

## 1.14 Challenges that influence design

All manufactured items we use have been designed. Designers work to a design brief or a specification, but they must take many other factors into consideration. Designers must understand and respect the preferences of different groups so that they can target their products appropriately, the impact on the environment, the capabilities of humans and manufacturing methods.

### Preferences of different Groups

#### Social Groups

Share a common social aspect, such as education level, age or gender. Example; phones designed for young people that enable easy access to social media.

#### Economic Groups

Share similar incomes and may be divided by class. Example; kettles ranging from cheap and basic to expensive and sophisticated.

#### Ethnic Groups

Share a common cultural background, such as ancestry, homeland, dialect or cultural heritage. Example; care should be taken when using certain symbols, clothing or labels.

### Impact on the Environment

#### Fairtrade Foundation:

tackles poverty and injustice across the world. Ensuring farmers from developing countries are paid a fair price for their goods.

#### Carbon offsetting:

allows companies to try and reduce their carbon footprint by planting trees or adopting renewable resources or encouraging staff to walk or cycle to work.

#### Product disassembly:

enables a product to be recycled, or the parts reused. Meaning products can last longer as they can be upgraded or repaired.

#### Disposal of waste:

ensures that the collection, transportation, recovery and disposal of waste has the least impact on the environment.

#### Promoting Green Designs:

To combat global warming and rising energy costs designers need to design green without compromising on function, quality and performance. Areas to consider:

- Designing for energy efficiency in the use of a product.
- Using more non-toxic recyclable materials or reusable materials.
- Using biodegradable materials.
- Using renewable energy sources or efficient energy resources.
- Reducing waste or using less materials.

#### Recycling/reusing materials and products:

If waste from construction use and disposal of a product cannot be eliminated, products should be designed to be recycled or reused.  
**Example:** Reusing could mean that a product is refilled, such as printer cartridges or used again such as carrier bags.

#### Product Costs:

The cost of products and materials have the potential to increase from the initial cost of the raw material to the ongoing costs of maintenance, transportation, recycling and disposal at the end of its life.

This cost could be monetary or an environmental cost such as the production of raw materials and the costs to recycle, reuse or dispose of the material.  
**Example:** damage to the landscape, emissions from production or the amount of energy used.

### Manufacturing Capability Design for manufacture (DFM)

The easier a product is to construct the lower the manufacturing costs.

- Using standardised parts, reducing the amount of specialised parts.
- Simplifying or using repeatable processes.
- Reducing the complexity of design making it modular.
- Designing simple quality control tests
- Designing for disassembly for service and repair.

#### Modular:

a design featuring parts of standard sizes so they can be constructed in different ways.

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### Key points to remember:

- Designers must respect different social, ethnic and economic groups.
- Designers need to consider the environmental costs of the design.
- The capabilities of humans and manufacturing methods need to be understood when designing.

### Impact on the Environment

#### Life-cycle analysis (LCA):

Is a systematic inventory that assesses environmental impacts relating to every stage of a product's life.

Designers need to calculate all the environmental costs of a product, from **extraction, transportation and processing of the raw materials**, to **manufacture, transportation and distribution** of the product, **use** of the product by the consumer and its **disposal or recovery** at the end of its life.

The **LCA** makes it easier to identify what areas can be changed to reduce the costs and environmental impact.



#### Human Capability:

Ensuring that products meet the needs of the user and can be operated with ease making sure that the product and usage is safe. **Example:** if electric heater controls are unclear there is a risk of an accident.

#### Potential advantages of recycling and reuse:

- Less waste material to go to landfill
- Reduces the demand for new raw materials
- Helps reduce global warming caused by emissions from processing raw materials
- Can reduce the need for transportation and mining
- Jobs can be created in the recycling industry
- Money is saved as the materials are used for a second time

#### Potential disadvantages of recycling and reuse:

- The recycling process can be complex when separating materials.
- Not always cost efficient, as a lot of energy is needed to transport, process and reassemble recyclable materials.
- The recycling process may produce waste and pollutants, creating more environmental problems.
- Jobs created in recycling industry may be low quality.
- The quality of the recycled material may be inferior.