

Collaborative Engineering

Product Concepts



- Creativity, Creative People
- Barriers to Creativity
- Divergent Convergent Thinking
- Creativity Toolbox

OrthoCAD Lab, I.I.T. Bombay

Creativity



[Plato](#) (427 BC - 347 BC)

Necessity is the mother of invention.
[Imagination is the father.]



[George Bernard Shaw](#) (1856-1950)

You see things; and you say 'Why?'
But I dream of things that never were;
and I say 'Why not?'

*The reasonable man adapts himself to the world;
the unreasonable one tries to adapt the world to himself.
Therefore, all progress depends on the unreasonable man.*

Creative People

People considered 'creative':

- Artist (Painter)
- Fiction Writer, Poet
- Music Composer
- Sculptor, Architect
- Industrial Designer...



Creative People



EVERY CHILD IS AN ARTIST.
THE PROBLEM IS STAYING AN ARTIST WHEN YOU GROW UP.



Mental Blocks

- Barriers to creativity
- Develop over years
- Become a habit

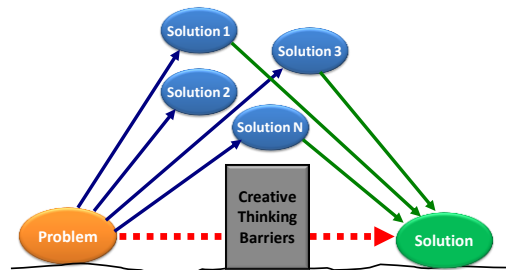
- Fear of criticism
- Practical-minded
- Hyper-specialization
- Centralized authority
- Distrust of intuition
- Mental stagnation



Overcoming Mental Blocks

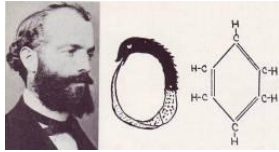
Diverging thinking
(Creative Hat)

Convergence
(Analysis Hat)



Convergent-Divergent Thinking

- **Information**
 - Define and search
- **Intensification**
 - Idea generation
- **Incubation**
 - Meditation, Off-focus
- **Illumination**
 - Serendipity



German chemist Friedrich Kekulé visualized the ring structure of Benzene in 1865

Creativity Tool Box # 1

- **Restate the problem**
 - Use thesaurus to replace every word in problem definition
 - **Example:**
 - "Remove water puddles formed on pavement after rain"
 - Synonyms of "remove":
 - Eliminate, take away, expel, clear, sweep, pour out, dry out, transfer, absorb, dredge, destroy, squeeze, pressurize, vaporize, disappear, vanish...



Creativity Tool Box # 2

- **Borrow ideas from other domains**
 - Engineering, Bionics, Personal Analogy, Fantasy..
 - **Example:**
 - "Remove walnut pulp without damage"



Creativity Tool Box # 3

- **Brainstorming**
 - Build-up on each other's ideas
- **Rules**
 - Small group size (4-8)
 - Adequate time (20-30 min)
 - Speed and quantity important
 - No evaluation during session



SUMMARY

- Inventions are required to improve standard of living
- Everyone is born creative; barriers develop over years
- Barriers can be overcome by divergent-convergent thinking
- Information → Intensification → Incubation → Illumination
- Simple creativity techniques:
 - ✓ Restate the problem / use thesaurus
 - ✓ Borrow ideas from other domains / nature
 - ✓ Brainstorm