OCR GCSE Computer Science

Your notes

Ethical, Legal, Cultural & Environmental Impact

Contents

Impacts of Digital Technology on Wider Society


Your notes

While new technologies offer exciting possibilities, beyond **feasibility** we must carefully consider:

- **Legal issues**
- **Ethical issues**
- **Cultural issues**
- **Environmental issues**
- **Privacy issues**

Legal & Ethical Issues in Computing

What is a legal issue?

- A legal issue is a problem or dispute concerning the interpretation, application, or violation of **laws**
- Examples of legal issues in computing are:
  - **Copyright** - The use of other peoples content without permission
  - **Cybersecurity** - Protecting against hackings, data breaches and all other cybercrimes
  - **Data protection** - Responsible collection, storing and use of personal information
- These issues are covered in more detail here 'Legislation in Computer Science'

What is an ethical issue?

- An ethical issue is a situation that raises questions about what is **right and wrong**
- As technology advances and **laws are slow** to keep up, ethical issues are more prevalent
- Ethical issues call in a persons own **morals** and **values** as there is often a **lack of an easy answer** and decisions can have **consequences** for **yourself and others**

Examples of ethical issues in computing

Digital divide

- The increasing reliance on computers increases the **digital divide**, creating **inequality** between those who have access to technology and those who do not

- This can **hinder opportunities** for education, employment, and economic advancement for **disadvantaged groups**


Your notes

Algorithmic bias

- Using algorithms in **decision-making** can unintentionally promote unfair **biases**, leading to **discriminatory outcomes** in areas such as:
  - **Job seekers** - Factors unrelated to qualifications such as post code or social media activity
  - **Loans** - Denying lending to minority groups
  - **Criminal justice** - Racial profiling, harsher sentences for certain groups

Intellectual property

- The ease of **digital copying** and **distribution** raises ethical questions about protecting **intellectual property** rights and fair compensation for creators
- Digital piracy can lead to **significant revenue loss for creators**. When consumers access pirated content instead of purchasing it legally, creators are deprived of the revenues they deserve

Automation

- The automation of tasks through computers raises ethical concerns about **job losses** and the **potential loss of livelihood for workers**

Cultural Issues in Computing

What is a cultural issue?

- A cultural issue is an issue that relates to the impact of technology on the **nature** and **culture of society**
- Advances in technology have changed the way people lead their lives, in areas such as:
  - Online shopping
  - On-demand content/streaming
  - Navigation (Sat Nav)
  - Gaming
  - Social media
  - Remote working

Examples of cultural issues in computing

Digital divide

- An **inequality** in the **access, use**, **education** and **confidence** in **new technologies** exists
- Access to technology is limited by **geography**, some countries have limited/no access to the internet
- Use of technology can be limited by **cost**, the ability to purchases the latest technology is both a national and international issue, as more wealth means more access
- A lack of **education** in technology can limit employment, many employers now require good ICT skills
- **Confidence** to use new technologies can also widen the divide, older generations, lacking the confidence of growing up with technology like social media, can feel intimidated and excluded, while younger generations readily accept it


Your notes

Landscape of employment

- The advancement of technology has changed the way people work, with many new jobs allowing employees to work from home
- Positive cultural impacts include:
  - **Work-life balance** - increased flexibility gives employees the ability to manage their personal and professional lives
  - **Global collaboration** - working remotely increases opportunities to work with colleagues and clients across the world
  - **Diversity & Inclusion** - remote working can remove barriers caused by geography and lead to job opportunities for people from diverse backgrounds
- Negative cultural impacts include:
  - **Social isolation** - working remotely can lead to a lack of social interaction and increase isolation
  - **Communication** - remote working can sometimes make communication a challenge, this can impact on team dynamics and efficiency
  - **Boundaries** - increased flexibility and freedom can blur the boundaries of work and personal time, which can lead to a mismanagement of time and/or burnout

Censorship

- **Restricting access** to online content based on different **beliefs** of what is acceptable or harmful can lead to social unrest
- Censorship can be used to **preserve cultural identify** and **tradition**, but can also **stifle cultural expression** and **diversity**

Environmental Issues in Computing


Your notes

What is an environmental issue?

- An environmental issue is an issue caused by **manufacturing** and **use of computers** that has a **negative impact** on the **environment**
- As technology becomes a bigger part of everyday life, the number of devices being manufactured increases

Examples of environmental issues in computing

Natural resources

- A great amount of natural resources (**metals/plastic**) are used during the **manufacturing** and **distribution** of components

Energy consumption

- An **increase** in demand for **24/7 access** to resources such as web servers and data centres means an increase in the **energy** needed to maintain them

Throw-away society

- As **consumption of technology increases** and competition in the market expands, the **rapid disposal** of devices becomes a problem
- **Pollution** caused by the production, distribution and disposal of technology gets higher
- The volume of waste in **landfill** causes **environmental contamination**

Privacy Issues in Computing

What is a privacy issue?

- A privacy issue is an issue that comes from collecting, accessing or using personal information **without consent or control**
- Who **controls the data** and **how it is used** raises crucial questions as technology becomes a bigger part of every day life

Examples of privacy issues in computing

Face recognition

- The increase in cameras and advances in technology means face recognition is possible, whilst this can mean an **advantage in crime prevention/detection**, people are concerned about **privacy**.
- Privacy concerns include, **what else is being watched?** and **who is watching?**

GPS

- GPS is built in to most smart phones and brings with it a number of features that many see as a benefit, '**find my phone**' for when it gets **lost/stolen**, **location tagging** in photos and for **navigation software**.
- Some users are concerned with **where this data is kept?** ,**who might have access to it?** and **is it being used for any other purposes?**

Internet monitoring

- Most schools and businesses use monitoring software to **track their students' and employees' internet activity**
- Social media companies also employ similar tools to **detect and remove illegal or harmful content** like hate speech, misinformation, or violent threats
- Arguments for, these measures **promote responsible online behaviour** and **prevent cyberbullying**
- Arguments against, concerns about **limitations to free speech**, **potential abuse by authorities** who control the monitoring systems, and **biased algorithms** leading to **censorship**

Examiner Tips and Tricks

In the exam, this content will be tested using a '**discuss**' (extended response) **8 mark question**.

Planning is crucial for securing the top marks, a wide range of considerations must be looked at and you must weigh up both sides of the discussion

- Start by bullet pointing **1 positive** and **1 negative** for **each of the issues** mentioned in the question
- For each bullet point, expand it to explain why it is a positive or negative
- They must apply to the context/scenario in the question
- Add a conclusion - without it you can't access the top marks!

Tip! do not feel like you have to use all available space, its quality over quantity, try not to waffle!

Worked Example

Harrison is a medical researcher trying to find a cure for a disease. He has a team of hundreds of people carrying
out medical testing.

Your notes

Recent developments in Artificial Intelligence (AI) mean that a computer program could do the work of dozens of
researchers in a much shorter time. Harrison decides to increase his use of Artificial Intelligence.

Discuss the issues surrounding this decision. Consider the following in your answer:

- ethical issues
- legal issues
- cultural issues **[8]**

How to answer this question

- Consider each issue first, can you think of any immediate positive and negatives?
- Try not to start writing the first thing that comes into your head, planning will help achieve higher marks and manage your time spent on the question
- Remember, there is not a prescriptive list of factors you need to mention, they are looking at how you can use what you have learnt about the issues and apply in a variety of contexts

Indicative Content

- **Ethical**
  - Replacing people with machines
  - Loss of jobs
  - Community will suffer
  - Working will be completed faster
  - May find a cure faster
  - More reliable calculations
  - Save more lives
- **Legal**
  - More secure than people seeing personal data
  - May be at risk if not backed up
  - May be at risk of threats e.g. hackers
  - Who is responsible if there is an error
- **Cultural**
  - Removal of people from workforce
  - Change in demand for skills
  - Need people to manage the hardware/software instead of medical experts
  - Skills may be lost

Possible response

Ethical

- ***Replacing people*** *– Using more AI will mean people losing jobs. Losing jobs will lead to higher unemployment.*
- ***Cure faster*** *– Using more AI could lead to a cure being found faster which mean many lives could be saved.*


Your notes

Legal

- **Secure** – *Using more AI could improve the security of the patient data being used. Using AI means people do not see the data, improving patient privacy.*
- **Hacks** – *Using more AI could increase the chance of hackers targeting the network, increasing the chance of data breaches and putting patient data at more risk.*

Cultural

- **Demand** – *Using more AI could impact on the demand for skilled workers to perform these jobs. This could lead to large groups of workers needing to retrain or find other jobs.*
- **Management** – *Using more AI would create a need for more workers to manage the hardware/software of the network.*

In conclusion, I think Harrison is right to increase his use in AI as the ultimate goal of his work is to help find a cure for a disease which could save lives.

Your notes

Legislation in Computer Science

Your notes

The Data Protection Act (2018)

What is the Data Protection Act?

- The **Data Protection Act** (DPA) is a law that protects personal data from being misused
- Examples of personal data would include
  - Name
  - Address
  - Date of Birth
  - Race
  - Religion
- Most people that store personal data has to follow the Data Protection Principles although there are a few exemptions:
  - **Domestic purposes** – if you only use personal data for such things as writing to friends and family or taking pictures for your own enjoyment, you are not subject to the DPA
  - **Law enforcement** – the Police investigating a crime is not subject to the DPA. E.g. if someone has been suspected of a crime they can't request to see the evidence about them
  - **Intelligence services processing** – personal data processed by the intelligence services (eg MI5) is not covered by the DPA

The data protection principles

Principle	How does it affect a company?	Example
1. Personal data must be fairly and lawfully processed	A company has to be clear about what personal data they wish to collect and what they want to use it for.	A school can request personal data to be able to call guardians in an emergency.
2. Personal data must be collected for specified and lawful purposes	A company cannot use personal data for any purpose other than what they stated originally. They also cannot pass this data on without permission.	A company asks for a phone number to call regarding delivery but then uses it to market new products.

3. Personal data must be adequate, relevant and not excessive	A company cannot request personal data that they do not need right away.	A bank cannot ask for their customer's previous trips when opening an account.
4. Personal data must be kept accurate and up to date	If a company holds personal data that is wrong or out of date then you have a right to have it corrected or deleted.	If a bank has a customer's old address then they will not be able to send up to date statements.
5. Personal data will not be kept for longer than is necessary	A company must delete personal data once they no longer have a need for it.	If a customer closes their account the company must delete their data.
6. Personal data must be processed in line with people's rights	If requested a company must provide a customer with all the personal data they hold on them.	A hospital has to give a patient's full records if requested by the patient.


Your notes

Computer Misuse Act (1990)

What is the Computer Misuse Act?

- The **Computer Misuse Act (CMA)** concerns the malicious use of computers.
- The act was originally created to make sure that computer **hacking** was covered within the law
- It has been updated regularly to ensure it remains relevant
- **Firewalls** can be used to prevent external people accessing the system. They are key in preventing **DoS** or **DDos** attacks

Primary offences under the CMA

The Computer Misuse Act has 3 primary offences:

1. **Unauthorised access** to computer materials
   E.g. If a student finds out a teacher's password and then accesses their computer and opens their files
2. **Unauthorised access with intent** to commit further offences
   E.g. If the student finds out a teacher's password and then accesses their computer with the intent to increase their marks on their last test result

3. **Unauthorised modification** of computer files
   E.g. If the student finds out a teacher's password and then accesses their computer and increases their mark on their last test result

The consequences of each offence are worse depending on whether it's offence 1, 2 or 3 with each offence being punishable with time in prison


Your notes

Copyright Designs & Patents Act (1988)

What is the Copyright Designs & Patents Act?

- This protects the **intellectual property** of an individual or a company
- It makes it illegal to copy, modify or distribute software or other intellectual property without the relevant **permission**
- If **original work** is original, **copyright** will be automatically applied and will not expire until 25 - 70 years from the death of the creator depending on the type of work
- If an individual believes that their work has been copied it is their responsibility to take action under the **Copyright Designs and Patents Act**
- Many sites online offer free downloads of copyrighted **software/videos** which prevents the intellectual copyright holder from earning their income on the work they have created
  - E.g. If someone downloaded videos from Netflix and shared them with others, they would be breaching the act
- The act covers videos and audio where **peer-to-peer streaming** prevents a copyright owner from receiving an income

What is prohibited under the Copyright, Designs & Patents Act?

Primary breaches:

- Copying an original work
- Issuing the copy of the original work to the public
- Renting/lending the copy of the original work to the public
- Performing, showing or playing the original work in public
- Making an adaptation of the original work

Secondary breaches:

- Importing a copy of original work

- Possessing or dealing with a copy of the original work
- Providing means to make copies of the original work
- Permitting the use of premises for making copies of the original work
- Provision of props/equipment for a performance of a copy of the original work

Your notes

Software Licences (Open Source & Proprietary)

What is a software licence?

- A software licence is **a legal agreement** that lays out **rules for how software can and can't be used**
- There are two main types of software licence, each with very different rules on **usage**, **distribution** and **support**, they are, **open source & proprietary**

Features of open source & proprietary software

Software Licence	Features
Open source	▪ Access to source code to edit/change ▪ Usually free ▪ May be able to edit and distribute
Proprietary	▪ Costs money ▪ Produced by 'professional' companies ▪ More regular official updates/support/upgrades/fixes

Advantages & disadvantages of open source & proprietary software

Software Licence	Advantages	Disadvantages
Open source	▪ Allows collaboration with other people who may want the same modifications ▪ Less buggy versions of the software may appear faster	▪ Relies on support of other users ▪ To edit the code, you need expert knowledge ▪ May not receive regular updates

	▪ Usually free, good for companies with limited budgets ▪ Generally strong social support	▪ Could be more open to exploitation through users adding malicious code
Proprietary	▪ Generally free customer support ▪ Created to professional standards ▪ Always someone to go back to with any problems	▪ Cost can be significant ▪ Limited expansion, only what is available ▪ Relies on one company ▪ May not fully meet the need of the user/customer

Your notes

Worked Example

Highlight one box on each row to identify the legislation that would cover each of the given events **[5]**

Event	The Data Protection Act (2018)	Computer Misuse Act (1990)	Copyright, Designs and Patents Act (1988)
A company stores personal data without the individual's permission.			
A university accidentally publishes their students' addresses on the university website.			
The interface for a piece of software is replicated by a rival company			
A user leaves a computer logged on and another person deletes their files			
A student guesses their teacher's password and accesses their computer account.			

Answer

Event	The Data Protection Act (2018)	Computer Misuse Act (1990)	Copyright, Designs and Patents Act (1988)
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