES

Throughout this unit, we have taken a basic look at the some of the most commonly used storage devices. We have discussed the advantages and limitations of each device, and have given some indication of which device will be suited for a specific task.

Table 2.19 gives a summary of the capacity and cost of these devices, as well as for which task they are best suited.

Table 2.19: *Cost, capacity and application of storage devices*

STORAGE DEVICE	STORAGE CAPACITY	TASK BEST SUITED
Internal HDD	200 Gb–10 000 Gb	Primary computer storage
External HDD	200 Gb–8 000 Gb	Transferring large amounts of data between computers, or backing up data
SSD	128 Gb–1 024 Gb	Improving the speed of certain important programs, such as your operating system
Flash drive	1 Gb–512 Gb	Transferring smaller amounts of data between computers
Optical drives	CD–0.7 Gb	Distributing small amounts of data to multiple recipients
	DVD–4.7 Gb	Distributing data to multiple recipients

CLOUD STORAGE

One of the advantages of living in the modern world is the luxury of the internet. This global network makes it possible to communicate over great distances. It also provides access to vast amounts of information. The internet has also become one of the best places to store your personal data through cloud storage.

Cloud storage is a type of storage service provided to users that allow them to store information on the internet. The two best known services is Apple's iCloud and Google's Google Drive. Both provide users with a specific amount of storage at no charge (5 Gb for iCloud and 15 Gb for Google Drive), although additional storage space can be purchased at a monthly fee.

Table 2.20: *Advantages and disadvantages of cloud storage*

ADVANTAGES	DISADVANTAGES
Accessibility: It is accessible from anywhere in the world where there is an internet connection.	**Less control over security and privacy:** Cloud computing is vulnerable to attacks. The best example of this was seen on 31 August 2014, when the iCloud accounts of several celebrities were hacked and personal photos leaked to the internet.
Provides disaster recovery: To prevent important information from getting lost due to hardware problems, it can be saved on the cloud from where it can be accessed.	Depending on the service you choose, there can be bandwidth limitations, or vendor lock-ins.
Reliability: If you are with a well-managed service provider, cloud computing is much more reliable than in-house computer infrastructures, and services can be easily transmitted when a server fails.	**Cost:** The cost might increase over the years.
Cost savings: You only pay for what you need. You also save on capital and operational costs, as you do not have to buy expensive hardware, software and storage devices. There is no maintenance.	**Downtime:** Since this service is internet-based, service outages can occur for many reasons.

Activity 2.4

1. Write down the correct answer for each of the following questions.
   a. What current technology is replacing the DVD?
      - **A.** Flash disk
      - **B.** HDD
      - **C.** Blu-ray
      - **D.** CD
   b. What is the average capacity of a DVD?
      - **A.** 700 Mb
      - **B.** 125 Gb
      - **C.** 4.9 Gb
      - **D.** 4.7 Gb
   c. Which of the following is NOT a storage device?
      - **A.** HDD
      - **B.** RAM
      - **C.** SSD
      - **D.** USB stick
   d. Which one is an internal hard drive's average rotational speed?
      - **A.** 3 600 rpm
      - **B.** 7 200 rps
      - **C.** 7 200 rpm
      - **D.** 8 400 rps

… continued
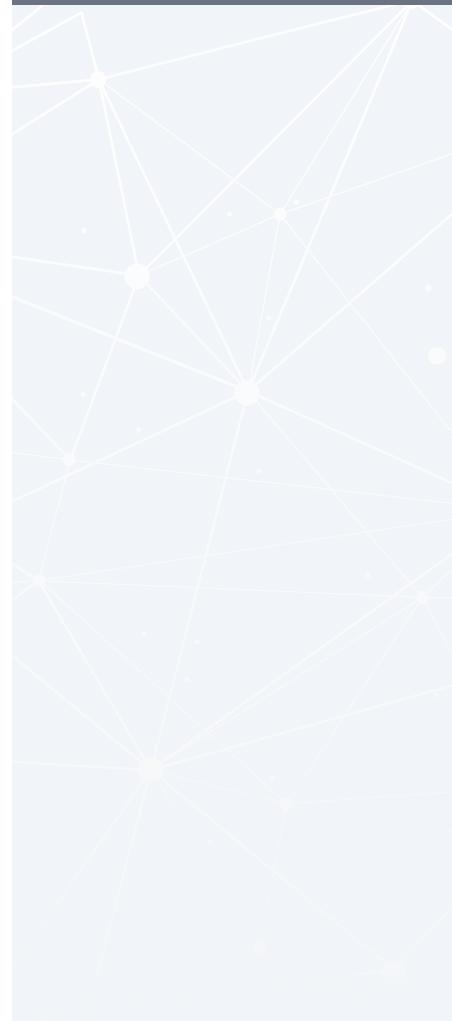
Activity 2.4

e. Which of the following is a limitation of an internal hard drive?
    A. Data can be retrieved and saved much faster than from DVDs or CDs
    B. Lacks portability, as they are fixed inside the computer
    C. Permanent storage of data
    D. Large capacity of storage space

f. Which of the following is a limitation of an external hard drive?
    A. Large capacity of storage space
    B. Lacks portability, as they are fixed inside the computer
    C. Slightly slower than an internal hard drive
    D. Slightly more storage space than an internal hard drive

g. Which of the following is an advantage of SSDs?
    A. More durable and compact due to absence of mechanical parts
    B. Longer life span than standard hard drives or flash drives
    C. Less expensive than standard mechanical hard drives
    D. Increased storage capacity due to high cost per gigabyte

h. Which of the following is an advantage of flash drives?
    A. Low cost per gigabyte
    B. Does not require a power source to be used
    C. Difficult to lose due to physical size
    D. Longer life span, as the flash memory in the drive can be used an infinite number of times

i. Which of the following is an advantage of optical drives?
    A. Data transfer and access rate is higher than either hard drive or flash drive
    B. To reuse the same disc requires special rewritable CDs and DVDs, which are less expensive
    C. Discs are robust and cannot easily be lost or damaged
    D. Certain CDs and DVDs can be used multiple times

j. Which of the following is NOT an advantage of cloud storage?
    A. Accessibility
    B. Reliability
    C. Control
    D. Disaster recovery

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Primary computer storage	**A.** Storage device
2.2 Device most suited for backing up data	**B.** Optical discs
2.3 Storage medium that can easily be scratched or damaged	**C.** Internal HDD
2.4 Storage accessible anywhere in the world as long as there is internet	**D.** Cloud storage
2.5 Personally transferring a smaller amount of data between computers	**E.** External HDD
	F. SDD
	G. Flash disk

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
   a. Another name for a flash disk is a <u>thumb drive</u>.
   b. A flash drive is the <u>least</u> robust storage device.
   c. An internal <u>hard drive</u> has the highest storage capacity.
   d. A hard drive has a <u>shorter</u> life span than an SSD.
   e. Cloud storage is <u>for free</u> for a specific amount.
4. Answer the following questions:
   a. What is the difference between an internal and an external hard drive?
   b. What is the difference between an HDD and an SSD?
   c. How would you explain cloud storage to a Grade 10 CAT learner?
   d. What five points must you take into consideration when choosing a storage device? Explain these points briefly.
5. Read through and understand the following scenarios to provide an appropriate solution:
   a. Your parents gave you R1 500 to buy a storage device for your computer. Explain the factors involved in your decision to either buy a hard drive or an SSD. State your choice at the end.
   b. Your uncle wants to open up a store that sells music CDs and DVDs, as well as clean CDs. Give him advice on the relevancy and future of CDs and DVDs. Give your opinion on whether or not it will be wise to open such a store and state why.

2.4 Processing devices

The data received from an input device must be modified and changed before it can be sent to the computer's output device. This is done by the computer's processing devices through the implementation of certain instructions and calculations.

In this section, we will take a brief look at the most common processing devices. This includes the CPU, GPU and RAM. We will also provide some guidelines on how to determine which processing device is best suited for you.

CENTRAL PROCESSING UNIT

The CPU is one of the most important parts of any computer. It is responsible for the following tasks:
- Receiving and carrying out the computer's instructions
- Allocating more complicated tasks to other chips that will better handle the task

The CPU functions by using billions of microscopic transistors that can each be switched on or off individually. As the name suggests, it is the core or centre of any computer.
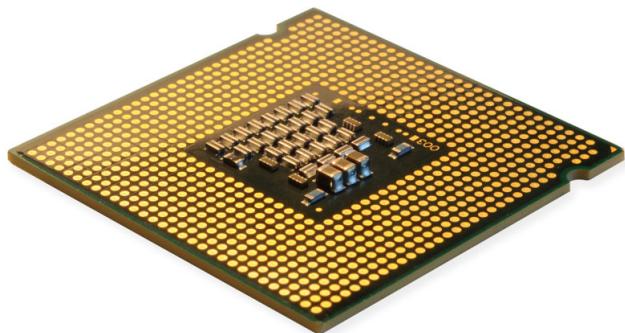
Figure 2.12: *A CPU*

EVALUATING A CPU

When trying to decide which CPU is best suited for your needs, you should consider the following:
- **Gigahertz of the processor:** Gigahertz refers to the CPU frequency and is an indication of the processor's speed. As a general guideline; the higher the frequency, the better the CPU.
- **Number of cores:** As with the processor speed, generally more cores are better.

However, as with many of the other factors, this is not a fool-proof method, as computers with the same number of cores and the same gigahertz can operate at very different speeds. The best advice is, therefore, to research CPUs on the internet and find the best CPU in your price range.

Table 2.21 and Table 2.22 give a summary of some of the most commonly used CPU models.

Table 2.21: *Celeron and Core processors*

MODEL	TARGET AUDIENCE	COMMENTS
Celeron	Entry level	The slowest of the models
Core i3	Mid range	Good starting point for most people
Core i5	Suitable for most uses	Very fast CPU that is suitable for most users
Core i7	Gamers and power users	Faster and more expensive
Core i9	Power users who need cutting edge technology	Fastest and most expensive currently available

Table 2.22: *Ryzen processors*

MODEL	TARGET AUDIENCE	COMMENTS
Ryzen 3	Entry level	The slowest of the Ryzen models
Ryzen 5	Mid range	Good starting point for most people
Ryzen 7	Suitable for most uses	Very fast CPU that is suitable for most users
RyzenThreadripper	Top of the line	Faster and more expensive than any other model

GRAPHICS PROCESSING UNIT

The GPU is a specialised processing unit responsible for display functions. Like the CPU, the GPU is responsible for making calculations and following instructions. However, unlike the CPU, the GPU's instructions are limited to the calculations needed to render and display images on the screen.

Figure 2.13: *A GPU on a PCB board*

EVALUATING A GPU

When you try to decide which GPU is best suited to your needs, ask yourself the question: "What am I going to use my computer for?" If your answer is "general use", such as email, word processing and photos, then you might not even need to purchase a GPU. Most modern computers come equipped with a fairly powerful onboard GPU that is more than capable of performing the actions needed by the average computer user. However, if you plan to use your computer for graphically intensive tasks, such as graphic design or gaming, you will definitely have to consider an advanced GPU.

Unfortunately, buying an advanced GPU is not as easy as it sounds. There are various manufacturers that have a variety of products with different specifications. To find the correct product for your needs, you have to look at the manufacturer's model numbers and benchmarks. Looking at the model number will provide you with an indication of which generation the card is, while the benchmarks will show you how powerful it is.

Table 2.23: *An example of GPUs*

MODEL	TARGET AUDIENCE	COMMENTS
X30	Entry level	The slowest of the models
X50	Mid range	Good starting point for most users
X60	Suitable for most users	Very fast GPU that is suitable for most users
X70	High end	Very fast GPU that will allow you to run the most complicated 3D applications
X80	Top of the line	Fastest and more expensive of the models

With these model numbers, the X is replaced by a number that refers to the generation of the graphics card. For example, the GTX 980 was released in March 2015; while the GTX 1080 was released one year later in May 2016. This model was followed by the RTX 2080 that was released in September 2018.

While these model numbers and the patterns behind them may change, spending a few minutes to understand what the different numbers mean, will allow you to pick a graphics card suited for you at an appropriate price.

RANDOM ACCESS MEMORY

RAM is a piece of hardware (chip) responsible for temporarily storing data. It also enables the computer to work with a vast amount of information at the same time. It does this by acting as a helper to the GPU and CPU, storing the information that is currently being used, and loading the data that they may want to use next.

HOW DO GRAPHICS CARDS WORK?

https://www.youtube.com/watch?v=ZfnPFNnXqC0

Something to know

The GPU is also referred to as the display adapter, graphics card, video adapter, video card, video controller or even gaming card.

Something to know

RAM can be as much as 90 times faster than the fastest storage devices.

Figure 2.14: *RAM*

EVALUATING RAM

To be able to both store data and load new data fast enough to let the GPU and CPU operate without any interruptions, RAM needs to me much faster than any other storage device. Having a processor that can complete four billion instructions per second is not useful if it cannot be provided with four billion instructions each second. It is, therefore, very important that your computer is equipped with enough memory to allow the GPU and CPU to operate at their full potential.

Determining how much RAM is needed will depend on the following two main factors:
1. Which operating system are you using?
2. What are you planning to do with your computer?

Table 2.24: *Recommendations with regards to RAM*

TYPE OF USER	RECOMMENDATION	ACTIVITIES
Casual user	4 Gb–8 Gb	Internet browsing, email, watching movies and listening to music
Frequent user	8 Gb–16 Gb	Simple graphic programs and flash games
Power user	16 Gb	Photo editing, video editing and gaming
Professional user	32 Gb	High-performance gaming and graphic design

Activity 2.5

1. Write down the correct answer for each of the following questions.
   a. How much faster can RAM be than the fastest storage device?
      A. 90 times   B. 80 times
      C. 70 times   D. 100 times
   b. Most modern computers use this type of RAM.
      A. DDR2 SDRAM   B. DDR3 SDRAM
      C. DDR4 SDRAM   D. DDR5 SDRAM

… continued

Something to know

Take note that your motherboard will determine which type of RAM you will need to buy. The most common varieties include the following:
- **DDR2 SDRAM:** This RAM is normally found in older computers. It was succeeded in 2007 by the DDR3 SDRAM.
- **DDR3 SDRAM:** This RAM is normally found in computers made after 2007. It was succeeded in 2014 by the DDR4 SDRAM.
- **DDR4 SDRAM**: This RAM is found in most modern computers.

The best advice is to do some research on the internet to find out which RAM will work best with your motherboard.

c. Which amount of RAM is recommended for a professional user?
  A. 32 Gb   **B.** 16 Gb
  C. 8 Gb   **D.** 4 Gb

d. Which of following can be used to decide on a CPU?
  A. The amount of heat produced
  B. Number of pins
  C. Number of cores
  D. The amount of data that can be stored

e. Which of the following is responsible for temporarily storing data?
  A. RAM   **B.** GPU
  C. CPU   **D.** HDD

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Other name for a GPU	**A.** Graphics card
2.2 Volatile temporary data storage	**B.** CPU
2.3 Processing unit for displaying	**C.** GPU
2.4 Functions by using billions of microscopic transistors for all calculations	**D.** RAM
2.5 User uses 8–16 Gb RAM for simple graphic programs and flash games	**E.** ROM
	F. DDR3
	G. Power user
	H. Frequent user

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
  a. A home computer or <u>entry-level user</u> does not need a GPU.
  b. <u>All types</u> of RAM fit on any motherboard.
  c. A <u>GPU</u> is the core of any computer.
  d. A GPU is located on the <u>motherboard</u>.
  e. The more cores a <u>CPU</u> has, the more prone it is to gain heat and slow down the processing speed.

4. Answer the following questions:
  a. For what is the CPU responsible?
  b. What must you consider when evaluating a CPU?
  c. What is the difference between a CPU and a GPU?
  d. What is RAM and what does it do?
  e. What must you consider when evaluating a GPU?

In the previous unit, we looked at the devices that feed data into your computer, the hardware that is responsible for storing the data and the hardware that processes the data. We will now take a closer look at some of the most common devices that are used to present the processed data to the user, or to other computers and networks.

OUTPUT DEVICES

An output device is any device that takes the data that has been stored on a computer and makes it available to the user. This can be done visually (such as, a computer screen or printer), or auditory (such as, speakers).

COMPUTER SCREEN

The computer screen or monitor is the most important output device of any computer. It makes it possible for the user to visually interact with data and programs in a quick and easy manner. This is possible because the computer software is built around a visual representation of data; whether it is a page of text, video on the internet, or 3D elements in a game.

EVALUATING A COMPUTER SCREEN

When looking to buy a new computer screen, there are three main things to look at:
1. **Pixels:** A good number of pixels is 1 920 pixels across the width of the monitor and 1 080 pixels across the height of the monitor. This is normally represented by the resolution of the screen as 1 920 × 1 080, or full HD – i.e. the higher the number of pixels, the better the screen.
2. **Screen size:** The size of a computer screen is measured diagonally from the bottom of the screen to the top right. The measurement is made in inches and one inch is roughly 2.5 cm long. When looking at the size of the computer screen, you should take into consideration how big your desk is. A big screen can cause eye fatigue and even damage to your sight if not placed at the correct distance from your face. Any screen bigger than a 27-inch monitor will be too big for a normal-sized desk.
3. **Refresh rate:** This refers to the amount of time it takes for the screen to be updated with the newest information. It is normally represented as the number of times the screen updates in one second. Most modern computer screens have a refresh rate of 60 Hz. This means that the screen is updated with new image information 60 times in one second. This should be more than sufficient for most users. However, there are advanced screens available that have a refresh rate of up to 144 Hz. These screens, like those with a higher number of pixels, will be much more expensive.

> **Something to know**
>
> Modern monitors can have up to 3 840 × 2 160 pixels (called "4K" resolution). This, however, can be an expensive purchase.

VIRTUAL REALITY
Virtual reality or sometimes abbreviated as VR, is one of the most exciting and interesting advances of technology. It is a type of output device that uses a specially designed headset to fully immerse the user in a high-quality 3D virtual world using both sight and sound.
What sets virtual reality apart from other 3D viewing devices is that it is not limited to just normal 3D images. The virtual reality headset adjusts your vision, depending on where you look in real life, changing the picture you see as you look at different things. This gives the device a much more realistic feeling.
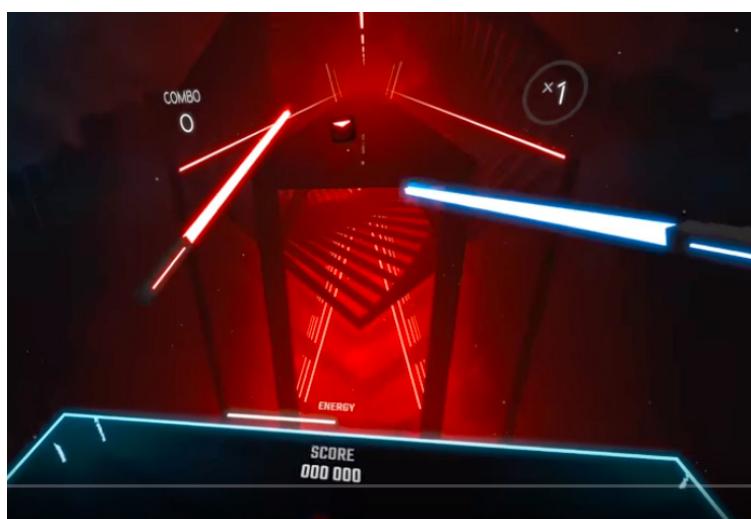
Discuss the following questions in class:
1. Who in your group has experienced virtual reality? How does it feel?

2. Would you like to have virtual reality available to you? Why or why not?
3. Apart from gaming, what else can virtual reality be used for? Do some research on the internet and find at least five different applications.

VIRTUAL REALITY

Watch the following video:

Beat saber
https://www.youtube.com/
watch?v=9Rqgu2d3QG8

SPEAKERS

Speakers are one of the most popular output devices. They play back the sound on your computer. This makes it possible to listen to music, speak to friends over Skype, or watch movies.

EVALUATING COMPUTER SPEAKERS
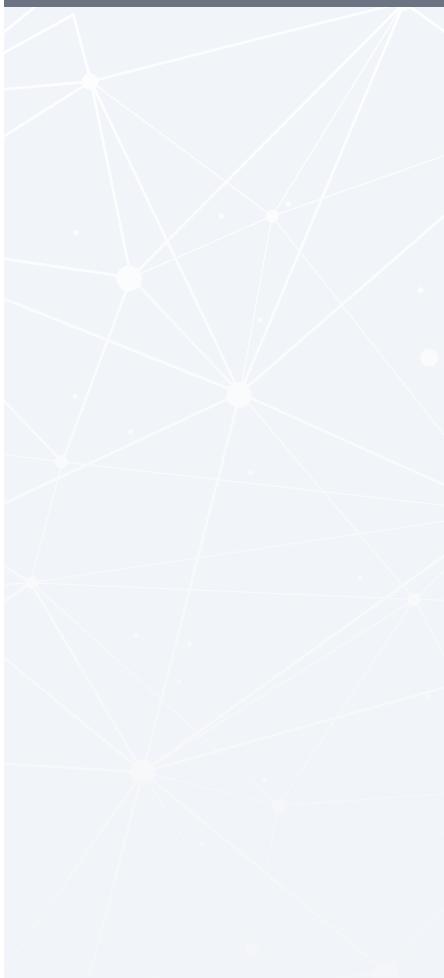
Most computers have their own built-in speakers, which are fine for hearing the normal computer sounds. However, if you want to listen to music, movies or games, you should get additional speakers. The easiest option is to buy a set of computer speakers that you can just plug into the audio jack on the computer.

Let's take a look at some of the following tips of what to look for when you buy speakers:
- **Speakers with or without a subwoofer (2.0 or 2.1 speakers):** A subwoofer is a loudspeaker designed to reproduce low-frequency sound (for example, bass sounds). Table 2.25 compares speaker systems with and without subwoofers.

Table 2.25: *Comparison of a 2.0 and 2.1 speaker system*

2.0 (NO SUBWOOFER)	2.1 (WITH SUBWOOFER)
Has two channels (left and right) and no subwoofer	Has two channels (left and right) with a subwoofer
The amplifiers housed inside one of the speakers	Uses smaller left- and right-hand speakers for higher frequencies and a subwoofer that produces the lower frequencies
Is smaller and takes up less space	Can reproduce lower frequencies and a more powerful bass

- **Specifications and sound quality:** The best way to evaluate the quality of sound produced by the speakers is to go and listen to them. If that is not possible, do your research on the internet and read the reviews of sources you trust. A good speaker system usually provides a good balance between the treble (high), mid-range and bass (low) frequencies; producing a full, rich sound while keeping the detail.
- **Input:** Look for a system that gives you more than one audio-input jack so that you can also plug in your iPod, smartphone, or other audio devices.
- **Control:** Although the systems that provide no control are the cheapest, it is better to get a system with at least a volume control. Some systems let you adjust the bass and treble levels as well. When you buy a system with more controls, make sure that they are easy to reach.
- **Appearance:** Make sure that you like the way the speakers look, as you are going to see them whenever you are sitting at your computer.
- **Price:** It is mostly true that the more you pay for speakers, the better they are. However, make sure that you shop around, as speakers are some of the most discounted computer accessories around.

PRINTERS

A printer is a device that makes it possible to transfer text and graphic output data from your computer to a piece of paper. You can print pages of text, illustrations, diagrams and photos.

WHICH PRINTER IS BEST FOR THE TASK?

When you buy a printer, it is very important to know what you will be using the printer for, since different printers are good at different things. If you are looking at printing only black and white documents, you do not need to purchase a colour printer, as it will cost more to operate. Other things to keep in mind include the following:
- **Speed:** Budget printers should be able to print about three to six colour pages per minute.
- **Paper type and size:** Make sure to select a printer based on the type of documents you have to print.
- **Printer resolution:** This is normally measured in dots per inch (dpi), and affects the sharpness of the text and images on the paper. A resolution of 600 dpi should be sufficient for the average user.
- **Costs to print a page:** Colour printers are more expensive to operate and will cost more per page. This is also true for printers with a higher resolution.
- **Memory:** All printers come with a limited amount of memory. Having more memory increases the speed at which printing takes place. This will only be noticeable if you are planning on printing pages with large images or tables on a regular basis.
- **Wireless capabilities:** Most modern printers come with Wi-Fi capabilities. This makes it possible for the user to print documents without the need to be physically connected to the printer.
- **Ink cartridges:** Make sure that ink cartridges are available for when you have to replace them.

COMMUNICATION DEVICES

A communication device is a type of device that connects a computer to other computers in a network. Examples of communication devices include internal equipment, such as a network or Wi-Fi card, as well as external equipment, such as a router.

Built-in communication devices are usually designed to communicate with a very specific type of network. For example, a computer network card will either allow you to connect using a physical ethernet cable, to a Wi-Fi network, or to the internet. In contrast, the purpose of a networking device, such as a router, is to connect many different types of networks, so that it may connect devices using ethernet cables, Wi-Fi, DSL and 3G on the same network.
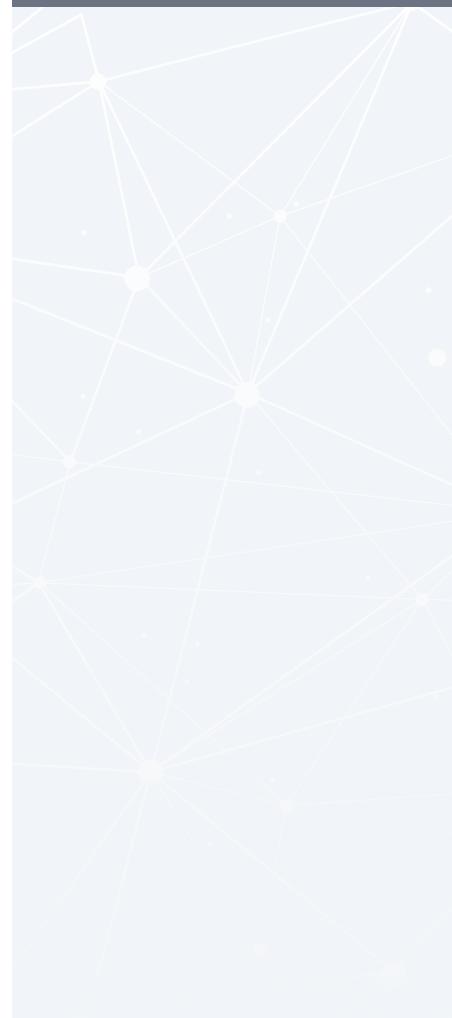
Activity 2.6

1. Write down the correct answer for each of the following questions.
   a. What is the refresh rate of a computer screen measured in?
      A. Frames per minute   **B.** Hz
      C. rpm   **D.** m/s
   b. What is the most limiting factor when buying an output device?
      A. Cost   **B.** Performance
      C. Quality   **D.** Durability
   c. Which of the following is NOT an output device?
      A. Speakers   **B.** Virtual-reality glasses
      C. Scanner   **D.** Touch screen
   d. Which of the following is an important factor when buying a printer?
      A. Power usage   **B.** Size
      C. Memory   **D.** Lens quality
   e. Which of the following is NOT a factor when buying speakers?
      A. Input   **B.** Control
      C. Appearance   **D.** Storage

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Transfers text and graphics to paper	**A.** Subwoofer
2.2 A communication device	**B.** Printer
2.3 The output device is a headset	**C.** Flash card
2.4 Speaker producing a low-frequency sound	**D.** Treble speaker
2.5 Printer and scanner integrated into one device	**E.** Virtual reality
	F. Scanner
	G. Multi-functional printer
	H. Wi-Fi card

… continued

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
   a. The bigger the screen size, the <u>better</u> it is for your eyes.
   b. When a screen is described as 1 920 × 1 080, it means that the screen has 1 920 pixels along the <u>height</u> of the monitor.
   c. It is possible to listen to music on your computer without a <u>dedicated sound card</u>.
   d. The price of any output device is <u>always</u> a factor when evaluating the output device.
   e. Having more memory in a printer increases the <u>printing speed</u>.
4. Answer the following questions:
   a. Define an output device and give three examples of it.
   b. How does a speaker system with a subwoofer compare to a speaker without one?
   c. What are the three most important aspects you must look at when buying a monitor?
   d. What five aspects must you look at when buying a printer?
   e. Virtual reality equipment is becoming more affordable. In what way can virtual reality be used? Name two pieces of equipment that one would need for virtual reality.

2.6 Troubleshooting hardware devices

As with most things in life, computer equipment is not without fault. As hardware gets older, wear and tear sets in, leading to a variety of potential issues. To make your life easier (and hopefully save some money), we will be taking a look at some of the most common issues that you might encounter, as well as how to resolve them.

In this unit, we will look at some of the most common problems that people experience with their computers. We will also look at ways in which to solve these problems.

ERRATIC MOUSE MOVEMENT

Erratic mouse movement is one of the most common issues that might occur when you use a mouse. This happens when your mouse pointer starts acting erratically, jumping across the screen and does not move properly.

Let's take a look at some of the possible causes and solutions to fix erratic mouse movements:
- **The mouse is dirty:** The performance of an optical mouse might be affected by dirt inside the mouse. Removing the dirt by cleaning the mouse should fix the issue. Be sure to look up how to clean the mouse properly before you do it.
- **Bad surface:** An irregular or shiny surface might interfere with the optical laser that is used by your mouse. This can be fixed by getting a mousepad or book to work on.
- **Wireless mouse:** If you are using a wireless mouse, the issue might be caused by low battery power. Replacing the batteries should fix the issue.

SCANNING
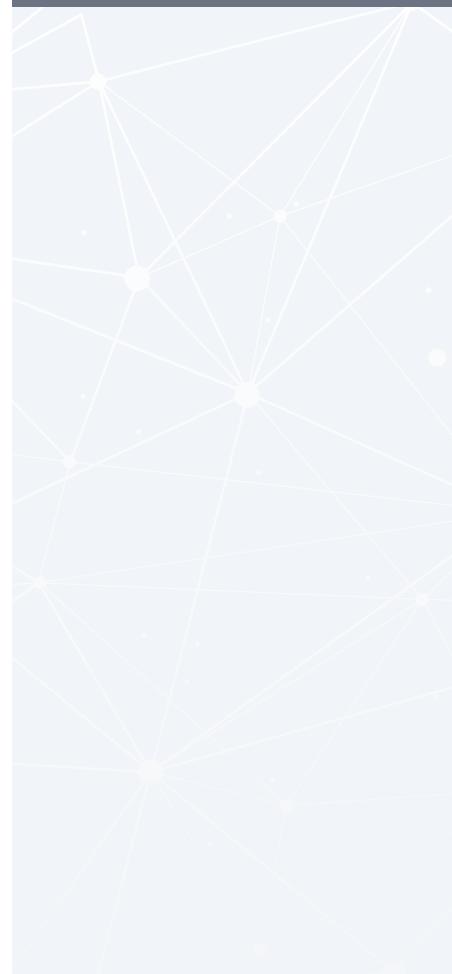
Scanning a document does not always produce the expected result. Let's take a look at some of the most common issues that you might encounter, as well as their possible solutions:
- **A skew or cut-off scanned document:** This is caused by a document that is not properly aligned. To fix it, reposition the document on the scanner.
- **Poor image quality:** This can be due to two reasons:
  - Caused by a dirty scanner surface: Cleaning the surface should resolve the issue.
  - Caused by the inability of the OCR software to read the text: This can be fixed by making sure that the document you want to scan is clear and readable.
- **Connection errors:** This is most likely caused due to a poorly attached connection. Make sure to properly connect the scanner to fix the issue.

DISK ERRORS (DEFRAGGING)

Hard drives are prone to wear and tear, which can lead to a variety of problems, such as disk errors caused by disk fragmentation. Therefore, it is very important to regularly check the condition of the hard drives to make sure that they do not fail. In order to do so, you can do the following.

Guided Activity 2.1

1. Open your computer's *Start* menu.
2. Enter "command prompt". Then, click the *Command Prompt* option. You should now see a window open.
3. Type in the following command: "wmic diskdrive get status". This command will look at the key health indicators of your hard drives and see if there are any problems.
4. Press *Enter* to see the status of your hard drive.

Figure 2.15: *Checking the status or condition of your hard drive*

5. If you receive the "Status OK" message, your hard drives are in a good condition. If not, you should immediately back up the important files from your hard drive and try to replace it as soon as possible.

Another tool that you can use to maintain your hard disks is the *Optimize Drives* tool (previously called the *Disk Defragmenter*). This tool will help you to reorganise the way in which the data is stored on your hard drives (without changing any files), so that your drives can run smoothly.

Guided Activity 2.2

1. Open your computer's *Start* menu.
2. Enter the words "optimize drives".
3. Click the *Defragment and Optimize Drives* application. The *Optimize Drives* window should open.

Figure 2.16: *The Optimise Drives window*

4. Click the *Optimise* button to begin optimising your hard drive.
5. At the bottom of the *Optimise Drives* window, the *Scheduled optimisation* should be enabled. If not, you can enable it by using the *Change settings* button.

RESOLUTION

As previously discussed, resolution refers to the number of pixels on the computer screen and plays an important role in determining image quality. We will now look at some of the most common resolution-related issues that you might encounter, as well as how to fix them.

Black screen:
- The screen is not plugged into the computer. Plugging in the screen should fix this issue.
- The setting of the screen resolution is too high. Operating systems, such as Windows, have a built-in feature that allows you to return to your previous resolution 15 seconds after you selected a new one. Just make sure that you do not click on *Keep these changes*.
- The images and text on the screen look very big. This is most likely because the resolution is very low and changing the resolution should fix the problem. This issue is sometimes caused when updating your computer's graphics drivers.

Guided Activity 2.3

1. Open your computer's *Start* menu.
2. Enter "display settings" and click the *Change Display Setting* option. You should now see a new window open. (The *Display Setting* window can also be opened by right clicking on your desktop and selecting the *Display Setting* option from the menu.)
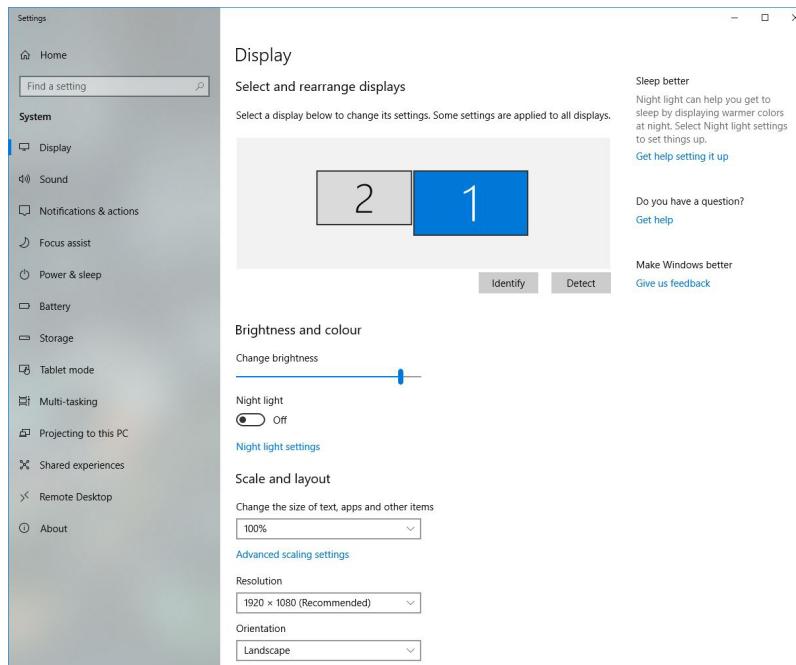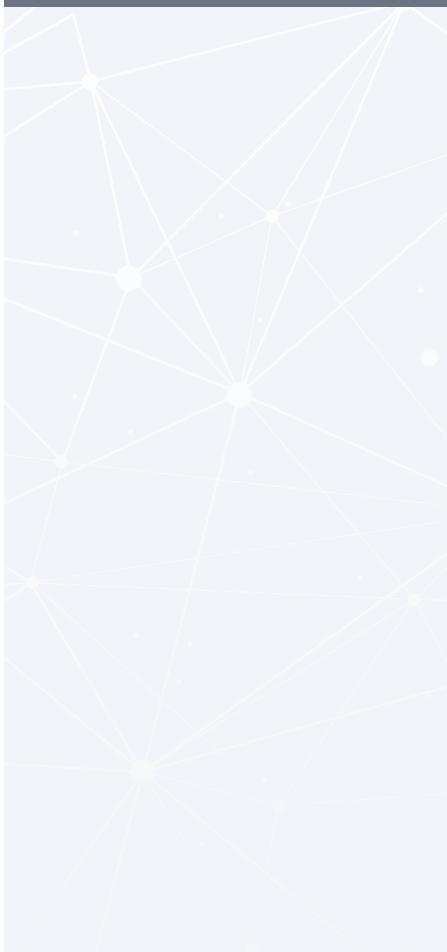
Figure 2.17: *The Display Settings window*

Guided Activity 2.3

3. Scroll down to the resolution section and select an appropriate resolution from the drop-down menu. (There should be a recommended resolution that you can use.)
4. Click to keep these changes and close the *Display Settings* window.
5. If you encounter a black screen when changing the resolution, do not worry as Windows 10 has a built-in feature that allows you to return to your previous resolution 15 seconds after you have selected a new one.

NON-RESPONDING PROGRAMS, MOUSE AND KEYBOARD

One of the most common problems that you might encounter when working on a computer, is that the program you are using, stops responding. This might be caused by a variety of factors, such as faulty programs, your computer running out of resources, or faulty hardware. The best way to resolve this issue is to close the non-responding program and then to re-open it. However, it is difficult to close programs that are not responding, as they do not respond to clicking, or selecting the *Close Program* option.

Guided Activity 2.4

1. Open your computer's *Start* menu.
2. Type in "task manager" and click the *Task Manager* option. You should now see a new window open. (You can also open *Task Manager* by pressing the *Ctrl*, *Shift* and *Esc* keys at the same time, or you can right click on the taskbar.)
3. Select the program that is not responding. There will be a list of all the programs that are currently running on your computer. Scroll down and select the non-responding program.
4. Click the *End Task* button. This should close the non-responding program.
5. Once the non-responding program has been closed, re-open it again.

PRINTING PROBLEMS

Printing problems is one of those things that every person will suffer through at least one point in their lives. Let's take a look at the some of the most common printing problems and their possible solutions:

- **Printing takes too long:** This can be caused by a high-resolution setting, memory issues, or printer drivers.
- **High-resolution images:** High-resolution images require more data from your computer, which can slow the printing process down. This can be fixed by selecting the standard or normal mode. This also works to resolve memory issues.
- **Printer software:** Make sure that your printer software is updated. If not, updating the software could fix the issue.
- **Paper jams:** This is caused by a piece of paper becoming stuck inside the printer. To fix the problem, start by inspecting the paper path and removing any stuck papers.
- **Bad printing quality:** Check that your printer has enough ink or toner and that it contains the correct paper.
- **Printer does not print:** This might be caused by a bad connection, the printer running out of ink or toner, or the printer driver not being installed on your computer.

LACK OF FREE SPACE ON STORAGE MEDIUM

The storage on your computer is limited and as such, you might come across a message telling you that you do not have enough hard-drive space to copy, or save a file. This issue can be resolved by deleting some of the files that you no longer need. To determine how many files you should remove, look at the amount of free disk space that is currently available.

Guided Activity 2.5

1. Open your computer's *Start* menu.
2. Enter "file explorer" and click the *File Explorer* option. You should now see a new window open.
3. On the left of the new window, click the *This PC* option. This will open a summary of all the hard drives in your computer.
4. The free available space should now be visible for each of your hard drives. It is displayed as 23.00 Gb free of 118 Gb.

CONNECTION PROBLEMS

If you are struggling to use your computer to connect to the internet, the problem could be caused by any one of the following:
- Your computer
- The network cable
- The router
- The internet cable
- The internet service provider (ISP)

The following table shows you how to identify the cause of the problem.

Table 2.26: *Troubleshooting*

LOCATION	EVIDENCE	SOLUTIONS
Computer	• Other computers on the network are still connected to the internet • The ethernet cable works when plugged into a different computer	• Make sure that your cable or Wi-Fi is connected. • Run the *Troubleshoot Network* application. • Restart your computer.
Network cable	• Other computers on the network are still connected to the internet • Computers using a wireless connection are still connected to the internet • Your computer states that no cable is plugged in • The ethernet cable does not work when plugged into a different computer	• Ensure that the cable is plugged in to your computer and the router properly. • Replace the cable. • Change to a Wi-Fi connection.
Router	• No computer on the network has access to the internet • No computer on the network can access the router's setup page	• Make sure that the router is turned on. • Restart the router. • Unplug all cables from the router, except your own cable. • Connect to the router via Wi-Fi if you were using ethernet, or via ethernet if you were using Wi-Fi.

LOCATION	EVIDENCE	SOLUTIONS
Internet cable	• No computer on the network has access to the internet • You can access the router's setup page • The internet and internet cable light on the router are off	• Plug the internet cable into the router. • Restart the router. • Contact the ISP.
ISP	• No computer on the network has access to the internet • You can access the router's setup page • The internet light on the router is off	• Ensure that you have not reached your data limit. • Restart the router. • Contact the ISP.

While network problems can be caused by a number of different devices, they are often easier to fix than hardware or software problems. Once a network has been set up correctly, most problems can be fixed by simply checking all the connections, restarting the affected computers and restarting the router. If this does not work, most ISPs have excellent support teams that should be able to assist you in resolving the problem.

Activity 2.7

1. Write down the correct answer for each of the following questions.
   a. What application do you use to close a non-responsive program?
      A. *Command Prompt*   B. *Task Manager*
      C. *Settings*   D. *Disk Manager*
   b. The window of this option displays the available disk space on your computer.
      A. *System*   B. *Settings*
      C. *This PC*   D. *Search*
   c. Which system settings allow you to change the screen's resolution?
      A. *Power & Sleep*   B. *Sound Settings*
      C. *Notifications*   D. *Display Settings*
   d. Which of the following will cause your scanned document to be of poor quality?
      A. Inability of the OCR software to read the text
      B. Clean alignment and shiny scanner surface
      C. Poorly attached connection
      D. Document too big for the scanner

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Shortcut used to close non-responding programs	A. Disk fragmentation
2.2 An available resolution option	B. Paper jams
2.3 Causes disk errors	C. *Alt+F4*
2.4 When a piece of paper gets stuck in the printer	D. Papier mâché
2.5 To trace and correct faults in a computer system	E. 1 920 × 1 080
	F. 1 234 × 720
	G. Troubleshooting
	H. Debugging

… continued

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
    a. An <u>SSD</u> should be defragmented once in a while.
    b. A lower resolution makes the images and text look <u>smaller</u>.
    c. A lack of disk space can <u>slow down</u> your computer.
    d. <u>SSDs</u> should never be optimised or defragmented.
    e. Having a higher screen resolution can <u>slow down</u> your computer.
4. Answer the following questions:
    a. Give three possible causes to erratic mouse movement and how to fix it.
    b. Describe three of the most common occurring scanning problems and the causes thereof.
    c. What causes a black screen to occur?
    d. You are a learner who has just finished writing a very important essay for an assignment. However, the printer that you are using to print the essay is not working. What could be causing this problem?

Computer technology is an ever-changing field. Each day, new technologies are developed to replace or improve existing technologies. The most powerful computing device today will not be the most powerful device tomorrow. This is part of what makes the fields of computers and technology so exciting.

Let's take a look at some examples of technologies that were introduced in 2018 already:
- **Holographic phone:** This opened many new possibilities for communication as images could be viewed in 3D.
- **5G connections:** This type of wireless connection greatly increased the speed of mobile communications, reduced latency and costs, and helped with energy savings.
- **Blockchain technology:** Blockchain technology has been around for several years, with the best known user of this technology being Bitcoin. However, it should be noted that this technology has the potential to change the ways in which we process and store data.

REVISION ACTIVITY

PART 1: MULTIPLE CHOICE

1.1   Which of the following is an example of memory?   (1)
    A. RAM
    B. HDD
    C. SSD
    D. GPU

1.2   Which of the following is NOT a communication device?   (1)
    A. Router
    B. Switch
    C. USB flash
    D. Wi-Fi card

1.3   Which of the following networks would a home user use?   (1)
    A. WAN
    B. LAN
    C. HAN
    D. WLAN

1.4   Which of the following storage is NOT physical?   (1)
    A. Blu-ray disk
    B. ROM
    C. Cloud storage
    D. Internal hard drive

1.5   Which of these problems has to do with the computer's software?   (1)
    A. The mouse is not responding
    B. The computer is overheating
    C. The computer cannot connect to the printer
    D. The computer keeps freezing when you run a program

                                                 [5]

PART 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Correct the statement if it is false. Change the underlined word(s) to make the statement true.

2.1   <u>SOHO users</u> are people who work at home and in small offices.   (1)
2.2   A smartphone is ideal for a <u>mobile user</u>.   (1)

2.3   When you use a keyboard, make sure that your <u>elbow</u> does not bend a lot.   (1)
2.4   A digital camera captures photographs and stores them on an <u>internal hard drive</u>.   (1)
2.5   Cache is located on the <u>hard disk,</u> while RAM is located on the <u>CPU</u>.   (1)
                                                                                                        [5]

PART 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A.   (5)

COLUMN A	COLUMN B
3.1 Over the years, Mary-Anne's computer has started performing slower	**A.** Input device
3.2 Kabelo uses loud speakers to listen to his favourite music	**B.** Output device
	C. Network error
3.3 Patrice saves all her college assignments on her flash drive so that she can access them with any computer	**D.** Processing device
	E. Printer error
3.4 Sangram uses a router to connect his smartphone to his laptop and tablet	**F.** Communication device
	G. Storage device
	H. Display screen error
3.5 Busisiwe's computer keeps disconnecting from the internet every ten minutes	**I.** Embedded device

[5]

PART 4: CATEGORISATION QUESTIONS

Classify the following pieces of hardware as input, processing, output, or communication devices.   (10)
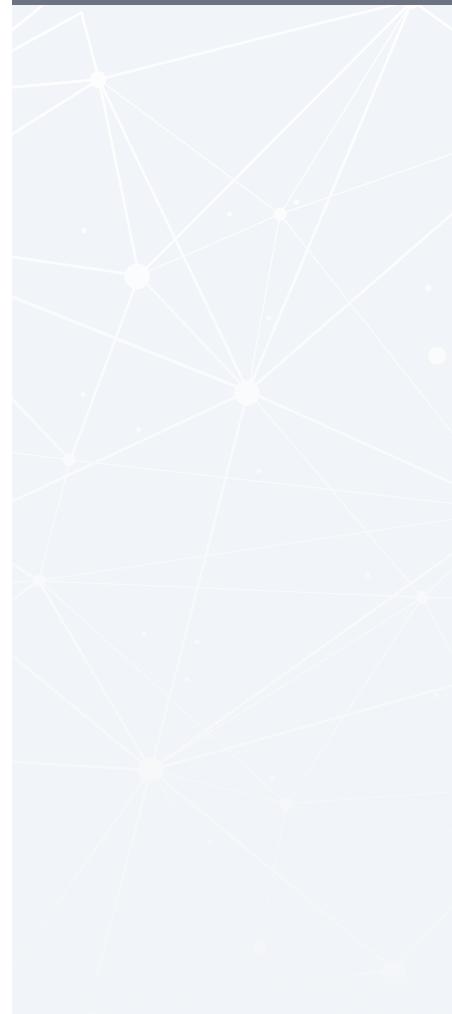
HARDWARE	TYPE OF DEVICE
4.1 Touch screen	
4.2 Headphones	
4.3 Printer	
4.4 GPU	
4.5 SSD	
4.6 Microphone	
4.7 Modem	
4.8 CD/DVD writer	
4.9 Scanner	
4.10 Router	

[10]

PART 5: MEDIUM QUESTIONS

5.1   Provide three examples of an input device that a paralysed person would use.   (3)
5.2   How do you access and use the *Optimise Drives* tool?   (5)
5.3   If you want to watch a video on YouTube, what hardware do you need? Mention ONE piece of hardware you will need for each step of the information-processing cycle.   (5)
5.4   Which do you think is better, wired or wireless input devices? Give a reason for your answer.   (2)
                                                                                                        [15]
TOTAL: [40]

AT THE END OF THE CHAPTER

NO.	CAN YOU ...	YES	NO
1.	Evaluate hardware devices?		
2.	Suggest input, output, storage and communication devices, as well as CPU and RAM; including specifying basic specifications in terms of processor, memory and storage for: • home users • SOHO users • mobile users • power users • disabled users?		
3.	Fix ordinary hardware problems?		

SOFTWARE

CHAPTER OVERVIEW	
Unit 3.1	Uses of common applications
Unit 3.2	Software enhancing accessibility, efficiency and productivity
Unit 3.3	Interpreting system requirements
Unit 3.4	Common software problems
Unit 3.5	Social implications: User-centred design

By the end of this chapter, you will be able to:

- Explain why software is important.
- Identify some of the most commonly used software applications.
- Describe how software can enhance accessibility, efficiency and productivity.
- Understand the difference between web-based and installed applications.
- Interpret software system requirements.
- Describe some of the most common software problems.
- Explain the risk of using flawed software.
- Discuss user-centred design.
- Understand the social implication of software design.

INTRODUCTION

When you think of a computer, the first thing that comes to mind will probably be the physical components (the hardware). However, a computer would not be able to function without something giving instructions to the hardware. This "something" is called software. Software is a collection of computer instructions that tells the computer how to perform specific tasks. Software, in other words, tells a computer how to work.

Figure 3.1: *Software is the instructions that a programmer has created for a computer*

To better illustrate this, let's look at the following scenario. Computer hardware is like a team of workers that can do many different jobs – for example, dig holes, mix cement, join wood, lay bricks, fit glass, pour a foundation, build a roof, and so on. The computer software is the lead builder, who tells each worker exactly what to do, where to do it and when to do it in order to build the house.

In this chapter, we will take a closer look at some of the most commonly used computer applications, as well as software that enhances your productivity and efficiency. We will also discuss the most common software problems and why it is risky to use faulty software.

3.1 Uses of common applications

Application software is a type of software that allows the user to perform a specific personal, educational, or business-related function. In short, application software refers to the computer programs that we use on a daily basis. Examples of these include the following:

- Word processing
- Spreadsheet
- Database
- Presentation
- Email
- Document management
- Web browsers

WORD-PROCESSING SOFTWARE
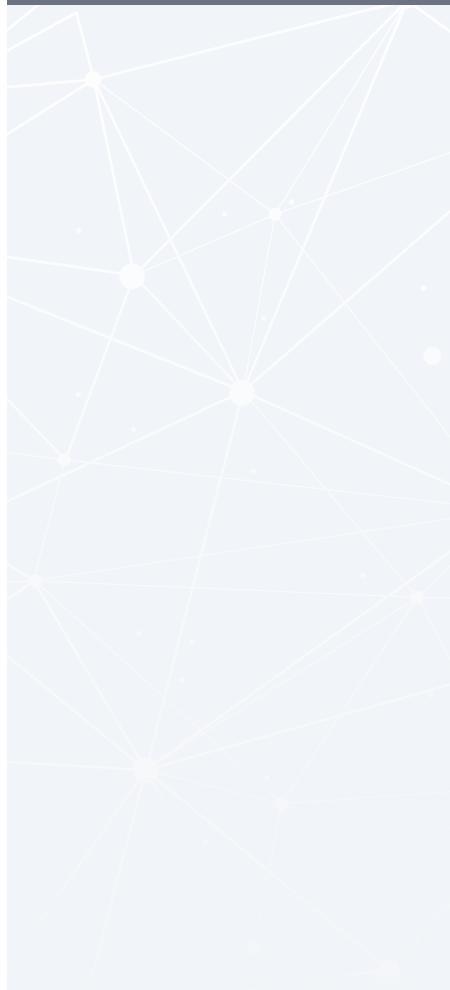
Word-processing software is a type of program that allows the user to compose, edit, format, save and print typed documents. Let's take a look at some of the other features of word-processing software:

- **Graphics:** Word processors contain a variety of different backgrounds, clipart and colours that can be used. It also allows you to add images, photos and videos obtained from an external source.
- **Templates:** Word processors possess the ability to create templates that can be used to standardise documents. This is extremely useful if you have to write multiple documents that cover the same topics.
- **Spell checker:** Word processors come equipped with a built-in spell checker that will check your spelling and grammar. You can update the spell-checker's database to include words that are not used very often, for example scientific names, such as *Beauveria bassiana*.
- **Thesaurus:** Word processors come equipped with a built-in thesaurus that will suggest similar words to the word that you are currently using.

If you are writing a letter, doing an assignment, or making a few notes, there are a few word-processing software applications that you can use. Table 3.1 shows examples of these.

Table 3.1: *Types of word-processing software*

PAID	FREE	ONLINE	
Microsoft Word	LibreOffice	Google Docs	Office 365

INSTALLED APPLICATIONS VERSUS WEB-BASED APPLICATIONS

Installed applications are applications that can be accessed on your computer without the need of an internet connection. Installed applications refers to software that is permanently installed onto the hard drive of the computer

The following table lists some of the advantages and disadvantages of using installed software.

Table 3.2: *The advantages and disadvantages of using installed software*

ADVANTAGES	DISADVANTAGES
No internet connection is needed	The user must install the application on the computer before using it
Installed applications offer users with more features and functions	When the user installs the software on one computer and he or she can only access it on that computer
Data is stored on the local disk of the computer	User is responsible for backing up and saving data
Allows for faster data entry and reporting as data does not need to be uploaded to the internet	Applications take up storage space on the user's computer, which results into less disk space
	Software might need to be updated, which requires an internet connection

Web-based applications are stored on servers on the Internet or an Intranet. Users need an internet connection to access the software.

Table 3.3: *The advantages and disadvantages of using web-based software*

ADVANTAGES	DISADVANTAGES
Software does not take up any disk space on the computer	Requires an internet connection
Data is managed and backed up by the software providers	Application might be slower than an installed application due to internet speed
Can be used anywhere, provided one has an internet connection	Interfaces of web-based applications are not always as highly developed as those on installed applications
In large organisations, all the computers with a web browser can access the application without any individual installations being needed	Data is not always safe and secure on the internet
Users do not need to update the application on their computer because it will be updated on the server where the application is hosted	The web browser needs to be compatible with the web-based application

When trying to decide whether to use installed or web-based programs, look at your personal needs and situation. For example, if you do *not* have an active internet connection, web-based applications will not work.

SPREADSHEET SOFTWARE

Spreadsheet software is a type of program that sorts, arranges and analyses data in a table format. The user enters data into the columns and then the software performs various calculations.

Let's take a look at some of the other features of spreadsheet software:
- **Forms:** The user can create forms that can be used for a variety of applications, including time sheets, surveys and review forms.
- **Data analysis:** The user can analyse the data that is entered into the workbook cells. This can be done using a variety of formulae available in the workbook, or through graphs (which can be created automatically with the *Insert Graph* function).
- **Conditional formatting:** The user can customise the data based on the content of the cells in the workbook. This can be used to highlight errors, identify important patterns in data, or to keep track of activities (for example, to show which employees have not been signing in with their time sheets).
- **Sorting and filtering:** Spreadsheets may contain a huge amount of data. To make it easier to find the data you need, spreadsheet software can sort and filter the data, based on your requirements.
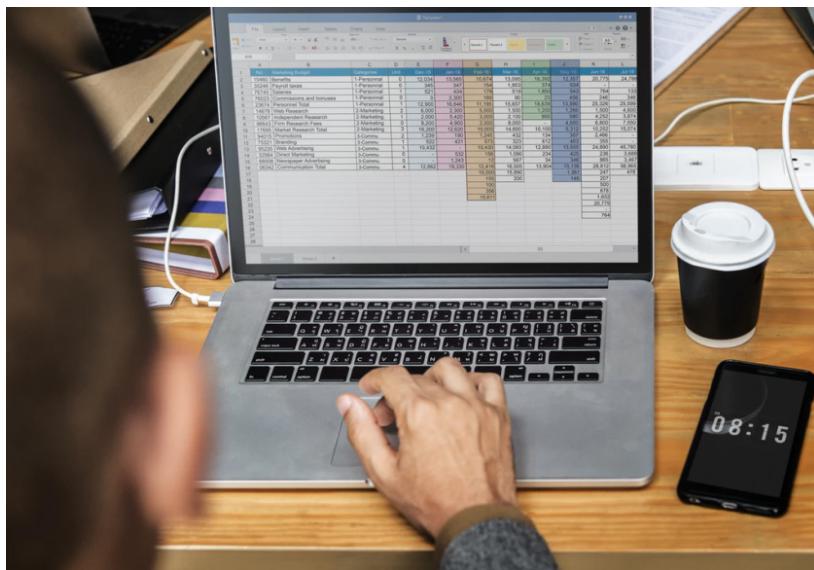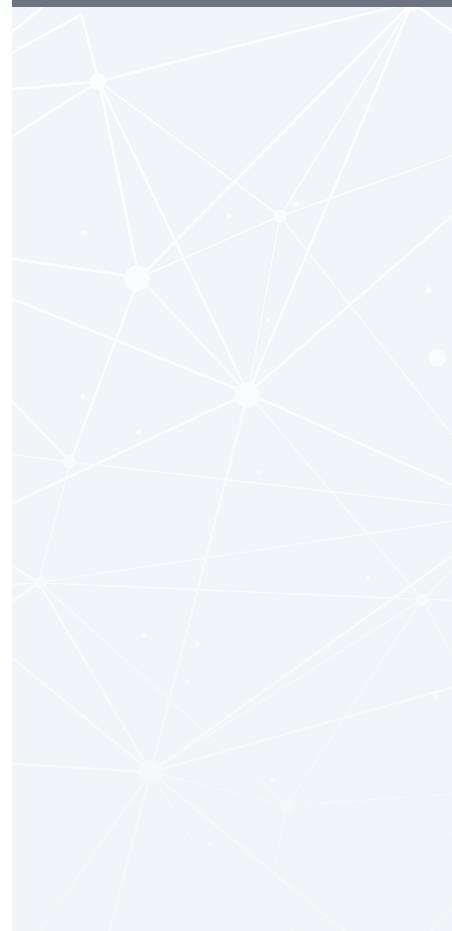
Figure 3.2: *Spreadsheets*

The following table lists some examples of spreadsheet software.

Table 3.4: *Types of spreadsheet software*

PAID	FREE	ONLINE
Microsoft Excel	LibreOffice	Google Sheets

DATABASE SOFTWARE

Database software is designed to create and manage databases. A database is an organised collection of data, usually stored in the form of structured fields, tables and columns. With database software, the user can create, edit and maintain the database files, and sort, search for and retrieve information when needed.

Let's look at some of the other features of database software:

- **Security:** One of the biggest concerns when working with data is how secure it is. With database software, a user can protect his or her data by giving only specific people access to the data.
- **Permanent storage:** Database software makes it possible to create a database that can store data permanently. To help with this, the software is equipped with a file backup and recovery system.

The following table shows some examples of database software.

Table 3.5: *Types of database software*

PAID	FREE	ONLINE
Microsoft Access	MySQL	Amazon SimpleDB
Microsoft SQL Server		

PRESENTATION SOFTWARE

Presentation software is specifically designed to help the user create and edit presentations in the form of a slide show. Presentations can include text, videos, or images.

Let's take a look at some of the features of presentation software:
- **Animation effects:** Animation effects allow the user to add animations to the text and images on the slides. This helps to give the presentation a more interactive feel.
- **Slide notes:** Slide notes allow the user to add notes and comments to each slide. This is especially useful to add a description for an image or video.
- **Transitions:** Transitions allow the user to customise how the slides change when going from one slide to the next. This can help make the presentation "feel" like it is a video.

Figure 3.3: *Presentation templates*

The following table lists some of the examples of possible presentation software.

Table 3.6: *Types of presentation software*

PAID	FREE	ONLINE
Microsoft PowerPoint	Apache OpenOffice Impress	Google Slides

EMAIL SOFTWARE

Email software makes it possible for a user to compose and send email messages to other people using the internet, as well as to receive such messages. Email messages can include text, videos and images.

Let's take a look at some of the other features of email software:
- **Address book:** The address book allows the user to store and sort the email addresses of friends, family and work colleagues.
- **Mailing list:** This makes it possible to send one email to multiple recipients.
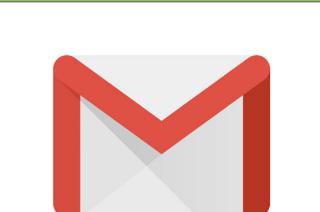
Figure 3.4: *Using email software*

The following table lists some of the examples of email software.

Table 3.7: *Types of email software*

YAHOO	OUTLOOK	GMAIL
YAHOO! MAIL	Outlook	M

DOCUMENT MANAGEMENT SOFTWARE

Document management software is a type of program that allows the user to store, manage, and track electronic documents and images. One of the ways in which this is done is by converting the document to a PDF format, as it prevents the user or recipients from mistakenly making any changes to the document.

Let's take a look at some of the other features of document management software:

- **Password protection:** This allows you to encrypt and protect your documents. Only people who have the correct password will be able to access and read the documents.
- **Restricted access:** Restricting the access to your documents allows only certain people to view specific documents. As with password protection, this helps to protect your documents.
- **Version control:** The software helps maintain version control by enabling you to see all the versions of a specific document, including its latest version.

Figure 3.5: *Organising documents through software*

WEB BROWSERS

A web browser is a software application that allows the user to access information on the internet. This is done by allowing the user to open and view web pages.
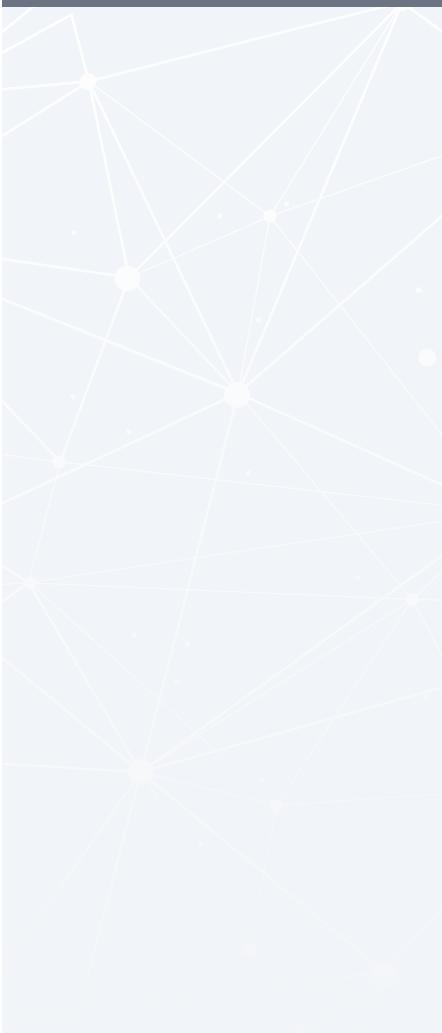
Examples of web browsers include the following:

- **Microsoft Edge:** This web browser comes pre-installed with any computer that runs on Windows 10.
- **Google Chrome:** This is a free web browser developed by Google.
- **Firefox:** This is a free open-source web browser developed by Mozilla.

Figure 3.6: *Types of web browsers*

1. Write down the correct answer for each of the following questions.
   a. Which of the following are some of the features of email software?
      A. Accessibility, multimedia, hyperlinks, updated
      B. Password protection, restricted areas, version control
      C. Instant messaging, address book, antivirus, mailing list
      D. Security, permanent storage
   b. Which of the following are some of the features of spreadsheet software?
      A. Instant messaging, address book, antivirus, mailing list
      B. Forms, data analysis, conditional formatting, sorting and filtering
      C. Graphics, templates, spell checker, thesaurus
      D. Accessibility, multimedia, hyperlinks, updated
   c. Which of the following are some of the features of presentation software?
      A. Graphics, templates, spell checker, thesaurus
      B. Password protection, restricted areas, version control
      C. Accessibility, multimedia, hyperlinks, updated
      D. Animation effects, slide notes, transitions

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Software you can access over the internet	A. Database software
2.2 Software that sorts, arranges and analyses data in a table format	B. Email software
2.3 Software that is designed to create and manage databases	C. Presentation software
2.4 Software that allows the user to store, manage and track electronic documents and images	D. Spreadsheet software
2.5 Software that allows the user to compose, edit, format, save and print typed documents	E. Web-based application software
2.6 Software that is specifically designed to help the user create and edit presentations in the form of a slide show	F. Word-processing software
2.7 Software that makes it possible for a user to compose, send and receive email messages to and from other people using the internet	G. Document management software

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. Firefox is a web-browser developed by Microsoft.
   b. Wikipedia is a free, online email software.
   c. Google Maps is a free reference software, but it cannot work without an internet connection.
   d. The serial key required for activating installed software is legally and freely given on the software application's website.
   e. One of the biggest concerns when working with data is the internet connection.
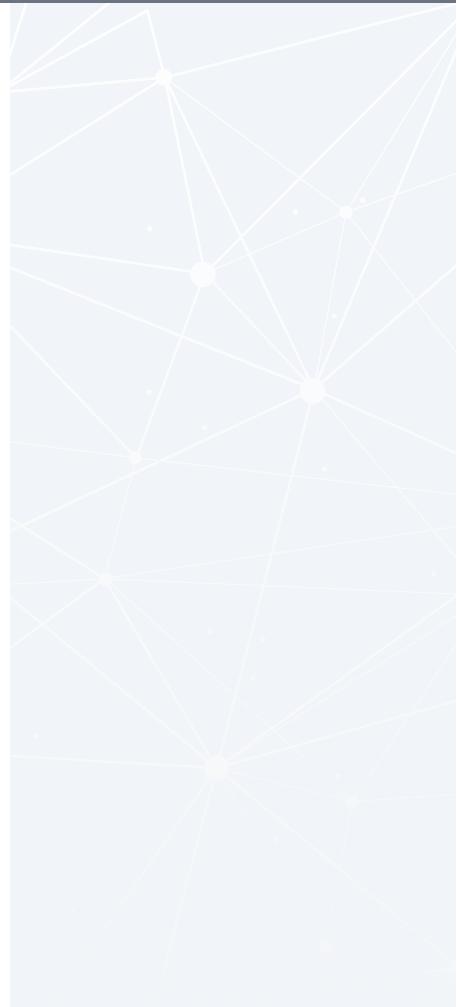
… continued

4. Answer the following questions:
   a. What advantages do web-based applications have over installed applications?
   b. A big disadvantage of web-based software is that an internet connection is required. Is this a limiting factor for most South Africans? Explain why.
   c. List one example of each type of free software.
   d. Name and explain four features of word-processing software, and give instructions on the necessary steps that have to be taken in order to use these features.
   e. While installing software, you were not required to enter a product key. Give a reason as to why this occurred.

In previous sections, we looked at why software is important. We also looked at the most commonly used programs. However, the usefulness of software is not just limited to you being able to use your computer. Software can also play an important role in helping to increase your efficiency and productivity, as well as improve the lives of people with disabilities.

To better illustrate this, we will look at the following examples of software that make our lives easier:
- Voice-recognition software
- Typing tutor or keyboarding skills
- Note-taking software
- Cloud applications

VOICE-RECOGNITION SOFTWARE

Voice-recognition or speech-recognition software is a type of program that allows the computer to take verbal commands from the user and then interpret them. It does this by converting the audio that is received from the microphone, to digital signals that the computer can understand. The signals are then compared to a database containing words and phrases, as well as the actions that should be performed.

Voice recognition has many advantages that help to make our daily lives better, including the following:
- Helping people with physical disabilities to use a computer
- Giving the option to make phone calls without having to touch a phone (which is very useful when driving especially)
- Using the software to search for information on the internet, for example using Siri or Alexa to search for a recipe while cooking
- Improving productivity as you can talk much faster than you can type or write
- Improving security, as your voice can be used as a security measure to help protect your data

HOW VOICE RECOGNITION WORKS | CADILLAC

https://www.youtube.com/watch?v=cSsnYmopB8M

Figure 3.7: *Voice-recognition software installed on a smartphone*

The following table lists some examples of voice-recognition software.

Table 3.8: *Types of voice-recognition software*

PAID	FREE	ONLINE
Dragon Professional Individual	Windows 10 Speech recognition (this is included with the Windows operating system) Google Docs Voice Typing	Google Docs Voice Typing

TYPING TUTOR OR KEYBOARDING SKILLS

A **typing tutor** is a type of software that teaches a user how to use the keyboard more effectively and accurately, as well as improve typing stamina and speed. The program supplies exercises in which the user must type certain words and phrases within a specific timeframe.

In order to make these activities more fun and interactive, many typing tutor programs have been designed in the form of a game. An example of this is the game "Typing War Master". In this game, the objective is to protect your town by typing the words contained within the bombs falling from the sky. If you type the word correctly, the bomb disappears. If you mistype a word, the bomb falls and destroys a part of your town.

The following table lists some examples of typing tutors.

Table 3.9: *Types of typing tutors*

PAID	FREE	ONLINE
Typesy	RataType	Speed Typing Online

NOTE-TAKING SOFTWARE

Much like taking notes on a notepad, note-taking software allows the user to take digital notes on the computer. The notes are then recorded, organised and stored in a single place, allowing the user to search for specific documents without any hassle.

Note-taking software is not limited to just text; you can include images and videos. Let's take a look at some of the advantages of note-taking software:
- Your notes are stored on your computer, preventing them from getting lost.
- Your notes are always at hand and can be accessed as long as you have your smartphone or computer with you. There is also no risk of running out of pages on which to write.
- Note-taking software enables you to search for specific topics and information. This makes it much easier for you to work through the notes.
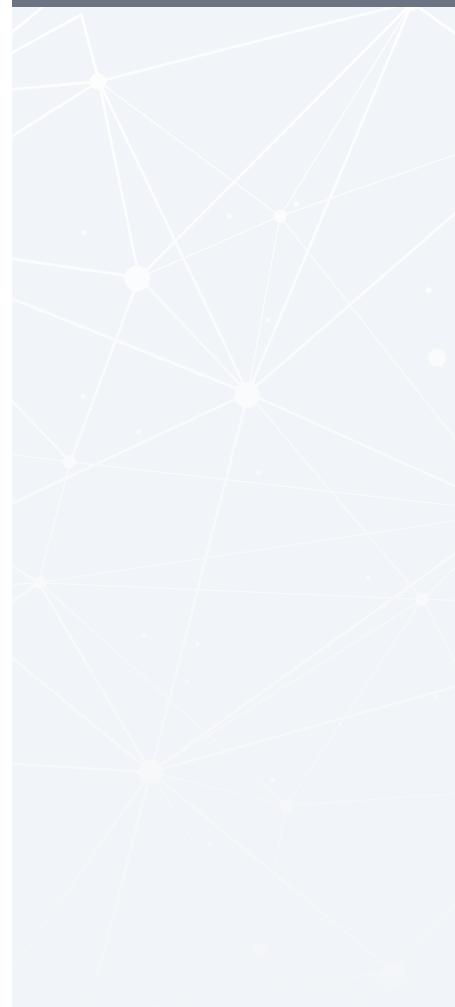
Figure 3.8: *Note-taking software installed on a tablet*

The following table lists some examples of note-taking software.

Table 3.10: *Types of note-taking software*

PAID	FREE	ONLINE
Evernote Microsoft OneNote	Evernote (can upload 60 Mb free per month)	Simplenote

CLOUD APPLICATIONS

Cloud computing is a new technology that allows the user to store information, or use applications on the internet, instead of being on his or her own computer. It uses a network of remote servers to maintain data storage and software applications so that the user can access the service from any device that can connect to the internet.

Let's take a look at the following examples of cloud computing applications:
- Email services, such as Gmail
- Cloud storage, such as OneDrive and Dropbox

The main advantage of cloud computing is that it allows the user to store large amounts of data and information, without the worry of running out of hard-drive space, or having to purchase expensive software applications.

The advantages of cloud computing are:
- It saves the cost of maintaining your own IT equipment.
- It is available 24/7.
- It offers backup and recovery functions.
- It uses automatic software integration.

The disadvantages are:
- Sometimes users experience technical issues.
- Security concerns in the cloud.
- It could be prone to attacks.
- Need internet connection.

Activity 3.2

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
1.1 A type of program that allows the computer to interpret voice commands from the user	A. Note-taking software
1.2 A software where the user can take digital notes on the computer	B. Simplenote
1.3 An online note-taking software	C. Voice-recognition software
1.4 An online voice-recognition software	D. Dragon Professional Individual
1.5 A note-taking software for which you pay	E. Microsoft OneNote
	F. Evernote
	G. Notepad
	H. Google Docs voice typing

2. Answer the following questions:
   a. Give three advantages of note-taking software.
   b. How does note-taking software help the environment?
   c. Give three advantages of voice-recognition software.
   d. Name an example of free and paid-for voice-recognition software.
   e. One of the advantages of voice-recognition software is that it increases productivity. Explain through the use of an example why this is so.

3.3 Interpreting system requirements

By now you know that all computers are made up of hardware and software. A computer will not function properly if it receives instructions from software that it cannot carry out. It is, therefore, very important that you get the correct software for your hardware.

SYSTEM REQUIREMENTS OF SOFTWARE

In order to determine which software would work best for your computer, you will need to look at the system requirements of the software. The system requirements refer to a list of hardware and software requirements that the software will need in order to function. The list will normally include the **minimum** (the lowest specifications needed to let the program work) and **recommended** (the specifications where the program should function best) hardware requirements for the software. This includes the following:

- The amount of hard-drive space needed to install the software
- The amount of RAM needed for the software to function normally
- The GPU and CPU required to do calculations
- The type of programs (usually the type of operating system) that is required for the new program to function
- The input and output device needed for data to be collected and displayed

The following table is an example of the system requirements that software might need in order to function.

Table 3.11: *System requirements to play a game called "World of Warcraft"*

COMPONENTS	MINIMUM	RECOMMENDED
Operating system	Windows 7 64-bit	Windows 10 64-bit
Processor	Intel® Core™ i5-760, or AMD FX™-8100, or better	Intel® Core™ i7-4770, or AMD FX™-8310, or better
Video	NVIDIA® GeForce® GTX 560 2 Gb or AMD™ Radeon™ HD 7850 2 Gb or Intel® HD Graphics 530 (45W TDP)	NVIDIA® GeForce® GTX 960 4 Gb or AMD™ Radeon™ R9 280, or better
Memory	4 Gb RAM (8 Gb for Intel HD Graphics 530)	8 Gb RAM
Storage	70 Gb available space 7 200 RPM HDD	70 Gb available space SSD
Internet	Broadband internet connection	Broadband internet connection
Input	Keyboard and mouse required; other input devices are not supported	Multi-button mouse with scroll wheel
Resolution	1 024 × 768 minimum display resolution	1 024 × 768 minimum display resolution

The following table is an example of the basic system requirements for entry-level computers – for personal or SOHO users.

GENERAL SYSTEM REQUIREMENTS FOR PC (E.G. STUDENT LAPTOP)	SOFTWARE FOR PC
• Intel Core i3 processor • 4 GB RAM • 500 GB HDD • Wireless Ethernet (802.11 g/n) • Windows 10 • Microphone and camera	• **MS Office for PC 2013 to 2019 or Office 365** • **Adobe Reader (PDF Reader):** Many of the documents shared with students are in .pdf format. You will need this software to download and read these documents. The program can be downloaded for free at: www.adobe.com • **Oracle Java Runtime:** Oracle Java Runtime is a free web-browser plug-in that enables interactive media experiences, rich business applications and immersive mobile apps. The system requirements for Oracle Java Runtime and the following associated technologies: (Windows Operating System: Windows 7, Windows 8, Windows 10) (Intel® Pentium® III 450MHz or faster processor or equivalent) (4GB of RAM) at www.java.com. *Note: Most browsers require that Java be enabled in the preferences.* • **Adobe Shockwave:** Adobe Shockwave is a free web-browser plug-in that enables interactive media experiences, rich business applications and immersive mobile apps. The system requirements for Adobe Shockwave and the following associated technologies: (Windows Operating System: Windows 7, Windows 8, Windows 10) (Intel® Pentium® III 450MHz or faster processor or equivalent) (4GB of RAM) at www.adobe.com

Activity 3.3

1. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. If your <u>software</u> does not meet the system requirements, it means that the software will not work.
   b. Running out of <u>RAM</u> may cause programs to stop working.
   c. Certain programs cannot work if you do not have the right <u>operating system</u>.
   d. <u>Modern laptops</u> (after 2009) meet systems requirements for Office packages (for example, Microsoft Word, Microsoft Excel and Microsoft PowerPoint).
   e. A computer will not function properly if it contains <u>software</u> instructions that cannot be performed by the hardware.
2. You have recently purchased the Dell laptop described below.
   The requirements to run Windows 10, an image editing software and two games are given.
   Use the information given to answer the questions that follow.

Minimum requirements, *Call of Duty 4:* Modern Warfare 2	**Recommended requirements, *Call of Duty 4*:** Modern Warfare 2
OS: Win 7 × 64	OS: Win 10 × 64
Processor: Intel Core i3-530 2.9 GHz / AMD Phenom II X4 810	Processor: Intel Core 2 Duo E8500 3.16 GHz / AMD Athlon II X3 415e
Graphics: AMD Radeon HD 7850 or NVIDIA GeForce GTS 450 v4	Graphics: AMD Radeon R7 265 or NVIDIA GeForce GTX 750 Ti
VRAM: 1 Gb	VRAM: 2 Gb
System Memory: 6 Gb RAM	System memory: 6 Gb RAM
Storage: 55 Gb hard-drive space	Storage: 55 Gb hard-drive space
DirectX 11 compatible graphics card	

Figure 3.9: *A scene from "Call of Duty 4"*
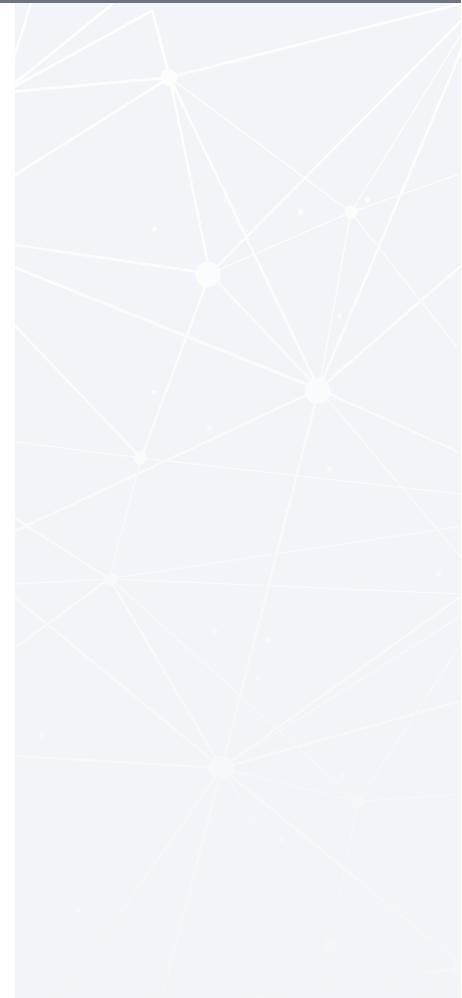
… continued

Activity 3.3

a. What difference does it make to your computer when you run a program that makes the minimum requirement, compared to a program that is run at the recommended requirements?
b. Does the Dell laptop have the minimum requirements for Windows 10? Show how you came to this answer.
c. What does OS mean in the "Call of Duty" game requirements?
d. What does display resolution 1 366 × 768 mean?
e. What is meant by "touch display"?
f. Give an example of an image editing software program.
g. Can the "Call of Duty: Modern Warfare 2" and image editing software be installed on the laptop?
h. List the different processors' names in the advertisements and sort them from fastest to slowest.

3.4 Common software problems

As with most things in life, software comes with its own problems. Programmers often make small errors when they write the code for software. The process is further complicated by the fact that most software is designed to be used by a variety of different users, on many different computers and operating systems.

UPDATING SOFTWARE

It is very difficult for developers to test the software for each possible mistake that might occur. Because of this, software developers use software updates to fix any problems that have been identified once the software has been released. The updates also include improvements to program performance, stability and security, as well as new program features.

Software developers regularly release updates in the form of update patches. These patches can vary in size, depending on the amount of new program information contained within the patch. The patches can be downloaded from the developer's website. However, most programs have a setting that automatically updates the program whenever an update is available. This setting can be changed so that it asks your permission to update the program. This is especially useful if you have limited bandwidth.

READ-ONLY FILES

Read-only files allow users to open and read the file, but no changes can be made to the file. This protects data from being changes on purpose or by accident.

If you find that you cannot save or edit a file, it may be that the file had accidentally been changed to "read-only". This problem might occur due to software updates that contain a faulty code. Despite this, software developers are quick to release updates to fix this issue.

The term **Software versioning** is defined as a way to categorise the unique levels of computer software as it is developed and released. The identifier can be a number, a word, or both. For example, version 1.0 is commonly used to denote the initial release of a program.

A **software upgrade** is a new version of the software that offers a major improvement over the current version of your software. In many cases, a software upgrade requires you to purchase the new version of the software, sometimes at a discounted price if you own an older version of the software.

Follow these steps to turn off the read-only setting:
1. Go to the file you are trying to edit.
2. Right click the file and select *Properties* from the options list. This will open a new *Properties* window.
3. At the bottom of the *Properties* window, under *Attributes*, cancel the *Read-only* option selection.

4. Click *OK* at the bottom of the *Properties* window.
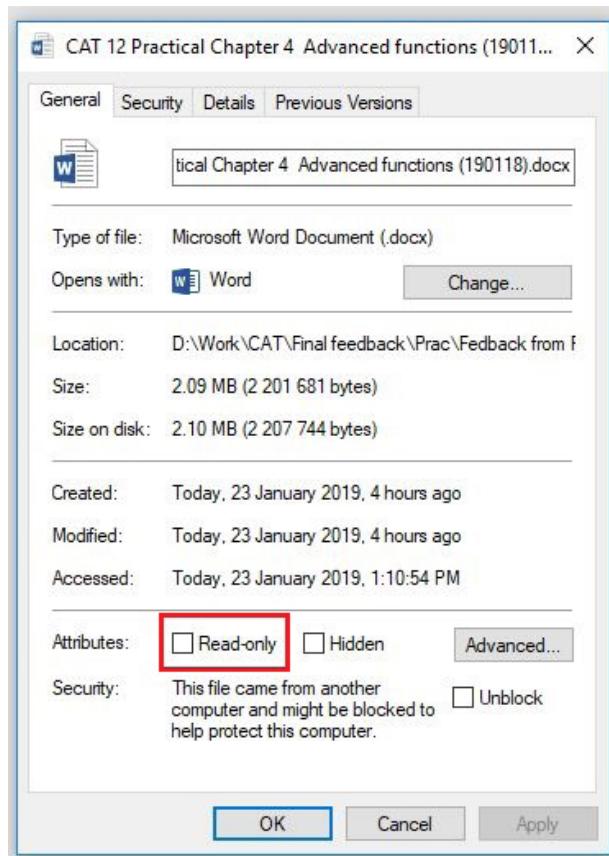
Figure 3.10: *Turning off the "Read-only" setting*

Something to know

Software developers use read-only files by selling their software on CDs/DVDs. This allows you to install the program onto your computer, but will prevent you from making changes to the installation files on the CD/DVD. That way, even if you make changes to the program on your computer, you will always have the CD/DVD containing the original program.

Once you have turned off the read-only attribute of the file, you should be able to edit and save the file as normal.

RISKS OF USING FLAWED SOFTWARE

As we have stated previously, not all software is perfect. Some software might contain flaws or bugs that will cause the system to produce an incorrect or unexpected result. Using such software has certain risks associated with it. These risks include the following:
- **Security risks:** Faulty software might not be fully secure and can contain flaws that people with malicious intent can exploit in order to access your computer and steal your data.
- **Underperformance:** Faulty software might cause your computer to underperform due to slow system response and transaction rates.
- **No performance:** Faulty software can lead to program and computer crashes. This might require you to restart your computer.

- **Navigation risks:** Faulty software can cause programs that use a global positioning system (GPS) to give inaccurate results. This can lead to the user getting lost and wasting a lot of time trying to determine how to get to his or her destination.
- **Economical risks:** Faulty software used to make payments to workers can lead to some workers getting paid more than intended, while others might not get paid at all.

When you encounter a fault or bug in software, you should report the fault to the software developers. This can be done on the software's Home page. Make sure to include as much information as possible, including what the error is, how it occurred and how often it occurs. By letting the developers know of the fault, you will help to ensure that all users have a fault-free program to use.

Activity 3.4

1. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. Software updates include improvements to program performance, stability and <u>improved access.</u>
   b. Software developers use <u>write-only</u> files by selling their software on CDs/DVDs.
   c. <u>Faulty software</u> leaves space for people with malicious intent to exploit the user.
   d. Flawed software can lead to problems, such as security risks, underperformance and <u>overperformance</u>.
2. Answer the following questions:
   a. What is the difference between a service pack and a patch?
   b. How do read-only files work?
   c. Is it possible for a home user to change a file's attribute to or from "Read-only"? If so, explain how this can be done.
   d. Name and describe five risks associated with using flawed software.
   e. How can you minimise the risk of faulty or flawed software?
3. Bongi has recently downloaded a music album. She has a certain way of naming her music files, but is having trouble in trying to rename them.
   a. Why do you think Bongi is having this problem? Name at least two possible causes.
   b. Explain in detail how Bongi should go about fixing the problems mentioned in your previous answer.

3.5   Social implications: User-centred design

User-centred design (UCD) is a design process whereby the developers design software based on the focus and needs of the users. This involves a four-phase process:
1. Identify how the user will use the product
2. Determine the user's requirements
3. Design the product
4. Evaluate the product according to the user's needs, requirements and product performance
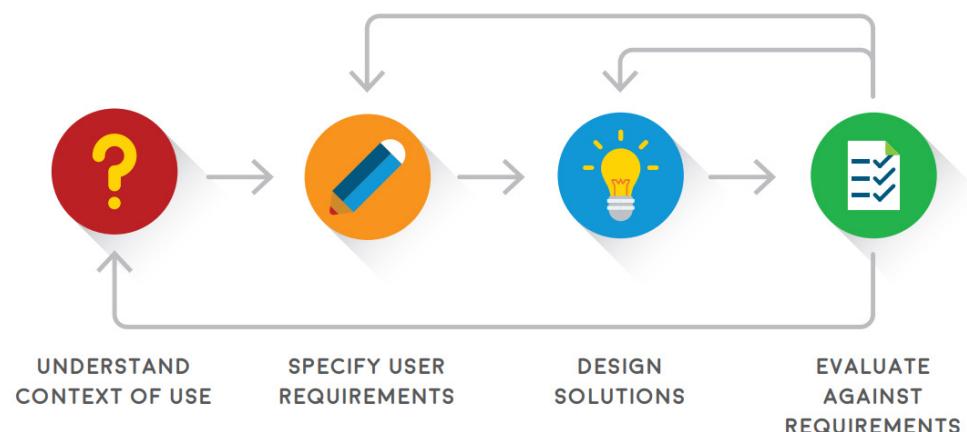
Figure 3.11: *The process of user-centred design*

Based on the evaluation of the product, the whole process might be moved back one step, or even restarted from the beginning.

Advantages of UCD include the following:
- **Meeting customers' expectations:** This will lead to an increase in sales and lower costs caused by returns and customer support.
- **Safer products:** Because UCD focuses on the user, products can be designed for specific tasks. This reduces the risk that the product will be used for the wrong task.
- **No training:** UCD allows products to be designed in a user-friendly manner. This reduces the amount of training needed to use the product and ensures that customers are not frustrated by using it.
- **Designing websites:** UCD plays an important role when designing a new website, as users need to be able to navigate and find what they are looking for without having any problems. The following factors should be considered when designing a website:
    - Visibility
    - Accessibility
    - Legibility
    - Language
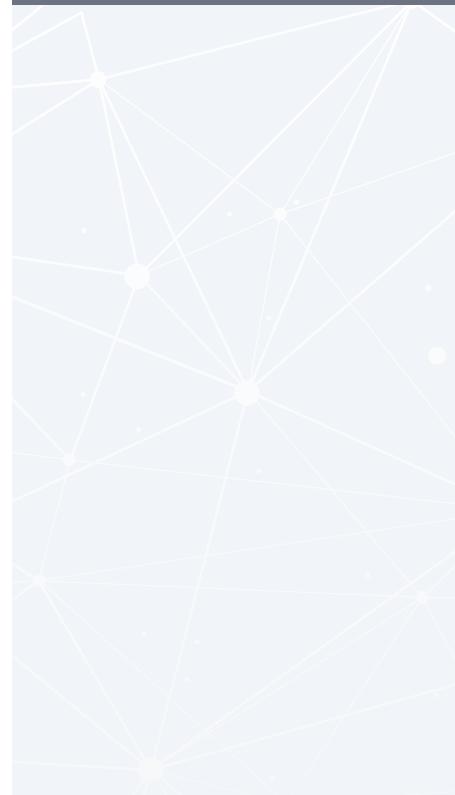
Figure 3.12: *An example of a bad website design*
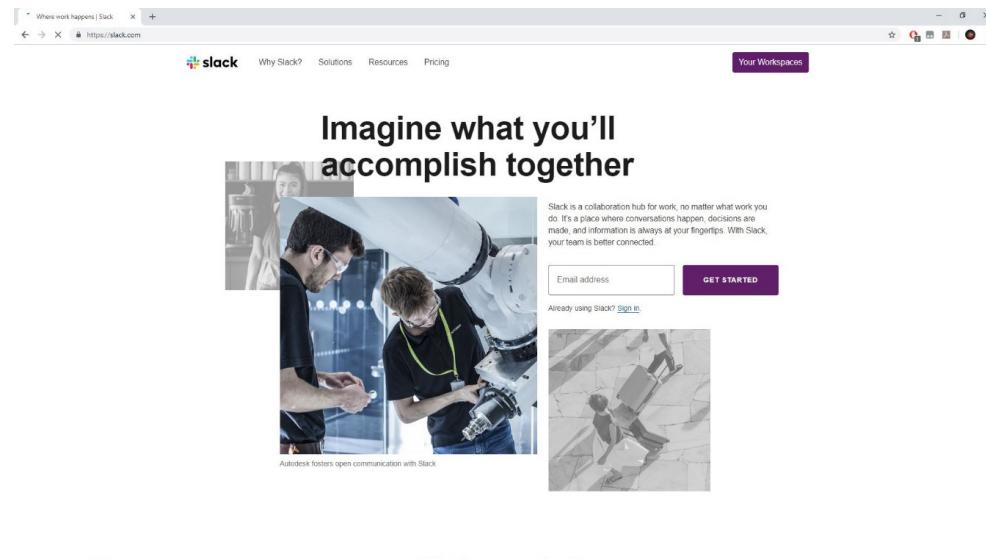
Figure 3.13: *An example of a good website design*

- UCD makes it easier for a user to enter data into a database, as it ensures that the user enters the correct information where needed. The following factors should be considered when designing a database:
  - Purpose of the database
  - Type of data being stored
  - Data fields required for data entry
  - Data-validation techniques to protect data entry
- UCD assists in making presentations easier to present and understand. This can be done in the following ways:
  - Keep bullet points and text to a minimum
  - Avoid using too many transitions
  - Use high-quality images
  - Use the white space (blank space); avoid cluttering the slide with too much information and unnecessary images
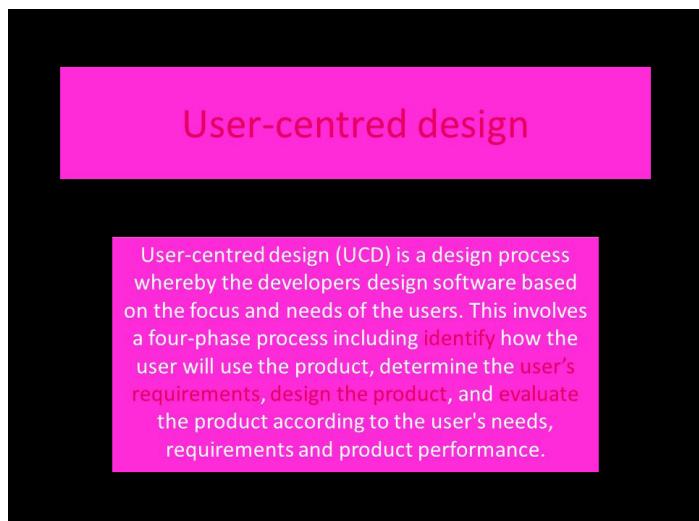
Figure 3.14: *An example of a bad presentation slide*
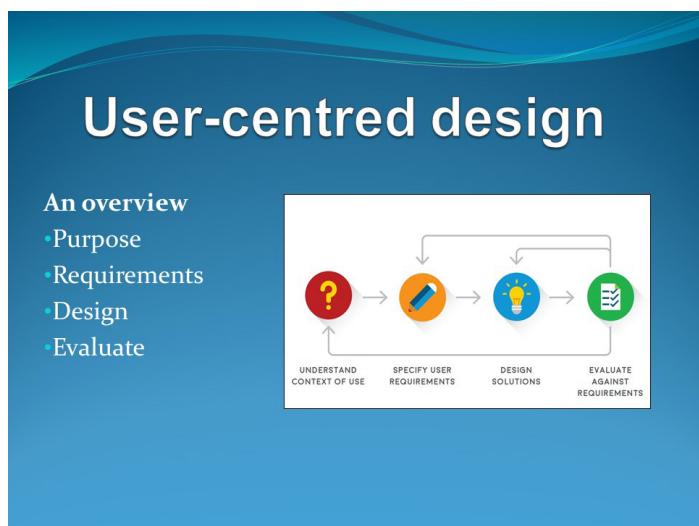
Figure 3.15: *An example of a good presentation slide*
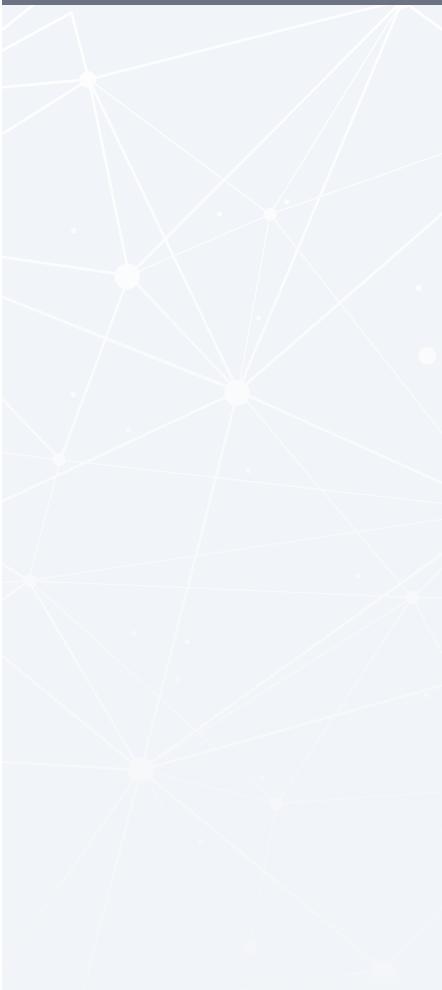
Activity 3.5

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
1. Third step in the UCD process	A. No training needed
2. A factor to be considered when designing a website	B. Understand context of use
3. One of the advantages of using UCD	C. Yes
4. Are visuals an important factor in website design?	D. No
5. The step in UCD that has input in the first step of UCD	E. Accessibility
	F. Design method
	G. Design solutions
	H. Evaluate against requirements

QUESTION 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A. (5)

COLUMN A	COLUMN B
3.1 A secure way of storing your data	**A.** Read-only files
3.2 Software that allows you to add animation effects to text	**B.** Document management software **C.** Presentation software
3.3 A document that does not allow you to edit, rename, or save changes to it	**D.** Typing tutor **E.** Minimum system requirements **F.** Cloud applications
3.4 The system requirements needed to make a program work	**G.** Recommended system requirements
3.5 Software that makes use of **encryption** and passwords to protect your information	**H.** Updating software

[5]

QUESTION 4: CATEGORISATION QUESTIONS

Using the following table, determine which applications are used for the following software. Copy and complete the table. (8)

- Word-processing software
- Spreadsheet software
- Database software
- Presentation software
- Reference software
- Email software
- Web browsers
- Document management software

SOFTWARE	APPLICATION
4.1 Microsoft PowerPoint	
4.2 Google Maps	
4.3 FileInvite	
4.4 Opera	
4.5 MySQL	
4.6 Microsoft Outlook	
4.7 Wikipedia	
4.8 Microsoft Excel	

[8]

REVISION ACTIVITY

QUESTION 5: SCENARIO-BASED QUESTIONS

5.1 Recently, Sizwe's computer programs have been running very slowly and providing him with constant error messages. Since he bought his computer two years ago, he has never allowed his computer to access the internet.

    a. What kind of software problem do you think Sizwe has? (1)

    b. Give two reasons why it is important for Sizwe to address this problem? (2)

    c. Now that Sizwe has started to access the internet more regularly, he has noticed that some websites do not work on his current web browser. Mention two things that could be causing this problem. (2)

    d. Sizwe decides to update all the software on his computer, but some of them do not want to update. Give two reasons why this might be happening and provide a solution to each problem. (4)

    e. Explain to Sizwe the difference between minimum requirements and recommended requirements. (4)

5.2 The Tinder dating app revolutionised online dating, so much so that it made a social-cultural impact.

    a. Do you think that the creator of the app used the UCD process when creating the app? Give two reasons for your answer. (2)

    b. Provide two advantages of using the UCD process. (2)

    [17]

TOTAL: [40]

AT THE END OF THE CHAPTER

NO.	CAN YOU …	YES	NO
1.	Explain why software is important?		
2.	Identify some of the most commonly used software applications?		
3.	Describe how software can enhance accessibility, efficiency and productivity?		
4.	Explain the difference between web-based and installed applications?		
5.	Interpret software system requirements?		
6.	Describe some of the most common software problems?		
7.	Explain the risk of using flawed software?		
8.	Discuss UCD?		
9.	Explain the social implication of software design?		

NETWORKS

CHAPTER OVERVIEW
Unit 4.1   Networks
Unit 4.2   Internet services
Unit 4.3   Internet connections

By the end of this chapter, you will be able to:

- Discuss a wide-area network.
- Explain what the internet is.
- Identify and explain various internet services.
- Identify and explain government internet services.
- Discuss the concepts of broadband and bandwidth.
- Explain throttling and shaping.

INTRODUCTION

The internet is one of the largest, most powerful and entertaining inventions ever made by humans. It has brought us a wealth of information, it has enabled us to conduct business from our homes, it connects millions of people and it provides an endless source of entertainment. But how exactly does it work? In order to answer this question, we will be taking a look at the basis of the internet – i.e. the network.

In this chapter, we will look at a wide-area network (WAN), as well as the best-known wide-area network, the internet. We will discuss how to obtain an internet connection and give some examples of internet services. Finally, we will explain broadband and bandwidth, and how they are affected by throttling and shaping.
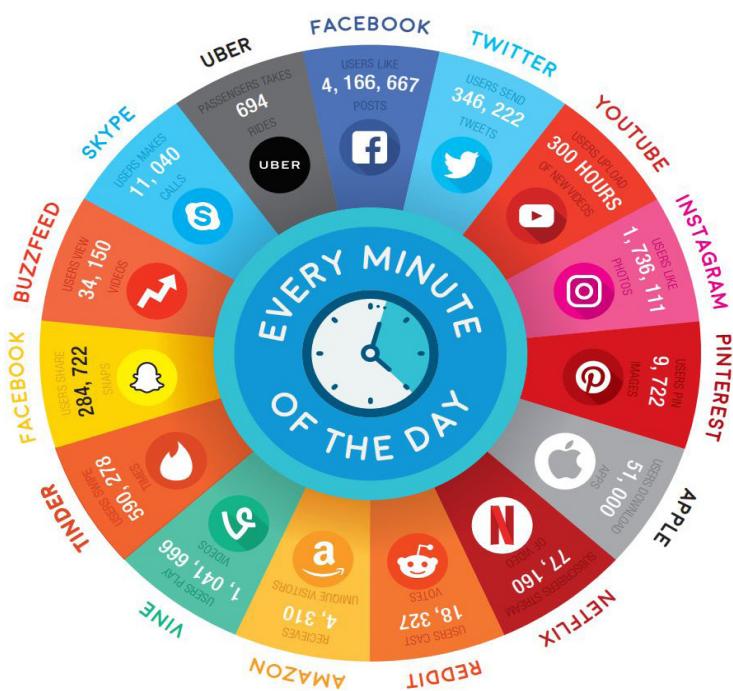
Figure 4.1: *A breakdown of internet usage every day*

4.1 Networks

In previous years, you learned that a network is a series of independent computers that have been connected with either a physical, or a wireless connection. In Grade 10, you learned about home and personal area networks, and in Grade 11, you learned that a **local area network** (LAN) is a computer network that covers a small area, such as a house or office, and that the computers in the network share resources, such as internet connections, printers and server connections. The network is usually limited to a certain number of computers (between two and 25), but there is no absolute limit.

Networks are incredibly powerful tools that are used on a daily basis by businesses and private users. These uses include the following:

- Sharing data and information
- Sharing hardware
- Storing information
- Providing access to entertainment
- Providing access to services
- Connecting people

WIDE-AREA NETWORKS

A **wide-area network** (WAN) is a network that covers a large geographical area, such as a neighbourhood, a city, a country, or even the world.

A WAN connects two or more LANs. A typical use of WANs in business is where different branches of a business are connected to share resources. This can be done through the use of satellites or telecommunication networks. Unlike LANs, many WANs are not private; instead, they are organised by communities or businesses. The following table shows some of the advantages and disadvantages of a WAN.

EQUIPMENT NEEDED TO CONNECT TO A NETWORK

To create a wired network, you need the following three types of networking equipment:

1. **A network adapter:** This is a piece of hardware that can be added to a computer and makes it possible to connect to a network. These days, most computers and laptops have a network adapter built into their motherboards.
2. **Network cables:** These cables are used to connect a computer to a LAN, or to connect one network to another network. If you are connecting directly to the internet, you may require a specific cable for the type of internet connection you are using, for example a DSL-enabled phone cable, or a fibre-optic cable.
3. **Hubs**, **switches or routers:** These are devices that allow multiple computers to connect to the same network. They can also be used to connect two networks to each other.

Something to know

Setting up a wired LAN versus a wireless LAN

https://www.geeksonsite.com/faqs/how-to-setup-a-router/
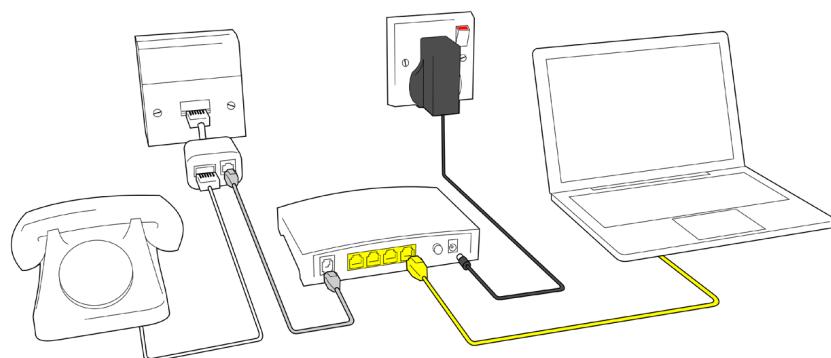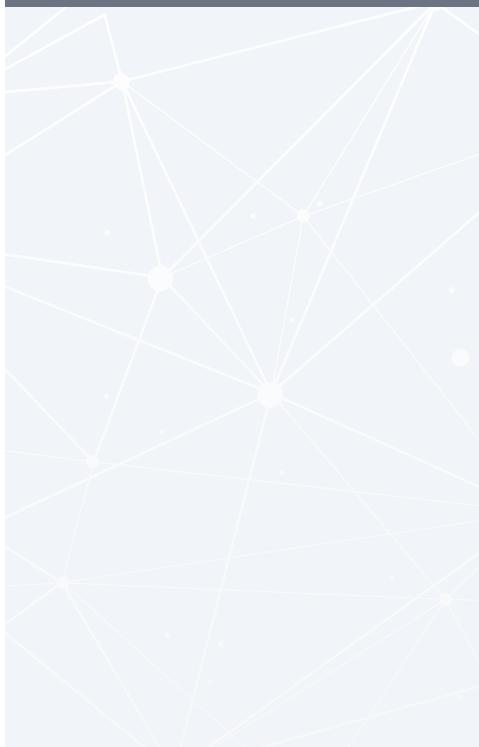
Figure 4.2: *Setting up a wired connection*

To create a wireless network, you only need two types of networking equipment:
1. Wireless network adapter
2. Wireless router or access point

Much like a network adapter, a wireless network adapter is a device that you can purchase and connect to your computer to access wireless networks. Most notebooks and smartphones have built-in wireless network adapters, while most desktop computers do not.

As with a wired network, you can use a router with wireless capabilities to connect all your devices in the same network. The router can connect all your devices to the internet. If you do not need internet access, you could also use a **wireless access point** (WAP). A WAP is like a hub for wireless devices. It allows wireless devices to connect to each other in a local network, but does not connect the local network to the internet.

THE INTERNET AS AN EXAMPLE OF A WAN

The internet is a computer network that consists of billions of connected devices, allowing people to share information, obtain entertainment, or chat to one another.

HOW DOES THE INTERNET WORK?

The internet is a global network of networks. It is made up of many different networks, in different countries around the world that are all connected together into one huge WAN.

The following diagram shows how a user connects to the internet. Remember that the user can be a group of users in a network that connect to the ISP. There are also many different ISPs; each with their own network connected to the internet.
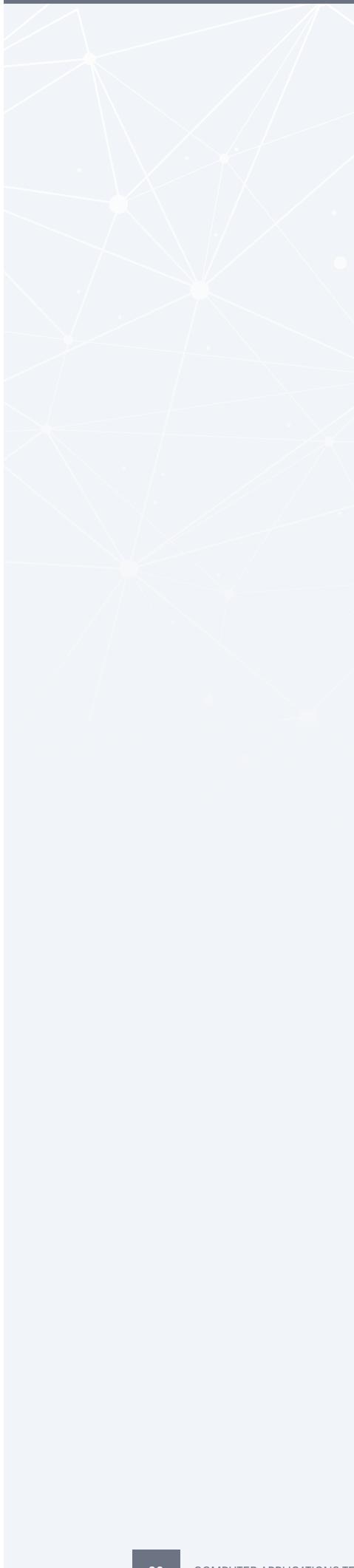
Figure 4.3: *How the internet works*

When the ISP gives its user access to the ISP's network, the users are connected to the internet. Users connect to their ISP via telephone lines, wirelessly, or through other standard networking methods. The information is transferred between computers using protocols. A **protocol** is a set of rules for the transmission of data between devices. Let's take a look at some of the following common protocols:

- **File transfer protocol (FTP):** Used to transfer and manipulate files on the internet
- **Hyper-text transfer protocol (HTTP):** An Internet-based protocol for sending and receiving web pages
- **HTTP secure (HTTPS):** Secure HTTP protocol; used mainly for e-commerce
- **Internet message access protocol (IMAP):** Used for email messages on the internet
- **Post office protocol version 3 (POP3):** Used by email clients to retrieve messages from remote servers
- **Simple mail transfer protocol (SMTP):** Used for email messages on the internet
- **Email client protocol:** is a standard method of exchanging information between email clients like Thunderbird or Apple Mail and email provider's servers like Gmail, Outlook, Yahoo, and vice versa
- **Voice over internet protocol (VoIP):** Used to transmit voice data (phone calls) over the internet.

You will learn more about some of these protocols in the following unit where we will get to discuss internet services.

1. Write down the correct answer for each of the following questions.
   a. Which one of the following is NOT part of networking equipment?
      A. Network cables
      B. Network signaller
      C. Hub
      D. Router
   b. An advantage of a WAN is that everyone on the network can access the same data and _____.
      A. Videos and photos
      B. Information
      C. News
      D. All of the above
   c. A disadvantage of a WAN is that the setting up of it can be _____.
      A. Difficult
      B. Time consuming
      C. Expensive
      D. All of the above

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Protocol used to transfer and manipulate files on the internet	**A.** VoIP
2.2 Protocol for emails over the internet	**B.** IRC
2.3 Protocol to transmit voice data over the internet	**C.** HTTP
2.4 Protocol to receive emails from remote servers	**D.** IMAP
2.5 Protocol used to chat over the internet and also used for other forms of communication	**E.** REC
	F. POP3
	G. HTTPS
	H. FTP

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. An <u>extender</u> is a piece of hardware that can be added to a computer and makes it possible to connect to a network.
   b. The internet is the best-known <u>LAN</u>.
   c. A WAN is a computer network that covers a <u>small</u> area.
   d. To create a wireless network, you only need two types of networking equipment: a WAP and a <u>wireless network adapter</u>.
   e. In modern computers, the network adapters are built into the <u>motherboard</u>.

4. Answer the following questions.
   a. What is a WAP and why is it important in a wireless network?
   b. In your own words, describe what the internet is and why it is important in modern society.
   c. What role does an ISP play when connecting to the internet?
   d. Large networks have changed the way in which we share and store information. Name three additional advantages of large networks.
   e. If you are looking to create a home network, what equipment will be needed? Will this change when you want to connect the network to the internet?
   f. What are the advantages and disadvantages of using a wireless network instead of a wired network when connecting to the internet?
   g. Give an example of where HTTPS protocol is used and how it differs from HTTP.

In the previous unit, you learned that you can access the internet via an ISP. Once you are connected to the internet, there is a range of services that you can use.

INTERNET SERVICES

Each type of internet service available is responsible for transferring a specific type of information. These services include the following:
- Communication services
- Information-retrieval services
- Web services
- World-wide web
- Video conferencing

In the following sections, we will be taking a closer look at the some of these internet services, as well as their advantages and disadvantages.

INSTANT MESSAGING

Instant messaging, sometimes referred to as IM, is a term used to describe online chat programs that allow the user to send real-time messages over the internet. This includes text messages, as well as multimedia messages, such as pictures, voice notes and videos. Short, instant messages usually occur between two parties. However, you do have the option to have a group discussion where multiple users can participate.

ADVANTAGES AND DISADVANTAGES OF INSTANT MESSAGING

Instant messaging has played a big role in shaping the way in which we communicate on a daily basis. This is because of the wide variety of uses that this method of communication offers. However, it is not without fault. Here are some of the advantages and disadvantages of instant messaging.

ADVANTAGES OF INSTANT MESSAGING
- Allows you to chat in "real time" to other people who also have an IM client
- Messages are delivered immediately after being sent, if the person is online or is connected to the internet
- One can see when your message has been read
- It connects people regardless of where they are located
- People can speak to multiple people in virtual conference/groups, share ideas and reach conclusions.

DISADVANTAGES OF INSTANT MESSAGING
- Because it is immediate, you have no time to reflect on the message you are sending, unlike an email where you can review the draft before sending it
- Messages are not always saved
- Instant messaging takes away the face to face, personal experience that people have when they are speaking to someone in person.

EXAMPLES OF INSTANT MESSAGING SERVICES

There are a few main instant messaging services that you most probably use on a daily basis. Let's take a look at some examples of the most popular instant messenging services:

- **WhatsApp:** This is a popular instant messaging service that is used on smartphones and computers
- **Facebook Messenger:** This service is built into Facebook
- **iMessage:** This is Apple's built-in instant messaging service
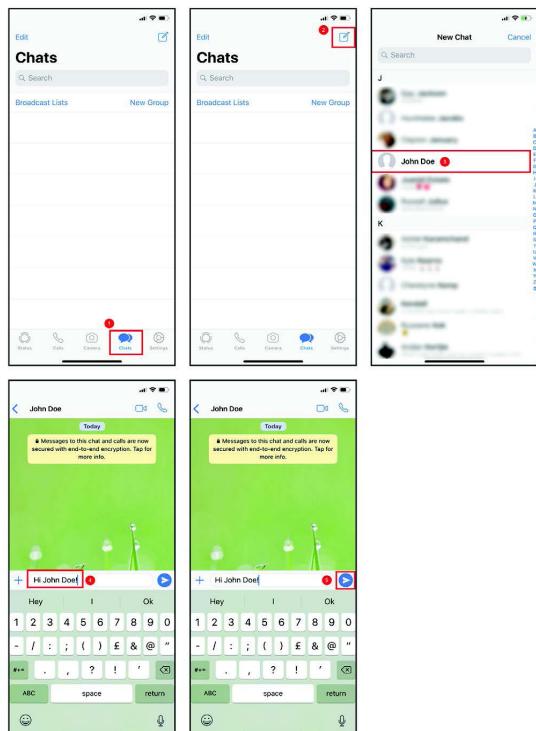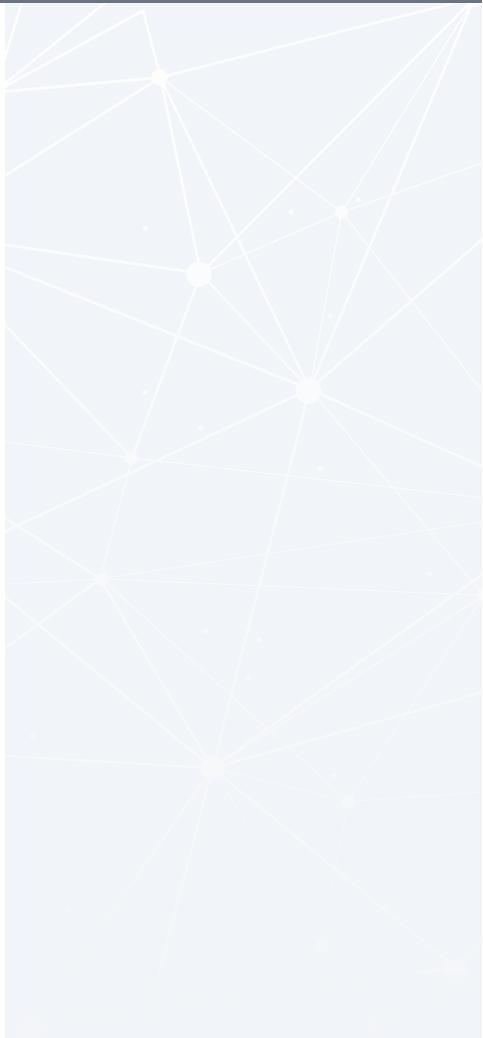
Figure 4.4: *WhatsApp is a popular instant messaging service*

VOICE OVER INTERNET PROTOCOL (VOIP)

If you have ever been fortunate enough to travel overseas, you have most likely come to the realisation that phoning home is expensive. To alleviate this, internet companies have invented technologies that allow the user to make voice calls over the internet.

ADVANTAGES AND DISADVANTAGES OF VOIP

VoIP converts sound into data. The data is then transmitted over the internet to the recipient, where it is converted back to sound. Today, most online call services allow you to make video calls, enabling you to see the person (or people) to whom you are speaking. Since a large part of communication is non-verbal, being able to see a person's body language and facial expressions, while speaking to them, can be very useful. This is especially useful in a video conferencing situation, where there are multiple people connected to the same video call. In such a situation, being able to see which person is speaking allows you to communicate significantly more clearly. On the next page are some of the other advantages and disadvantages of VoIP.

ADVANTAGES OF VOIP

- Saves money on travelling to another country to attend a meeting.
- Audio and video information can be shared.
- Enables collaboration and can strengthen relationships between colleagues who work far away from each other.
- VoIP is much cheaper than using traditional telephonic calls.

ADVANTAGES OF VOIP

- It is expensive to set up and maintain.
- You need to have an active internet connection.
- Power failures will cause a break in communications.

EXAMPLES OF VOIP SERVICES

By now, you are most probably aware of the most-famous VoIP service, Skype. Skype has been around for more than a decade and since it is owned by Microsoft, it is integrated with Windows 10. Let's take a look at the following examples of VoIP services:

- **Google Hangouts**: This is a standard VoIP service provided by Google, which has recently been built into Android cellular devices.
- **WhatsApp:** This instant messaging application allows the user to make both standard and video calls over the internet.
- **Discord:** This application has become very popular for gamers, allowing them to talk to each other over the internet.
- **TeamSpeak:** Like Discord, TeamSpeak is used mostly by gamers to talk to each other over the internet.
- **Skype** is an example of a voice over Internet Protocol (VoIP) software application used for voice, video and instant messaging communications.

Figure 4.5: *A Skype conference call*

FILE TRANSFER PROTOCOL (FTP)

FTP, is a standard network protocol that is used to transfer files between a computer and the network server (usually over the internet). It does this by setting the rules for the way in which files can be uploaded and downloaded. For example, it can require you to use a username and password to access files on the server.

ADVANTAGES AND DISADVANTAGES OF FTP

No matter which business you are running, if you need to share large amounts of data internally, an FTP service might be the answer. Here are some of the advantages and disadvantages of using FTP.

ADVANTAGES OF USING FTP

- Easy to use (with the proper training)
- Multiple file directories can be sent at the same time
- File transfer progress is not lost if your connection fails
- File transfers can be scheduled at times that are best suited to your needs

DISADVANTAGES OF USING FTP

- Data, username and password are shared in plain text, which makes it easy for hackers to access information
- Requires training to use FTP effectively
- It is difficult to monitor mishandled data and track the source of the problem
- Not all FTP services encrypt your data, which makes it vulnerable to attack

EXAMPLES OF FTP SERVICES

While FTP was used quite commonly in the past, it is now used mainly in technical situations (for example, when uploading new files to a web server). Let's take a look at some of the examples of the most commonly used FTP servers:

- **FileZilla Server:** This is an FTP server available to Windows users.

GRID COMPUTING AND CLOUD COMPUTING

As technology advances, so do our requirements. It is no longer sufficient, nor economical to use your own personal computer to analyse and store complex data. An alternative was clearly needed. This answer was obtained on the form of cloud-based and grid computing.
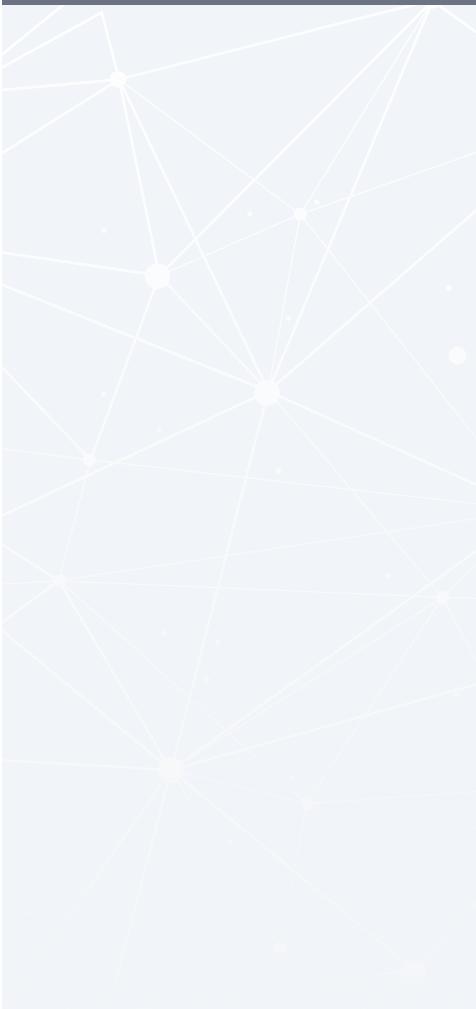
- Grid computing is a computer model that has been connected to a network. It has the ability to process large volumes of data with the help of a group of networked computers that coordinate to solve a problem together.
- Cloud computing is the use of hardware or software on a server on the internet. It allows users to use software or save data without worrying about using up storage space.

ADVANTAGES AND DISADVANTAGES OF GRID AND CLOUD COMPUTING

Although cloud and grid computing offer huge benefits to users, they also have drawbacks. Here are some of the advantages and disadvantages of cloud and grid computing.

ADVANTAGES OF GRID COMPUTING

- It can help you solve larger, much more complex problems in a much shorter time span
- You do not have to buy more powerful hardware as you will make better use of existing hardware
- If one computer fails, the other computers will take over the work, which makes the system very reliable

GRID COMPUTING VS CLOUD COMPUTING

A Comparison You Wanted to See

https://www.youtube.com/watch?v=PX89E8wQXQs

DISADVANTAGES OF GRID COMPUTING
- Training is needed to make full use of grid computing
- May require multiple people in order for the grid system to function

ADVANTAGES OF CLOUD COMPUTING
- Since the cloud platform is managed and updated, it is much more reliable
- It can be used from any device capable of connecting to the internet

DISADVANTAGES OF CLOUD COMPUTING
- You may experience downtime if the cloud server is undergoing maintenance
- Even though cloud computing uses security measures to protect your data, there is always a risk of files being compromised
- You do not have full control over the platform as it is owned and managed by the service provider

EXAMPLES OF CLOUD AND GRID COMPUTING
Both cloud and grid computing help the user to distribute computing over a large area. Table 4.1 shows examples of the most commonly used cloud and grid computing software.

In the ideal grid computing system, every resource is shared, turning a computer network into a powerful supercomputer. With the right user interface, accessing a grid computing system would look no different than accessing a local machine's resources. Every authorised computer would have access to enormous processing power and storage capacity.
- **World Community Grid:** World Community Grid's mission is to create the largest public computing grid benefiting humanity, which is funded and operated by IBM. Using the idle time of computers around the world, World Community Grid's research projects have analysed aspects of the human genome, HIV, dengue, muscular dystrophy, and cancer.
- Scientific research, helping scientists around the world to analyse and store massive amounts of data.
- **SKA (Square Kilometre Array):** The SKA is a worldwide network of radio telescopes that will consist of over one million squares metres of collecting area. This will generate an enormous amount of data will be processed by an enormous computing grid consisting of more than half a million computing cores (processors) distributed around the globe and linked by a powerful network.

Table 4.1: *Commonly used cloud and grid computing software*

CLOUD COMPUTING	GRID COMPUTING
1. Amazon Web Services (AWS) 2. Microsoft Azure 3. Google Cloud Platform	1. Berkeley Open Infrastructure for Network Computing 2. Advanced Resource Connector 3. g-EclipseTechnology Project
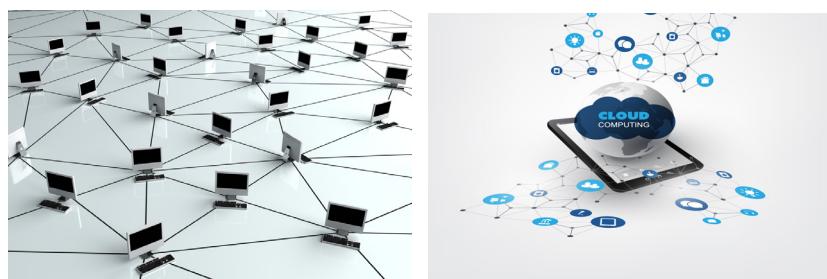
Figure 4.6: *Examples of cloud and grid computing software*

CLOUD-BASED FILE SHARING

Since the advent of the internet, the technology industry has been steadily moving away from local storage to remote, server-based storage and processing—what is known as the cloud. We've rounded up the best cloud storage and file-sharing and file-syncing services to help you decide which are right for you.

ADVANTAGES AND DISADVANTAGES OF FILE SHARING

Cloud-based file sharing allows the user to easily store and share files, documents, photos and videos on the internet. However, it also has its drawbacks. Here are some of the advantages and disadvantages of using cloud-based file sharing.

ADVANTAGES AND DISADVANTAGES OF CLOUD-BASED FILE SHARING

- It is very easy to use as you can just drag and drop files between your computer and the file-sharing service
- It can save data and bandwidth, as you can share the file with multiple people instead of having to mail it to each of them
- You can access the files with any device that is capable of connecting to the internet
- It is very convenient as it reduces the time and effort it takes to share information with multiple people

DISADVANTAGES OF CLOUD-BASED FILE SHARING

- The files might not be very secure as multiple people will have access to them
- People might misplace or delete some files by mistake
- You need an internet connection to access the files
- Some services might require software to use, which will require you to download the software before being able to access the files

EXAMPLES OF CLOUD-BASED FILE SHARING

To use cloud-based file sharing, you will need to use a service provider. The service provider is responsible for providing you with a service that is highly available and provides backups and file recovery in a timely manner. To help make this decision easier, let's look at some of the most commonly used cloud-based files-sharing services.

Table 4.2: *Most commonly used cloud-based file-sharing services*

FILE-SHARING SERVICE	DESCRIPTION	IMAGE
Dropbox	This is the most widely used file-sharing service, as of May 2018	Dropbox
MediaFire	This is a file-sharing service that can be used with Windows, MacOS and Linux	MediaFire
Google Drive	This is a file-sharing service provided by Google	Google Drive
iCloud	This is a file-sharing service provided by Apple	
Microsoft OneDrive	This is a file-sharing service provided by Windows and MacOS	OneDrive

These services provide seamless access to all your important data—Word docs, PDFs, spreadsheets, photos, and any other digital assets—from wherever you are. You no longer need to be sitting at your work PC to see your work files. With cloud syncing you can get to them from your smartphone on the train, from your tablet on your couch, and from the laptop in your hotel room or kitchen. If you don't yet have a service for storing and syncing your data in the cloud, you should seriously consider one. Which you choose depends on the kinds of files you store, how much security you need, whether you plan to collaborate with other people, and which devices you use to edit and access your files. It may also depend on your comfort level with computers in general. Some services are extremely user-friendly, while others offer advanced customisation for more experienced technophiles.

STREAMING

Broadcast, cable and satellite television have been responsible for supplying news and entertainment to households for many years; however, this may be coming to end. With the advances made in the internet, a more diverse service has become available – i.e. streaming.

Streaming is a service that allows the user to view live events, series, movies and sporting events over the internet. This includes streaming to your smartphone, smart television or computer.

UNDERSTANDING VIDEO STREAMING

https://www.youtube.com/watch?v=AeJzoqtuf-o

ADVANTAGES AND DISADVANTAGES OF STREAMING

Streaming has made it very easy to catch up on series, view sports and keep up to date with the news. But like all other entertainment services, it is not without a downside. Here are some of the advantages and disadvantages of streaming.

ADVANTAGES OF STREAMING

- You are in control of what you watch and when you want to watch it
- Streams can be paused, rewound and resumed as you please
- It does not require you to have the shows on your computer and, therefore, saves storage space

DISADVANTAGES OF STREAMING

- You need an active (fast) internet connection in order to stream
- Streaming may use a lot of data
- The luxury of streaming may result in health problems as it is easy to spend many uninterrupted hours watching series and shows

EXAMPLES OF STREAMING SERVICES

Over the past few years, streaming has become more popular and widespread. Let's take a look at some of the examples of streaming services that you might find helpful:

- **Twitch:** This is a streaming platform dedicated to gamers. Gaming tournaments and "Let's Play" are some of the most popular streams on this platform.
- **Netflix:** This is a platform dedicated to series and movies. Netflix has become very popular as it releases a whole season of a series at once, allowing the user to dedicate a block of time to binge watch the series.
- **Showmax:** This platform was released in South Africa just before Netflix. Showmax allows you to stream some titles that are not available on Netflix, including Afrikaans movies and series.

Figure 4.7: *Twitch, the streaming platform for gamers*

GOVERNMENT INTERNET SERVICES

Government institutions are known to have queues in which you could wait for hours. Thanks to the internet, many government institutions now have quick and easy solutions. Government internet services are internet services that allow users to skip queues by using government websites, from the comfort of their homes, to conduct business, pay bills and obtain information.

ADVANTAGES OF GOVERNMENT INTERNET SERVICES

More and more people are beginning to use government internet services as it saves them a lot of time and effort. This, however, is not the only advantage. Let's take a look at some other examples of how government internet services can make your life easier.

PAYING YOUR TELEVISION LICENCE

You can pay your TV Licence online by using your credit card details, or online at your own banking website/banking app using the TV Licenses account details, or go to the EasyPay website for a virtual payment solution.

ELECTORAL INFORMATION

One of the advantages of living in a democratic country is that you are able to vote for the people you want to be in charge of your city and country. To do this, you need to know:

- Who the people and parties running for office are
- If you are registered to vote
- Where you should go to cast your vote
- What the results of the election were

This information and more can be obtained from the various government websites, which you can access through the internet. One such website is the "Elections" website (www.elections.org.za), which you can use to confirm if you are registered to vote.

SUBMITTING TAX RETURNS

Tax season is a stressful time of the year for every person involved, especially when you get to the SARS office and the queues are so long. Sometimes you need to return another day just to finish filing your taxes. Fortunately, SARS has come up with the solution of e-filing.

Electronic filing (commonly known as e-filing) gives users a free, simple and secure way to do tax returns from the comfort of their homes. It is available 24 hours a day and allows users to see their tax status, change their information and make any payments required. You can submit tax returns via e-filing on the SARS website (www.sarsefiling.gov.za).

SMART ID AND PASSPORT APPLICATIONS

Applications for Smart IDs and passports can be done online. This is done via the eHomeAffairs website. Instead of standing in long queues at Home Affairs Offices users can complete an online application, upload supporting documents, make payments and schedule a time to collect the documents from a Home Affairs enabled bank.

ONLINE TERTIARY APPLICATIONS

The Department of Higher Education and Training runs an online Central Applications Clearing House (CACH). This is open in January and February each year. Students who have not succeeded in finding a place at a tertiary institution can submit an online application via the CACH and they will be assisted to find a place at a tertiary institution.

Activity 4.2

1. Write down the correct answer for each of the following questions.
   a. Which one of the following is NOT an example of FTP services?
      - **A.** Pure FTPd
      - **B.** FileZilla Server
      - **C.** ProFTPd
      - **D.** FT protocol
   b. Which one of the following is an example of instant messaging?
      - **A.** Wikipedia
      - **B.** Facebook
      - **C.** Telegram
      - **D.** YouTube
   c. When you are in control of what you watch and when you want to watch it.
      - **A.** Cable
      - **B.** Broadcast
      - **C.** Streaming
      - **D.** Satellite television

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Example of cloud-based file sharing	**A.** VoIP
2.2 Standard network protocol that is used to enable your computer to transfer files between the computer and the network server	**B.** SARS
2.3 May use a lot of data when watching a video	**C.** HTTP
2.4 An example of cloud computing	**D.** Microsoft Azure
2.5 Where you pay your taxes	**E.** REC
	F. Dropbox
	G. Streaming
	H. FTP

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. Netflix is more popular than M-Net.
   b. Showmax is an example of a streaming service.
   c. Electronic payments give users a free, simple and secure way to do their tax returns from home.
   d. Instant messaging allows the user to make voice calls over the internet.

4. Answer the following questions.
   a. What is the difference between cloud computing and grid computing?
   b. Explain e-filing and give one advantage thereof.
   c. Why would people want to use government internet services? Mention a government institution that uses the internet.
   d. List four advantages, one disadvantage and three examples of instant messaging.
   e. Give two examples of apps on a smartphone that use the following internet services:
      i. VoIP
      ii. FTP
      iii. Cloud computing and grid computing
      iv. Cloud-based file sharing
      v. Streaming

Throughout this chapter, we have looked at some of the wonderful services that you can access through the internet. However, in order to access these services, you need an internet connection. In this section, we will be taking a look at how you can connect to the internet and which internet connection is best for your purpose. In South Africa, you need to pay an ISP, such as MWeb or WebAfrica, or a **mobile network provider** (MNP), such as Vodacom or MTN, a monthly fee in order to access the internet.

BROADBAND

In the early days of the internet, you had to use a modem that allowed you to connect to the internet through dial up. This type of connection had many drawbacks; it was slow, it required you to dial up each time you wanted to connect to the internet, and it would disconnect you when you used your phone. This all changed with the invention of broadband.

Broadband is a high data-rate connection that allows the user to send data over multiple channels. This makes the connection faster and more reliable than the old dial-up method. Examples of broadband include ADSL, 3G and fibre. It is important to note that not all broadband connections are available in all areas. When you decide on getting either a wired or a wireless connection, you should consider the coverage and availability of the various connections in your area. You can get this information from your service provider, or you can look at a network coverage map on a service provider's website.

Figure 4.8: *The green indicates areas with internet coverage*

WHAT TYPE OF INTERNET CONNECTION DO YOU NEED?

When choosing an internet connection, you need to consider the following four factors:
1. Speed of the internet
2. Data cap of your connection
3. Cost of the internet
4. Equipment you will need to connect to the internet

INTERNET SPEED OR BANDWIDTH

When choosing an internet connection one needs to look at the following:
- Speed of the internet connection
- Type of connection one can afford

Bandwith refers to the amount of data that can be transferred over a network in a specific time. Higher the bandwith the more data can be transferred in less the time. Downloading refers to the transfer of data from the internet to your computer. This includes downloading files, for example, videos, as well as browsing the internet. Uploading: refers to the transfer of data from a computer to the internet, for example, uploading a video to YouTube.

DATA CAPS AND BUNDLES

A **data cap** (bandwidth cap) is a service provider-imposed limit on the amount of data transferred by a user account at a specified level of through put over a given time period, for a specified fee. The term applies to both home Internet service and mobile data plans.

Data caps are usually imposed as a maximum allowed amount of data in a month for an agreed-upon charge. As a rule, when the user exceeds that limit, they are charged at a higher rate for further data use. However, the provider may not charge overage but instead throttle the users' transfer rate per second beyond the limit. For example, a mobile user paying for a 4G plan may be downgraded to 3g for mobile data beyond their data cap.

An ISP might impose a data cap when a customer shares access with many users, employs file-sharing software or otherwise breaks terms of use. Service providers also sometimes impose data caps when they have a monopoly in a given area.

Data caps result in lower rates of access to online materials, especially multimedia and streaming content which is a problem for content creators and their advertisers. Data caps are also uniformly unpopular with customers. As a result, service providers often refer to data caps by other names such as fair usage or fair access policies, usage based billing or vaguely as band caps.

A data bundle gives access to the internet. To surf we use internet data which is measured in bytes – with data bundles it doesn't matter how many minutes you stay connected, but rather how many bytes you use. It's a cheaper yet a convenient way to connect to the internet. Whether you just want to surf or make downloads it's still an ideal choice. It works more or less the same way we surf using airtime on our cell phones.

FAIR-USAGE POLICY

A **fair-usage policy** (FUP) (also called a reasonable-usage policy, or an acceptable-usage policy) is a data limit placed on "uncapped" internet accounts. According to this policy, your internet account will not be capped or limited unless you use too much data, in which case your internet access may be slowed (throttled) to the point where it is unusable. Many uncapped internet accounts have strict fair-usage policies that will catch unsuspecting users off guard.

INTERNET COSTS

The third thing to consider is the cost of the internet. Unfortunately, in South Africa, internet is still an expensive luxury item for most people. In general, a fast internet connection with a large data cap will be more expensive than a slow internet connection with a low data cap.

EQUIPMENT NEEDED

The final thing to consider is what equipment you will need in order to connect to the internet. This includes four basic components:
1. Computer
2. Internet connection channel
3. Internet communication device
4. An ISP

WHAT IS THROTTLING?

Bandwidth throttling is a purposeful slowing of available bandwidth. In other words, and in general, it's an *intentional* lowering of the "speed" that's typically available over an internet connection. Bandwidth throttling can happen at various places between your device (like your computer or smartphone) and the website or service that you're using over the internet.

WHY WOULD ANYONE WANT TO THROTTLE BANDWIDTH?

You as the user of an internet connection or service rarely benefit from bandwidth throttling. Very simply, bandwidth throttling means limiting how fast you can access something when online. For example, an ISP might throttle bandwidth during certain times of the day to decrease congestion over their network, which lowers the amount of data they have to process at once, saving them the need to buy more and faster equipment to handle internet traffic at that level.

Another reason a service provider might throttle bandwidth is to provide a way for users to avoid the throttling by paying for a more expensive service that doesn't limit bandwidth. In other words, the bandwidth throttling might just be an incentive to encourage heavy users to upgrade their plan.

WHAT IS SHAPING?

Traffic shaping is used for a number of purposes:
- Time-sensitive data may be given priority over traffic that can be delayed briefly with little-to-no ill effect.
- A large ISP (Internet service provider) may shape the traffic of an independent reseller.
- In a corporate environment, business-related traffic may be given priority over other traffic.
- An ISP may limit bandwidth consumption for certain applications to reduce costs and create the capacity to take on additional subscribers. This practice can effectively limit a subscriber's "unlimited connection" and is often imposed without notification.
- Traffic shaping could be an integral component of the proposed two-tiered Internet, in which certain customers or services would get traffic priority for a premium charge.

Activity 4.3

1. Write down the correct answer for each of the following questions.
   a. Which one of the following is NOT an ISP?
      A. MWEB
      B. M-Net
      C. Afrihost
      D. Webafrica
   b. Which one of the following is NOT an example of broadband?
      A. 3G
      B. ADSL
      C. 4K
      D. Fibre
   c. Which one of the following is NOT an option for fast internet users whose speed is more than 20 Mb/s?
      A. 56 k
      B. VDSL
      C. LTE
      D. Fibre
2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 An internet connection without limited data	**A.** ADSL
2.2 Connection option suited for 4 Mb/s download speed	**B.** MTN
2.3 ISP with fibre option	**C.** 56K
2.4 What you pay to get internet access	**D.** LTE
2.5 Mobile network provider	**E.** ISP
	F. Capped
	G. Uncapped
	H. Afrihost

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if they are false.
   a. Everything you do on the <u>internet</u> affects data.
   b. <u>Axxess</u> is not an ISP for fibre connections.
   c. You need an <u>ONT device</u> if you want to use DSL internet.
   d. Speed of internet is <u>not</u> important when choosing an internet connection.
   e. <u>High-quality videos</u> use about 1 Tb/h of data.
4. Answer the following questions:
   a. What is the difference between uploading and downloading?
   b. What is broadband?
   c. What is the difference between a shaped and an unshaped internet connection?
   d. What four things must you consider when choosing an internet connection?
   e. Explain the FUP.

REVISION ACTIVITY

QUESTION 1: MULTIPLE CHOICE

1.1 What type of network is the internet? (1)
- **A.** LAN
- **B.** PAN
- **C.** WAN
- **D.** WHAN

1.2 Which of the following protocols sends web pages? (1)
- **A.** IMAP
- **B.** HTTP
- **C.** VoIP
- **D.** IMAP

1.3 Which of the following is NOT a service provided by ISPs? (1)
- **A.** Instant messaging
- **B.** World-wide web
- **C.** Skype
- **D.** Broadband

1.4 Which of the following is an example of an FTP? (1)
- **A.** FileZilla Server
- **B.** Amazon Web Services
- **C.** MediaFire
- **D.** Twitch

1.5 Which of the following is an advantage of government internet services? (1)
- **A.** You can pay your water bills online
- **B.** You can communicate through video conferencing
- **C.** You can stand in shorter queues at SARS
- **D.** You can find out where to pay your TV licence

[5]

QUESTION 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Correct the statement if it is false.
Change the underlined word(s) to make the statement true.

2.1 <u>HANs</u> can can be public and private. (1)
2.2 A WAP can be used to create a <u>wireless network</u>. (1)
2.3 <u>FTP</u> is used to connect computers in a network. (1)
2.4 <u>Google Drive</u> is Google's instant-messaging platform. (1)
2.5 <u>4G connections</u> are a new technology of broadband. (1)

[5]

REVISION ACTIVITY

QUESTION 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A. (5)

COLUMN A	COLUMN B
3.1 Maven can use SARS e-filing to submit his tax returns	**A.** Uncapped data
3.2 Carleen uses Skype to talk to her family while she is teaching English in Madagascar	**B.** FTP **C.** VoIP **D.** ISP
3.3 A method of sending documents and videos between computers over a network server	**E.** Government internet service
3.4 Telkom provides Zoey with the tools she needs to send WhatsApp messages to her friends with her smartphone	**F.** Capped data **G.** Cloud computing
3.5 To save money, Darrel limits the amount of data his family can use each month	

[5]

QUESTION 4: CATEGORISATION QUESTIONS

Look through the following advantages and disadvantages, and indicate to which internet service each belongs. (5)

ADVANTAGE OR DISADVANTAGE	INTERNET SERVICE
4.1 Since the cloud platform is managed and updated, it is much more reliable	
4.2 You are in control of what you watch and when you want to watch it	
4.3 Audio quality depends on the quality of your internet connection	
4.4 Maintaining multiple computers may become expensive	
4.5 The files might not be very secure as multiple people will have access to them	

[5]

QUESTION 5: SCENARIO-BASED QUESTIONS

Your cousin is moving out of the house soon and has started investigating connectivity options. She is considering the following packages:

PACKAGE 1	PACKAGE 2	PACKAGE 3
Uncapped ADSL Free Data after hours (24:00 – 08:00) Up to 2Mbps Semi-shaped	15GB 3G / LTE on Cell C Data only SIM No out-of-bundle rates 3 month Data Rollover	200GB Cap Fibre Up to 4Mbps Unshaped data No contracts

5.1 What does the term *uncapped* for package 1 mean? (1)

5.2 Explain why you would never be throttled on package 2 or 3? (1)

5.3 What does it mean when your internet connection is shaped? (2)

5.4 Which one of these packages has the highest speed? (1)

5.5 Refer to package 2: What does out-of-bundle rates refer to? (1)

Nkosi has to hold Skype conferences for his company for the next month. Recently, the company has been having serious problems with big clients; therefore, an emergency meeting can occur at any time, which means he must make sure he is readily available.

5.6 What should Nkosi consider when buying an internet connection for the next month? (4)

5.7 What internet specifications do you think would be best for him in this situation? Give a suggestion for each factor. (4)

5.8 Compare the difference between capped data and uncapped data. (4)

5.9 Explain to him what the purpose of a WAP is. (2)

[14]

TOTAL: [40]

AT THE END OF THE CHAPTER

NO.	CAN YOU ...	YES	NO
1.	Explain what a WAN is?		
2.	Explain what the internet is?		
3.	Identify and explain various internet services?		
4.	Identify and explain government internet services?		
5.	Discuss the concepts of broadband and bandwidth?		
6.	Explain throttling and shaping?		

SOCIAL IMPLICATIONS OF NETWORKS

CHAPTER OVERVIEW	
Unit 5.1	Computer-related crimes
Unit 5.2	Security issues
Unit 5.3	Security and safeguards
Unit 5.4	Impact of technology on the global community

By the end of this chapter, you will be able to:

- Discuss computer-related crimes, attacks and frauds.
- Describe security problems.
- Identify how to avoid security threats.
- List and describe safeguards against cyber attacks.

INTRODUCTION

The internet has made it easier than ever to obtain, share and store information on a platform that you can access from around the world. However, it has also created a new gateway for people with malicious intent to commit crimes against others.

In a world where your computer or smartphone can be used to transfer money with online banking, obtain ID documents and passports, it is important to ensure that you and your information are protected and secure. In this chapter, we will look at some examples of computer-related crimes, attacks and frauds. We will also discuss some security problems that you need to be aware of and how to avoid these threats. We will also give advice on how to protect yourself against cyber attacks.

Figure 5.1: *Cyber security is always important*

Computer-related crimes, or cybercrimes, have become more frequent as new methods are discovered to infiltrate your computer. From using something as simple as a virus, to more complex attacks such as phishing, cybercriminals aim to access people's computers and their passwords. These can then be used to access the users' bank accounts, steal their identities, or obtain their personal information. Cybercriminals can also use their computers to send spam emails and add unwanted advertisements to every website that the user visits. It is for this reason that computer users need to understand the basics of computer crimes, as well as how to use computers and the internet safely.

TYPES OF COMPUTER-RELATED CRIMES

Computer-related crimes range from physical crimes to crimes committed over the internet. In the sections that follow, we will look at the different types of crime.

THEFT OF COMPUTER HARDWARE

Theft of computer hardware refers to the theft of physical hardware components, which includes internal components, such as RAM and graphics cards, external components such as a keyboard and mouse, as well as the theft of your laptop or smartphone.

Computer hardware is very expensive and is, therefore, very important that you protect yourself against hardware theft. Let's take a look at some general guidelines on how to protect yourself:

- Never leave your laptop or mobile device unattended in a public place.
- Use passwords as a security method.
- Use a cable to lock your equipment to a table or desk in the office.

SOFTWARE THEFT

Software theft refers to the use and distribution of software obtained by illegal methods. This includes stealing a CD or DVD that contains software, as well as downloading illegal software from the internet (piracy).

Software theft and piracy are crimes in many countries, including South Africa. Therefore, it is important to make sure that you do not partake in these activities. Let's take a look at some guidelines to help you stay clear of software theft:

- Do not copy, duplicate or distribute any software without a copyright licence.
- Do not download and use illegal software from the internet.
- Do not lend your software so that an illegal copy can be made.

BANDWIDTH THEFT

Bandwith theft refers to the use of bandwidth without paying for it. People steal bandwith in many ways, which includes stealing usernames and passwords and connections that are not owned by them. Bandwith theft can also occur when one is connected to an unprotected network.

Something to know

Piracy is one of the most widespread computer-related crimes in modern society. This is due to the widespread illegal downloading of music, TV series and movies.

Precautions include:
- Having good password policies.
- Being careful when installing free software from the internet, as it might be malware.

The second type of bandwidth theft is hotlinking. Hotlinking is when someone takes a file or video from his or her website and links it to your website. This is problematic as each time a user clicks on the link in order to download the file or view the video, your bandwidth will be used.
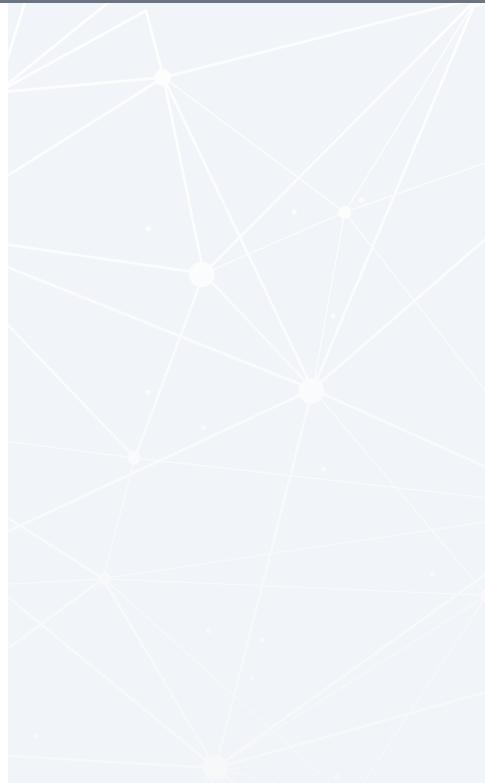
IDENTITY THEFT

Identity theft refers to stealing data that can be used to pretend that a person is someone else. Identity theft can range from stealing any personal information such as your name, your address, your favourite food or more official information such as your ID number, telephone number, etc. The stolen information can be used to take over your accounts on websites like, Twitter, instagram, etc, so as to post messages or use these services whilst pretending to be you. Personal information, such as identity numbers, can be used to impersonate a person (i.e. steal his or her identity). This allows the thief to open accounts, take out loans and buy things in that person's name.

To avoid these problems, do not share your sensitive information unnecessarily and protect your information using a secure password. While sharing information is part of using the internet, be selective with the websites on which you choose to share your information. If you use your email address for every website you visit, do not be surprised if you start receiving a lot of spam emails!

Figure 5 2: *A hacker using someone else's details to hack into his or her account*

MISUSE OF PERSONAL INFORMATION

Information about you has value. For example, if you use Google to search for the rules of the computer game "Defence of the Ancients" ("Dota") and then watch YouTube videos about how to play it, your web browser and search engine may record this information. Without you telling them, they have now learned that you like the game and might be interested in playing it. This information is very valuable to people who make games or gaming hardware. Google then takes this information (and all the information it records about the billions of people who use its software) and sells it to advertisers. The next time you open a website, you suddenly see an advertisement for a brand-new gaming mouse in your web browser!

THEFT OF TIME AND SERVICES

Theft of time refers to a person receiving payment from his or her employer for work that the employee did NOT do. This is usually because the person is busy with non-work-related activities during work time. Theft of services refers to the person using company equipment, such as a computer or the internet, for personal matters.

INTERNET-RELATED FRAUD

A **scam** is a fraudulent scheme used by a malicious person to obtain money or something of value from someone else.

Table 5.1: *Examples of internet scams*

TYPE	DESCRIPTION	PROTECTION
Phishing and email spoofing	**Phishing and email spoofing** attacks try to obtain sensitive information (such as usernames, passwords and banking details) by sending emails to users that look like official emails. These emails will either directly request the sensitive information, or redirect users to an official-looking website where their information will be stolen.	Never send sensitive information, such as usernames and passwords over email. No company will ever ask for this information via email or phone. Make sure the email address and domain name are correct for any email that looks suspicious.
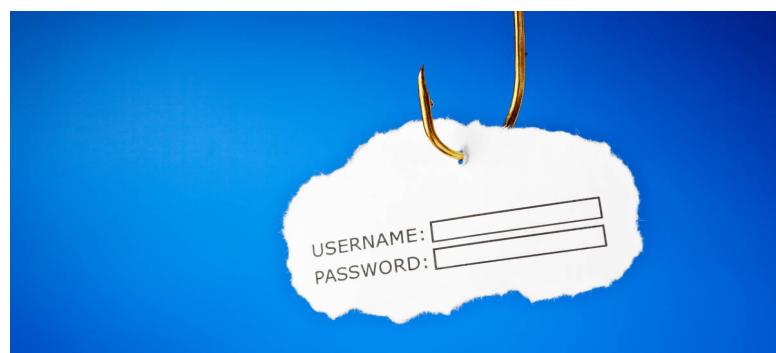
Figure 5.3: *Internet phishing*

CROWD FUNDING

Crowd funding is a way for individuals and organisations to raise money from a large number of people. It can be an alternative to using a bank or investment firm. Below are some examples of crowd funding:

DONATION CROWD FUNDING

Donation crowd funding is used to raise money for a cause. It's not just charities who can do this – groups and individuals can also start crowd funding projects, for example to pay for a community centre or a child's surgery.

REWARD CROWD FUNDING

This involves funding a project for a set reward. For example, you might give money to help a band record its music and get their album in return. The reward may vary depending on how much money you give. For example, if you gave R20 you might get the album, but if you gave R50 you might get the album and a t-shirt.

LOAN BASED CROWD FUNDING

This is also known as "peer-to-peer" (P2P) and "peer-to-business" (P2B) lending. You'll lend a certain amount of money, which should be repaid to you with interest over time. So, the idea is you get back more than you lent.

INVESTMENT CROWD FUNDING

Investment crowd funding (also called "equity crowd funding") typically involves buying part of a company. The part you own is called a "share". You'll usually be one of many shareholders, along with other crowd funders, investment firms and people working at the company.

Activity 5.1

1. Write down the correct answer for each of the following questions.
   a. When a thief knows and sells the information about what you like and do not like, or do and do not do, what do we call this type of identity theft?
      A. Personal information
      B. Financial information
      C. Social media information
      D. Interests
   b. Which of the following is NOT an internet scam?
      A. Phishing
      B. Cryptocurrencies
      C. "Nigerian letter"
      D. "Congratulations, you have won"
   c. You have received an email from your bank saying that the bank is converting to an electronic system and asks you to type in your banking details so that it can be saved onto their system. Which of the following scams fit this scenario?
      A. Phishing
      B. Cryptocurrencies
      C. "Nigerian letter"
      D. "Congratulations, you have won"

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 World-wide illegal sharing of music, TV series and movies	A. "Congratulations, you have won"
2.2 This scam requires the target to make a financial investment with promises of high returns and little risk	B. Phishing
2.3 Internet-related fraud	C. Social media information
2.4 Type of computer-related crime	D. Care-share
	E. Piracy
	F. Denial-of-service
	G. Crypto

3. Answer the following questions:
   a. What steps can you take to protect yourself from computer hardware theft?
   b. Explain bandwidth theft.
   c. What steps can you take to protect yourself from bandwidth theft where a third party gains access to your internet connection?
   d. Explain how other people can misuse your personal information.
   e. Describe two examples of internet scams.

5.2   Security issues

One of the disadvantages of networks is that other people can sometimes get unauthorised access to computers via the network. Security breaches can occur in LANs, but there is a bigger threat in WANs, such as the internet.

INTERNET ATTACKS

Internet attacks or cyber attacks refers to an attack on the infrustracture of the web itself. Examples include the following:

- **Denial-of-service (DOS/DDOS):** The use of compromised computers to flood a server with requests for information. The attack can be regarded as successful if the server becomes so overwhelmed that normal users cannot connect to the system.
- **Cyberterrorism:** Attacks that only occurs in parts of a country's IT infratructure.
- **Spoofing attacks:** Spoofing attacks work by masking the attacker and making it seem as if he or she is a legitimate user. This is done by using false data to connect to the network.
- **Sniffer attacks:** Sniffer attacks works by checking the data packets sent over the network. Hackers use sniffer applications to analyse the network and access all unencrypted data being transmitted.

MALWARE

In our modern society, computers and smartphones are used to do everything; from transferring money with online banking, to storing personal information on the cloud. It is, therefore, very important that computer users understand the basics of computer malware, and know how to use computers and the internet safely. Table 5.2 gives some information on the most common threats and how best to avoid them.

Table 5.2: *Common security threats*

TYPE	DESCRIPTION	PROTECTION
Pharming	A scamung practice where a user is automatically redirected to a fake website even if they type in the correct URL of the official site.	• Take note of redirection warnings • Check wherher the site is secure • Make sure that your anti-soyware software is up to date
Click-jacking	Click jacking is an attack in which a site appears to do one thing but your click are actually redirected to do something else	• Add ons can be installed on the browser • Sever programs can be installed to protect users on a network
Spoofing	The changing of an email header so that the email appears to come from a different source	• Make sure the email comes from a trusted sender
Spyware	Any technique or software that tries to monitor and track the way you use your computer, once it has done this, your information is sent to a third party.	• Install anti-spyware software. • Do not fall victim for any internet hoaxes

Something to know

Malware is a term used to describe software that can be used to cause harm to the user's computer or computer network, without the user's knowledge. This includes viruses, Trojans, worms, bots and zombies. Malware programs normally function by causing your computer to perform unwanted actions, such as sending emails and messages to help spread the infection, giving the hacker personal information stored on your computer, or allowing the hacker to take control of your system.

Table 5.2: *Common security threats*

TYPE	DESCRIPTION	PROTECTION
Keylogger	A type of software that records your keystrokes as you type in an attempt to dicover your personal information	• Make use of a firewall • Install a password manager. • Keep your system updated • Consider anti malware software
Computer virus	A program that is written to disrupt the normal functioning of a computer. Most viruses activate when you open or run an infected file	• Install anti-virus software and keep it updated • Scan email attachments and portable storage devices • Do not open email attachments or run programs from untrusted sources
Computer worm	Malware that is able to distribute itself over a network. It is able to reproduce itself. Usually distributed via email, without a person having to run an infected program.	• Install anti virus software • Do not open unrecognised or suspicious emails
Trojan	A disruptive program disguised as a useful application. It relies on one to activate it before it can operate	• Do not run any programs unless you are sure it is safe to do so
Ransomware	Malware that makes data unavailable until you pay the hacket a ransom fee	• Install anti-virus software and keep it updated.
Adware	Software that downloads itself onto your computer and bombards your computer with adverts that pop us whenever you are connected to the internet	• Install ant-malware software • Do not click on any unknown links
Scams	A message or article intended to deceive or defraud others	• Check sources for reliability • Do not forward a scam to others • Never take any actions suggested in a scam message

BOTS

A **bot** (short for robot) is a software application that allows the user to automate tasks and actions. On the internet, they are normally used to analyse and gather file information. An example of this is web crawlers. These bots gather, analyse and index data that can be used by search engines, such as Google.

While bots can be used to make the user's life easier, they often come in the form of malware. **Malware bots** function by infecting the user's computer and automatically performing malicious actions, such as gathering keystrokes, obtaining financial information, gathering passwords, or opening back doors on the infected computer.

ZOMBIES

Malware bots also have the capability to completely take over the user's computer, allowing the hacker to take control. When this happens it is known as a zombie. Hackers can use zombie computers for a wide variety of applications; including launching DoS attacks and sending spam emails in order to spread the malware.

RIGHT TO ACCESS VS RIGHT TO PRIVACY

We know by now that computer crimes depends on access to data. For one to prevent fraud and identity theft one needs to keep their data private and one needs to protect it.

The important part here is to know who has the right to access data, versus your right to keep your data private. Below are a few examples to look at when it comes to the right of access versus the right to privacy:

- If you do your work on a computer owned by someone else, they may have the right to claim access to your data files.
- If you use online services such as Facebook you should be aware that their End User License Agreement states that whatever you post belongs to them.
- If your school has an AUP for the computer lab that you have accepted, you may have allowed people other than yourself to access your data files.

Something to know

Hackers can infect multiple computers in order to create a "botnet"; better known as a "zombie army".

Activity 5.2

1. Computer viruses often get the blame when we experience problems with our computers. Briefly explain what a computer virus is.
2. How does a computer worm work?
3. Which one of the following is NOT anti-virus software?
   - **A.** Avast
   - **B.** AVG
   - **C.** Sharepoint
   - **D.** NOD32
   - **E.** Chrome
   - **F.** Microsoft Security Essentials
   - **G.** Microsoft Office
4. Why is spam a type of harassment?

The computer operating system provides support software that provides security for applications. This includes preventing malicious applications, such as a keylogger, from finding out what password you enter on your banking website. Without these protections, malicious software can do incredible damage to your computer and to you as a person.

AVOIDING SECURITY THREATS

The first and best defence against security threats is to prevent them from occurring in the first place. Therefore, in order to help you avoid security threats, let's take a look at some of the following suggestions:

- Use a secure password.
- Pay careful attention to the websites and links you open.
- **Do not share your sensitive information unnecessarily:** While sharing information is part of using the internet, be selective about the websites with which you choose to share your information. If you use your email address for every website you visit, do not be surprised if you start receiving a lot of spam emails!
- **Do not open suspicious emails:** Suspicious emails are emails from unknown or suspicious email addresses, emails that seem too good to be true, emails that request sensitive information, emails with executable attachments and emails with poor spelling or grammar.
- **Do not download suspicious programs or attachments:** If you do not know who the sender of the email is, never download the attachment. Even if you know who the sender is, but you are not expecting an attachment, do not open it. Your friend may have been hacked and sending you a virus!
- **Keep your antivirus application up to date:** Your antivirus application is your last line of defence against viruses. By keeping it up to date, you make sure that it knows how to detect all the newest security threats.
- **Keep your other software up to date:** Software weaknesses or vulnerabilities can be used by hackers to gain access to your computer. One of the main reasons that programmers release updates is to fix these vulnerabilities.
- **Use two-factor authentication whenever possible:** Two-factor authentication prevents anyone from logging into your accounts using just your username and password. Instead, they need a second factor (which is usually a physical device, such as your phone) to access your account. This means that your account can only be hacked by the small number of people with access to your phone.

SAFEGUARDS AGAINST CRIMINALS, VIRUSES AND THREATS

There are times that you are not able to avoid all the security risks that we have just discussed. Fortunately, there is a solution to this problem. Firewalls and software, such as antivirus and anti-spyware, help protect users against the threats that they cannot see.

FIREWALLS

The firewall is responsible for monitoring all incoming and outgoing traffic on a network. If the firewall detects any traffic that is not within the defined set of security rules, it is blocked. Through this action, the firewall prevents malware from spreading over a computer network.

Examples of firewall software include ZoneAlarm, Comodo and GlassWire. Windows 10 comes equipped with a basic firewall, but this might not be strong enough to protect your computer against powerful malware.

Figure 5.4: *A computer firewall*

ANTIVIRUS PROGRAMS

An antivirus or anti-malware is a computer program designed to detect, identify, prevent and remove malware from your computer. The program achieves this by running on your computer as a background process. This allows the program to scan the computer, as well as any external storage devices that are connected to the computer, for malicious software.

Examples of antivirus programs include Bitdefender, Norton and Webroot. Windows 10 comes equipped with a basic antivirus program, called "Windows Defender". This program should be sufficient to protect you against most threats. However, an antivirus application with more features might be needed for more serious threats.

Figure 5.5: *The "Virus & threat protection" screen*

ANTI-SPYWARE

Anti-spyware is a type of computer program designed to prevent, detect and remove spyware programs from your computer. The anti-spyware program does this by monitoring your emails, the websites you visit and files you download. If a malicious program is detected, the anti-spyware will prevent it from being transferred onto your computer. Examples of anti-spyware programs include Bitdefender, Kaspersky and AVG.

Activity 5.3

1. Your anti-virus program reports that it has quarantined a virus. What does this mean?
2. Provlde THREE measures you can take to avoid computer viruses, besides installing anti-virus software and keeping the software up to date.
3. Give TWO examples of firewall software.
4. Your father says that he makes a point of updating his anti-virus software twice a year. Explain to him why this approach is not sufficient
5. A pop-up appeared on your aunt's computer saying that she should download an anti-virus program from the internet, as viruses had been detected on the computer. Why should she not respond to this warninf, if viruses are so dangerous?
6. Give the name of one popular anti-virus software package.

With the invention and popularisation of the internet, the world is more connected than ever before. This connectivity has led to the creation of new technologies that have eliminated the problem of distance that we once faced. Not only have new technologies changed the way in which we find information; it has also changed the way in which we communicate, conduct business and meet new people.

COMMUNICATION

In the old days, we were limited to using landline phones to make calls and writing physical letters when communicating over a long distance. If you wanted to meet a person in another city, you had to travel to that city, or organise a meeting at a common location. Fortunately, that is no longer needed. Email, VoIP, video conferencing and smartphones have made communication much faster, cheaper and easier than ever before.

CONDUCTING BUSINESS

The internet has created a whole new platform that we can use to conduct business and to reach new customers. This includes the following:
- Creating online advertisements for products in order to reach more customers
- Creating and hosting online services, for example Netflix and Amazon
- Creating completely new business ideas, for example YouTube and Esports

MEETING NEW PEOPLE

For today's teens, friendships can start digitally: 57% of teens have met a new friend online. Social media and online gameplay are the most common digital venues for meeting friends The most common spots for meeting friends online are social media sites like Facebook or Instagram, followed by playing networked video games. Girls who have met new friends online are more likely to meet them via social media, while boys are substantially more likely to meet new friends while playing games online.

Text messaging is a key component of day-to-day friend interactions: 55% of teens spend time every day texting with friends. Social media helps teens feel more connected to their friends' feelings and daily lives, and also offers teens a place to receive support from others during challenging times. For many teens, texting is the dominant way that they communicate on a day-to-day basis with their friends.

DISTRIBUTED COMPUTING POWER

One of most important ways in which technology has impacted our daily lives, is through the invention of distributed computing power. Distributed computing power technologies, such as cloud and grid computing, allow users to store information on the internet, as well as increase their computing power, by using a network where one computer can use the computing power and resources of other computers. This saves users both time and money, as they do not have to invest in expensive processing equipment.

QUESTION 1: MULTIPLE CHOICE

1.1 Which of the following is NOT a computer-related crime? (1)
  A. Downloading illegal software
  B. Accessing hardware on a shared network
  C. Stealing a network's password
  D. Hotlinking

1.2 What does DoS stands for? (1)
  A. Denial-of-service
  B. Data on server
  C. Delivery of services
  D. Digital office software

1.3 Which of the following can be used to launch DoS attacks? (1)
  A. Spyware
  B. Zombies
  C. Worms
  D. Phishing

1.4 Which of the following is NOT a result of telecommunication technologies? (1)
  A. Meeting new people
  b. Conducting business
  C. Reducing pollution
  D. Distributing computer power

1.5 What is the purpose of a firewall? (1)
  A. Preventing other computers on a network from accessing your computer
  B. Removing viruses on the computer
  C. Detecting spyware programs
  D. Installing anti-malware

[5]

QUESTION 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Correct the statement if it is false.
Change the underlined word(s) to make the statement true.

a. Malware is software that can be used to cause harm to the user's computer or computer network, without the user's knowledge. (1)

b. Identity theft is when someone uses your credentials to access your personal information. (1)

c. You can prevent adware by being careful when installing new applications. (1)

d. All bots are malicious. (1)

[4]

QUESTION 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A. (5)

COLUMN A	COLUMN B
3.1 Katya received an SMS claiming that she won a cash prize for a lucky draw she does not recall entering. The message asked her to provide her banking details so that they can transfer the money.	**A.** DoS **B.** Spoofing attacks **C.** Worm **D.** Phishing **E.** Trojan **F.** Sniffer attacks **G.** "Congratulations, you have won" **H.** Antivirus **I.** "Nigerian letter" **J.** Adware **K.** Firewall **L.** Zombie **M.** Anti-malware
3.2 Coleman is a hacker who intercepts data packets on a network and inspects these packets for useful information.	
3.3 Dillan was sent an email from someone claiming that they want him to help them wire some money to a charity organisation in India. In return for his efforts, they will give Dillan 5% of the transferred amount.	
3.4 When Rebetswe found a Trojan horse on her computer, she used software to remove it from her computer and check for any other viruses.	
3.5 Software that monitors the behaviour of a network and blocks any internet attacks.	

[5]

QUESTION 4: FILL IN THE MISSING WORDS

Fill in the missing word(s) in the following statements. Provide only ONE word for each space.

a. Businesses create _____ for products in order to reach more customers. (1)

b. _____ technologies saves users both _____ and money, as they do not have to invest in buying expensive processing equipment. (2)

c. People can use _____ to meet new people from anywhere in the world. (1)

d. Cell phones allow people to communicate over _____ distances and, therefore, save people money. (1)

[5]

QUESTION 5: SHORT QUESTIONS

State if the following are internet attacks or not. (5)

DESCRIPTION	YES/NO
5.1 Phishing	
5.2 Hotlinking	
5.3 Spoofing attacks	
5.4 DoS	
5.5 Spyware	

[5]

PART 6: SCENARIO-BASED QUESTIONS

6.1 Carlos recently downloaded a game online. Everything seemed fine at first, until he discovered a new hidden file on his computer. He soon started to notice that his hard-drive memory was starting to get used up, even though he was not installing any large files on his computer.

    a. To what type of threat(s) has Carlos been exposed? (2)

    b. What can Carlos use to get rid of this threat(s)? (1)

    c. Suggest three precautionary measures Carlos could take to safeguard himself against internet attacks. (3)

    d. Name five things Carlos could do in the future to protect himself from this type of threat(s). (5)

6.2 Mary downloads a lot of programs as a programmer and animator. Since Mary creates and maintains content for professional companies, she worries that her client's private information could be at risk.

    a. What would be the best safeguard for her current situation? (1)

    b. Mention three benefits of the safeguard that you suggested. (3)

    [15]

TOTAL: [40]

AT THE END OF THE CHAPTER

NO.	CAN YOU ...	YES	NO
1.	Explain computer-related crimes, attacks and frauds?		
2.	Describe security problems?		
3.	Identify how to avoid security threats?		
4.	List and describe safeguards against cyber attacks?		

SYSTEM SOFTWARE AND COMPUTER MANAGEMENT

CHAPTER OVERVIEW	
Unit 6.1	Computer management
Unit 6.2	The role of the operating system
Unit 6.3	Management of files
Unit 6.4	Troubleshooting your computer
Unit 6.5	Factors that influence performance

Learning outcomes

At the end of this chapter you should be able to:
- Describe the role of the operating system.
- Discuss file management.
- Identify and explain the uses of operating system utilities.
- List the factors that influence computer performance.

INTRODUCTION

In this chapter, we will look at what an operating system is and why it is important in managing programs. We will also look at how to best manage files and which operating utilities you can use to improve performance. Finally, we will look at some of the factors that may decrease a computer's performance, as well as some potential solutions.

6.1 Computer management

In Grade 10, you learned about file management and how you can use files and folders in order to manage and order your documents.

FILES AND FOLDERS

Files refer to any document that you have created; including text documents, spreadsheets, images and music. These can be distinguished from one another by looking at the file extension. The file extension consists of the letters that follow after the full stop in the file name.

Let's take a look at some examples of file extensions:
- **.txt** for text files created in Notepad or other text editors
- **.docx** (or **doc**) for files created in Microsoft Word
- **.xlsx** (or **xls**) for files created in Microsoft Excel
- **.pptx** (or **ppt**) for files created in Microsoft PowerPoint
- **.pdf** for PDF files that are opened in a PDF reader (such as Adobe Acrobat)
- **.html** or **htm** for web pages
- **.png**, **jpg**, **tiff** for images
- **.mp3** for music files
- **.mp4** for video files

Folders refer to the location where the files are stored on your computer. You can create, name, rename and sort folders, as and when needed. They are usually stored on your hard drive and can be transferred to a USB drive, a CD, DVD, or the internet.

In Grade 11, you learned how to find a specific file and how to obtain additional information about the file. To find a file, you can use your computer's search function. To search for a file, you can do the following:
1. Open the *Start* menu.
2. Type in "File Explorer" and click the *File Explorer* option. You should now see a new window open.
3. Click the *Quick Search* box and type in the name of the file for which you are looking. (The *Quick Search* box is located at the top right-hand part of the window.)
4. Select the correct file from the search results and open by double-clicking the filename.
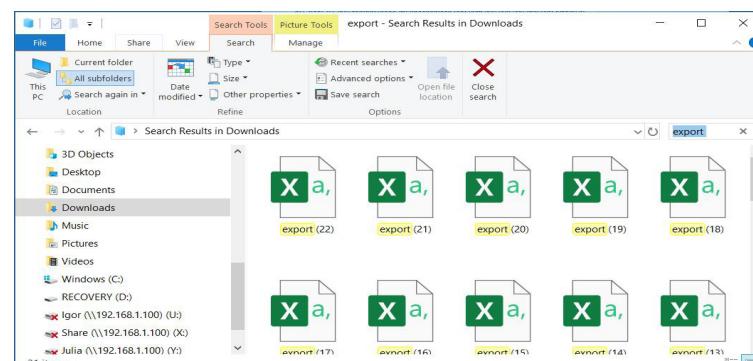
Figure 6.1: *How to search for a file*

FILE PROPERTIES

Once you have found the file you were looking for, you can obtain some additional information about the file by looking at its file properties. To open the *File Properties* window, you can do the following:

1. Open the folder where the file is saved.
2. Right click on the selected file to open the drop-down menu with options.
3. Scroll down the menu and select *Properties*.
4. A new window containing the file information will now open.
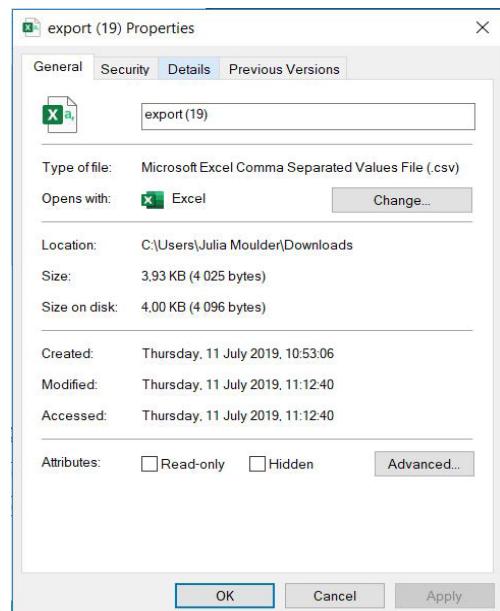
Figure 6.2: *The File Properties window*

You will notice that the **File Properties** window consists of the following four tabs:

1. *General*
2. *Security*
3. *Details*
4. *Previous versions*

Table 6.1: *Tabs in the File Properties window*

TAB	DESCRIPTION
General	The General tab contains information about the file type, the file location, the size of the document, and when the document was created, modified and accessed. It also indicates the attributes of the document, including *Read-only* and *Hidden*.
Security	The *Security* tab contains information on who has access to the document, as well as what they are allowed to do.
Details	The *Details* tab contains the file's meta information, which includes the title of the document and the name of the author.
Previous versions	The *Previous versions* tab indicates any previous versions of the document.

Example 6.1   Work with *Read-only* and *Hidden* files

The *Read-only* attribute allows the user to view, but not edit the file. In order to edit a read-only file, you need to change the file attribute and remove the read-only part. You can do this, by clearing the *Read-only* checkbox in the *File Properties* window.

The *Hidden* attribute makes the file invisible when you browse the folder. In order to view the file, you have to change the folder properties to allow you to view hidden files. This can be done as follows:

1. Open the *Start* menu.
2. Type in "control panel" and click *Control Panel*. A new window will open.
3. Click and open the *File Explorer* options. Your computer will now open a new window.
4. Select the *View* tab.
5. Under *Advanced Settings*, click *Show hidden files, folders and drives*.
6. Click *OK*.

Activity 6.1

1. Write down the correct answer for each of the following questions.
   a. Which one of the following file extensions are NOT used when you type a report?

      A. .txt   **B.** .docx
      C. .png   **D.** .pdf

   b. Which of the following file extensions are NOT part of the Microsoft Office package?

      A. .txt   **B.** .docx
      C. .xlsx   **D.** .pttx

   c. Which attribute allows the user to view, but not edit the file?

      A. Hidden   **B.** Read-only
      C. Security   **D.** Sharing

   d. Which of the following tabs is not found on the *File Properties* window?

      A. *General*   **B.** *Security*
      C. *Details*   **D.** *Properties*

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 The location where the files are stored on your computer	**A.** *File Properties*
2.2 You can obtain some additional information about the file	**B.** .gif
2.3 Any document that you have created; including text documents, spreadsheets, images and music	**C.** .psd
2.4 File extension for an animation	**D.** Folder
2.5 File extension for a picture	**E.** .mov
	F. File
	G. .html
	H. .jpeg

3. Answer the following questions:
   a. Define the concept of computer management.
   b. List the positive outcomes of computer management.
   c. Describe the four tabs visible when the *File Properties* window is displayed.
   d. You want to hide a folder on the school's PC. List the steps that you will take in order to hide the folder.
   e. How do you change the attribute of a file to enable yourself to edit the file?

6.2   The role of the operating system

An operating system is a group of system software that is responsible for controlling a computer's hardware and software, providing a user interface with which to interact and manage the computer's resources. Due to this, the operating system has a large number of different functions and jobs. To make these functions easier to understand, they will be grouped into different categories based on their goals.

These categories consist of the following:
- Starting the computer
- Providing a user interface
- Managing programs

STARTING THE COMPUTER

In computing, booting is the process of starting a computer. It can be initiated by hardware such as a button press, or by a software command. After it is switched on, a computer's central processing unit (CPU) has no software in its main memory, so some process must load softwarIt consists of picture-like items (icons and arrows for example). ...
GUI
The main pieces of a GUI are a pointer, icons, windows, menus, scroll bars, and an intuitive input device. Some common GUIs are the ones associated with Microsoft Windows, Mac OSX, Chrome OS, GNOME, KDE, and Android.e into memory before it can be executed.

PROVIDING A USER INTERFACE

In the past, you needed to know a lot about computers in order to open something as simple as a word-processing program. Fortunately, that has all changed. Today, even toddlers can use computers to open and play their favourite games. This is all thanks to the operating system.

The operating system makes the users' lives much easier by providing them with a user interface that can be used to interact with the computer. Most modern computers, laptops and smartphones use a graphical user interface (GUI), which allows the user to interact with programs using point-and-click technology.

Examples of a GUI include the following:
- Icons
- Program windows
- Menus
- Tabs on your browser
- Buttons

Figure 6.3: *The GUI on a smartphone*

Something to know

Microsoft's Windows 10 operating system is estimated to be made up of around 50 000 000 lines of code. In other words, it is made up of 50 000 000 lines of instructions that tell it how to do its job.

WHAT HAPPENS WHEN COMPUTER IS TURNED ON (BOOT PROCESS)

https://www.youtube.com/watch?v=Lp__Y-_DsfU

MANAGING PROGRAMS

One of the most important tasks of the operating system is to help the computer manage hundreds of processes that run at the same time. In other words, it needs to ensure that theappropriate number of resources is allocated to the processes, as well as the correct hardware is activated when required. An example of this can be seen when listening to music while you are playing games. You want your operating system to allocate the exact number of resources to each of the applications, allowing them to run at the same time. The last thing you want is for your computer to spend half the time playing music and the other half running your game. Fortunately, modern computers are very good at using resources effectively.

It should be noted that there are some circumstances where your computer might run out of resources. This includes running multiple high-intensity processes at the same time. When this happens, close other programs that are not important, or restart your computer. If the problems persist, you may have to buy a more powerful computer with more resources.

Figure 6.4: *Managing programs*

SINGLE VERSUS MULTIPLE USERS

Operating systems can be designed with one or multiple users in mind. Single-user operating systems are normally designed for home and private use, as these computers use software that is licensed for a single user only. This means that only a single person can use the computer at one time. Examples of single-user operating systems include Microsoft Windows and MacOS.

Multiple-user operating systems allow more than one user to access and use the computer system at the same time. Because of this, these operating systems are normally used as server. The **server computer** can be accessed and used by multiple users through a computer network. A mainframe computer uses multiple computer terminals that are connected to the main computer. Examples of multi-user operating systems include Unix and Linux.

MULTITASKING

One drawback of older operating systems is that they were only able to load one program onto the computer's memory at a time. This means that the computer could only run a single program at a time.

Multitasking operating systems allow the computer to run multiple processes (tasks), or applications at the same time. An example of this can be seen when you use your smartphone. You can listen to music and at the same time, browse the internet, or chat to a friend on WhatsApp. This is *not* where multitasking stops, however; it also allows certain services to run in the background. These background services allow your smartphone to check for messages, update your applications and manage your cellular network all at the same time.

TASK MANAGER (WINDOWS)

In order to find out how a computer is using its resources, Windows operating systems have been designed to include an application called *Task Manager*. *Task Manager* allows the user to see which tasks and applications are currently running on the computer, and how much memory and CPU processing power is being dedicated to each individual task. It also allows the user to forcefully end any applications that might have stopped working, or are using too many resources. The *Task Manager* window consists of several tabs; each dedicated to provide the user with specific information. Table 6.2 lists the description for each of these tabs.

Table 6.2: *Tabs in the Task Manager window*

TAB	DESCRIPTION
Processes	The *Processes* tab gives the user information on which programs are running and the resources that they are using.
Performance	The *Performance* tab contains information on how your hardware is being used. This includes your CPU, memory, hard drive, network and GPU.
App History	The *App History* tab shows the user how much of your CPU and network have been used by the various applications. This is measured from the date indicated to current.
Start-up	The *Start-up* tab provides information on which applications automatically become active once your computer is turned on. Disabling some applications can speed up the boot process.
Users	The *Users* tab provides more information on which users are currently signed into the computer and how many resources they are using.
Details	The *Details* tab displays every process that is currently running on the computer.
Services	The *Services* tab provides information on all the Windows services that have been installed on your computer.

To open the *Task Manager*, you can do the following:
1. Open the *Start* menu and enter the words "task manager".
2. Click on *Task Manager***.**

On most Windows 10 computers, there will be more than 50 applications and processes running at any given time.
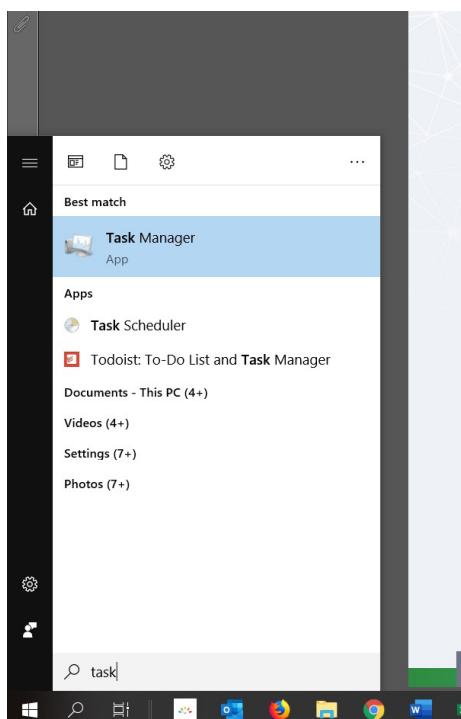
Figure 6.5: *Opening Task Manager in the Start menu*

Activity 6.2

1. Write down the correct answer for each of the following questions.
   a. Which tab provides information on the applications that automatically become active once your computer is turned on?
      A. *Start-up* tab
      B. *User* tab
      C. *Process* tab
      D. *Performance* tab
   b. Which tab provides more information on which users are currently signed in to the computer and how many resources they are using?
      A. *Performance* tab
      B. *Start-up* tab
      C. *User* tab
      D. *Process* tab
   c. Which of the following is NOT a GUI?
      A. Menus
      B. Buttons
      C. Icons
      D. Backlight
   d. Which of the following is a shortcut used to open Task Manager?
      A. Alt+F4
      B. Ctrl+Shift+Esc
      C. Ctrl+Shift+T
      D. Ctrl+Shift+D

e. Which application do you use to find out how the computer is using its resources?
   A. Task Manager
   B. Settings
   C. Windows Performance
   D. Device Manager

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A		COLUMN B
2.1	Contains information on how your hardware is being used, which includes your CPU, memory, hard drive, network and GPU	A. *Details* tab
2.2	Gives the user information on which programs are running and the resources that they are using	B. *Services* tab
2.3	Displays every process that is currently running on the computer	C. *Performance* tab
2.4	Shows the user how much of the CPU and network have been used by the various applications	D. Coke and Tab
2.5	Provides information on all the Windows services that have been installed on your computer	E. *Process* tab
		F. *Thinking* tab
		G. *App History* tab
		H. *Users* tab

3. Answer the following questions:
   a. Explain the role of the operating system.
   b. List the three categories into which the functions of the operating system are divided.
   c. Provide two ways in which to open *Task Manager*.
   d. Define "multitasking" in terms of a computer operating system.
   e. Discuss the difference of single user versus multiple users. Give a user type and a disadvantage that is associated with each.

File management ensures that a computer is user friendly, that no files go missing, and that you will be able to find your data and information without wasting any time.

FILE MANAGEMENT

File management allows users to name, organise and arrange their files and folders in such a way that they are easy to find and distinguish. In order to help you with this process, let's take a look at some tips on effective file management:

- When installing new programs, use the default installation folders. This will ensure that all your programs are installed in the same folder.
- Save all your documents in the same root folder. This also applies to all music (music folder), pictures (images folder) and videos (videos folder).
- Create subfolders within the root folder in order to distinguish between documents.
- Name or rename your folders appropriately. When a folder is created, it will be named "New Folder". Rename the folder according to the contents of it.
- File new documents as they are created. This will ensure that the document is in the correct folder and, therefore, can be found with more ease.
- Remove old documents and folders. Old documents and folders can take up space and cause your computer to become cluttered. In order to prevent this, you should delete documents and folders that are no longer needed. If you do not want to delete them, consider creating a root folder called "oldies" and moving all old documents to that folder.
- Make regular backups of important files. This will prevent you from losing any important information.

IMPORTING AND EXPORTING

Modern operating systems allow you to import and export files, documents and data. Importing a file refers to bringing a file from a different program into the one that you are currently using. An example of this is when you import information from a Microsoft Excel (.xls) file to Microsoft Word (.doc). Exporting a file refers to saving the file in a way so that it can be used by a different program. This normally includes converting the file format to one that is usable by the program. An example of this is exporting a file from Microsoft Word (.doc) to a PDF reader (.pdf).

Importing and exporting can also be used to manage files and documents on your computer or smartphone. This is best illustrated when exporting your contacts from your smartphone and transferring the data to your Google account (this can also be used to back-up the data). Once the data has been uploaded, you can import the contacts to your computer, tablet, or new smartphone.
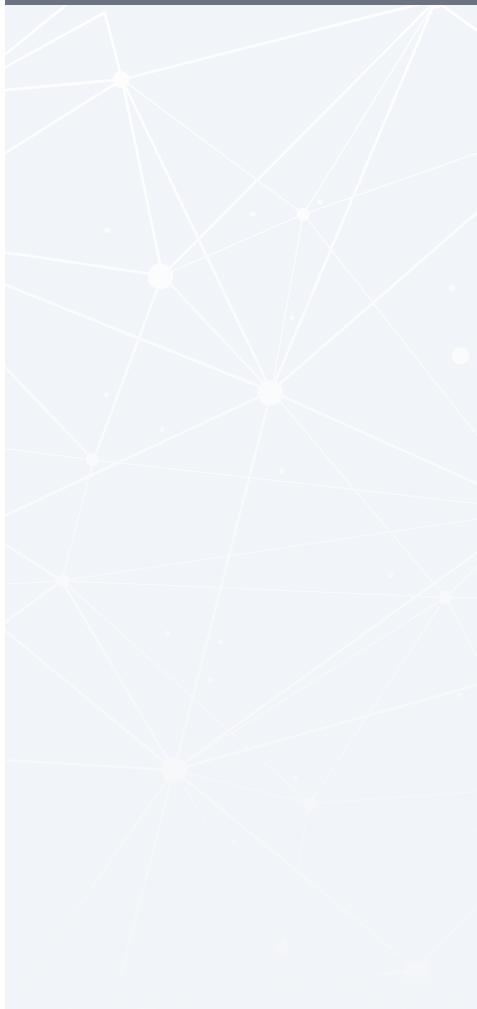
1. Briefly explain the following
   a. Spooling
   b. Firewall
   c. Spoofing
   d. File compressors

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Allows users to name, organise and arrange their files and folders in such a way that they are easy to find and distinguish	**A.** Antivirus
2.2 A utility that enables a printer to print documents that are much larger than the amount of memory that the printer even has	**B.** File management utilities
2.3 Programs that use advanced algorithms and mathematical formulas to decrease the amount of space used by files	**C.** Importing
2.4 Utility that provides users with a GUI that they can use to organise files and folders	**D.** File management
2.5 Refers to bringing a file from a different program into the one you are currently using	**E.** Firewall
	F. Spooling
	G. Exporting
	H. File compression

3. Answer the following questions:
   a. Give two main reasons why it is good to constantly keep your computer programs updated.
   b. List two reasons why file compression is rarely used.
   c. Explain "converting" and give an example of when it is implemented.

OPERATING SYSTEM UTILITIES

Most operating systems include various system utilities. These utilities are small programs that work with the operating system in order to help users maintain and protect their computers. The following are some of the most commonly used utilities:

- Firewall
- File compressors
- File management utilities
- Update schedulers
- Backups

FILE COMPRESSORS

File-compression programs use advanced algorithms and mathematical formulas to decrease the amount of space used by files. While this sounds like a great way to free storage space, in reality, file compression is rarely used to free storage space. There are two important reasons for this:

1. Compressed files *cannot* be used immediately; they first need to be decompressed. Not only does this waste time every time you open up a file; it uses up the space you saved when you compressed the files in the first place.
2. The files most likely to use up your storage space are already compressed. This includes most video and music files. As such, compressing them further does not help.

Compression is, however, useful to archive files. When many files and folders are grouped together into a single file, they are said to be archived. This makes them easier to store or transfer. For example, it is a lot easier to email a single archived file than thousands of separate files. Since a single compressed file can contain thousands of files and folders, they are often used to archive files.

FILE MANAGEMENT UTILITIES

File management utilities provide users with a GUI that they can use to organise files and folders. Operating systems, such as Windows, use a variety of different GUI options to enable users to customise files and folders to best suit their needs.
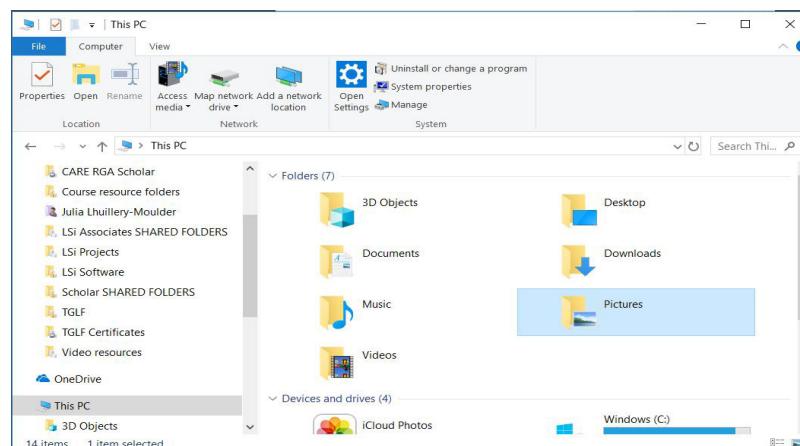
Figure 6.6: *My Computer is an example of a file management utility*

SCHEDULING UTILITY

In today's competitive market, computer programmers continue to improve their software after they have been released. This includes adding new features, fixing bugs, improving system reliability or security. In order to obtain these improvements, the user needs to update the software, or download a patch from the supplier's website.

If an application or operating system asks you if it can automatically install an update, the best idea is to simply allow it to do so. This takes a few minutes to complete, but ensures that your computer is up to date with the newest software. Since updates are so important for software, saying no to an update will cause the application to constantly remind (and annoy) you about the update, until you eventually allow it. As such, it is better to update the application as soon as possible.

The Scheduling Utility is located in the System ribbon menu. The new Scheduling feature provides savings in both time and human resources and greatly improves the efficiency with which you can automate repetitive and time consuming activities. The three areas controlled by this utility are Report Scheduling, Email Alerts and Process Scheduling.

BACKUP UTILITIES

Operating systems, such as Windows, come equipped with a backup and restore utility. This program allows users to back up important files and folders, as well the important settings for the operating system. To use *Backup and Restore*, you can do the following:

1. Purchase an external hard drive to use for the backup and connect it to your computer.
2. Open the *Start* menu and type in "control panel". This will open the *Control Panel*.
3. Click *Backup and Restore* (in Windows 7) to open the *Backup and Restore* window.
4. Click *Set up backup*.
5. Select the external hard drive as the location where you would like to save the backup.
6. If all your files are stored in your private folders (such as the Documents, Music and Videos folders), let Windows choose. Otherwise, select the folders that should be backed up manually.
7. Click *Save and run the backup* option to create a backup of all your files.
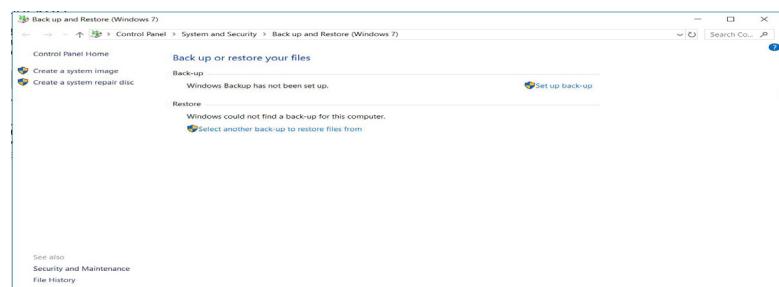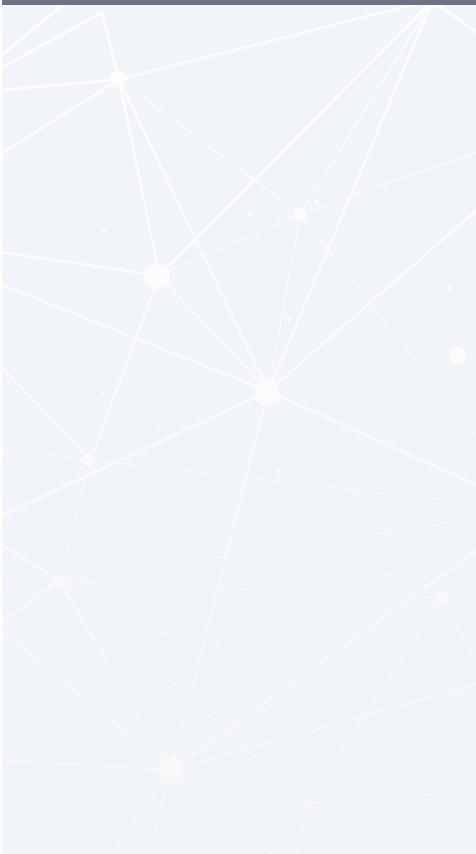
Figure 6.7: *Creating a backup using the Backup and Restore application*

To restore files from a Windows backup, you can do the following:

1. Connect your external hard drive to your computer.
2. Open the *Backup and Restore* (Windows 7) application from the *Control Panel*.
3. Click *Restore all users' files*.
4. Click *Browse for files* or *Browse for folders*.
5. Select in the original location box and click *Restore*.
6. This will restore your files to where they used to be; therefore, the files are no longer deleted.

DEFRAGMENTATION

When you save a file onto your computer, the computer breaks the file up into smaller pieces. This is done so that the file can be stored on your hard drive. Unfortunately, the file pieces are not always stored in the same location, but rather spread over several locations. When this happens, it is known as fragmentation.

Fragmentation occurs from files being constantly written, deleted and resized, and can lead to several problems. These include a slow computer, long boot-up times, random computer crashes and the computer freezing. In order to prevent these problems from happening, you can defragment your hard drive. This process reorganises your hard drive by taking all the pieces of data that are spread across your hard drive and reorganising it so that the pieces are closer to each other.
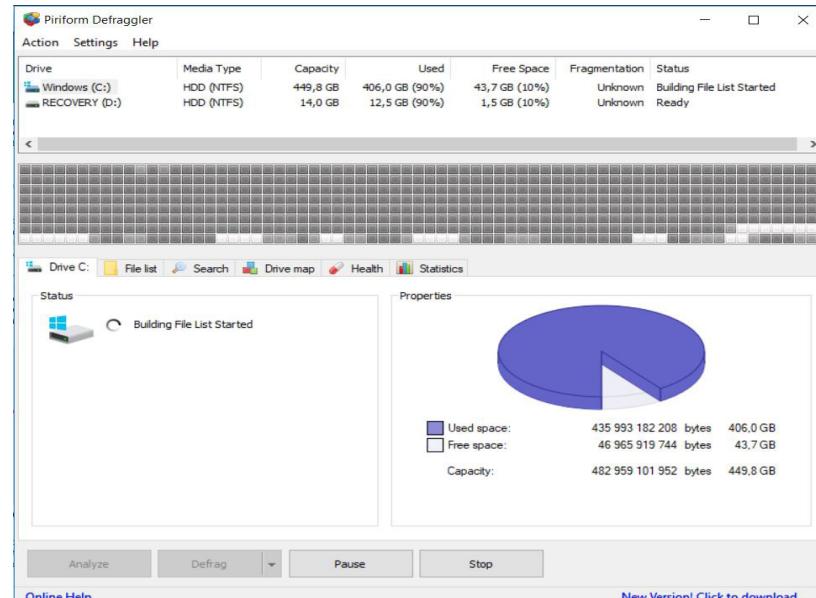
Figure 6.8: *The process of fragmentation and defragmentation*

Examples of programs that you can use to defragment your computer include the following:

- *Optimise Drive Tool*, which comes with the Windows operating system and was previously known as *Disk Defragmenter*
- PerfectDisk
- Norton Utilities

DEFRAGMENTATION EXPLAINED

To show the *Disk Deframenter* process, watch the following video:

https://www.youtube.com/watch?v=AtRIOUZuI2c

SPOOLING

Spooling is a process in which data is temporarily held to be used and executed by a device, program or the system. Data is sent to and stored in memory or other volatile storage until the program or computer requests it for execution.

"Spool" is technically an acronym for simultaneous peripheral operations online.

Spooling works like a typical request queue or spool where data, instructions and processes from multiple sources are accumulated for execution later on. Generally, the spool is maintained on the computer's physical memory, buffers or the I/O device-specific interrupts. The spool is processed in ascending order, working on the basis of a FIFO (first in, first out) algorithm.

The most common implementation of spooling can be found in typical input/output devices such as the keyboard, mouse and printer. For example, in printer spooling, the documents/files that are sent to the printer are first stored in the memory or printer spooler. Once the printer is ready, it fetches the data from that spool and prints it.

Activity 6.4

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
1.1 System utilities that come standard with an operating system that helps to find computer-related problems	**A.** Fragmentation
1.2 Occurs due to files being constantly written, deleted and resized, and can lead to several problems	**B.** Disk Clean-up
1.3 The tool that identifies different types of files that can be deleted without affecting the user	**C.** Troubleshooting

2. Answer the following questions:
   a. Explain the process of fragmentation and defragmentation.
   b. Explain how a troubleshooting wizard works.

6.4   Troubleshooting your computer

In Chapter 1, we looked at some of the potential problems (and solutions) that you might encounter while using a computer. So, in order to make your life even easier, in this section, we will be taking a look at some of the utility software that you can use in order to resolve your computer problems.

UTILITY SOFTWARE FOR TROUBLESHOOTING

DISK CLEAN-UP

Sooner or later, you are going to encounter the problem of running out of hard-drive storage space. When this occurs, the *Disk Clean-up* utility can be a very handy tool to free up some hard-drive space. The tool comes standard with Microsoft Windows and works by identifying different types of files that can be deleted without affecting you. These include temporary files, the files in your *Recycle Bin* and the files used as part of a completed software upgrade. Once the *Disk Clean-up* tool has identified the files, it lets you decide which files can be deleted.

To use the *Disk Clean-up* tool, you can do the following:
1. Click the *Start* menu.
2. Type in "disk clean-up" and select *Disk Clean-up*. Your computer will calculate how much space you can free up.
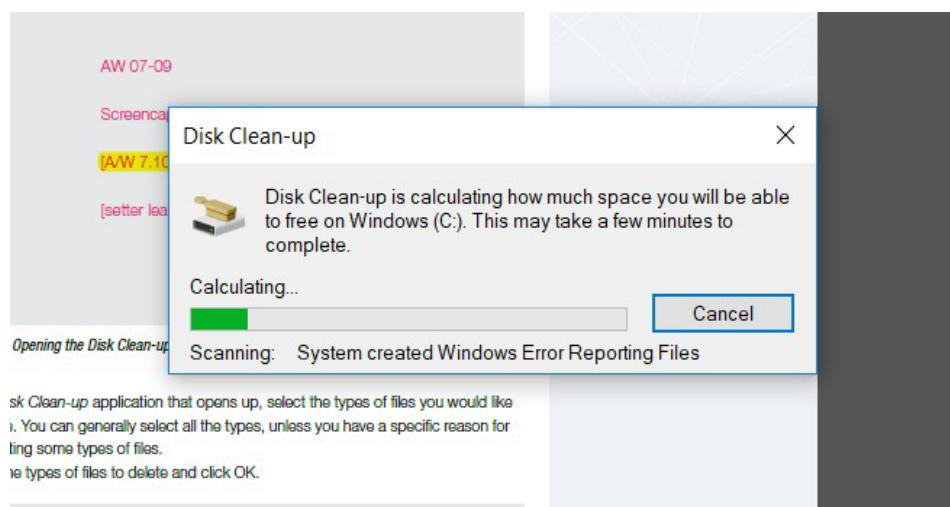
Figure 6.9: *Opening the Disk Clean-up tool*

3. In the *Disk Clean-up* application that opens up, select the types of files you would like to delete. You can generally select all the types, unless you have a specific reason for not deleting some types of files.
4. Select the types of files to delete and click OK.

RUN DISK CLEANUP

To show the *Disk Clean-up* process, watch the following video:

https://www.youtube.com/watch?v=5UfMKd3SPtY
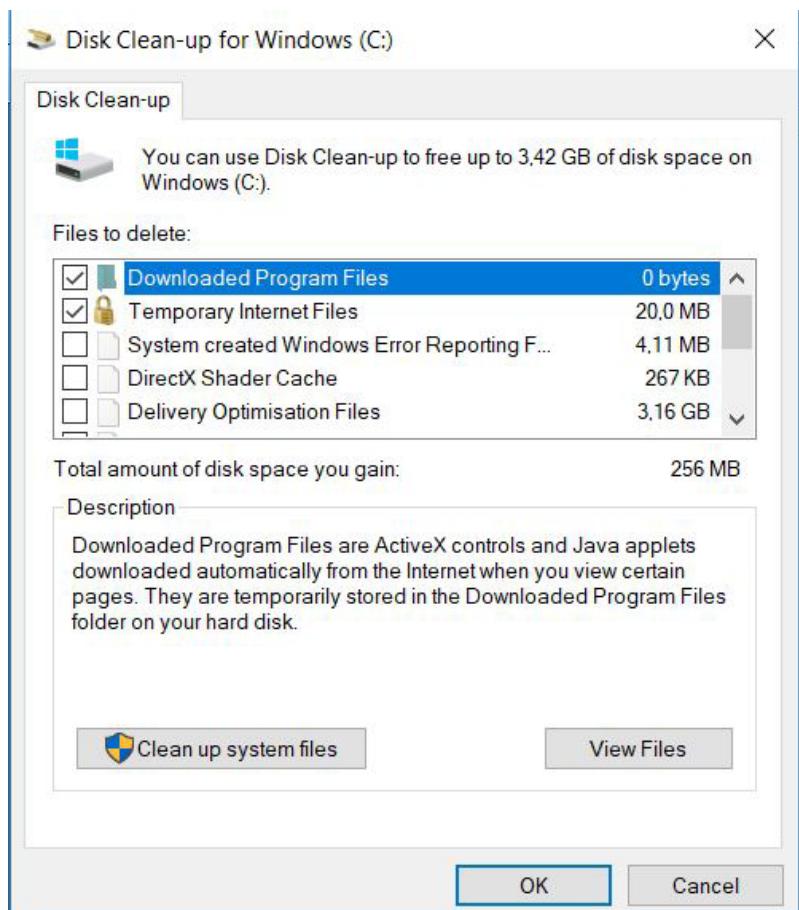
Figure 6.10: *Using the Disk Clean-up tool*

The amount of space cleaned up with this application will depend on how regularly you use it. If you rarely use the *Disk Clean-up* tool, it can free up a few gigabytes at a time. However, if you use it regularly, it may only free a few megabytes at a time.

WIZARDS

Troubleshooting can be a time-consuming and annoying procedure; fortunately, your operating system can fix this. Troubleshooting wizards are system utilities that come standard with your operating system. The tool allows you to quickly check if your operating system or hardware is functioning as required. If a problem is encountered, the wizard will attempt to fix it. If the wizard cannot fix the problem, it will ask you some questions in order to determine the cause of the problem.
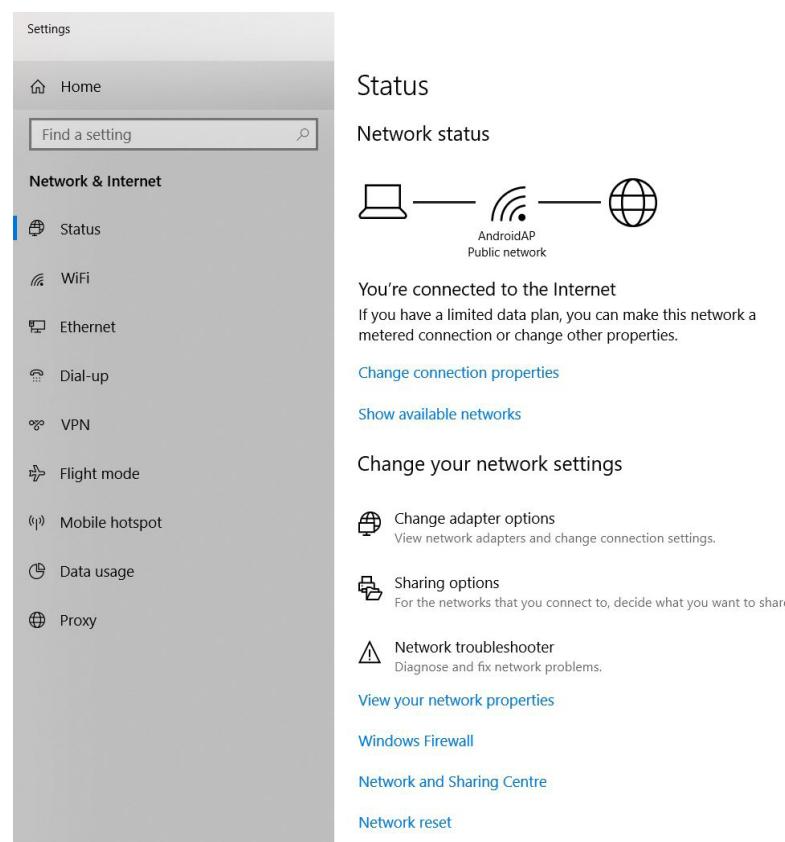
Figure 6.11: *Using a wizard to fix a network connection*

Examples of problems that can be fixed using the troubleshooting wizards include network connection problems, printing problems and software compatibility problems.

6.5   Factors that influence performance

As you are most likely aware, you use your computer a lot. Due to this, the computer is subject to some wear and tear, which can reduce its speed and performance. In order to help you determine *why* your computer is becoming slower, we will be taking a look at some of the most common factors that might influence computer performance.

RAM

RAM is responsible for temporarily storing the data that is being used by the computer's processor. This allows the processor to access the data much faster and easier than would be possible if the data was loaded from a secondary storage device, such as a hard drive.

A slow computer can be an indication that you have too little RAM. This can be solved by buying and adding additional RAM to your computer. If you are looking to buy additional RAM, do proper research regarding the speed and type of RAM that is used by your motherboard.

PROCESSOR

The CPU is the part of a computer that is responsible for receiving and carrying out a computer's instructions. Because of this, the CPU is one of the most important components for determining how fast a computer will be.

There are two main factors that influence the speed of the CPU:
1. The first is the GHz of the processor, which refers to the CPU frequency and is an indication of the processor speed. As a general guideline, the higher the frequency, the better the CPU.
2. The second factor is the amount of cores. As with processor speed, more cores are generally better.

APPLICATIONS

Every computer has a limited number of resources (such as RAM and CPU processing time) that can be used to run applications. For each application currently running, the amount of available resources will become less. If you open too many applications at the same time, all available resources will be used up and your computer's processing speed will slow down significantly. This might even lead to some applications freezing entirely.

In order to prevent this from happening, close any application that you are not currently using. You can do this by using the *Task Manager* application, as described earlier in this chapter.

CACHING

One of the methods that your computer uses in order to improve processing speed is caching. Caching is a small, temporary form of storage that is created in a fast form of

FIXING YOUR SLOW COMPUTER

To show why a computer becomes slow, watch the following video:

https://www.youtube.com/watch?v=k_RpftRwrNk

Something to know

More RAM allows more data to be stored in the RAM, which allows your programs to run faster.

memory in order to allow data to be accessed more quickly. An example of this can be seen when you are browsing the internet. When you open a website, such as Facebook, your computer temporarily stores the files for the website in your cache. Next time you open Facebook, the files are loaded from the cache instead of the internet. This not only helps the site to load faster; it also reduces the burden on your network.

Your computer uses the following three forms of caching:
1. **CPU cache:** The difference in speed between a computer's CPU and RAM has recently become too large. As a result, the RAM cannot provide all the information the CPU needs fast enough. To prevent this problem, many CPUs now have a small, high-speed cache built into the CPU, where it can temporarily store the data it needs.
2. **Disk cache:** The disk cache is a small amount of RAM that is built into a hard-disk drive. It stores data that is being sent or received by the hard-disk plates for a short period of time.
3. **Web cache:** The web cache is a small area on a computer's hard drive where images and pages from the world-wide web are stored for a short period. This allows you to quickly load those images from your computer when you visit the page again, rather than to wait to have them load over a slow internet connection.

DISK OPTIMISATION

As discussed previously in this chapter, fragmentation of data can cause your computer to slow down. To prevent this from happening, you can use a defragmentation tool to reorganise the data on your hard drive. This will rearrange the areas where data is stored on the hard drive to make sure the pieces of a file are close to each other and that the fastest parts of the hard drive are used.

Another potential problem that you might encounter is running out of storage space. When this happens, you have the following options:
- Delete any files that you do not need any more.
- Use the *Disk Clean-up* application to help create some additional space.
- Buy an additional hard drive.

MALWARE

As discussed in Chapter 5, malware has been designed to cause harm and use your computer's resources without your knowledge. Due to this, malware is often responsible for slowing down your computer. In order to prevent malware from infecting your computer, or to remove any malware that might already be installed on your computer, you can use security applications, such as a firewall, antivirus and anti-spyware.

A processor, or "microprocessor," is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

Something to know

Computers are not limited to a single hard drive. If you are running low on storage space, do not hesitate to buy an additional hard drive to store more data.

Something to know

Windows 10 comes equipped with a basic firewall and antivirus program. If you feel that you will need additional protection, Chapter 6 has some recommendations on which programs to buy.

The central processor of a computer is also known as the CPU, or "central processing unit." This processor handles all the basic system instructions, such as processing mouse and keyboard input and running applications. Most desktop computers contain a CPU developed by either Intel or AMD, both of which use the x86 processor architecture. Mobile devices, such as laptops and tablets may use Intel and AMD CPUs, but can also use specific mobile processors developed by companies like ARM or Apple.

Modern CPUs often include multiple processing cores, which work together to process instructions. While these "cores" are contained in one physical unit, they are actually individual processors. In fact, if you view your computer's performance with a system monitoring utility like Windows Task Manager (Windows) or Activity Monitor (Mac OS X), you will see separate graphs for each processor.

Processors that include two cores are called dual-core processors, while those with four cores are called quad-core processors. Some high-end workstations contain multiple CPUs with multiple cores, allowing a single machine to have eight, twelve, or even more processing cores.

Besides the central processing unit, most desktop and laptop computers also include a GPU. This processor is specifically designed for rendering graphics that are output on a monitor. Desktop computers often have a video card that contains the GPU, while mobile devices usually contain a graphics chip that is integrated into the motherboard. By using separate processors for system and graphics processing, computers are able to handle graphic-intensive applications more efficiently.

Activity 6.5

1. Which of the following refers to cache located on the CPU?
   a. Disk cache
   b. CPU cache
   c. Web cache
   d. Motherboard cache
2. Answer the following questions:
   a. Define RAM.
   b. Explain what influences a CPU's speed.
   c. What can potentially happen if you open too many applications at the same time?
   d. Describe how cache improves performance.
   e. List three ways in which you can free up disk space.
   f. What is meant by a CPU's generation and how does this affect its speed?

QUESTION 1: MULTIPLE CHOICE

1.1 Where can you search for additional information about a file? (1)
    A. *Properties*
    B. Windows Explorer
    C. *Security* tab
    D. *Start* menu

1.2 Which of the following tabs is only found in the *Properties* window of a folder? (1)
    A. General
    B. Security
    C. Details
    D. Location

1.3 When a computer is started up the operating system is loaded into the _____. (1)
    A. ROM
    B. RAM
    C. Hard disk
    D. Cache

1.4 Which of the following is not on a smartphone's GUI? (1)
    A. Browser tabs
    B. Buttons
    C. Settings menu
    D. Mouse icon

1.5 Which of the following troubleshooting utilities is used to increase your computer's storage capacity? (1)
    A. Defragmentation tool
    B. Disk Clean-up tool
    C. Wizard tool
    D. Antivirus software

[5]

QUESTION 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Correct the statement if it is false. Change the underlined word(s) to make the statement true.

2.1 <u>Multitasking</u> operating systems allow more than one user to access and use the computer system at the same time. (1)
2.2 A new computer's performance <u>increases</u> over time. (1)
2.3 The <u>write-only</u> attribute allows the user to view but not edit the file. (1)
2.4 <u>Print management</u> allows a printer to print documents that are much <u>smaller</u> than the amount of memory the printer has. (1)
2.5 <u>CPU cache</u> is high-speed memory stored on CPU that is <u>larger</u> than RAM. (1)
[5]

QUESTION 3: MATCHING ITEMS

Choose a term or concept from Column B that matches a description in Column A.

COLUMN A	COLUMN B
3.1 A system that allows the computer to run multiple tasks or applications at the same time.	**A.** Performance tab **B.** Disk Clean-up tool **C.** Multiple user operating system **D.** Single user operating system **E.** Previous version tab **F.** Task Manager **G.** App History tab **H.** Disk cache **I.** General tab **J.** Wizard tool **K.** Multitasking operating system **L.** Startup tab **M.** Web cache **N.** Processes tab
3.2 Where you go to see which tasks and applications are impacting the performance of your computer, so you can stop any unnecessary processes.	
3.3 Where you go to see which applications are automatically activated when your computer is turned on.	
3.4 Where you go to find information on how your hardware is being used.	
3.5 A system that is used for a person's personal use. The software on this computer can only be used by one person at a time.	

[5]

QUESTION 4: MEDIUM AND LONG QUESTIONS

4.1 How can a wizard be used to improve the troubleshooting process? (3)

4.2 What is a multitasking operating system? (2)

4.3 Mention TWO situations where your computer can run out of resources. (2)

4.4 Mention ONE profession that would use a single user operating system. Give a reason for your answer. (2)

4.5 Mention ONE profession that would use a multiple user operating system. Give a reason for your answer. (2)

TOTAL: 21

AT THE END OF THE CHAPTER

NO.	CAN YOU ...	YES	NO
1.	Describe the role of the operating system?		
2.	Explain file management?		
3.	Identify and explain the uses of operating system utilities?		
4.	List the factors that influence computer performance?		

CHAPTER 7

INTERNET COMMUNICATION TOOLS

CHAPTER OVERVIEW	
Unit 7.1	Electronic communication
Unit 7.2	Web browsers
Unit 7.3	Computer communications
Unit 7.4	Communication devices

By the end of this chapter, you will be able to:

- Explain what digital communication is.
- Identify and discuss the different types of digital communication.
- Describe the most common features of a web browser.
- Discuss some of the most popular communication devices.
- List and describe the uses of computer communications.

INTRODUCTION

In this chapter, we will take a look at how the internet and the world-wide web are used to connect people around the world, as well as the tools that make this possible. We will start by discussing digital communication and communication devices. Thereafter, we will identify and discuss some of the most common and useful features of web browsers. Finally, we will take a look at the some of the social implications related to digital communications.

Figure 7.1: *The world-wide web*

In previous years, you learned that digital or electronic communication refers to any data, information, words or photos that are sent electronically in order to communicate with one or more people. This includes calls, messages, group chats, emails, social networks and websites. These methods of electronic communication have made our lives much easier and enabled us to communicate with people around the world. However, they do have some flaws and risks that you need to be aware of.

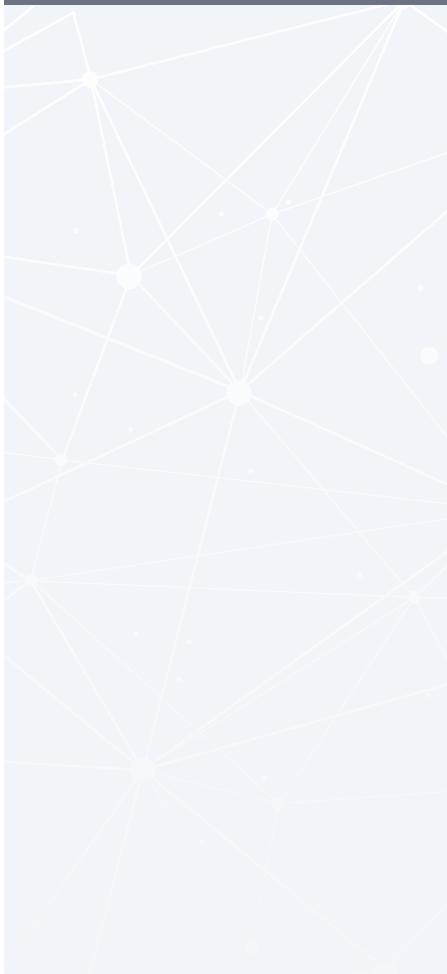## ADVANTAGES OF ELECTRONIC COMMUNICATION

- **Speedy transmission**: It requires only a few seconds to communicate through electronic media because it supports quick transmission.
- **Wide coverage**: The world has become a global village and communication around the globe requires only a second.
- **Low cost**: Electronic communication saves time and money. For example, text SMS is cheaper than the traditional letter.
- **Exchange of feedback**: Electronic communication allows the instant exchange of feedback. So communication becomes perfect using electronic media.
- **Managing global operation**: Due to the advancement of electronic media, business managers can easily control operation across the globe. Video or teleconferencing e-mail and mobile communication are helping managers in this regard.

DISADVANTAGES OF ELECTRONIC COMMUNICATION

- **The volume of data**: The volume of telecommunication information is increasing at such a fast rate that business people are unable to absorb it within the relevant time limit.
- **The cost of development**: Electronic communication requires huge investment for infrastructural development. Frequent change in technology also demands further investment.
- **Legal status**: Data or information, if faxed, may be distorted and will cause zero value in the eye of law.
- **Undelivered data**: Data may not be retrieved due to system error or fault with the technology. Hence required service will be delayed.
- **Dependency**: Technology is changing every day and therefore poor countries face the problem as they cannot afford the new or advanced technology. Therefore poor countries need to be dependent towards developed countries for sharing global network.

ELECTRONIC COMMUNICATION BEST PRACTICES

When you communicate on the internet – whether it is via email, instant messaging, or posting a blog – it is important that you follow proper **netiquette**. This will not only make the internet a more pleasant place for everyone else, it will also save you from potential embarrassment in the future!

GUIDELINES WHEN COMMUNICATING ON THE INTERNET

- Texting (messaging):
  - Keep texts short
  - Longer texts can be misinterpreted
  - Sign a text with your name
  - Spell out all words and do not use "texting lingo" or shorthand
  - Texts can be saved and can be altered
- Email:
  - Use a descriptive subject line
  - Be courteous
  - Reply promptly – but allow yourself time to get over an initial reaction to an angry email
  - Remember attachments to an email may contain metadata that can disclose unwanted information to the recipient
- Social Media:
  - There is no expectation of privacy on the internet
  - Change your passwords frequently
  - Log off after visiting the page
  - Delete your browsing history, saved passwords and cookies regularly
  - Do not disparage anyone via social media
  - Educate yourself about a site before joining.

While the tips covered in this section are generally good guidelines, it is important to note that netiquette differs from site to site and changes over time. Find out what is acceptable behaviour on that website before sending your own messages.

TYPES OF ELECTRONIC COMMUNICATION

With the advances in computer technology and the internet, there are many new and exciting ways to communicate; from sending instant messages on social network sites, to email. In this section, we will discuss the most popular types of digital communications, their advantages, as well as their disadvantages.

EMAIL

Email is one of the first and most popular forms of electronic communication. It allows the user to send and receive files and messages over the internet, and can be used on a wide variety of devices. Here are some of the advantages and disadvantages of email.

ADVANTAGES OF EMAIL

- Email is a free tool.
- Email is quick. Once you have finished composing a message, sending it is as simple as clicking a button. Once it is sent and delivered, it can be read almost immediately.
- Email is simple. It is easy to use, email allows for the easy and quick access of information and contacts.
- Email allows for easy referencing. Messages that have been sent and received can stored, and searched through safely and easily.
- Email is accessible from anywhere – as long as you have an internet connection.
- Email is paperless, and therefore, beneficial for the planet.

Something to know

Asynchronous communication means that a message can be sent without the message receiver being available at the time. Most messaging applications are asynchronous. Most phone call applications, however, are synchronous.

- Email allows for mass sending of messages, you can send one particular message to several recipients all at once.
- Email allows for instant access of information and files.

DISADVANTAGES OF EMAIL
- Email could potentially cause information overload. Some messages may be dismissed or left unread, especially if there are a lot coming in and the network has not integrated some sort of email alert system into the computers at work.
- Email lacks a personal touch.
- Email can be disruptive. Going through each email can be disruptive to work as it does require a bit of time. This disruption is decreased through the utilisation of an email alert system.
- Email cannot be ignored for a long time.
- Emails can cause misunderstandings. Because email does not include nonverbal communication, recipients may misinterpret the sender's message. This is particularly true of senders fail to go through their messages before they send them.
- Email messages can contain viruses. It's best to be aware of this possibility so that you are careful when opening messages from people you don't know, or when downloading attachments.
- Email should be kept short and brief. This is especially difficult if you are one to send messages that are too long.
- Email requires timely responses. While some people tend to disregard messages, those that require responses should be replied to as soon as they are received and read. If not, urgent and important messages may be left untended.

Figure 7.2: *Using email for communication purposes*

When communicating by email, always note the following:
- Be polite.
- Do not write emails that are unnecessarily long.
- Do not spam people with emails that they are not interested in.
- Make sure that your message is logical and says what you intended to say.
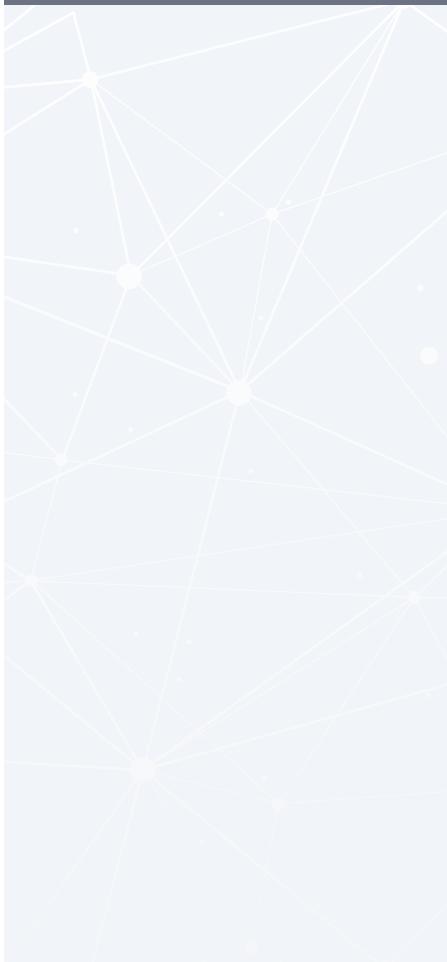
> **Something to know**
>
> **Asynchronous communication** means that a message can be sent without the message receiver being available at the time. Most messaging applications are asynchronous. Most phone call applications, however, are synchronous.

SOME ADDITIONAL FEATURES

Email is not limited to only sending messages over the internet; it provides users with many features. We will now take a look at each of these in some more detail.

CALENDAR

Google Calendar is a time-management and scheduling calendar service developed by Google. It became available in beta release April 13, 2006, and in general release in July 2009, on the web and as mobile apps for the Android and iOS platforms.

Google Calendar allows users to create and edit events. Reminders can be enabled for events, with options available for type and time. Event locations can also be added, and other users can be invited to events. Users can enable or disable the visibility of special calendars, including Birthdays, where the app retrieves dates of births from Google contacts and displays birthday cards on a yearly basis, and Holidays, a country-specific calendar that displays dates of special occasions.

Over time, Google has added functionality that makes use of machine learning, including "Events from Gmail", where event information from a user's Gmail messages are automatically added to Google Calendar; "Reminders", where users add to-do activities that can be automatically updated with new information; "Smart Suggestions", where the app recommends titles, contacts, and locations when creating events; and "Goals", where users enter information on a specified personal goal, and the app automatically schedules the activity at optimal times.

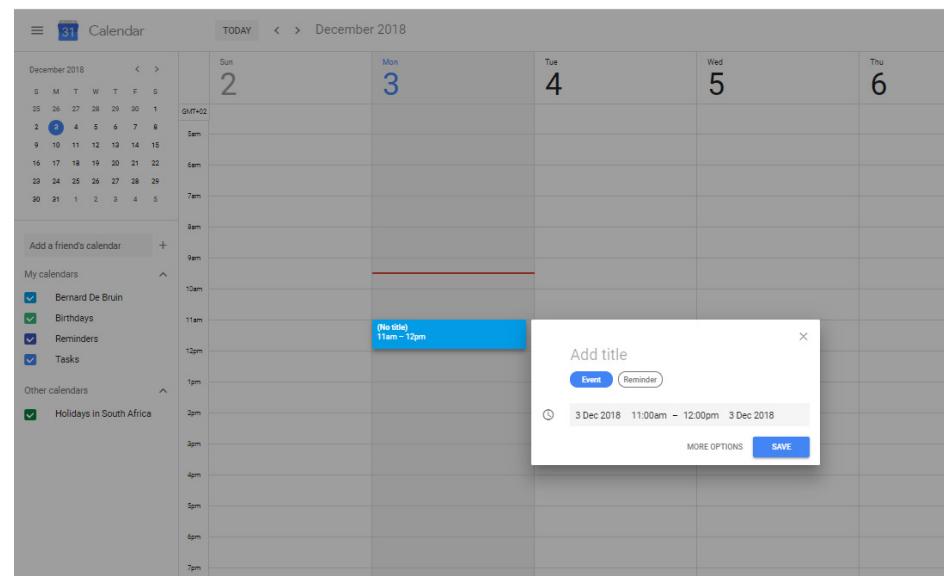

Figure 7.3: *Set the date and time on Google Calendar*

CONTACT LIST

You can now get to the contacts page by clicking the Apps icon in the upper right corner of the Gmail inbox. When you click the Apps icon, which is a square made up of nine smaller squares, it unfolds to reveal a panel of icons for other Google programs and services, including Google Photos, Google News and YouTube.

Figure 7.4: *Create new contact form*

TASKS

Gmail integrates a simple to-do list into your account. Google Tasks allows you to create lists of items, set due dates, and add notes. You can even create tasks directly from Gmail messages.

To add a task in in your Gmail account using Google Tasks, click the down arrow on the "Mail" menu in the upper-left corner of the Gmail window and select "Tasks."

The "Tasks" window displays in the bottom-right corner of the Gmail window. Notice that the cursor is blinking in the first blank task. If the cursor is not blinking in the first empty task, move the mouse over it and click in it. Then type directly in the first blank task.

Once you've added a task, you can click the plus icon to create additional tasks. Pressing return after entering a task also creates a new task directly below it.

ARCHIVES
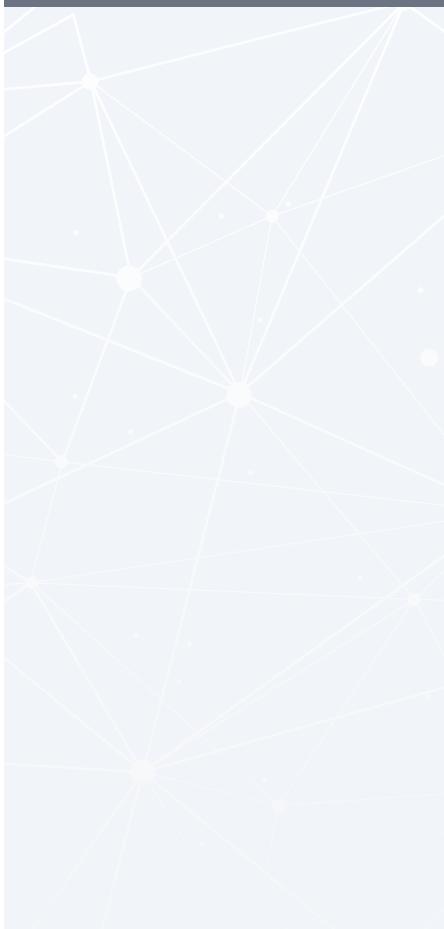
Rather than deleting an email and losing it for good, you can choose to archive it instead. As soon as a message is placed in the Gmail archive, it is removed from your inbox and tagged with the label All Mail. These messages remain in your Gmail account and can be retrieved easily at a later time, but in the meantime, they are out of sight and out of mind.

When someone replies to an archived message, it automatically returns to your inbox.

Sending a message to your Gmail archive is easy, so much so that some people mistakenly archive emails by clicking on or tapping the wrong option. Fortunately for them, retrieving archive messages is almost as easy as archiving them in the first place.

INSTANT MESSAGING

Instant messaging refers to short messages that are sent in real time over the internet. The messages can include multimedia items, such as pictures, videos and voice recordings.

ADVANTAGES OF INSTANT MESSAGING

- Messages are free to send
- Messages are received directly after being sent
- You can see if the message has been delivered
- You can see when your message has been read
- You can send a variety of messages; including text messages, pictures, videos, music and web links
- You can create group conversations in order to discuss a specific topic or plan events

DISADVANTAGES OF INSTANT MESSAGING

- Messages are not always saved
- It is an informal method of communication and might not be suited for business-related communications
- There is a pressure to respond immediately as people can see when you read their messages
- Can be distracting as one message can lead to a whole conversation
- Low security, as instant messaging services use a public network
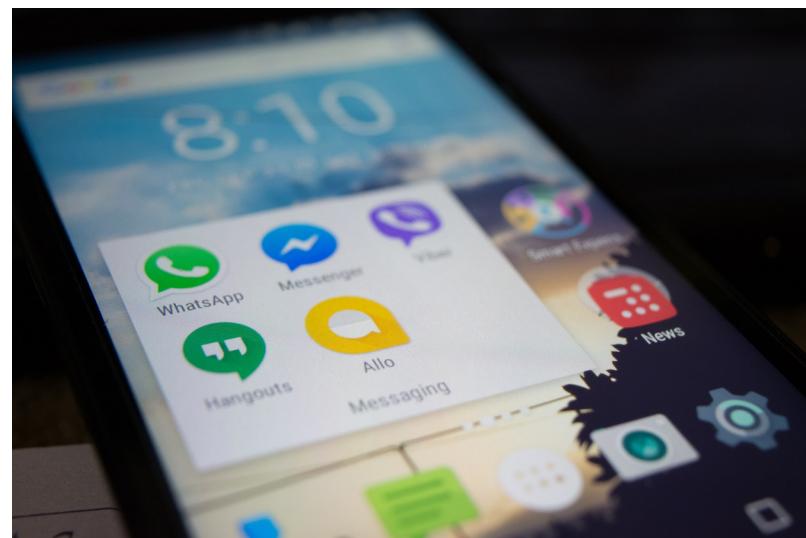
Figure 7.5: *Examples of instant messanging apps*

When communicating by instant messaging, take note of the following:
- Do not expect an immediate reply. The person you are messaging might be busy and will reply once he or she is available.
- Keep your messages short and to the point.
- Do not type your messages using uppercase as it can be interpreted as shouting.
- Be polite.
- Do not use slang words and abbreviations. This might save you time, but it can also confuse others if they are not aware of the meaning.

VOIP

VoIP is a type of digital communication that allows the user to speak with one or more users over the internet. This type of communication is very similar to a phone call, with the exception being that it uses your internet connection and, therefore, uses data. Here are some of the advantages and disadvantages of VoIP.

ADVANTAGES OF VOIP

- VoIP is much cheaper than using traditional telecommunication services
- It can help with productivity as you can have face-to-face meetings with colleagues in different cities
- It saves time and money as you can have face-to-face business meetings without having to travel to the client

DISADVANTAGES OF VOIP

- You need an active internet connection
- Audio quality depends on the quality of your internet connection
- Some VoIP programs use large amounts of data

When communicating using VoIP, take note of the following:
- Be polite and speak clearly.
- Indicate that you are listening to the person with whom you are speaking.
- Repeat important details to ensure that you understand them correctly.
- Do not be afraid to ask questions if something is not clear.

VIDEO CONFERENCING

- Everyone can see you, all the time. This is not an audio conference, just because you are not speaking does not mean others in the conference can't still see you.
- Be punctual and courteous. Introduce yourself and take note of other attendees' names so you can address them by name. Turn off ringers for your other phones. Treat this just like you would an on-site meeting.
- No multi-tasking, we can see you. Look at your screen, pay attention to others and when speaking make sure to look at your camera.
- If it is improper for a face-to-face meeting, then it doesn't work for video either. Don't click your pen, tap on your desk or anything else annoying or distracting. Avoid yawning, gum chewing, etc.
- Make sure you have good light. Adjust lighting or use a portable light source to make sure you have good light shining at you from the front. You can overdo it too, so experiment until you find a good balance. Try pointing a strong desk lamp at the wall you're facing. You get good front light without having to look directly into a harsh light.
- Do not eat! You may enjoy a glass of water or coffee, but drinking a glass of wine or a bottle of beer is not acceptable. Do not smoke during the meetings either.
- Video allows us to do face-to-face meetings right from our virtual office. Even though we all enjoy sitting in a short and t-shirt in our virtual offices, it is not appropriate when you are called into a virtual meeting. Business casual at all times is the new rule. If you have a planned customer call you should consider dressing the same as you would for an on-site meeting.
- Do video calls from your desk or other appropriate location. Lying on the couch (or anywhere) with your pc on your chest or stomach doesn't present a flattering view.

- If you have a cluttered work space, make sure it's not showing up on camera. Consider removing award plaques from other (competitor) companies on your wall.
- Make sure to have current client version loaded before scheduled calls. Test your audio and/or video before a scheduled call.
- Avoid high traffic areas. Sometimes it's hard to avoid but do not position yourself where other people will be parading through the view of the camera on a regular basis.
- Close unused applications, video can be CPU/memory intensive.
- Avoid creating pixilation! Do not wear stripes, or anything with a heavy pattern. If you have vertical mini-blinds do not have them in the background. Minimise your hand gestures and body/head movements as well.
- Consider posting your comment/question in the chat window.
- Picture in Picture is your best reference, you can see yourself and your surroundings just as others on the call can. Pay close attention to what you see there, and make adjustments as necessary.
- DO NOT video while driving.

Activity 7.1

1. Write down the correct answer for each of the following questions.
   a. Which of the following is NOT an additional email feature?
      A. Contact list
      B. Calendar
      C. Tasks
      D. Voice calls
   b. Which of the following is NOT a type of electronic communication?
      A. Instant messaging
      B. Posting a letter
      C. Email
      D. Video conferencing
   c. Which of the following is the most common netiquette when using electronic communication?
      A. Be polite
      B. Be there
      C. Mute everyone
      D. Explain everything thoroughly.

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 Allows users to save their emails for later use	**A.** Video conference
2.2 The advantage of being able to save messages for future reference	**B.** Archiving
2.3 Low security is a disadvantage since a public network is being used	**C.** Tasks
2.4 A direct conversation with multiple people at the same time	**D.** Email
2.5 Much cheaper than traditional telecommunication services, but you need an active internet connection	**E.** Calendar
	F. Netiquette
	G. Instant messaging
	H. VoIP

3. Say if the following statements are TRUE or FALSE. Correct the underlined word(s) if it is false.
   a. <u>Do not</u> say things to people you would not say to them in real life.
   b. On the internet, there is <u>no need</u> to show people respect.
   c. When joining an existing conversation, speak about the subjects <u>relevant to you</u>.
   d. Make sure your messages are <u>clearly written</u> and easy to understand.
   e. Things posted on the internet do not last forever. This means that things you post as a teenager or young adult will <u>not</u> affect the rest of your life.
4. Answer the following questions:
   a. Explain the world wide web to your peer.
   b. List the disadvantages of electronic communication.
   c. Explain the advantages of email.
   d. Define 'netiquette' and describe proper netiquette when communicating on email.
4. VoIP software, such as Skype, is becoming increasingly popular to use.
   a. Give TWO reasons why more people are currently using Skype than in the past.
   b. Give ONE reason why the video and sound quality is sometimes poor when using Skype to make a video call.
   c. Suggest ONE way in which the sound quality of a VoIP call can be improved without ending the session or changing any hardware.

Web browsers are software applications that allow users to access information on the world-wide web. This is done by allowing users to open and view web pages containing images, videos, text, as well as links to other web pages. The most common web browsers include Microsoft Edge, Google Chrome, Safari and Firefox.
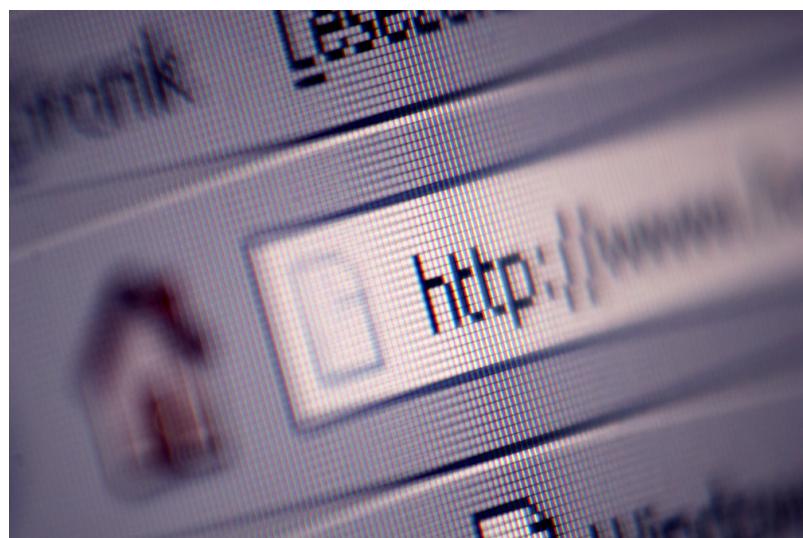
Figure 7.6: *Types of web browsers*

In the following section, we will look at some of the features that have been included in web browsers to help make your internet browsing experience as safe and as enjoyable as possible.

BOOKMARKS

When you think of a bookmark, you most likely think of a piece of paper or card that you place in a book in order to mark the page you are currently reading. This same principle applies to the bookmarks used in your internet browsers. A bookmark is a saved shortcut that tells your browser to go to a specific website address. This saves the user the effort of having to remember and type the website address or URL each time he or she visits the page.

Depending on your web browser, you can also bookmark a web page by clicking on the star icon to the right of the website URL. This will automatically add the address to your bookmarks.

To add a new bookmark in Firefox 4, the latest version of Mozilla's Web browser, click on the star-shaped icon next to the website URL, located in the address bar at the top of the browser window. This adds the website currently opened to the list of bookmarks. To view bookmarks, click on the book-shaped icon with the star on it, located on the top right of the browser window.

Something to know

Some web browsers, for example Internet Explorer, use the term "Favourites" instead of "Bookmarks". Do not be alarmed by this, as they perform the same function.

bookmarks, click on the wrench-shaped icon at the top right of the browser window (next to the star-shaped icon). Select "Bookmark Manager" from the drop-down menu.

To add a bookmark in Apple Safari, click the "Bookmarks" menu at the top of the browser window, then select "Add Bookmark" from the drop-down menu. Click the "Add" button. This adds the website you're currently browsing to your bookmarks. To view a list of saved bookmarks, click the "Bookmarks" menu at the top of the browser window and select "Show All Bookmarks."

To add a bookmark in Google Chrome, click on the star-shaped icon located in the address bar at the top of the browser window. A dialogue box appears to confirm the new bookmark. Click "Done." This adds the website currently opened to the list of bookmarks. To view
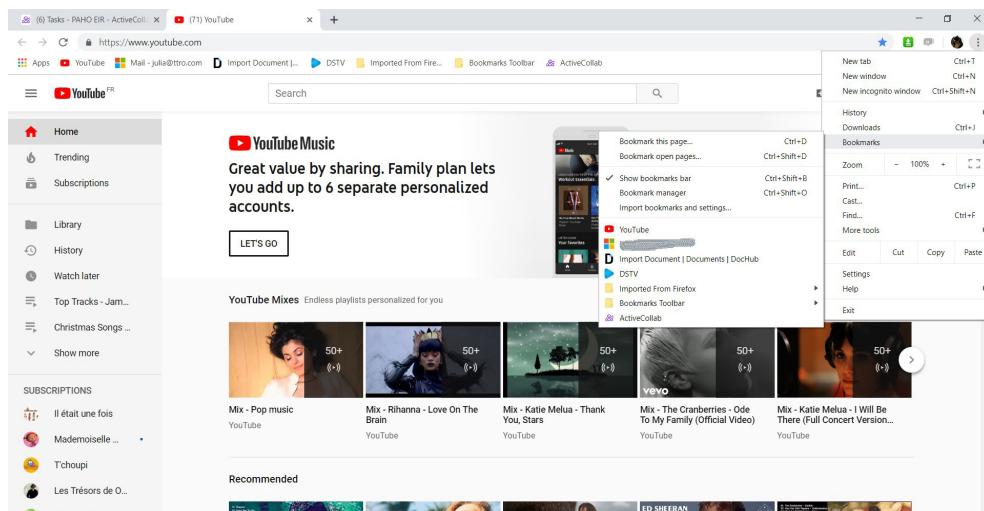
Figure 7.7: *Creating and accessing bookmarks in Google Chrome*

HISTORY AND FAVOURITES

History list organizes the list of webpages that are visited over a period of time by category. History List contains the URLs for the websites and page that visited through internet explorer browser. The history will save the list of webpage URL's by Today, Yesterday, Two weeks ago and Three weeks age and so on to easily find the date and URL of the visited page on that particular date.

Favourites saves them like if you click add to favourites in the options with the particular webpage open; then it adds the website you are currently browsing to your favourites list.

IMPORTING FAVOURITES AND BOOKMARKS

Import your favourites or bookmarks from one browser to another if you're switching browsers or would like to use more than one. To import bookmarks or favourites into Firefox 4, open Firefox and press the "Alt" key to temporarily bring up the "File" menu. Click the "File" menu and select "Import." An "Import Wizard" is then displayed. Select the browser from which you wish to import bookmarks or favourites and click "Next." Select which items to import and click "Next."

To import bookmarks as favourites in Internet Explorer 9, click on the star-shaped icon on the top right of the browser window. Click on the down-pointing arrow next to "Add to favourites" and select "Import and Export." Select "Import from another Browser" and click "Next." Tick the box next to the name of the browser from which you wish to import bookmarks and click "Import."

HOME PAGE SETTINGS

A home page is a webpage that serves as the starting point of website. It is the default webpage that loads when you visit a web address that only contains a domain name. For example, visiting https://techterms.com will display the Tech Terms home page.

SET YOUR HOME PAGE
You can customize Google Chrome to open any page for the homepage or startup page. These two pages aren't the same unless you set them to be.
- Your start up page is the one that shows when you first launch Chrome on your computer.
- Your homepage is the one you go to when you click Home .

CHOOSE YOUR HOMEPAGE
You can control what page appears when you click Home.
- On your computer, open Chrome.
- At the top right, click More and then Settings.
- Under "Appearance," turn on Show Home button.
- Below "Show Home button," choose to use the New Tab page or a custom page
- The Home button will appear to the left of your address bar.

BLOCKING WEBSITES

Website Blocking is a process by which a Firewall or WW Proxy prevents users from accessing some network resources, such as Word Wide Web sites or FTP servers.

Site Blocking is a legally dangerous practice, since it prevents the organisation that employs it to effectively argue that their Internet connection constitutes a Common carrier. This may make the organisation liable for offensive or illegal documents downloaded from the Internet.

HOW TO BLOCK WEB SITES IN GOOGLE CHROME
Do you find yourself accessing Facebook, Twitter, or other distracting websites when you really should be doing something else instead? Block that website in Google Chrome. Other solutions will let you block websites for children at home or employees, too.

We recommend Block Site for Chrome for quickly blocking websites. Install it, and you can use the extension's simple options to define a list of blocked sites. You can even set up a redirection, so you're automatically pointed at a website you should be using (perhaps your

workplace's website) when you visit a blocked site. Or, enable it on a schedule so you can look at Facebook all you want—as long as it's outside of the hours you should define.

This isn't fool proof. In fact, it's the opposite. You can quickly edit Block Site's permissions to unblock websites. And, while you can define password protection, anyone using your computer could open any other web browser to get around the block. It's a way to keep yourself on track and add some additional friction before you access a website—that's all. It's not a way to control access to websites for children at home or employees in an organisation

If you don't want an extension like Block Site to run on every website you visit, you can use Google Chrome's extensions permissions to restrict its access. For example, if you just want to block Facebook, you could restrict Block Site to only run on facebook.com.

CACHING

Caching is the temporary storage of web documents such as HTML pages and images. Basically your web browser stores copies of web pages you've visited recently to reduce its bandwidth usage, server load, and lag.

This could be why our website is offline, why it seems like your name servers still aren't set, or why you can't see the changes you've made to your website.

If you suspect this is the case, you can first try clicking "refresh" on your browser a few times. If this still does not work, you can clear your browser's cache to see if that is the problem. Each browser is different, but here are some links to the most popular browsers cache clearing instructions:
- Chrome
- Firefox
- Safari
- Internet Explorer
- Opera

Another good tip is to visit the website on a device after turning OFF the wifi. This should get you a real-time view page and confirm a local caching issue on the original machine.
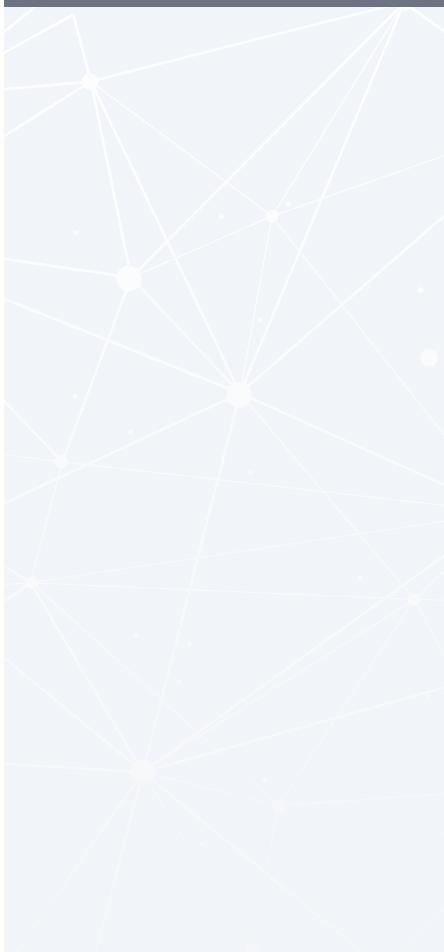
BROWSER PLUG-INS

A plugin is a piece of software that acts as an add-on to a web browser and gives the browser additional functionality. Plugins can allow a web browser to display additional content it was not originally designed to display.

An example of a plugin is the free Macromedia Flash Player, a plugin that allows the web browser to display animations using the Flash format. As the Web has become more commercial, Flash has become a popular format for displaying ads in web pages. As a result, many web users have been prompted to download the Flash plug in and have it installed on their systems.

Other popular plugins include Quicktime Player (available on the Apple website) and Acrobat Reader (which in addition to being a plugin for the major browsers is also a stand-alone application used to display files using the PDF format).

Most plugins are available as free downloads. To install the plugin, you visit the website of the plugin's developer and click on a link that will download the installer for the plugin you have selected. You can save the installer to an easy to find location such as the Desktop or a specific folder you have created to organize all of your downloads. Once you have downloaded the installer, you can open it and follow the prompts to install the plugin on your system. You may have to restart your web browser to enable the additional functionality provided by the plugin.

POP UP BLOCKERS

Pop-ups are frequently used by websites to advertise products or features. They are therefore meant to be as eye-catching as possible. This is achieved by making the pop-up open in a small secondary window, which becomes the active window. To get the maximum amount of attention, a pop-up may also feature bright colours, animation and motion. For browsers that support tabbed browsing, the pop-up may open in a secondary tab instead of a whole new window. Pop-ups are commonly generated using JavaScript.

Pop-up blocking is usually enabled by means of a check-box that one must tick to enable pop-up blocking, or untick to disable. All the major browsers now support pop-up blocking.

Pop-up blockers may also be installed as third-party software tools. These typically incorporate additional features such as ad filtering and highly customizable pop-up blocking options. For the majority of users, however, the blockers built into all major browsers are perfectly adequate.

Not all pop-ups are a nuisance. In fact, some are very helpful. For example, pop-ups are often used to provide guidance to users on how to fill in a form on a Web page. Unfortunately, modern browsers may accidentally block these as well (hence the ability to enable or disable the whole feature). Some browsers have the ability to discern which pop-ups are genuine tools on the website and treat them differently from pop-up advertisements, a feature called intelligent blocking. Some browsers indicate to the user when they have blocked a pop-up, usually by means of a small information bar lasting a few seconds, an audible signal, or both.

| Example 7.1 | How to view all the installed plug-ins in Google Chrome |

1. Click the *Open* menu icon.
2. Click *Settings*.
3. Click *Advanced*.
4. Click *Content Settings*. This will open a new menu.
5. Scroll down and select the plug-in you would like to view.

PRIVATE BROWSING

Since 2008, January 28th has been set aside for Data Privacy Day. The goal: "to create awareness about the importance of privacy and protecting personal information."
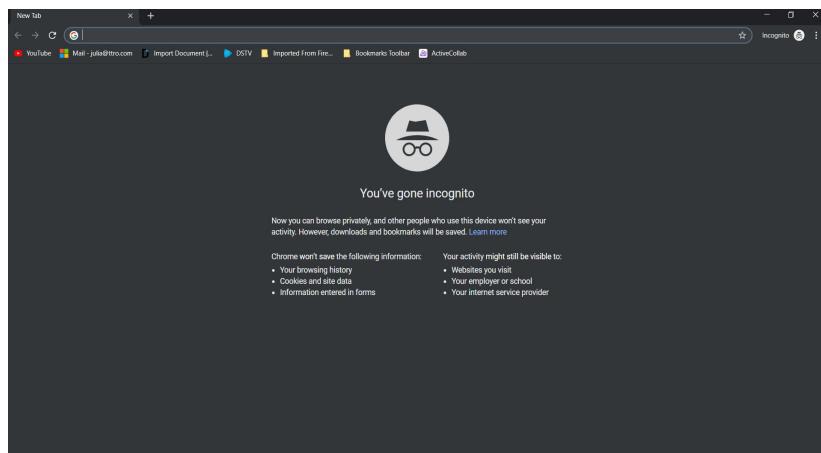
Figure 7.8: *People use private browsing for a variety of reasons*

It's the perfect time to take a look at one privacy feature that's right in front of you: your web browser's private browsing mode. Just what is it that makes private browsing private? Let's take a look at the major browsers and see.

GOOGLE CHROME

Google Chrome calls it *Incognito Mode*, and you can tell you're using it by looking for the "secret agent" icon in the top left corner of the window. Chrome also shows you a big, bold new tab page when you open an Incognito window. That's it at the top of this post. In *Incognito Mode*, Chrome won't keep track of the pages you visit, the data you enter into forms, or any searches you submit. It won't remember what files you download, but those files will stay on your computer after you close the Incognito window. You'll have to manually delete them if you want them gone. The same goes for bookmarks you create.

Example 7.2 How to use private browsing with Google Chrome

1. Click on the *Open* menu icon.
2. Click on *New incognito* tab. This will open a new private browser.

You can also open a private browser by pressing *Ctrl+Shift+N*.

Activity 7.2

1. To create bookmarks, you can do the following:
   a. Open your Google Chrome browser.
   b. Create four bookmarks.
   c. Pin your bookmarks on the browser.
1. A variety of plug-ins can be installed on web browsers.
   a. Why would you use or need browser plug-ins?.
   b. Give ONE common example of a browser plug-in.

Activity 7.3

1. Which is NOT an example of a web browser?
   a. Avast
   b. Microsoft Edge
   c. Google Chrome
   d. Firefox

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A		COLUMN B	
2.1	Another term used for bookmarks	A.	Pop-up ad
2.2	A small area allocated on your hard drive in order to temporarily store images and pages from the world-wide web	B.	Bookmark
2.3	What a star icon on a web browser indicates	C.	Her story
2.4	Documenting the websites that you previously visited	D.	Favourites
2.5	A digital advertisement that appears when you open a specific web page	E.	Web cache
		F.	History
		G.	Disk cache

3. Define a bookmark.
4. State TWO disadvantages of adware, other than the fact that it might be annoying.

In the first unit of this chapter, we discussed different types of digital communication, as well as their advantages and disadvantages. In this section, we will be taking a closer look at how these different types of digital communication can be used in order to communicate with others.

BLOGGING

A **blog** (shortening of "weblog") is an online journal or informational website displaying information in the reverse chronological order, with the latest posts appearing first. It is a platform where a writer or even a group of writers share their views on an individual subject.

ADVANTAGES OF BLOGGING
- Enables you to write down your thoughts on anything of interest
- Very quick and easy to set up
- Easy and quick to update and add a new post
- People can leave comments on your blog

DISADVANTAGES OF BLOGGING
- Whatever you publish is available for everyone to see.
- Personal blogs may be biased
- Blogs can be time consuming
- People may leave rude an inappropriate comments
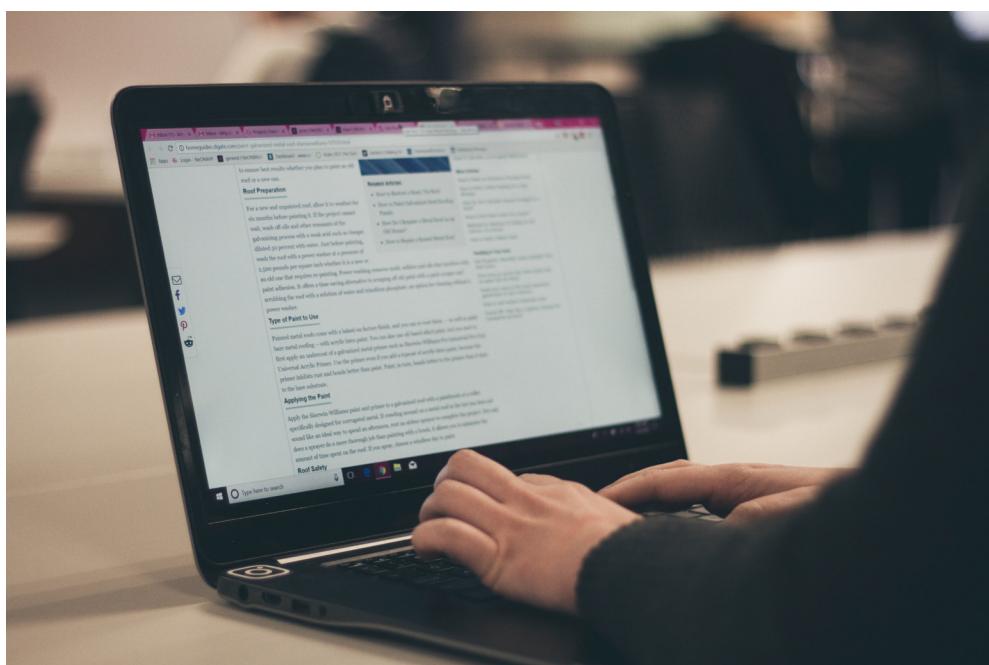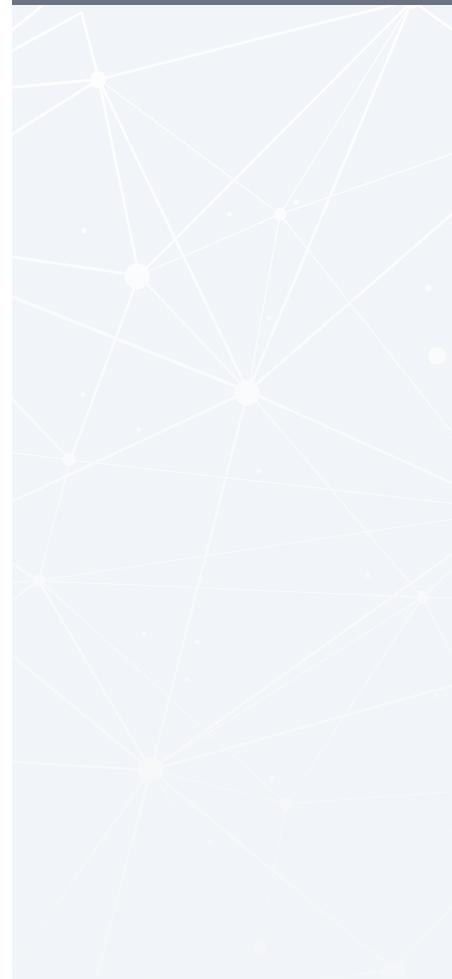
Figure 7.9: *Blogging as a form of communication*

CREATING A BLOG, REGISTERING A BLOG SPACE AND PUBLISHING A BLOG
The easiest way to create a blog is to register a blog space using a free blogging service, such as WordPress or Blogger.com.

This not only enables you to create a blog with little effort; it also makes it easier for readers to find your blog as it is associated with the blogging platform.

The first step in creating your blog is to register a blogging space. This can be done in the following way:

1. Make sure you have an internet connection and a Gmail account. (Some services do not require a Gmail account, but do require an email account.) If you do not have a Gmail account, make sure to register a Google account. (The Google account includes a Gmail account.)
2. Go to the blogging service website by typing the URL into your browser, or by searching for the service in Google.
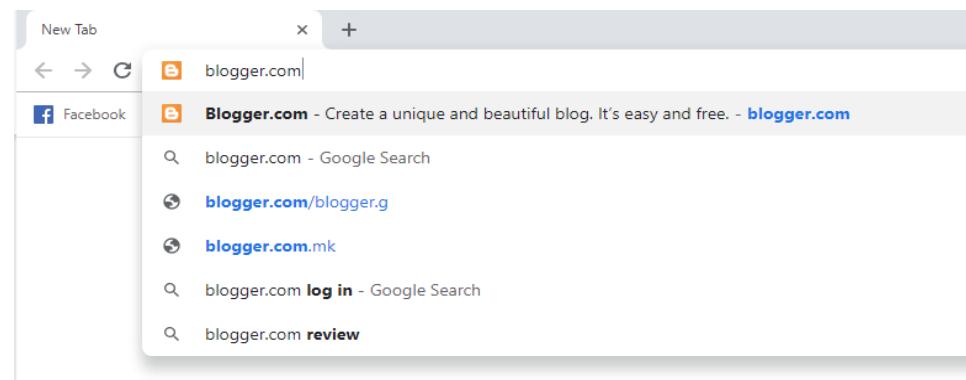
Figure 7.10: *Registering a blog space*

3. Once you are on the blogging service website, click *Get Started,* or *Create Your Blog* to register a new account. (The option will differ, depending on the website.)
4. Complete the account registration process by following the step-by-step instructions. This will include choosing an address for your blog.

Once you have registered your blogging account, you are ready to start creating your blog by writing your first post.

To create posts for your blog by using a word processor, such as Microsoft Word, you can do the following:
1. Open Microsoft Word.
2. Click *File* and go to *New*.
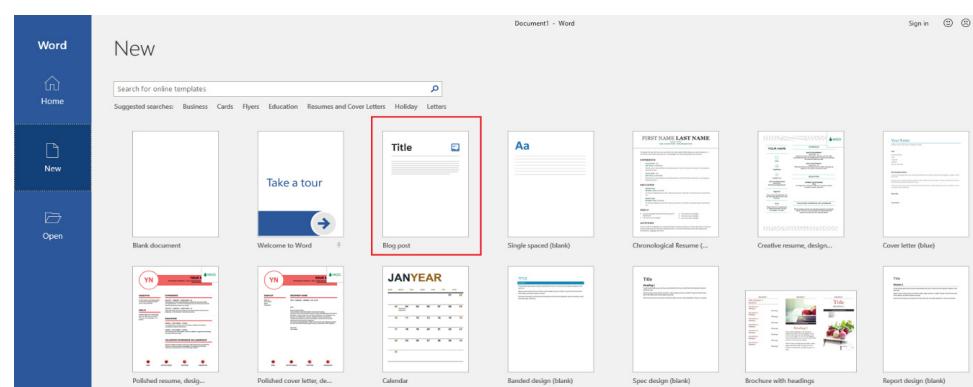
Figure 7.11: *Creating a blog using a word processor*

3. Select *Blog post* from the list of new documents. This will open a preview of the
    blog post.

Figure 7.12: *A preview of the blog post*

4. Click *Create*. This will open the *Register* a *Blog Account* window.
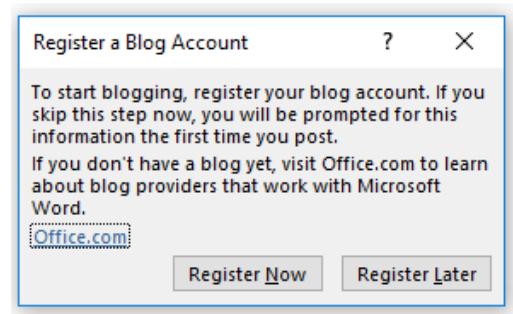
Figure 7.13: *Registering a blog account*

5. Click *Register Now*.
6. Select the service where you have registered a domain name from the blog drop-down
    list and click *Next*.
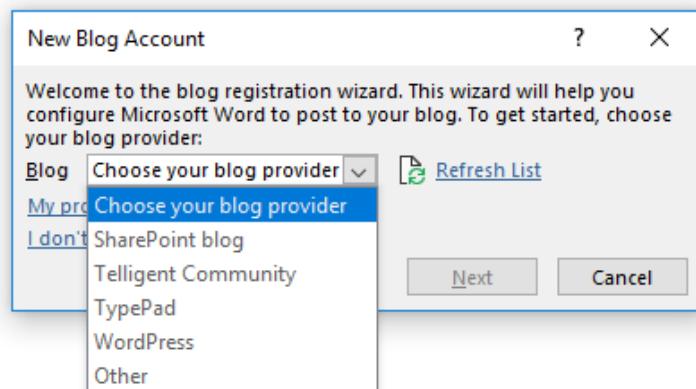
Figure 7.14: *Choosing the blog provider*

7. Fill in the details of your domain and click *OK*. This will allow you to start creating your
    blog in Word.
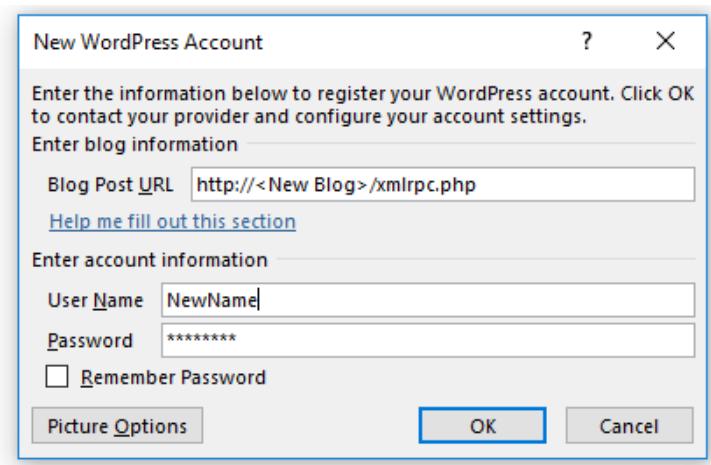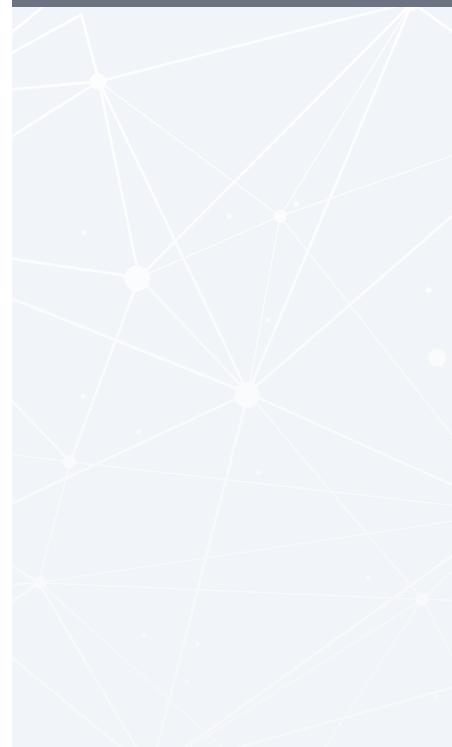
Figure 7.15: *Filling in the details of the domain*

8. Once you have created content for your blog, click *Publish*.
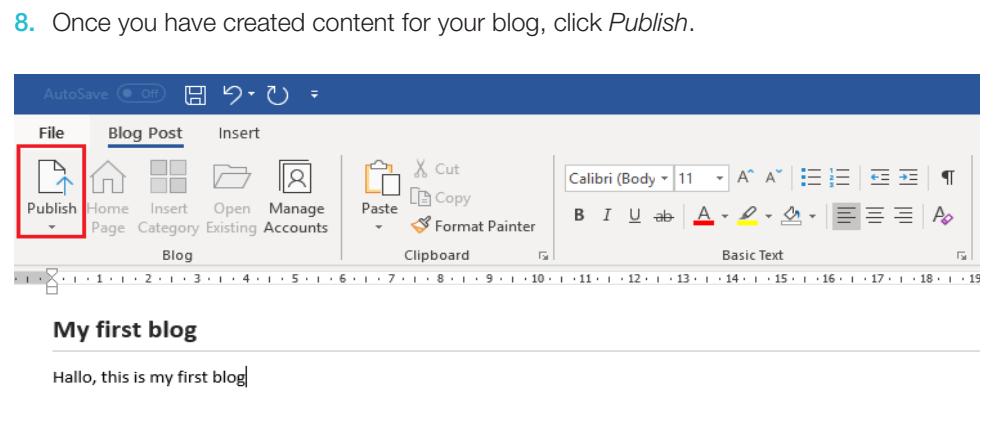
Figure 7.16: *Publishing a blog*

VLOGGING

A video blog or video log, usually shortened to **vlog**, is a form of blog for which the medium is video, and is a form of web television. Vlog entries often combine embedded video (or a video link) with supporting text, images, and other metadata. A vlog is like a personal website or social media account where a person regularly posts short videos Entries can be recorded in one take or cut into multiple parts.

ADVANTAGES OF VLOGGING

- Easy to connect with an audience
- You do not have to create your own website
- Does not need to be professional

DISADVANTAGES OF VLOGGING

- Requires basic recording equipment
- Requires basic video editing knowledge
- Can be very time consuming

PODCASTING AND VODCASTING

Podcasting is a free service that allows internet users to pull audio files (typically MP3s) from a podcasting website to listen to on their computers or personal digital audio players. The term comes from a combination of the words iPod (a personal digital audio player made by Apple) and broadcasting. A podcast is an audio programme produced on a regular basis, delivered over the internet in a compressed digital format and designed for playback on computers or portable digital audio players, such as the ipod.

A **vodcast** is a podcast consisting of video recordings, instead of solely audio.

ADVANTAGES OF PODCASTING AND VODCASTING
- Good to listen to while travelling
- A good way to get a daily update
- Can be professional or relaxed
- Can be very informative

DISADVANTAGES OF PODCASTING AND VODCASTING
- Can be time consuming and difficult to make, especially scripted podcasts
- Needs a good reader, good information and good writing in order for it to be interesting
- Audience for podcasts is smaller

BEST PRACTICE
Podcasts or vodcasts can cover a variety of subjects; including novels, dramas, news, or even talk shows discussing daily events or the latest games. To help you start your very own podcast or vodcast, you can do the following:
- Ensure that you have enough time to script, record and edit the podcast or vodcast.
- Stay consistent with your uploads; schedule your updates so that listeners will know when new content will be posted.
- Be polite, and speak naturally and clearly.
- Choose topics about which you are passionate.
- Advertise your podcast or vodcast. Sharing the release and topic information on social media is a good way in which to obtain new listeners.
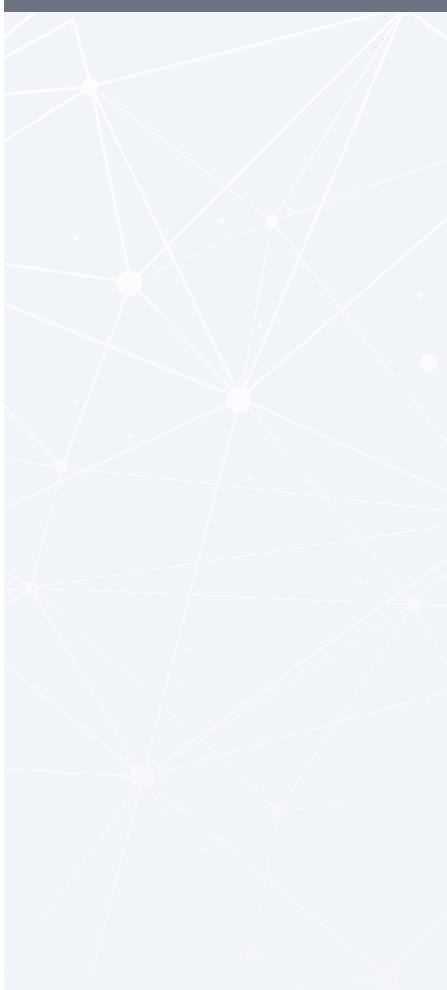
WIKIS

Wiki websites are a form of digital communication that are used to obtain and share information with other users. The website can be accessed and edited by any user across the world, so long as that person has a computer and an internet connection. Due to this reason, it is very important to verify any information obtained from a wiki.

ADVANTAGES OF WIKIS
- Anyone can edit the information and, therefore, is updated regularly
- Easy and free to use
- Can be accessed from any device that has an internet connection

DISADVANTAGES OF WIKIS

- Anyone can edit the information, which means it can lead to misinformation
- Open to spam and vandalism if not moderated
- Needs an active internet connection

The most famous wiki website is Wikipedia, an online encyclopaedia. However, there are many other wiki websites; each covering a specific topic.

RSS FEEDS

WHAT IS RSS?

RSS stands for "Really Simple Syndication". It is a way to easily distribute a list of headlines, update notices, and sometimes content to a wide number of people. It is used by computer programs that organize those headlines and notices for easy reading.

WHAT PROBLEM DOES RSS SOLVE?

Most people are interested in many websites whose content changes on an unpredictable schedule. Examples of such websites are news sites, community and religious organization information pages, product information pages, medical websites, and weblogs. Repeatedly checking each website to see if there is any new content can be very tedious.

Email notification of changes was an early solution to this problem. Unfortunately, when you receive email notifications from multiple websites they are usually disorganized and can get overwhelming, and are often mistaken for spam.

RSS is a better way to be notified of new and changed content. Notifications of changes to multiple websites are handled easily, and the results are presented to you well organized and distinct from email.

HOW DOES RSS WORK?

RSS works by having the website author maintain a list of notifications on their website in a standard way. This list of notifications is called an "RSS Feed". People who are interested in finding out the latest headlines or changes can check this list. Special computer programs called "RSS aggregators" have been developed that automatically access the RSS feeds of websites you care about on your behalf and organize the results for you. (RSS feeds and aggregators are also sometimes called "RSS Channels" and "RSS Readers".)

Producing an RSS feed is very simple and hundreds of thousands of websites now provide this feature, including major news organizations like the New York Times, the BBC, and Reuters, as well as many weblogs.

RSS FEED PROVIDE THE FOLLOWING INFORMATION

RSS provides very basic information to do its notification. It is made up of a list of items presented in order from newest to oldest. Each item usually consists of a simple title describing the item along with a more complete description and a link to a web page with

the actual information being described. Sometimes this description is the full information you want to read (such as the content of a weblog post) and sometimes it is just a summary.

GPS

GPS is a form of digital communication that uses satellite-based radio navigation in order to determine where you are in the world. This information can then be used to navigate to a new destination, or to let others know where you currently are.

ADVANTAGES OF GPS
- GPS is available from anywhere in the world
- GPS can be used to locate a person quickly and efficiently if he or she is in trouble
- GPS software is updated regularly to account for any change to the landscape
- GPS can be used to plan your route, get directions and find retail outlets
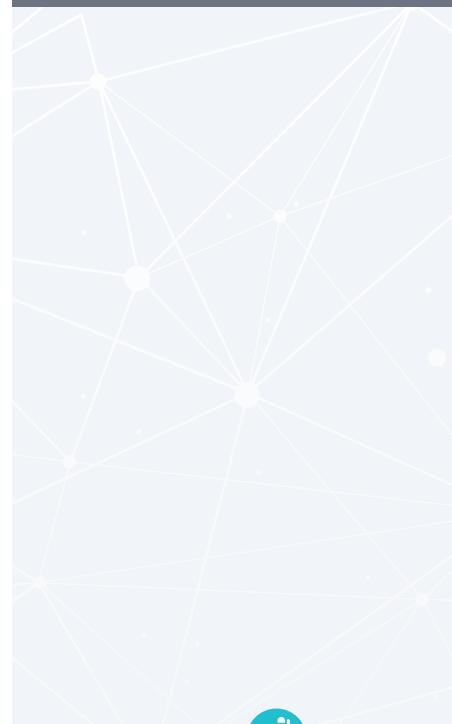
DISADVANTAGES OF GPS
- GPS devices use a lot of power, which requires that the battery be charged regularly
- GPS signal might be affected by weather, tall buildings and structures
- GPS accuracy depends of the strength of the signal; a weak signal can lead to inaccurate information, which is why we recommend that you always bring a map as backup
- GPS devices are expensive to purchase

In the past, users had to buy a GPS device, such as a TomTom, in order to receive and analyse signals from a satellite network. This is no longer the case. Modern smartphones come equipped with a built-in GPS, as well as navigating software, such as Google Maps.

Figure 7.17: *Using GPS to navigate your way around*

GEOTAGGING

Geotagging is the process of attaching geographical data (obtained using a GPS) to media and websites. This includes attaching latitude and longitude coordinates, timestamps, altitude, distance and place names to videos, photos, messages and QR codes.

Figure 7.18: *Geotagging is used to attach geographical data to media and websites*

SOCIAL NETWORKS

A social networking service is an online platform that allows the user to communicate and share information with other users from around the world. In simple terms, it is a website that connects you to people by making friends and seeing what they are up to. You can usually also post pictures and share photos, videos and ideas with an individual (through direct message) or group of friends (through posting a message).

ADVANTAGES AND DISADVANTAGES OF SOCIAL NETWORKS
- Helps the user to stay connected with friends and family
- Helps the user to meet people with common interest
- Can be used to promote a product and find products in which you are interested
- Lets the user stay up to date with the latest news from around the world

ADVANTAGES AND DISADVANTAGES OF SOCIAL NETWORKS
- Cyberbullying is a growing problem in social media
- Information obtained from social media can be used to profile and discriminate against people
- Some people can get addicted to using and posting on social media
- Social media is a big source of false and misleading information

Figure 7.19: *Social media sites*

CREATING A NEW FACEBOOK ACCOUNT

You can create a social media account on a site such as Facebook, by going to www.facebook.com and completing the *Create an account* form. Once you are done, click *Sign Up*.

Figure 7.20: *Creating a new Facebook account*
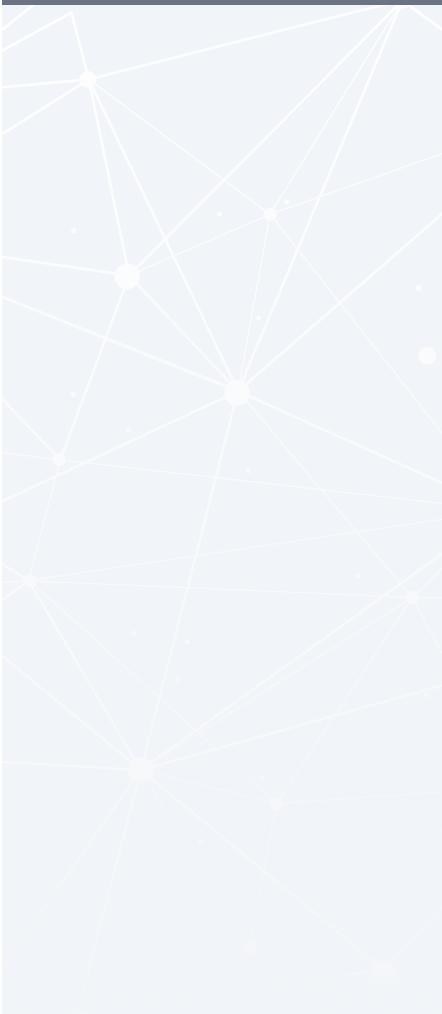
Activity 7.4

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A		COLUMN B
1.1	A standardised format that is used to summarise stories or articles that can be found on a website	**A.** GPS
1.2	A form of digital communication that uses satellite-based radio navigation in order to determine where you are in the world	**B.** Vodcasting
1.3	Similar to blogging; with the major difference being that it uses video instead of written stories and articles	**C.** RSS feeds
1.4	Type of digital communication that uses an audio-only broadcast	**D.** Best practice
1.5	Uses both audio and video for the broadcast	**E.** Wikis
		F. Vlogging
		G. Podcasting
		H. Geotagging

Activity 7.4

2. Christy wants to create a website to share her make-up tips with others. Do some research and write a short essay including the following information:
   a. Advise Christy on what type of computer communication she should use.
   b. Inform Christy of five advantages of this type of computer communication.
   c. Inform Christy of five disadvantages of this type of computer communication.
3. Answer the following questions:
   a. List three advantages and one disadvantage of blogging.
   b. Explain how you would create and publish a blog using Microsoft Word.
   c. Give one disadvantage of wiki websites.
   d. Explain what geotagging is.
   e. Explain how cyberbullying works and give an opinion on how to prevent cyberbullying, without taking away the technology.

7.4 Communication devices

Throughout this chapter, we have taken a look at electronic communication, what it is, the different types, as well as its uses. In this section, we will be investigating some of the devices that you can use to communicate with your friends, family, colleagues, or even strangers over the internet.

COMPUTERS AND LAPTOPS

Desktops and laptop computers have become a big part of our everyday lives. They enable us to make use of a variety of different digital communication methods, including the following:
- Written communication, such as instant messaging and email
- Audio communication, such as VoIP
- Video communication, such as video conferencing
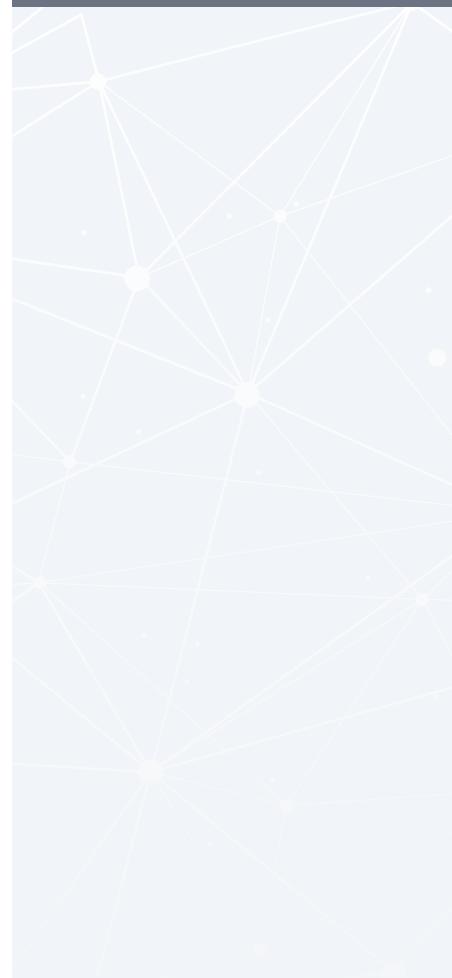
Computers can also be found in a variety of electronic devices where it enables the system to communicate with itself in order to function properly.

SMARTPHONES

The smartphone is a type of computer that people can carry in their pockets and is thousands of times more powerful than the computers that were used to put the first man on the moon. The smartphone can connect to the internet and can perform a variety of different functions, including the following:
- Making and receiving calls
- Sending and receiving written messages
- Sending and receiving audio messages
- Video conferencing
- Social networking
- GPS
- Listen to music
- Take photos and videos
- Play a variety of mobile games

WEARABLES

Wearables are a new category of computers, which consist of small devices that have been designed to be worn, or attached to your body. Examples of these include the following:

- **Smartwatches:** Smartwatches can be synced with your smartphone, allowing you to see your messages and calls on your watch.
- **Smart clothing:** Smart clothing is specially designed clothing to monitor a user's behaviour, such as the heart rate and blood glucose levels.
- **Fitness trackers:** Fitness trackers allow users to record their daily activities, work-outs, heart rate, number of steps and number of calories burned. These trackers are promoted by healthcare companies.

TABLETS

Tablets are small hand-held computers that are smaller than a laptop. but bigger than a smartphone. Modern tablets work in a way very similar to that of smartphones. The main differences between the two are that tablets are bigger and are normally used for different activities. For example:

- Tablets are traditionally used by the whole family to watch shows at home
- Smartphones are used when the owner of the phone leaves home to communicate with others

Activity 8.5

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A		COLUMN B
1.1 A type of computer that users can carry in their pockets	**A.** Wearables
1.2 Computers that consist of small devices, which have been designed to be worn or attached to the body	**B.** Smartphone
1.3 Small hand-held computers that are smaller than a laptop, but bigger than a smartphone	**C.** Tables
1.4 Hand-held digital device that only has the following functions: calendar, calculator, notepad and appointment book	**D.** Tablets
1.5 An example of blockchain technology	**E.** 5G

2. Answer the following questions:
   a. What is the difference between a smartphone and a tablet?
   b. Name and describe four functions of a smartphone.
   c. Describe the three different digital communication methods that enable global connection.

QUESTION 1: MULTIPLE CHOICE

1.1   Which of the following is a disadvantage of electronic communication?   (1)
    A.   Fast and easy to use.
    B.   Can be used for a wide variety of applications.
    C.   People can become addicted to certain forms of digital communication.
    D.   Saves you money as it is cheaper than traditional communication methods.

1.2   Which of the following is NOT proper netiquette?   (1)
    A.   Show people on the internet the same respect you would show to them in real life.
    B.   Make sure your messages are clearly written and easy to understand.
    C.   When joining an existing conversation, speak about subjects that interest you.
    D.   Try to make useful contributions and help people out on the internet.

1.3   Which of the following uses asynchronous communication?   (1)
    A.   Email   **B.**   Instant messaging
    C.   Video conferencing   **D.**   VoIP

1.4   Which web browser comes preinstalled on Windows XP?   (1)
    A.   Microsoft Edge   **B.**   Internet Explorer
    C.   Google Chrome   **D.**   Safari

1.5   Which of the following can be used to prevent a person from accessing dangerous content on
the internet?   (1)
    A.   Bookmarks   **B.**   Private browsing
    C.   Website blockers   **D.**   Caching

                                                                         [5]

QUESTION 2: TRUE OR FALSE

Indicate if the following statements are TRUE or FALSE. Choose the answer and write true or false next to the question number Correct the statement if it is FALSE. Change the underlined word(s) to make the statement TRUE. (You may not simply use the word 'NOT' to change the statement.)

2.1   It is proper etiquette to be careful about the things you say to people online.   (1)
2.2   When you write instant messages you must not use slang and symbols.   (1)
2.3   VoIP requires more bandwidth than instant messaging.   (1)
2.4   During VoIP mute yourself when you are not speaking.   (1)
2.5   You can import bookmarks from one web browser to another.   (1)
                                                                         [5]

REVISION ACTIVITY

QUESTION 3: MEDIUM QUESTIONS

3.1 Which of the following types of electronic communication describes the disadvantages in the table below the best? (6)

COMMUNICATION TECHNIQUES
Blogs
Wikis
VoIP
IM
Video conferencing

	DISADVANTAGE	COMMUNICATION TECHNIQUES
a.	Anyone can edit the information which can lead to misinformation.	
b.	It is an informal method of communication and might not be suited for business related communications.	
c.	It uses a significant amount of data which can be expensive.	
d.	Can be time consuming to keep updated.	
e.	Designed for letter writing, rather than having conversations.	
f.	You need an active internet connection.	

3.2 Name two web browser features that you can use daily. (2)
3.3 Describe three different digital communication methods that enables you to connect globally. (3)
3.4 What is geotagging? Give an example of when you would make use of geotagging. (2)
3.5 Briefly explain how companies can benefit from knowing your search history. (2)

[15]

TOTAL: 25

AT THE END OF THE CHAPTER

NO.	CAN YOU …	YES	NO
1.	Explain what digital communication is?		
2.	Identify and discuss the different types of digital communication?		
3.	Describe the most common features of a web browser?		
4.	Discuss some of the most popular communication devices?		
5.	List and describe the uses of computer communications?		

SOCIAL IMPLICATIONS OF E-COMMUNICATIONS AND TECHNOLOGY

CHAPTER 8

CHAPTER OVERVIEW

Unit 8.1	Social networking sites and technologies
Unit 8.2	Impact of technology

By the end of this chapter, you will be able to:

- Discuss the impact that social media has had on the community.
- Identify and list the benefits and harm of technology.
- Explain what information overload is.
- Describe the impact of virtual reality.

INTRODUCTION

The fastest way to advertise anything is to upload it on social sites. Social media is faster in conveying the news or information than any other media say radio, television or newspapers. Also, government sites as well as private sites are available for filing documents. Ticket booking has become very serviceable to the customers, may it be for a movie show, a hotel in a far town or for an overseas travel trip.

Through many years, social media has helped people stay in contact with their distant friends, relatives and other influential people in their lives, which would have otherwise been impossible. Hence social media proves to be an excellent platform to promote and facilitate innumerable things.

Figure 8.1: *We rely heavily on technology in modern times*

8.1 Social networking sites and technologies

Modern technology and the internet have made it easier than ever to meet new people by using social networking sites. A social networking website is an online platform that allows users to create a digital profile of themselves; including their likes, dislikes, personal information and much more. This profile is then used to build a network of friends with whom the user can communicate and share information.

- **Facebook:** This is the most popular social networking site in the world. Facebook allows the user to create a profile that can be used to upload photos and videos, send messages, and keep in touch with friends and family.
- **Twitter:** Twitter is a social media and news platform that allows users to share their thoughts, ideas and opinions with other users, in 280 characters or less.
- **Instagram:** Instagram is a social network that allows users to share photos and videos with other users.
- **YouTube:** YouTube is a video-sharing platform that allows users to upload and view videos over the internet.
- **GoFundMe:** GoFundMe is a social networking site that allows users to donate money (crowdfund) towards a cause or project.
- **WhatsApp:** WhatsApp is a messaging app for smartphones where messages, images, audio and video can be sent using the internet.
- **LinkedIn:** LinkedIn is a professional networking site that is used to display your business or professional profile. It can be used to apply for jobs.

Figure 8.2: *Examples of social networking sites*

IMPACT OF SOCIAL NETWORKING SITES

There can be little doubt that social networking sites have changed the way in which we interact with each other. From Facebook to Instagram, social networking sites allow users to find and connect with people from around the world, based on your personal information and interests. But how safe is that information?

POSITIVE EFFECTS OF SOCIAL MEDIA

Social media has changed the way in which we make friends, talk to each other and obtain news. Let's take a look at some of the additional positive effects of social media:

- **It can be used for education:** Over the last few years, YouTube has become a platform where people can find educational videos on a variety of subjects. This can include something as simple as how to cook a steak; to more complicated subjects, such as Mathematics and Science.
- **It can be used to raise awareness:** Sites like Facebook and Twitter have made it easier than ever for people to raise awareness around a special cause. This can include creating a support group for people suffering from cancer; to raising awareness of how to treat people with disabilities.
- **It encourages creativity:** Using little creativity, social networking sites, such as YouTube and Instagram, have allowed users to create a professional career out of social media. This includes people making and uploading videos to YouTube, as well as Instagram models.
- **It can be used to increase your visibility:** Social networking sites, such as LinkedIn, allow users to create a professional profile that can be viewed by potential employers. The site allows the employer to see your educational information, professional working experience, as well as your interests and achievements. Users can also upload their CVs and apply for job vacancies. Your online presence is also known as your digital footprint. Websites collect information as you use them, with or without the knowledge of the user. All the traces you leave online by way of your web activities make up your cyber profile.
- **It can be used to build a community:** Social networking sites allow users to find and create communities of people with similar interests, religious views, or nationalities.
- **It can be used to help a cause:** Raising funds to start a business, to help someone, or to simply try to get an education, has never been easier. Crowdfunding sites, such as GoFundMe, allow users to create a profile explaining their situation and why they are in need of funds. This then allows other users to donate money towards the project of their choice. Crowdfunding is a way of raising funds through customers, family, friends and investors online.

NEGATIVE EFFECTS OF SOCIAL MEDIA

As more people start depending on the internet and social media for their news and information, it is important to understand that what you put on the internet, might come back to haunt you.

Something to know

Since the Cambridge Analytica incident, Facebook has taken steps to improve its security to protect its users' information.

Something to know

Every time you click on a website, download a file, or update your Facebook status, you are busy creating a trail of virtual data that makes up your **digital footprint**.

Let's take a look at some of the following negative effects of social media:

- **It can create a false sense of relationships:** More and more people are building online relationships as it is much easier for them to meet and chat with someone over the phone or computer, than meeting in person. This can lead to a decrease in the number of real-life relationships, which can cause people to suffer from isolation and depression.
- **It can affect your privacy:** Social networking sites encourage users to share information about their personal lives, what they like and dislike, as well as where they live. This information can then be used by people with malicious intent, such as with the Facebook Cambridge Analytica case.
- **It can affect your productivity:** Social media sites, such as Facebook, contain information and entertainment that is tailored towards the likes and hobbies of users. This can cause users to spend a lot of time browsing the site for things that they find interesting.
- **It can lead to peer pressure:** One thing that has always been true is that humans like to be part of a group. Social media sites allow users to view the thoughts and opinions of the people in their friends' group. This could lead to users changing their opinions on certain topics due to not wanting to be left out.
- **It can affect your actions:** People tend to act differently on the internet than in real life. Some people are more confident while others might take advantage of the anonymity of the internet to bully and ridicule someone.
- **It can lead to the distribution of fake news.** Fake news is news, stories or hoaxes created to deliberately misinforming or deceiving readers. Usually, these stories are created to either influence people's views, push a political agenda or cause confusion and can often be a profitable business for online publishers. Fake news stories can deceive people by looking like trusted websites.

Activity 8.1

1. Write down the correct answer for each of the following questions.
   a. Which of the following is NOT a social networking site?
      A. Facebook
      B. GoFundMe
      C. Instagram
      D. Google
   b. Which of the following is a business networking site?
      A. Twitter
      B. WhatsApp
      C. LinkedIn
      D. YouTube
   c. Which of the following social network platforms can be used to obtain an income?
      A. Facebook
      B. YouTube
      C. Twitter
      D. WhatsApp
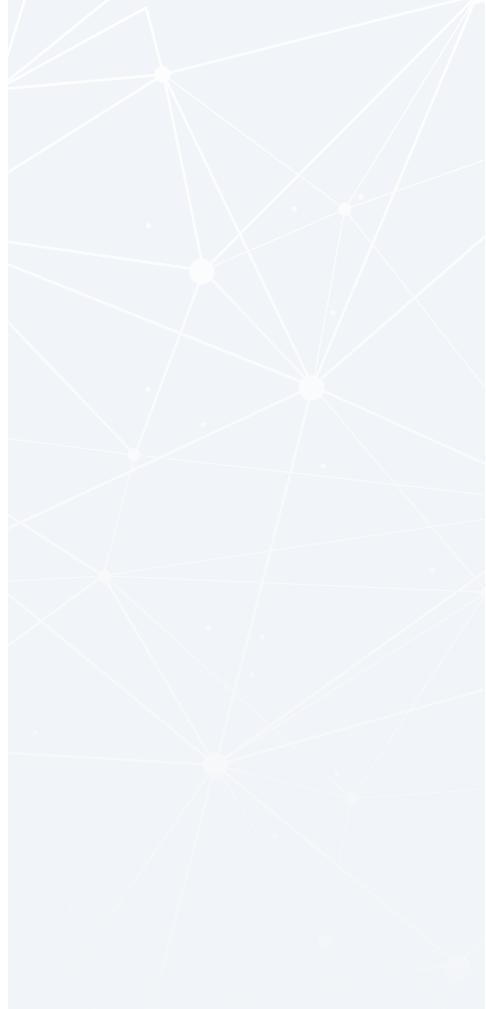
2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 A social network that allows the user to share photos and videos with other users	**A.** Instagram
2.2 A social media and news platform that allows users to share their thoughts, ideas and opinions with other users, in 280 characters or less	**B.** YouTube
2.3 A video-sharing platform that allows users to upload and view videos over the internet	**C.** Facebook
2.4 A social networking site that allows users to donate money towards a cause or project	**D.** WhatsApp

3. Answer the following questions:
   a. Discuss the positive and negative aspects of social networking. Do you think that the good outweighs the bad?
   b. Define the term "crowdfunding".
   c. Define "anonymity" and explain why it can have a negative effect on online communication.

In the introduction to this chapter, we took a look at how technology has influenced our daily lives. Smartphones help us to wake up in the morning, communicate with friends and family, and navigate our way around the world. Computers, on the other hand, can be used for everything; from the car's navigation system to entertainment. To better illustrate this, in this section we will be taking a closer look at some of the positive and negative effects that technology has had on society.
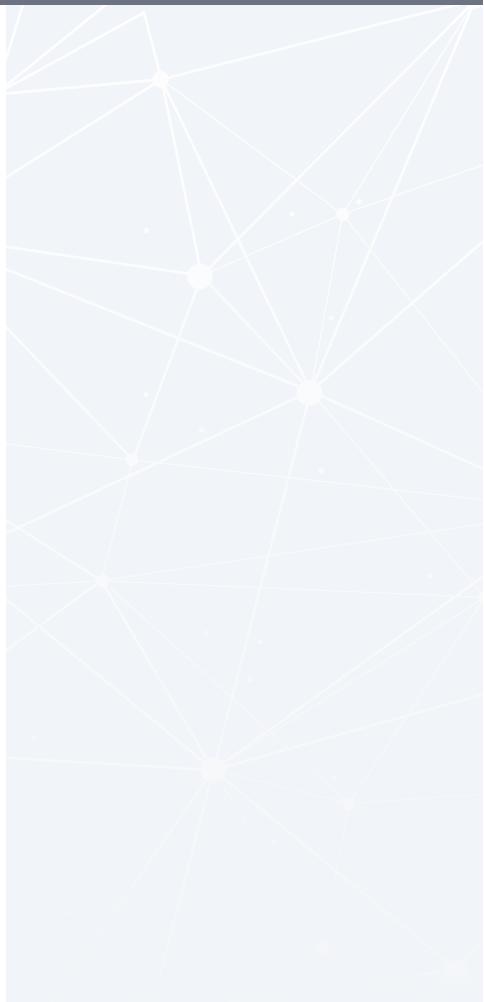
Figure 8.3: *Technology in our lives today*

POSITIVE EFFECTS OF TECHNOLOGY

We use technology for just about everything; including communication, travel, entertainment and education. Here are some additional ways in which technology has improved our lives:

- **Telecommuting (e-commuting):** Telecommuting or teleworking is a work arrangement made between the employee and the employer. The arrangement allows the employee to work from home, or from a location that is close to the employee's home by using computers, telephones and the internet. Telecommuting has been found to be advantageous to employers, saving them office space and improving worker morale saving travel costs and allowing a more flexible work schedule.
- **Improved healthcare:** There are many ways in which technology has improved our healthcare system. This includes the development of new medicine, new treatments and detection techniques, as well as the digitalisation of health records.
- **Enhances our ability to fight crime:** Technology not only helps us to fight; it also prevents crime. Examples of this include cameras, drones, facial recognition, online databases and metal detectors.
- **Increased productivity:** Regardless of the task you are doing, computers can make you more effective at it. For example, you can research any topic on the internet in less than an hour. Twenty years ago, you needed to travel to a library and then spend hours looking through books without knowing if any of the books would help you.
- **Making the impossible, possible:** Computers can complete tasks that are impossible or incredibly time consuming for humans to do. For example, in 1624, Henry Briggs published a book containing the logarithms for 35 000 numbers, which took him years to calculate. Today, a person with a computer could do the same work in less than five minutes.

- **Artificial Intelligence:** Artificial intelligence is important because it makes life much easier for everyone. The so-called weak artificial intelligences, such as the GPS in your car and the operating system assistants like Alexa, Siri, and Cortana, are all designed to make simple things like searching for something online or navigating your way through an unknown street much easier. On the other hand, strong artificial intelligences, such as intelligent robots, are used in space exploration programs, performing tasks that would be otherwise impossible to undertake by humans by themselves. They are also applied in the medical field to perform complex surgeries that would be impossible or extremely difficult for humans to successfully complete.
- **Machine learning:** The concept of machine learning allows computers to take in large amounts of data, process it, and teach themselves new skills using that input. Used for climate change modelling, autonomous vehicles, medical research and risk assessments. The concept of machine learning allows computers to take in large amounts of data, process it, and teach themselves new skills using that input.
- **Block chain:** Known as the backbone technology behind Bitcoin, is one of the current trends on the market. Due to the decentralized networks, blockchain does not have a central point of failure and is better able to withstand malicious attacks, users can trust that transactions will be executed exactly as they want and transactions can be processed 24/7.

NEGATIVE EFFECTS OF TECHNOLOGY

Technology has improved productivity, helped scientists to cure diseases, assisted engineers to design and construct fantastic new structures, and it has connected people from across the world. However, it is important to not be blinded by the advantages and ignore the disadvantages. Let's take a look at some examples of how technology might harm society:

- **Working environment:** Face-to-face meetings have often given way to video conferences, mailrooms to email inboxes, and typewriters and carbon paper to word processors. Technology has also allowed a substantial portion of work—and the workforce—to move beyond the confines of a traditional office.2 It is common for digitally connected professionals to perform some of their work in cafés or shops, at home, even lying by the pool while on 'vacation'.
- **Environmental problems:** The eternal race between companies to improve and gain a competitive advantage over others, does unfortunately negatively affect the environment too. Examples of this include e-waste, the depletion of natural resources and increased pollution.
- **Social effects:** Computers and the internet have increased our ability to communicate with people around the world, but by doing so, they have also decreased our personal and social interactions. An example of this can be seen when looking at the Hikikomori people in Japan. These reclusive people have withdrawn from society and use computers and the internet to isolate themselves to their homes.
-

- **Crime and abuse:** Computers give anyone connected to the internet, access to an incredible amount of information. Usually, people use this information to keep up to date with current events, improve their existing skills, or learn new skills; however, there are some that use the information to commit terrible deeds. Examples of this include cyberbullying, online stalking and computer fraud.
- **Lack of upskilling:** as businesses are getting digitised at a faster rate, upskilling employees regularly has become a major factor. Most employees are concerned that their skills are either already outmoded or will soon become so.

INFORMATION OVERLOAD

Have you ever found yourself in a situation where you need to decide on a matter, but you just cannot make up your mind? It could be that you are suffering from *information overload*. Information overload is a term used to describe a situation where there is just too much information available for your brain to process. In short, the hard drive is full, but you are attempting to copy more data to the drive.

Figure 8.4: *Information overload*

Information overload is caused from our brains' limited capability when it comes to processing information, as well as the massive amount of information it is subjected to each day. In order to help you deal with this problem, let's take a look at some tips on how to deal with information overload.

VIRTUAL AND AUGMENTED REALITY

One of the most exciting and interesting advances of technology, is virtual or augmented reality. Virtual reality is a type of output device that uses a specially designed headset to fully immerse the user in a high-quality 3D virtual world, using both sight and sound.

What sets virtual reality apart from other 3D viewing devices is that it is *not* limited to just normal 3D images. The headset functions to adjust your vision, depending on where you look in real life, changing the picture you see as you look at different things.

This gives the device a much more immersive feeling. Due to this, there is a high level of concern about the potential negative effects that virtual reality might have on the user.

Let's take a look at some of the potential negative effects of virtual reality:

- **Addiction:** The immersive feeling of virtual reality might cause some users to turn their back on the real world.
- **Cybersickness:** This is a form of motion sickness that is caused due to using virtual reality technology.
- **Physical injuries:** Prolonged use of virtual reality can lead to eye strain and muscle fatigue.
- Virtual reality devices can be used for a variety of things; including training simulations and games.

Figure 8.5: *Using virtual reality goggles*

Unlike virtual reality, augmented reality does not fully immerse the user in a 3D virtual world instead, it adds digital elements to the real world. These elements can be viewed and interacted with by making use of a camera or smartphone. The most well-known example of augmented reality can be seen when looking at the super popular mobile game, "Pokemon GO". In this game, players use their smartphones in order to find and catch Pokemon in the real world. The game uses the phone's GPS to locate and move each player's virtual character on the game's version on Google Maps.

Activity 8.2

1. Answer the following questions:
   a. What is a digital footprint and how can the average user obtain one?
   b. When is a person described as a Hikikomori?
   c. Are there any benefits to using e-commuting? If so, what are they?
   d. Discuss three positive and three negative effects that technology has had on modern society.

QUESTION 1: SCENARIO-BASED QUESTIONS

Ntuli has been given a big project that needs to be completed within a few days. This project has left him stressed, because he has to do a lot of research. After doing his research, Ntuli found that he had approximately 326 pages worth of research to go through.

1.1	What could Ntuli suffer from as a result of this project?	(1)
1.2	What four things can Ntuli do to prevent or reduce this problem?	(4)
1.3	When Ntuli completes his school project, he is very proud of it. He decides he wants to share it online so that he can get people's opinions of his work. What could he use to do this?	(2)
1.4	Mention four things that Ntuli should be cautious of when sharing his project online.	(4)

[11]

QUESTION 2

Copy and complete the following table. Which of the statements in the table are *negative* side effects of social media, technology and virtual reality?

STATEMENT	NEGATIVE SIDE EFFECT OF ...
2.1 It can lead to peer pressure	
2.2 It can cause cybersickness	
2.3 It can create a false sense of relationships	
2.4 It can lead to crime and abuse	
2.5 It can lead to information overload	
2.6 It can affect your privacy	
2.7 It can lead to addiction	
2.8 It can affect your productivity	
2.9 It can affect your actions	
2.10 It can affect the environment	

[10]

TOTAL: [21]

AT THE END OF THE CHAPTER

NO.	CAN YOU ...	YES	NO
1.	Explain the impact that social media has had on the community?		
2.	Identify and list the benefits and harm of technology?		
3.	Explain what information overload is?		
4.	Describe the impact of virtual reality?		

INFORMATION MANAGEMENT: PRACTICAL ASSESSMENT TASK

CHAPTER OVERVIEW	
Unit 9.1	Problem solving cycle
Unit 9.2	Information management

By the end of this chapter, you will be able to:

- Discuss the different methods that can be used to collect data.
- Process and analyse data.
- Present data..

INTRODUCTION

Every day, we are presented with new problems and challenges. These problems can be simple, such as deciding what to have for breakfast, or more complicated, such as trying to find out why your car is not starting. To solve these problems, you need to find and process data so that you can do the following:

- Identify what the problem is or how the problem occurred.
- Find a possible solution.
- Find out how to implement the solution.

You can do this by following the steps in the information management process, shown in the diagram below.

Information management
The five principles

Information and data requirements	Role and responsibilities	Processes, procedures and guidance	Enabling technologies	Audit and control
– What is needed?	– Who provides it?	– Where does it come from?	– How is it provided?	– Is it good enough?
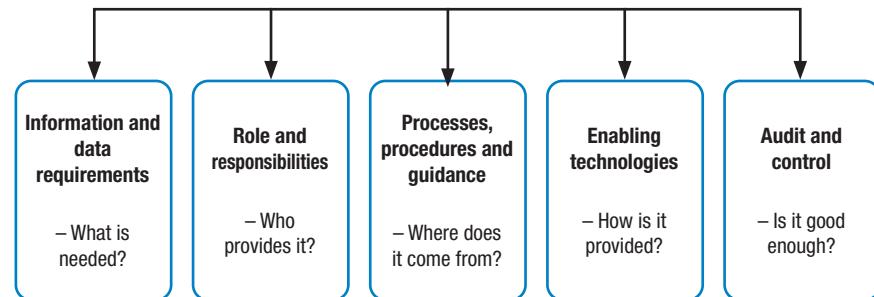
Figure 9.1: *The information management process*

The information management process is a good example of how to collect, organise, interpret and present data as information. To help you get a better understanding of this process, we will take a closer look at information management. We will start by looking at how data can be gathered. We will then discuss how data can be stored, how to check the quality of the data, as well as how to process the data. Finally, we will take look at how data can be interpreted to give us information and how we can present this information to others.

In previous years, you learned that data is raw, unorganised numbers or facts and that these facts are difficult to use without being organised or changed. When data is organised so that it can become useful to people, it becomes information. Converting data into information can be seen when solving a problem. Problem solving is a process where you attempt to determine a solution to your problem by looking at the data and trying to organise it into useful information. Problem solving consists of the following five steps:

1. **Define the problem:** Here, you need to determine what the problem is you are trying to resolve. In order to do this, you need to understand what the problem is. The best way to do this is to write down everything you know about the problem. Make sure to include the following:
   - What is known about the problem?
   - What information is missing or is needed in order to determine the problem?

   After you have written down everything that you know about the problem, you need to determine how you are going to find the missing information. One of the ways in which to do this is to use questions or questionnaires to collect data on the problem. This data can then be sorted into useful information that you can use to identify the problem as well as possible solutions.

2. **Identify possible solutions:** Once you have identified the problem, you need to research ways in which to solve the problem. You can use information sources and data-gathering tools for this. Information sources include electronic sources, such as wikis and internet articles, and printed media, such as books and standard operating procedures (SOPs). Data-gathering tools include conducting questionnaires and interviews with the relevant people or targeted market. Both of these sources will provide data that can be organised in order to come up with possible solutions.

3. **Choose a solution:** Your research would have identified several possible solutions to the problem, but how do you determine which solution is best? To do this, you need to apply your knowledge of the subject. Knowledge is something you gain through experience and education. Your knowledge of the subject should enable you to sift through all the information that you have obtained in order to identify the best possible solution to the problem.

4. **Implement the solution:** If you use your knowledge as well as the information that you have gathered, you should now have identified the best possible solution. Make sure that you implement the solution according to your knowledge and research. A solution that is not fully implemented might create new problems.

5. **Review the solution:** Problem solving does not end with the implementation of the solution. You still need to determine if the solution is effective for resolving the problem. If the chosen solution is not effective in resolving your problem, you will need to go back to Step 1 and identify why the solution did not work. Then repeat the process by choosing a new solution and testing to see if it resolves the issue.

Something to know

Sifting through information is the process of ONLY keeping information that will enable you to solve the problem.

FINISH — START

REVIEW THE RESULTS

DEFINE THE PROBLEM

IMPLEMENT THE SOLUTION

PICK A SOLUTION

BRAINSTORM SOLUTIONS
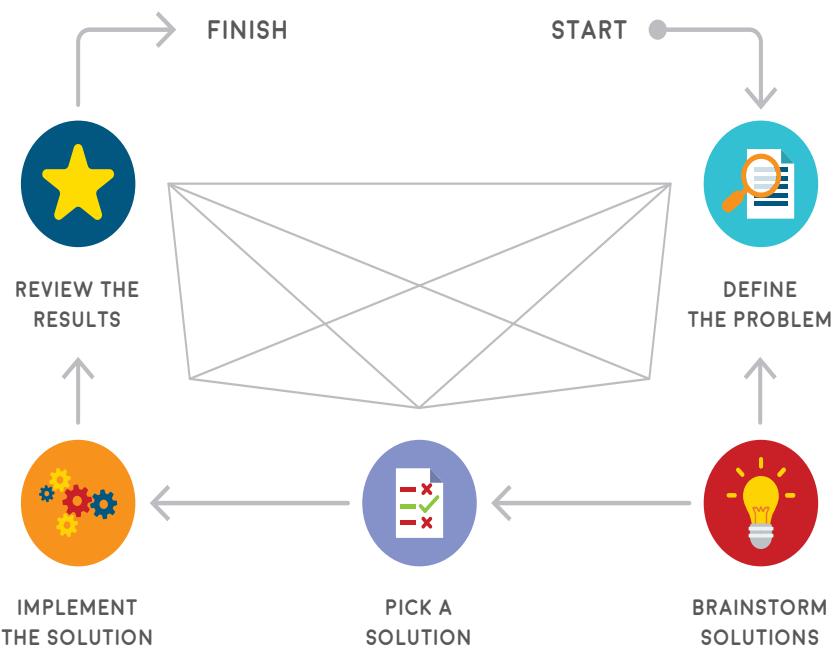
Figure 9.2: *Problem solving*

Example 9.1   Use data to solve a problem

Miss Peterson is a High School Natural Sciences teacher who is very concerned for her students. Not only does she want her students to pass; she wants them to strive to be the best that they can be. So, in order to determine which students are underperforming, Miss Peterson has decided to look at the school's database to see how her current class is performing when compared to previous year's classes.

When Miss Peterson opens the database, she finds hundreds of pages containing data for each student that has enrolled in the school over the last five years. Miss Peterson requests the database to convert all the data into percentages and to display only the data for students that take her Natural Sciences class.

Once the database has converted all the data, Miss Peterson is presented with five columns containing the averages for her students over the last five years. She can now use this data to compare the averages and identify the students who will need extra attention and support.

Activity 9.1

1. Write down the correct answer for each of the following questions.
   a. Which of the following is part of reading an academic article on the problem?
      A. Research
      B. Knowledge
      C. Experience
      D. Work
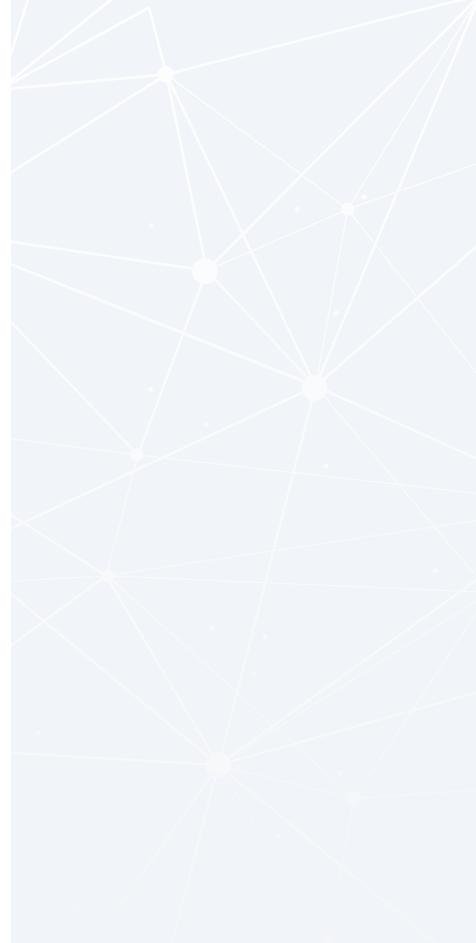
    b. Which is the first step in problem solving?

        A. List possible solutions

        B. Review the suggested answer

        C. Find the answer

        D. Define the problem

    c. What are raw, unorganised numbers or facts called?

        A. Information

        B. Knowledge

        C. Data

        D. Wisdom

2. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A	COLUMN B
2.1 A data-gathering tool	**A.** Questionnaires
2.2 The process of only keeping information that will enable you to solve the problem	**B.** Acquire and retrieve information
2.3 Examples include academic journals	**C.** True
2.4 An organisation uses an information management process to do this	**D.** False
2.5 Problem solving can be a continuous process due to "Step 5: Review the solution"	**E.** Sifting through information
	F. Exams
	G. Information sources
	H. Information management

3. Answer the following questions:

    a. What must be included in a problem statement?

    b. List the five steps of problem solving.

    c. Give four examples of information sources.

    d. Explain how an interview can lead to solving a problem.

Information management is the process of collecting, processing, and presenting data and information. The process consists of the following three main steps:

1. **Input:** This is the first step of the information management process and consists of identifying the main problems and collecting data.
2. **Process and analyse:** Once all the data has been gathered, it is converted to information by processing and analysing the data.
3. **Output:** This is the final step in the process and consists of presenting the information in such a way that it can be easily understood by other people.

> The information management process is very similar to the information-processing cycle that we discussed in Chapter 1, with the main difference being that the information management cycle consists of three main steps and not five. To recap, the five main steps of the information-processing cycle include:
>
> 1. **Input:** The first step in the information-processing cycle is when the computer receives data from the user. The data can be either in the form of information or instructions.
> 2. **Storage:** The input data is then stored by the computer. This can be either permanently on a hard drive, or temporarily in the RAM (the computers short-term memory).
> 3. **Processing:** Once the data is stored, the computer can start manipulating the data. This is done according to instructions programmed into the computer.
> 4. **Output:** The manipulated data can now be sent to an output device. This includes a screen that can display the data as well as other devices, such as a printer.
> 5. **Communication:** The final step of the information-processing cycle is communication of the information to other sources. This can be done between two computers, or over a massive network, such as the internet.

PAT AND THE INFORMATION MANAGEMENT CYCLE

During your Practical Assessment Task (PAT) examinations, you will be asked to research and present your findings on a given topic. To do this, you will use the information management process.

Start by identifying the potential problems highlighted in the given topic. These problems can then be used to generate questions that you will use in order to gather data. Once you have gathered the data, it has to be processed and analysed to obtain information. The final step of the examination is to take the information and present it in a format that others will be able to understand.

Examples of potential topics include:
- What is the impact of fake news on society?
- An investigation into the shortage of high-school pupils and university students studying in the scientific, technical/technology and engineering fields.

In order to assist with your PAT examination, we will be using the following practical example to demonstrate each step of the information management cycle.

Example 9.2   E-learning in South Africa

With the advances in computers and the internet, e-learning has started to replace traditional forms of education, such as printed textbooks. This form of education has become very popular in large parts of Europe and America, but has yet to do the same in South Africa.

As a current student, your task is to determine whether or not e-learning can be implemented in South African schools.

STEP 1: TASK REQUIREMENTS

In order to determine whether or not e-learning can be implemented in South African schools, you need to understand exactly what is expected of you. To do this, you will need to write down the task requirements by looking at the instructions given in your PAT assignment. You can do this in the following way:

1. **Identify the main problem you have to solve:** Start by writing down everything you know about the problem and determine the main question that you would like to answer.
2. **Identify a possible solution:** Determine what information you will need in order to answer your main question. This usually requires creating questions with answers that will let you solve your main problem.

You can expand on your task definition by using mind maps, bulleted lists, or any other method that best describes your plan of action.

Example 9.3   Find answers to a question

In the previous example, you were instructed to determine whether or not e-learning can be implemented in South African schools. In order to answer this question, we first need to look at what we know about the given topic, after which we will need to determine a possible solution to the question.

WHAT DO WE KNOW?
E-learning, or electronic learning, is a new method of education that uses electronic technology (computer and the internet) to present a course or subject. It is most commonly used over the internet. However, it can also be used in the classroom as a substitute for physical textbooks. This method of education has become very popular in Europe and America, but has yet to take off in South Africa. Why would this be?

ANSWER THE MAIN QUESTION
Now that we have determined our main question, we need to look at possible questions that will help us gather all the data and information needed to answer it.

Here are some of the questions that we will need to answer in order to solve our main problem:
- Does South Africa have the infrastructure for e-learning?
- Do people know what e-learning is?
- Would people make use of e-learning?

STEP 2: GATHER DATA

Once you have determined your task requirements, you need to start looking at ways in which to gather the data and information needed to answer your main question.

To assist you in gathering data, we will now take a look at some data-gathering techniques that you can use.

INTERVIEWS

An interview is a conversation between two people; the interviewer and the person being interviewed (interviewee). The interviewer asks questions that are then answered by the interviewee. Interviews are an example of a primary data source, because data is gathered and analysed by the person conducting the interview. They can be conducted in a formal manner, focusing on structured questions, or in an informal manner where the interviewer asks general questions. Examples of interviews used to collect data include the following:

- One-on-one interviews conducted in person
- Interviews conducted over the phone
- Group interviews

When conducting an interview, make sure that the questions are clear and focused on the topic that you would like to discuss. Interview answers usually include descriptions that are not numbers and cannot be computed; therefore, this data collected through the interview process.

Figure 9.3: *Conducting interviews*

QUESTIONNAIRES

A questionnaire is a research method that uses a series of questions in order to gather data. These questions can be **multiple choice**, or questions that require the respondent to give a short description. However, it is recommended to use multiple-choice questions, as people are more inclined to want to complete the questionnaire. Questionnaires should, therefore, not require long explanations or descriptions.

Examples of questionnaires used to collect data include the following:
- Surveys
- Opinion polls
- Multiple-choice tests

Figure 9.4: *Completing a questionnaire*

Let's take a look at the following guidelines for preparing a questionnaire:
- Decide what you are trying to learn from the questionnaire.
- Identify potential questions that will help you get the information that you need.
- Use closed questions (yes/no), as well as open questions (questions that require a description).
- Keep your questions short and simple to avoid confusion.
- Ask your questions in a way that will not guide people to a specific answer.
- Keep your questionnaire as short as possible.
- Test the questionnaire to ensure that it achieves what you are aiming for.

The data collected from questionnaires can be either quantitative or qualitative. Qualitative data is collected by looking at the answers provided. Quantitative data can be collected by assigning numerical values to the questions. An example of this can be seen in a survey that asks you on a scale of 1 to 5, how satisfied you are with the service you have received.

OBSERVATION

Observation is a method of collecting data where the researcher observes and documents participants performing a task in their natural setting. Unlike interviews and questionnaires, observation does not require the researcher to ask any questions; instead, it requires them to observe the task using their senses.

Examples of using observation to collect data include the following:
- Observing the interaction between a teacher and a student
- Observing a mechanic fixing a car
- Observing a train conductor operating a train

Observation can be used to collect both quantitative and qualitative data. Quantitative data is collected by looking at the amount of times a specific task is performed. Qualitative data is collected by looking at how the task is performed.

Something to know

When using observation to collect data, do not disturb or interrupt the person, or process, you are observing. Interruptions might lead to inaccurate observations as it might cause deviations in the process.

DOCUMENTS AND RECORDS

Written documents and records are one of the oldest methods used to capture data and present information. These documents can consist of databases, notes, reports, letters, records and written accounts. In the modern day, documents and records are stored electronically on your computer. The data that is obtained from documents and records is classified as secondary data. This is because the data was not generated by the person conducting the research, but rather by someone else. Examples of documents and records being used to collect data include the following:

- Looking at your financial records
- Examining the notes for a meeting that you did not attend
- Using information from a textbook

Figure 9.5: *Documents and records*

THE INTERNET

The internet has played a very big role in allowing people around the world to access a wealth of data and information. Using a search engine, such as Google, is much more time efficient and effective than visiting your local library.

Let's take a look at the following examples of where the internet is being used to collect data:

- **Wikipedia:** This website contains a wide variety of data and information. (Information obtained from Wikipedia should always be checked for quality and accuracy.)
- **PriceCheck:** This website allows you to compare the cost of items from different retailers.
- **LinkedIn:** This website provides information on job vacancies, as well as the professional profiles of people looking for part-time and full-time employment.

Figure 9.6: *Using the internet to obtain data*
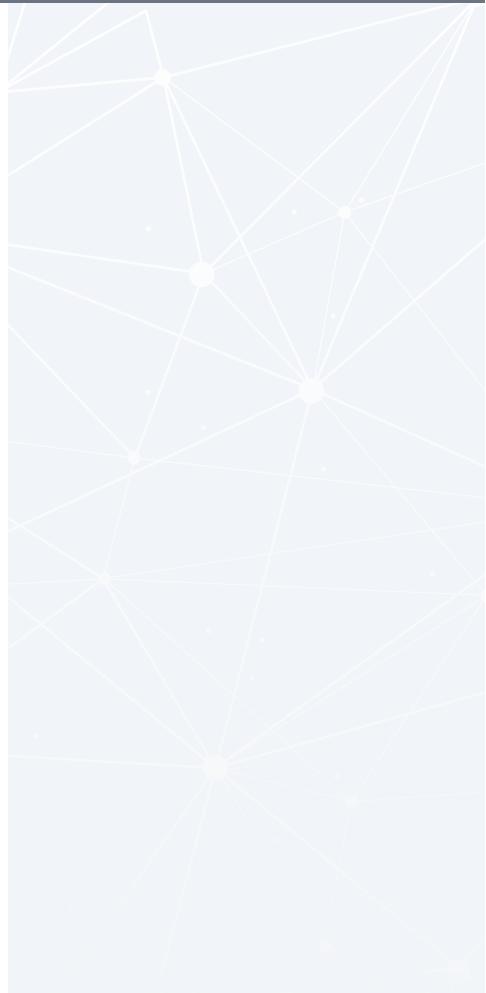
Example 9.4   Further research

Unfortunately, the information obtained from the data analysis is not sufficient to make any final conclusions. In order to obtain additional information, we used our own data as a guideline and did further research using secondary information sources, such as the internet and written media. When you use secondary information sources, always check the quality of the information to ensure that it is valid and accurate. You can ask a variety of questions to check the quality of information.

Let's take a look at some examples:
- **Questions focusing on facts:** These type of questions aim to gather as many facts as possible to ensure that the information is accurate:
  - Who generated the information?
  - Is there evidence to support the information?
  - Is the information relevant and up to date?
  - How many times has the information been used?
  - Does the information cover your topic?
  - Is the information biased toward a specific outcome?

- **Questions focusing on exploring the information:** These questions aim to help you get a better understanding of the information:
  - What does the information indicate?
  - Why does the information indicate this?
  - How did the information come to its conclusion?

- **Questions focusing on predicting the outcome of the information:** These questions help you use the information to predict a possible outcome, or come up with a hypothesis:
  - Will I be able to use this information to find a solution to my problem?

The internet contains a wealth of information that has been uploaded by many different people; however, not all the information is accurate. This is because some people do not do proper research to ensure that the information that they put on the internet is accurate. There are also some that attempt to mislead you on purpose. Due to this, it is especially important to ensure that information obtained from the internet is accurate. Check the website that you are using to make sure it contains accurate and relevant information from a reliable and trusted source. You can do this in the following way:
- Make sure the website is easy to navigate.
- Determine for whom the website is intended.
- Check that the website and its information are up to date.
- Look at who supports the website.
- Check the credentials of the author of the information you are looking at.
- Check that the links on the website are working. This is especially important when checking references.
- Make sure that the information on the website is similar to that obtained from other websites.

Something to know

Sites, such as Wikipedia, can be updated by any person who can access the website. Information obtained from such a website should always be verified from another relevant source.

Example 9.5   Further research

In the previous section, we came up with five questions that we would need to answer to determine if e-learning can be implemented in South Africa. After looking at each of the questions, we decided that the best method to answer these questions would be a questionnaire to test the knowledge of students, parents and teachers around e-learning.

Let's take a look at the following example of our questionnaire:

E-learning
General overview of e-learning in South Africa

Questionnaire/Self-test
The purpose of this questionnaire/self-test is to obtain information about the knowledge of students, parents and teachers of e-learning, and its use in South Africa. Circle the appropriate letter on the sheet to indicate your answer.

1.   Are you a student, parent or teacher?
     A. Student
     B. Parent
     C. Teacher
2.   Do you prefer physical (newspaper) or digital (internet) sources of information?
     A.   Physical sources
     B.   Digital sources
3.   E-textbooks are more cost effective than printed textbooks. Choose one of the following:
     A.   Strongly disagree
     B.   Disagree
     C.   Agree
     D.   Strongly disagree
4.   Why did you make the choice you did in Question 3?
5.   Do you know of any South African educational institutions that use e-learning?
     A.   Yes
     B.   No
6.   Do you own any of the following?
     A.   Smartphone
     B.   Laptop
7.   Does your school have Wi-Fi available?
     A. Yes
     B. No

Figure 9.7: *An example of a questionnaire*

Something to know

Group your files and folders to make it easier to locate and use your data.

SPREADSHEETS

A spreadsheet is an electronic document that can be used to capture data in rows and columns.

Example 9.6 — Capture data in a spreadsheet

The questionnaire regarding the use of e-learning in South African education was handed to and completed by 16 students, 27 parents and eight teachers. To help us get a better understanding of the data collected, we decided to capture the data by using a Microsoft Excel sheet. This was done in the following way:

1. Create a sheet called "Students".
2. Add headings for each of the questionnaire questions.
3. Capture the data for each questionnaire completed by a student.
4. Repeat Steps 1 to 3 for the questionnaires completed by parents and teachers.

Here is an example of our data captured in Excel.

	A	B	C	D	E	F	G
1	Response	Question 1	Question 2	Question 3	Question 5	Question 6	Question 7
2	1	Student	B	A	Yes	A	Yes
3	2	Teacher	A	D	Yes	B	Yes
4	3	Teacher	B	B	Yes	B	No
5	4	Parent	B	C	No	A	Yes

STEP 3: PROCESSING DATA

In order to convert your gathered data into usable information, you need to *analyse* the data. This can be done by sorting and grouping the data in a way that is easy to understand. Once the data has been sorted, you can use various formulae, functions and queries included in spreadsheets and databases to analyse the data.

Let's take a look at some of the tools that you can use to analyse your data:
- **Mathematical operators:** Excel and databases use standard mathematical signs, such as a plus (+), minus (-), multiplication (*) and division (/).
- **Formulae:** A data analysis can be performed using the following formulae:
  - ¿ **SUM:** This function calculates the total of a range of numbers.
  - ¿ **AVERAGE:** This function calculates the average of a range of numbers.
  - ¿ **MIN:** This function returns the minimum value from a list of values.
  - ¿ **MAX:** This function returns the maximum value from a list of values.
  - ¿ **COUNT:** This function counts the numbers in a list of values.
  - ¿ **VLOOKUP:** This function allows you to search for a value in the left-most column of a spreadsheet. If found, it returns a value.
  - ¿ **IF statements:** This function allows you to output text if a case is valid or false. For example, the formula IF(A1<A2, "Yes", "No") will give an answer of "Yes" when A1 is smaller than A2 and an answer of "No" when A1 is bigger than A2.

Database programs, such as Microsoft Access, use queries instead of formulae in order to analyse data. Queries do exactly the same things as the functions and formulae in Excel, but with less manual work.

Example 9.7 — Processing data

In order to analyse the data we collected using the questionnaires, we transferred the data to an Excel spreadsheet. From there, we used the COUNTIF function to count the number of answers for each question.

Something to know

The method used to sort your data depends on the type of data. For example, numerical data (numbers) can be sorted from lowest to highest, while string data (words) can be sorted alphabetically.

Note

There are many more formulas not discussed here; refer to the PAT rubric for more information on the complexity levels for formulas (SPREADSHEET COMPLEXITY).

This was done in the following way:

1. Open your sheet containing the answers obtained from students.
2. Create a new table with headings for each answer.
3. Use the COUNTIF function to count the number of times a specific answer was given.
4. Repeat Steps 2 and 3 for the answers obtained from parents and teachers.

Figure 9.8: *Processed data*

Figure 9.9: *Query in a database*

Using the information obtained from the database, we can now start answering some of the main questions:

- Does South Africa have the infrastructure for e-learning? We know that more than two-thirds of schools already have Wi-Fi available and that every person that was interviewed owned a device that can be used for e-learning. This would indicate that South Africa does possibly have the infrastructure available to implement e-learning.
- Do people know what e-learning is? Our data indicates that about half of the people know what e-learning is and that only one-third is aware that e-learning is currently being used in South Africa.
- Would people make use of e-learning? Slightly more than half of the people make use of a digital platform to obtain their information and when asked if they are interested in making use of e-learning, two-thirds indicated that they are.

STEP 4: ANALYSIS

Once data has been processed it is time to return your problem. Are you able to answer your main question? Based on information from other sources and the results of processing in spreadsheets and databases, you must formulate clear arguments in support of a solution to your problem.

An example would be "Most teachers strongly agreed (80%) that e-textbooks would be more cost effective while 40% of parents strongly disagreed. The introduction of e-textbooks would require an advocacy program to convince parents of the cost saving in using e-textbooks."

STEP 5: PRESENT INFORMATION

Now that you have collected, analysed and processed the data, the last step is to present all the data and information that you have collected so that it is easy to understand the main focus and outcome of the research. You can use the following methods to do this:
- Use graphs and tables
- Create a presentation
- Create a website
- Write a report

GRAPHS AND TABLES

One of the best ways to present your data is to use a visual representation of your findings. Table users visualise trends and comparisons by allowing them to organise the data; graphs help to represent the information visually.

To insert a chart in Excel, you can do the following:
1. Select the range.
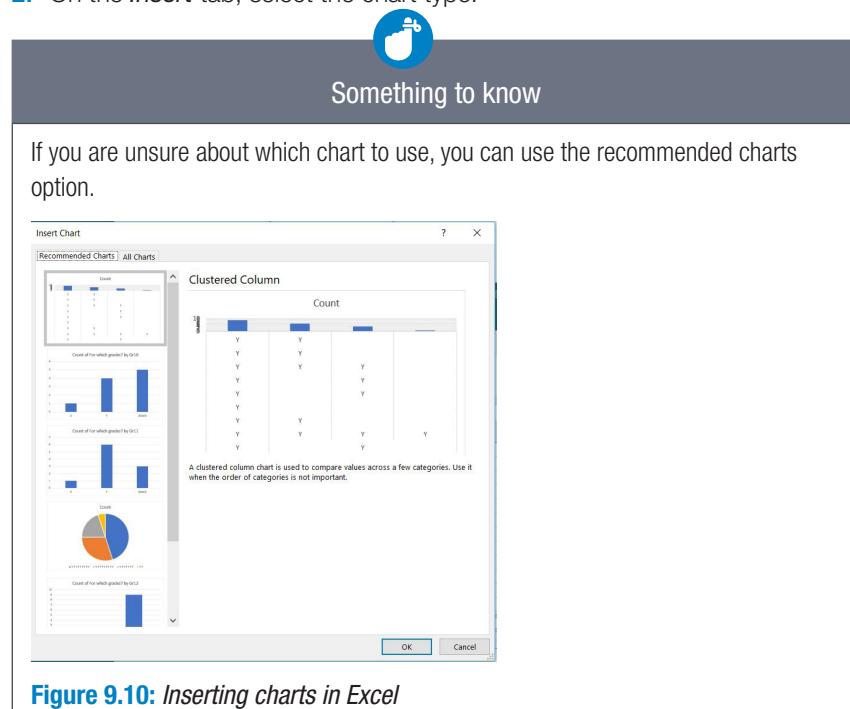2. On the *Insert* tab, select the chart type.

> **Something to know**
>
> If you are unsure about which chart to use, you can use the recommended charts option.
>
>
>
> **Figure 9.10:** *Inserting charts in Excel*

PRESENTATIONS

PowerPoint presentations allow users to create a visual presentation of their findings through the use of slides. These slides can contain text, graphics and other multimedia sources, such as videos and animations. If you are looking to create a PowerPoint presentation in order to present your findings, here are a couple of tips:

- **Keep it simple:** Do not include too much information on a single slide.
- **Keep it short:** Try and present your information using as few slides as possible. This will keep your audience attentive and interested. However, do not leave out important information while trying to keep it short.
- **Do not use too many animations:** Excessive use of animations can cause the audience to get bored and lose attention.
- **Choose a font size and colour that are easy to read:** It is important to make sure that the audience will be able to read the text on your presentation, no matter where they are sitting. If the font is too small, or the text colour is unclear, many people might not be able to follow your presentation.
- **Use graphics and charts:** Instead of just having text, graphics and charts can be used to present your information in an easy-to-read and understand format.
- **Use the notes:** PowerPoint allows the user to make notes for each slide. This is especially useful to help you remember your main talking points for each slide.

CREATE A WEBSITE

During your PAT examinations, you might be asked to create a website to present your findings and information. This website will contain the same basic information that you would write in a report, with the difference being that the website will contain a more summarised version of the information. Follow these guidelines on how to create a website that is engaging and visually appealing:

- **Simple:** Simpler is better; websites should not contain too many design features, especially if those features serve no purpose.
- **Understandable:** The target audience of a website should be able to understand everything on the website without any difficulty.
- **Purposeful:** Websites should have a clear purpose, and every design and programming decision should work toward this purpose.
- **Useful:** A website should be useful and easy to use.
- **Consistent:** The design of a website should be consistent. This will make the website easier to understand and also make the website's identity clearer.
- **Visually appealing:** It is important to remember that even the most simplest, understandable, purposeful, useful and consistent website will not be used if people do not like looking at it.

High-quality websites should contain good information and have a good design.

REPORTS

Many people look at memory as a filing cabinet in your brain, storing pieces of important information until you need them. However, memories may also be inaccurate, or you may forget certain things. A written report ensures that you have an accurate record of all the relevant information.

A report is a form of communication that provides data and information of an event or incident. It is used to inform another person or party of the facts surrounding the event.

It helps us to clearly state the problem, the solution that was implemented to fix the problem, as well as how effective the problem-solving solution was.

A report can be written in an informal or formal style. An informal report is a short report; usually consisting of one to three pages. It provides information, but contains little to no research. It makes use of personal language and is normally very direct. A formal report is usually longer, contains facts obtained from the research and analysis of data, and is more direct.

WRITING A REPORT

The information in a report should be presented in a way that is easy to understand and to use. A report consists of the following sections:

1. **Introduction:** The introduction is used to state the purpose of the report and provides a background on the issue. It is important to use your knowledge of the subject to provide a clear description of the problem that has occurred, as well as the solution that was implemented.
2. **Body:** The body of the report will consist of a summary of information found from various sources such as the internet, books, surveys and so on. Information should be supported by graphs and other evidence such as the output of database queries. This will be followed by an analysis of the information you found. On the basis of the information found, a possible solution to the problem should be formulated. Any references to information sources should be acknowledged (cited). Care should be taken to avoid plagiarism by using your own words.
3. **Conclusion:** This section is used to indicate whether or not the solution was a success and if any other solutions might be needed. If the solution was not successful, you need to include which steps you are planning to follow in order to make sure that the problem is resolved.

Always remember that it is important to write your report as soon as possible. This is to ensure that you include all the details that you have observed. The longer you wait, the better the chance that you might forget something important.

Example 9.7　　Present information

The final step in answering our question is to take all the information and data that we obtained from the questionnaire, data analysis and secondary information sources, and present it in a way that answers our main question. In order to do this, we decided to use a professional report.

A formal or professional report is an official report that contains a detailed data analysis, research, as well as the necessary information to make business decisions. Because of this, formal reports are usually used for problem solving. Examples of formal reports include the following:

- Inspection reports
- Safety reports
- Audits
- Annual reports

A brief, well-structured report that has clear objectives will get more attention and support, and is more likely to produce the intended results than a vague, poorly constructed report that takes a long time to reach the point. To help with this, here are the steps that you should take when writing a professional report:

1. **Determine the purpose of the report:** This is the first and most important step of writing a report. You need to decide what you wish to accomplish by writing the report. Make sure to get as much information as possible to help you determine exactly what you should include in the report. 2. **Determine for whom you are writing the report:** Once you know the purpose of the report, you need to determine who is going to read your report. This is very important as it will help you decide how much detail needs to be included, based on the experience of the readers.
3. **Write the report:** Now that you have identified the purpose of the report and who the report is aimed at, you can start writing the report. Make sure to have a clear, logical structure (introduction, body and conclusion) with clear headings to show where your ideas are leading. Take care not to make any assumptions about the readers' understanding and always explain why something is being said. Ensure that your report is long enough to fulfil its purpose, but not too long to lose the reader's interest.
4. **Review and revise:** The final step of writing any report is to review and revise what you have written. Make sure that everything makes sense and that the report is indicating what you had intended. It is recommended that you revise the report once some time has passed, for example a couple of hours later. This will allow you to review the report with a fresh mind set and will help identify mistakes that you might have missed previously.

THE STRUCTURE OF A FORMAL REPORT

In the first part of this section, we discussed the structure of a report, which includes an introduction, body and conclusion. However, a formal report may also include some additional sections. We will discuss these sections in three separate parts.

Part 1: Front section

This part of the formal report helps the reader understand what the report is about, as well as what is included in the report. This section contains the following:

- **Title page:** The function of the title page is to indicate what the report is about, who wrote the report, when the report was written and for whom the report was written.
- **Abstract:** An abstract is a summary of your report which you write after the report has been written. It should be written in the third person and in the past tense.

Example 9.7   Present information

- **Table of contents:** The table of contents gives the reader an overview of the document's contents. It also allows the reader to go directly to the section in which he or she is interested.

Part 2: Main section

This section contains the main report. It includes the following:

- **Introduction:** The introduction states the purpose of the report and provides background on the issue.
- **Body**: The body contains a discussion, analysis and provide possible solutions.
- **Conclusion:** In this section, the writer indicates whether or not the solution was a success and if any other solutions might be needed.

Part 3: Back section

The last section of the formal report is used to provide additional information that the reader might require. This includes the following:

- **References:** This is a list of the resources that were used during the writing of the report. The reader can use these references for additional reading, or to confirm the findings of the report.
- **Appendices:** The appendices include all documentation that was too large and bulky to be contained within the main report. This includes data sources, such as spreadsheets and databases. These documents are normally included to provide evidence for the findings of the report.
- **Glossary:** This is an alphabetised list of terms, definitions and abbreviations used in the report. The main function of the glossary is to provide the reader with a quick reference to terms that they might not recognise.

Something to know

When writing a report, take care not to plagiarise. Plagiarism is against the rules of any learning institution and could lead to you being prevented from finishing your studies. In order to show that you are responsible for obtaining the data and writing the report, you can use a declaration of authenticity.

1. Choose a term or concept from Column B that matches the description in Column A. Write only the letter next to the question number.

COLUMN A		COLUMN B
1.1	Data that looks at the description of things	**A.** Tables
1.2	A recorded conversation between two people when one person mostly asks all the questions	**B.** Qualitative data
1.3	This helps the user to visualise trends and comparisons by allowing the user to organise the data	**C.** PowerPoint presentations
1.4	Part of the back section of a report	**D.** Interview
1.5	A way to present your findings to a crowd	**E.** Written report
		F. Keep it simple
		G. Glossary
		H. Make it useful

2. Answer the following questions:
   a. List four guidelines to keep in mind when preparing a questionnaire.
   b. Explain the difference between primary and secondary data.
   c. What is the purpose of an executive summary?
   d. Explain the three sections of a report.
   e. Discuss the structure of a report. Make sure to elaborate on the three sections.
3. Which of the following criteria must be used to create a good presentation or website? State whether it is a presentation, website, or both. Copy the table into your exercise book and write the correct answer in the right-hand column.

CRITERIA	PRESENTATION/WEBSITE
Keep it simple	
Use graphics and charts	
Make sure it is understandable	
Keep it consistent	
Keep it short	
Ensure it looks beautiful	
Use the notes	
Do not use too many animations	
Make it useful	
Choose a font size and colour that is easy to read	

SCENARIO

Your local community has decided to run a campaign on healthy lifestyles. Amongst the activities they are organising is a triathlon race. They have asked you to help in sending invitations, creating documents that explain the event, recording results, keeping records of athletes and creating a website to market the event.

QUESTION 1: WORD-PROCESSING

Study the questionnaire below and answer the questions that follow.

Questionnaire: Living a healthy lifestyle.

A. Indicate your gender: [M] [F]

B. Why is it beneficial to live a healthy lifestyle?
_____

C. Do you eat healthily? YES / NO

D. Do you love sport and living outdoors?

1.1 Identify any ONE closed question in the questionnaire. Explain why you say that the question is a "closed" question. (2)

1.2 Explain why it would be difficult to analyse the answers to Question B in a spreadsheet. (2)

1.3 Explain why Question D on the questionnaire is not a good survey question. (2)

1.4 The questionnaire does not have an introduction. Give ONE element that should be included in the introduction of a survey. (2)

1.5 The above questionnaire was done as a word-processing form. Explain how you would capture the responses to the questionnaire in a spreadsheet or database. (3)

[11]

QUESTION 2

In the PAT of 2018 leaners were asked to investigate the problem of fake news. A learner asked the following question in her survey:

"How often do you see fake news?" Answer 1 to 5 where:

1 = Not at all
2 = Not frequently
3 = Sometimes
4 = Regularly
5 = A lot

How often see fake news ,1 to 5	
I less likely 5 most likely	Description
5	A lot
3	Sometimes
2	Not frequently
3	Sometimes
5	A lot
2	Not frequently
2	Not frequently
3	Sometimes
4	Regularly
4	Regularly
3	Sometimes
4	Regularly
5	A lot

REVISION ACTIVITY

2.1 The learner captured the responses from each person who completed her questionnaire in a spreadsheet. Some of the results are shown in the image on the left.
The respondents answered using the number 1 to 5. The learner used a spreadsheet function to convert the number to its matching description.
What spreadsheet function did she use to do this? (1)
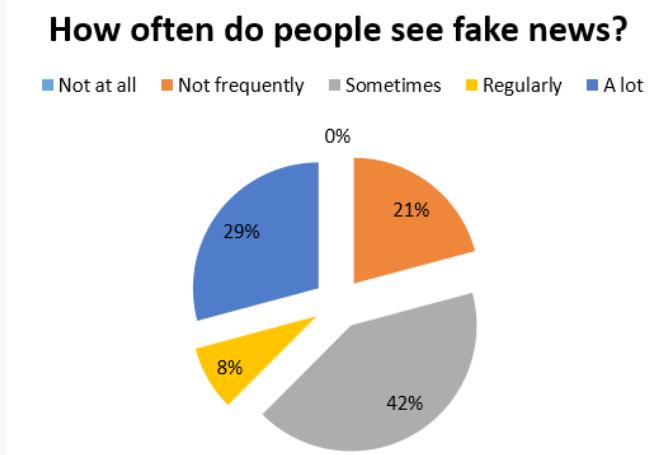
10. How often do people see fake news	
Not at all	0
Not frequently	5
Sometimes	10
Regularly	2
A lot	7

2.2 The learner then made a summary of all the responses to the question. What spreadsheet function did she use to do this? (1)

2.3 The learner created a graph of the results shown in 2.2.

How often do people see fake news?

■ Not at all   ■ Not frequently   ■ Sometimes   ■ Regularly   ■ A lot

a. Write an argument to include in a report based on the information in the graph. (3)

b. The number 0% appears on the graph but is not linked to a "pie slice". Why is this the case? (1)

c. What other types of graph could you use where it would be clearer which data item this is? (1)

[7]

REVISION ACTIVITY

QUESTION 3

In the PAT of 2016 learners were required to investigate the problem of water shortages. A learner captured data about the capacity of dams which supply the Greater Cape Town area in a database table. The data spanned a period of three years from 2014 to 2015. The learner then created the following query:

Dam Name	Capacity (Ml)	Jan 11 2014	Jan 11 2015	Jan 18 2014	Jan 18 2015	Jan 25 2014	Jan 25 2015
WEMMERSHOEK	58644	90.6	76.3	90.6	76.3	85.2	71.1
STEENBRAS LOWER	31767	84.4	63.1	84.4	63.1	79.4	54
STEENBRAS UPPER	33517	98.8	99.3	98.8	99.3	99.7	96.6
VOELVLEI	164095	88.7	81.9	88.7	81.9	84.1	73.9
THEEWATERSKLOOF	480188	94	85.4	94	85.4	90.6	78.5
BERG RIVER	130010	98.6	88.1	98.6	88.1	99.5	80.8

The output of the query is shown in the figure above.

3.1 Suggest two query design techniques that will produce a meaningful outcome. (2)

3.2 Write down the criteria to inlaced all the dam names that starts with the letter 'S' and the dams that have exceeded capacity > than 80% in 2015. (3)

(4)

QUESTION 4

As part of the PAT you are required to create a website. The image below shows a small part of the HTML.

```html
<body bgcolor="darkblue">
    <h1><font color="darkslateblue">Load Shedding Facts</font></h1>
</body>
```

The image below shows the output on the browser screen.

4.1 What is the problem with the browser display? (2)

4.2 Make ONE change to the HTML above to correct the problem. (1)

4.3 A learner in your class says that if an image is on the internet, it is fine to use that image in your PAT website because it is for schoolwork. Is the learner correct? Justify your answer. (2)

[5]

TOTAL: 27

AT THE END OF THE CHAPTER

NO.	CAN YOU …	YES	NO
1.	Collect data?		
2.	Process and analyse data?		
3.	Present data?		

Glossary

A

adware A type of virus that creates unwanted advertisements all over a user's computer. Adware is generally hidden in other installations and asks the user's permission before installing.

application software A type of software that allows the user to perform a specific personal, educational, or business-related function.

asynchronous communication A message can be sent without the message receiver being available at the time.

augmented reality Does not fully immerse the user in a 3D virtual world; it adds digital elements to the real world.

automation The process of using computers and software to automatically complete tasks with little human input.

AVERAGE This function calculates the average of a range of numbers.

B

blog An online diary that allows users to share their daily experiences with others.

boot process During this process, the computer checks that all the required hardware is in place and functioning, after which the operating system is loaded in the RAM. Once loaded, the operating system allows the user to interact with the computer hardware and software.

bot A software application that allows the user to automate tasks and actions. On the internet, bots are normally used to analyse and gather file information.

broadband A high data-rate connection that allows the user to send data over multiple channels. This makes the connection faster and more reliable than the old dial-up method. Examples of broadband include ADSL, 3G and fibre.

C

caching A small, temporary form of storage that is created in a fast form of memory in order to allow data to be accessed more quickly.

cloud-based file sharing An online file-sharing service that allows the user to share files that he or she has stored on the internet.

cloud computing A new technology that allows the user to store information, or use applications on the internet, instead of being on his or her own computer.

communication device A type of device that connects a computer to other computers in a network.

convergence A term used to describe a situation where multiple technologies are combined to deliver a new and more exciting product.

COUNT This function counts the numbers in a list of values.

Central Processing Unit (CPU) The primary component of a computer that processes data.

cyborg A being with both organic and mechanical parts.

D

data Raw, unorganised numbers, signals, or facts.

database An organised collection of data, usually stored in the form of structured fields, tables and columns.

database software Software designed to create and manage databases.

data-gathering tools Conducting questionnaires and interviews with the relevant people or targeted market.

data processing Involves using spreadsheets and databases to make data easier to understand and use.

denial-of-service (DoS) An attack that works by flooding a network or website with more information than it can handle, causing the network to be so slow that nobody can use it.

desktop PCs The most used type of computer.

disk cache Memory that stores data from the disk and allows fast activation of the disk.

distributed computing power A computing model that acomponents of a software system and computer resources to be shared amongst multiple users.

document management software A type of program that allows the user to store, manage and track electronic documents and images.

E

efiling Gives users a free, simple and secure way to complete and submit their tax returns online

email software Makes it possible for a user to compose and send email messages to other people using the internet, as well as to receive such messages.

encryption The process of converting data to an encrypted form that is protected from being viewed by unauthorised persons.

e-waste Any waste created by discarded electronic devices, components and substances used in their manufacture or use materials and heavy metals (lead, cadmium and

mercury) that are toxic.

F

fair-usage policy (FUP) A data limit placed on "uncapped" internet accounts. Your "uncapped" account will not be capped or limited unless you use too much data, in which case your internet access may be slowed (throttled) to the point where it is unusable.

files A collection of data stored in one unit, identified by a file name. It can be a document, picture, application, or any other collection of data.

file extension Consists of the letters that follow after the full stop in the filename.

file transfer protocol (FTP) A way to transfer data, particularly files, from one computer to another, usually over the internet but also over a local network.

folders The location where the files are stored on your computer.

fragmentation When you save a file onto your computer, the computer breaks the file up into smaller pieces in order to store the file on your hard drive.

G

gigahertz An indication of the processor's speed. As a general guideline: the higher the frequency, the better the CPU.

green computing The study of designing, manufacturing, using and disposing of hardware, software and networks in a way that reduces their environmental impact.

grid computing A method of increasing the processing power at your disposal. It works by creating a computer network where each computer is able to use the other computer's resources.

H

hotlinking Displaying an image on a website by linking to the website hosting the image.

I

IF statements This function allows you to output text if a case is valid or false.

information sources Electronic sources, such as wikis and internet articles, and printed media, such as books and standard operating procedures (SOPs)

instant messaging Describes online chat programs that allow the user to send real-time messages over the internet. This includes text messages, as well as multimedia messages, such as pictures, voice notes and videos.

interdependent Hardware and software cannot exist without each other

J

keylogger A function that records keystrokes on a computer. It can be used by hackers or cybercriminals to steal your information.

keystroke logging A type of surveillance software that has the capability to record every keystroke made on a computer system.

L

laptops Portable PCs that combine the display, keyboard, processor, memory, hard drive and cursor positioning device (a touchpad or trackpad).

local area network (LAN) A computer network that covers a small area in which the computers in the network share resources, such as internet connections, printers and server connections.

M

malware Malicious software used by cybercriminals.

malware bots Infect the user's computer and automatically perform malicious actions, such as gathering keystrokes, obtaining financial information, gathering passwords, or opening back doors on the infected computer.

MAX This function returns the maximum value from a list of values.

megapixels The resolution of the amount of detail that a camera can capture.

MIN This function returns the minimum value from a list of values.

N

netiquette Refers to internet etiquette. It is a list of rules and guidelines about acceptable behaviour on the internet.

P

personal computers (microcomputers) More commonly known as a PC; they are the smallest, least expensive and most used type of computer.

phishing and email spoofing attacks Methods used to obtain sensitive information (such as usernames, passwords and banking details) by sending emails that

look like official emails.

podcast A type of digital communication that uses an audio-only broadcast.

pop-up A form of advertising normally found on the internet

presentation software Specifically designed to help the user create and edit presentations in the form of a slide show. Presentations can include text, videos, or images.

protocol A set of rules for the transmission of data between devices.

R

read-only files Files that have been set; allowing the user to only read or move the file.

RSS A way to easily distribute headlines, updates and content many people at once.

S

scam A fraudulent scheme used by a malicious person to obtain money or something of value from someone else.

server A computer designed to process a large number of requests and deliver data to another computer over the internet or by using a local network

server computer A computer that can be accessed and used by multiple users through a computer network.

smartphones Handheld computers that use flash memory instead of a hard drive for storage.

sniffer attacks Data packets that are being sent over the network are inspected using a sniffer application, which allows the hacker to analyse the network and read all unencrypted data being transmitted. The information gained from the attack can then be used to crash the network, cause network data to become corrupt, or to observe network communications.

social networks The use of internet-based social media programs to connect with friends, family, customers and clients.

software A collection of data or computer instructions that tells the computer how to work.

software theft The unauthorised or illegal copying, sharing and usage of copyright-protected software programs.

spoofing attacks Attacks that are masked and makes it seem as if the attacker is a legitimate user. This is done by using falsified data to gain access to the network.

spooling A combination of buffering and queueing used by a printer.

spreadsheet software A type of program that sorts, arranges and analyses data in a table format. The user enters data into the columns and then does various calculations.

spyware Software installed on a computing device without the user's knowledge that is designed to gather data from that device.

storage capacity How much disk space a storage device provides.

storage speed How quickly new information can be written to the device or read from the device.

streaming A service that allows a user to play back a multimedia file without completely downloading it first.

stylus A small pen-shaped instrument used to directly press buttons and select options that appear on the computer screen.

SUM This function calculates the total of a range of numbers.

system requirements A list of hardware and software requirements that the software will need in order to function.

T

tablets A portable computer that uses touchscreen as its primary input device.

telecommunication Information that is obtained or exchanged using either a telephone, or a computer network.

typing tutor A type of software that teaches a user how to use the keyboard more effectively and accurately, as well as improve typing stamina and speed.

U

ultrabook Small and very powerful notebooks able to run any application. They have long battery lives and are easy to carry around.

user-centred design (UCD) Developers design software based on the focus and needs of the users.

V

vlogging Similar to blogging, with the major difference being that vlogging uses video instead of written stories and articles.

VLOOKUP This function allows you to search for a value in the left-most column of a spreadsheet. If found, it returns a value.

voice over internet protocol (VoIP) A telephone connection over the internet.

W

web-based applications Software that you can access over the internet.

web browser A software application that allows the user to access information on the internet.

web cache A small area on a hard drive where images and pages from the world-wide web are stored for a short period.

wide-area network (WAN) A network that covers a large geographical area.

wikis Specialised websites that allow users to share their information.

wireless access point (WAP) A networking hardware device that allows other Wi-Fi devices to connect to a wired network.

workstation A desktop computer typically networked and more powerful that a personal computer.

Z

zombie A hacked computer connected to a network. It can be used to perform malicious tasks that will compromise other computers on the same network.