COMPLEXITY

Why do companies make decisions with imperfect information?

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Agenda

AM

- Complexity, Wicked Problems, and Clumsy Solutions
- Trash as Treasure
- Perceptual Anchors

LUNCH

PM

- Scenario Planning - EL Project work
- Stakeholder Mapping

Map of the Term

TACTICAL

Process Optimization

Decisions are based on ***how*** to make improvements

RISK

Forecasting

Decisions are based on ***what*** you're trying to optimize

INNOVATION

Creativity, Noticing

Decisions are based on ***what*** insights you can come up with

PHILOSOPHICAL

Fail Fast; Gain Experience

Decisions are based on ***why*** something should be done

What is Complexity?

From Latin *Com* “together” and *plex* “Woven”

- Complexity characterizes the behavior of a system or model whose components interact in multiple ways and follow local rules, meaning there is no reasonable higher instruction to define the various possible interactions

Complicated

- Latin *plic* “folded”

How complexity shapes our world

Complex behavior emerge out of simple rules.

- I know “Where the end ***might*** be”
- I will never know “Where the end will be ***1 second from now***”

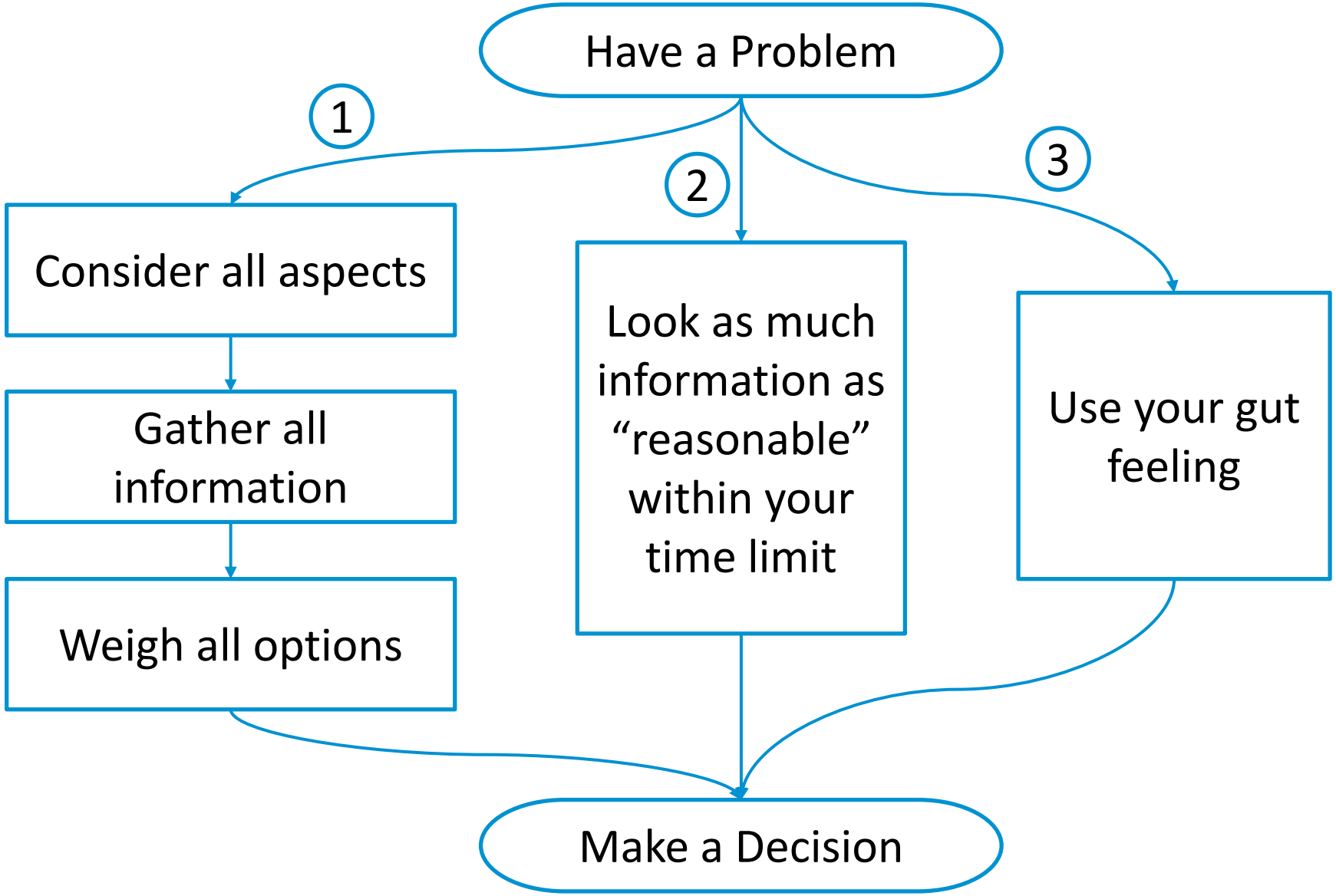
There is built-in uncertainty in this system

- Are society’s behavior simple or complex?
- Can we predict emergent behavior?

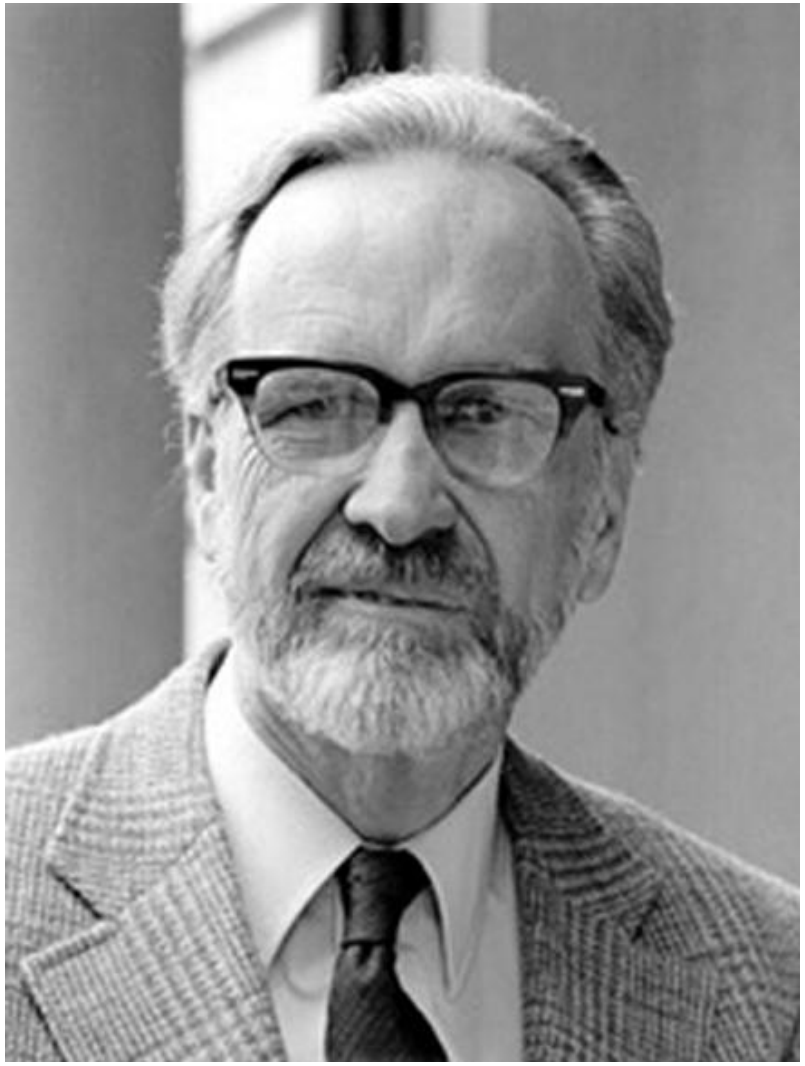
My informal terminology

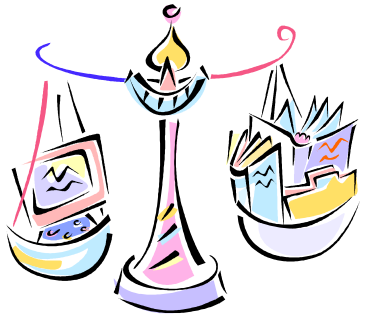
Hard Problems	Easy Problems	
A problem where we don't know if an answer exist…yet	**A problem where we know a solution exists**	**A problem where we know a solution *cannot* exists**
How do humans reverse climate change?	Creating a user interface for your app idea.	Building a Star Trek-like transporter.
Your EL's should be here.	Calculating the next largest prime number. (current largest $2^{77,232,917} - 1$)	There is no largest prime
"Unsolvable" problems for a variety of reasons.	*Can still be challenging to solve.*	*Don't need to waste time solving these*

How do you prefer to make decisions?



Technique: The Art of Muddling Through

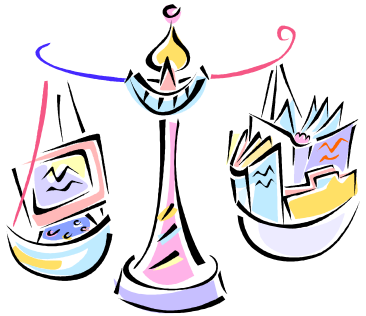




Why do policy makers mean well yet seemingly make poor decisions?

Incrementalism – making small changes instead of few, large jumps.

Technique: The Art of Muddling Through



1. Select Goal
2. Create a path based on information
3. "Good" is based on most appropriate means to achieve ends
4. Overcoming fear and making decisions with best available information
5. Re-examine results and process

Lindblom, Charles., *The Science Of 'Muddling Through'*, Public Administration Review, Vol. 19, pp. 79–88, 1959

Muddling works if you have a goal.

What if you don’t have a goal?

What if the goal is aspirational?

- Solve hunger?
- Eliminate poverty?

The Wicked Problem

Coined by Prof. Horst Rittel and Melvin Webber in 1973*

- ‘Wicked’ meant to be opposite of ‘Tame’
- Tame – Solvable, ie math, chess, puzzles
- Wicked – Problems that lack simplistic or straightforward planning responses

*Rittel H, and Webber, M. *Dilemmas in a General Theory of Planning* Policy Sciences 4 1973]

The 10 Characteristics

1. There is ***no definition*** of a wicked problem (defining wicked problems is itself a wicked problem).
2. Wicked problems ***do not 'stop'*** being problems.
3. Solutions to wicked problems are not true-or-false, but ***better-or-worse***.
4. There is ***no test of a solution*** to a wicked problem.
5. There is no opportunity to learn by trial and error.

   Every solution changes the problem.

The 10 Characteristics

6. Wicked problems do not have a describable set of potential solutions nor describable set of actions.
7. ***Every wicked problem is essentially unique***.
8. ***Every wicked problem is a symptom of another problem***.
9. The description of the problem is through a ***frame of reference***. Any proposed solution only meets the ***need of that frame***.
10. Planners are liable for the consequences of the actions they generate

Property 10: Planners are liable for the consequences of the actions they generate

Can you prevent unintended consequences?

1. There will always be unintended consequences.

2. ***Delaying an action*** or ***choosing to take no action*** is a decision itself.

3. Therefore, not taking action will have unintended consequences.

How should one approach unintended consequences?

Most problems we face are wicked problems

- **Ambiguity** of the definition of the problem

The Problem: NYC had 100,000 horses, generating 2.5 million pounds of manure per day. How would you solve this public health crisis?

Most problems we face are wicked problems

- **Ambiguity** of the definition of the problem
- **Temporary** as the problem keeps shifting

The Problem: “Pollution” is now considered to be Smog, causing cancer and asthma. How would you solve this public health crisis?

Most problems we face are wicked problems

- **Ambiguity** of the definition of the problem
- **Temporary** as the problem keeps shifting
- **Fluidity** of timescales, attention, etc.

What's the transportation problem?

Reduce time in congestion?

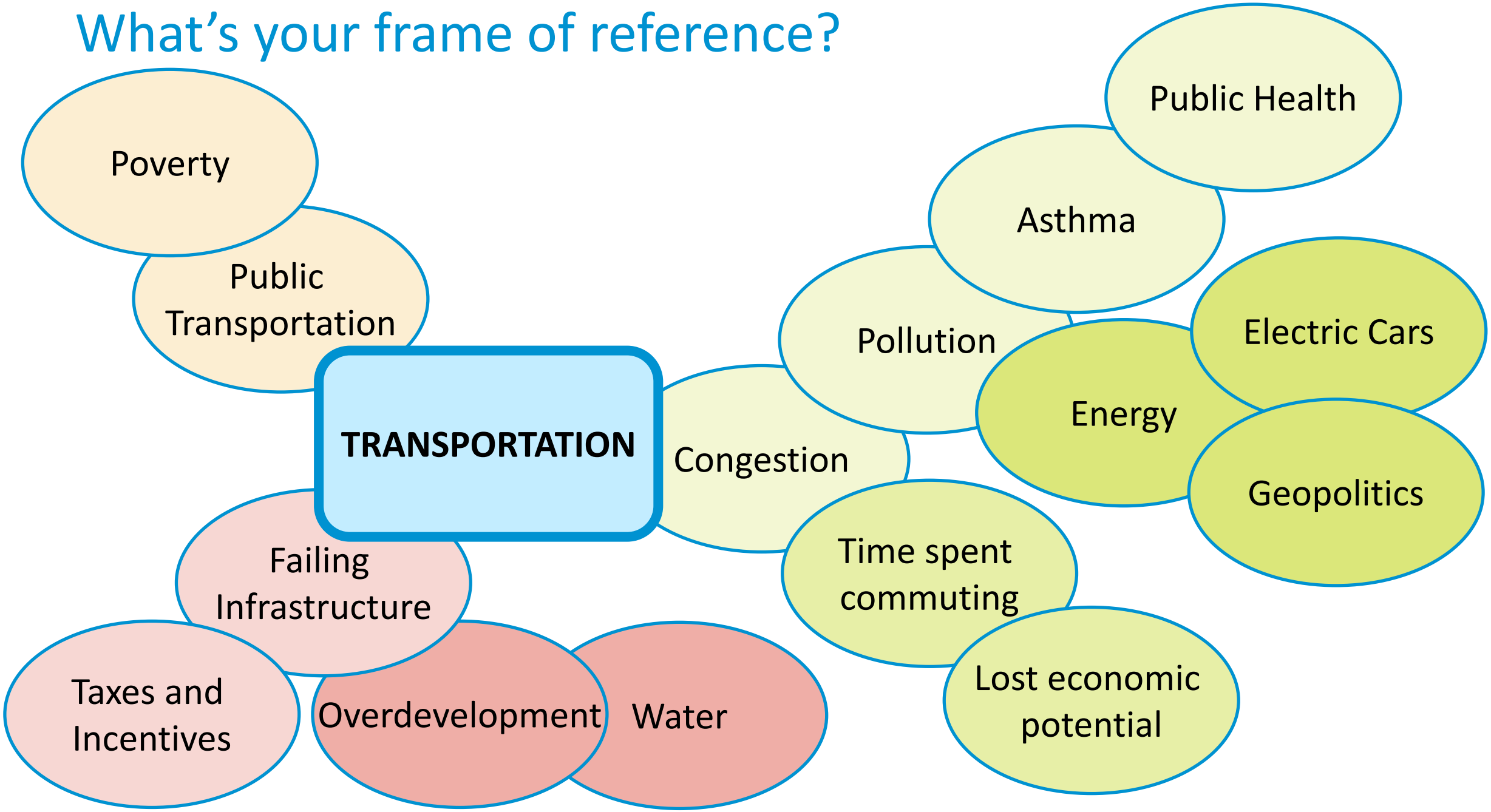
Limit urban sprawl?

Ensure freedom to get away?

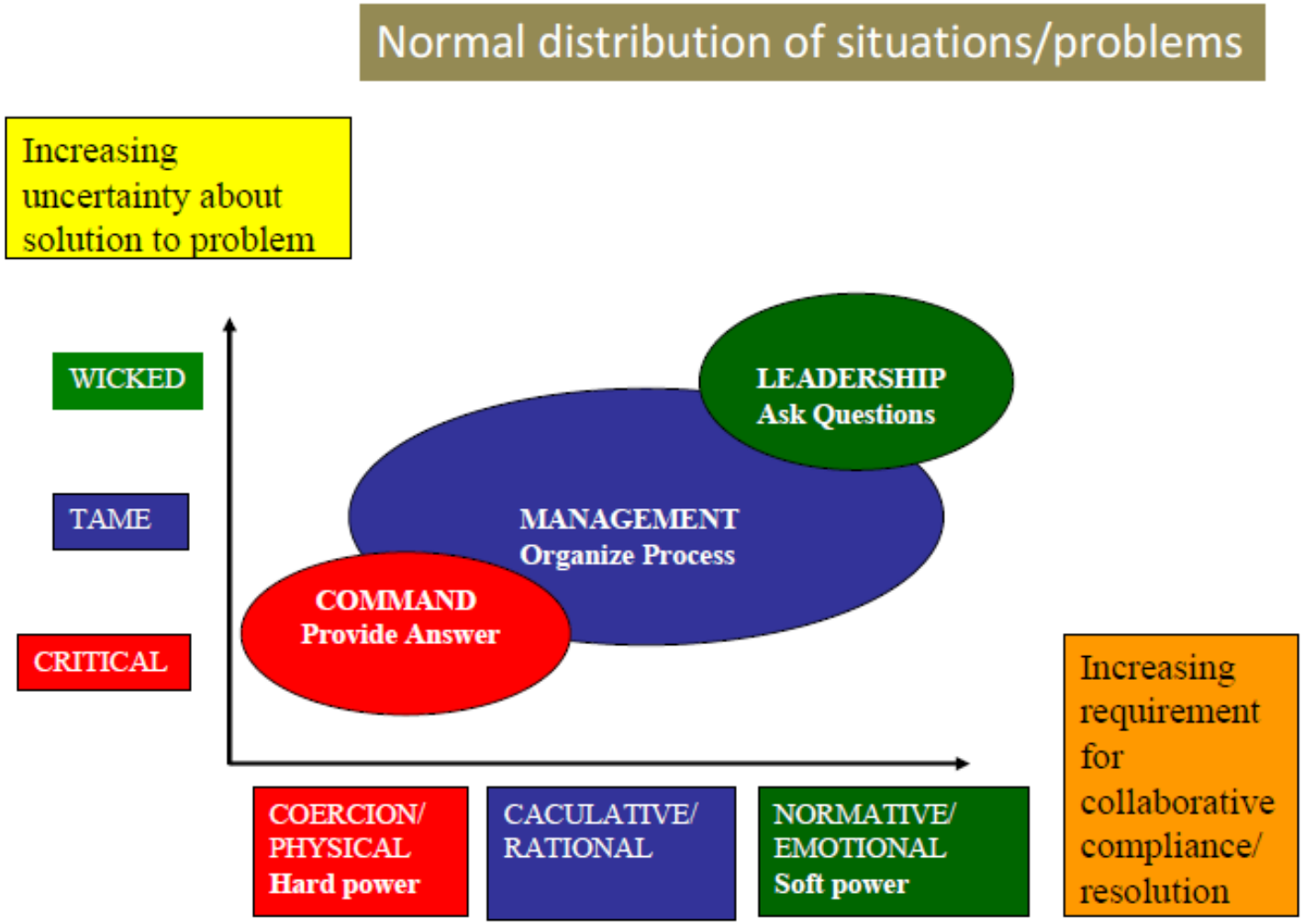
Fix bridges that are falling apart?

Are some solutions in opposition to other possible goals?

What's your frame of reference?



Types of Leaders



The Bystander Problem, or lack of leadership

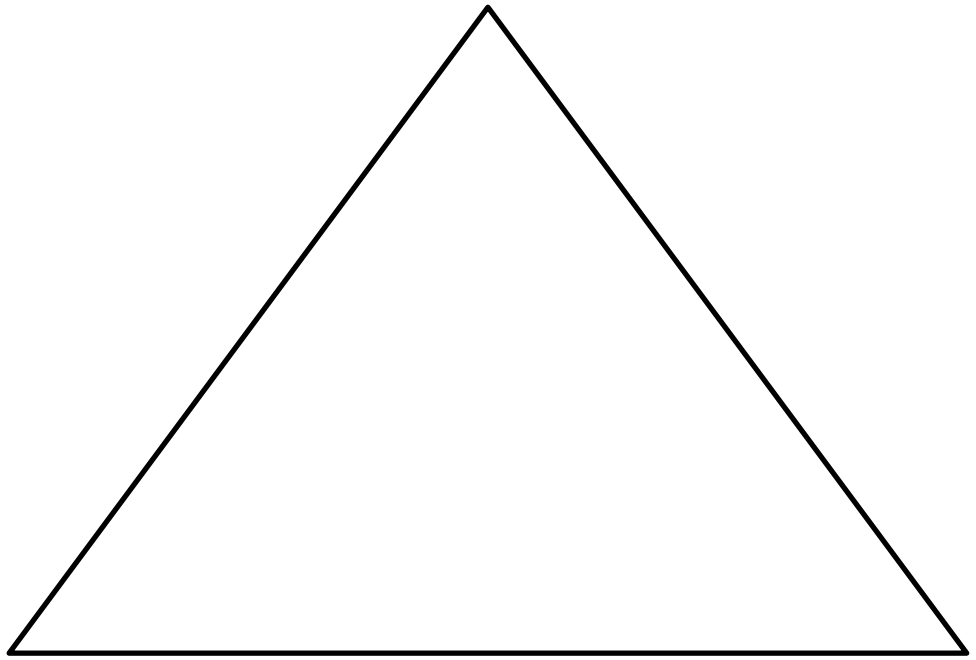
Latane and Darley: The Bystander Problem (1968)

Room 1 has an individual staging an epileptic fit
Adjoining room has:
1 person = helps 85% of the time
5 people + = help only 31% of the time

Smoke emerging from room reported
75% of the time by lone passers by
38% of the time by groups passing by
Groups diffuse responsibility

Framework – The Clumsy Solution

Hierarchical
(eg. Government)



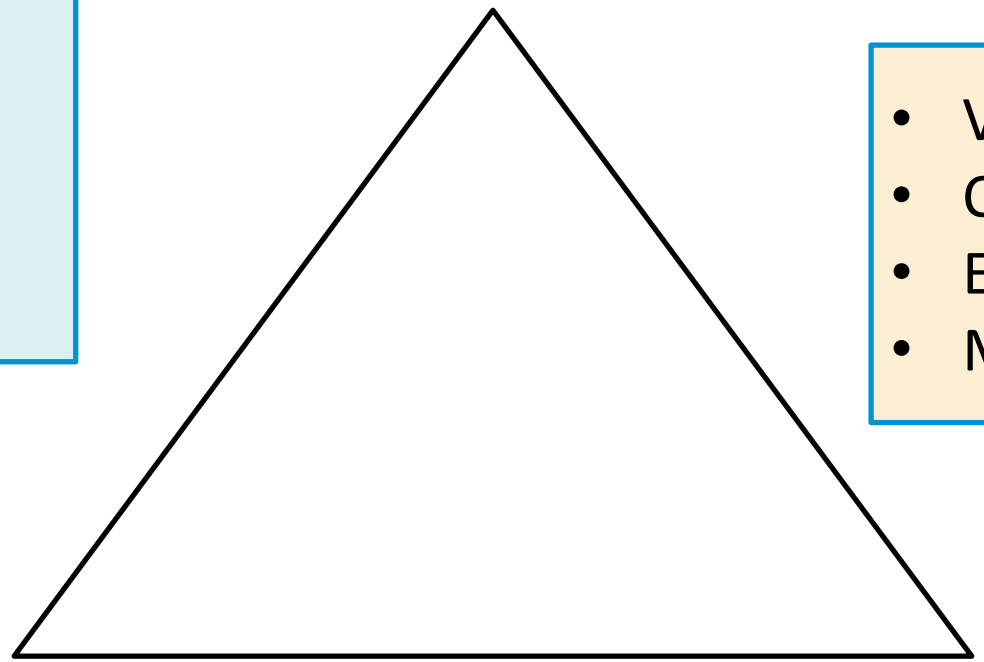
Competitive
(eg. Business)

Egalitarian
(eg. Public Interest Groups)

Framework – The Clumsy Solution

- Process Driven
- Rules oriented
- A structure to reach a solution.
- Indifferent to the actual outcomes.

Hierarchical
(eg. Government)



- "The Best" wins
- Solves the problem at hand
- Encourages constructive criticism
- Driven by ego and individualism

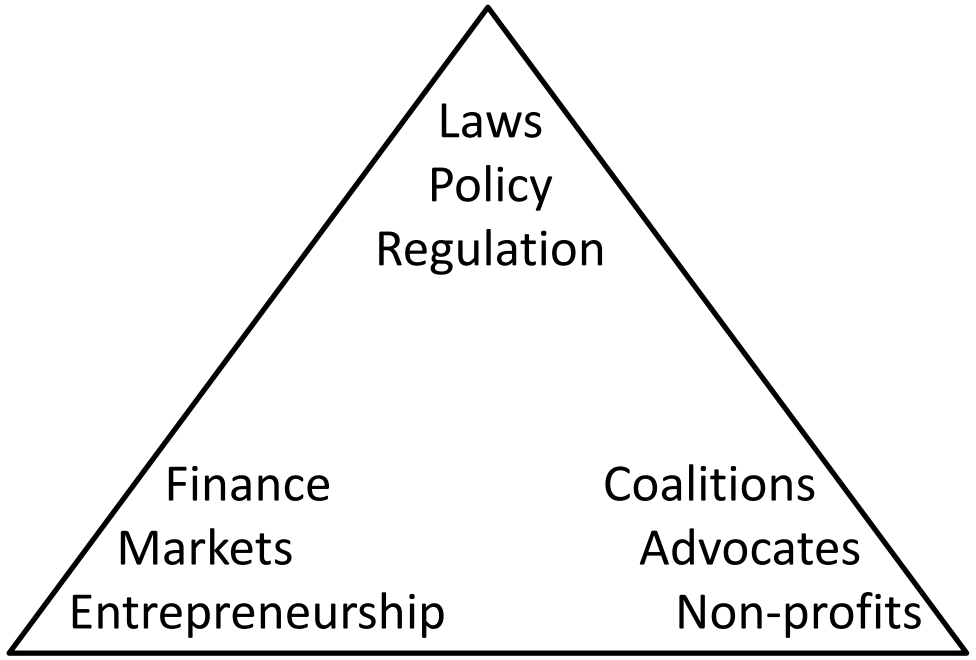
Competitive
(eg. Business)

- Values- and outcome-driven
- Collective-based concerns
- Empathy and community
- May have impractical ideals

Egalitarian
(eg. Public Interest Groups)

Can you list some other clumsy solution approaches?

Hierarchical
(eg. Government)



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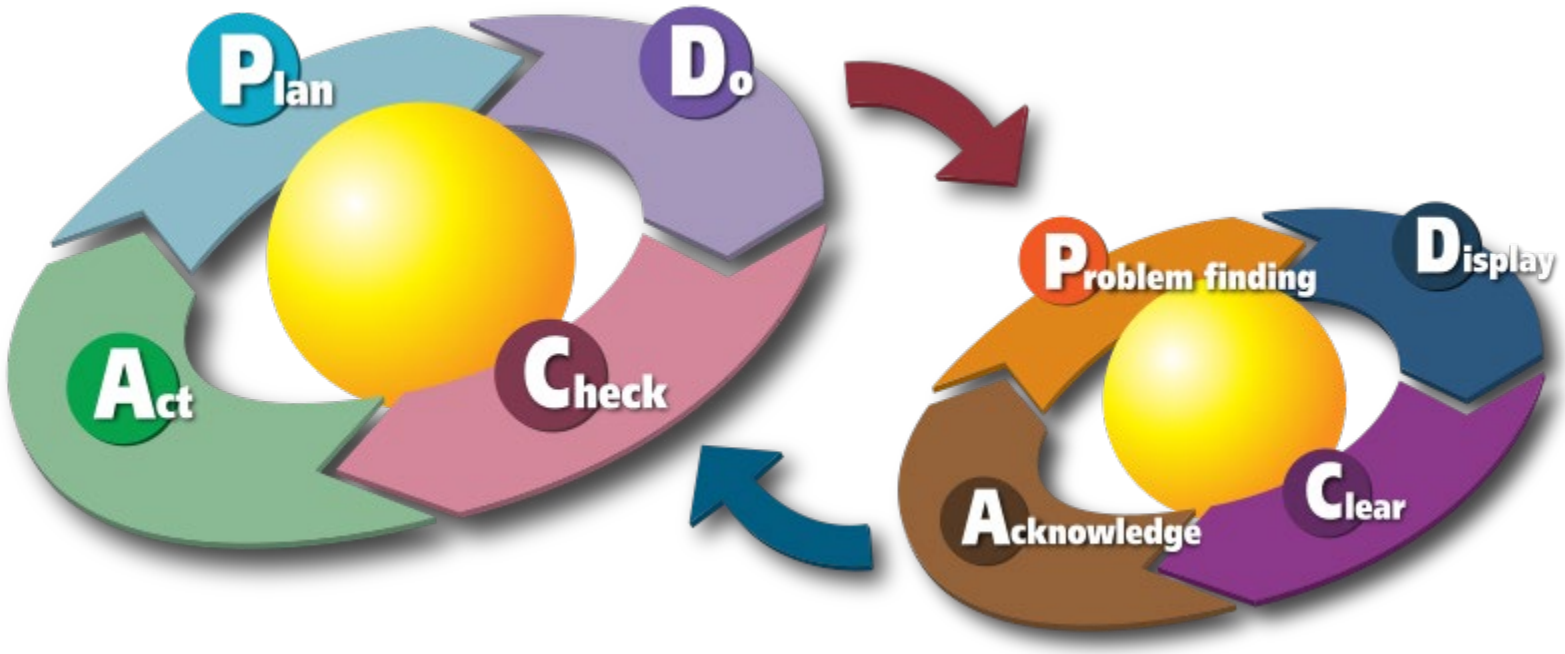
Technique: Kaizen – Continuous Improvement

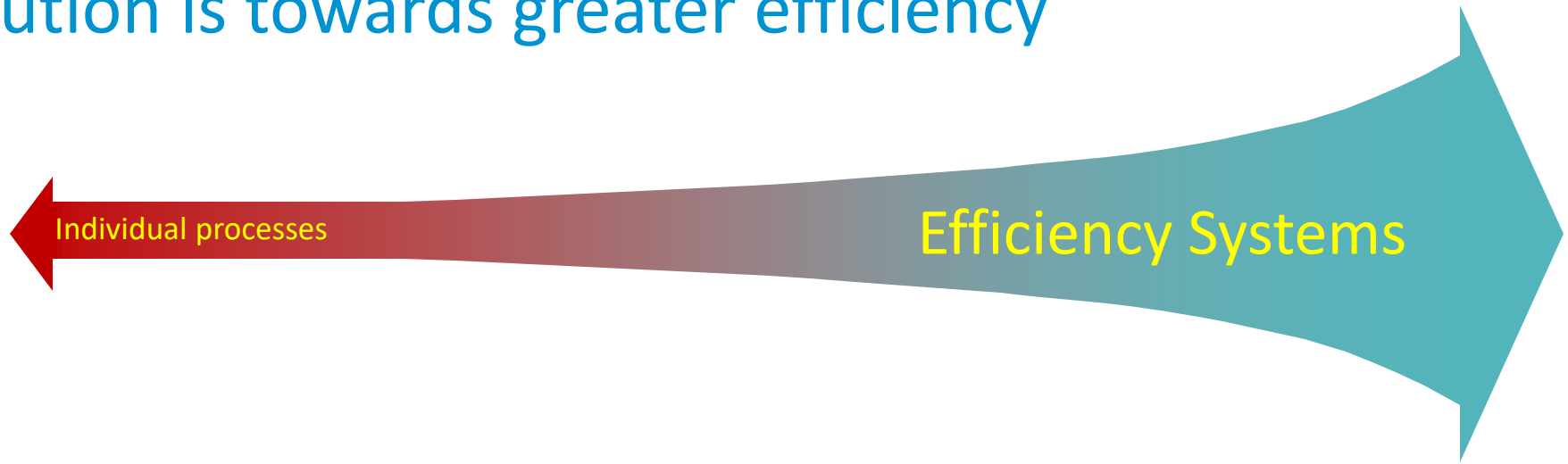


Goal: To make operations more efficient

Properties of Efficiency

Individual Process	Efficient System
Robust	Fragile
Many network connections	Few network connections
Localized System	Centralized Systems
Higher costs to operate	***Lower costs to operate***
Lower costs to implement	Higher costs to implement

The evolution is towards greater efficiency

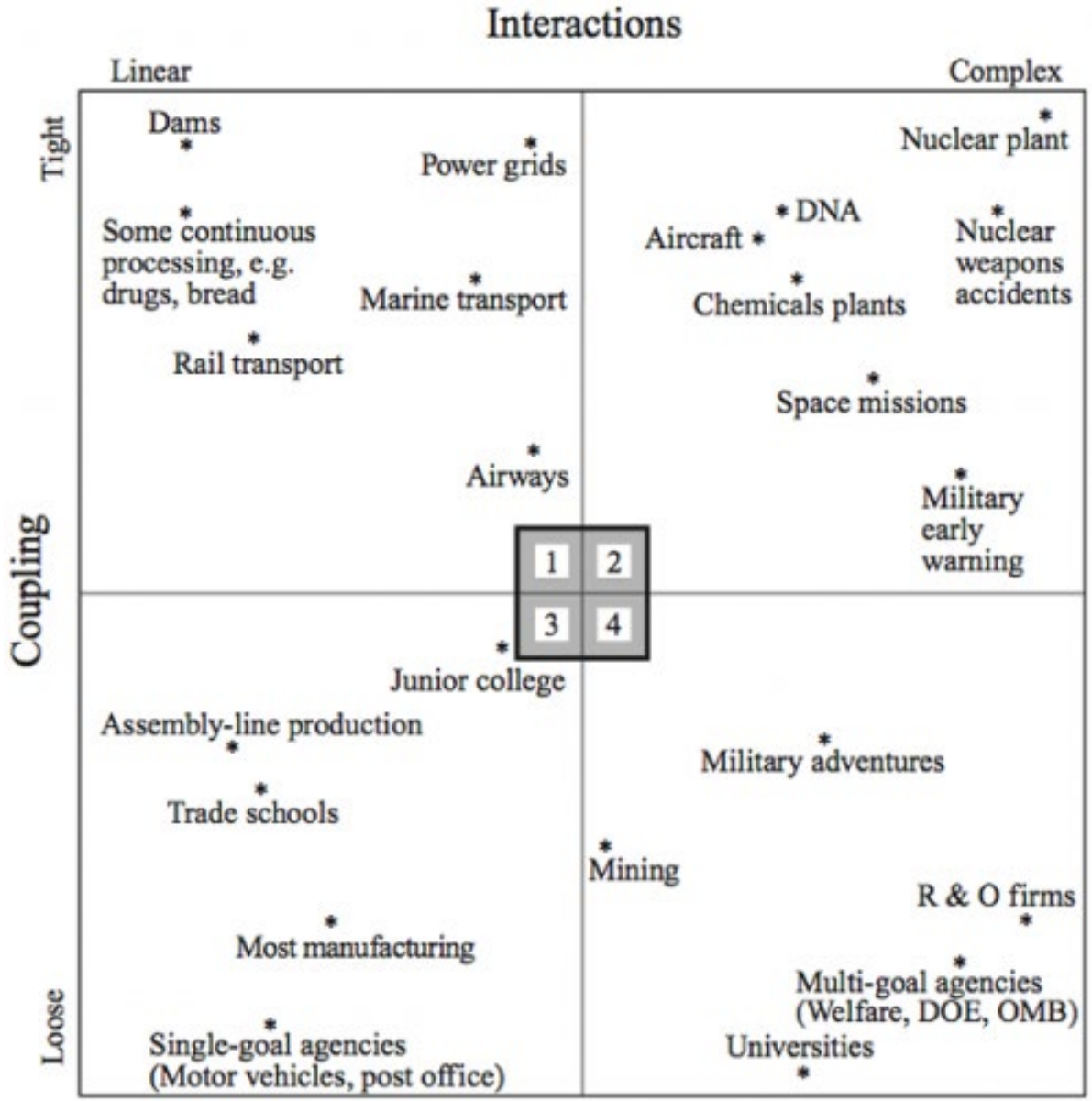


Organized Energy Infrastructure: Cascading failures of access results in blackouts

Organized Fiscal Markets: Failures of individual companies affect entire economy

Efficiency is the opposite of Resiliency!!!

Perrow's Four Quadrant Taxonomy



http://www.fogbanking.com/2013/10/ http://www.dodccrp.org/html4/bibliography/copch7.htm

Technique: How to Cope

- Dispersion of dangerous substances
- Dispersion of vulnerable populations
- Modularization of large organization
- Decentralization of critical components

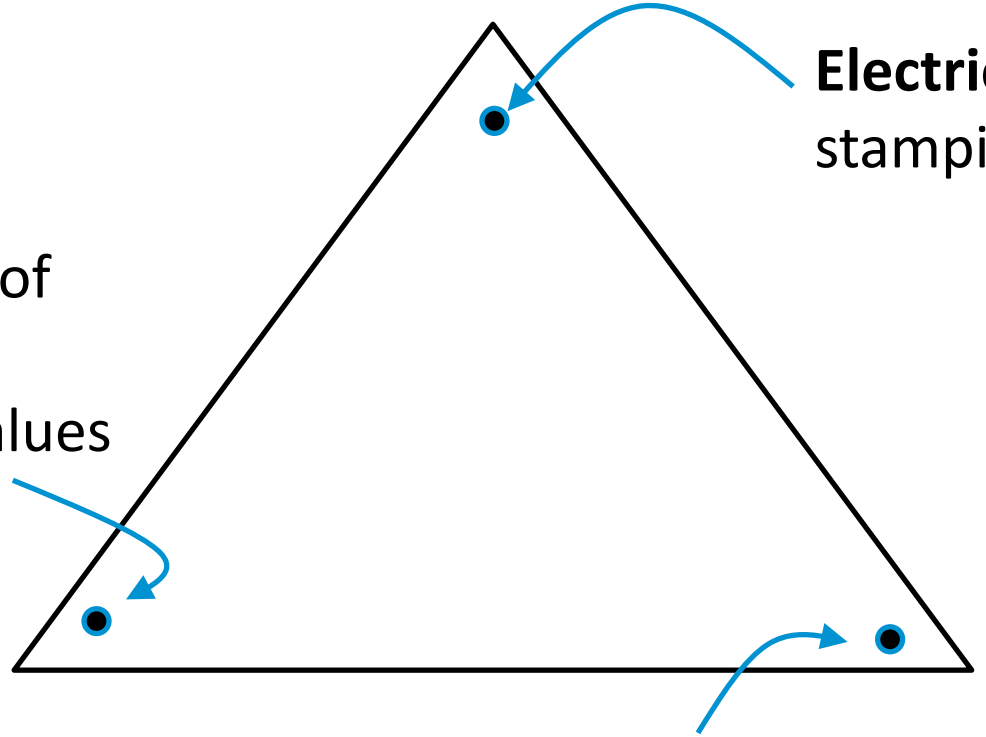
C. Perrow, *Normal accidents, living with high-risk technologies*, Princeton University Press, Princeton, NJ, 1999

When governed by extremes we get ***distortions***…

Hierarchical
(eg. Government)

Electric Utilities – accused of stamping out innovation

Wall Street – accused of making money at the expense of all other values



Competitive
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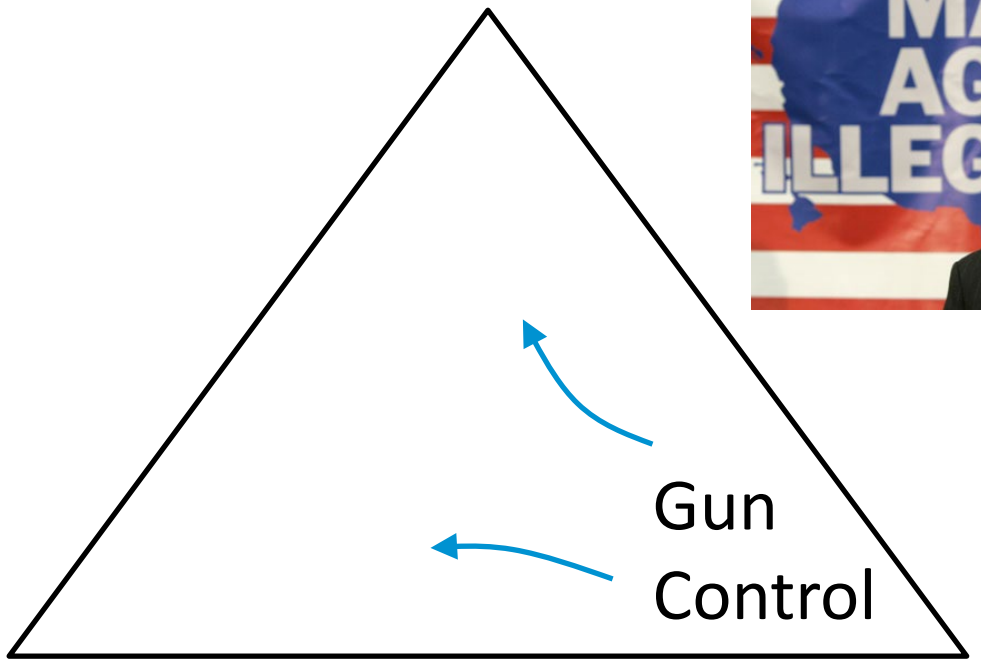
NRA – accused of valuing gun ownership over gun deaths

The response is to find solutions opposite triangle

Hierarchical
(eg. Government)

Trigger-lock guns



Competitive
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Egalitarian
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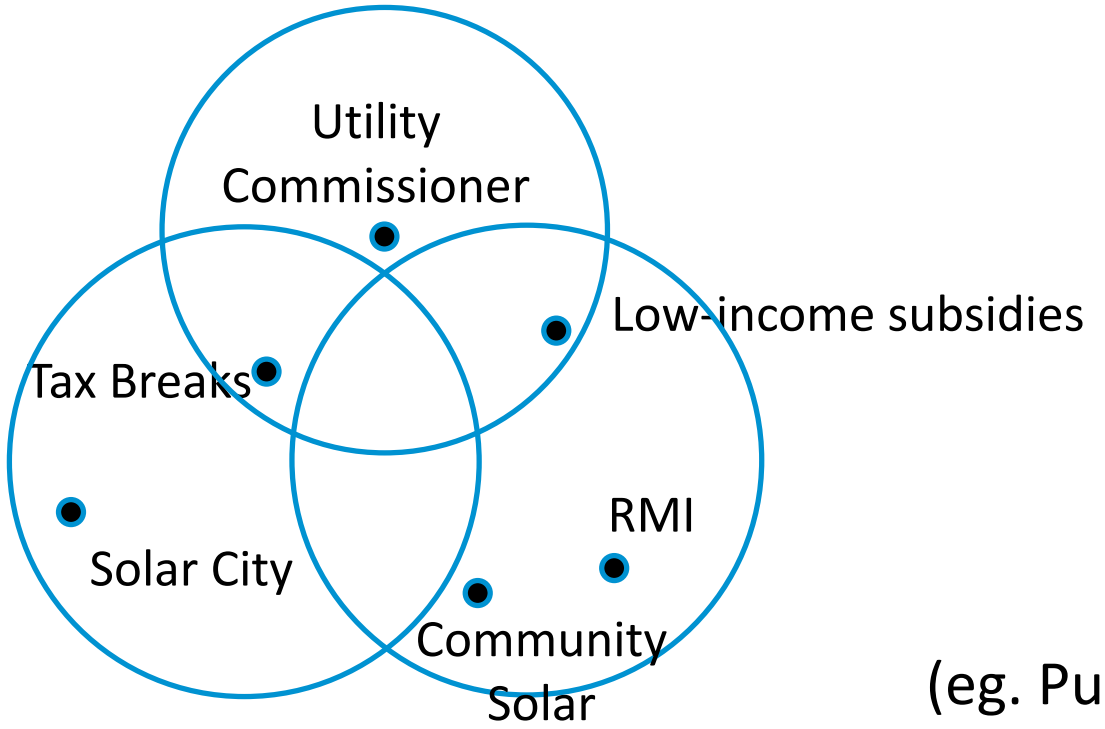
Solutions are usually a combination of all three voices

Hierarchical
(eg. Government)



Competitive
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Egalitarian
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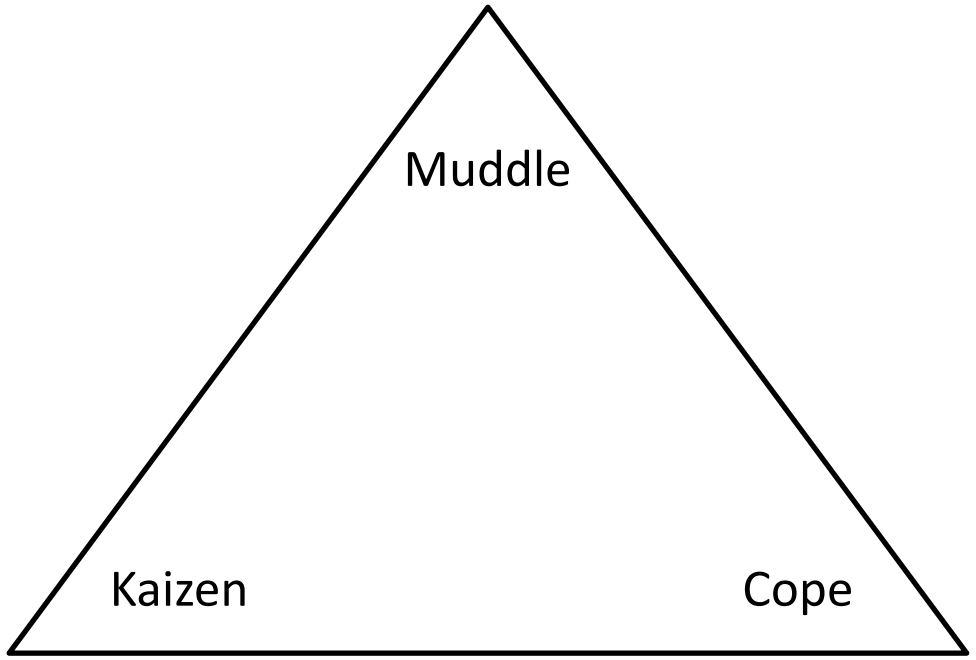
Techniques

Hierarchical
(eg. Government)



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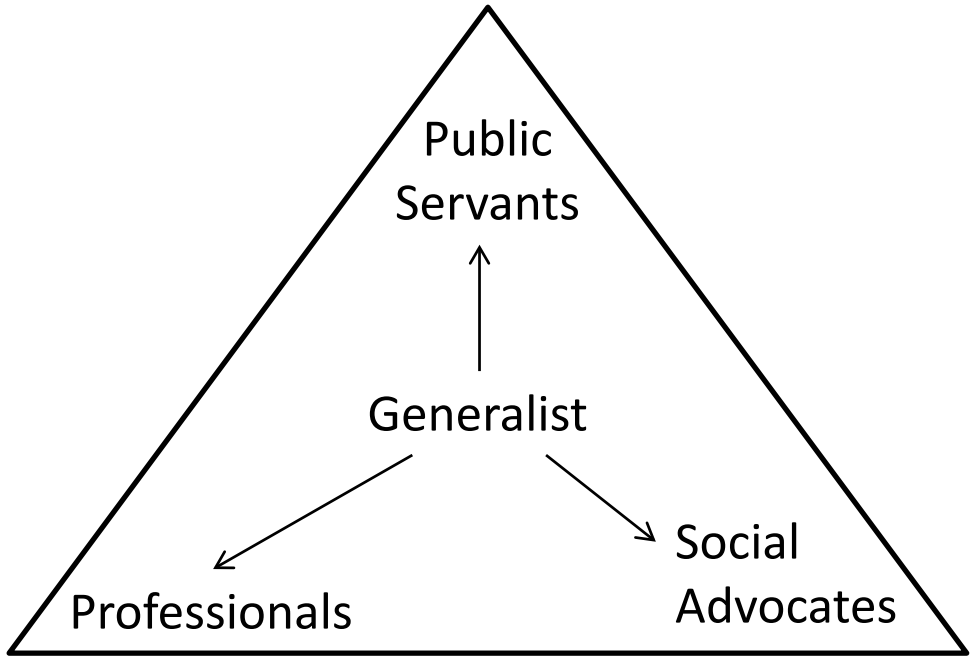
Your Role

Hierarchical
(eg. Government)



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Your frame of reference matters!

- The frame of reference defines the problem you're solving.
- Furthermore, it actually defines the solution you're proposing.

- Frequently, we define the frame of reference based on our favorite solution, ***NOT*** based on the facts of the situation.

Questions?