THEORY design factors

Design Factors - Function

Function What does the product do? Does it only do one thing, or does it do many things? Normally products have one main function, this is called the Primary Function. Along with the main function, the product may also have many other functions that are less important, these are called Secondary Functions.

Primary function of this product is having a space to do work of some sorts as it is a desk.

Secondary functions are Storage (it has drawers) and to be nice to look at (it is not your average flat pack desk

Design Factors - Environment

Environment Many people (potential customers) are concerned about the environment and the damage caused to it by industrial production. When designing a product it may be wise to ensure that the materials can be recycled or the product itself can be manufactured from a large proportion of recycled materials.

Along with looking into recycled materials many people like to know if The products were "Greenly" produced and manufactured. So were the products made individually by hand with a small Carbon Footprint, or were they mass produced in a big factory that uses up lots of electricity and have a big Carbon Footprint?

Location

(can also come under the Environment heading).
Where will the product be used (inside, outside, what room)? Where will the product be stored when not in use (space/size)? If you were looking at a product that was going to be used mainly in the bathroom then you would have to think about the environment of a bathroom.... It is a wet and warm environment as this is where people shower and take baths, meaning that condensation will build up on the things in the room. The product would therefore need to be waterproof and easily cleaned. The product would have to be made of a material that would not rot or rust..... etc.....

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Design Factors - Economics and Performance

Economics is when we are thinking about how much everything is going to cost... What is the cost of the materials and labour required to manufacture the product? How do you know if the price you make the product is going to cover all of your outgoing cost? Most products are much cheaper to buy today than in the past. This is mainly due to the economies of mass production. The more a process produces, the cheaper each item becomes. The use of modern materials, e.g. plastics, means that complex items can be produced by a single process like injection molding.

The price of a product depends on creating a balance between:
➢Manufacturing costs. How much it costs to make the product, including materials & labor.
➢Advertising and distribution costs. If potential customers don't know that you have a new product then no-one will buy it, Advertising the product in magazines/tv/radio costs money. The product also needs to get to the shops from the factory and hiring lorries costs money.
➢Prices set by other manufacturers. If the product is too expensive compared to similar products that are already on the market customers probably won't buy it, if it is too cheap then customers might think that it's no good and not buy it either... the price of the product has to be similar to other similar products but still competitive.

Performance - When talking about the performance of a product it is important to consider things like Durability, Ease of Maintenance, Running Costs, and more importantly is the product value for money? To determine whether a product is good value for money you must consider several things: Is it worth the price it is sold at? Consider its quality, how well it performs its intended purpose, as well as other design factors such as its aesthetic and ergonomic qualities. What are the running costs of the product after the initial purchase cost? Is the product Durable or will it break easily after a few uses? Will it cost anything to maintain? If it breaks will it be cheaper to fix it or get a new one?

Durability
Durability is the life expectancy of a product, or how long it is expected to last. This is decided by the materials that the product is made from and Planned obsolescence.

Eg 1. A car exhaust is normally made from mild steel which will eventually rust and need replaced after several years. But the exhaust could be manufactured in Stainless steel which will last a great deal longer, but will be more expensive to purchase and will mean that the manufacturers will not sell as may spares.
Eg 2 Traditional Light bulbs are expected to last no more than six months in normal use. But new low energy light bulbs which are more expensive can last for years.
Eg 3 Washing machines are designed to be replaced after about six years, this allows the manufacturer to constantly sell new models, bringing in more business by continuing to satisfy the buyer's desire to have the latest, most fashionable model.

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Design Factors - Market Niche

Where in the market are you aiming to sell your product?

- Bottom end – Cheap but functional for a reasonable lifespan.
- Top end – Expensive, best of everything, long lasting.

Planned Obsolescence

In many instances it is possible to design a product that will last a lifetime but is this necessary or indeed desirable?
If a manufacturer of washing machines produces a machine that will last forever, what impact will this have on the manufacturer's business?

- The manufacturer will not sell as many machines.
- The machines will be very expensive.
- The buyer will end up with a product that still works well, but is old fashioned in style and uses older technology.
- Think of computers - who wants last year's model?

Designers and manufacturers have to find a balance between profit, value for money, durability and satisfying the buyers' desire to own the latest, most fashionable products.

So they build in obsolescence and this allows the manufacturer to constantly sell new models, bringing in more business by continuing to satisfy the buyer's desire to have the latest, most ashionable model.

In reality, most products have a built-in life expectancy.

- Light bulbs are expected to last no more than six months in normal use.
- Washing machines are designed to be replaced after about six years.

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Ease of maintenance
Ease of Maintenance is how difficult it is for a user to keep a product in good working order throughout its life. A cheaper product is probably intended to be thrown away after use and will need no maintenance. A more expensive product is likely to last much longer and will require periodic maintenance to keep it in good order. The complexity of a product will have a direct effect on the amount of maintenance required. A very complex product like a car will require a great deal of maintenance in its lifetime, from the regular servicing of the engine to ensure oil and water levels are correct to the replacement of worn parts like brake disks to prolong the life of the car.

These disposable toothbrushes are designed to be thrown away once the heads are worn out. There is no design for ease of maintenance required and their price is fairly low.

The oral-B electric toothbrush is designed to have a replaceable head, so that a consumer does not have to buy a whole new toothbrush each time the head wears out. This increases the initial cost of the product as There are additional components required to enable the head to join to the body, but allows the main body of the toothbrush to be used for a long time. Consumers would not buy the Oral-B at all if they needed to replace the whole product as often as they replace a fixed head.

Materials
When coming up with a design for a product we must consider how many are to be produced, who the target market is, what the product is going to be used for, how and where it is to be used. When we have established all of this it becomes easier to decide which materials would be most suitable for the job.
In order to decide which materials to use we must have an idea of what properties we wish them to have. For instance, a car wing-mirror must be waterproof, resistant to sunlight, impact resistant, chemically resistant and corrosion resistant. On top of this, the shape of the wing mirror must be able to be formed easily as it is a 'mass produced' product.

Choice of Materials will have a direct effect on several aspects of the design, including:
The manufacturing processes that can be used, The finishes that can be applied, The disposal of a product at the end of its life, The cost of the product, The lifespan of the product, The product's performance in terms of strength, weight etc. Cutlery made from stainless steel will be long lasting, corrosion resistant, expensive and will require costly die cast moulds to produce. Cutlery made from HIPS will be cheap, light, easily broken, recyclable, will come in a range of colours, and will require injection moulding machinery to produce.

THEORY design factors

Design Factors - Aesthetics

This is about how good a product will look. A well designed product will look attractive and possibly have a distinctive style of its own, if a product was designed and its function was extremely good but it did not look good, how many people do you think would buy it? It is sad to say but very few people would buy something that did not look good. The look of the product is very important. What makes a product look good? Factors which would be used in evaluating how good a product looks would be as follows:

- The shape, size and proportion of the product.
- The colours, materials and textures.
- Does it have a distinctive style of its own?
- What sort of image does it project? Is it aimed at young people or the older generation?

Aesthetics is an important consideration for the designer because it concerns the way Things look. Consumers are more likely to buy products based on their appearance. The following are the main considerations that a designer would make when considering aesthetics.

Colour and Shape

- The two aesthetic properties that are easiest to understand.
- Both colour and shape can be used to create contrast or harmony.
- Colour can be used to target specific markets i.e. bright colours would be used for children's toys, sophisticated colouring for high class products and so on.

Harmony

- This is where parts of a design work well together or the design fits in with a specific environment
- It creates a sense of peace of relaxation.
- Simples shapes and colours that work well together should be used to achieve this.

Balance

- Most products are designed to be symmetrical. Others can be designed asymmetrically.
- Experimenting with different shapes or colours can add interest to your design.

Pattern

- Repeating a design feature to create a pattern can create a unified and organised looking design.

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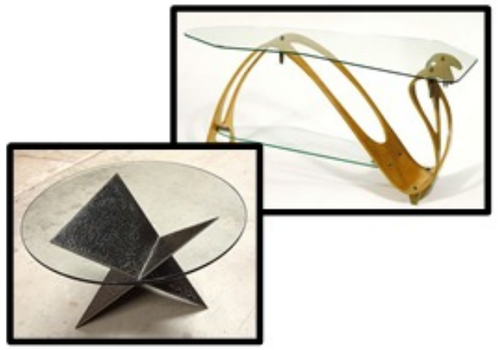
Texture
- Different textures can makes designs look more stylish or interesting. Effects such as glass, concrete, wood grain, hard, soft, glossy (shine), matt (flat dull colour) and so on.

Contrast
- The opposite of harmony where designs are made to stand out and be bold.
- This can sometimes make a design more eye-catching.
- Contrasting colours (purple/yellow) and a mixture of shapes can make designs bold and contrasting.

Proportion
- Small changes to the proportion of a shape can make it look more elegant, classy, stable or sleek.
- This example of a 1980's BMW 3 series and a modern 2007 BMW 3 series shows how simple changes to shape can make designs more modern, sleek and elegant.



Form
- This regards that shape of a design. Will it be geometric (Squares, triangles, circles and so on) or will it be organic (free flowing curves, natural designs).
- Form is also 3D and is developed from initial 2D shapes.

Line
- Using lines in a design can make it formal and informal.
- Lines normally cause a contrast and can add a lot of interest to your design.

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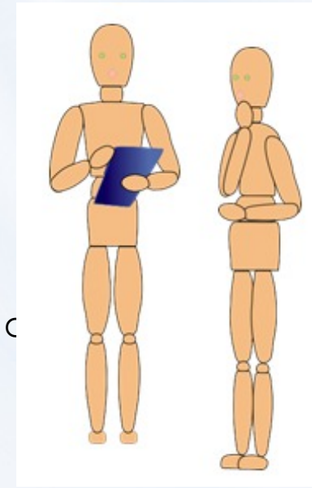
Design Factors - Ergonomics

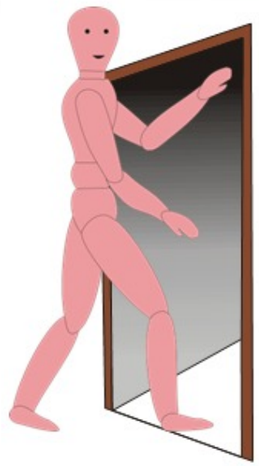


What is this ergonomics? As far as we are concerned, it is about designing products to suit a particular need and/or want. This statement means that, we design products to "FIT" the user whether that user is six months old or an adult. The two figure opposite are ERGONOMES (scale models of humans that can be posed in various ways).

You and the product – How well do you work together?
Ergonomics (or the human/product interface) is about making your life simpler, safer or easier, by taking account o dimensions of relevant human body parts when we design things.

Taking the example of the **ergonome** sitting in the car seat, the seat has been specifically designed to fit our body shape with respect length of leg, back support, the headrest and the position of the steering wheel. As you sit reading this booklet, take any object around you and think about it. Why has it been designed the way it has? A pencil is the shape it is, because it fits neatly between our fingers. An aerosol can is of a diameter to allow easy handling, the nozzle is shaped to make it easy for a finger to disperse the contents.

Looking at each of these items do you think they have been designed with short or tall people in mind. The answer to that question is neither. The vast
majority of designing is done for the average sized person. This is because the people who design and make products want to sell as many as possible and therefore designing for the majority will result in more product sales.



It has just been stated that ergonomics is about designing things to suit our needs and that we design for the "average person", this is true for the majority of cases but there are the exceptions.

One of the most obvious every day objects in use, is a doorway. If the doorway was designed for the average person anybody above the average height would hit their head off the top of the door frame. The height of a door frame is designed to suit the taller people in our society. As for the handle of the door, if this was placed at a height which was suited to a person of average height the smaller people may find the handle difficult to operate.

THEORY design factors

Design Factors - Safety

Why is safety important?

Unsafe products have the potential to cause harm through injury and legislation forbids or restricts their sale. All products are required by law, to meet safety standards, and cannot be sold if they do not meet those standards.
Products will often display symbols to show compliance with safety legislation. If, after being sold, a product is found to be unsafe, the product would be recalled and some form of compensation made to the consumer. Recalling a product is very expensive for a company to do.

Safety is also seen as a major selling point for many products. For example, cars are often advertised by highlighting their safety features. A consumer is more likely to buy a product which has additional safety features.
Many products are created to fulfil a specific safety need. For example child seats for cars, or bicycle helmets are created to protect the user in the case of an accident. Designing safety products is an example of niche marketing.

How do I know if a product is safe?

All products sold must pass safety standards, and many will have symbols on them which show the consumer that they have been approved by the relevant organisation.
These symbols are often found on a sticker or moulded onto a product, or printed in the product's instructions.

British Standards Institute (BSI)

The BSI set and check standards for all products sold in Britain. Products which meet the standards are awarded the BSI Kitemark.

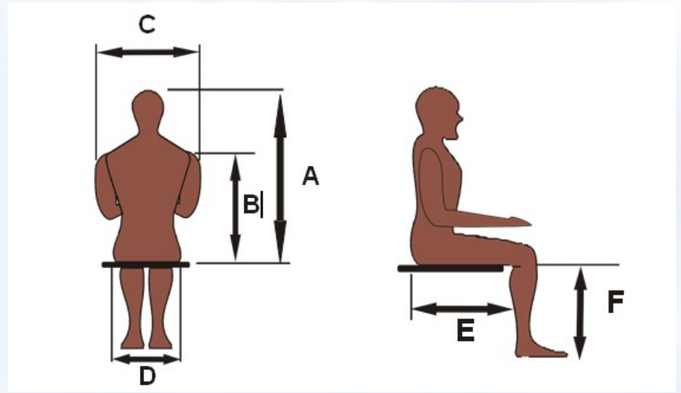
European Community

The CE symbol indicates that the product has met European regulations and can be sold across Europe.

THEORY anthropometrics

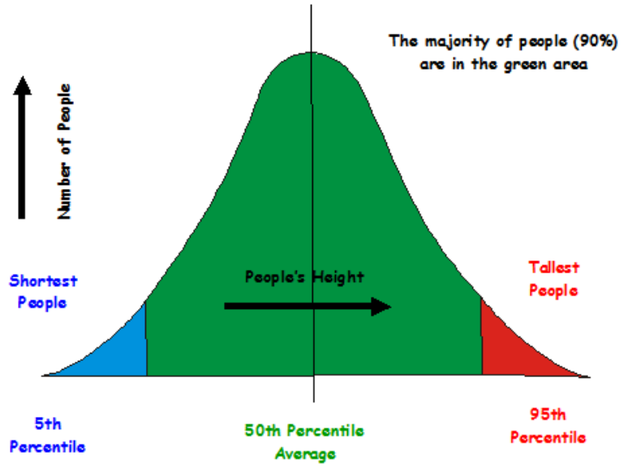
Anthro – what/ - Anthro·pom·etry.

So far we have discussed designing things to suit our needs i.e. ensuring anything which we design will fit us. Anthropometrics is about the sizes of individual body parts. If the design brief we were given was to design a chair, the sizes which would require to be taken would be as shown in the sketch below. E, F & D.



Although it has been stated that these sizes will be taken, it is not quite as simple as that. Remember that it is the average size of person that we require to design for. We all come in various shapes and sizes, therefore a large sample of people will require to be measured to establish the average sizes.

Regardless of where in the world we took the sample, the results would produce a graph very similar to the one shown below. What the middle of the graph is telling us, is, the majority of peoples height is quite similar. The graph above has taken peoples heights as its sample. Assuming the combined average height of adult men and women is 1.65m. This AVERAGE HEIGHT we call the 50^{th} Percentile (50^{th} %ile).



As designers, this would represent the majority of potential consumers and therefore there would be more likelihood of them buying the product. The graph also shows 0 - 5^{th} %ile and a 95 – 100^{th} % ile.

The 0 - 5^{th} %ile represents the minority of people who are VERY SHORT.
The 95 - 100^{th} %ile represents the minority of people who are EXCEPTIONALLY TALL.

Designers generally regard anybody who is below the 5^{th} %ile or above the 95^{th} %ile as being either too short or too tall, and are therefore not taken consideration of when designing the majority of products.

Now that we have considered that we have to take the average size of a persons body parts, we are now going to consider what sizes are required to design a mobile telephone. Some of the factors which will require to be considered are the finger size, finger