Lecture 2

Brainstorming

ECE398psc – Innovation and Engineering Design

https://courses.engr.illinois.edu/ece398psc/

Agenda

Guest Presentation:

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Review:

Assignment

Lecture:

Brainstorming

Activity:

Brainstorming

Review: Definition of engineering includes design

"Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind."
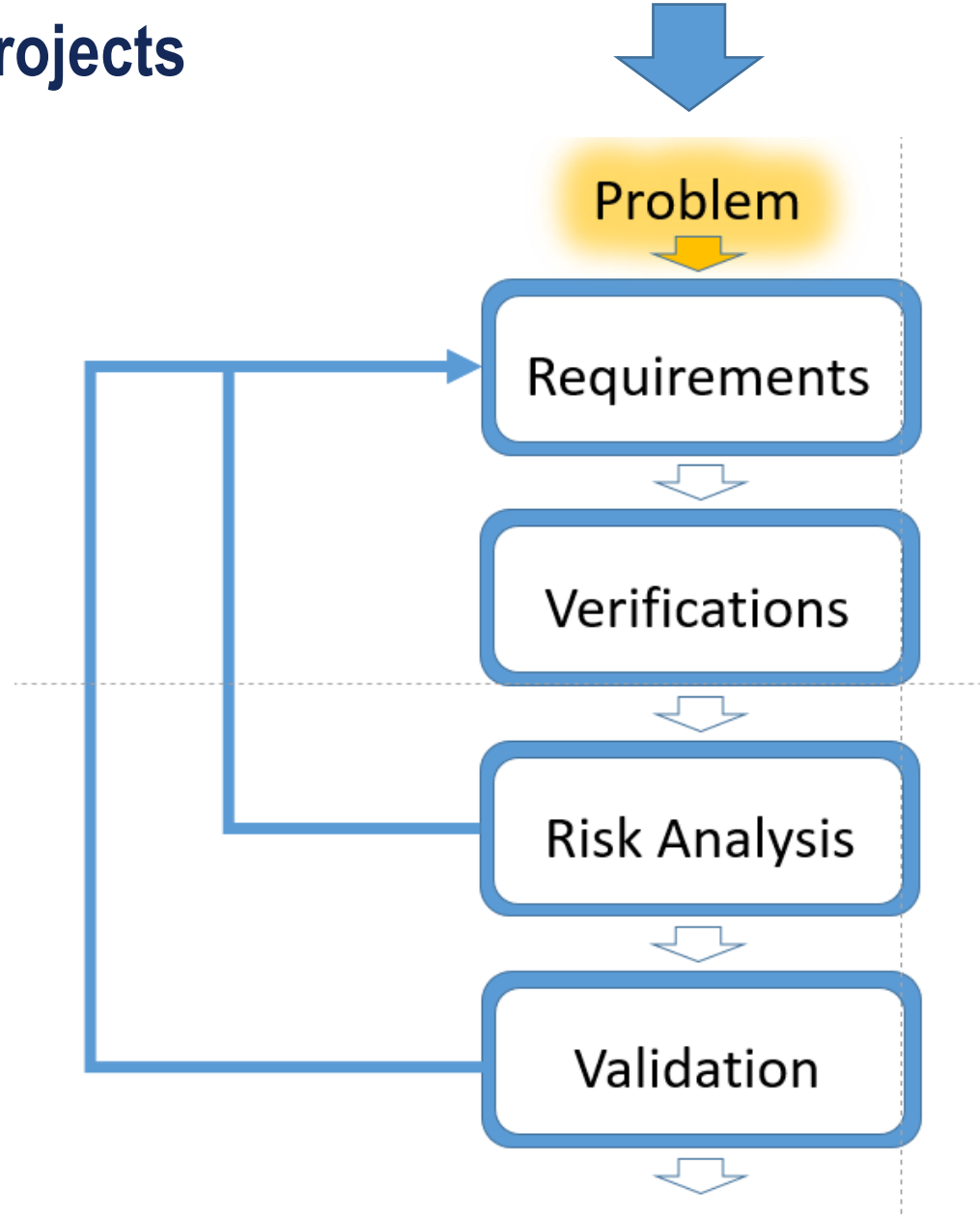
Note: UIUC is accredited by ABET.

Review: Introduced engineering design
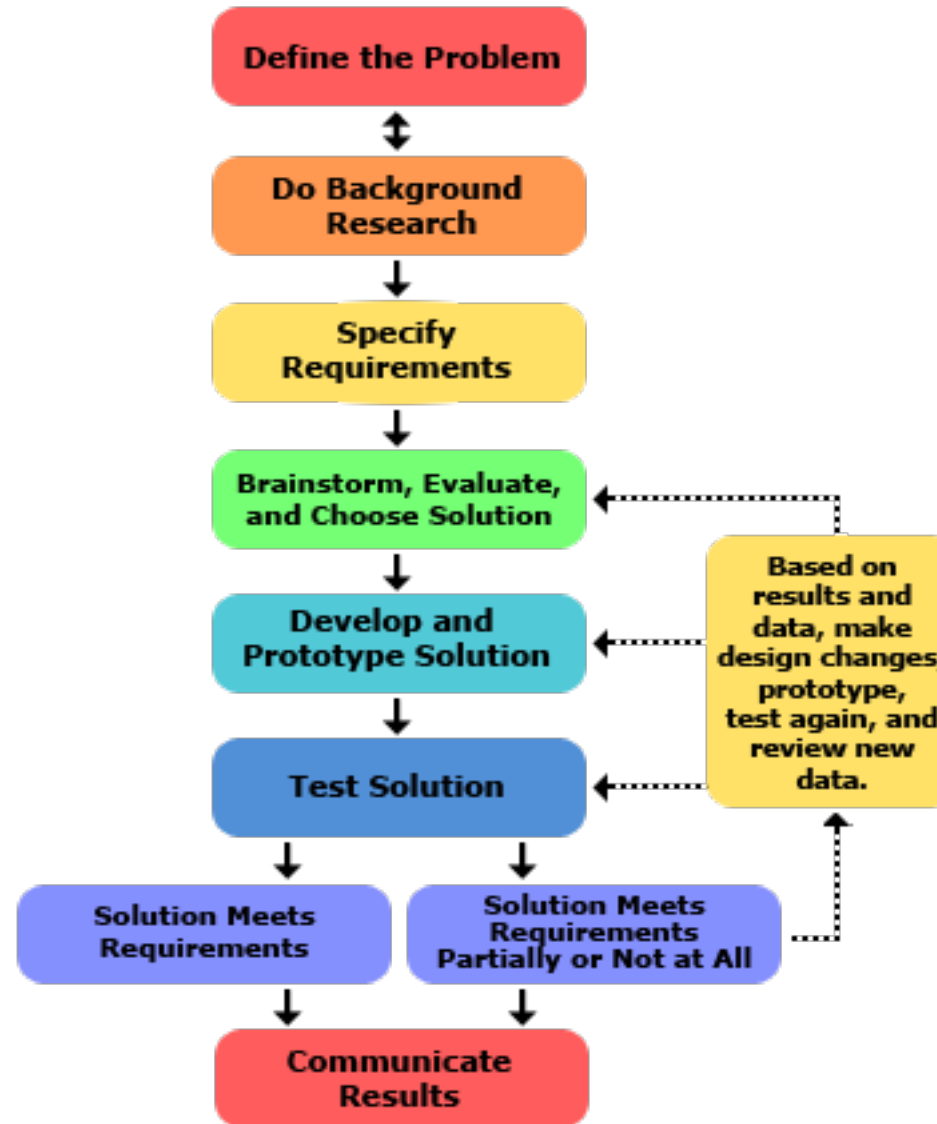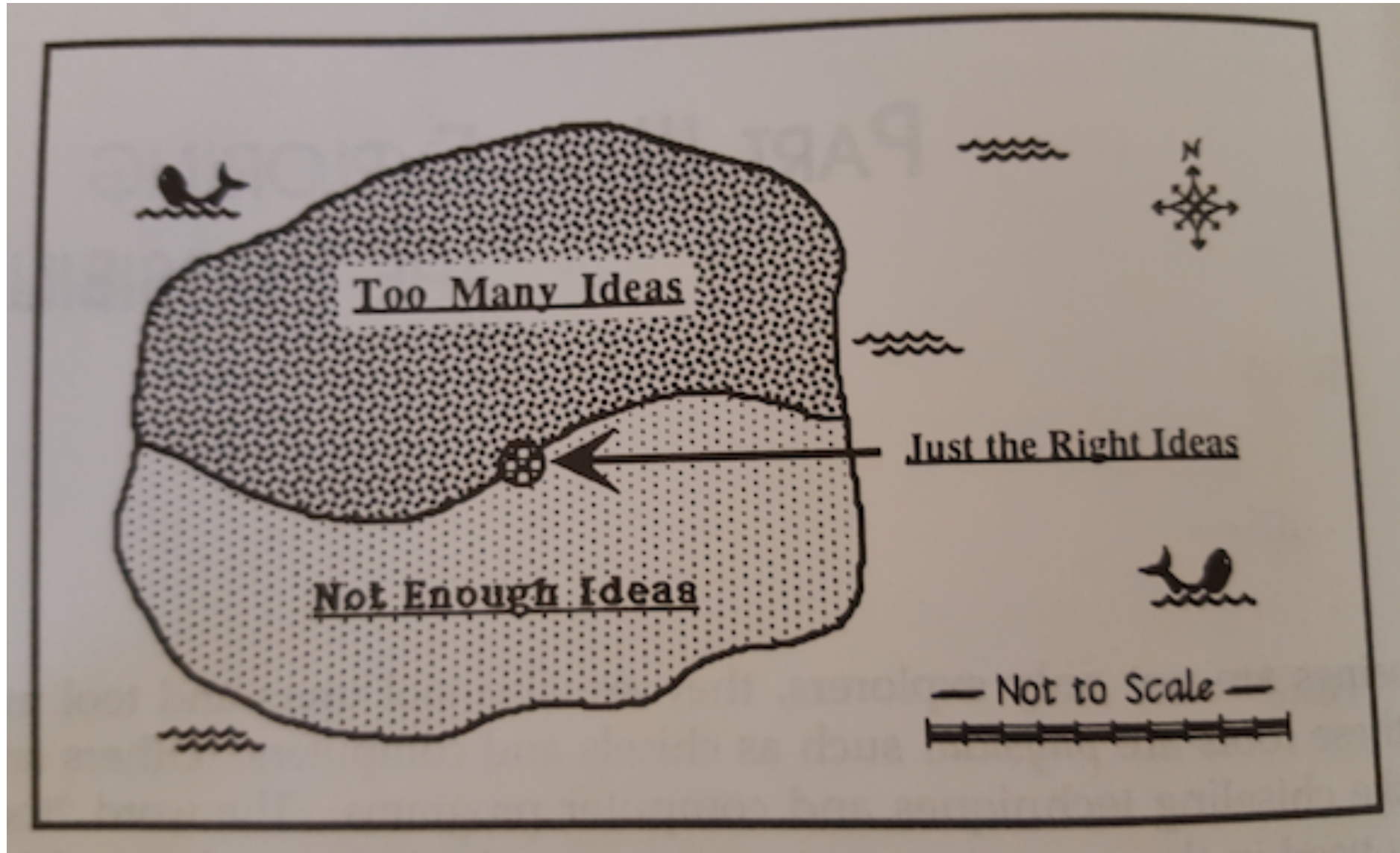
Problems vs. Projects

PROJECT SPACE

Exploring the possibilities…

- Humans are toolmakers.
  - Moving
  - Looking
  - Recording
  - Analyzing
  - Deciding

- Today we are going to talk about tools for ideation.

Example Example from: "Exploring requirements – quality before design" – Weinberg and Gause

The "jungle of ideas"

Example Example from: "Exploring requirements – quality before design" – Weinberg and Gause

Categories of ideation tools

- Three rough categories
    1. Tools that help you generate more ideas
    2. Tools that help you eliminate some ideas
    3. Tools that tell you where you are

- Note: Today we will consider the first two categories, third category will be covered during "block diagrams" in a few weeks.

Example Example from: "Exploring requirements – quality before design" – Weinberg and Gause

Meetings for Ideation

- Ideas should be discussed across team members.

- If you are going to hold a meeting, it should have a specific purpose.

- Canonical idea generation meeting is known as "brainstorm".

http://www.printwand.com/blog/media/2012/01/Naming-A-Product-8-Keys-For-Brainstorming-Your-Ideas.jpg

Brainstorm

- Let's define it!

Merriam-Webster
"a group problem-solving technique that involves the spontaneous contribution of ideas from all members of the group; *also* : the mulling over of ideas by one or more individuals in an attempt to devise or find a solution to a problem"

https://www.merriam-webster.com/dictionary/brainstorming

History of Brainstorming

- Invented by Alex Osborne

- Osborne was in advertising at BBDO
  - BBDO currently employs more than 15,000 people

- In 1939, Osborne became frustrated with his team's inability to generate creative ideas

- Wrote about his ideas in the 1942 book "How to Think Up"

- Coined the term "brainstorm"

Brainblizzard

- Before we consider the brainstorm, let us consider the brainblizzard…
- Brainblizzard activity

Brainblizzard

- Before we consider the brainstorm, let us consider the brainblizzard…
- Brainblizzard activity

Brainblizzard

"They freeze your brain, bury you under mounds of snow, and leave you cold"
Gause and Weinberg

Brainstorming rules

- Recorder of ideas should not be the same as the session leader
- Osbourne established four rules
1. Criticism
2. Let imagination soar
3. Quantity
4. Mutate and Transform

Criticism

- NO criticism allowed
- Many ideas seem foolish at first
- You may want to keep meeting minutes private if you are worried about foolishness

Let imagination soar

- Wild ideas are awesome
- Fun is good
- If you need to, do things to reduce your inhibitions

Quantity

- Lots of ideas
- Set a time limit, use all of that time
- Pauses are OK, work through them

Mutate and Transform

- Bad ideas may be the basis for a good idea
- Combine ideas, take parts from one and add it to another
- Write everything down, put in place that it can be seen

Example Example from: "Exploring requirements – quality before design" – Weinberg and Gause

Criticisms of Brainstorming

- Research on effectiveness of brainstorming is mixed
  - Early ideas may constrain rest of session
  - Individual ideation may be more efficient, have people come up with ideas and then come together to discuss
    - May not be as well
  - May lead to social loafing
  - Be careful of people dominating the session
  - You can work around by?

# Reducing the number of ideas

- 5 ways to reduce the number of ideas
    1. Voting with a threshold
        - Everyone gets set number of votes
    2. Voting with campaign speeches
    3. Blending ideas
    4. Applying criteria
    5. Scoring or ranking

Some specific brainstorming methods

- Generating more ideas
  - Idea tree

- Reducing the number of ideas
  - Voting

- Exploring an idea further
  - Diving deeper
  - Reverse brainstorming

Example Example from: "Exploring requirements – quality before design" – Weinberg and Gause

The idea tree

- The high-level problem forms the trunk

- Try to identify the roots of the problem

- Be inspired by the roots to grow solution branches

Generating Solutions
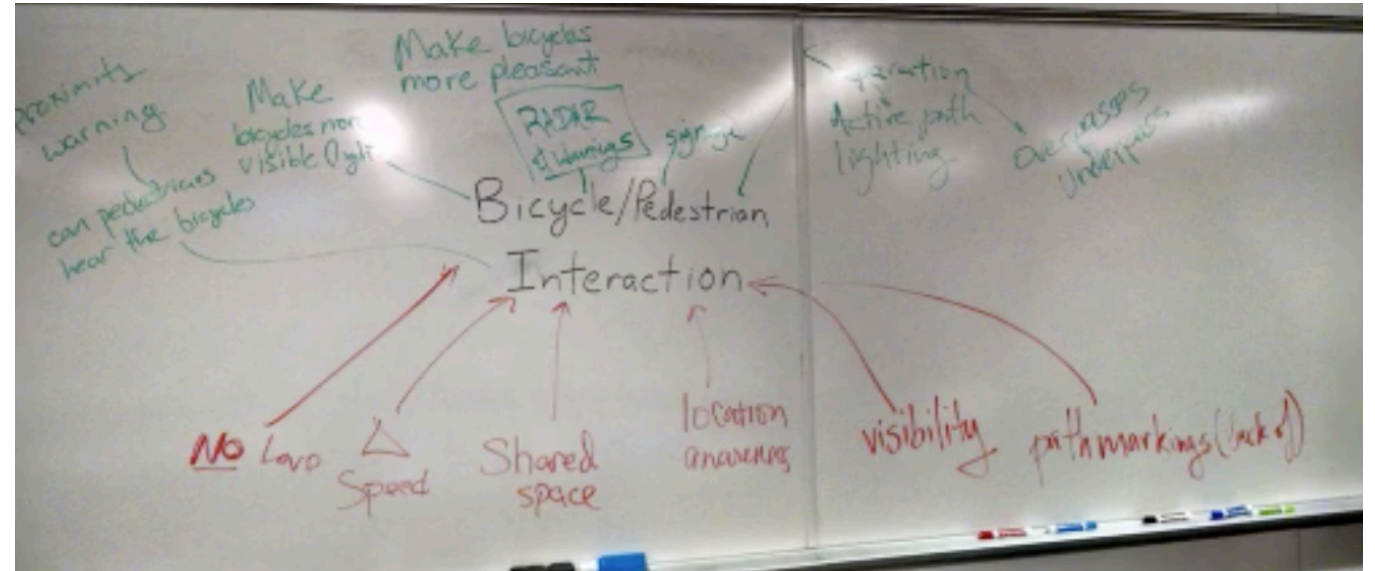
How reverse brainstorming works

- Come up with ideas as to how you could cause this problem or how you could make the product worse

- Reverse these ideas of how to make things worse into potential ways to solve the problem or make the product better

How voting works

- Deselect at end
  - 2 positive votes
  - 1 negative vote

Diving deeper into an idea

Post it notes can be used to clarify idea potential:

Yellow: Core idea

Blue: improvement or modification

Red: problem or challenge

Activity

Groups of 4-5
- Idea tree, top 5 ideas from project spaces exercise
- 5 minutes on roots, swap posters and groups
- 5 minutes on leaves, swap posters and groups, remove page
- 2.5 minutes on roots, 2.5 minutes on leaves, swap posters and groups
- 5 minutes reverse brainstorming
- whoever is in your group, do quad chart

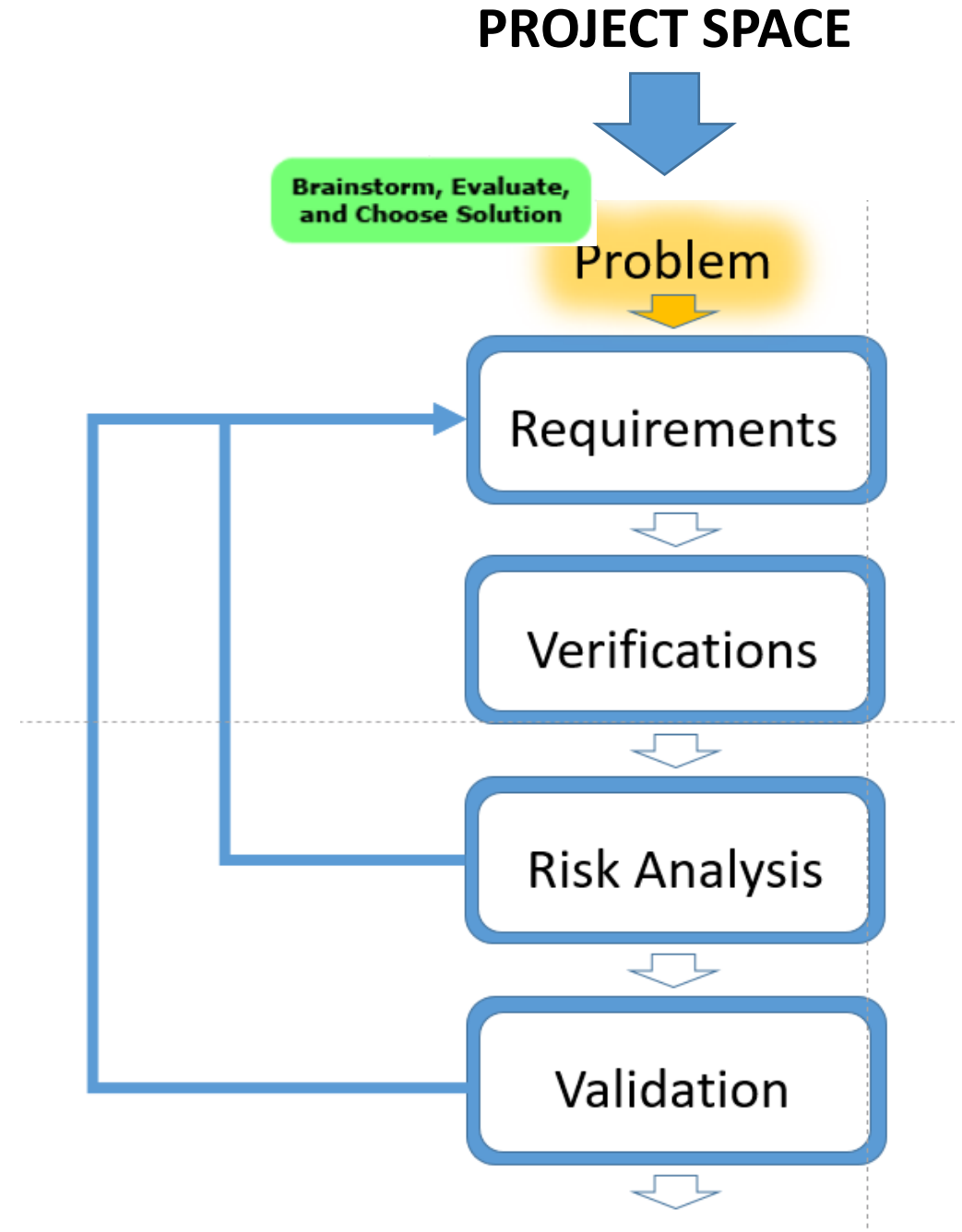# When to use brainstorming techniques?
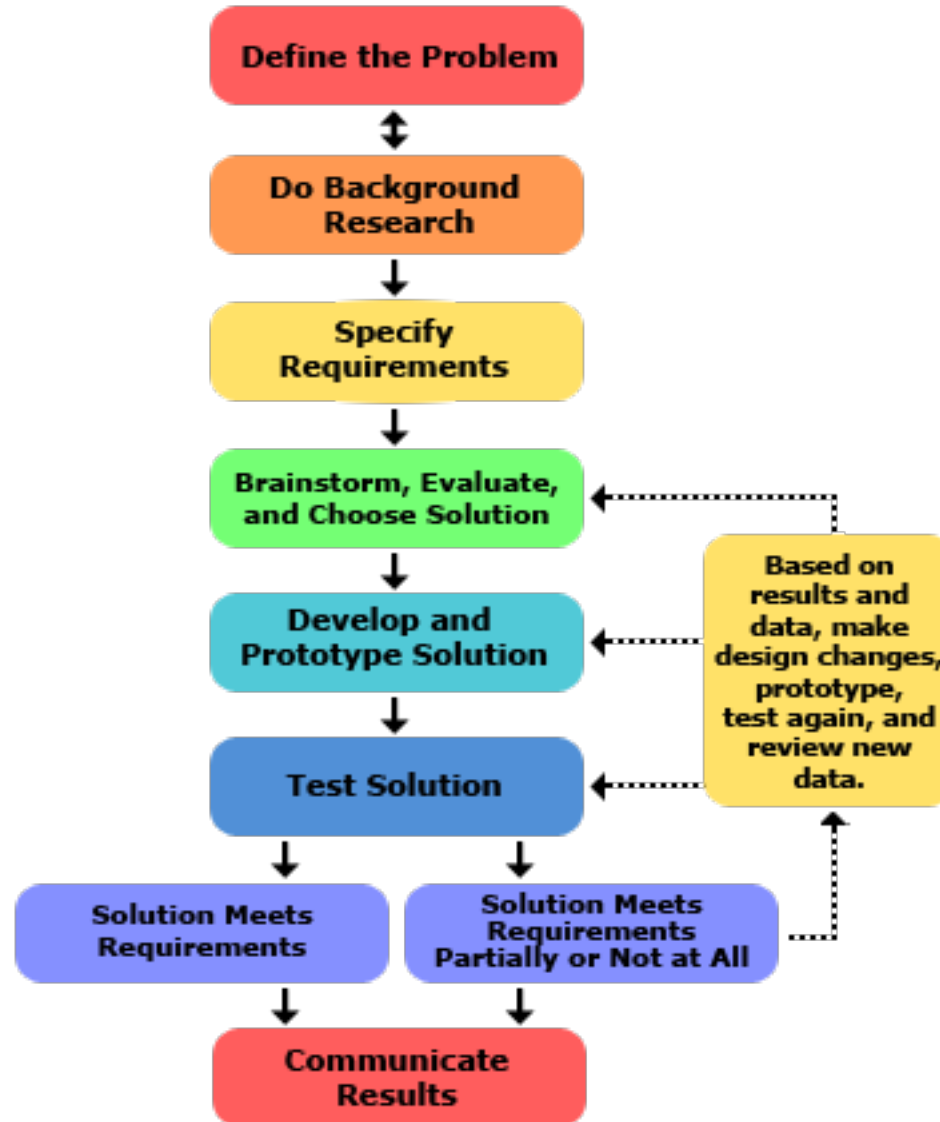
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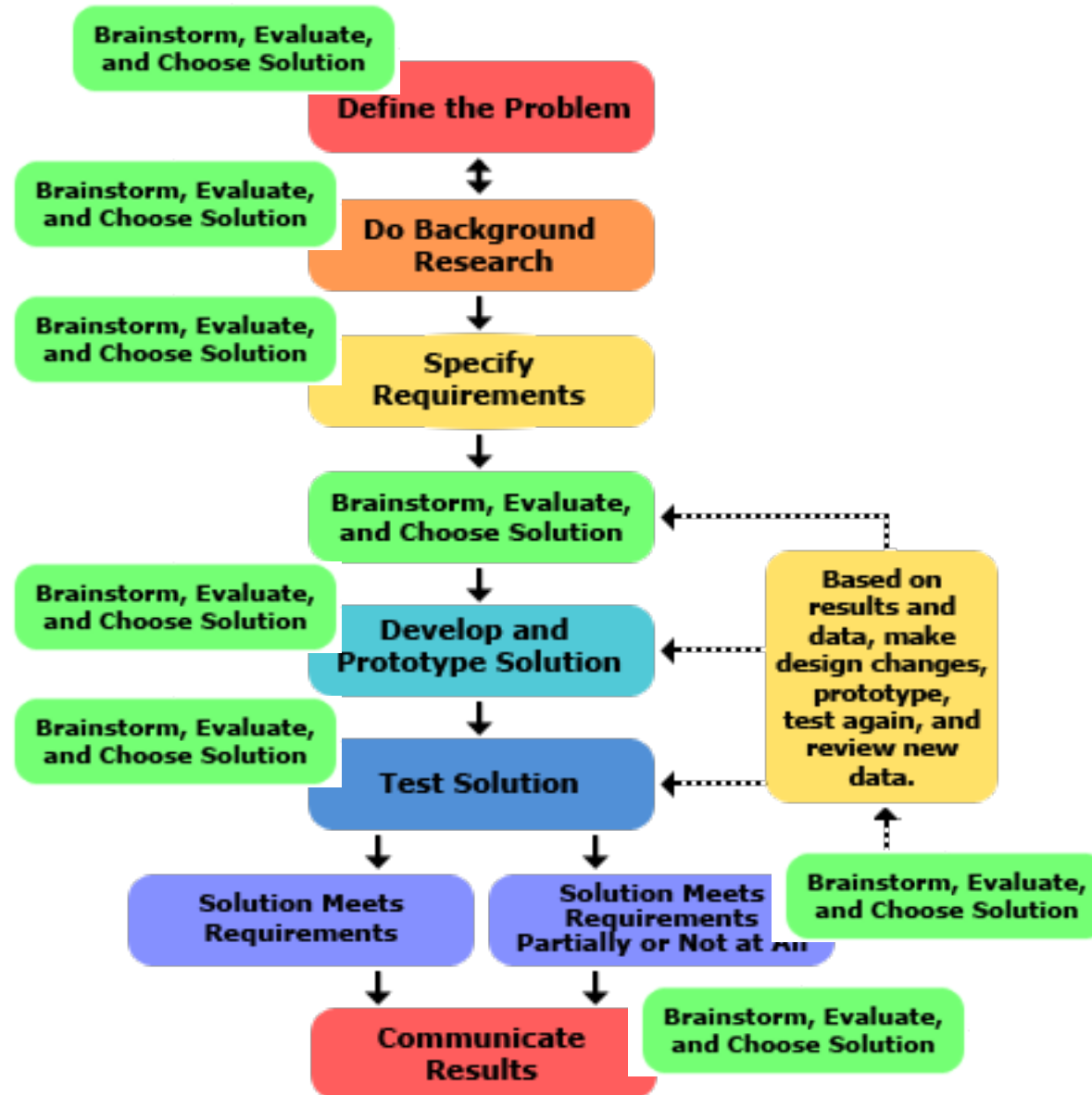
Brainstorming Problems

- We haven't yet come up with a problem…

- Last week assignment was to start thinking about project spaces.

- Today we will use brainstorming to identify potential problems within these problem spaces.

Brainstorm, Evaluate, and Choose Solution

Problem

Requirements

Verifications

Risk Analysis

Validation

Summarizing information: the quad chart

Problem Space	**Problems**
Solutions and Reverse	**Final Problem Statement**

Next time…

- Moving from a project space to a problem statement
- Writing a problem statement
- Crafting high-level requirements
- Reducing ambiguity   ; 4 credits

Reference

- Many of the quotes, ideas, and images from these slides are taken from:

"Exploring requirements
quality before design"
Gause and Weinberg