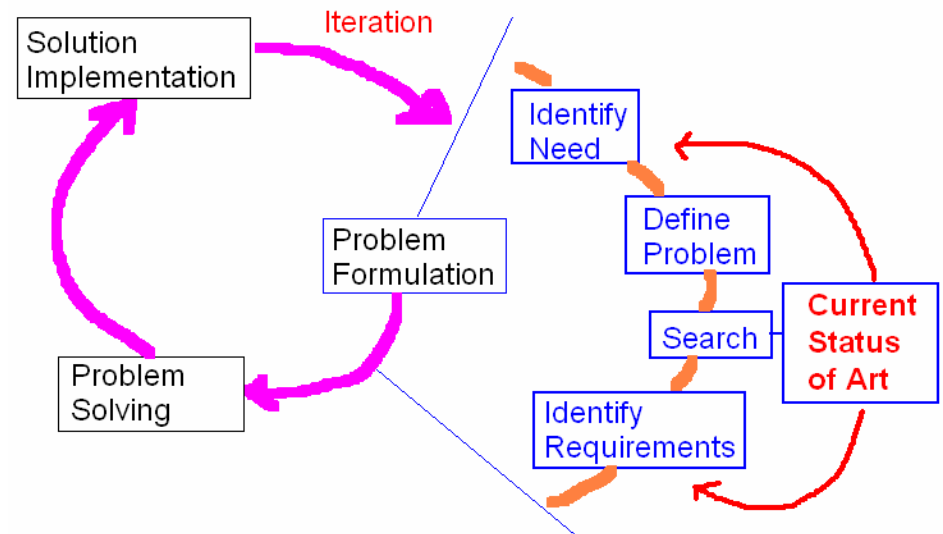


Problem Formulation and Design Requirement

- **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

Problem Formulation Stage

- “The process of converting a dissatisfied situation into a well-understood problem”
 - Understanding the problem to be addressed
 - **Not finding solution** to the problem
 - It’s result?
 - Clear set of **requirements** that can guide the design process through to its completion



Identifying Needs and Defining Problem

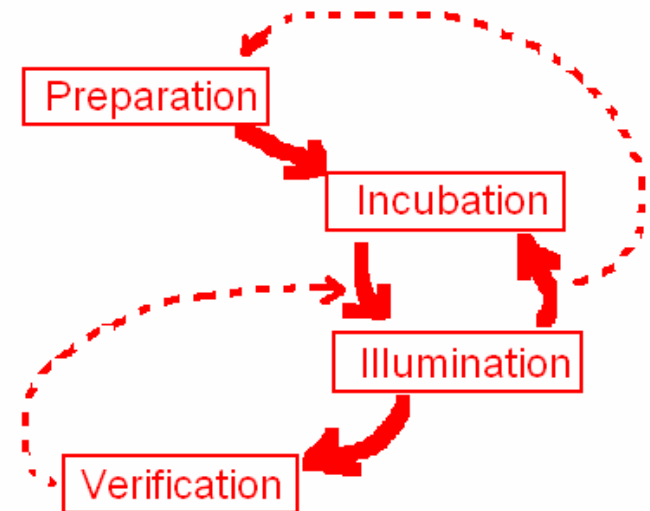
- **Identify Needs**
 - Pioneer Mentality
 - Identifying a need and accepting responsibility for meeting it
 - Commit time, energy, other resources
 - Take risks
 - Willingness to adapt to situation and use available resources
 - Agent of change
- **Search for Current Status of Art**
 - Patent Search
 - Web Search
 - Market
- **Defining Problem -No Rush to get a solution** after identifying needs:
 - A wrong problem may be solved!
 - A symptom (a clue about the problem) may be solved!
 - A part of the problem may be solved!
 - **Powerful approach?**
 - **Brainstorming**
 - **Creation of Affinity Diagram**
 - **Creation of Cause-and-Effect Diagram**

Side Bar-Brainstorming

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

Fill in the missing number.

5	6	7	8	9
52	63	94		18

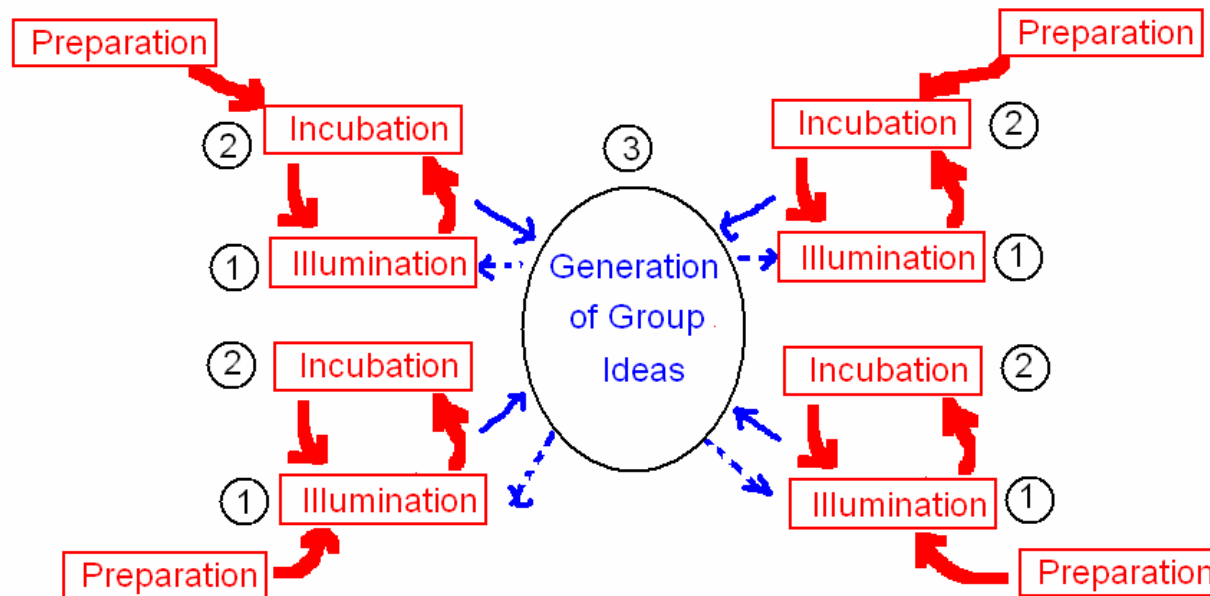


Side Bar - Brainstorming

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

Side Bar - Brainstorming

- Team Idea-generation Strategy
 - Illuminate the first time individually: “generate ideas”
 - Incubate: “set the problem aside”
 - Presentation of individual ideas and build on them in group brainstorming
 - Incubate
 - Generate ideas as a team, and cycles of incubation-illumination- until....



Side Bar - Attributes of Creativity

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

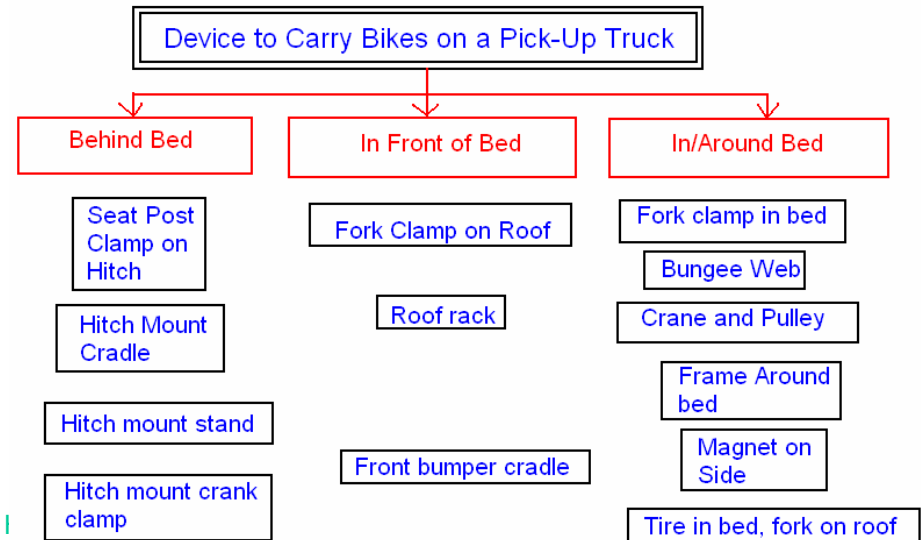
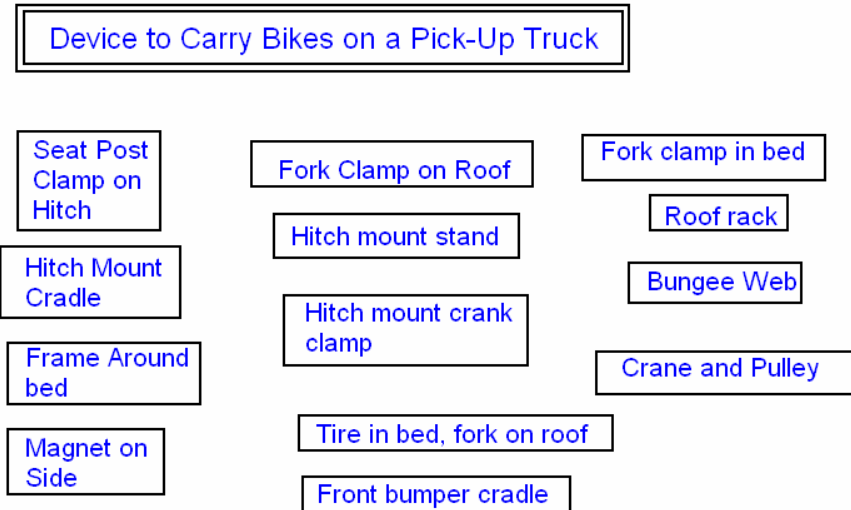


Side Bar - Attention-Directing Tools

- Affinity Chart
 - Team has a big list of ideas (after brainstorming) and is not sure what to do with it
 - Grouping similar ideas into **categories**
- Fishbone Diagram
 - Team wants to identify **causes** for a problem
 - Examples:
 - What are all possible safety issues with the design?
 - Why are meetings always so unproductive?

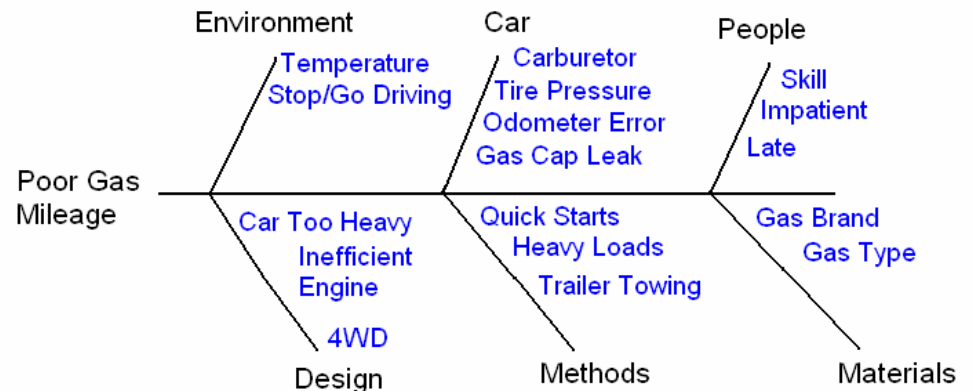
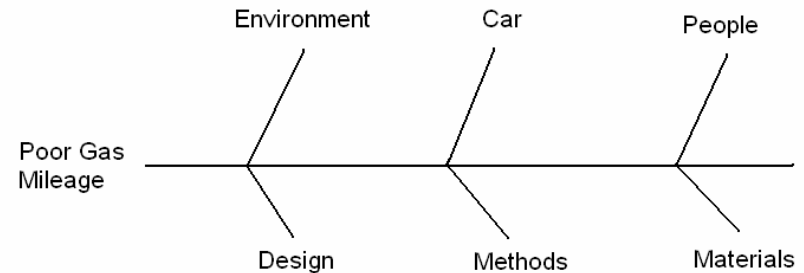
Side Bar - Affinity Chart

- Grouping Ideas into Categories
 - Generate Ideas
 - Sort the ideas
 - Create Headings
 - Draw an Affinity Diagram



Side Bar - Fishbone (Cause-and-Effect) Diagram

- The opposite of Affinity Chart
- Start from Categories and Ideas are found to fit within each category
 - Develop a problem statement
 - Construct an empty fishbone diagram with major cause categories identified
 - Generate ideas for each category
 - Identify most likely causes



Charles

Class Activity

- Form a Group (temporary)
- Define the needs and Identify the problem of “**Method and Idea of E-Waste Reduction**” by
 - Individual Idea Generation (5 minutes)
 - Brainstorming (20 minutes)
 - Affinity Chart **OR** Fishbone Diagram (10 min)