

Chapter 6: Ethical, Legal, Cultural and Environmental Concerns

In this chapter you will learn:

- ✱ the ethical, legal, cultural, environmental and privacy issues that surround the use of technology
- ✱ the difference between open-source and proprietary software
- ✱ the principles and penalties of the different legislation that governs the use of technology
- ✱ what is meant by a stakeholder
- ✱ who the key technology stakeholders are and how they are affected by different technologies

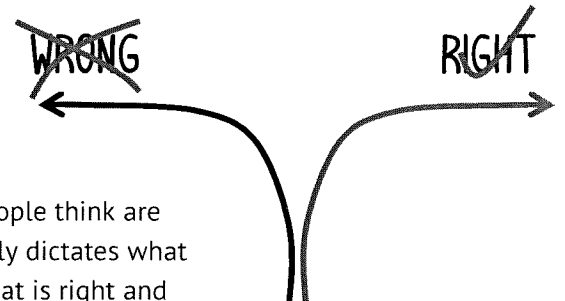
OCR specification reference:

- ☑ how to investigate and discuss Computer Science technologies while considering:
 - ethical issues
 - legal issues
 - cultural issues
 - environmental issues
 - privacy issues

What do we mean by ethics?

Ethics is an agreed set of principles that people should try to follow to keep conduct. While they do not have to be followed, it is normally in everyone's best interest to do so.

When we talk about ethics, we are referring to the things that people think are right and wrong in society. It is different to legislation that legally dictates what is right and wrong. Ethics represents society's opinions about what is right and what is wrong. When we talk about ethics in Computer Science, we are considering what society's opinions are about the use of computers and the development of hardware and software. One major area that is subject to lots of ethical reviews is the topic of artificial intelligence. To what extent should we try to make a computer think for itself? Another example is: should our search history be accessible by advertisement agencies to serve us personalised ads?



Ethics – a set of moral principles created by society

Discussion point: What do you think about the development of artificial intelligence? How do you feel about companies keeping track of your search history?

In order to be aware of ethical issues in Computer Science, we need to make sure that we are up to date with our knowledge and understanding of current issues and developments in the news. Therefore, it is very important for us to regularly read news stories surrounding technology to raise our awareness. If we do this, it will give us a good basis of knowledge to draw from regarding current ethical issues, allowing us to develop our own opinions that will help us answer the exam questions we may get about ethics.

There is a question that will appear in the exam that will require you to show a good level of analysis and evaluation of key areas in Computer Science. Ethics is a key area that may be questioned in this way. The question will have a more essay-based style and will normally be worth approximately 8 marks.

What is open-source software?

OCR specification reference:

- ☒ open-source vs proprietary software

Open-source software is a type of software for which the **source code** is made freely available. The software is available to users free of charge and some users will look to develop the software and add new features to it. If these features are successful after testing, the software can be upgraded with them. This gives users the freedom to adapt the software to their needs.

The advantages and disadvantages of open-source software include:

Open source – where the code for the software is made freely available and it can be freely modified

Source code – the list of programming commands that are compiled into an executable program

Advantages	Disadvantages
<ul style="list-style-type: none">• Usually free of charge• Software can be adapted to suit a user's needs• Wide community that encourages development and use of the software; they are normally happy to help any users that require it• Many contributors to the development of the software can result in creative features being added	<ul style="list-style-type: none">• The software may not be fully tested, so it could be susceptible to bugs and possible security issues• There is no official customer support available and no warranty with the software• The user interface may not be as finished as bought software; development tends to focus mainly on functionality• Developing the software requires specialist knowledge and not every user will have the ability to do this

Popular examples of open-source software are:

- Open Office – document creation software
- GIMP – image editing software
- Audacity – audio editing software
- Mozilla Firefox – web browser
- Linux – operation system



What is proprietary software?

OCR specification reference:

- ☒ open-source vs proprietary software

Proprietary software is software for which only the **compiled code** is released. To use the software, the user is normally required to pay a fee. The user will pay a fee for a licence to use the software only; they are normally not allowed to modify, copy or redistribute the software. Therefore, a user is not able to access the source code to adapt the software to their needs; they are only able to use the features already provided in the software.

The advantages and disadvantages of proprietary software include:

Proprietary – software that is owned by a company or an individual that is not free to be modified

Compiled code – the executable code that is created from compiling the source code

Advantages	Disadvantages
<ul style="list-style-type: none"> • The software will have undergone thorough and rigorous testing to rid it of any bugs and discover any security issues • The software will have full customer support and warranty options that come with it • Updates to improve features in the software will be released periodically • The interface of the software will have gone through an extensive design process in order to make it user-friendly 	<ul style="list-style-type: none"> • The software can be expensive to purchase; this may frustrate a user as they are often paying for many features that they will never use. • A user cannot customise the software to meet their needs

Popular examples of proprietary software are:

- Microsoft Office – document creation software
- Adobe Photoshop – image editing software
- Garageband – audio editing software
- Internet Explorer – web browser
- Windows – operating system

What are the principles and penalties of the legislation that governs the use of technology?

OCR specification reference:

☒ Legislation relevant to Computer Science:

- Data Protection Act 1998
- Computer Misuse Act 1990
- Copyright Designs and Patents Act 1988
- Creative Commons Licensing
- Freedom of Information Act 2000

Unfortunately, despite the many benefits that technology brings, it can also cause a great number of issues. Society has reacted to many of these issues by creating **legislation** that governs the use of technology, and puts in place **sanctions** if rules are broken.

Legislation – a collection of rules and laws, where people can be punished through sanctions

Sanction – a punishment, or action, for breaking a specific rule or law

The Data Protection Act 1998

The Data Protection Act governs the personal data held by an organisation. Organisations collect personal data from their customers and potential customers. This data is very valuable. The Data Protection Act limits the amount of data an organisation is allowed to collect about a person. It also governs the security of the data when it has been collected.

The Data Protection Act has eight main principles that an organisation is required to follow:

1. Personal data shall be processed fairly and lawfully
2. Personal data shall only be obtained for a lawful purpose and not used for any other purpose than for the one it was obtained for
3. Personal data shall be adequate, relevant and not excessive for the purpose that it is required for
4. Personal data shall be accurate and kept up to date
5. Personal data shall not be kept for longer than the purpose it is required for
6. Personal data shall be processed in accordance with an individual's rights under the act
7. Personal data must be kept safe and secure at all times, and protected against accidental loss, damage and destruction
8. Personal data shall not be transferred to a country outside the European Economic Area, unless the country has adequate levels of protection in place

An individual has a number of rights under the Data Protection Act; these include:

- They are allowed to see what data is being held of theirs by an organisation. This requires the individual to write to the organisation to request to see the data they hold. The organisation is allowed to charge a small processing fee to provide the data. The organisation must provide the requested data within a reasonable timescale.
- They are allowed to have any data that is incorrect or out of date be corrected or updated.
- They are entitled to compensation if they can prove that an organisation has caused them damage by breaking the principles of the act. Damage can be physical or financial loss.

There are some exemptions to the Data Protection Act. An organisation does not have to provide the data requested if it affects national security, if they believe it would cause excessive harm, or for tax assessments.

Sanctions: Serious breaches of the Data Protection Act can carry a fine of up to £500,000. If the act is deliberately and maliciously breached, then a prison sentence can be given.

Computer Misuse Act 1990

The Computer Misuse Act protects personal data held by organisations from hackers. The act makes the following illegal:

- Unauthorised access to computer material – this refers to entering a computer system without permission
- Unauthorised access to computer materials with intent to commit a further crime – this refers to entering a computer system to steal data or destroy a device or network
- Unauthorised modification of data – this refers to modifying or deleting data, and also covers the introduction of malware onto a computer



The Computer Misuse Act is designed to prevent people committing crimes online.

There is one major issue with the Computer Misuse Act: intent has to be proven. Accidental access cannot be prosecuted and if intent cannot be proven, a perpetrator can claim access was accidental. In order for intent to be proven there needs to be a witness to the crime being planned and to the fact that the perpetrator intended to hack into the system. This is often a very difficult thing to obtain.

Sanctions: Minor breaches of the act will result in a heavy fine or a six-month prison sentence. Serious breaches of the act can carry a 10-year prison sentence.

Discussion point: Do you think it is right that intent must be proven to be able to prosecute someone under the Computer Misuse Act?

Copyright, Designs and Patents Act 1988

The Copyright, Designs and Patents Act protects **intellectual property**.

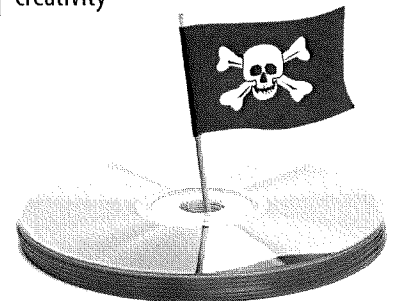
This refers to anything an individual or organisation has created, including books, music, films, games and software. It makes it illegal to:

- Share any work that has copyright without the owner's permission
- Plagiarise the work of another that has a copyright

The Internet made it much easier for people to commit these illegal acts of piracy, making it much easier to steal the intellectual property of another and share their files.

Sanctions: A breach of the act can result in a heavy fine or a prison sentence of up to two years.

Intellectual property – a person's property that is the result of their creativity

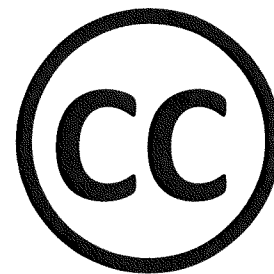


Theft of intellectual property is called piracy.

Discussion point: Many people share files illegally using file-sharing peer-to-peer networks. Do you think that the person running the website should be prosecuted for enabling this to occur? This is a grey area in the prosecution of individuals under the Copyright, Designs and Patents Act.

Creative Commons Licencing

Creative Commons is an organisation that provides licences to individuals or other organisations that want to give the public the ability to legally share and develop their work. If a person's intellectual property has a Creative Commons Licence, the individual does not need to ask the owner's permission to do this.



There are normally conditions to what can be done with the work; depending on the type of Creative Commons Licence that is applied:

Type of licence	Condition
Attribution	This allows work to be shared, copied and modified, but the creator must be credited
Share-alike	This allows work to be shared, copied and modified, but the creator must be credited, and the modified work must be released under the same terms as the original
Non-commercial	This allows work to be shared, copied and modified, but the creator must be credited, and the work cannot be used to make a profit
No derivative works	This allows work to be shared and redistributed, but not modified in any way

Freedom of Information Act 2000

The Freedom of Information Act makes it possible for the public to access information about a public organisation, including the activities they partake in. The act covers information that the organisation stores, emails and any hard copies of documents. The conditions of the act mean that public organisations are to publish certain data on a regular basis, so that the public can access these records and request further information that they want to see.

The act defines a public organisation as schools, universities, governmental departments, the Houses of Parliament, local councils, the police, the National Health Service and the armed forces.

There are some exemptions from information being shared. An organisation has the right to withhold data that they think could cause harm or affect national security. They can also withhold data that they intend to publish at a later date.

We have looked at the legislation that is in place to govern the use of technology. These are the legal matters that we need to consider regarding Computer Science. We also need to consider the ethical matters surrounding Computer Science; this includes the stakeholders involved, the privacy issues that can occur, the cultural implications and the environmental impact.



Discussion point: There are many that feel that the legislation that governs the use of technology is vastly in need of updating. To what extent do you agree with them?

Who are the key stakeholders affected by technology and how are they affected?

OCR specification reference:

- ☒ how key stakeholders are affected by technologies

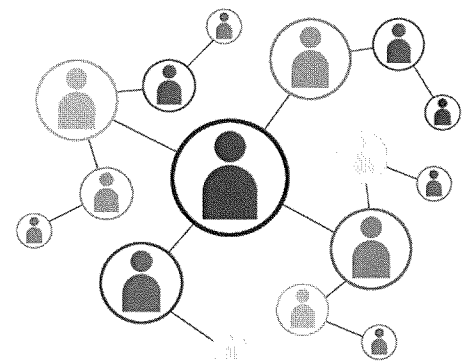
A **stakeholder** is an individual or an organisation that has an interest in, or is affected by, the development of a product or the actions of a company.

Examples of key stakeholders include:

- Customers
- Company owner(s)
- Company employees
- Company suppliers
- General public
- Retail establishments
- Government
- Shareholders and investors

Each stakeholder may be individually affected by a product that a company has in development, or by the actions a company takes. Sometimes, the priorities of each different stakeholder can conflict; this can create problems for the company. A company will need to consider the impact of their products or actions on each of their stakeholders. If they cause a negative situation for the stakeholder, this could create issues for the company that may eventually affect their reputation with the stakeholder.

Stakeholder – an individual or group of people that are interested in, or concerned about a business.



What privacy issues can occur through the use of technology?

Many people put very personal information on the Internet, mostly using their social networking profiles. However, it is very difficult to keep data private on the Internet. Social networking sites actively encourage people to post personal details about their life. A lot of data about a person's private issues can be gleaned from these posts. Many of these sites will have a privacy policy that is agreed to when a user signs up for an account. Most users, however, do not read the privacy policy and have no idea what can be done with the data that they post. This makes them very unaware of what they have agreed to.

Discussion point: Think about the last social networking account that you signed up for. Did you read the privacy agreement? Do you know what the company can do with any of the data that you post?

A company may have a privacy policy that gives them the right to:

- Sell your personal data
- Make any of your photographs and details public
- Disclose your Internet surfing and buying habits to allow for targeted advertising
- Retain any of your data posted, including images and videos, even after you delete them from your account

As long as they stay within the limits of the privacy agreement you have signed, they can do any of the above and more.

Many social networking sites allow a user to set the level of privacy on access to their data. When an account is opened, these settings are often quite relaxed and open, so it is always advisable to find the privacy settings and change them to the level you would like as soon as you open the account.

A criminal could also monitor a person's online activity and social media, and the more information the person posts, the greater the understanding of their identity that can be developed. This would make it easier for the criminal to steal their identity.



People should be very wary of posting any private data online. Data can be gathered over time to steal a person's identity.

Disclosing private information online can also sadly encourage cyberbullying. If a person posts private details about their life or thoughts, a cyberbully could use this information to attack the person. They may try to intimidate them, insult them or humiliate them for what they are disclosing.

Cyberbullying can cause serious distress to a person, and any person who is being subject to cyberbullying should seek help and guidance to stop it from occurring. No one deserves to suffer through the bullying.

There are other privacy issues we need to consider that can arise through the use of technology. We are watched a great deal by surveillance cameras on a daily basis, when we walking into shops, banks and other places on the high street, even when we are simply walking down the high street. This kind of technology is becoming more and more sophisticated and has been vital in identifying many criminals.

Facial recognition software can be used alongside surveillance cameras to track a possible suspect's movements throughout a city, so that the police can watch their every move. However, some people argue that this is an invasion of privacy and that the police and the government authorities should not have this much power to track a person's movements. They see it as an invasion of their privacy.

Discussion point: Do you think this kind of technology should be used to catch possible suspects for a crime, or do you think it is a step too far?

What are the cultural implications of technology?

OCR specification reference:

- ☒ cultural implications of Computer Science

Technologies have a profound effect on the way we live our lives. We use them in the way we schedule our daily lives, the way we communicate, the way we work and the way we interact with many different aspects of our daily lives.

They have allowed us to share many different parts of our culture with lots of different people around the world, as well as learning about many different cultures around the world.

The use of technology has caused both short-term and long-term changes in our culture. The introduction of the Internet revolutionised the way we communicate and the way we can research anything we desire at the touch of our fingertips. It has also changed the way many of us listen to music and watch television shows and films, with the introduction of streaming services such as Netflix and Spotify.

Social networking sites and blogs have opened up a world of sharing our daily lives and thoughts on a global scale. This has introduced the concept of viral media, when media posts get so rapidly spread around the Internet that they are seen by millions of people in a very short space of time. They have also developed a culture of 'selfies', allowing us to share a self-taken picture of us showing what we are currently doing, or where we currently are.

Discussion point: Do you agree with the thoughts of some people, that those that post lots of 'selfies' are self-obsessed? Why do you think that some people think this?



People who just like to share, or a nation self-obsessed?

Developments in technologies has led to improvements in many areas, such as:

- Education
- Medicine
- Transportation
- Sport
- Research
- Space exploration

It is reading news stories about these areas that will expand your knowledge of the impact of technology, helping you answer your exam questions.



Self-driving cars will revolutionise the way we travel. Does this possibility excite you or scare you? What could be the implications?

Access to technology and the benefits it provides is sometimes not possible for some people. This is known as the **digital divide**. The lack of ability to access the technology could be due to a number of factors:

- They may not have enough money to purchase the technology
- They may live in a rural area that lacks network coverage
- They lack experience with technology and are often afraid to use it
- They live in a country that does not have the infrastructure to support the technology

Digital divide – the gap between those who have access to computers and the Internet, and those who do not

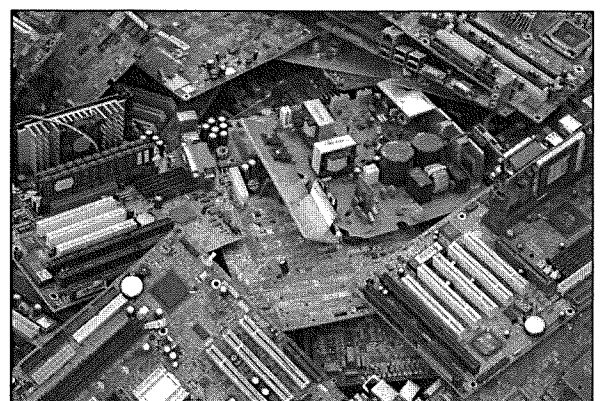
Discussion point: People that are not able to access the technology may find they are missing out on many of the benefits it offers. What do you think could be done to close the digital divide?

What is the environmental impact of technology?

OCR specification reference:

- ☒ environmental impact of Computer Science

Our increased use of technology has a great impact on the environment. When we use the plethora of electronic devices we possess, we use a lot of energy. The more powerful the devices we use, the more energy we also use. The vast majority of the energy that we create is non-renewable. We have an ever-depleting stock of resources for this kind of fuel and extracting the resources often causes pollution to the environment. In order to make the new devices we crave we need to use a great deal of resources, such as plastics and precious metals. Again, extracting and creating these resources can cause pollution to the environment.



Vast amounts of unwanted electrical goods are disposed of every year.

We have developed a constant need for the newest and best device. This is driven by the technology market and also drives the technology market to produce even more. This causes us to throw away much of the technology that we have, in favour of getting the newest device. These throwaway technologies need to be disposed of and there is the danger that much of it can end up in landfill. This harms the environment as toxic waste from some of the metals used can leak into the soil.

There are ways that we can help protect our environment through being more careful with our use of technology:

- Don't leave our electronic devices switched on constantly, or even on standby. Turn them off.
- Recycle the old technologies we no longer want or need.
- Carefully consider whether we need a new device or whether the one we have works perfectly fine and deals with our needs effectively.

Discussion point: Companies have started sending many of our discarded devices to be buried as landfill in less economically developed countries in Africa. Do you think this practice is ethical?



Chapter Summary

- Ethics represents society's opinions about what is right and what is wrong. When we talk about ethics in Computer Science, we are considering what society's opinions are about the use of computers and the development of hardware and software.
- Open-source software is a type of software for which the source code is made freely available.
- Proprietary software is software for which only the compiled code is released.
- There are a number of legislative acts that govern the use of computers; these include the Data Protection Act 1998, Computer Misuse Act 1990, Copyright Designs and Patents Act 1988, Creative Commons Licensing and Freedom of Information Act 2000.
- A stakeholder is an individual or an organisation that has an interest in, or is affected by, the development of a product or the actions of a company.
- The use of computers can affect many areas of our lives, including our culture, our privacy and our environment.



Practice Questions

1. State what is meant by a stakeholder. [1]
2. Explain two disadvantages of using social media. [4]
3. State two rights of an individual under the Data Protection Act. [2]
4. Explain what is meant by Creative Commons licensing. [2]
5. We increasingly throw away technology in favour of the next new device. Discuss the impact this has on our environment. [8]