

Introduction to Design

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The title of this course is "Craft & Design", but what do we actually mean by these words? The word "Craft" basically means "skill in making". "Design" is not so easily explained. The dictionary defines the word "design" in many different ways e.g. "to plan by drawing the outline or figure of"; "to form an idea"; "a plan or scheme formed in the mind". These are a few of the definitions given, but basically any design process involves solving practical problems or situations in a creative and logical way.

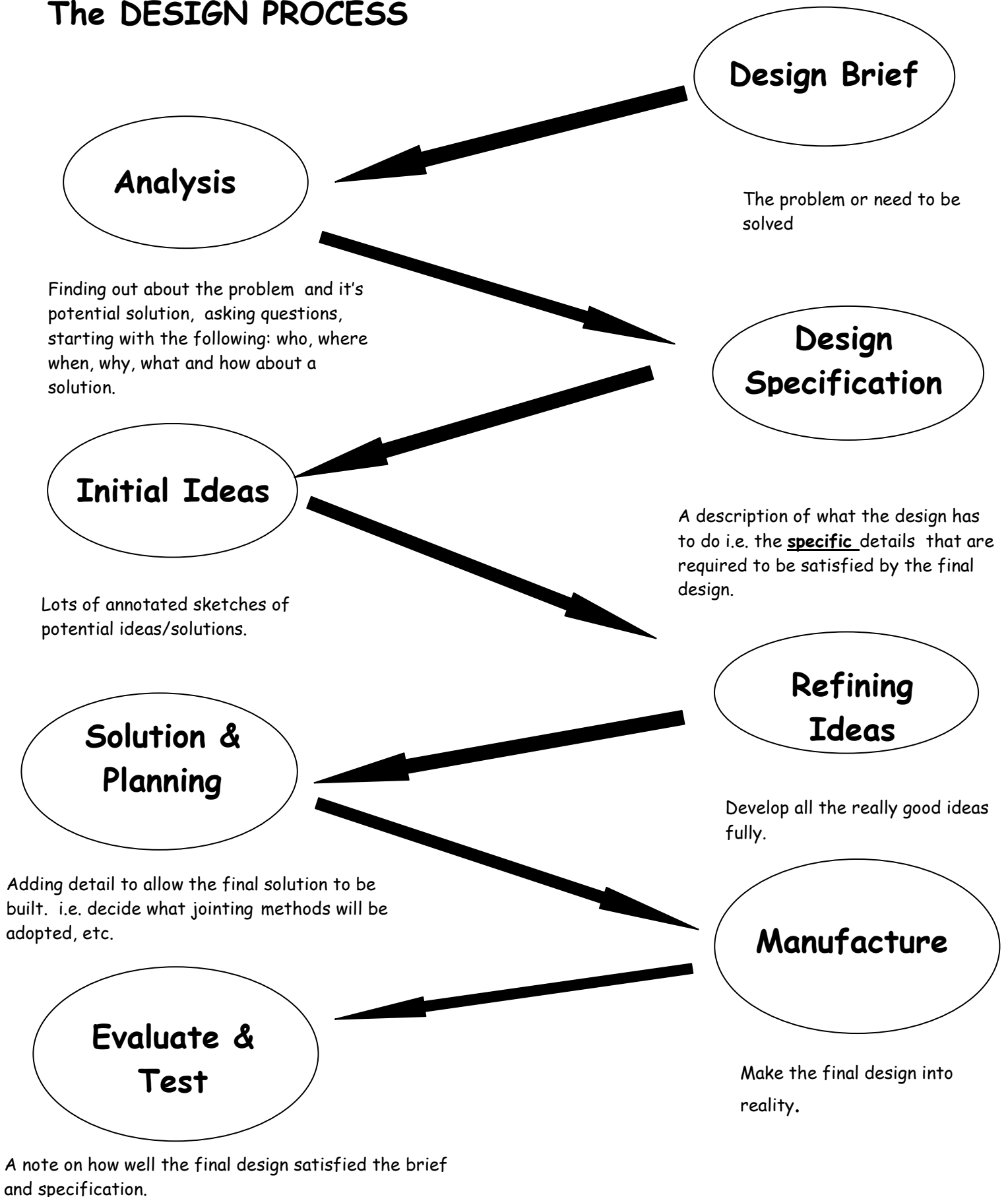
Designing involves satisfying needs and/or wants and to do this requires taking an idea which could potentially solve a problem and turning that idea into reality. Every manmade artefact that is in existence around us has been manufactured but before the manufacture took place, the product was firstly designed.

How do we approach this design process? The best way is to approach it in a pre-determined logical order, i.e. in a step by step approach tackling each step at a time.

This is usually undertaken by producing a design folio, which incidentally the fourth year folio contributes to one third of the overall Standard Grade mark. It is generally preferred to produce your folio in A3 but can be carried out in A4 if your teacher agrees to this.

To be a successful designer you will have to carry out the design process in a logical order, in the following page a flow diagram has been drawn which briefly describes each stage of the design process. It is important to follow this process.

# The DESIGN PROCESS



# Design Brief

## Problem/Brief

As was explained in the previous page the starting point in any design assignment is the need and/or want for a particular product. This need or want is generally put to a designer in the form of a problem or brief. It can be a short statement or a long detailed specification. The BRIEF as a starting point basically states what has to be designed to solve the need or want.

## Analysis

This is where you try to fully understand the DESIGN BRIEF by researching all the possible factors which may have an influence on potential solutions.

This might include; looking through catalogues, talking to the client (the person who has come to you to design for their need or want) or looking at similar products in the market place.

### *Initial research*

This stage of the design process is often started by tackling the problem using a **mind map** (brainstorming). A mind map tries to tease out early thoughts about what factors will be required to resolve the problem. Some of the most important questions which will require to be asked are; Who will use it? Where will it be used? When will it be used? Why will it be used? What will it be used for? How will it be used?

## ***Detailed Research***

Having carried out the mind map to try to tease out the various pieces of information which could have an influence in the design, the next stage is to carry out a more detailed investigation into the following design aspects.

- Function & performance - What exactly the product must do.
- Location - Where the product will be used & stored.
- Ergonomics - How the product can be made to suit the users.
- Anthropometrics - Ensuring the correct sizes are used to suit the users.
- Aesthetics & Style - The image, appearance, colour & finish of the product.
- Materials & construction - Properties of the material and build.
- Restrictions - Limits in time, cost, size, skill & performance.

## **Design Specification**

Having carried out an analysis to establish all the important facts which will have an influence in the final design of the product, the DESIGN SPECIFICATION should be a listed summary of all these important facts. What the design specification is doing is SPECIFYING what the final product must have as part of its design. i.e. a specific detail for the design of a chair could be as follows:-

- *It must be comfortable to sit on as the user will require to sit on it for long periods of time.*
- *It must have four legs for stability.*

## **Initial Ideas**

At this stage of the design process your actual ideas of potential solutions are sketched down on paper. The quality of the sketch at this stage is not important, what is important is the quantity of different ideas. A habit to get into at this early stage is to ANNOTATE your sketches. What this means is you write comments about all your ideas so that the reader can see what you are thinking about for each of the sketches.

## Refining Ideas

Here all your best ideas are examined in detail and improved with respect to improving the quality of the sketch, adding in sizes, exploding the views, etc.

It could be that two or three ideas need to be combined to create the final solution.

When the final design has been drawn, it then has to be compared to the design specification to ensure that all the **specific** details listed there are covered in the final sketched idea.

## Solution & Planning

At this stage of the design process details such as sizes are added to allow the building of the design. Various types of suitable joints are investigated. The final solution will be presented as a fully rendered drawing.

## 3D model

Where appropriate it is ideal to make a scaled down version of the proposed idea. The model could be made from various mediums such as card, modelling clay to miniature versions in wood. By doing this allows a greater insight in to how the product will look with respect to proportion. i.e. ensuring all the parts of the product look good and not out of place with each other.

## Working Drawing

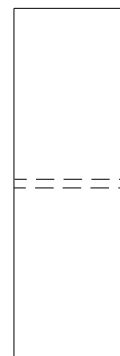
The working drawing shows all the various sizes of the design usually in orthographic format, i.e. three views of the object. An example of a typical orthographic drawing is shown below. A working drawing allows the manufacture of the product as it shows all the relevant sizes.



PLAN



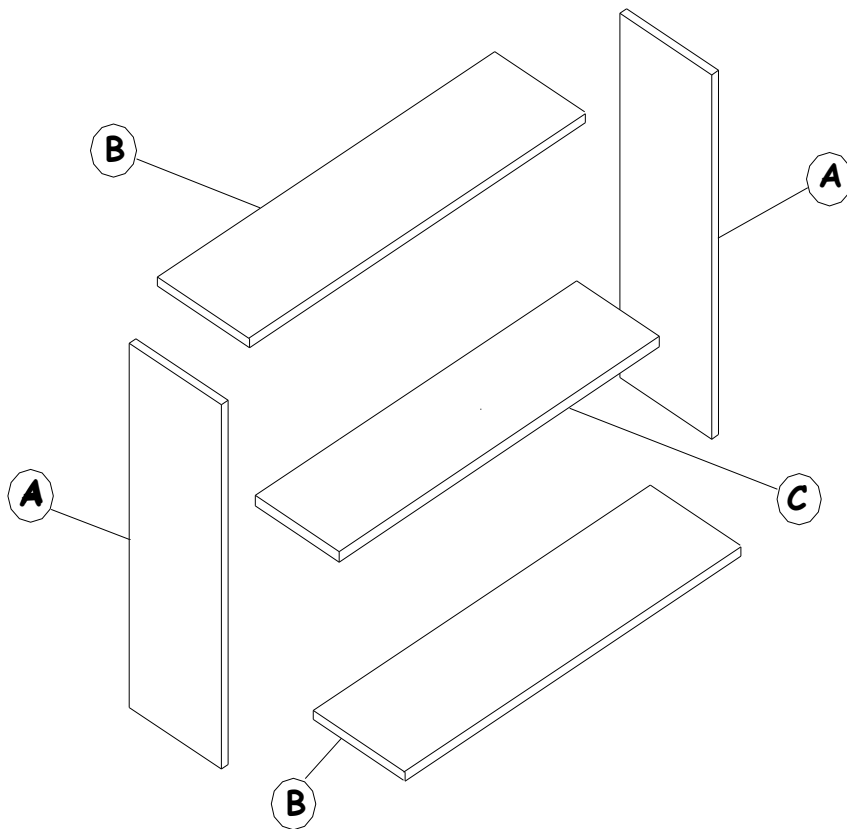
ELEVATION



END  
ELEVATION

## Exploded View

An exploded view is very important as it shows how the entire project may be assembled. Individual joints and other relevant parts may also be shown in exploded form. The exploded view shown below is of a shelf unit showing all the component parts. It is easier to identify parts of the assembly if each part is individually labelled as shown below.

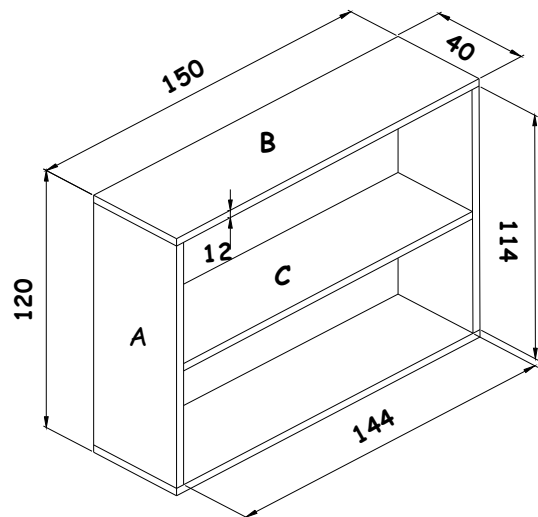




## Cutting List (or Parts List)

This is a list of all the parts which will be required to assemble the product.

The drawing on the next page is a finished 3D model of a product that was designed for a client. To enable the materials for that product to be made available, a cutting list has to be made. This is generally done in the form of a table as shown below.



Item	Quantity	Length	Width	Thick	Material
A	2	114	40	12	PINE
B	2	150	40	12	PINE
C	1	144	40	12	PINE

## **Presentation Drawing**

The presentation drawing is a very important aspect of the design process, if the final rendered drawing is carried out accurately and as real to life as possible, this can be presented to the client for his/her approval before the actual making of the product. It could be that the client is not entirely satisfied with the final product and therefore will be much easier to re-do a drawing than re-make the prototype model.

## **Sequence of Operations (manufacture)**

Your sequence of operations page is really just a list of what you need to do in order to make your design. Having said that, however, writing a sequence of operations from start to finish can be difficult and should be broken down into smaller stages. The main stages in any sequence of operations should include.

- **Marking Out**
- **Cutting, Drilling and Shaping**
- **Assembling**
- **Finishing**

The sequence of operations should be broken down into instructions for the individual parts, i.e. the carcass, the doors, drawers etc.

## **Evaluate & Test**

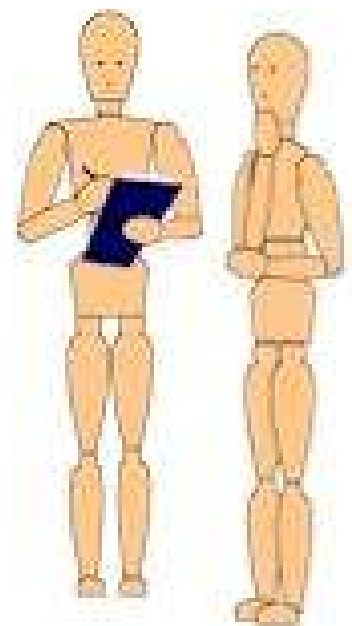
This is the final stage of the design process and involves writing a report to summarise how well the product satisfied the BRIEF. This is done by comparing the final product to the DESIGN SPECIFICATION.

Some typical investigation questions used to help structure the evaluation report might include the following:-

- What tests were carried to ensure the product can do the job it was designed for, i.e. if it was a seat does it hold the weight of the person it was designed for?
- What are the strengths and weaknesses of the product?
- How could the design be improved?
- Did the product solve the problem?
- What do other people think of the final design?
- Does it look good?
- Does the final product meet the specific details listed in the SPECIFICATION.

## Ergonomics

Ergonomics was briefly spoken about earlier  
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 of the dimensions of relevant human body parts when we design things.

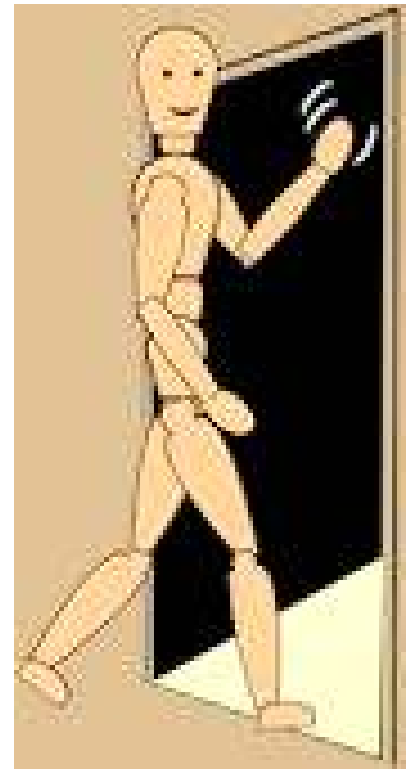
Taking the example of the Ergonome sitting in the car seat below, the seat has been specifically designed to fit our body shape with respect length of leg, back support, the headrest and the position of the steering wheel. As you sit



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.

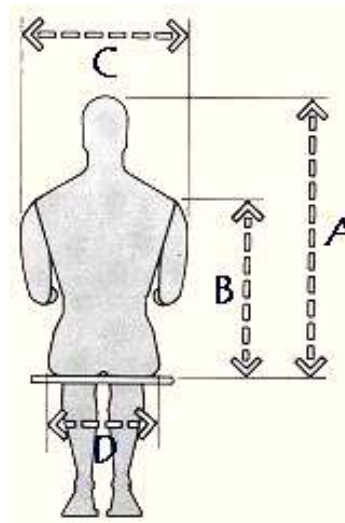
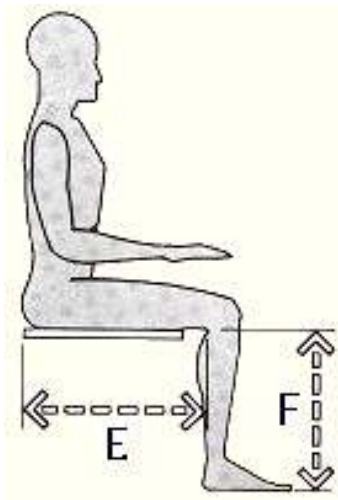


# Anthropometry

## Anthro - what?

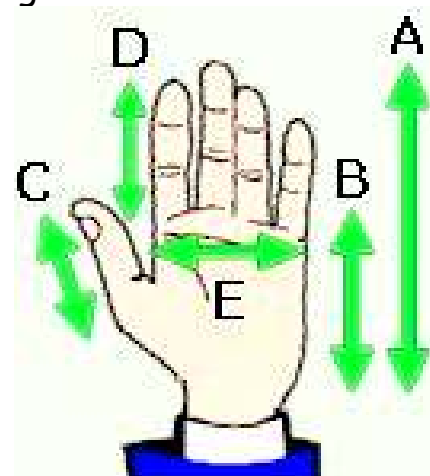
Anthro·pom·etry.

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.

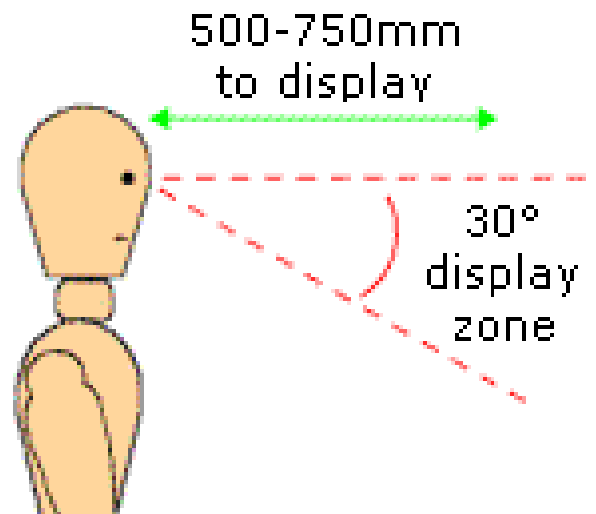


There are tables that give you these sizes but for the present we will leave these alone.

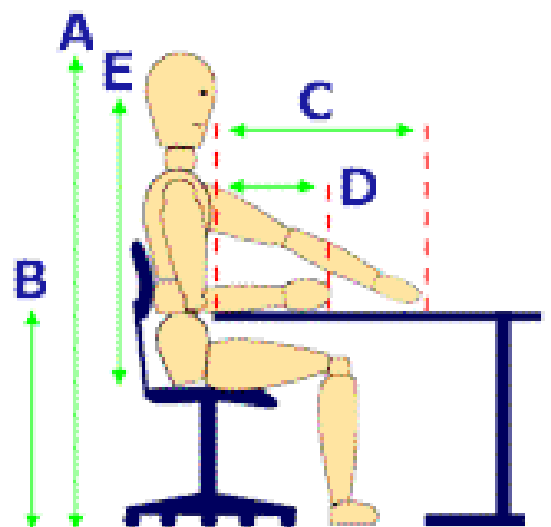
We are now going to consider what sizes are required to design a mobile telephone. Some of the factors which will require to be considered are the finger size, finger length, hand grip, etc. and since men's hands are generally larger than those of a woman's, you would have to consider both at the design stage.



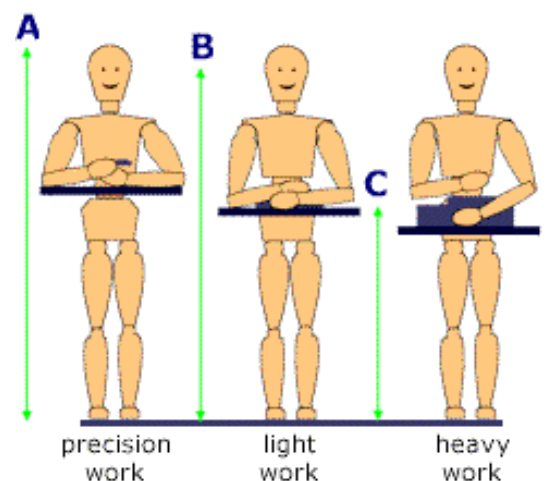
We all know supermarkets sell products, but why are the shelves not higher than they are. They could store a lot more food etc. if they were higher? The reason they are not is: firstly, the average sized person could not reach them and secondly, they could not see what is on the shelf. Another important factor when designing shelving is to ensure the correct height is established for people looking at the products. If a customer has to reach for product that is too high for them, they could over balance and cause the products to fall the ground.



In the picture opposite, factors which would have to be considered when designing a table, would be to ensure the table was high enough to clear the persons legs but not too high so as to make the working height uncomfortable. The reach of the person is also very important. If the desk was too wide the person would not be able to reach anything at the far edge.



This picture shows three different table heights for a person to work. If the object being worked upon was very heavy, the person at the higher work surface would tire very quickly. It would be more beneficial to work at the lower height. The higher work surfaces are more suited to light or precision work.



## Aesthetics

Aesthetics is another very important aspect of design. It is about how good a product will look. A well designed product will look attractive and possibly have a distinctive style of its own.

Think about it, if a product was designed and the function of the product 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.

Having discussed this, 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.