What are the core skills of a designer?

The Core Skills of a Designer

- To synthesize a solution from all of the relevant constraints
- To frame, or reframe, the problem and objective
- To create alternatives
- To select from those alternatives
- Prototyping

[Moggridge]

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[Moggridge]

How do you generate new ideas?

Analogy
Metaphor
Simile

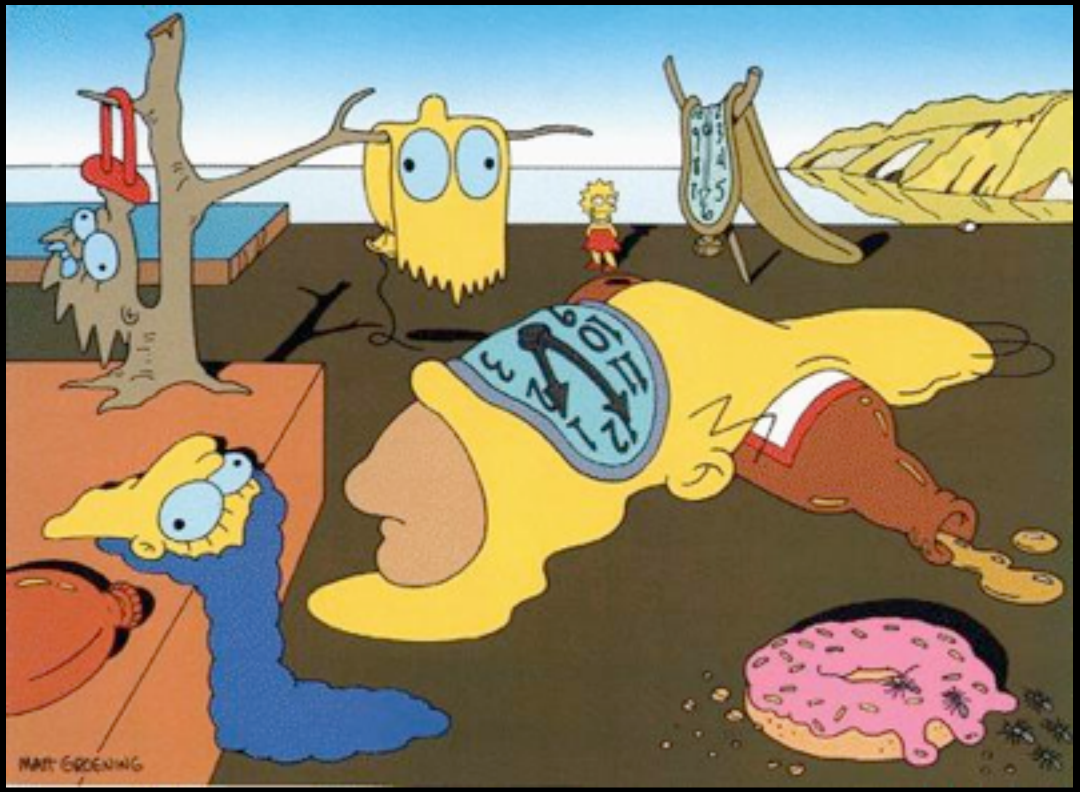
Analogy {

Local Mac ≈ Alto

Distant Genetic Algorithms
Neural Networks

> *“We may say most aptly that the Analytical Engine weaves algebraic patterns just as the Jacquard loom weaves flowers and leaves.” — Ada Lovelace*

[Sanders & Thagard]



Make the familiar strange

Make the strange familiar

[W. J.J. Gordon, *Synectics*]

Intense Mode Creativity

- Whiteboard
- Paper
- Focus

[Sanders & Thagard]

Casual Mode Creativity

1. **Immersion in problem domain**
2. Absence of immediate pressure
3. Absence of distractions
4. Mental relaxation
5. Unstructured time
6. Solitude

[Sanders & Thagard]

Casual Mode Creativity

- take a shower
- go for a walk
- garden
- knit
- cook
- doodle

⇒ light physical activity that you are comfortable with and not distracted by

Guiding Your Search

Guiding Your Search

- Morphological Analysis
- Relax a Constraint
- Find another Pareto point
- Try a different architectural style / pattern
- Change the technology
- Local analogy to normal programs
- What would Dijkstra do?

Morphological Analysis

- Identify components
- Compute all component combinations
- Evaluate each
- Find the Pareto Front

Relax a Constraint

- Restaurants:
  - have menus
  - serve food
  - charge money for food
- The kernel manages the file system

Another Pareto Point

- Your current design(s) represent different trade-offs in terms of the analytical criteria
- Pick a different trade-off and design for it

Different Pattern/Style

- Garlan & Shaw designed KWIC in four different architectural styles
  - they have additional (larger) case studies
- Exercise #2 used two different patterns for a simple calculator
- Grab a catalog of patterns/styles and start browsing through it

Change the Technology

- *Weak Form:*
    - substitute an interchangeable component
- *Strong Form:*
    - change programming paradigms
    - Haskell? Prolog?
    - etc.

Local Analogy to *the* Normal Programs

- ***OS***: monolithic, microkernel, hypervisor
- ***DB***: hierarchical, relational row-store, relational column-store, object-oriented, time-series
- ***Compilers***: ahead-of-time batch, ahead-of-time incremental, just-in-time, interpreter
- ***Distributed systems***: centralized, p2p

What would Dijkstra do?

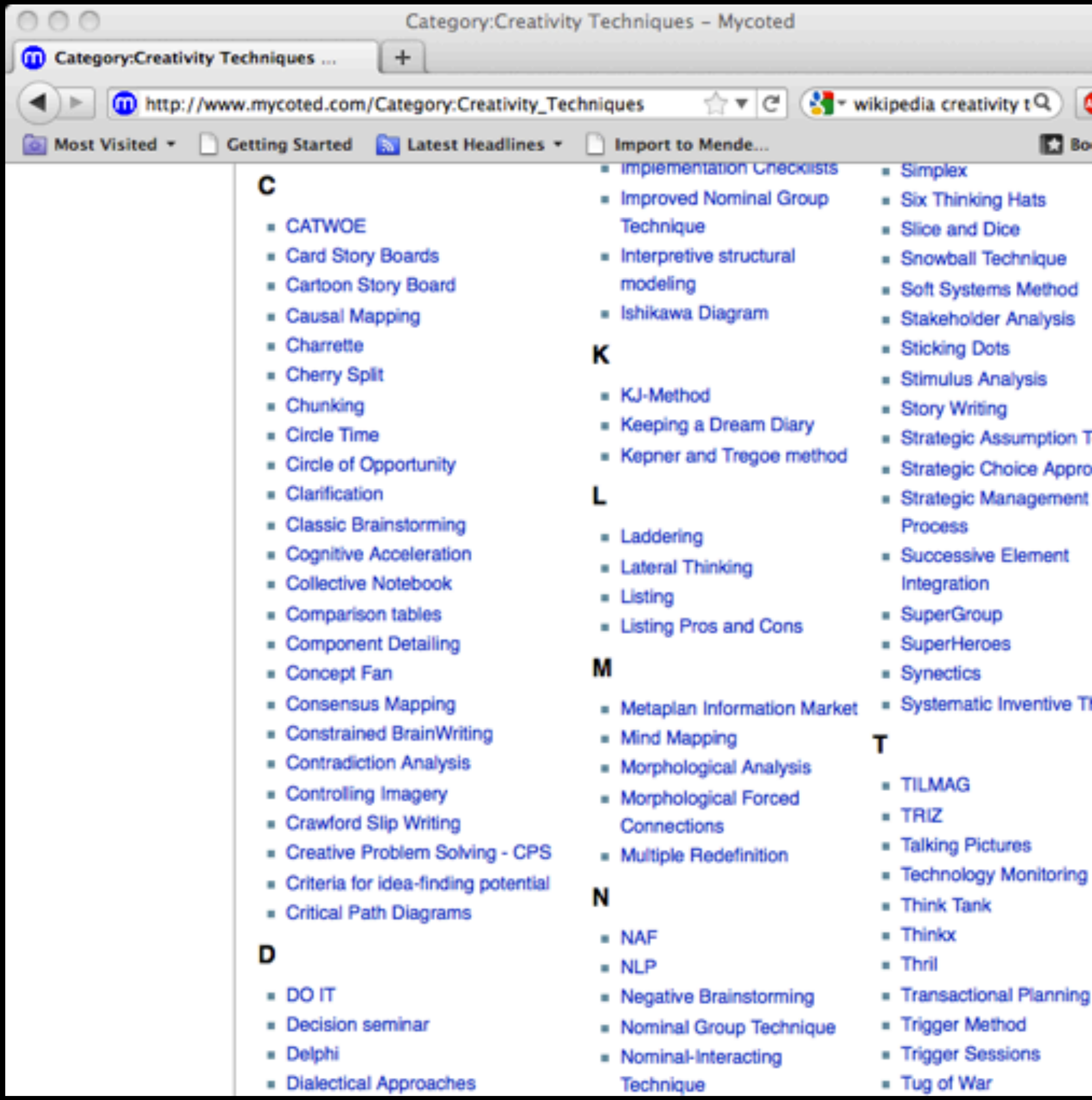
- Simon Peyton-Jones
- Tony Hoare
- Rob Pike
- Joshua Bloch
- Michael Stonebreaker
- Ted Codd
- Linus Torvalds
- Larry Wall
- Donald Knuth
- David Parnas
- Fred Brooks
- Michael Jackson

Can creativity be done in a group?

Or is it a flicker of solitary genius?

Group Approaches

- Brainstorming
- Think, Pair, Share
- Six Hats [de Bono]
- Synectics [Gordon]
- *etc*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- CATWOE
- Card Story Boards
- Cartoon Story Board
- Causal Mapping
- Charrette
- Cherry Split
- Chunking
- Circle Time
- Circle of Opportunity
- Clarification
- Classic Brainstorming
- Cognitive Acceleration
- Collective Notebook
- Comparison tables
- Component Detailing
- Concept Fan
- Consensus Mapping
- Constrained BrainWriting
- Contradiction Analysis
- Controlling Imagery
- Crawford Slip Writing
- Creative Problem Solving - CPS
- Criteria for idea-finding potential
- Critical Path Diagrams

D

- DO IT
- Decision seminar
- Delphi
- Dialectical Approaches

- Implementation Checklists
- Improved Nominal Group Technique
- Interpretive structural modeling
- Ishikawa Diagram

K

- KJ-Method
- Keeping a Dream Diary
- Kepner and Tregoe method

L

- Laddering
- Lateral Thinking
- Listing
- Listing Pros and Cons

M

- Metaplan Information Market
- Mind Mapping
- Morphological Analysis
- Morphological Forced Connections
- Multiple Redefinition

N

- NAF
- NLP
- Negative Brainstorming
- Nominal Group Technique
- Nominal-Interacting Technique

- Simplex
- Six Thinking Hats
- Slice and Dice
- Snowball Technique
- Soft Systems Method
- Stakeholder Analysis
- Sticking Dots
- Stimulus Analysis
- Story Writing
- Strategic Assumption T
- Strategic Choice Appro
- Strategic Management Process
- Successive Element Integration
- SuperGroup
- SuperHeroes
- Synectics
- Systematic Inventive Th

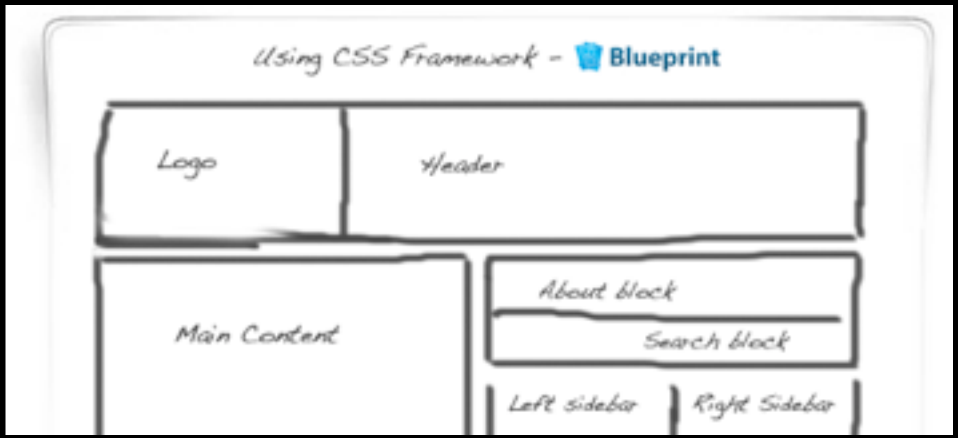
T

- TILMAG
- TRIZ
- Talking Pictures
- Technology Monitoring
- Think Tank
- Thinkx
- Thril
- Transactional Planning
- Trigger Method
- Trigger Sessions
- Tug of War

blurt out ideas
lower inhibitions

don’t judge
don’t discuss

aim for quantity
set a quota

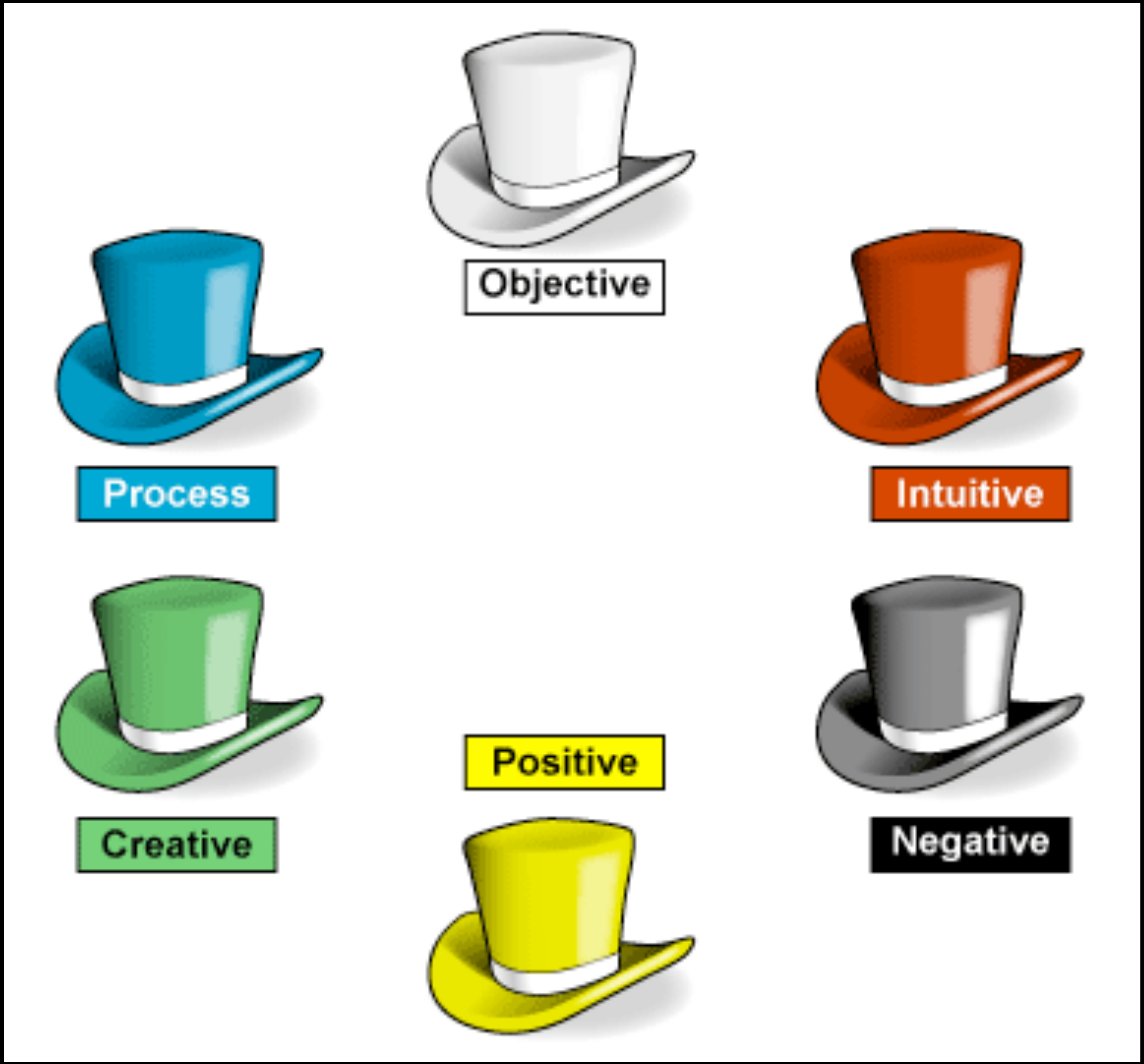


Think: sketch *k* ideas

Pair: annotate sketches

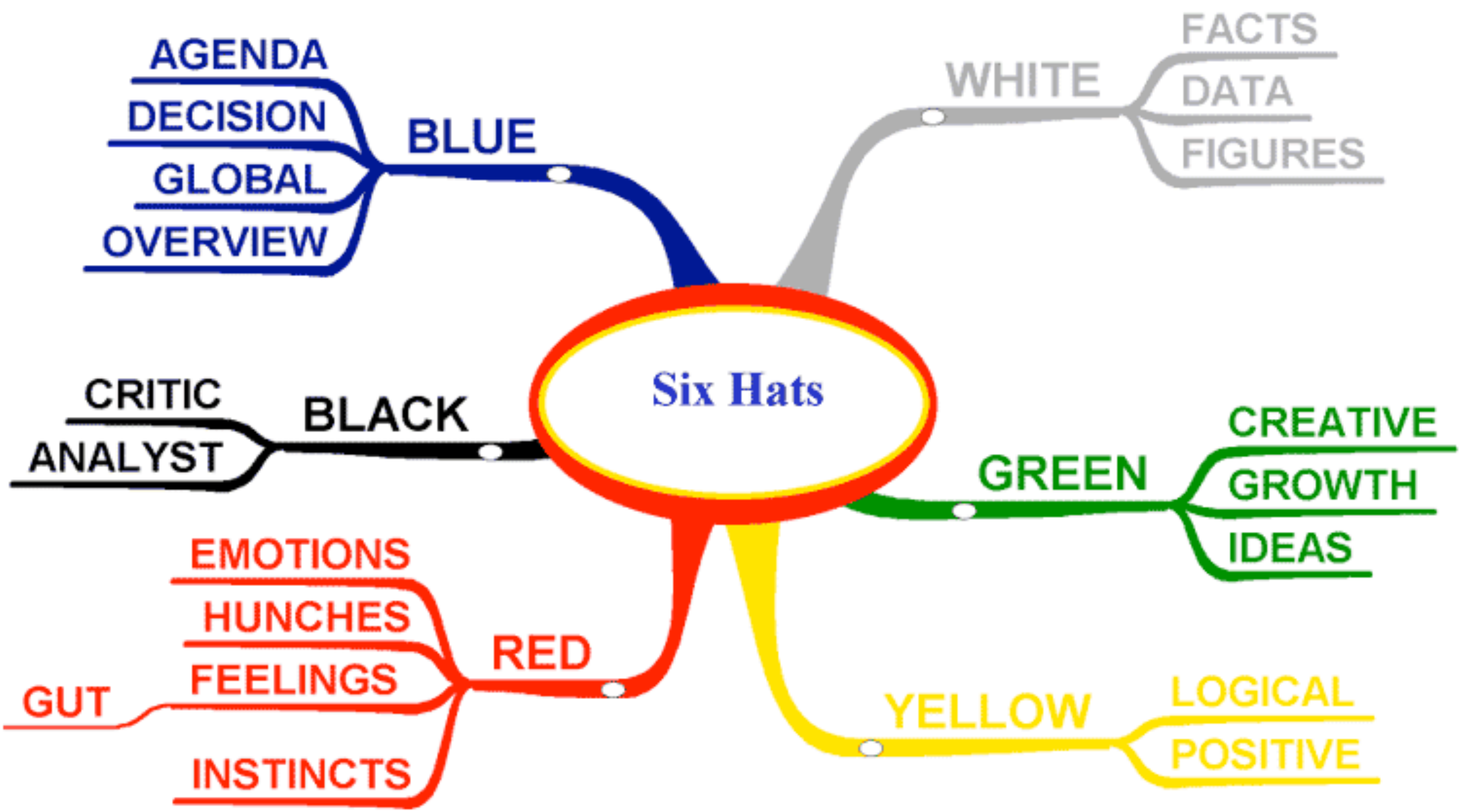
Share: post & discuss

Six Thinking Hats



[de Bono]

Summary of Edward de Bono's Six Thinking Hats



Hat Sequences

- Initial Ideas: 🟦⬜🟩
- Solving Problems: 🟦⬜🟩🟥🟨⬛
- Choosing: 🟦⬜🟩🟨⬛🟥
- *etc.*

Solve an Analogous Problem

$$\begin{tikzcd}
P' \arrow[r, "\text{Group solves P'}"] & S' \arrow[d, "\text{Facilitator reveals original problem and mapping}"] \\
P \arrow[u, "\text{Facilitator maps original problem to analogous problem}"] & S
\end{tikzcd}$$

[W.J.J. Gordon, *Synectics*]