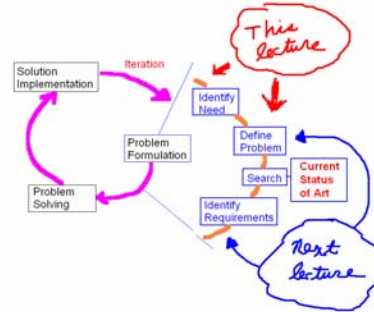


Problem Formulation and Design Requirement

- **Contents**

- Identify Needs
- Define Problems
- Current Status of Art
- Identify Requirements



- **Goals**

- Why need identification and problem definition are important
- Strategies for gathering information about a problem
- Develop a set of **requirements** for a problem (next week's lecture)

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Problem Formulation

- “The process of converting a dissatisfied situation into a well-understood problem”



- **Understanding** the problem, **Not finding solution** to the problem
- It's result?
 - **Need Identification** and **Problem Definition**
 - Clear set of **Requirements** that can guide the design process through to its completion

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Identifying Needs and Defining Problem

- **Identify Needs**
 - Dissatisfied situation
 - Need exists
 - Accept responsibility for corrective actions
 - “Attitude”?
 - Pioneer Mentality
 - Identifying a need and accepting responsibility for meeting it
 - Commit time, energy, and resources
- **No Rush to get a solution** after Needs Identified:
 - A wrong problem may be solved!
 - A symptom may be solved!
 - **A part** of the problem may be solved!
 - Or a partial solution is obtained

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The Blind Men and the Elephant

- Pillar? Rope?
Tree branch?
Hand fan?
Wall? Pipe?
- Parts vs. Whole
- Need of
communication

Problem Definition (Answer to “what is THE problem?”)

- Process of Defining Problem
 - Outline why the present situation is so dissatisfying
 - Asking questions about it
 - Comparing it to other situations that are familiar or where experience already exists
 - Gaining and understanding what caused it.
 - Then “*one sentence problem statement*” which includes every element
- **Needs from customer:**
 - “**Actually, we need help figuring out how to fit everything in our room... it’s way too small for all of our stuff,**”
 - **And your problem statement is?**

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“Problem”

- **Problem Definition:**
 - “We need to rearrange the contents of the room in such a way as to increase the efficiency of space usage and the convenience of item location”

Gathering Information

- Search for Current Status of Art
 - Patent Search
 - Web Search
 - Market Search
- Customer Interview
 - Customer Interview
 - Focus group interview
 - Objective is to define needs not to write out a solution
- Gathering Information from Within the Design Team
 - Draw insight from previous experiences
 - Focus on customer's needs NOT team's own needs
 - Use Creativity

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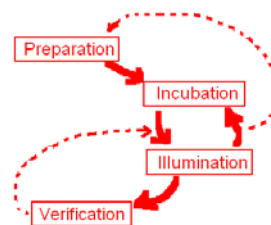
Creativity

- Unleashing Your Creativity- “How can one gain better access to his or her creative energy?”

Fill in the missing number.

5	6	7	8	9
52	63	94		18

- **Creativity** as Process
 - **Preparation:** Ground work. Background of the situation
 - **Incubation:** Taking time out. A rest period.
 - **Illumination:** Getting the answer (Aha!). The light bulb is on! Generate ideas.
 - **Verification:** Does the idea work? Confronting and solving the practical problems.



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Aha 4

- **Question:** How do you get down from an elephant?
- **Answer:** You don't! You get down from a duck.

Attributes of Creative People

- Discipline and Self-Confidence
- Adaptability and Resilience
- Conceptualization and Recall
- Flexibility and Fluency
- Visualization Ability
- Curiosity
- Comfort with Complexity
- Mental Agility, detachment, and playfulness
- Skeptical of Accepted Ideas
- Persistence and Capacity
- Informality
- Originality

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Approaches for Creative Solution

- Powerful approaches
 - Brainstorming
 - Creation of Affinity Diagram
 - Creation of Cause-and-Effect Diagram
 - Synectics
 - “joining together different and seemingly irrelevant elements”
 - Analogy (Personal, Direct, Symbolic, Fantasy)
 - TRIZ
 - The Theory of Inventive Problem Solving
 - Systematic method based on the hypothesis that creative innovations follow universal principles which can be followed.

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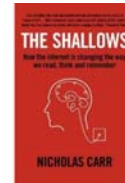
Brainstorming

- A group process
- Popularized but misunderstood –
 - Not just “sitting down and thinking of i
- A process with guiding principles
- Primary Goal
 - Generation of a large quantity of ideas
- Core Elements
 - No judgment of other people’s ideas is
 - No judgment of your own ideas is allo
 - Build onto the ideas of others
 - Welcome wild ideas
- People Involvement
 - Gather a diverse team of people
 - Designate a facilitator
 - Keep everyone involved

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But can 'I' give a storm to my brain?

- “I’m, therefore, I’m right”: Opinion by Jim Sollisch in Christian Science Monitor, July 21, 2011
 - The culture of ‘I’
 - Base our thinking and behavior almost exclusively on personal experience
 - “I experience, therefore, I am right”
 - Result: Lack of critical thinking
 - What accelerated Americans to become shallow thinkers? Internet’s segregation by their interests
- “The Shallows: What the Internet is doing to our brains” –by Nicholas Carr
 - “The Internet rewards shallow thinking: One search leads to thousands of results that skim over the surface of a subject.”
 - People skim on line; they don’t read.
 - And there is tangible evidence, based on studies of brain scans, that the medium is changing our physical brains, strengthening the synapses and areas used for **referential thinking** while weakening the areas used for **critical thinking**.



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Class Activity

- Form a Group (temporary)
- Define the needs and Identify the problem
 - “Individual Idea Generation (10 minutes)
 - Brainstorming (10 minutes)
- Writing and Submission (10 min)
 - Problem Definition --- 1 complete sentence

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“Wireless Guitar Amp”

- Jimmy Hendrix and Eric Clapton: “I want my guitar amp wireless-ed”
- FOCUS: Gathering Information from Within the Design Team
 - Draw insight from previous experiences
 - Focus on customers needs NOT their own needs
 - Use Creativity
- Then, write a 1-sentence problem statement
- Submit with all team member names