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]
The Core Skills of a Designer

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[Moggridge]
How do you generate new ideas?
Analogy
Metaphor
Simile
"We may say most aptly that the Analytical Engine weaves algebraic patterns just as the Jacquard loom weaves flowers and leaves." — Ada Lovelace
Make the familiar strange

Make the strange familiar

[W. J. J. Gordon, Synectics]
Intense Mode Creativity

- Whiteboard
- Paper
- Focus
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
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

Six Hats

Agenda
Decision
Overview

Blue

Critic
Analyst

Black

Emotions
Hunches
Feelings
Instincts

Red

White

Facts
Data
Figures

Green

Creative
Growth
Ideas

Yellow

Logical
Positive
Hat Sequences

• Initial Ideas:  

• Solving Problems:  

• Choosing:  

• etc.
Solve an Analogous Problem

Facilitator maps original problem to analogous problem.

Group solves $P'$.

Facilitator reveals original problem and mapping.

[W.J.J. Gordon, Synectics]