Problem Solving Strategies—Why Bother??

Introduction to the Course
Problem Solving Strategies, Why Bother?
Joel Barker: Discovering the Future
Relative Importance of Skills for Employers

- Problem Solving
- Communication
- Team Work
- Learning Skills
- Critical Thinking
- Ethics
- Technical Skills
- Working with Diversity

Important: 5
Very Important: 6
$350,000 National Science Foundation Grant to Research Problem Solving
Contributing Companies
Goal: To learn how engineers, scientists and managers went about solving problems and the techniques they used.
Chapter 1

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with Benjamin Rizzo

Strategies for Creative Problem Solving
Prentice Hall

The greatest hurdle companies faced in Problem Solving
The greatest hurdle they faced in Problem Solving

Defining the *Perceived Problem* Instead of the *Real Problem*
The Perceived Problem
Shortly after the upper floors of a hotel got renovated, guests started to complain that the elevators were too slow.
The manager’s instructions to solve the perceived problem: “Find a way to speed up the elevators.”

Next, the manager’s directions were: “Find a location and design a shaft to install another elevator.”
Problem Solved
A few years ago a major oil company was developing a process for the Department of Energy to produce liquid petroleum products from coal in order to reduce the U.S. dependence on foreign oil.
In this process, solid coal particles were ground up, mixed with solvent and hydrogen, then passed through a furnace heater to a reactor that would convert the coal to gasoline.
The Better Solvent

Sometime after installation excessive amounts of a tar-like material were being deposited on the pipes in the furnace, causing fouling and plugging. Management told its engineers

“Find a better solvent”
The Better Solvent

• Why is the Deposit Forming?

• Brainstorm and List all the Possible Causes.
Perceived Problem Statement:
“Find ways to improve oil recovery”

Proposed Solution to Solve the Perceived Problem

Inject Better Surfactants and Viscosifers
Perceived Problem Statement:
“Find ways to improve oil recovery”

Real Problem Statement
“Learn why the well is not producing as expected”
Perceived Problem Statement:

“Find a Better Printing Ink”
Better Problem Statement.

• Brainstorm and List all the things that could cause the ink to smear.
Right Problem Definition

BUT

Wrong Solution
Grow agriculture crops in arid land
Grow Agriculture Crops in Arid Land

The following solution was chosen by the Australian government:

“Design and build a dam to divert the river water inland to irrigate the land.”
Murray River Flows From the Mountains to the Sea
Build Dams along the Murrary River
The following solution was chosen by the Australian government:

“Design and build a dam to divert the river water inland to irrigate the land.”

Unfortunately, no new vegetation grew.
Right Problem Definition

BUT

Wrong Solution
Jubilee Line
Jubilee Line

Southbound platform 2

Swiss Cottage
St. John's Wood
Baker Street
Bond Street
Green Park
Westminster
Waterloo
Southwark
London Bridge
Bermondsey
Canada Water
Canary Wharf
North Greenwich
Canning Town
West Ham
Stratford
Always Carry Out a Potential Problem Analysis
What Could Go Wrong?
K.T. Potential Problem Analysis

1. Brainstorming a list of all the potential problems
2. For each problem identified, brainstorm all the possible causes to that problem
3. For each cause, brainstorm a list of preventive actions.
4. For each problem, brainstorm a list of contingency actions if your preventive actions fail to prevent the problem from occurring.
Components of the Heuristic

Define
- Critical Thinking
  - Duncker Diagram
  - Statement-Restatement
  - K.T. Problem Analysis (Is/Is Not)
  - Troubleshooting
- Safety Considerations
- Ethical Considerations
- Evaluation Checklist

Generate
- Brainstorming
  - Futuring
  - Cross-Fertilization
  - Analogy
  - TRIZ
  - Blockbusting
  - Free Association
  - Vertical Thinking
  - Lateral Thinking

Decide
- K.T. Analysis
  - Situation (Timing, Trend, Impact)
  - Decision (Musts/Wants)
  - Potential Problems (preventative actions)

Implement
- Approval
  - Change Management
- Planning
  - Gantt Chart
  - Deployment Chart
  - Budget
  - Carry Through
  - Follow up

Evaluate
- Evaluation Checklist
- Ethical Considerations
- Safety Considerations
The Five Steps of the Heuristic

1. Define the Problem
2. Generate Solutions
3. Decide Course of Action
4. Implement Solution
5. Evaluate Solution

PROBLEM SOLVED!
Advice from Previous Classes

Top 5 Consensus Comments

• Start work on the project early
• Mention that you’ve taken a problem solving class in any interviews you have and you’d be surprised how impressed people are when you can explain a KT decision analysis.
• Pay attention to lecture. At first I thought his class was going to be a joke, I was dead wrong. I believe it helped me tremendously.
• What you put into the class is proportional to what you will get out of it
• Outside of class, think about situations or other classes you could apply the material: you’ll surprise yourself.