

Engine Design

Chapter 01: How Mechanical Engineering Design works?

by

Mohd Razali Hanipah
Faculty of Mechanical Engineering
mohdrazali@ump.edu.my



Chapter Description



- **Aims**

- To overview and the mechanical engineering design process.
- To overview mechanical engineers' 'toolbox'

- **Expected Outcomes**

- To understand and the mechanical engineering design process.
- To understand mechanical engineers' 'toolbox'.

- **Main Reference**

- R. G. Budynas, J. K. Nisbett, 2015. Shigley's Mechanical Engineering Design, Tenth Edition in SI, McGraw-Hill.

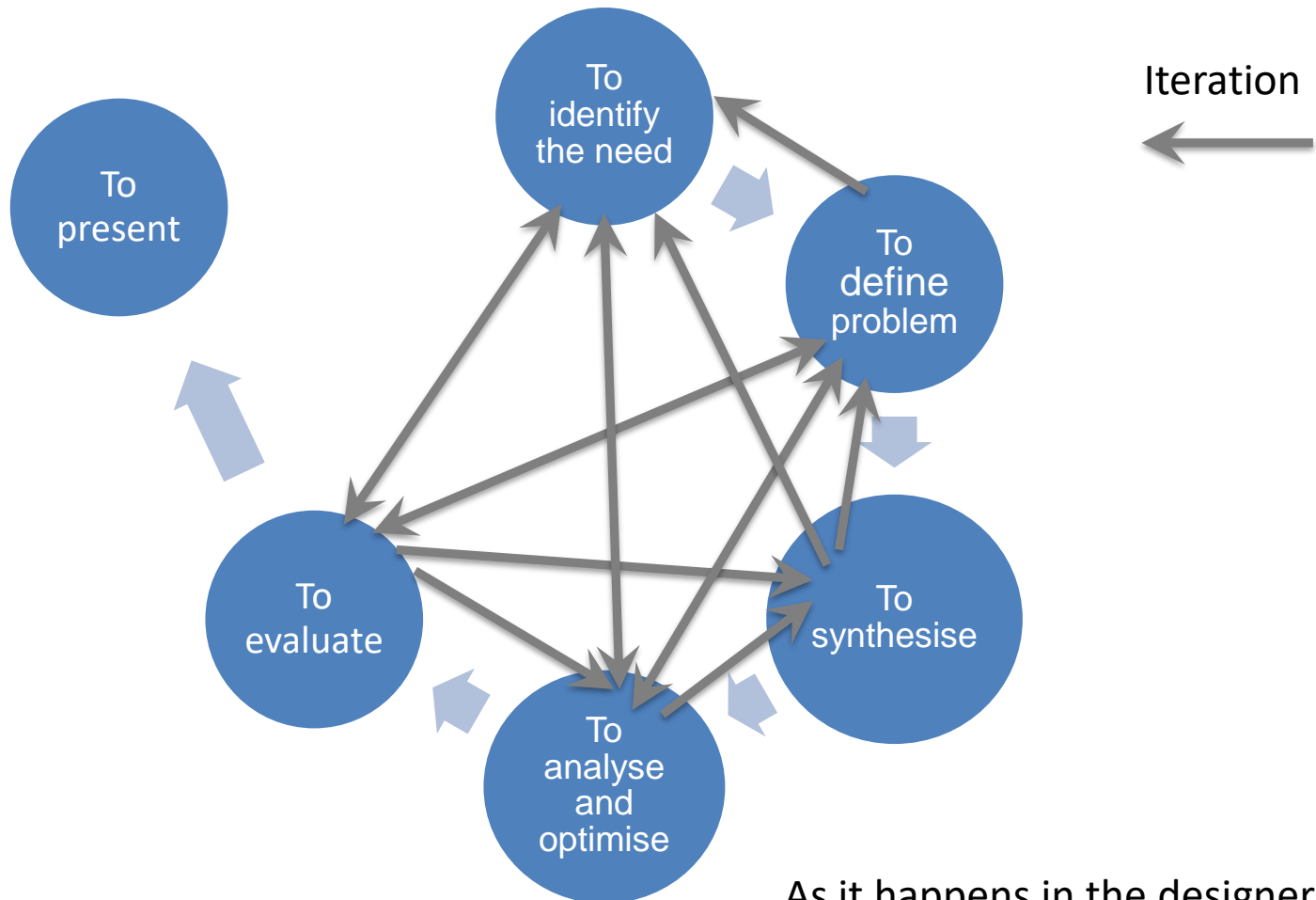


The Mechanical Engineering Design

- Design involves creative process of inventing and producing something for a specific purpose.
- Mechanical Engineering Design is to invent and produce mechanical components or systems for meeting specific functions.
- The mechanical design is iterative in nature, you will have to go around a circle!



The cycle of design



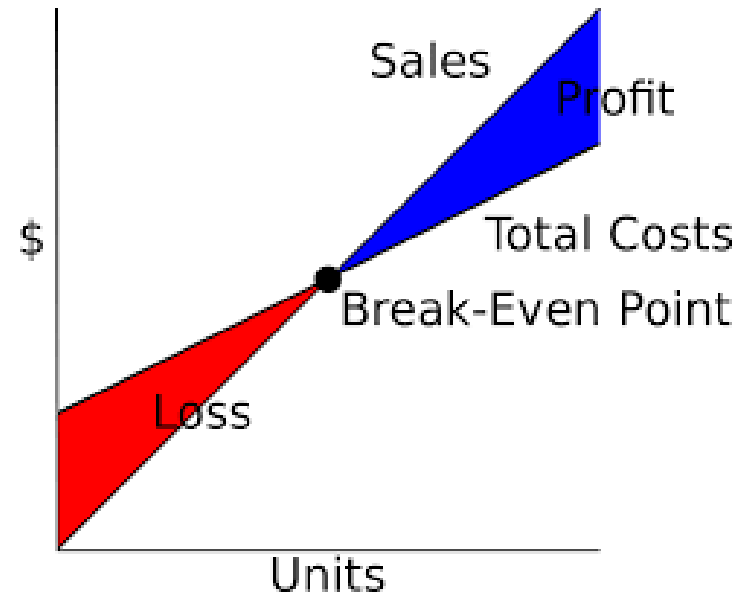
As it happens in the designer's mind!



The break-even

- A good design has to be cost effective and able to gain profits.
- It is critical to match the design with its initial cost and selling volume and price.

E.g.. A bolt designed for an aeroplane's wing which must sustain high stress requires higher initial cost but lower volume, hence must be set at higher selling price in order the design to break-even at **reasonable deadline**.



[The cost-profit break-even](#)

The units

- There are two common measurement systems:
 1. SI (meter, kilograms, litre)
 2. Imperial (pounds, inches, pint)
- It is essential to be consistent and precise on the measurements and dimensionings during design.



Strength and Stress

- **Strength**
 - An inherent property of a material or of a mechanical element
 - Depends on treatment and processing
 - May or may not be uniform throughout the part
 - Examples: Ultimate strength, yield strength
- **Stress**
 - A state property at a specific point within a body
 - Primarily a function of load and geometry
 - Sometimes also a function of temperature and processing



© Mohd Razali Hanipah (2017)

BSc Mechanical (Automotive), UTM, Malaysia

MSc Mechanical, UTP, Malaysia

PhD in Energy Technologies, Newcastle University, UK

mohdrazali@ump.edu.my