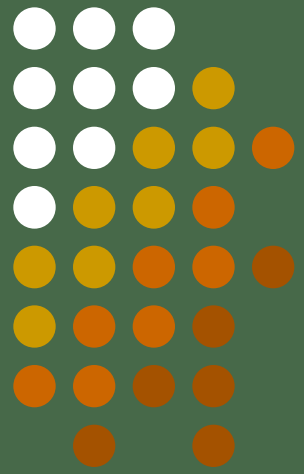
# FUNDAMENTALS OF ENGINEERING DESIGN



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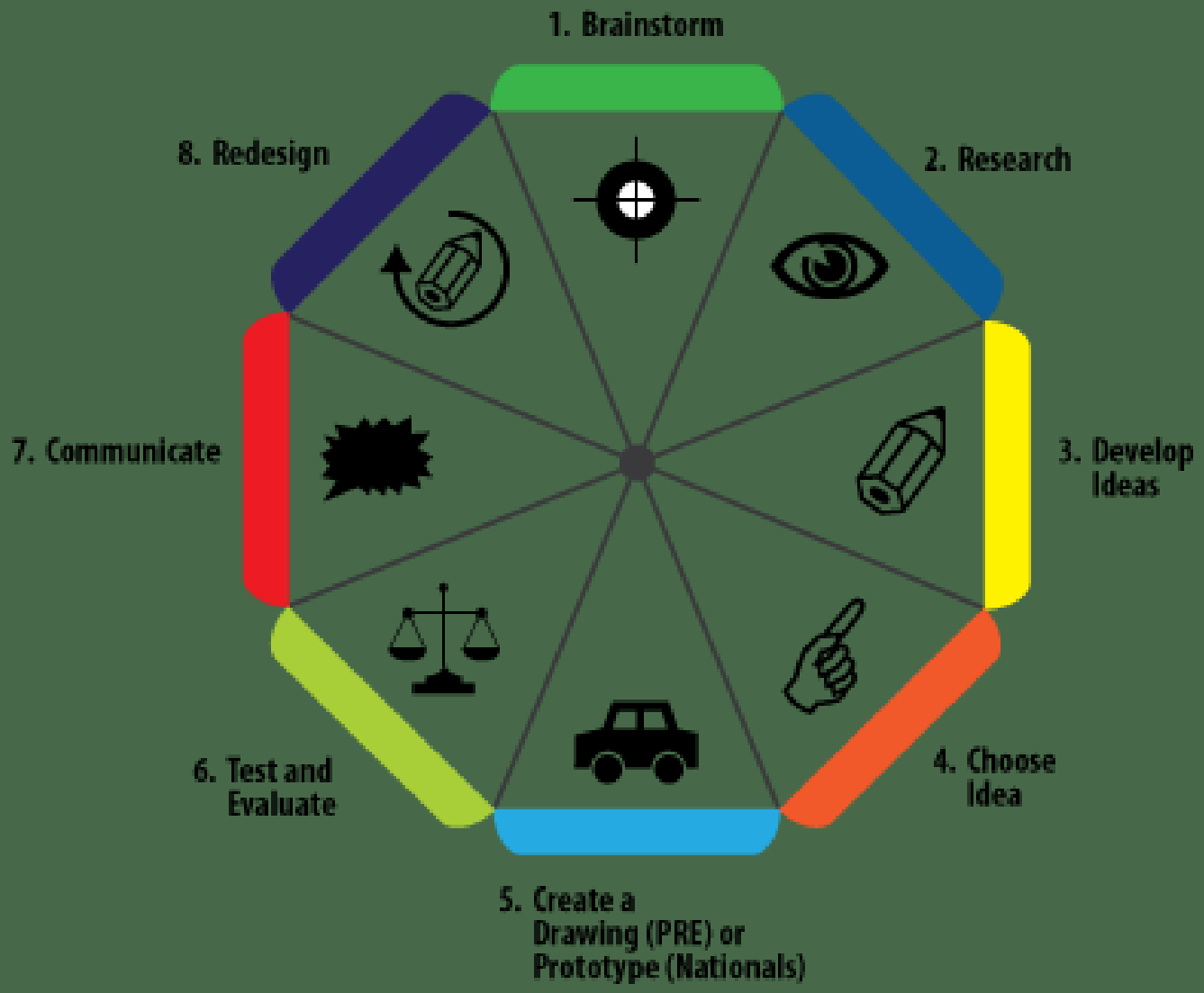
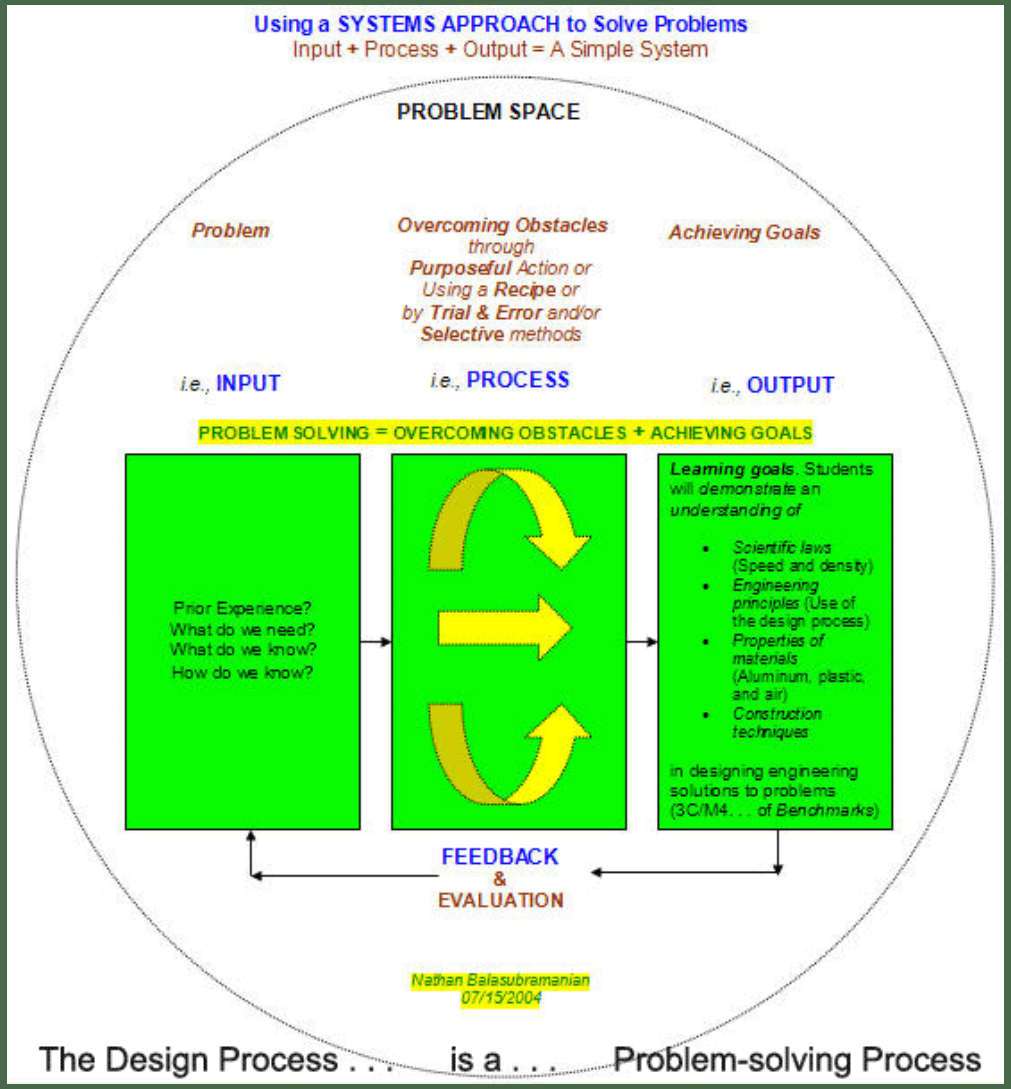
# TYPES OF ENGINEERING DESIGN

- Empirical Design
- Rational Design
- Design by Evolution
- Design by Innovation
- New Design
- Adaptive or Redesign

# FLOW DIAGRAM OF DESIGN PROCESS CYCLE



# DESIGN PROCESS – PROBLEM SOLVING PROCESS



# ENGINEERING DESIGN PROCEDURE

1. RECOGNIZATION OF NEED
2. DEFINITION OF PROBLEM
3. PRELIMINARY DESIGN
4. DETAILED DESIGN
5. PRESENTATION

# 1. RECOGNIZATION OF NEED

- Identifying The Client
- Does The Client Know What They Want?

  Issue: Confusing A Potential Solution With Actual Need
- Why Does The Client Want This?
- Needs Statement Defines Current Unsatisfactory Situation

# Points To Be Considered At This Stage

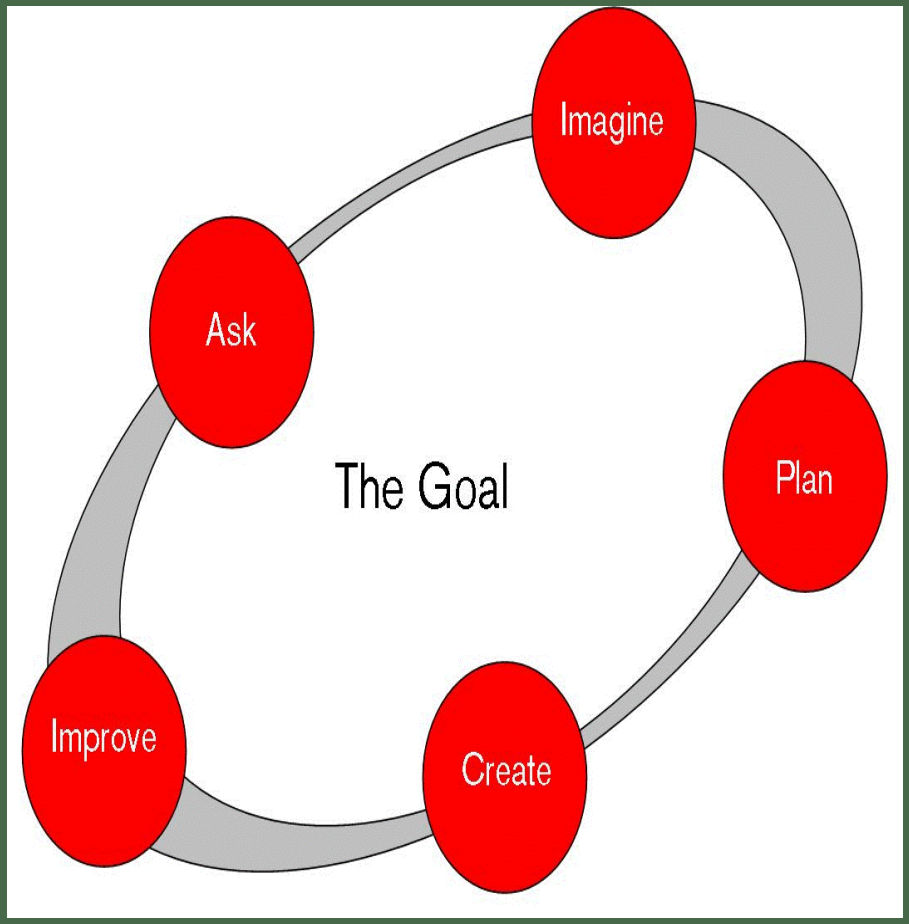
- Study the Nature of Need
- Establish the need reasonably well to extent possible
- Make primitive statement of need
- Do reasonable study with qualitative and quantitative aspects

# 2. DEFINATION OF PROBLEM

- GOAL
- OBJECTIVE
- CONSTRAINT

# Goal

- Brief, general and ideal statement
- “How are we going to address the need”
- Rules out other solutions to Needs statement



# Objectives

- Objectives = quantifiable expectations of performance of design
- Objectives can be refined later while keeping the general goal

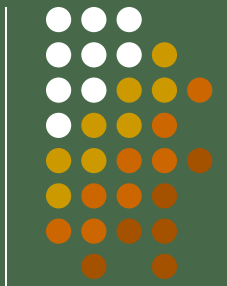
# Constraints

- Constraints: Requirements that the design must satisfy
- Define permissible range of design and performance parameters
- Cost must have payback in time savings
- Constraints can become part of objectives
- Must Follow standards

# General Consideration in Defining Problem

- Workshop Facilities
- Form and Size of the Parts
- Selection of Material and Sizes
- Economical Consideration
- Selecting type of Production for Economy
- Safety in Operation

# 3. PRELIMINARY DESIGN STEPS



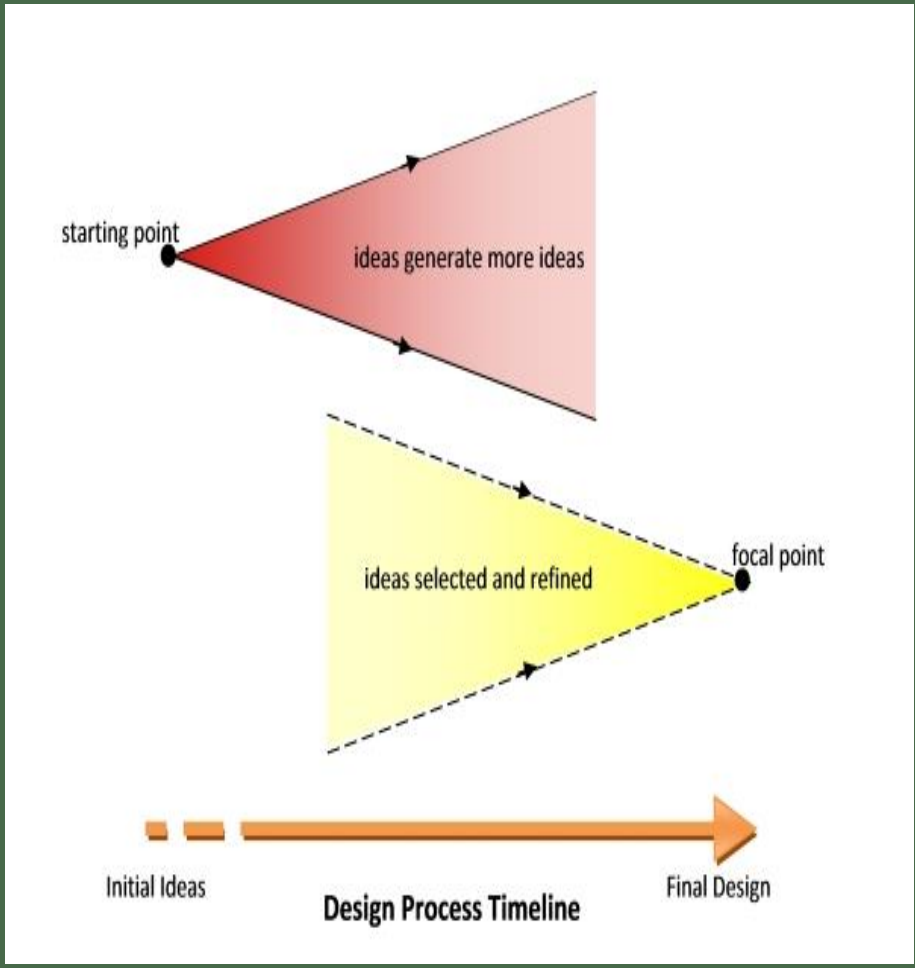
- Generate Alternatives
- Formulation of Mathematical Model
- Synthesis, Analysis and Optimization

# Generate Alternatives

Techniques:

– Brainstorming

1. Let imagination run wild
2. Avoid moving to detail
3. Avoid critiquing of any concepts
4. Problem: domination by a few team members



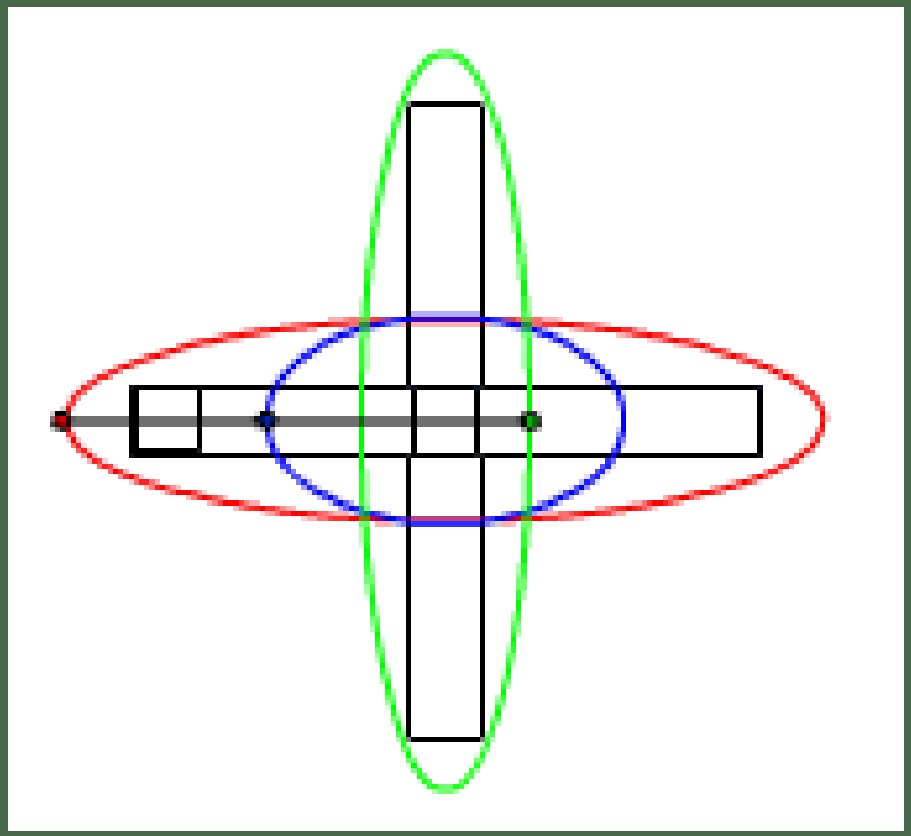
# Formulation of Mathematical Model

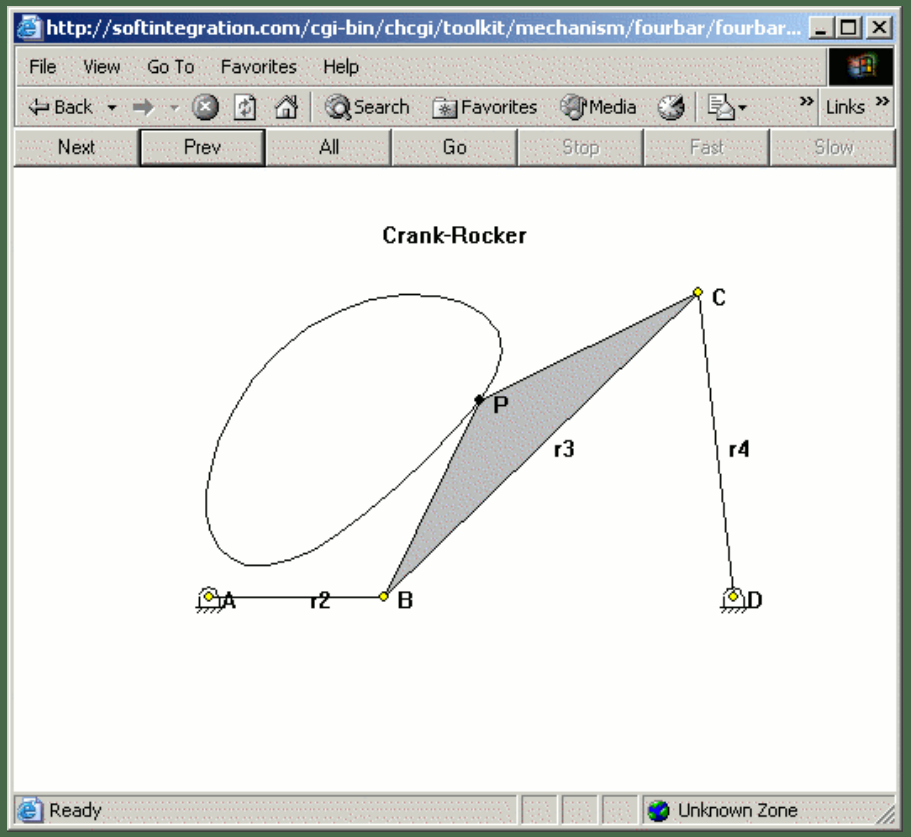
- Formulating Models for selected solutions preferably Mathematical Model for optimization purpose

# Synthesis, Analysis And Optimization

- Types of Load and Stress
- Kinematics
- Dynamics

# Concept of Kinematics





# 4. DETAILED DESIGN STEPS

- Detailing the Parts and Design for Assembly
- Design for Production
  - Scheduling the Manufacturing Process in a optimum way
  - Value Analysis
- Design Review and Evaluation

  (Verification Stage of Design)

1. Making prototype
2. Geometric Modeling and Animation on CAD Software
3. Other Engineering Testing Methods

# 5. PRESENTATION

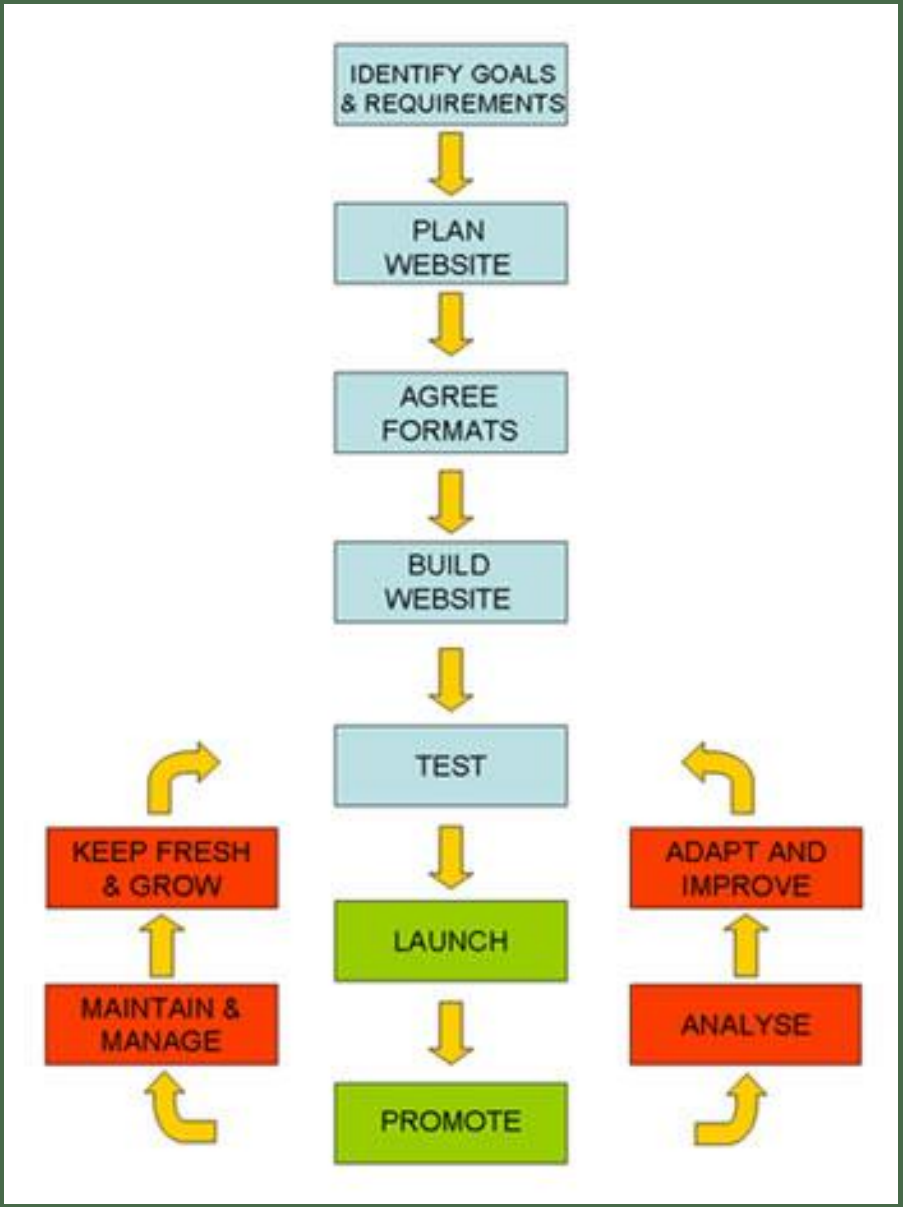
- Communication Stage of Design

  Written/Oral/Pictorial/Graphical form

- Documentation

1. Permanently bound notebook or diary
2. Dated entries of thoughts, activities, notes, sketches, calculations, etc. related to your design projects.
3. Central record of all activity and information
4. Chronological record—for patent or liability
5. Documentation of time for budgeting and billing

# Example - Website



# NEXT…

- PRODUCT SPECIFICATION AND STANDARDIZATION AND CONSTRAINT IN DESIGN
- DESIGN - MORPHOLOGICAL PROCESS