Benha Faculty of Engineering
Mechanical Engineering Department

M1382 : **Computer Aided Design CAD**
First Semester 2018, Y3

Lecture No. 01

Presented by:
Mahmoud Magdy

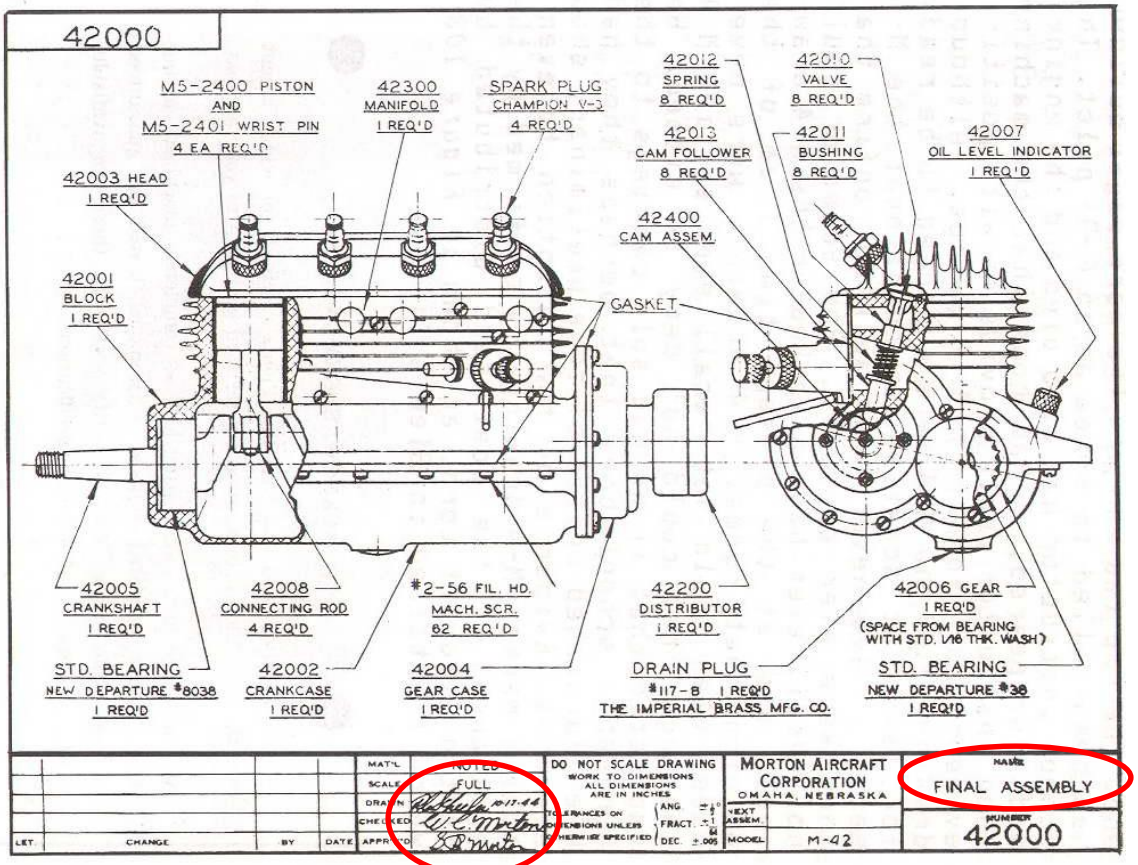
Week	Topics
1	**Introduction**
2	Introduction to CAD (Solid Modeling)
3	Part modeling
4	Finite element analysis (FEA)
5	Parts assembly using SolidWorks
6	Basic concepts of engineering drafting
7	Linear Static Analysis
8	Adaptive Analysis and Mesh Control
9	Modal Analysis
10	Design Optimization
11	Case study 1
12	Case study 2
13	Co-simulation SolidWorks and ADMS software
14	Project Discussion

Design-Manufacturing Process
Old (before computer era)

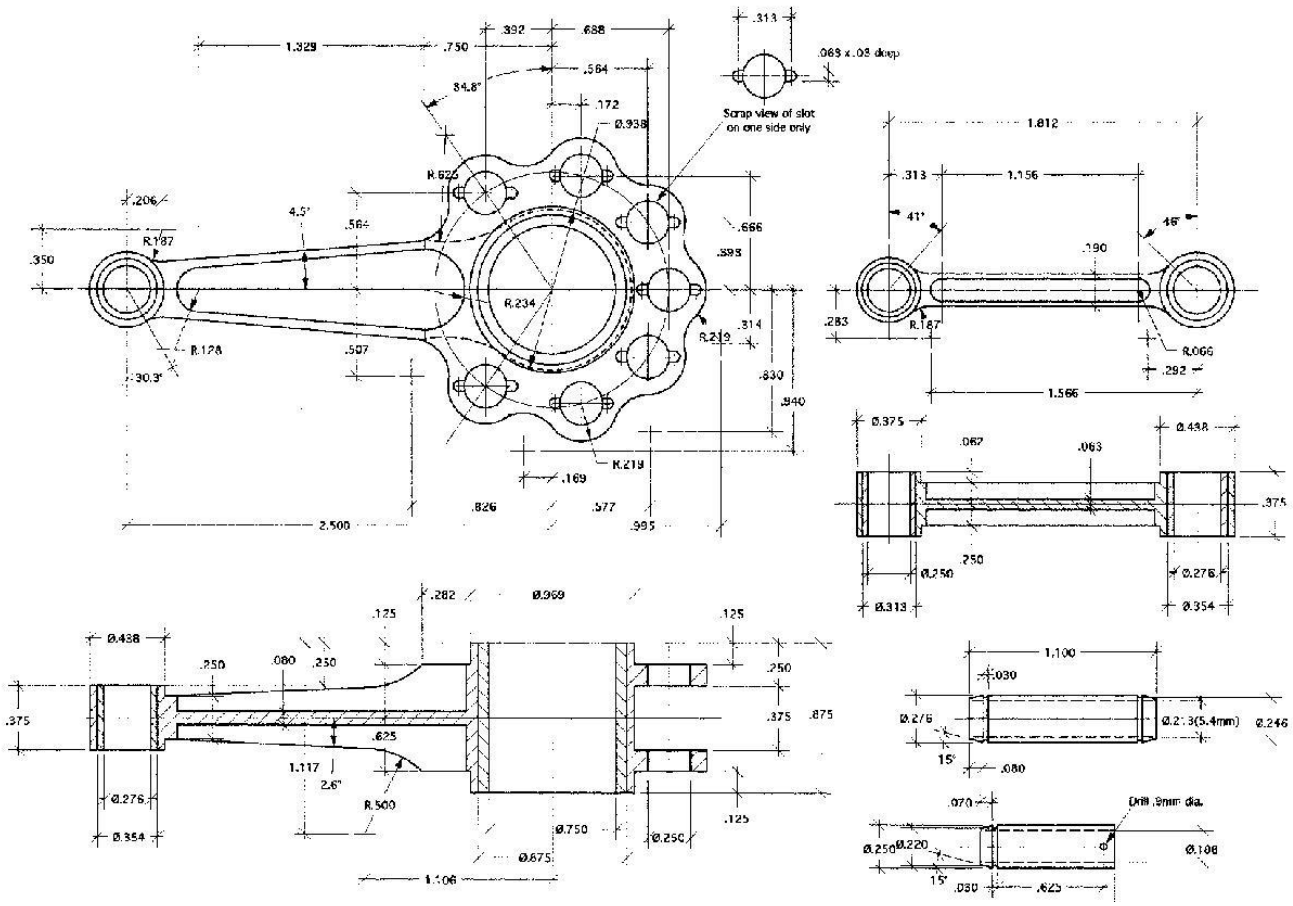
Sketch with pencils

Engineering Drawing with pencils

Manufacturing



Engineering Drawing- Assembly



Engineering Drawing-Part

Manufacturing

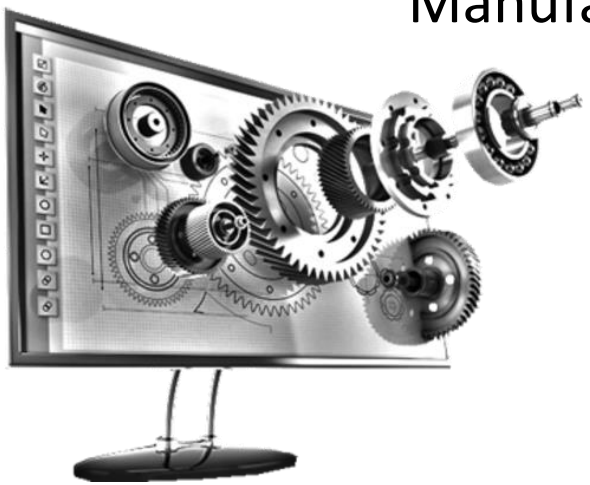
Now…. with computer

CAD (Solid Modeling) ⟷ CAA (Computer Aided Analysis)

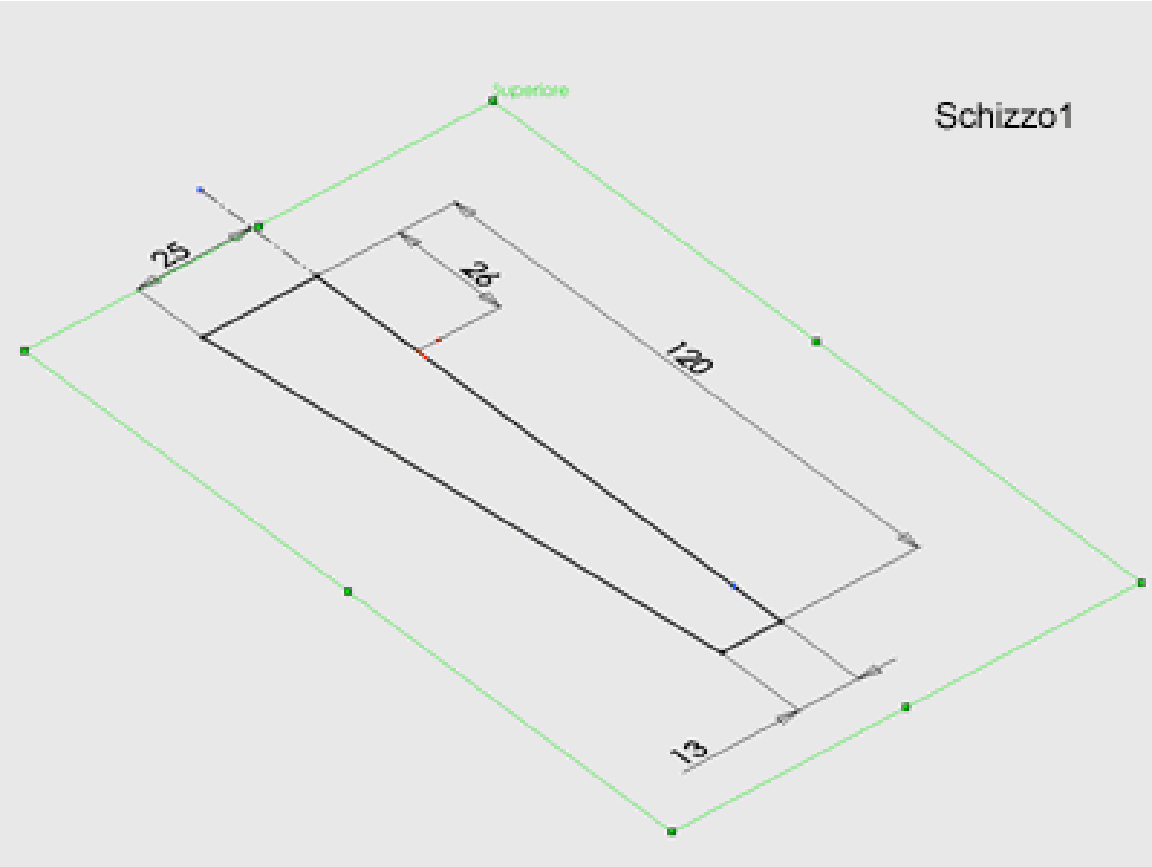
↓ Engineering Drawing

↓ Manufacturing

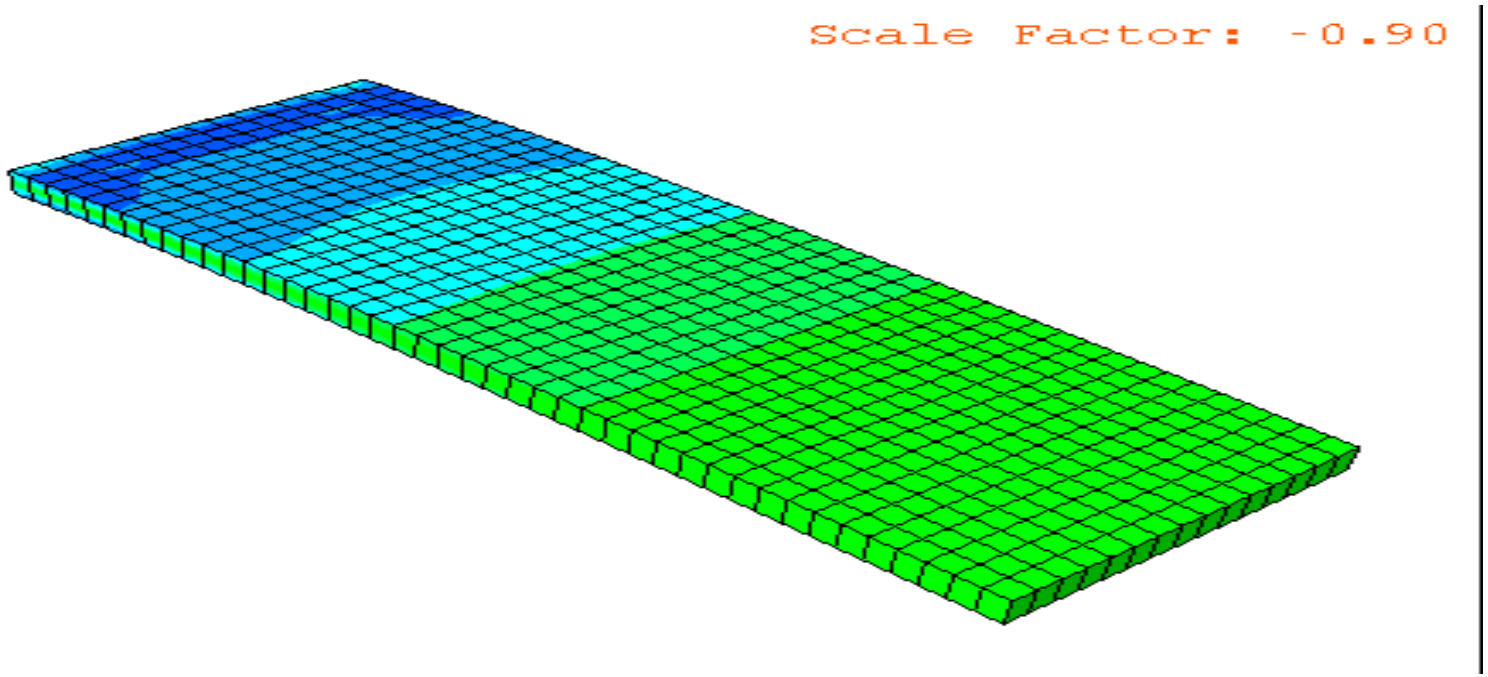
↘ CAM (Computer Aided Manufacturing) /Direct Manufacturing



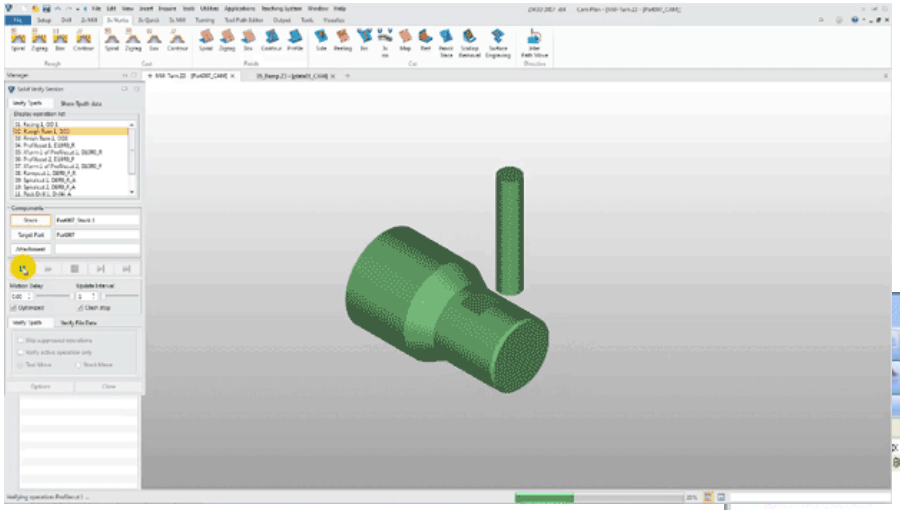
CAD is a starting point of everything!

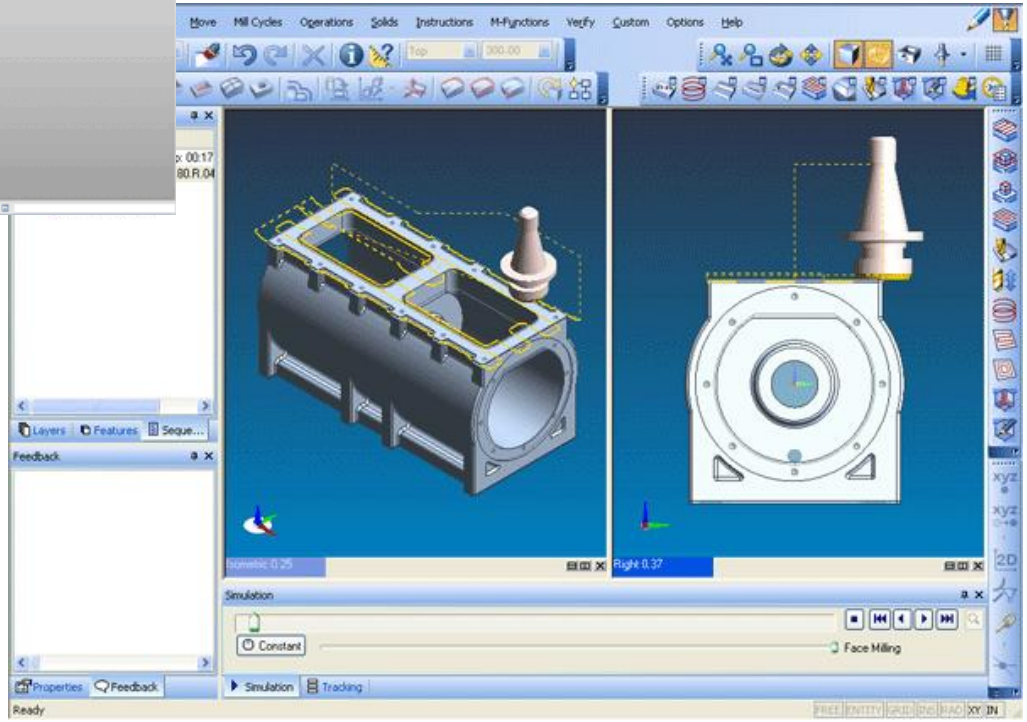


CAD



CAA

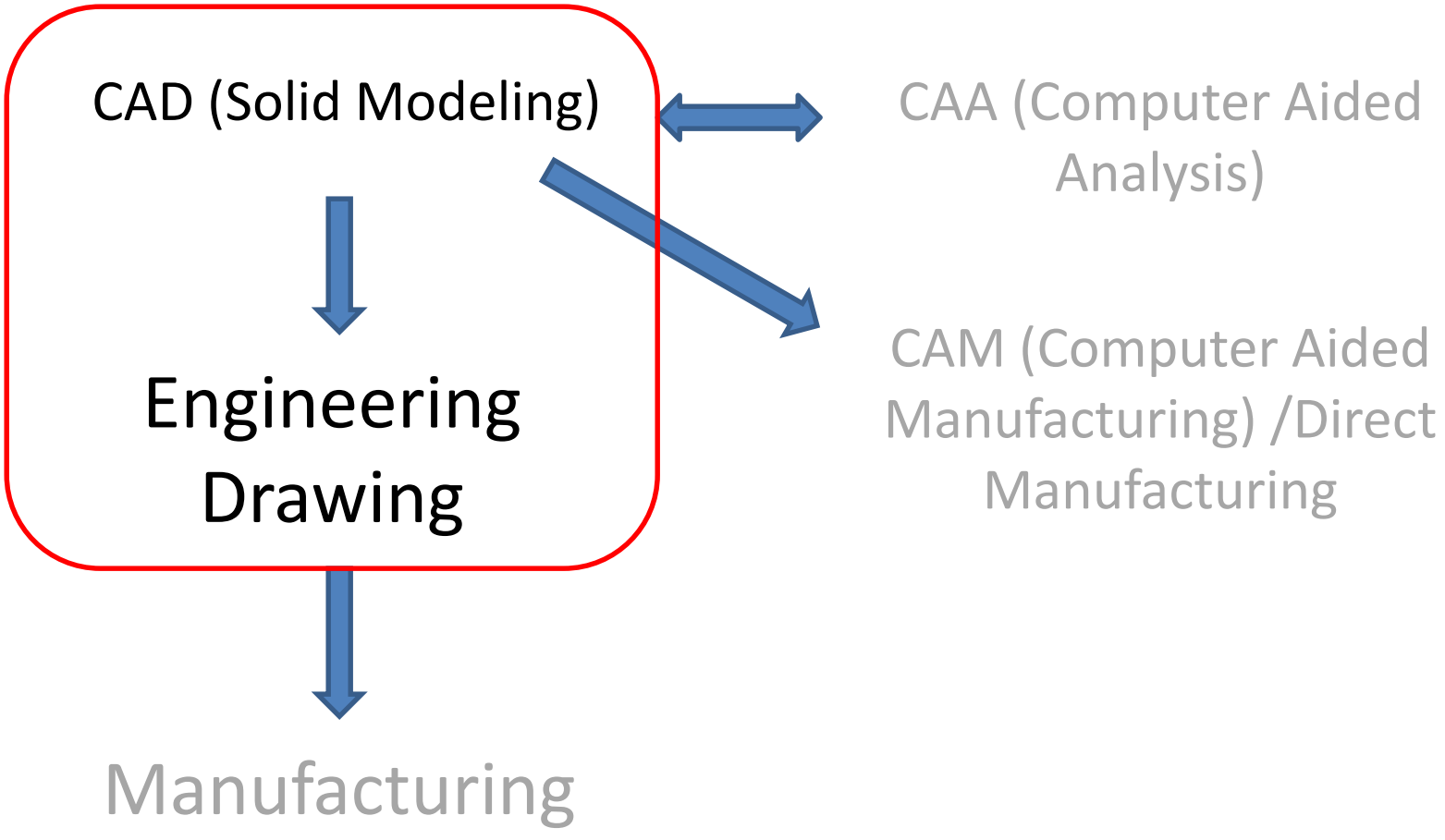


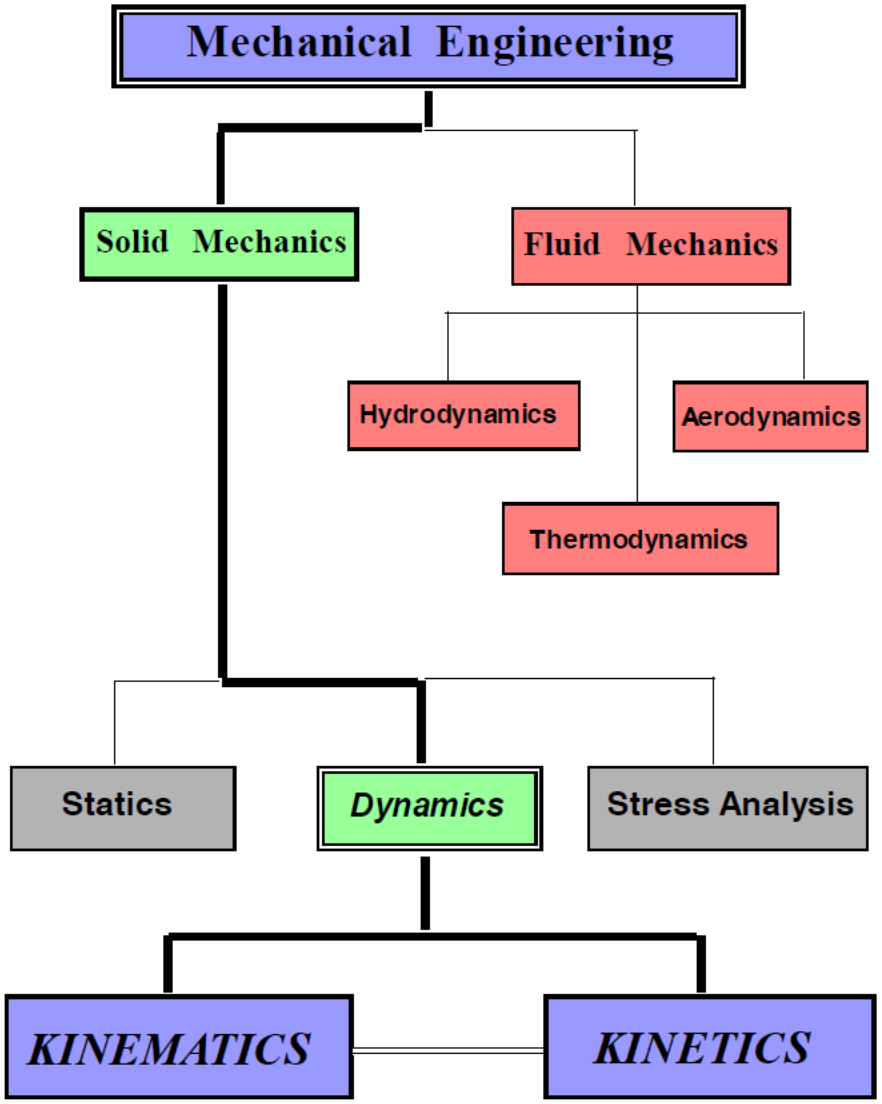

Move
Mill Cycles
Operations
Solids
Instructions
M-Functions
Verify
Custom
Options
Help
Layers
Features
Feedback
Properties
Feedback
Simulation
Tracking
Constant
Face Milling
Ready

CAM

Direct Manufacturing

In this course, we cover




Mechanical Engineering
Solid Mechanics
Fluid Mechanics
Hydrodynamics
Aerodynamics
Thermodynamics
Statics
Dynamics
Stress Analysis
KINEMATICS
KINETICS

KINEMATICS - THE STUDY OF MOTION WITHOUT REGARD T O FORCES

KINETICS - THE STUDY OF FORCES DUE TO MOTION

DESIGN - THE CREATION OF SOMETHING THAT DIDN'T EXIST BEFORE

CAD software

- AutoCAD
- SolidWorks,
- Pro/Engineer,
- CATIA,……

Which one is the best?

Depends what you want.

Product Design

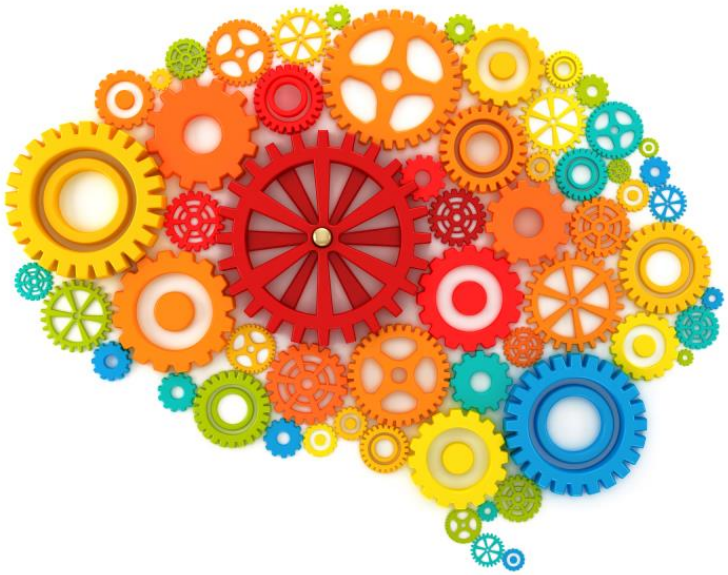
Defining Design

- “Good design is good business.”
  Thomas Watson, Jr., President, IBM
- “Good design is good citizenship.”
  “Milton Glaser, Designer”
- “Design is the fundamental soul of a man-made creation that ends up expressing itself in successive outer layers of the product or service. Design is not just what it looks like and feels like. Design is how it works.”
  Steve Jobs, CEO, Apple

Core of Innovation

- “Everything that can be invented already has been.”

  This statement was released in 1899 by the U.S. Patent Office.



Products are Always Improving

Siemens C10 1999 | NEC DB700 2000 | Nokia 6560 2003 | Nokia 6230i 2006 | Sony Ericcson T630 2007 | Sony Ericcson K800i 2008 | Samsung Wave 2010 | Sony Ericcson Xperia Arc 2012

Market Demand Trends

- Mobile / Connectivity

- Green / Sustainable Design
- Complete Experience

- Value and Quality

- Customized / Personalized

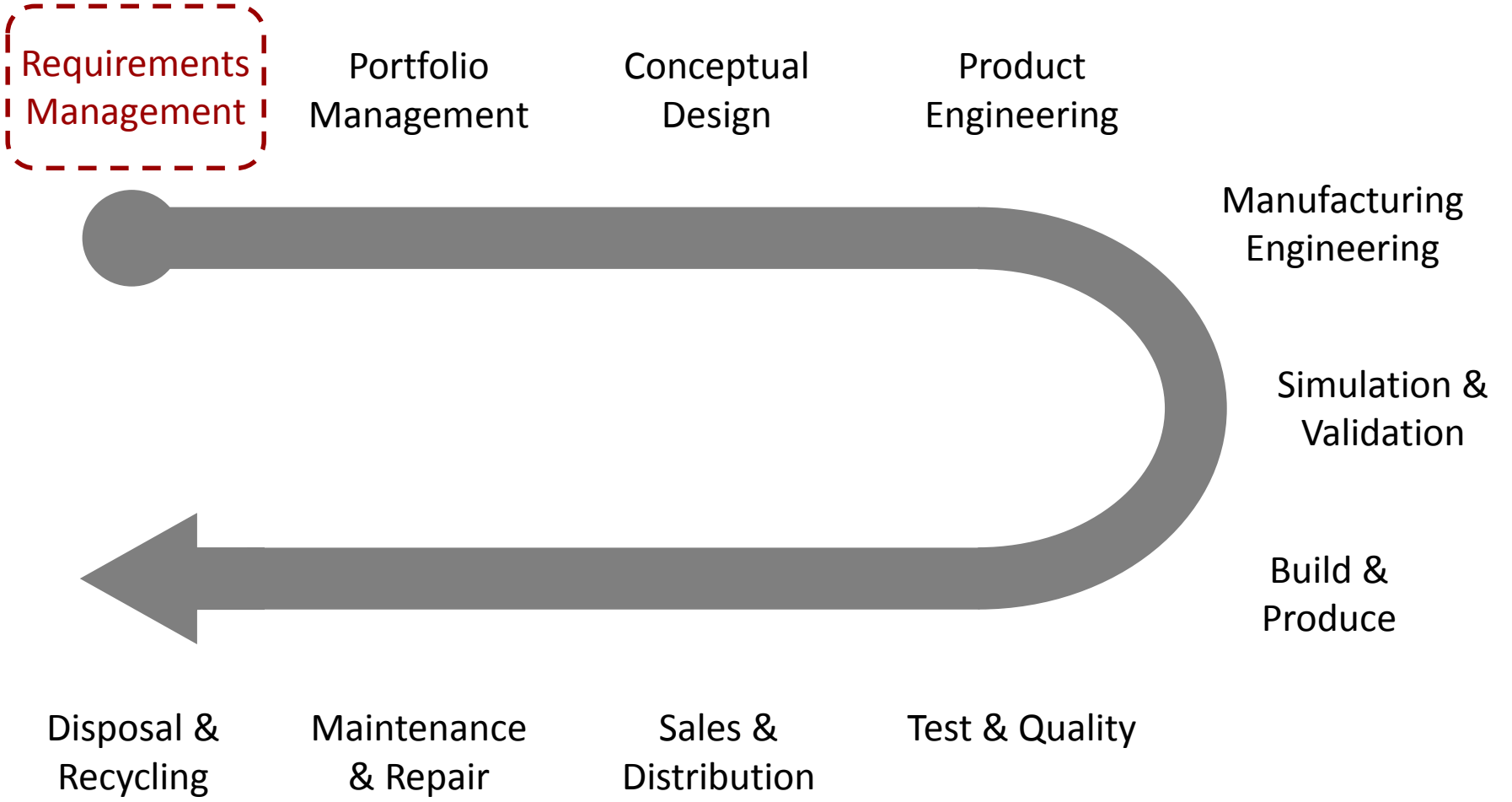
- Global Access

Product Design Challenges

- Project Timelines
- Global Availability
- Features & Configurations
- Reducing Cost
- Ensuring High Quality

Product Lifecycle

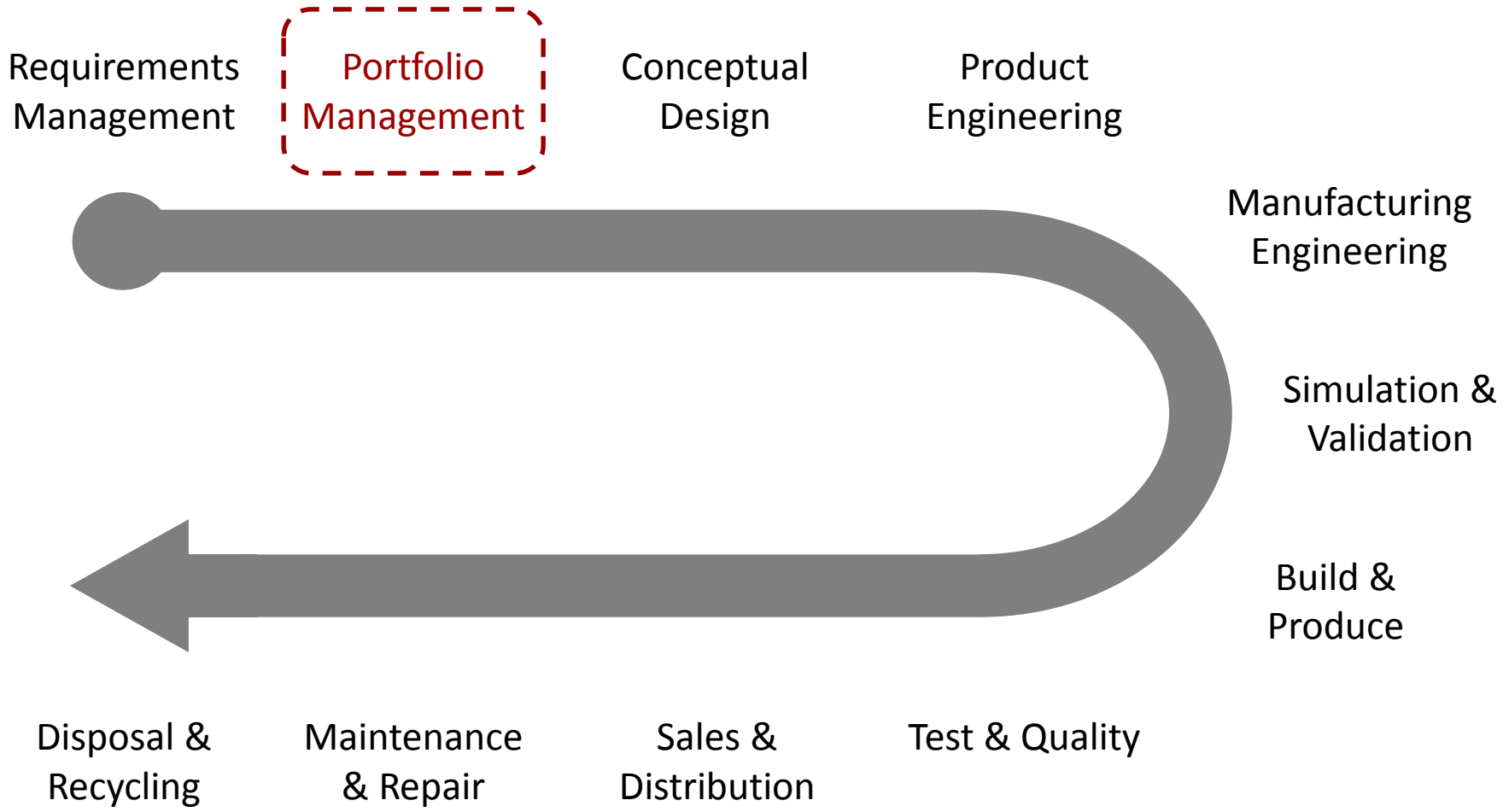
Product Lifecycle



Requirements Management

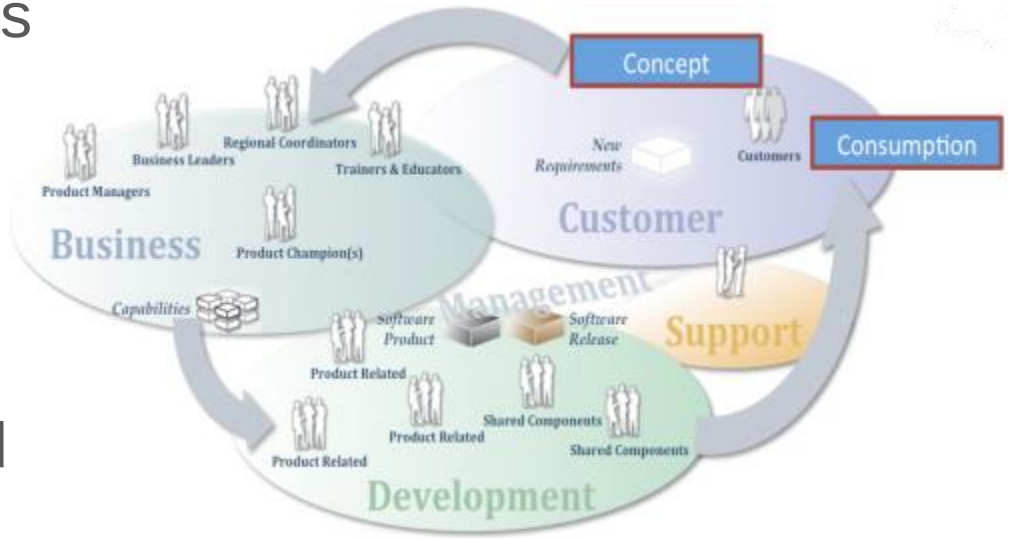
- The capturing, management, and tracking of all product requirements to ensure alignment for market success and reduced risk.
  - Integration of requirements throughout the lifecycle
  - Captured customer input and requirements
  - Relation of final results to requirements
  - Provides audit trail documentation

Product Lifecycle

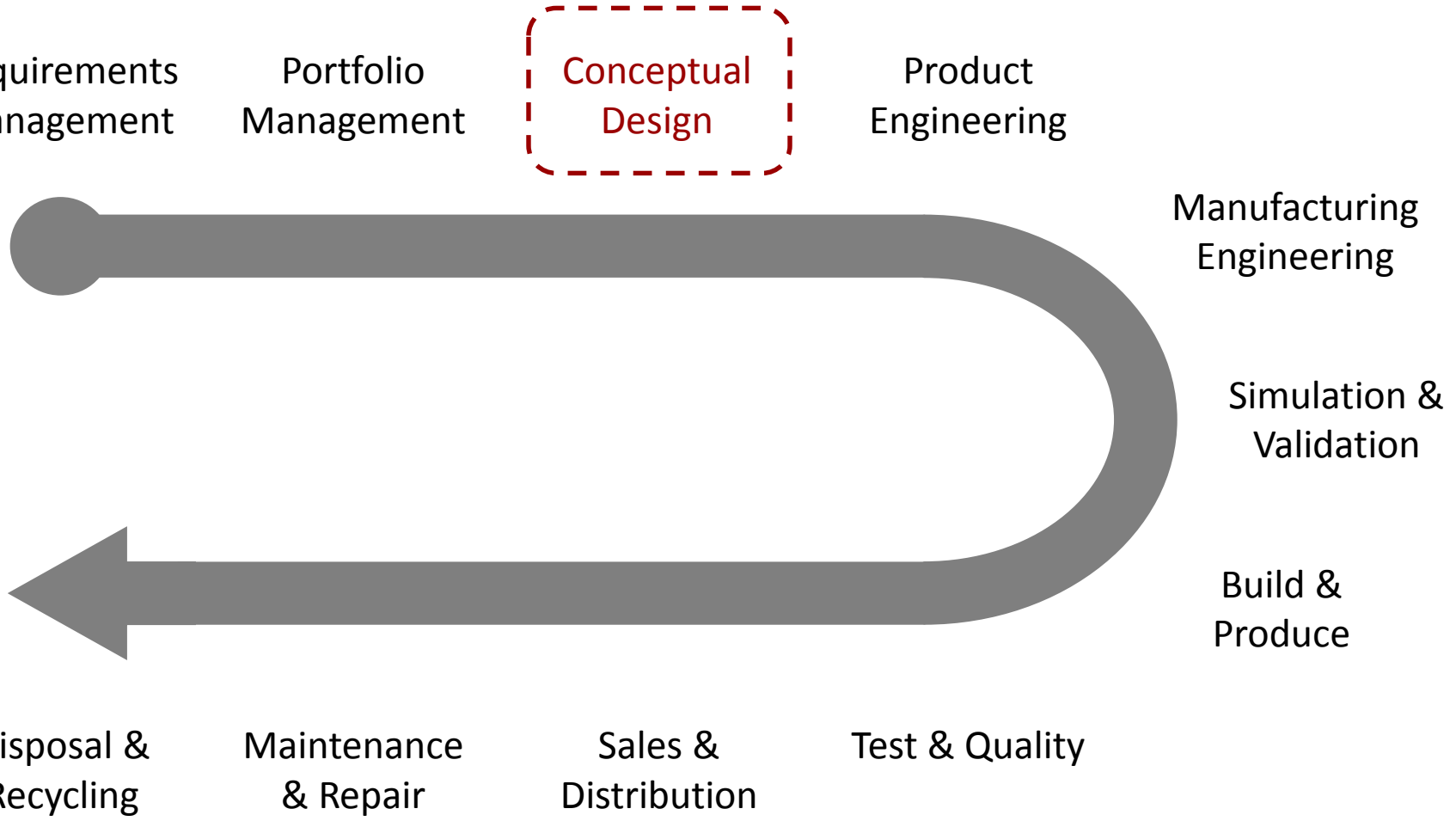


Portfolio Management

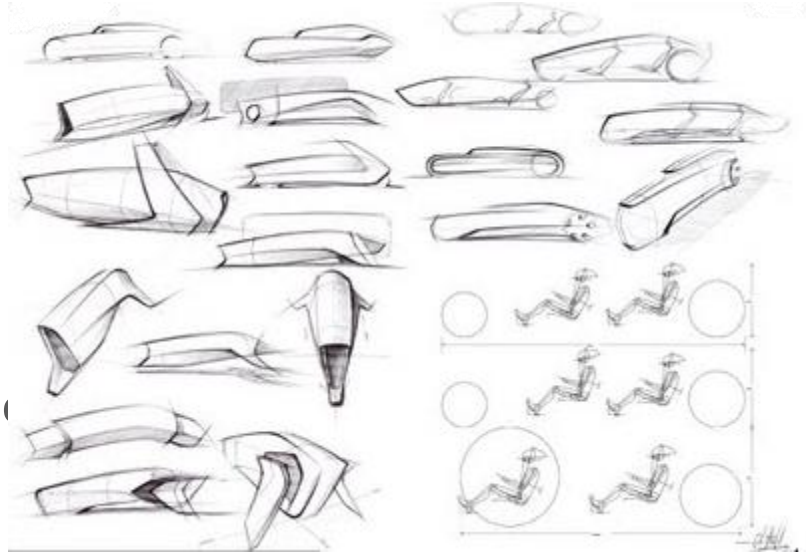
- Product portfolio management is the planning of product lines and relationships of current and future products.
  - Product Configurations
  - Different Market Requirements
  - Hierarchies & Relationships
  - Future Expansion and Enhancements



Product Lifecycle



Common Terms Used



- **Ideation**

  The process of creating new ideas

- **Conceptual Design**

  Type of art which gives precedence to hyp
  function

- **Industrial Design**

  Improve the aesthetics, ergonomics, and usability of a product

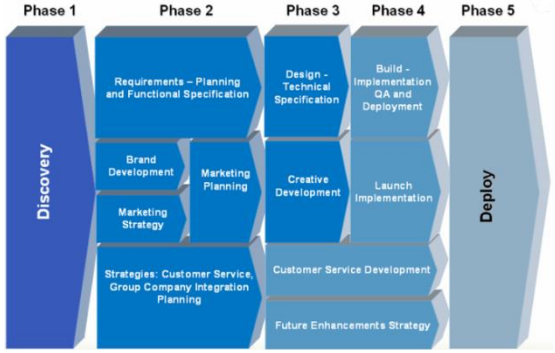

break

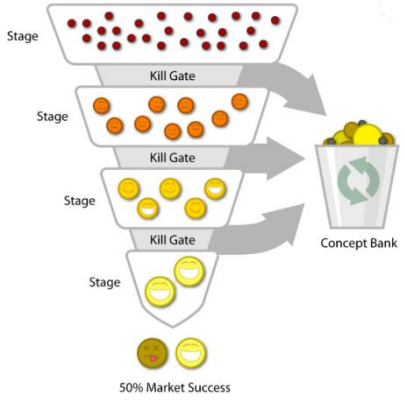
Conceptual Design

- **Team / Group Activity**
  Gather wide range of input to ensure best approach

- **Phased Approach**
  Ensures open exploration down to final selection

- **Gated Process**
  Controls the timeline and ensure selection

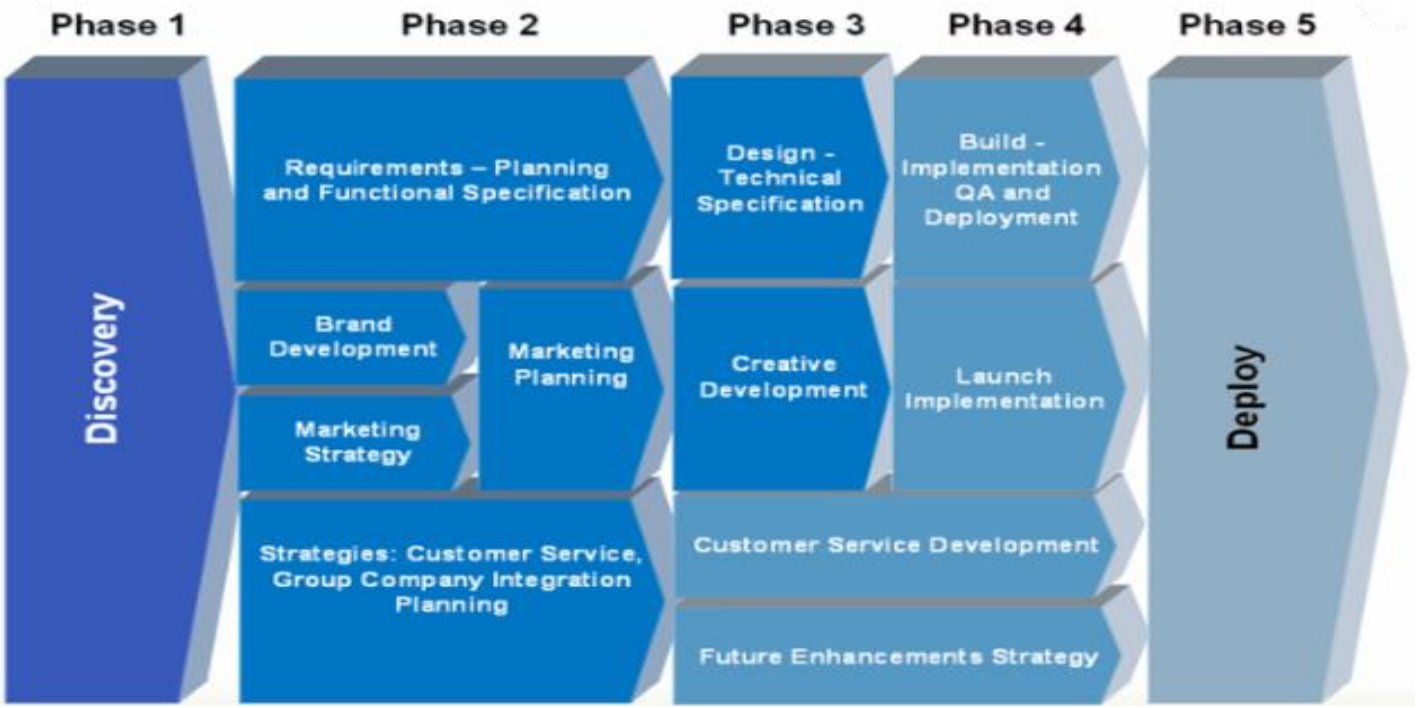




Conceptual Design

- Phased Approach

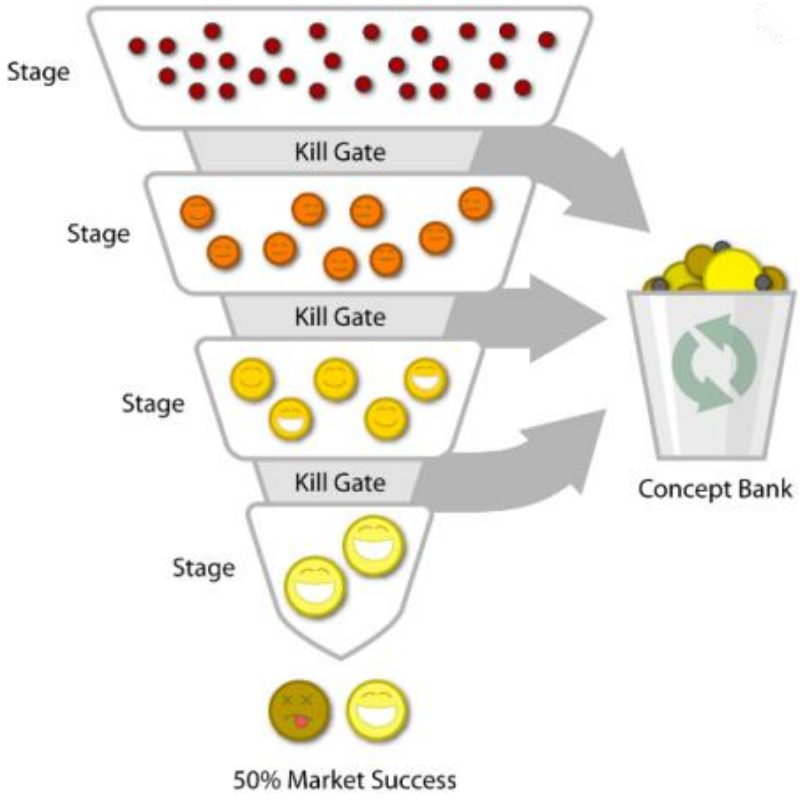
  Ensures open exploration down to final selection



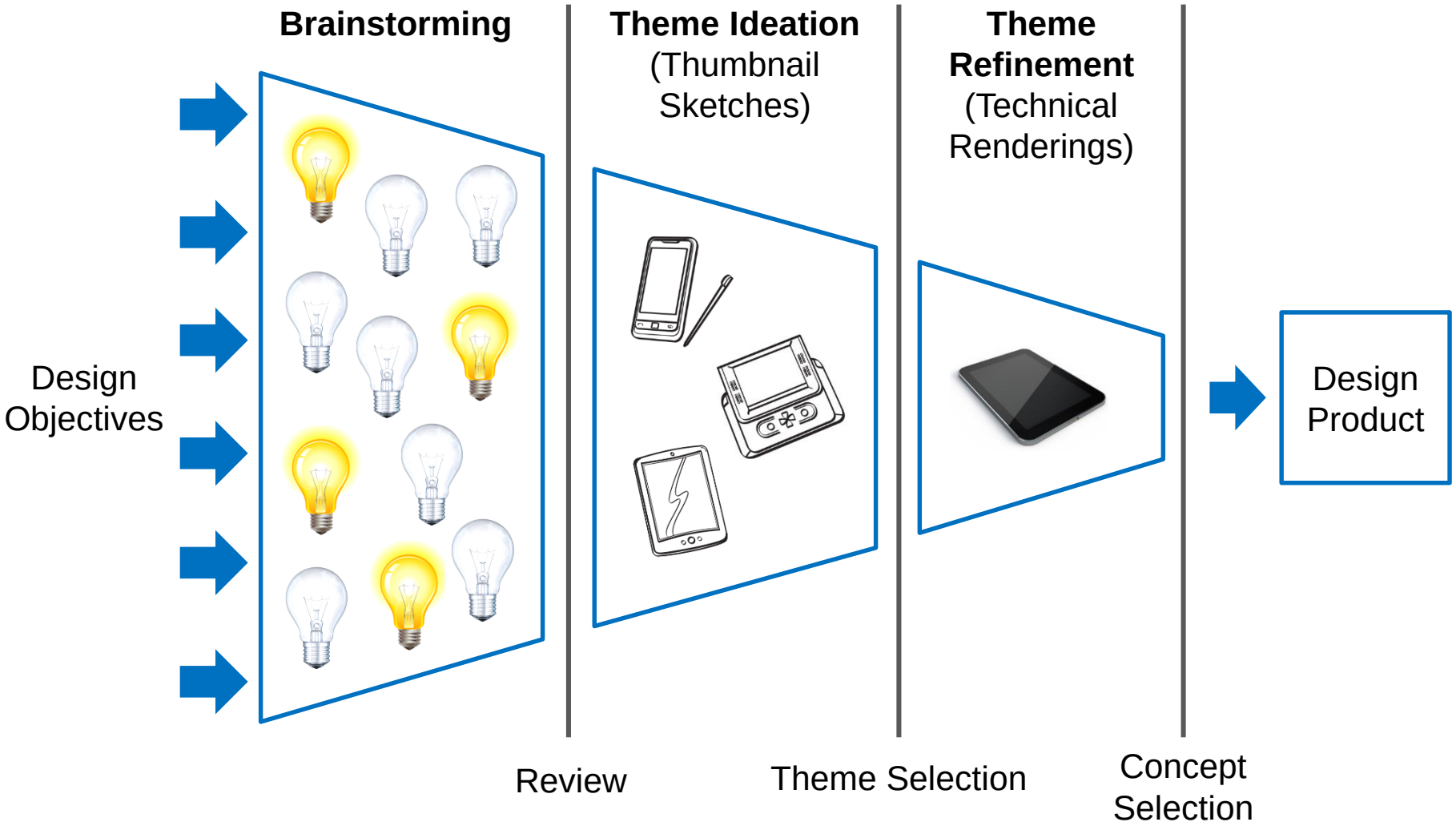
Conceptual Design

- Gated Process

  Controls the timeline and ensure selection



Conceptual Design Process

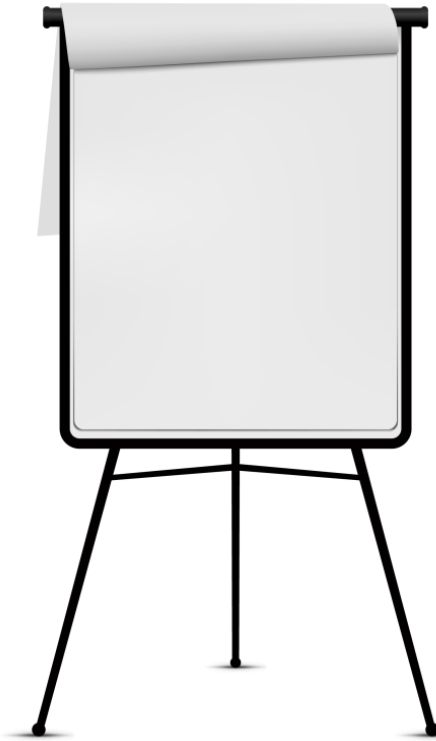


Design Objectives

- Reference Products
- Technical Specification
- Feature Requirements
- Already Captured Ideas
- Target Customer Profile
- Voice of Customer

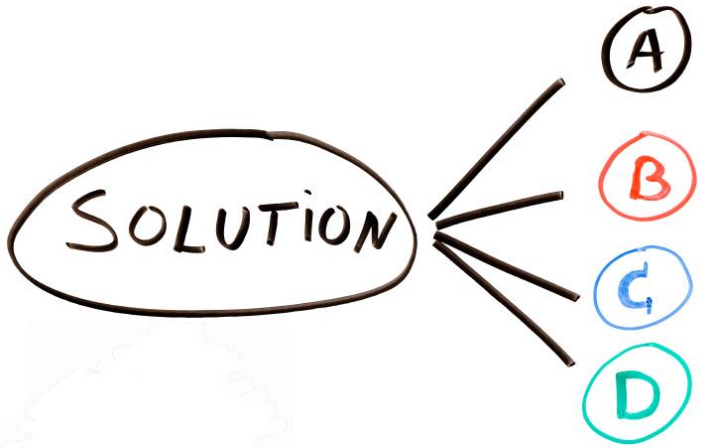
Brainstorming Phase

- Ensure Alignment to Design Objectives
- Group Based Activity
- Typically Structured Sessions
- No Idea is a Bad Idea
- Capture and Group Results



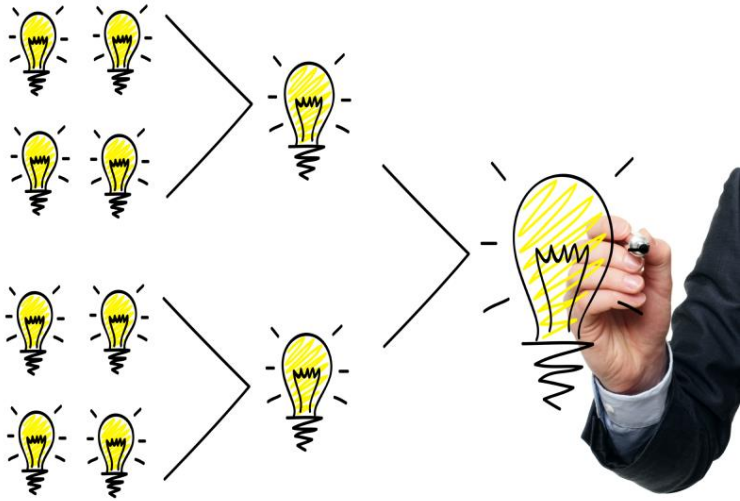
Theme Ideation Phase

- Leverage Brainstorming Results
- Reference Back to Design Objectives
- Create Multiple Theme Thumbnail Sketches
- Types of Themes Created
  - Most obtainable
  - Stretched design
  - Blue sky design



Theme Refinement Phase

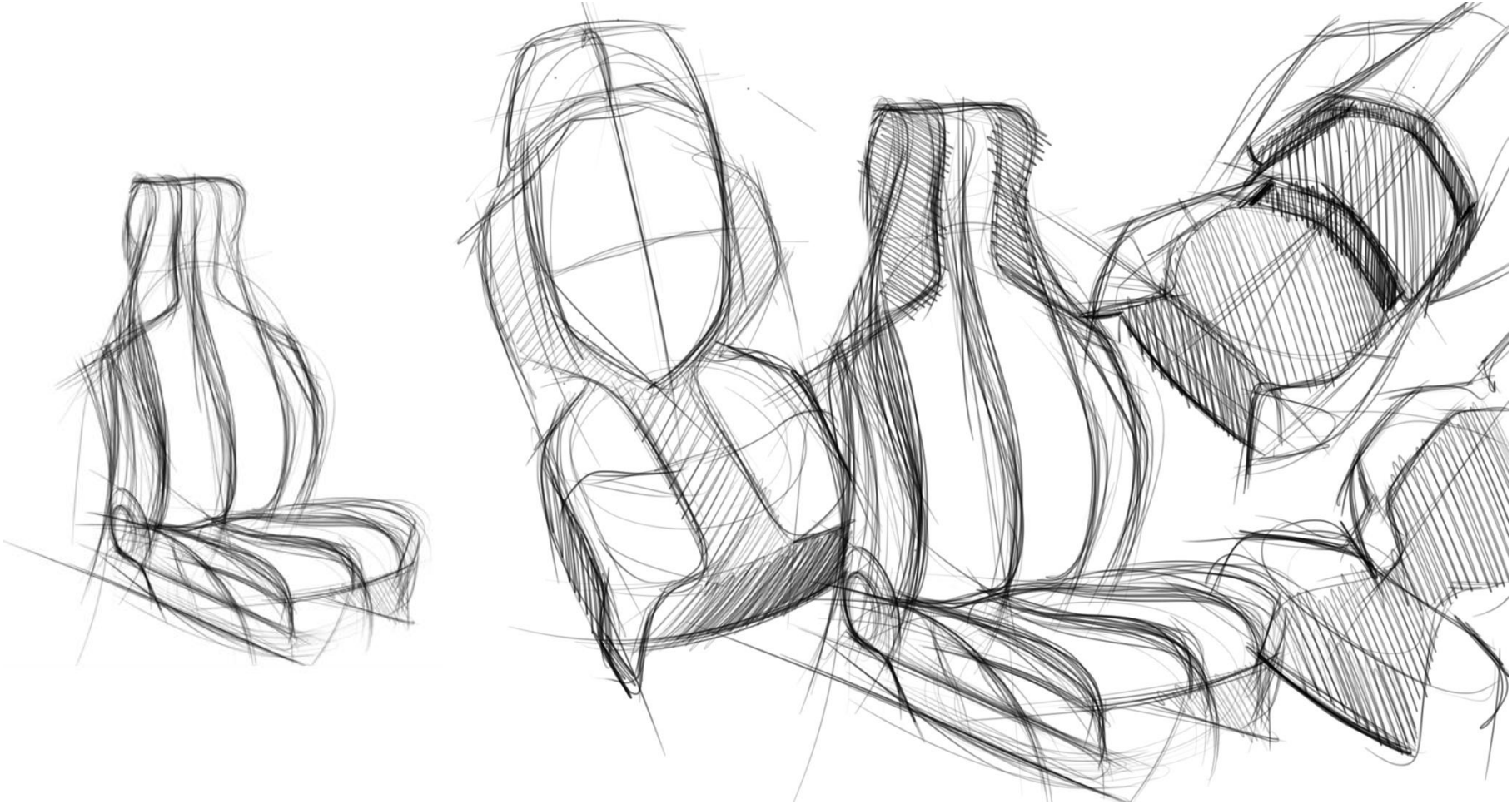
- Leverage Aspects of Multiple Themes
- Technically Complete
- Complete Presentation of Design
- Rendering Format



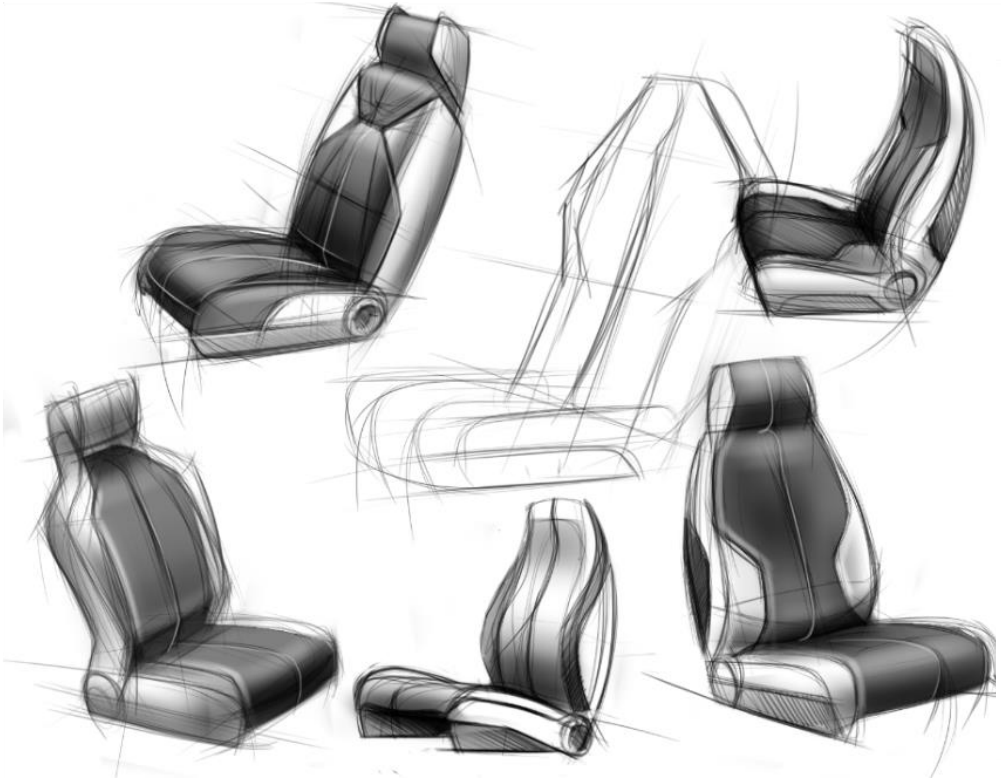
Explore Design Options

Automotive Seat Introduction

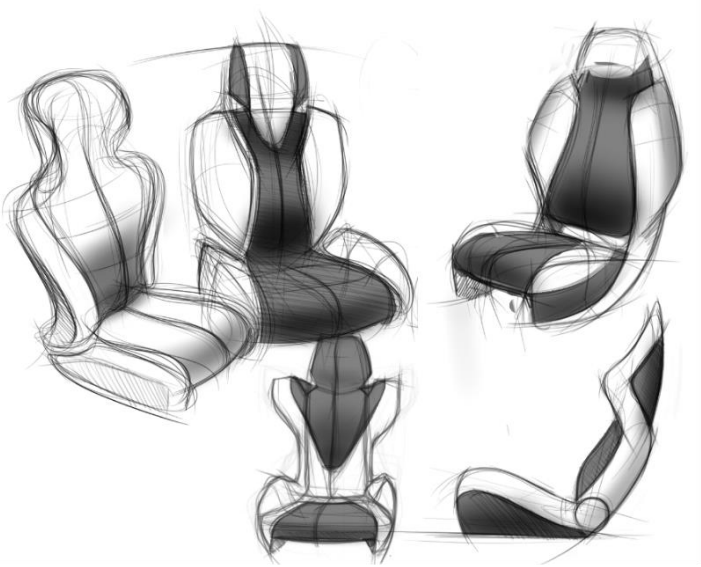
Concept Brainstorming

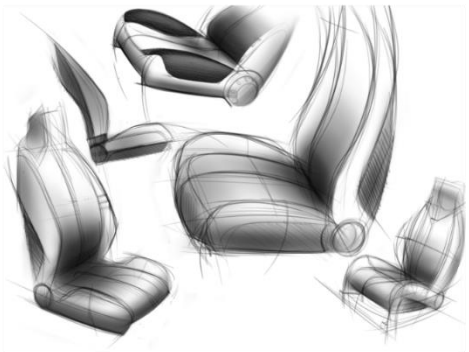


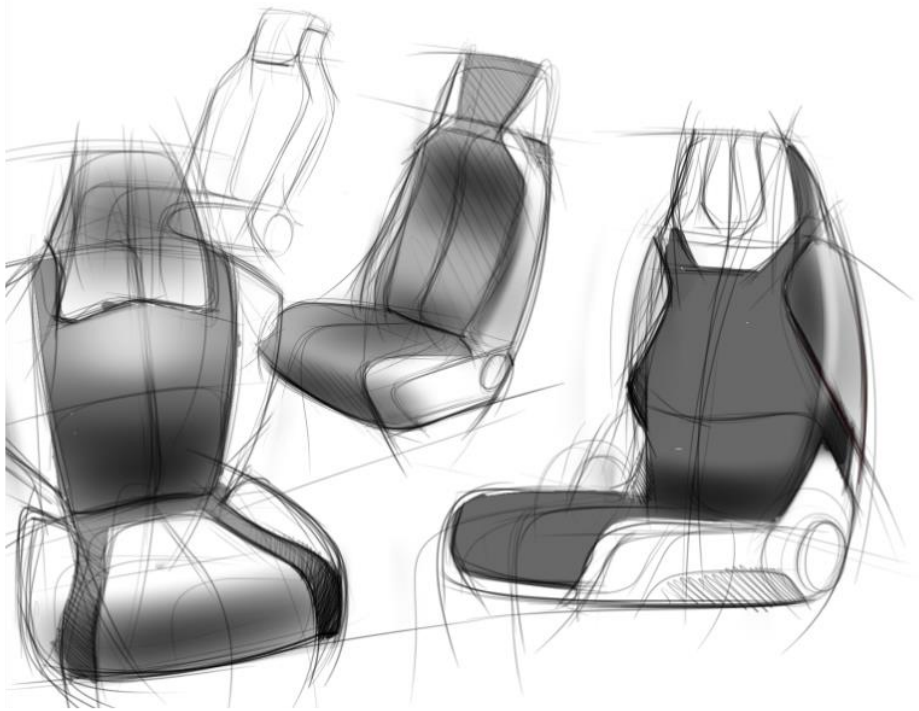
Design Expressions



Design Expressions (Thumbnails)





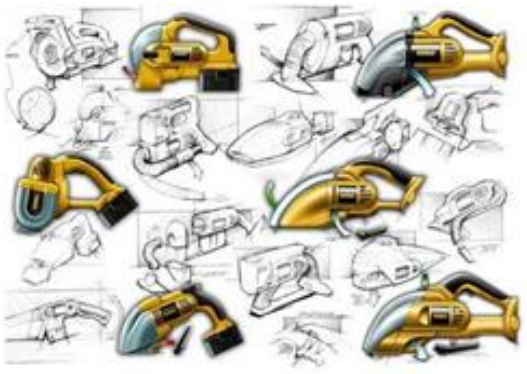


Theme Selection

Digital Sketching Benefits

- **Sharing & Collaboration**
  The digital file can easily be shared with others witho scanning

- **Productivity – Faster**
  Ability to sketch faster and make edits to explore more design options



- **Leverage Existing Assets**
  Use existing digital files like photos and CAD files for reference

- **Downstream Use**
  Reuse the digital sketch vectors and graphics for 3D model creation

Digital Sketching Input Devices

- **Mouse**
  All general computer mouse devices
- **Screen Pen**
  Wacom Cintiq devices are industry leading pen screen devices
- **Touch**
  Tablet based mobile or computer devices like the Apple iPad

CAD Survey Homework

- ✓ Assume that you are a CAD engineer in a company.
- ✓ Name the company and include what the company is producing.
- ✓ Survey three CAD software to buy one.
- ✓ Break down them: cost, customers, cons, pros, …
- ✓ Choose the best one and report why
- ✓ Include all references (websites, …)
- ✓ Your report should be up to 2 pages and typed. (**No cut and paste from web**)

Thank You for Attention !!

Any Questions