

2.2e Relationship between material cost, form, manufacturing processes and scale of production

Relationship between factors that affect products

- Material cost:** the expense generated by selecting a particular material.
- Form:** the shape that a design takes.
- Manufacturing processes:** the way materials are manipulated to form the product.
- Scale of production:** the number of products produced can vary, this dictates the way the manufacturer sets about making this number.
- Disposal of waste:** every process generates waste, in different forms, and how waste is dealt with responsibly.

Factors that influence material cost

Material selection is considered at the design stage because the performance of the product relies on the materials used to construct it.

Material selection is influenced by factors such as manufacturing processes, assembly, service, environmental impact of material, use and disposal and recycling.

Other factors may include:

- strength
- availability
- durability
- workability
- ease of transportation
- cost
- aesthetic values
- resistance to fire.

Manufacturing products

During design and development, it is essential that materials and processes are tested fully to ensure that the eventual form of a product is achievable.

Some materials and manufacturing processes have limitations, and so this needs to be explored and understood before the final production commences.

- There are limitations when using all types of materials.
- The energy required and pollution generated, and overall cost and efficiency.
- The source of the material and transporting this material for production.

Costs

The biggest single factor affecting the cost price of a product is the amount being made. The scale of production will be dictated by the number required. Other cost factors include:

- wage costs for manual workers
- labour productivity
- exchange rates
- raw materials
- taxes
- bureaucracy and administration
- transportation
- interest rates.

Environmental factors

Industrial factories are a major contributor to water pollution. The dumping of contaminated water, gases, chemicals, heavy metals or radioactive materials causes damage to marine life and the environment as a whole.

- Reducing carbon footprint:** all manufacturing will have some negative impact on the environment but decreasing or limiting this is important.
- Selecting **materials** that are **sustainably sourced**, and where possible, you should **reuse** or **recycle** waste materials rather than deplete natural resources further.
- Many industrial and commercial settings now harness **green energy** using solar or wind power to contribute towards the energy required for manufacturing.

Scales of production

One off production will be used when making single products. This will be reliant on manual labour as no automated machinery would be set up. Labour costs will be high, and production will be slower than if machinery were being used.

Batch production will see a limited number of similar products manufactured. There may be less manual work and more automated machinery employed, and rates could be faster.

Mass production would be thousands of identical products with the use of automation. This would be quick and efficient but set up costs would be high.

Continuous flow production would be a 24/7 approach constantly manufacturing identical items with high levels of automation and quality control.