**The Design Process**

**Design Process** is the steps used in resources and technology to arrive at solutions or to meet the need that is desired.

**Design Elements**

There are five elements of design and every object has these elements of design. They are lines, shape, colour, texture and solid.

* **Lines: All** things have lines in their form. There many types of lines, curved, zig –zag and circular. These lines, when properly combine gives an article a nice shape.
* **Shapes**: Lines are combine to give an object its shape or form. These shapes can be square, rectangle, triangle and circles. Solid: Plain shapes are in turn joined to make a solid object. The pieces of wood or metal that you might work with are solid shapes such as cylinder and rectangles.
* **Colour**: All metal or wood have colours of their own. For example, aluminium is silver, while sycamore is ash white. Colour can also be added with paint or other finishes.
* **Texture**: Texture is the condition of a material. Texture can be added to metal by cutting, pressing, rolling and perforating. These are things that govern how our design will look. There are four principles of design are balance, harmony, emphasis, rhythm.
	+ **Balance: A** shape has balance when its parts appear to be of equal weight or equal area on both sides of the centre.
	+ **Harmony**: This is putting together different shapes of different sizes to make a complete item.
	+ **Emphasis:** This to highlight or show up a particular area or design on your design or project.
	+ **Rhythm:** This is the repeating of a particular pattern on your design or project.

The **design process** is very important in finding a successful solution to a problem and can be used in almost any situation. There are nine stages in the design process

The stages are:

* **Brief** – to identify a need
* **Specification** – list of criteria
* **Research**- investigate existing products, materials and processes.
* **Design ideas**- think up a wide range of possible designs
* **Development**- to make modifications
* **Final design**- produce working drawings
* **Planning** – produce a plan of how the object will be made.
* **Making** – make the object

**Brief:** The first stage of the design process is to work out exactly what the need is. This is called generating a brief. A brief is a statement about the task to be solved. It should be short and clear, for example:

*1        Design and make a device to attach washing to a line.*

*2        Design and make a device to hole pen ,pencils and markers.*

In business a great deal of time and money is spent doing market research. This tells a company what sort of things people will buy

**specification stage**

**Specification :**The next stage is to write a specification. This is a list of criteria - or targets - which must be met. A specification for a clothes peg might look like this:

1        must hold washing on the line

2        must resist wet conditions

3        must resist ultraviolet rays

4        must be quick and easy to use

5        must be easy to store

6        must be cheap enough to compete with existing products

It is possible to change the design even as the object is being made. Changes to the design are called modifications. Reasons for the - modifications can be explained in the evaluation.

Research into a project need to give you information about many areas. Some of these are: materials, safety, existing products, processes, cost, legal issues. Also to find out as much as possible to help you design  and make a product.

The research part of the design process has five key stages

* **Stage 1**To work out what information is needed ,ask key questions about the product you are going to design
* **Stage 2**
Try to use several sources. The wider the variety of the information the better
* **Stage 3**
**Question : Sorting and assessing the information means to do what?***Not everything will be useful and it will not arrive in a logical order.*
* **Stage 4**
Presenting information is important it more clear to understand and important point can be highlighted for better reading.
* **Stage 5**Using the information you are able to make the best possible design base on the information about which are good ones to use.

**Question : What does it mean to have a design idea?**

*Design ideas - are the first thoughts about how to solve a problem. Drawing and writing about those ideas allows the designer to think more clearly about the task. This can also help produce even more ideas.*
Sketches can save having to write down your ideas. Pictures cut from magazines or catalogues can also show your design thinking.

**Question :Why is it so important to have several design for an idea?**

*So generating a number of design ideas helps you to consider a variety of solutions and think more clearly about ways of solving a need. There is always more than one solution to a problem. Your first idea is not always the best one.*Most ideas come from existing designs or personal  experiences.

**Question : When choosing a design what are the criteria would you use?**

*Consider each idea to decide which ones are worth developing. You need some criteria to make choices, for example:

1        are the materials suitable?

2        what are the costs?

3        how difficult is it to make?

4        will people buy it?

5        how well does it meet the specification?*

**Development stage**

Decide which solution to develop. Although the chosen solution should, ideally, be the one that best satisfies the specifications, other constraints such as time, cost, or skills may limit the decision. These are some of the questions that must be answered in the development stage. They are

    Is the product satisfying consumer needs and wants?
    Is it safe?
    Is it legal?
    Can the present product be used, or are new ones needed?
    Are there raw materials available?
    What are the costs of further development and commercial
    production and marketing?
    Can the present storage and transport methods be used, or is a
    new method needed?
    What are the estimated profits and probabilities of success?

**Final Design Stage**

The final Design is made up of three parts. They are the drawing, the parts list and the flow chart.

* Drawing

The working drawing is an accurate, scaled drawing of the final product. It is normally drawn in third angle orthographic projection. The drawing includes at least two views and more likely three views of the product. Diagrams can group all information that is used together thus avoiding large amounts of search for needed elements.

***Drawing is a necessary extension of visual imagery used in mechanical design. It is a necessary extension of a designer cognitive capability for all but the most trivial data representation, constraint propagation, and mental simulation.***

* **Parts list**

These are usually the front, side and plan views. Dimensions are added as well as parts list. The working drawing should be so accurate that it could be used by a manufacturer elsewhere in the world to make the product. It should include all the necessary information to make this possible.

***The parts list is a table of information that includes; all the parts, their dimensions, the number required and the finish applied to each part. This ensures that each part will be cut to the correct size and from the right material***.

* **Flow chart**

A flowchart is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution to a given problem. Process operations are represented in these boxes, and arrows; rather, they are implied by the sequencing of operations.

***Flowcharts are used in analysing, designing, documenting or managing a process or program in various fields***

**Planning stage**

Planning is part of project management, which relates to the use of schedules such as  charts to plan and subsequently report progress within the project environment.

Initially, the project scope is defined and the appropriate methods for completing the project are determined. Following this step, the durations for the various tasks necessary to complete the work are listed and grouped into a work breakdown structure. Planning is often used to organize different areas of a project, including project plans, workloads and the management of teams and individuals. The logical dependencies between tasks are defined using an activity network diagram that enables identification of the critical path. Float or slack time in the schedule can be calculated using project management software. Then the necessary resources can be estimated and costs for each activity can be allocated to each resource, giving the total project cost. At this stage, the project schedule may be optimized to achieve the appropriate balance between resource usage and project duration to comply with the project objectives. Once established and agreed, the project schedule becomes what is known as the baseline schedule. Progress will be measured against the baseline schedule throughout the life of the project

Making Stage This is where the project is actual made. That is the project move from being just a drawing on paper to a physical object.

**Evaluation stage**

**Evaluation** is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards. It can assist an organization, program, project or any other intervention or initiative to assess any aim, realizable proposal, or any alternative, to help in decision-making; or to ascertain the degree of achievement or value in regard to the aim and objectives and results of any such action that has been completed. The primary purpose of evaluation in design process is to ensure that the following were met

1.      Did the solution meet the brief?

2.      How well did the solution work?

3.      What is the best feature of the solution?

4.      Is the solution cost effective?

In addition to gaining insight into prior or existing initiatives, is to enable reflection and assist in the identification of future change.