Creative Problem Solving Lectures

Four Quadrant Brain Model
Problem Definition
Idea Generation, Brainstorming and Teamwork
Creative Evaluation, Judgement and Critical Thinking
Solution Implementation

Four Quadrant Brain Model

Ned Herrmann - Brain Dominance Technology

The brain contains four distinct quadrants that have their own language, values and ways of knowing.

Earlier Research

Left Brain - Mathematical and Verbal Thinking (Reading)
Right Brain - Spatial, Holistic, Imaginative Thinking (Watching, Hands-On Activities)

Cerebral Hemispheres: Vision, hearing, body sensation, intentional
motor control, reasoning, conscious thinking and decision making, language and nonverbal visualization, imagination and idea synthesis.

*Limbic System* (in each hemisphere) - Regulates hunger, thirst, sleeping, waking, body temperature, chemical balances, heart rate, blood pressure, hormones and emotions.

Easy connections: A-B, D-C, A-D, B-C
Hard connections: A-C, B-D
Figure 3-2  The four-quadrant Herrmann model of thinking preferences.
Personality Type Measurement

Herrmann Brain Dominance Instrument (HBDI)
Meyers-Briggs Type Indicator (Psychologically based)

1+ - Extremely strong preference
1  - Strong preference
2  - Secondary preference (Comfortable with mode)
3  - No preference (Will avoid this mode)

University of Toledo study (1990-1992)
Freshmen 1-1-2-2 (21%)  1-2-2-1 (13%)  1-1-2-1 (12%)
Seniors       1-1-2-2 (22%)  1-1-2-1 (20%)  1-1-3-2 (18%)
Characteristics of Quadrant A Thinkers

Definition: Factual, Analytical, Quantitative, Technical, Logical, Rational, Critical

Example: Mr. Spock

Preferences: Mathematics, Science, Technology

Talk: Bottom line, Getting the facts

Answer to question, What is an Engineer?

Not necessarily a train driver
Creative in a technical way
See and understand how things work
Use facts to solve problems
Makes big bucks
Characteristics of a Quadrant B Thinker

Definition: Organized, Sequential, Controlled, Planned, Conservative, Structured, Detailed, Disciplined and Persistent

Example: J. Edgar Hoover

Preferences: Structured and organized courses

Talk: We have always done it this way, Law and order, Self-discipline, Play it safe

What is an Engineer?

A whole-brain thinker
A communicator
A creative problem solver
A designer and inventor
A person with good judgement
A person who breaks the rules
A leader
A correlator of abstract ideas
Characteristics of Quadrant C Thinkers

Definition: Sensory, Kinesthetic, Emotional, Symbolic

Example: Mahatma Gandi

Preferences: Social Sciences, Music, Dance, Drama, Highly-Skilled Sports

Talk: The family, Team work, Personal growth, Values

What is an Engineer?

Administrative
Hard working
Creative
Problem solver
Over worked
Under paid
Under appreciated
Synthesizer
Characteristics of Quadrant D Thinkers

Definition: Visual, Holistic, Innovative, Metaphorical, Creative, Imaginative, Conceptual, Spatial, Flexible, Intuitive

Example: Pablo Picasso

Preferences: Arts (Painting, Sculpting), Geometry, Design, Poetry Architecture

Talk: Playing with an idea, The big picture, The cutting edge, Innovation

What is an Engineer?
- Solves problems
- Finds solutions
- Implement solutions
- Translates solutions
- Synthesizes ideas
- New and unique ideas
- Makes a lot of money
- Works hard
- Sometimes destroys bridges
- Is creative
- Generates ideas
Results of a Multi-dominant Team to: What is an Engineer?

1. A guy who drives a train.
   - or -
2. An individual who uses existing knowledge creatively to solve current problems.

Striped Hat

HBDI

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Problem Definition

Data Collection
Data Analysis
Briefing Document/Problem Definition Statement
Incubation Period

Objective: Identify the real problem.

Requires both the Explorer’s and Detectives’ mindsets.
Detective:  ● Search for causes and clues
       ● Collect and analyze data

Explorer:  ● Seek out the context and trends
       ● See connections; look into the future

Data Collection and Problem Analysis: Detectives Mindset

Collect as much relevant data as possible.
Requires a methodical quadrant B approach.

Answering the List of Questions for the problem.

Statistical Process Control - Shawhart and Deming

Checksheets:    Pilot checklist, class evaluations, location checklist
Histogram:     Frequency versus product parameter variation
Fishbone Diagram: Cause and effect connections
Pareto Diagram: Bar graph indicating decreasing areas of importance
Scatter Diagram: Relationship between cause and effect
Control Charts:  Chronological charts of mean and deviation.
Figure 5-2  Example of a histogram for metal block thicknesses.

Figure 5-3  Example of a Pareto diagram.

Figure 5-4  Scatter diagram showing a positive correlation.
The Context of the Problem: Explorer’s Mindset

Observe trends, be on the look-out for new opportunities.

*Becoming a Good Trend Spotter*

1. Read and audit your information intake.
2. Develop frontline observational skills.
3. Adopt the methods of professional trend watchers.
4. Find opportunities.

Place problem in correct context.

The cost of gas, oil, maintenance, and depreciation for running a certain truck is \(50 + \frac{S}{8}\) cents/mile when it travels at a speed of \(S\) mph. A truck driver earns $10/hr. What is the most economical speed at which to operate truck?

Assemble the information about the problem into a briefing document.

Converge the problem down to a positive goal.: The Problem Definition Statement.
Introspection

Don’t move directly from Problem Definition to Idea Generation.

*You should sleep on it*

Subconscious Mind - Right Brain Activity,
**Idea Generation**

Verbal Brainstorming: The Artist’s Mindset

*Transform information into new ideas.*

The wild and crazy guy(s)

Team Activity

*Quantity counts!*

Quadrant D Imagination + Quadrant C Feelings

<table>
<thead>
<tr>
<th>The Three Rules of Brainstorming</th>
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| 1. Generate as many solutions as possible  
- quantity counts. |
| 2. Wild ideas are encouraged. |
| 3. No criticism is allowed  
- judgement is deferred until later. |

Wild Ideas are very useful - thinking outside of the box.

Ideas should be built upon, expanded or converged as necessary.

Everyone owns the results.
Guidelines for Leading a Brainstorming Session

1. Brief the team on the problem's background and post the problem definition statement.
2. Review the three brainstorming rules.
3. Explain the brainstorming procedure that will be used.
4. Do a creative thinking warm-up exercise.
5. Conduct the brainstorming.
6. End the session; collect all ideas.
7. Thank and dismiss the team.

Creative Thinking Warm-up Exercises - See Handout.
Get the creative juices flowing!

Break between brainstorming and evaluation.
Creative Evaluation and Judgement

Engineer’s Mindset: Convergent thinking to clarify problems.

Quality not Quantity

The Three Rules of Creative Idea Generation

1. Look for quality not quantity. Make ideas better.
2. Make wild ideas more practical.
3. Continue to defer judgement.

Task 1 - Sort related ideas into categories.

Task 2 - Develop quality ideas within a category.

Task 3 - Force-fit unrelated ideas between categories.
Idea Judgement - Ranking Ideas

Judge's Mindset: Critical, conscious mind

Note flaws, find ways to overcome.

Future oriented Quadrant D thinking balanced against critical and analytical Quadrant A thinking and risk avoiding Quadrant B thinking.

Judgement Criteria
1. Motivation
2. People
3. Cost
4. Support
5. Values
6. Time
7. Effects

Solution Implementation - Putting Ideas Into Action

Checklist for Final Idea Selection

___ Can ideas be combined to obtain a higher-quality solution?
___ Can different ideas of equal quality be implemented all at once or in sequence?
___ How well do ideas solve the problem? (7 point system.)
___ Do the ideas meet all needs? If they pass this go/no go checkpoint, rank them according to any extra wants that they satisfy.
___ Do a risk analysis on implementation with the top three ideas.
___ Make a cost/value analysis.
Solution Implementation – Putting Ideas into Action

Producer’s Mindset: Carries ideas from what-if to action
Takes well planned action

Selling the idea

Work plan and implementation

Final project evaluation

Time management