The Impact of New & Emerging Technologies

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.

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.
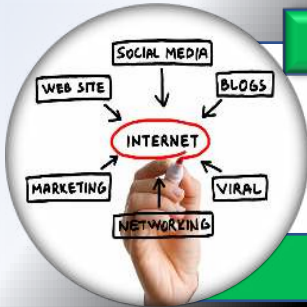
"**Charity:Water**" worked with "**Google**" to develop remote sensor technology to find water.

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).
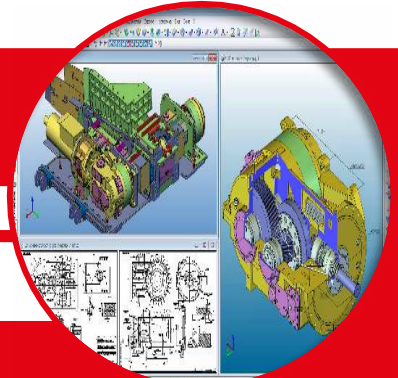
Industry

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

CAD is used to <u>design</u> products. CAM is used to <u>manufacture</u> 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 using CNC (computer numerical control) to make the CAD deigns. 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 drawings
- Enables designs to be extensively amended and tested before production
- Allows several designers to work on the same project simultaneously
- Offers views of 3D models from all angles

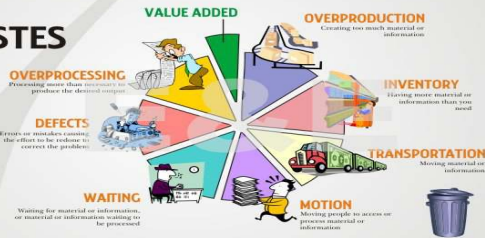## Advantages of CAM

- High level of accuracy
- Increases the speed and efficiency of the production process
- Products can be manufactured directly from CAD files
- Can operate 24 hours a day

Disadvantages of CAD

- Can be difficult to learn
- Can require large amounts of memory
- Expensive software

Disadvantages of CAM

- Expensive equipment
- Requires maintenance
- Replaces human workforce
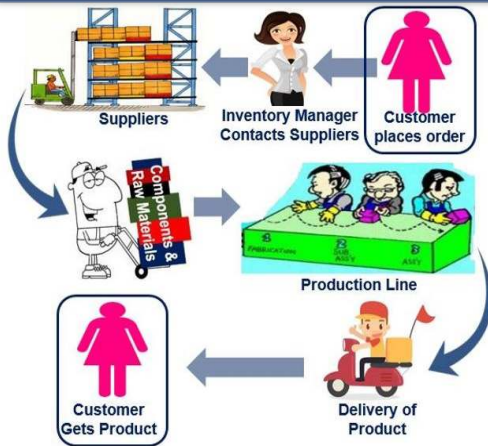
Production Techniques & Systems

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	Disadvantages
Increased efficiency/productivity	Expensive
Fewer errors	Leads to job losses
Reduced human labour	No human judgement
Can do work dangerous to humans	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.

The Impact of New & Emerging Technologies

CORE 1.1

Production Techniques & Systems

One-off Production

A single unique product is made by highly skilled workers, eg yachts, bespoke furniture, space station, aircraft carriers.

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. Eg. cakes, Olympic Medals, books. CNC machines are adaptable and work alongside production lines.

Advantages
Lower costs.
Machines can be reconfigured to match consumers' changing needs, by adjusting product designs
Reduces storage space

Disadvantages
Downtime when reconfiguring the equipment.

Mass Production

Many products are made on a long production run. Eg toys, newspapers, computers, games consoles, bicycles.

Advantages

Efficiently and consistently producing many products at a low cost per unit
Often automated with the use of flexible manufacturing systems (robots, cnc 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).

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.
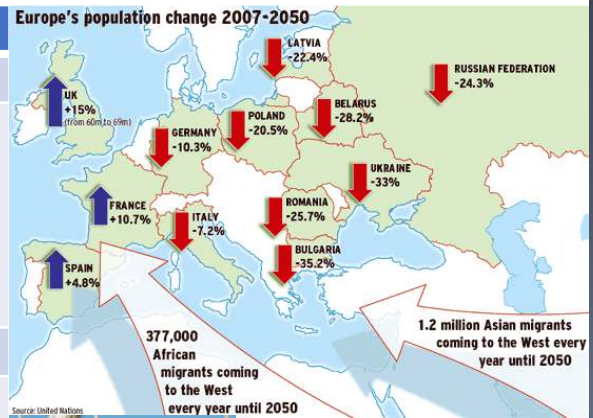
People

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
__advantages__	__advantages__
• Fewer people to house/feed • Less people going for the same job • Extra income can be sent home	• 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.
__disadvantages__	__Disadvantages__
• Loss of young and educated / skilled people • Families become divided	• Language and cultural differences can lead to problems regarding integration • Pressure on housing and health services

Europe's population change 2007-2050

LATVIA -22.4%
RUSSIAN FEDERATION -24.3%
UK +15% (from 60m to 69m)
BELARUS -28.2%
POLAND -20.5%
GERMANY -10.3%
UKRAINE -33%
FRANCE +10.7%
ROMANIA -25.7%
ITALY -7.2%
BULGARIA -35.2%
SPAIN +4.8%

1.2 million Asian migrants coming to the West every year until 2050

377,000 African migrants coming to the West every year until 2050

Source: United Nations

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	

People

New technologies are changing the way society works:

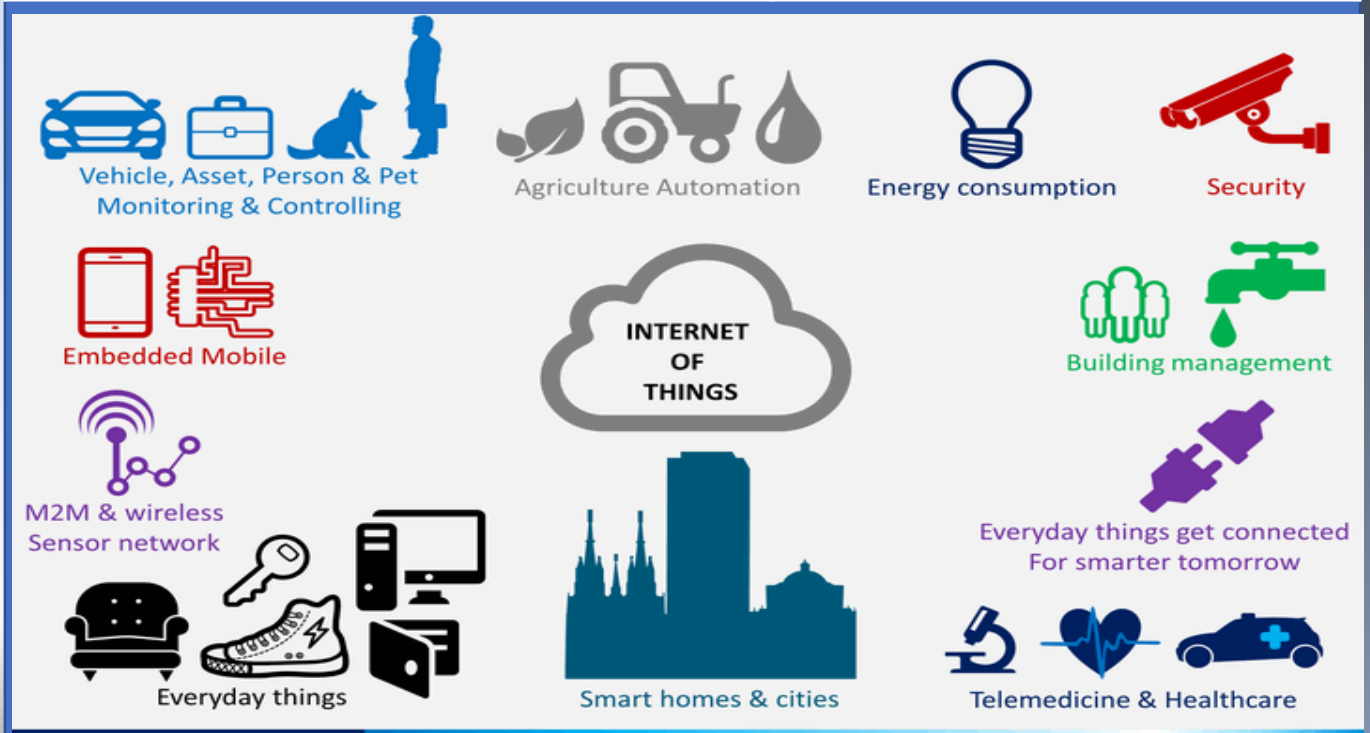**Changes in working hours and shift patterns**

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 devices are inter-related via the internet

- An app on your mobile phone can be used to program your heating or washing machine, remotely (Hive)
- Smartwatches

Advantages of IoT to companies	Disadvantages of IoT
Security, inventory control, factory management,	Security (personal data 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	

The Impact of New & Emerging Technologies

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
A society is 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.

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

Can emerging technologies help bring people together?

before / after

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 |

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.

CONSUMER

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.

The Impact of New & Emerging Technologies

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

Key term: Pollution
The release of contaminating substances that are likely to harm the natural environment

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

Examples: Fossil fuels (oil, gas, coal)

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

Examples: Timber and wind power

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

E-MOTION WITHOUT EMISSION

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.

Manufacturers need to consider...

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.

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.

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.

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.

most favoured strategy
- reducing
- reusing
- recycling
- recovering
- disposal

Industry
Companies are always looking to bring in new Technologies.
Explain what benefits this might give the company

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Despite the benefits of introducing New Technologies describe how this might affect the local community

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How might a local population make themselves more employable if a company adopts new Technologies?

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Demographic movement
Explain what is meant by the term Demographic movement

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Why might Demographic movement occur between countries?

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In Third world countries they are educating their Young people to be professional people with skills.
But these educated people are being employed by Developed countries to work in their high tech factories, laboratories or manufacturing plants.
Discuss the impact this will have on the Developing country

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Now discuss the advantages this will give the Developed country.

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Science parks
Explain how a science park can help transfer knowledge and promote economic development.
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Name a down side to the development of Science parks
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Enterprises
What advantage does a small privately owned business have over a big established company manufacturing one item
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Explain how crowd funding can be used to launch a new business of product
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What advantage does Government funding have over funding from a bank when settingup a new business?
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How does a 'Not for profit' organisation deal with its income compared to a privately owned company?
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Sustainability
Explain what is driving companies to adopt sustainable technologies
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Transportation costs
Companies are now trying to reduce the 'travel miles' that their products have, name two ways companies can achieve this.
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Pollution
Describe a method that companies can adopt to reduce the pollution
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Demand on natural resources
When 'Green organisations' comment on resources are 'finite' what does this mean?
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What can be done to reduce the use of 'finite' resources?
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Waste generated
Name the 4R's when it comes to controlling the amount of waste being generated
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People
Workforce
Explain how the internet has impacted people's 'worklife' balance

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Consumers
Name a product where the consumer can input into a design

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Evaluate this process

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Children
Explain how children have been targeted by Emerging technologies.

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People with disabilities
Describe how emerging technologies are targeting and improving the lives of people with disabilities

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Wage levels
What impact both negative and positive can emerging technologies have on wage levels.

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Highly skilled workforce
Explain why the workforce needs to be highly skilled

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Which skill set do you think would be most appropriate to have in an Emerging technological world?
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Apprenticeships
Explain how Apprentices can benefit from the use and awareness of Emerging technologies?

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Culture
Explain the effect that Emerging technologies can have on existing cultures

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Population movement within the EU
Explain why population movement is a benefit for both highly skilled and manual labour

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Social segregation

Explain what is meant by the term Social segregation

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Describe why social segregation can have a negative impact on the workplace

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Society

Explain what is meant by the term Society

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How can technology impact a society, what can it allow people to do / adapt peoples working practices?

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Name an advantage of how emerging technology can impact a society

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Explain how

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Name a disadvantage of how emerging technology can impact a society

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Explain how

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Video conference meetings

Explain what is meant by the term video conferencing

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Name an advantage of using Video conferences in the workplace

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Explain how

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Name a disadvantage of using video conferences in the workplace

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Explain how

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Environment – pollution

Explain why a company must monitor and minimise the pollution is creates when it manufactures a product.
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Name a method that a business can minimalise its waste
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Explain what advantages this might give to the company
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Describe the benefit to the environment of material separation when a product has come to the end of its life.
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Explain how the size of a product can impact transportation and the impact that this has on the environment
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State a material that is used to package a product
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Evaluate this material in terms of its environmental impact
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Production techniques

Explain how using standardised components can result in increased production speed and consistent quality and safety
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Explain the term Just in Time
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Explain how Lean manufacturing is good for the environment
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Explain what is meant by the term Batch production
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Describe why Continuous product would benefit from Cheaper materials compared to One off.
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Describe why One of Production is higher in cost than other products
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Describe how Mass production can be Automated
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