

The Impact of New & Emerging Technologies

CORE 1.1 1

Technology impacts the world around us, affecting the environment, the way we live, how we work, and especially how we communicate. Companies are more environmentally aware and many create more sustainable products. Types of production are changing as technology advances.

<https://www.bbc.com/bitesize/guides/zh2w7p3/revision>

Enterprise

Enterprise is the ability to spot business opportunities and take advantage of them. Successful businesses are those that can innovate and adapt quickly to change. New and emerging technologies present exciting opportunities to businesses and entrepreneurs.

Crowdfunding

Crowdfunding is a relatively new way of raising money to start a business. The internet has enabled its success. Before the internet, if you had a business idea, you would have to find an investor, or get a loan from the bank, to start up a company. There are crowdfunding websites, enabling you to find investors world-wide. People can invest in ideas that they like. They are usually rewarded with gifts, discounts or shares in the company.



There are many crowdfunding websites. www.kickstarter.com is a popular one.

Government funding

Grants / start up loans are available from central government and local councils, for initiatives that contribute to the overall economy. Over 40,000 UK businesses have already had start-up loans since 2012.

Not-for-profit

Not for profit organisations are those that reinvest any profits into their cause. Many of them engage with new technologies.

“Charity:Water” worked with “Google” to develop remote sensor technology to find water.

Virtual Marketing & Retailing

The increased use of the internet led to the rise of virtual marketing. It includes : online advertising, eg social media adverts and pay per click advertising. Businesses pay money to be more prominent in search engines searches.

Virtual retailing is where shoppers buy things online. This is starting to have a knock-on effect on shops in town centres, and many are closing down.

Most businesses now have online stores and websites for shoppers



Fairtrade

Fair trade ensures that farmers in countries with a low income get a fair price for their produce. It enables fairer trading and better working conditions. Fair trade items are allowed to show the logo, so consumers can make ethical choices when they shop.

e.g. coffee, bananas, wine, sugar, chocolate



Co-operatives

A co-op is a business owned and run by its workers and members. The workers and members share the profits. They are usually based in local communities, but can be large businesses eg Co-op Supermarket chain, Nationwide Building Society.

Science & Technology Parks

These support new & emerging technologies. They allow firms to associate with a university or research organisation. They promote technology-led companies. (eg Silicon Valley is linked with Stamford University. It transformed the area into a global centre of technology, finance, education and research. But they are built on outskirts of cities, resulting in loss of habitat for wildlife).

Core 1.1 The Impact of New & Emerging Technologies

1. What is “Enterprise”?

(1 mark)
2. i) Which of the following activities involves promoting a business idea on the internet, with the aim of getting people to invest money? **Circle your answer.**
a) Crowdfunding b) Virtual Marketing c) Fairtrade 4) Enterprise
(1 mark)
- ii) Explain how **crowd funding** works.

(1 mark)
- iii) What *advantage* does **government funding** have over a **bank loan**, when setting up a new business?

(1 mark)
3. a) How can **Science & Technology Parks** help transfer knowledge and promote economic development?

(1 mark)
- b) What might be a *disadvantage* of a **Science & Technology Park**?

(1 mark)
4. i) Which of the following organisations aims to enable farmers in low-income countries, get a fair price for their produce? *Circle your answer.*
a) **Co-op** b) **Science & Technology Parks** c) **Enterprise** d) **Fairtrade**
(1 mark)
- ii) What else does the organisation try to ensure?

(1 mark)
5. a) What does “**Virtual Marketing**” involve? _____

(1 mark)
- b) How has this started to affect town centres?

(1 mark)
6. Name 3 innovative enterprises using new and emerging technologies, that are currently bidding for crowdfunding on **www.Kickstarter.com**
a)
b)
c)
(3 marks)
7. How does a “**not for profit**” organisation deal with its income, compared to a privately owned company? _____

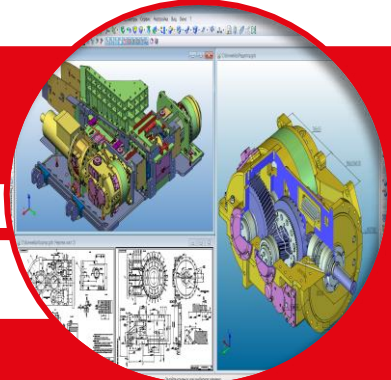
(1 mark)

Industry

Computer-Aided Design (CAD) & Computer-Aided Manufacture(CAM)

CAD is used to design products. CAM is used to manufacture products. CAD/CAM has greatly affected efficiency in the workplace.

CAD is used to draw and model products in 2D or 3D, using specialist software. Designs are easily edited and copied.



Examples of CAD in school: 2D Design Tools, Autodesk Inventor



CAM involves the use of CNC (computer numerical control) equipment to make the CAD designs. The CAM machine interprets the co-ordinates set by the CAD software, to make the design.

Examples of CAM in school:

LASER CUTTER



PLOTTER-CUTTER



CNC MILLING MACHINE



CNC LATHE



3D PRINTER



Advantages of CAD

- More accurate than hand drawn designs
- Can be edited any time
- Design can be tested before making
- Allows many designers to work on the same design as it can be sent via internet.

Advantages of CAM

- Products made very accurately
- Much quicker than making by hand
- Products can be made directly from CAD files
- Less human error.

Disadvantages of CAD

- Staff need training which costs money.
- Lots of back up memory needed
- Software is expensive

Disadvantages of CAM

- Replaces human workforce
- Equipment is expensive
- Staff need to be trained

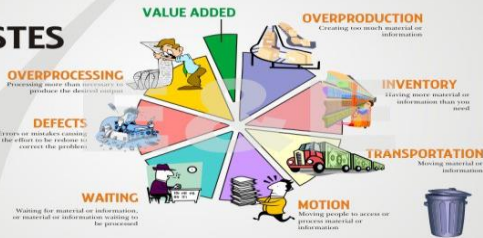
Core 1.1 The Impact of New & Emerging Technologies

1. What does the acronym "C.A.D." stand for ?
_____ (1 mark)
2. What is C.A.D. used for ?
a) draw and model products in 2D or 3D? or b) make a C.A.D. design? (1 mark)
3. Name one C.A.D. software package that we have in school:
_____ (1 mark)
4. Give three advantages of CAD over hand drawn designs:
1. _____
2. _____
3. _____ (3 marks)
5. What does the acronym "C.A.M." mean?
_____ (1 mark)
6. Name 3 pieces of C.A.M. machinery we have in school:
1. _____
2. _____
3. _____ (3 marks)
7. How does the C.A.M. machine understand the design drawing created using C.A.D.?
_____ (1 mark)
8. Give 3 advantages of C.A.M.
1. _____
2. _____
3. _____ (3 marks)
9. How might CAD/CAM affect the workforce of a factory? (Discuss advantages and disadvantages).

_____ (4 marks)

Production Techniques & Systems

THE 7 WASTES



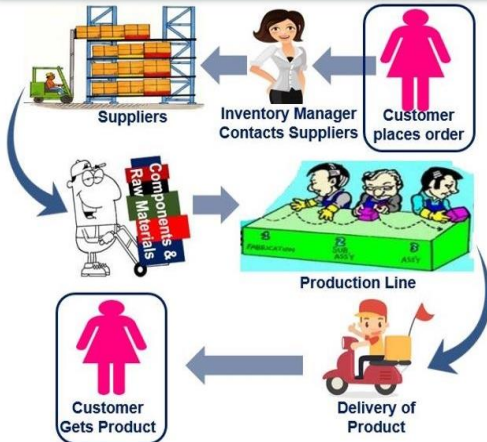
The 7 wastes are activities identified in an organisation that do not add value but cost money. Usually, only 5% of our time actually adds value to the customer, rest everything is waste. Identify and eliminate these wastes to become a lean organisation.

Lean Manufacturing

Lean manufacturing aims to minimise waste in design, manufacturing and distribution and customer services. This is done by:

- Not overproducing products,
- Minimising defects (constant tolerance checking),
- Reducing storage
- Reducing movement of goods,
- Reducing processing of parts or products (buying them in, instead).

Just-In-Time



J.I.T. is an example of lean manufacturing. Computerised stock control ensures parts are received "Just In Time", not stored. Stock control is closely monitored or automated.

Advantages of JIT

- Can increase efficiency and reduce waste,
- Reduces need for warehouse space
- Reduces cost of damaged, stolen or out-of-date stock.
- Decreases time between ordering stock and making/selling.
- Helps cash flow.

Disadvantages

- A break in the supply chain holds up production.
- Constant deliveries causes more pollution.
- Small orders cost more than bulk orders. (lost economies of scale).
- No room for error

Standardised Design & Components

The same components / modular systems are used across many designs, eg. McDonalds restaurants, kitchen cupboards, screws, nuts and bolts. Usually, an individual component is manufactured in large numbers to an internationally accepted standard (set by I.S.O.) eg drill bits, hinges, beds, diameters and lengths of machine screws, batteries etc.



Automation & Robotics

Automation began during the industrial revolution. Automatic equipment is used to manufacture goods. Nowadays, robots are programmed to perform tasks such as welding, assembly, painting, labelling and packaging.

Advantages

- Increased efficiency/productivity
- Fewer errors
- Reduced human labour
- Can do work dangerous to humans

Disadvantages

- Expensive
- Leads to job losses
- No human judgement
- High-skilled workers needed.



Buildings & Equipment

New technology has led to greater energy efficiency in buildings and equipment. Wi-Fi and 4G (and now 5G) have significantly improved workplace efficiency by enabling faster communication and data transfer on a global scale.



Core 1.1 The Impact of New & Emerging Technologies

1. What is “Lean Manufacturing” and how it is good for the environment.
- _____
- _____
- _____
- _____
- _____
- (4 marks)
2. What is “Just –in-Time” manufacturing?
- _____
- _____
- (1 mark)
- 3.a Give 3 advantages of J.I.T.
1. _____
2. _____
3. _____
- (3 marks)
- b. What could happen if there is a break in the supply chain?
- _____
- _____
- (1 mark)
4. Name an advantage and a disadvantage of Automation
- Advantage: _____
- Disadvantage: _____
- (2 marks)
5. What is a “standard component”?
- _____
- _____
- (1 mark)
6. Explain how, by **using** standard components, production speed can be improved. Include the following terms in your answer: **consistent, quality** and **safety**.
- _____
- _____
- _____
- _____
- _____
- _____
- (3 marks)
7. How does 4G and 5G improve the efficiency of a manufacturing company?
- _____
- _____
- _____
- (2 marks)

Production Techniques & Systems

One-off Production

A single unique product is made to meet specific customer requirements by highly skilled workers, eg yachts, bespoke furniture, space station, campervan interiors, aircraft carriers, jewellery etc.



Advantages

High quality products

Disadvantages

Expensive, as materials and labour costs are high.
Labour intensive
Production times are longer

Batch Production



A set number of products are manufactured, in limited quantities, or for a limited time, one stage at a time. Eg. cakes, Olympic Medals, books. CNC machines are adaptable and work alongside production lines. Jigs, templates and moulds are used ensure identical products are made.

Advantages

Lower costs.
Machines can be reconfigured to match consumers' changing needs, by adjusting product designs
Reduces storage space
Good for making small quantities.

Disadvantages

Downtime when reconfiguring the equipment. This causes inefficiency

Mass Production

Many products are made on a long production run, broken down into stages. Different tasks are performed as the products move down the assembly line. Eg toys, newspapers, computers, games consoles, bicycles, drinks bottles, cars.

Advantages

Efficiently and consistently producing many identical products at a time
Low cost per unit (good economy of scale).
Often automated with the use of flexible manufacturing systems (robots, c.n.c. machines) reducing human labour costs.

Disadvantages

High set-up costs.
If a production line stops, manufacture is halted.
Repetitive



Continuous Production

Manufacturing of identical high-demand products, 24 hours a day. eg sheet materials (steel, glass), standard components (screws, nails, nuts and bolts, toilet roll, cars, paper production, metal casting and smelting).

Advantages

No stopping of machines
Materials bought in bulk are cheaper, (better economy of scale).

Disadvantages

Automation leads to redundancy of low skilled workers
Expensive equipment
Low flexibility in design changes
A fault in production or supply chain will stop the whole process.



Core 1.1 The Impact of New & Emerging Technologies

1. Give one reason , with an example, of why a product might be built as a “one-off”.

(1 mark)

2. One-off production is “labour intensive”. What is your understanding of this term?

(1 mark)

3. An advantage of batch production is that machines can be reconfigured (altered) to meet the demands of consumers’ changes in taste and style. Give an example of a product that is constantly changing slightly.

(1 mark)

4. Mass Production is which of the following: (circle your answer).

a) Making a single item b) highly labour-intensive c) expensive to set up

(1 mark)

5. Why are standard components such as screws, made continuously?

(1 mark)

6a. What could happen if there was a fault in the machinery of a factory, or a break in the supply chain?

(1 mark)

b. How could this affect the jobs of the operators?

(1 mark)

7. Describe how companies using continuous production could benefit from cheaper materials than companies using batch production techniques.

(1 mark)

8. Describe how mass production can be automated.

8
(1 mark)

People

Workforce

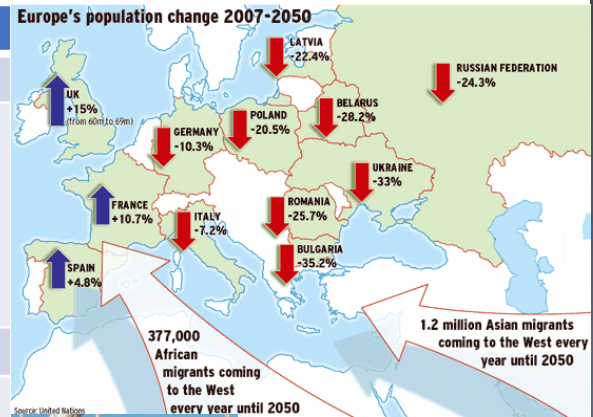
New technologies such as the internet have allowed people to choose how and where they work in many jobs. The European Union enables free movement of European citizens to work in another European country. This encourages demographic movement. Economic Immigrants also bring innovation, energy, experience and badly needed skills. Online communication reduces the need to emigrate for some jobs.



Demographic Movement / Economic Migration

Demographic movement is the way in which the population's structure changes, as a result of an aging population or migration into an area. There are advantages and disadvantages to demographic movement:

Countries losing people	Countries gaining people
<p><u>advantages</u></p> <ul style="list-style-type: none"> Fewer people to house/feed Less people going for the same job Extra income can be sent home 	<p><u>advantages</u></p> <ul style="list-style-type: none"> Labour shortages can be overcome by bringing in people that are skilled in new technologies Migrants often prepared to do low-skilled and low paid jobs Adds cultural diversity.
<p><u>disadvantages</u></p> <ul style="list-style-type: none"> Loss of young and educated / skilled people Families become divided 	<p><u>Disadvantages</u></p> <ul style="list-style-type: none"> Language and cultural differences can lead to problems regarding integration Pressure on housing and health services



Free movement may change in the UK because of Brexit

Apprenticeships

An apprenticeship is a job with training. New technology can create training opportunities. Apprentices gain nationally recognised qualifications.

Highly Skilled Workforce

Many jobs that were previously labour intensive but repetitive and low skilled, are now being automated. Demand is high for highly skilled, highly educated, managers and professionals. Workers have to keep up-to-date with new skills, if they are to keep or find jobs. Learning new skills can lead to higher wages, as companies will have to pay highly skilled employees more to attract them. However, as previously high skilled jobs become automated (eg car body paint-spraying) wages in those areas will reduce.



Remote Working

Remote working is when an employee completes work away from the normal place of work...on a train, plane, in a hotel etc.

Advantages of remote working	Disadvantages of remote working
Enables a flexible work schedule	Lack of routine?
Less time and money commuting	Less social interaction with customers/colleagues
No set hours	blurs work/life balance
Technological advances can lead to more work	Less IT support
Fewer distractions	Potential security breaches of information
Employees can access their employers information and systems using remote devices	

Name: _____

Date: _____

Core 1.1 The Impact of New & Emerging Technologies

1. What is meant by the term "Demographic Movement."
- _____
- _____
- (1 mark)
2. Why is there now more of a need for a highly skilled workforce, rather than low-skilled workers? _____
- _____
- _____
- (1 mark)
3. Developing countries are educating their young people to be professional people, with skills. But these educated people are then being employed by developed countries (such as UK), to work in their high tech factories, laboratories or manufacturing plants. Discuss the impact this will have on the **developing** country.
- _____
- _____
- _____
- (3 marks)
- 4a. Why might economic migrants want to come to the UK to work?
- _____
- _____
- _____
- (1 mark)
- b. How do companies in the UK benefit from economic migration?
- _____
- _____
- (1 mark)
- c. What negative impact might economic migration have if there is too much economic migration to the UK?
- _____
- _____
- (1 mark)
5. Explain what a "remote worker" is.
- _____
- (1 mark)
6. What sort of jobs might be filled by "remote workers" as we become more reliant on the internet and other new and emerging technologies?
- _____
- (1 mark)
7. How do apprentices benefit from emerging technologies?
- _____
- (1 mark)

Marks out of 11:

People

New technologies are changing the way society works:

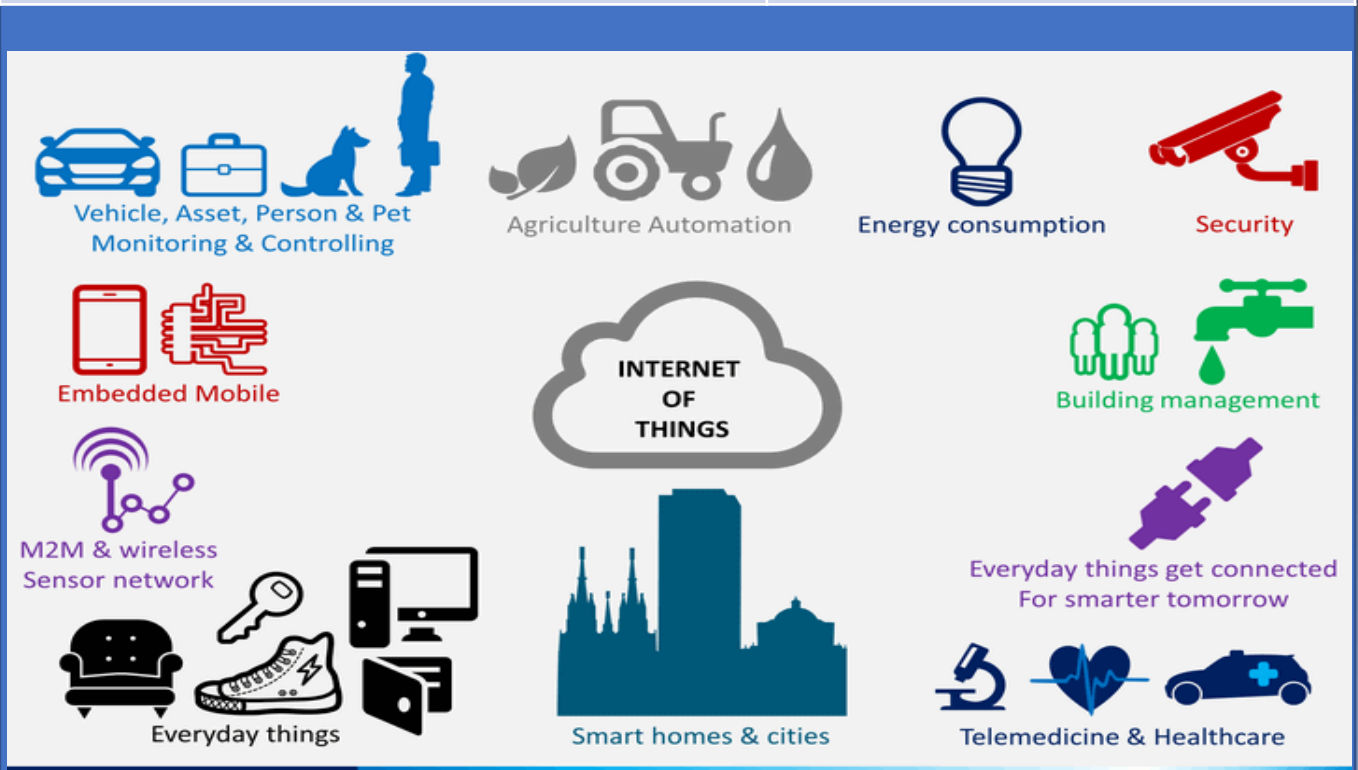
Changes in working hours and shift patterns

Internet and Mobile apps enable office workers to access work systems at times convenient to them. This maximises labour and increases productivity.

The internet of things (IoT):

When digital devices are inter-related (linked together) via the internet.

Advantages of IoT to companies	Disadvantages of IoT
Security, inventory control, factory management,	Security (personal data , designs etc can be stolen)
Energy conservation	Does not work if Internet is down
Less pollution	People feel that they never leave work. Adds to stress.



Video-Conferencing

2-way audio and video telecommunications which allow people to connect from 2 or more sites, for a meeting

SKYPE are making it widely available for free

Advantages of VC	Disadvantages of VC
Don't have to leave the office	Confidential documents need to be signed in person
Travel costs and travelling time reduced/eliminated	Time zones
Meetings can be called instantly at various locations with minimal notice	More difficult to read body language
Speed up decision making	

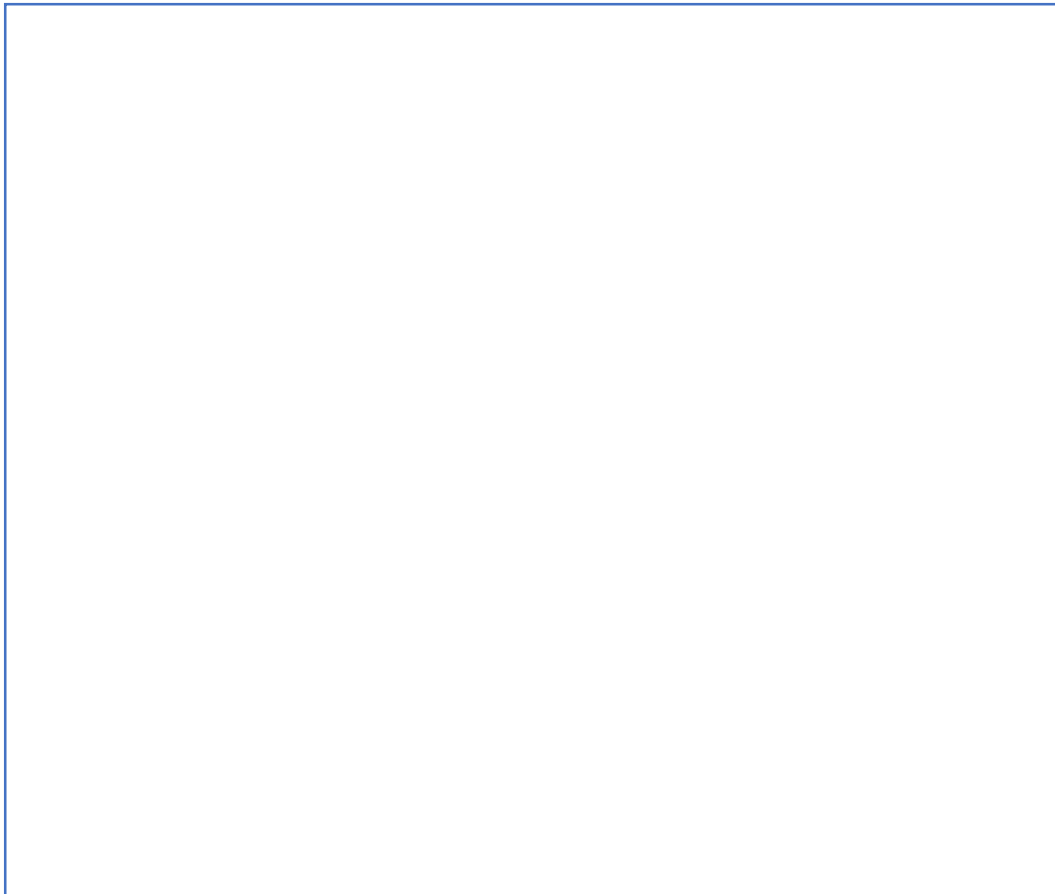


Core 1.1 The Impact of New & Emerging Technologies

1. Explain the term “Internet of things.”

(1 mark)

2. Look at the diagram overleaf on The internet of things. In the space below, create your own diagram showing how all the devices in your house and/ or at school, are linked to the internet.



(6 marks)

3a. Explain why video-conferencing helps reduce pollution.

(1mark)

Name a disadvantage of not meeting face-to-face?

b.

(1 mark)

4. Explain how the internet has impacted on people’s “work/life balance”.

(1 mark)

People

Culture & Society

Technology and culture have always been linked. New technologies may support existing patterns of behaviour or evolve to meet the needs of other cultures.

Cultures can also evolve as technology advances. Designers need to consider the values, customs and behaviours of different groups. So when a product is being designed for a particular group of consumers, care should be taken not to cause offence or have a negative impact on certain groups in society (elderly/male/female/disabled /race). (Eg. The racist Dove advert in 2017. The UK is multi-cultural and this caused offence).

Key term

Society: A large organised group of people living together.

Key term

Culture : the way a group of people behave, dress, eat and live their lives.

Culture can be influenced by

- Religion
- Tradition
- History
- Local food sources
- Climate
- Artistic expression

Social Segregation

Some minority populations tend to live in specific areas, which can lead to social segregation. This leads to reduced contact with other groups of the population.



This can lead to social barriers, and limited access to better education, jobs and technologies

Can emerging technologies help bring people together?



Colour can have a different association in different countries

WESTERN Culture

Harvest Warmth Affordable	Practicality Comfort Stability	Happiness Joy Caution	Luck Jealousy Greed	Depression Trust Calm	Royalty Spirituality Wealth	Love Danger Action	Intimidation Death Mourning
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Consumers

A consumer is someone who buys products. Consumers are well aware of new technologies and products, which increases demand, but also increases use of finite and scarce resources, such as precious metals.

Some technologies allow consumers to have input into the designs themselves, such as 3D printing, or customising business cards online. There are many different types of consumer in a society, all demanding different things.



Disabled & Elderly as Consumers

Some consumers such as the elderly, or people with physical disabilities, find some products difficult to use. It is important not to exclude these groups of people when designing new products. Products can be adapted to make them easier to use. Assistive technology covers small devices such as pencil grips, kitchen devices, weighted cutlery and bigger devices such as all-terrain wheelchairs, and mobility scooters. Text to speech technology is also developing.



Prosthetic limbs harness electrical activity in the body, providing the user with more control. Paralympic athletes benefit from this technology.

Children as Consumers



New and emerging technologies can offer educational enrichment to children, eg Minecraft offers greater creative opportunities than traditional building toys. However, there are concerns that they spend too much time using digital devices at the expense of social and physical activities.

Core 1.1 The Impact of New & Emerging Technologies

1. Explain the term "society."

_____ (1 mark)
2. What sort of things influence different cultures within a society?

_____ (1 mark)
3. Why is there social segregation in the UK?

_____ (1 mark)
4. How can emerging technologies bring different cultures together?

_____ (1 mark)
- 5.a Name a product where the customer (consumer) has an input of personalised data

- b. Give an example of what sort of this data this might be.

_____ (1 mark)
6. What type of consumer might be interested in assistive technology?

How might they have been helped?
_____ (1 mark)
7. Explain how children have been targeted by an emerging technology such as the internet. _____
_____ (1 mark)
8. What dangers could there be for children communicating with "friends" they have met when gaming?

_____ (1 mark)

Sustainability

Sustainable technologies have been driven by environmental awareness and the rising costs of fossil fuels. Designers must consider the sustainability of the resources to be used.

Key term: Sustainability

Sustainability is the ability to meet current needs of people, without compromising the ability of future generations to meet their own needs

Finite Resources

Finite resources are non-renewable. They cannot be replenished as fast as they are consumed and are therefore unsustainable.

Non-Finite Resources

Non-finite resources are renewable. They can be replenished faster than they are consumed and are therefore sustainable.



Examples: Fossil fuels (oil, gas, coal)

Examples: Timber and wind power

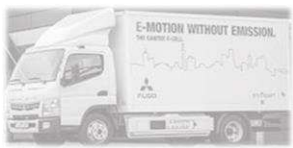
Key term: Pollution

The release of contaminating substances that are likely to harm the natural environment

Transportation Costs

Environmental costs of transporting goods is high. There is a need to reduce carbon emissions. Possible solutions:

- ✓ Change from diesel lorries to electric lorries or trains
- ✓ Make fewer journeys
- ✓ Design products that are lighter and smaller, with minimal packaging, so more can be carried in one journey



Demand on Natural Resources

Raw materials are wasted due to manufacturing methods. Minimising waste, using new technologies will help make products sustainable and save money.

Pollution

Companies have an economic and environmental obligation to keep pollution to a minimum. They can achieve this by:

- ✓ using new technologies to reuse or dispose of waste without harming the environment.
- ✓ being energy efficient so they are creating less pollution in the first place.

Government regulations encourage companies to reduce pollution by having :

- Carbon tax
- Subsidies for using alternative, cleaner energy sources.



Waste Generated

Recovering

Waste is generated by factories when products are made ((heat, energy, materials etc). They can be used as fuel for heating , eg mdf, or to power electric turbines.

Reducing

We can limit the amount of resources and energy used when creating, using and disposing of products. Eg tessellate shapes on CAD to reduce waste.

Disposal

Once a product comes to the end of a useful life, it must be disposed of. Historically, it went to a landfill site. (the tip). This causes pollution by contaminating water and land, generating greenhouse gases like methane... Only certain materials can be recycled. Waste can be burnt, creating more pollution.

Recycling

Consider how the product can be made from recyclable materials, or whether the materials you use can be recycled. Some plastics can be melted down and made into something new. Aluminium drinks cans could also be turned into something new.

Reusing

Think about how products can be used again, or used in a different way, once it has served its function. Eg refill ink cartridges, use plastic food containers around the home.



Core 1.1 The Impact of New & Emerging Technologies

1. Explain the term “sustainability.”

_____ (1 mark)
2. Name a “finite” resource, and explain the term.

_____ (2 marks)
3. Explain why a company must monitor and minimise the pollution it creates when it manufactures a product.

_____ (2 marks)
4. How could businesses reduce the amount of pollution created by lorries, as they transport goods from the factory? (Think about size and quantity of products in lorry loads).

_____ (2 marks)
5. Name a material often used for packaging goods, ready for transportation. Evaluate the material you have chosen in terms of its environmental impact.

_____ (2 marks)
6. What can governments do to encourage businesses to create less pollution?

_____ (2 marks)
7. How could a plastic packaging manufacturer help to create less waste?

_____ (1 mark)
8. How can we as consumers help reduce the amount of waste going to landfill? Use these terms in your answer: **reduce, reuse, recycle, material separation.**

_____ (4 marks)