

Engineering Exploration

Semester I

Course Code
116U06L106

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K J Somaiya College of Engineering



Lecture 3

Last Lecture

Module 2 Engineering Design Process

- Graduate Attributes
- Domains of Projects
- Features of Engineering Project
- Engineering Design Process

Engineering Design Process

- Fundamental elements of the design process
 - Identify the Problem
 - Research the Problem
 - Develop Possible Solutions
 - Choose Best Solution
 - Construct Prototype
 - Test and Evaluate Solution
 - Communicate and Document Solution
 - Redesign

Engineering Design Process



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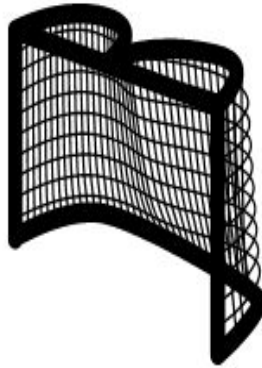
Engineering Design Process

- **Identify the Problem**

- Which problem are you trying to solve?
- Identify and describe the issue and the ultimate objective

- Consider:

- What do you want to accomplish?
- What are the requirements?
- Are there any limitations?
- Who is the customer?



Engineering Design Process



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Engineering Design: Key Concepts

- **Research the Problem**

- Collect all information pertinent to the problem:
 - Is the problem is real and accurate
 - Is there is a really need of new solution or has the problem is already solved
 - What are the existing solution to the problem
 - What is the wrong with existing solution
 - What are the right way to solve the problem
 - What are companies who are working on the same problem
 - What are economic factors governing the solution
 - How much people will pay for the solution

Engineering Design Process

Develop Possible Solutions

- Brainstorm
- Be creative
- Think outside the box
- Multiple solutions to the same problem



● Choose Best Solution

- Analyze design solutions based on the following factors:
 - Functional analysis – will it function the way it should?
-

Engineering Design Process

Choose Best Solution (Contd...)

- ◆ Ergonomics/ease of use – how easy/hard is it for humans to interactions with design?
- ◆ Safety – is this a safe design?
- ◆ Mechanical/Strength Analysis – will the mechanical components hold up during operation?
- ◆ Electrical System Analysis – how about the electrical components?
- ◆ Manufacturability/Testability – Can the design be made and tested with resources at hand?



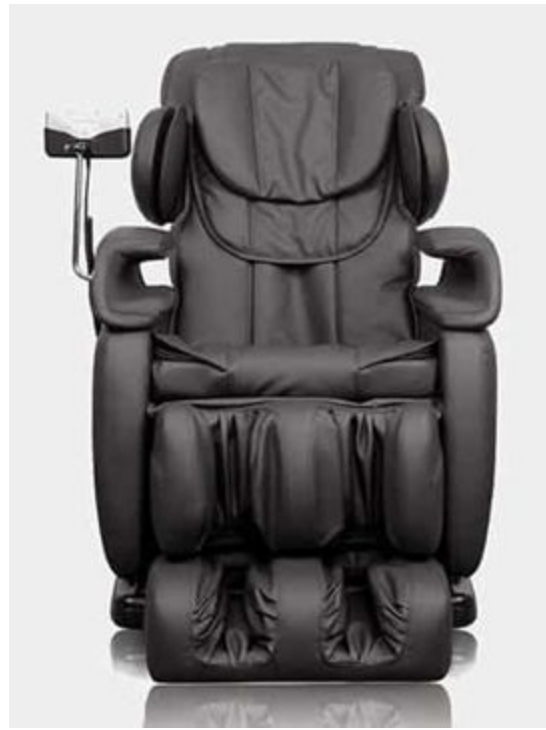
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Engineering Design Process

Let us design a CHAIR



TV Remote Control and Mobile phone holder



VS.



Engineering Design Process

- **Construct Prototype**

- ◆ Prototypes may not be fully tested or may not work or operate as intended
- ◆ Purpose: Test the design under solution under real Conditions

<http://www.youtube.com/watch?v=yyZtBYG0QOg>



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Engineering Design Process



Gaming Chair | Tinkercad
tinkercad.com



Gungstol- Rocking chair | Tinkercad
tinkercad.com



Dining Chair (arm) | Tinkercad
tinkercad.com



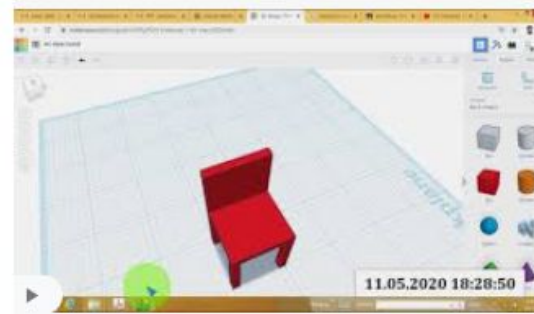
Ergonomic Chair | Tinkercad
tinkercad.com



Solid Cylinders, TinkerCad Tutorial ...
youtube.com



simple chair | Tinkercad
tinkercad.com



TINKERCAD CHAIR DESIGN - YouTube
youtube.com



My 3D Chair Design | Tinkercad
tinkercad.com

Engineering Design Process

- **Test and Evaluate Solution**
 - Design tests to tell you the following:
 - What works?
 - What doesn't work?
 - What can be fixed?
 - What has to be redesigned?

Engineering Design Process

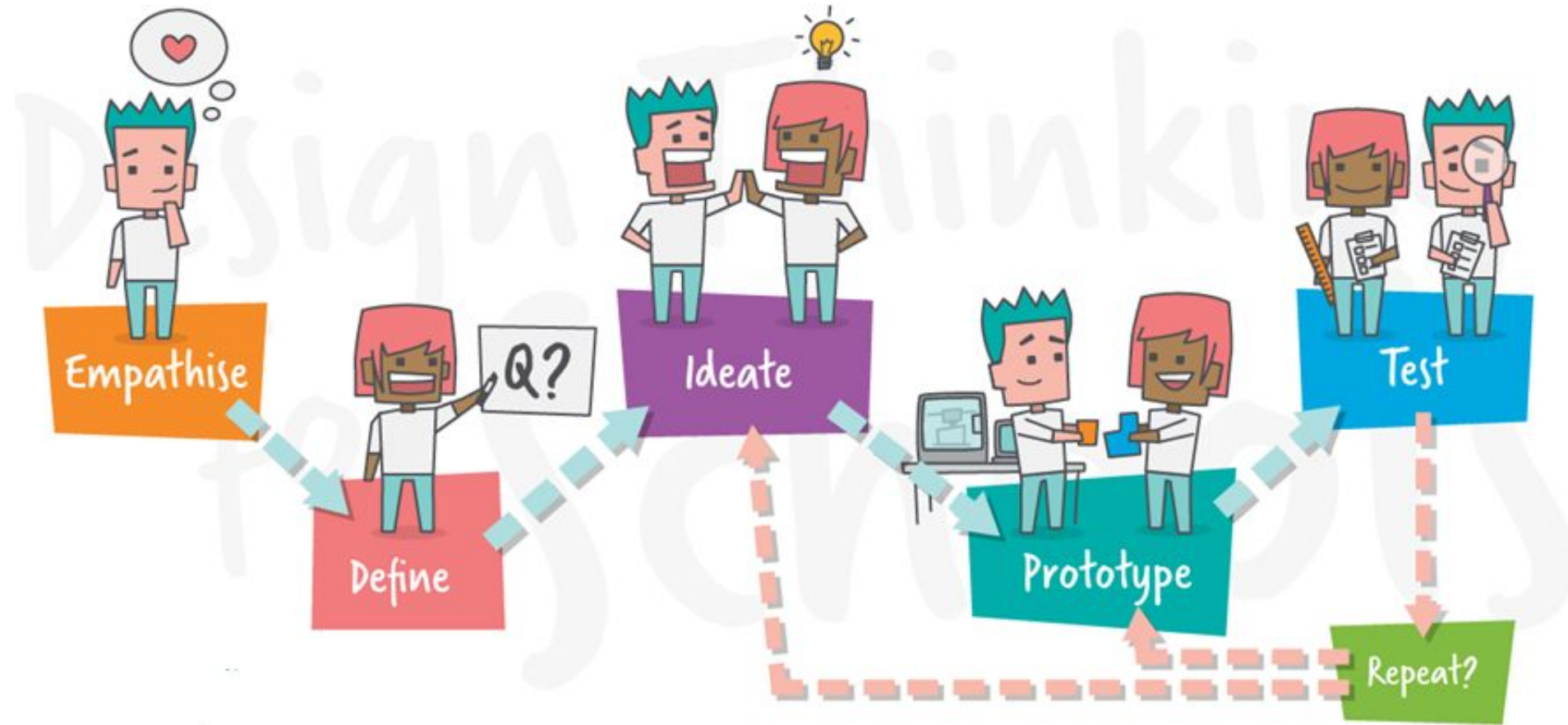
- **Communicate/Document Solution Performance**
 - Record:
 - Details of design
 - Manufacturing methods
 - Testing results
- **Redesign**
 - Design is an iterative process!
 - Redesign solution based on results

Examples

List few examples (Product/services) where you have seen innovations in past few years?

List few examples (Product/services) which was failed in last few years?

Engineering Design Process



Engineering Design Process: Define 5 Ws

- Who is the client and target audience?
(Size, nature, characteristics)
- What design solution is the client thinking for?
(Product, service, web, video)
- When will the design be needed and for how long?
(Project timescales)
- Where will be the design be used?
(Media, location, country)
- Why does the client think a design solution is required?
- How will the solution be implemented
(Budget, tools)

Engineering Design Process

Example of Active Toy

- 1 Need Statement: **“Active Toy”**
2. Designers: **Group of the students**
3. Clients: **Toy Company**
4. Users: **Children**

In order to understand what client and user wants, designer needs to do the following

- Ask questions
- Brainstorming

Answers to those questions help the designer to establish **client’s objectives, identify constraints and establishing functions** in the initial phases of design

Engineering Design Process

Example of Active Toy

1. How will the toy be used (Entertainment / Learning)?
2. How much can it cost?
3. What age group of children is a targeted user?
4. What does active mean?
5. What other features is expected?

Identify client's objective

Engineering Design Process

Identify Constraints

1. What's the maximum weight that a toy can be?
2. What shape and materials can the toy be made of?
3. What can be the size of the toy?

Establish functions

1. How should the device interact with child?
2. What learning is expected for children?
3. What entertainment is expected for children?

Engineering Design Process

Brainstorming and basic literature survey

Observation and from Lit.Survey	Requirements
1. Based on the weight of other toys and the weight that a child can easily carry	The toy's total weight should not exceed 400 gms
2. A child starts identifying alphabets, numbers and colours beginning from 2 years	Toy most suitable for the age group of 2-4 years
3. Based on the cost of competing products in the market	Cost of the toy should lie within the range of Rs 300 to Rs 700

Engineering Design Process

Problem Statement

“Design a toy for 2 to 4 years children which is simple to operate safe and nontoxic. Cost of the toy should range between Rs.300/- to Rs 700/-. Shape of the toy should not have sharp edges and weight of the toy should not exceed 400 gms”

Engineering Design Process

Activity

Time given 10 min

- Within your Team Assign roles as Customer and Designer (half students each)
- Let the Customer group specify what is their need (some rational for making a product defining age group of customer)
- Designers should ask questions such that they will
 - Understand the desire
 - Identify functionality
 - Identify constraints