

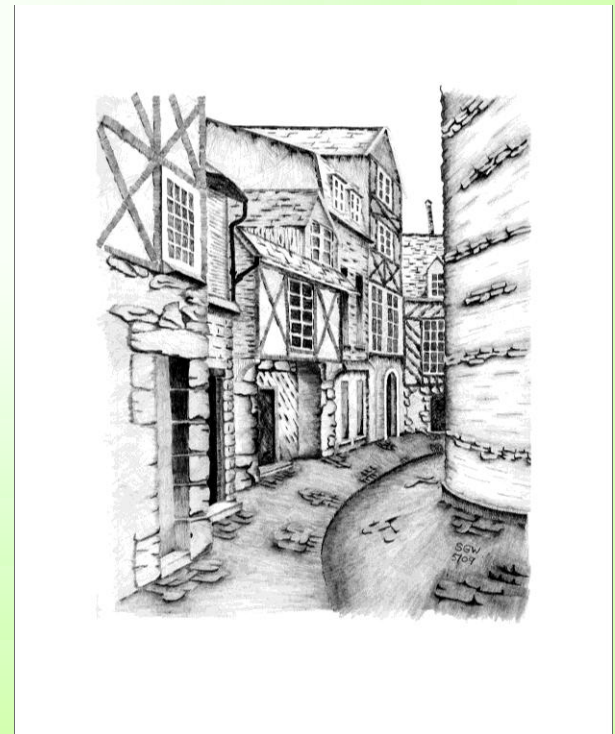
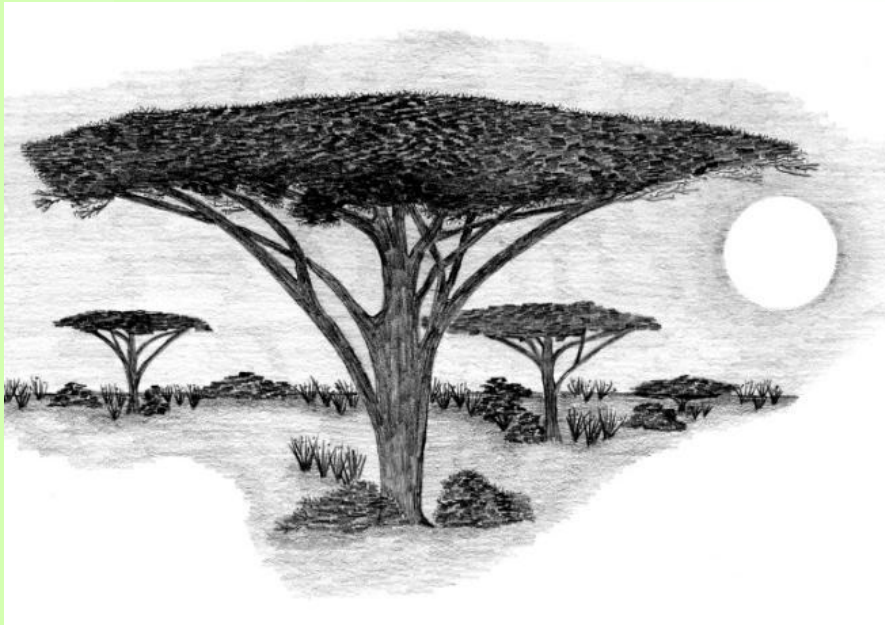
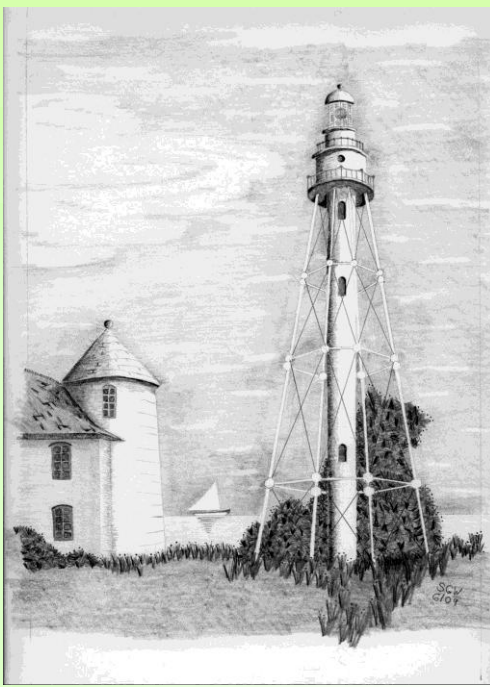
# **BENEFITS OF DEVELOPING A CREATIVE/INNOVATIVE CULTURE IN YOUR FIRM**



**Spring Meeting  
Orlando, FL  
April 25-27, 2012**

**Stuart G. Walesh, Ph.D., P.E.  
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~~Half  
empty?~~



Half  
full!

**Creativity/  
innovation**

**?  
=**

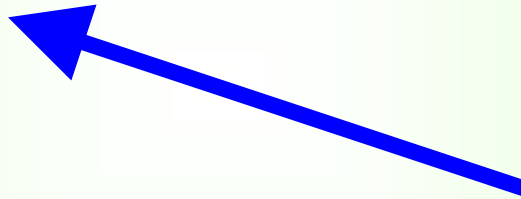
**Business/  
professional  
benefits**



**Not necessarily**

**Create:** Originate, make, or cause to come into existence an entirely new concept, principle, outcome, or object

**Innovate:** Make something new by purposefully combining different existing principles, ideas, and knowledge



**Guttenberg  
borrowed the screw  
press  
from wine making  
and olive oil  
production and he  
also borrowed from  
woodblock printing  
and copper  
and coin forging**

**Source: Murray 2009**

/CreativeInnovative





**Benefit:**

**Improved health and welfare in  
developing countries**



**Carrying water long distances is a daily task for mostly women and children in many developing countries**



# The Q-Drum

Capacity:  
13.2  
gal.



Filled  
Weight:  
120  
lb.



Sources: Innovative Concepts Group 2012 and GreenUpGrader 2012





Failure fear





**Belief  
that  
creativity/  
innovation  
are natural,  
that is,  
cannot be  
learned**





# Left-brain tendency



# Discomfort with “artistic” types







# Obstacles



- Failure fear
- It's nature, not nurture
- Left-brain tendency
- Discomfort with “artistic” types
- Reluctance to change
- Others?

**Benefit:**

**Increased profitability**

iPod

iTunes

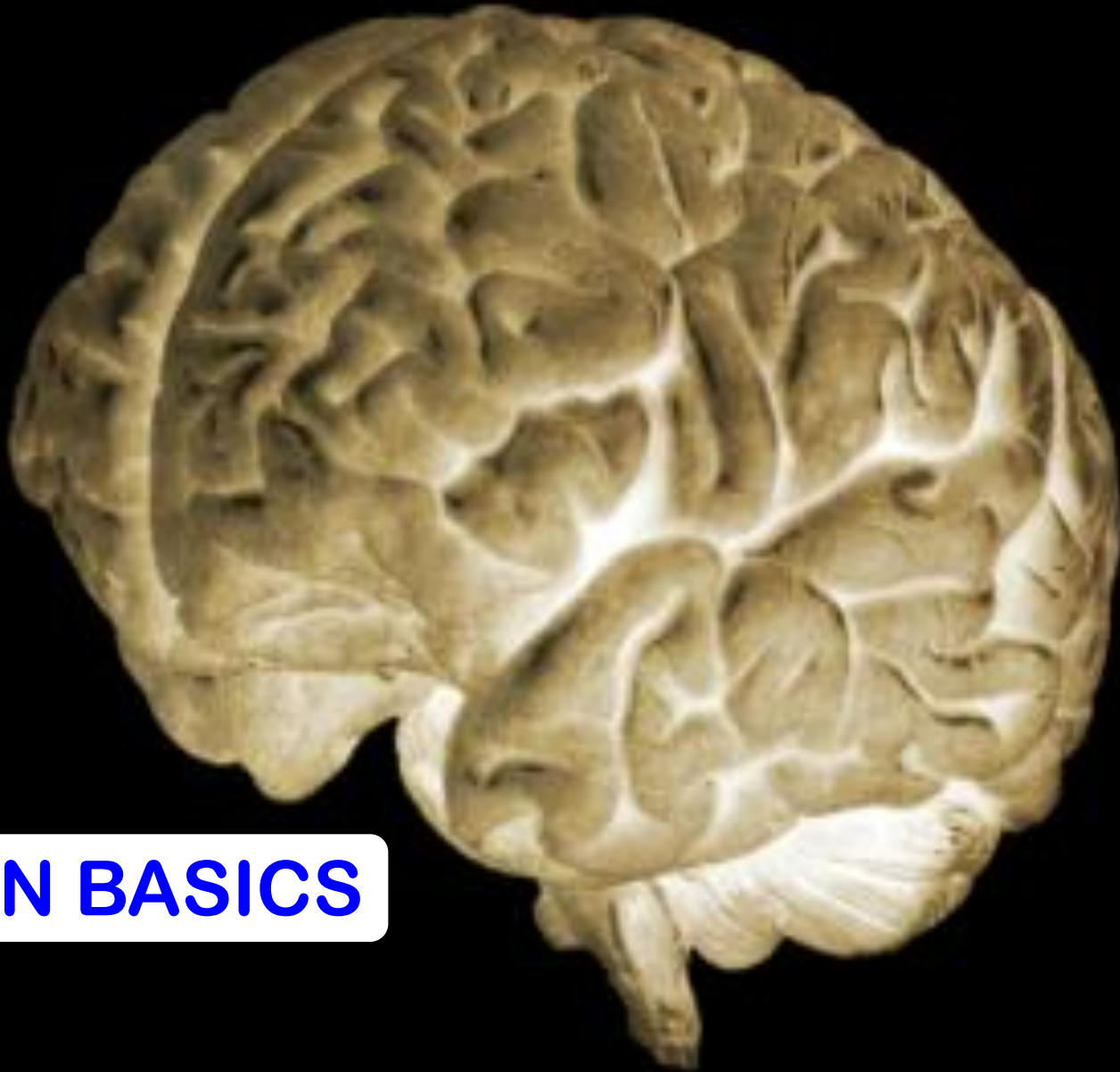
iPhone

iPad

?







# BRAIN BASICS

# The brain:

- Controls body temperature, heart rate, and breathing
- Accepts information from senses
- Handles physical motion
- Enables thinking, dreaming, reasoning, and experiencing emotions

**The brain  
performs  
functions by  
combining with  
the spinal cord  
and peripheral  
nerves**



**The brain contains  
50 to 100 billion nerve cells  
called neurons**





~~Hardwired?~~

or

Neuroplastic?

**Lateralization of functions means that the left side of the brain interacts with the right side of the body and vice-versa**



# The two hemispheres of the brain are **asymmetrical** with respect to **some capabilities**

LEFT HEMISPHERE	RIGHT HEMISPHERE
Verbal	Nonverbal
Analytic	Synthetic
Symbolic	Actual
Abstract	Analogic
Temporal	Nontemporal
Rational	Nonrational
Digital	Spatial
Logical	Intuitive
Linear	Holistic

Source: Edwards 1999

**Betty Edwards:**

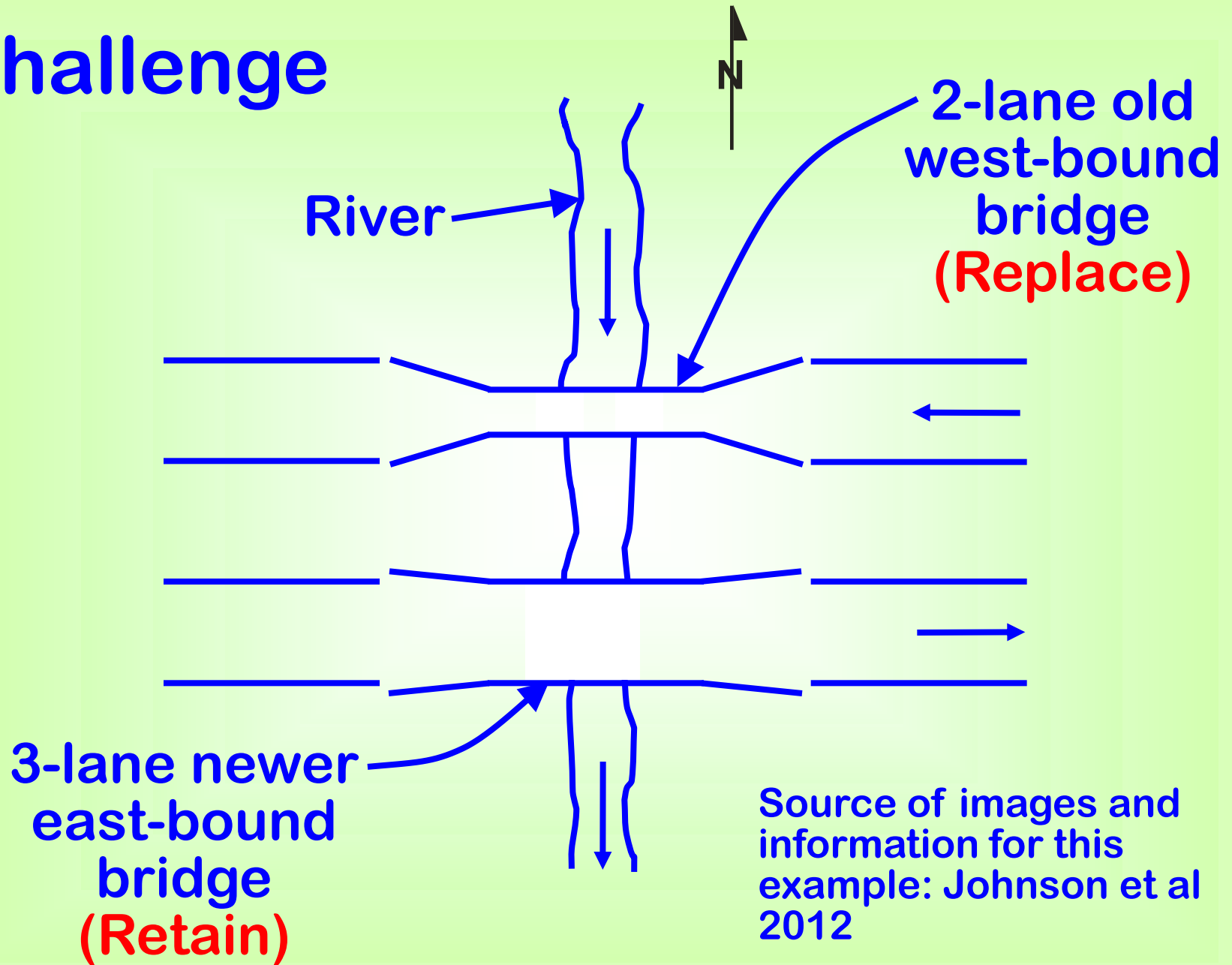
**“Half a brain is better than none.  
A whole brain would be better.”**

**Benefit:**

**Minimization of disruption caused  
by public works project**



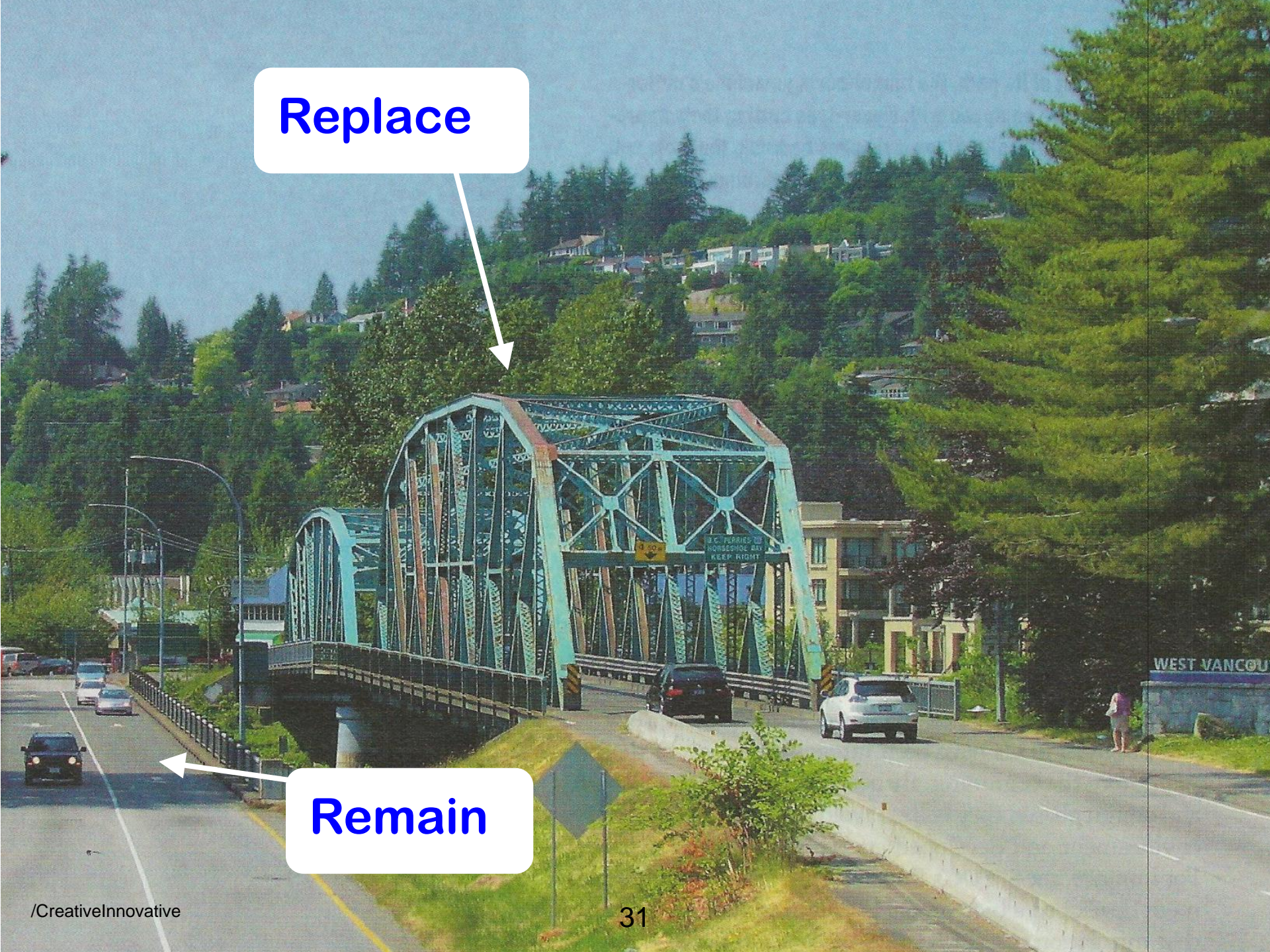
# Challenge





**Replace**

**Remain**





# Initial idea

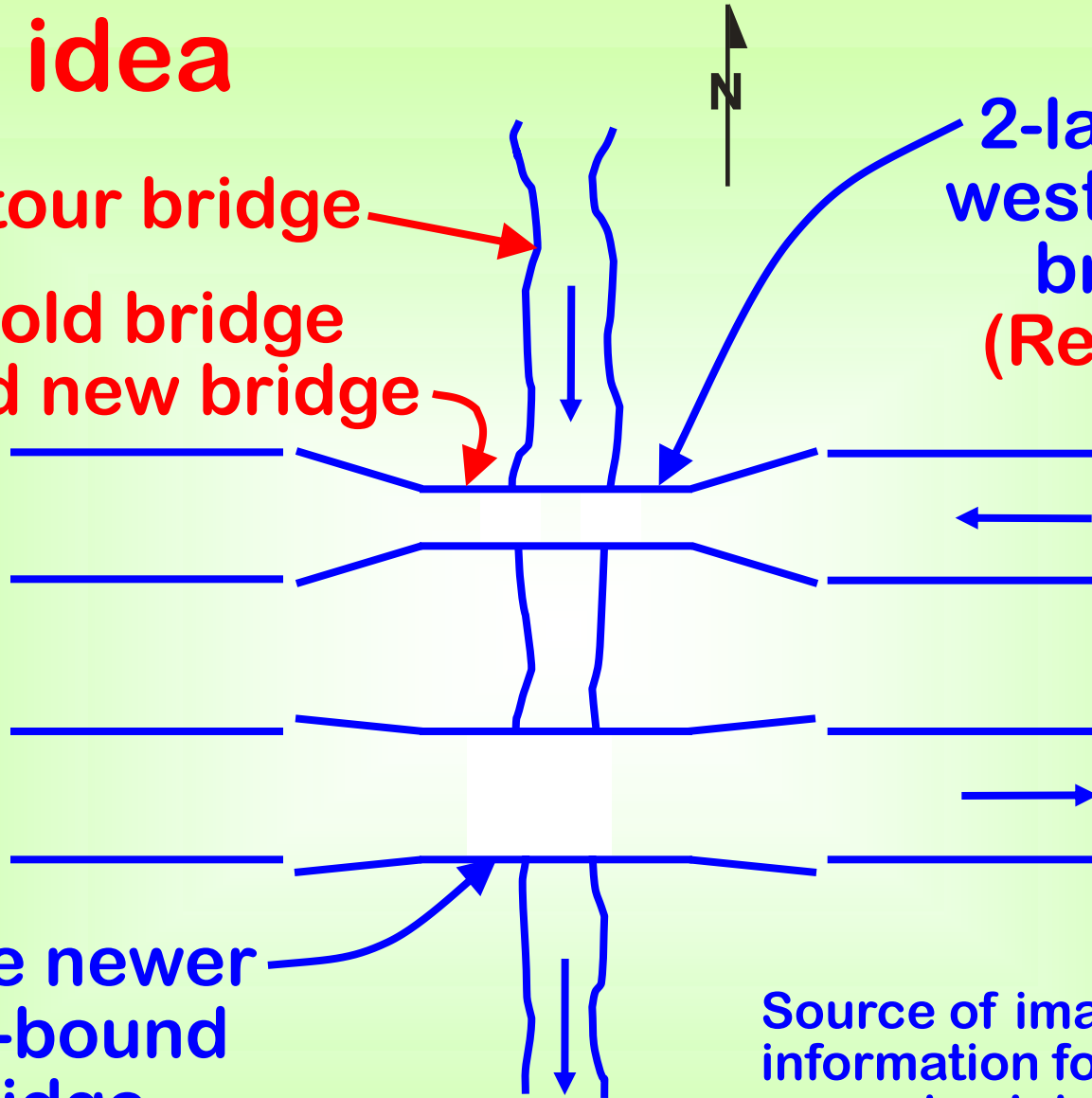
Build detour bridge

Remove old bridge  
and build new bridge

2-lane old  
west-bound  
bridge  
(Replace)

3-lane newer  
east-bound  
bridge  
(Retain)

Source of images and  
information for this  
example: Johnson et al  
2012



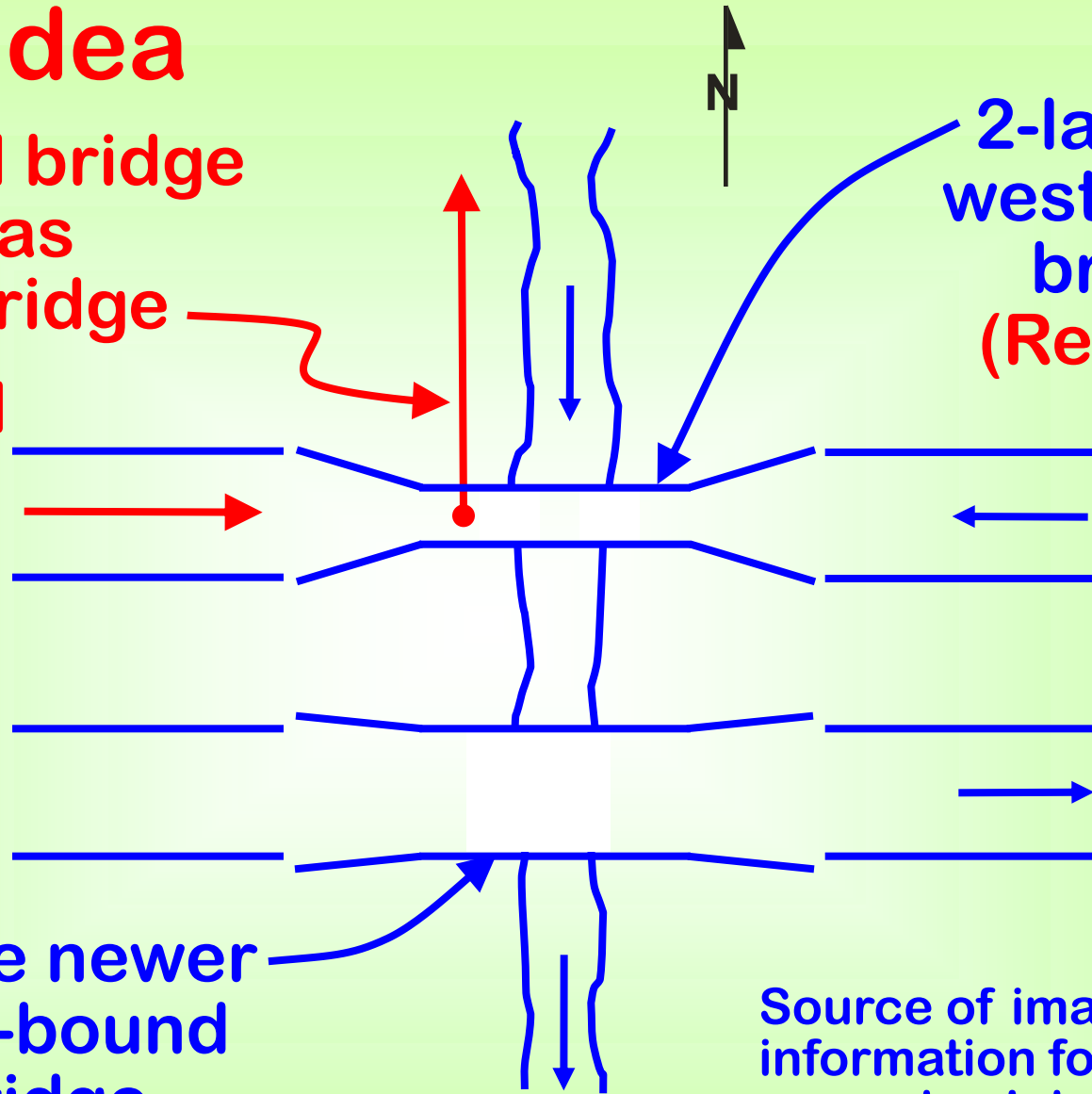
# Better idea

Move old bridge  
to serve as  
detour bridge

Remove old  
bridge and  
build new  
bridge

3-lane newer  
east-bound  
bridge  
(Retain)

2-lane old  
west-bound  
bridge  
(Replace)



Source of images and  
information for this  
example: Johnson et al  
2012



**Old bridge in temporary location**

**New bridge construction about to begin where old bridge was**





**Old bridge was placed temporarily here**

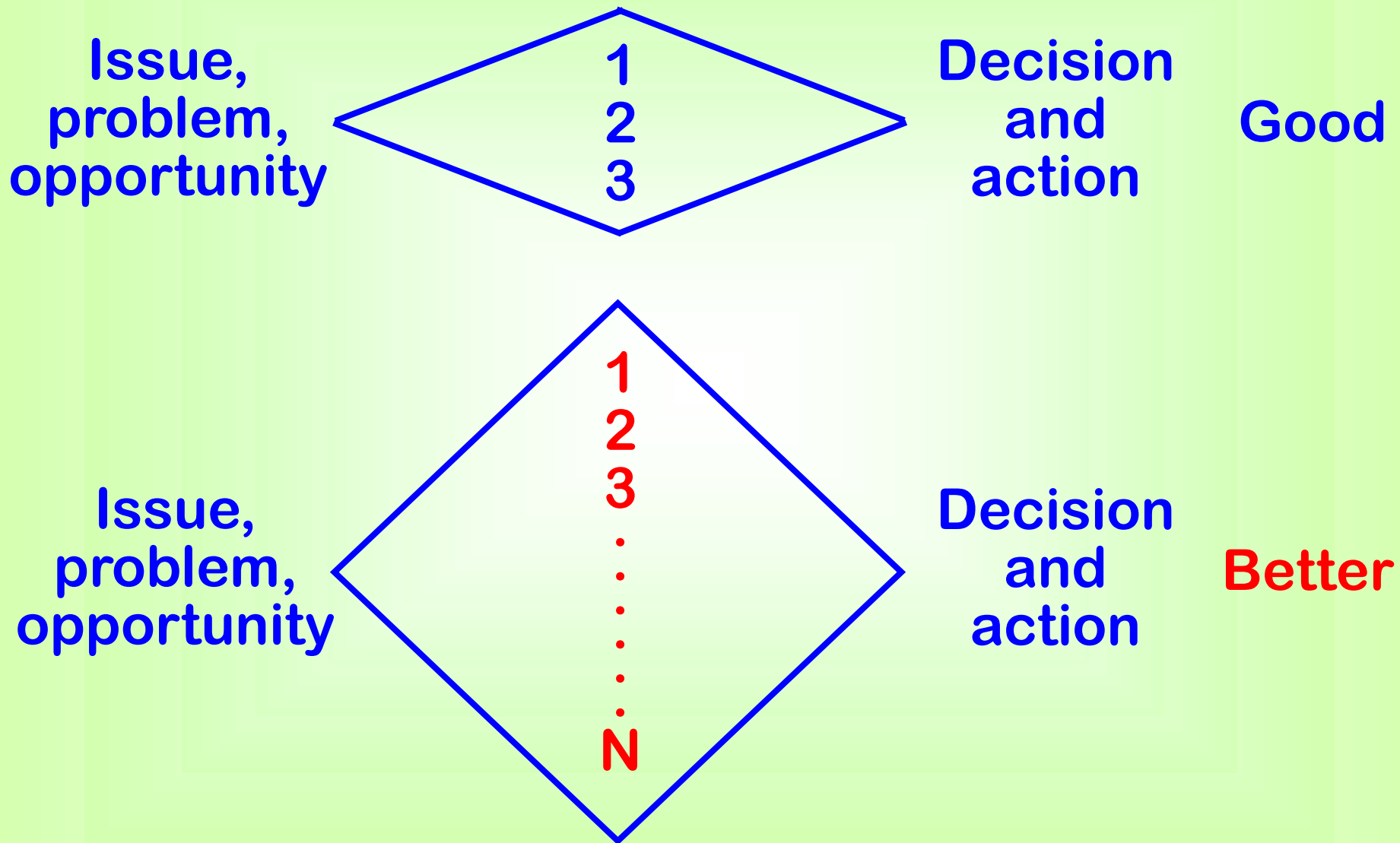


**New east-bound bridge**



**WHOLE BRAIN TOOLS**

## Options



**Biomimicry**

**Borrowing Brilliance**

**Brainstorming**

**Delphi Technique**

**Fishbone Diagramming**

**Freehand Drawing**

**Medici Effect**

**Mind Mapping**

**Multivoting**

**New Points of View**

**Ohno Circle**

**Problems & Ideas Meetings**

**Process Diagramming**

**Pugh Method**

**Puzzles**

**Six Thinking Caps**

**Stimulating Environment**

**Swiss Army Knife**

**SWOT**

**Synectics**

**Take a Break**



# How do we know that these tools **work**?

## Personal experience

## Observation of students





## Neuroscience findings

- Brain can work more productively in two ways
- First, focus
- Second, seek more options

# BORROWING BRILLIANCE



Murray,  
presumably  
with tongue-  
in-cheek,  
suggests that  
creativity  
borders on  
stealing

Source: Murray 2009

**Scholars cite their sources**





**Henry Ford borrowed disassembling  
cows and converting it into  
a system for assembling cars**



**Source: Murray 2009**

/CreativeInnovative





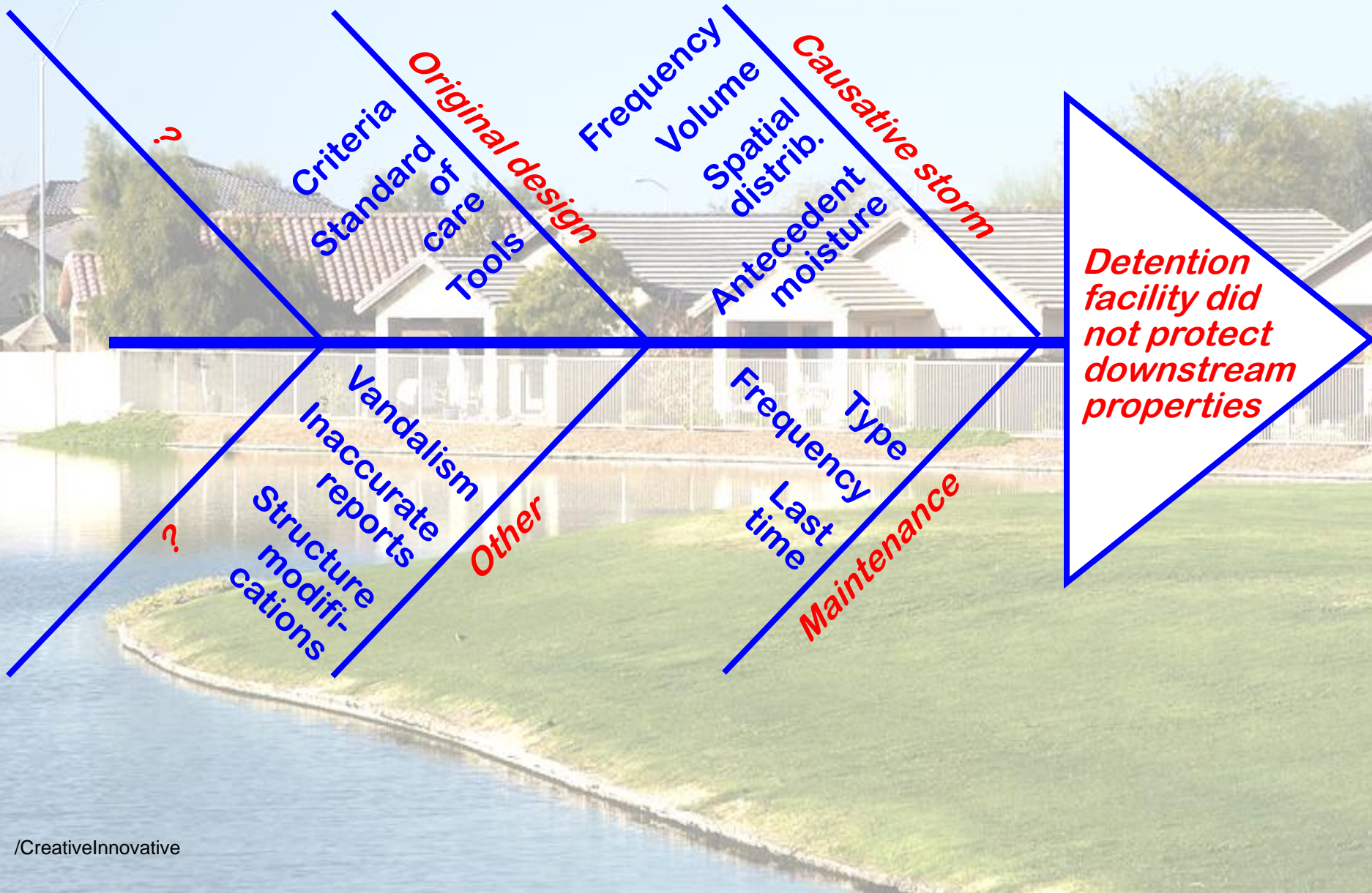
# BRAINSTORMING

- Invite *cross-section* of participants
- Create *non-threatening* environment
- *Pose problem*
- *Invite all* to offer ideas
- *Do not immediately evaluate* any of the ideas

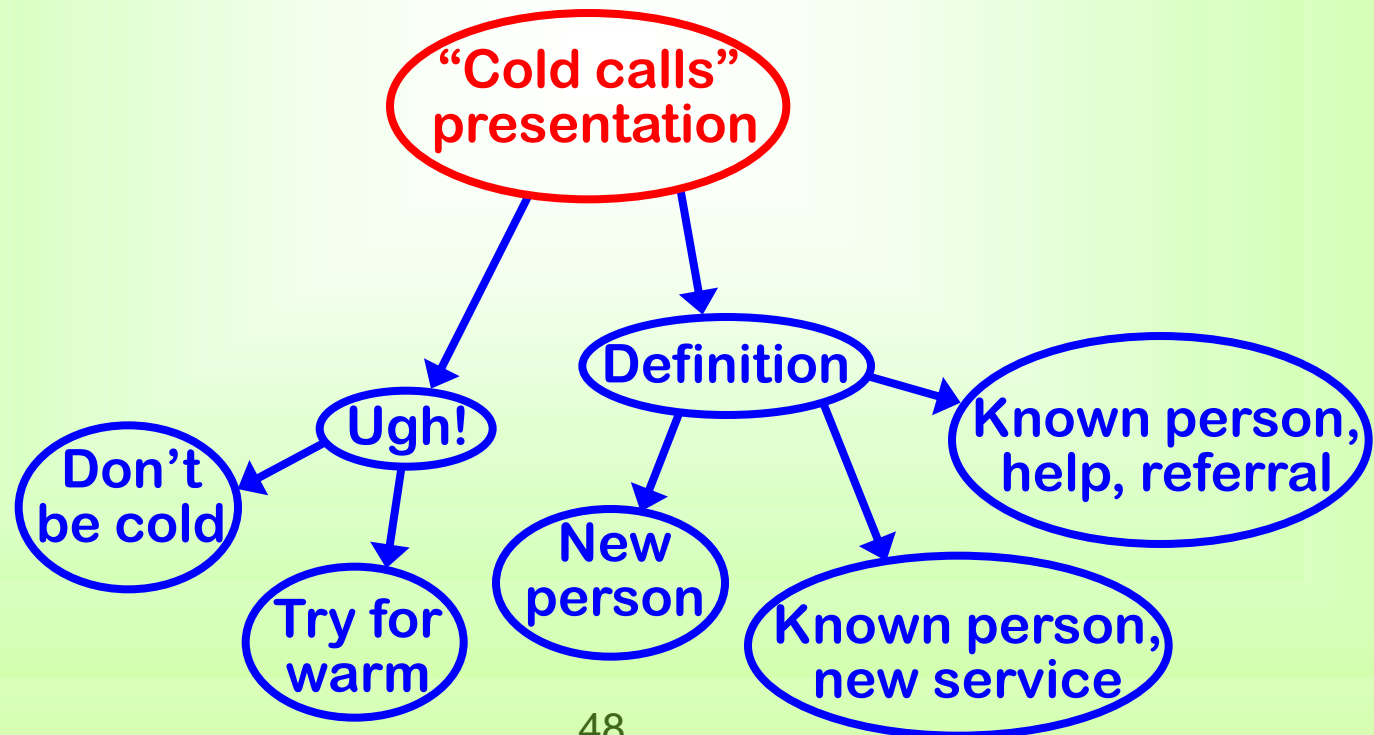


# FISHBONE DIAGRAMMING

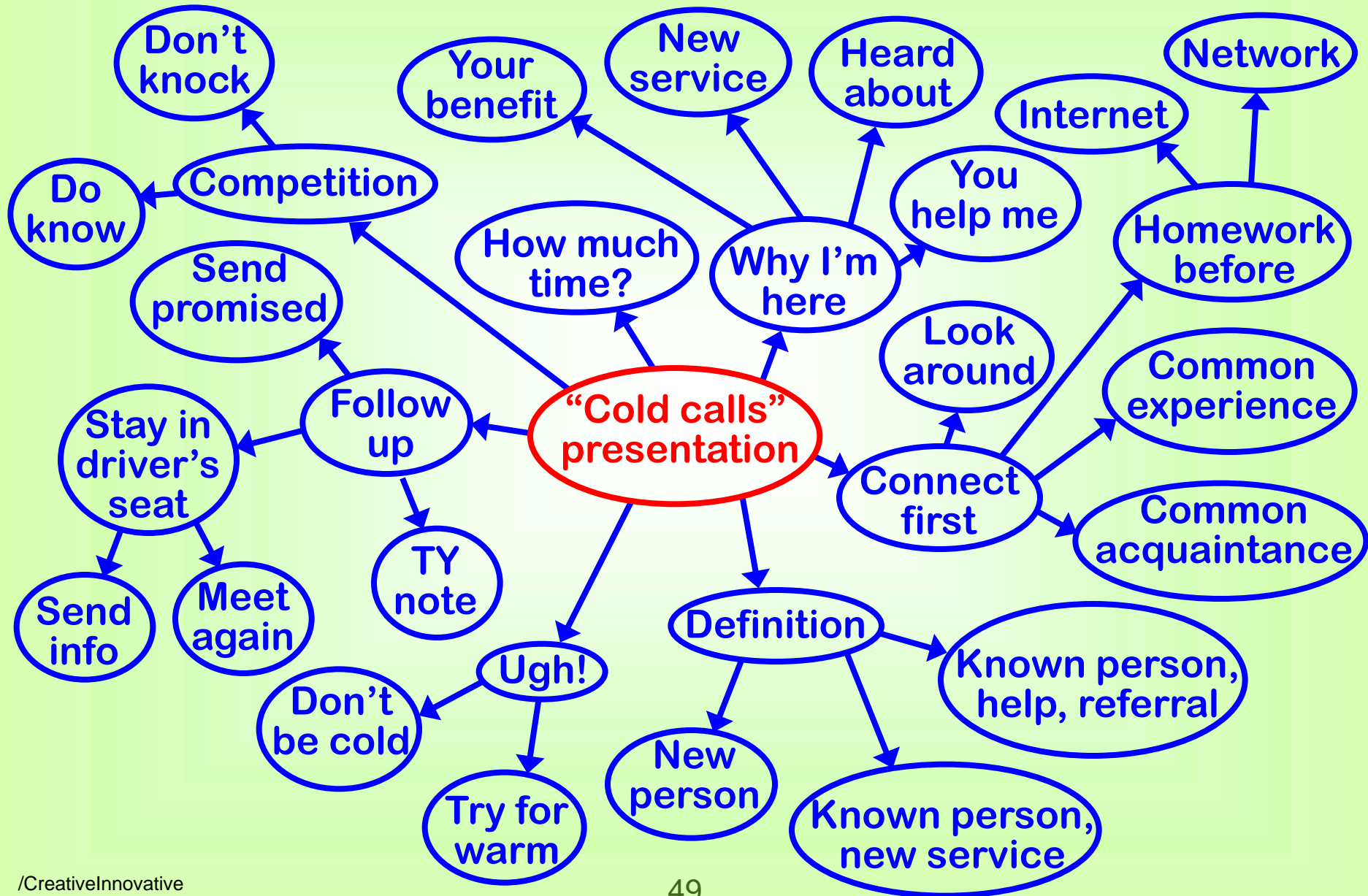
- Helps *identify possible causes* of a problem
- Invite *cross-section* of participants
- *Pose problem*
- Create *diagram*



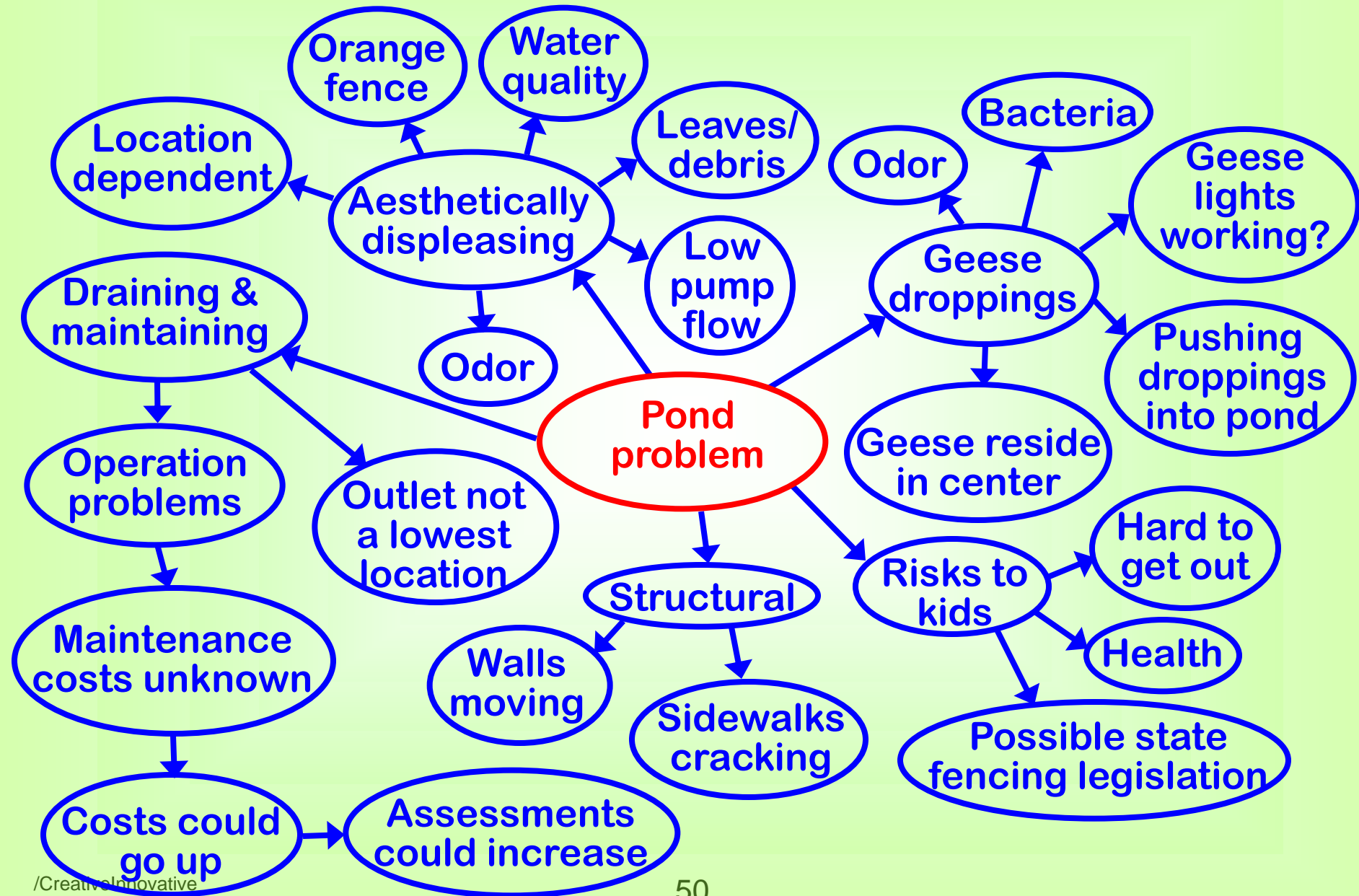
# MIND MAPPING







# Another example



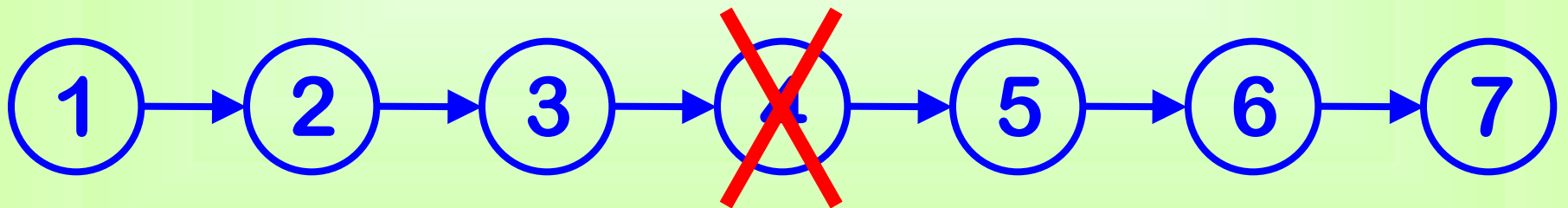
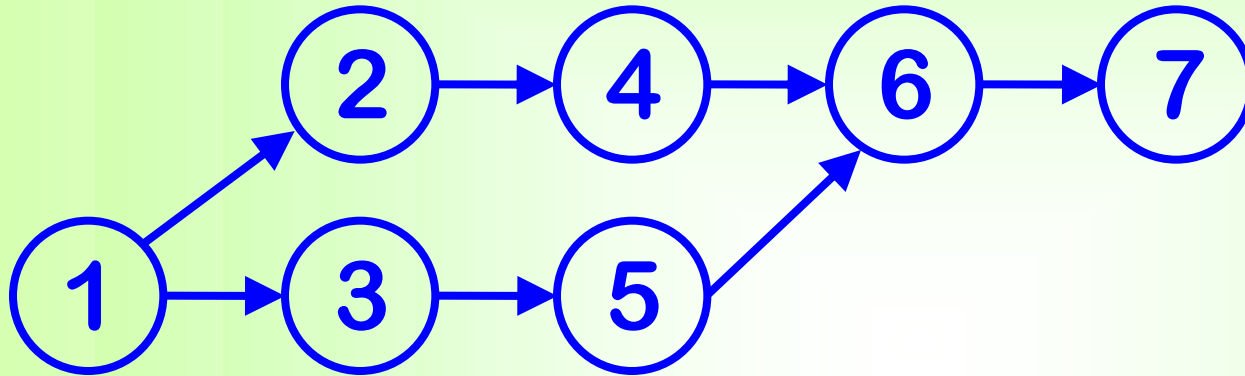
# Why is mind mapping **effective**?

- Can be done quickly by an individual or group
- No preparation required—it just happens
- Highly visual—engages the right hemisphere

# NEW POINTS OF VIEW







**Try**  
**“what if...”**  
**to get beyond**  
**constraints**

**Benefit:**

**Reduced cost of public works**

**Problem:  
Frequent,  
widespread  
basement flooding  
in Skokie, IL  
caused by back-up  
from combined  
sewers during  
rainfall events**

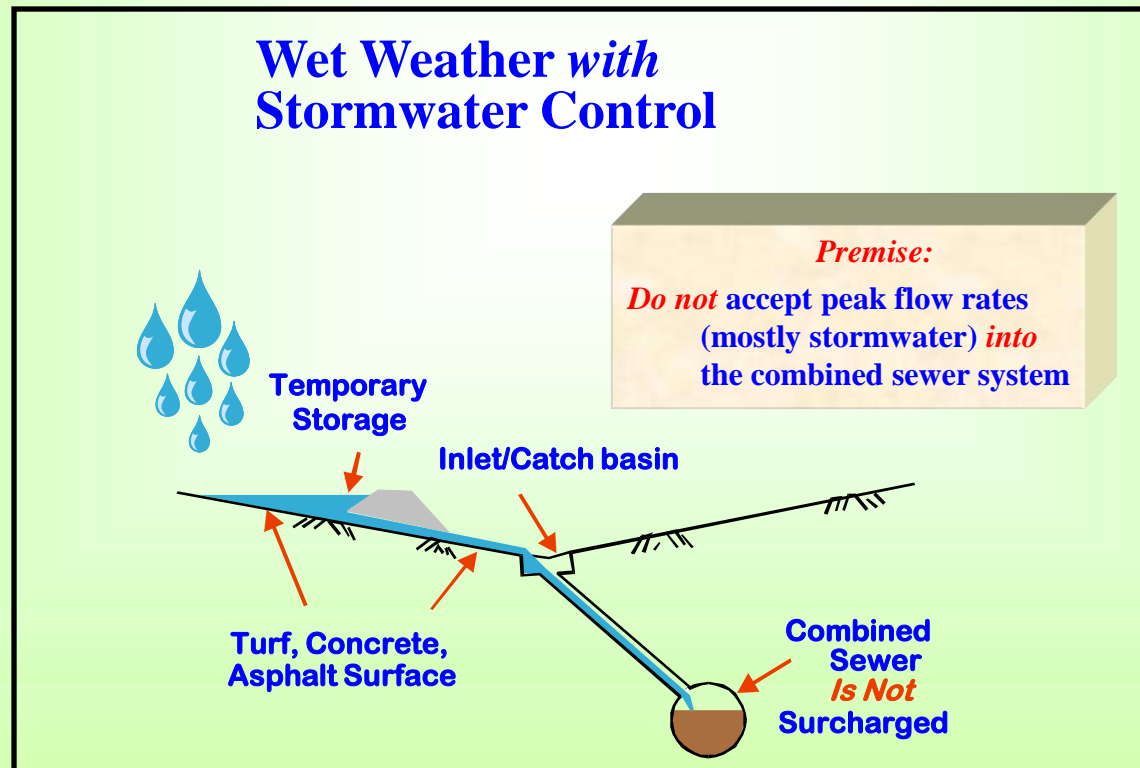


**Note: Sources of data and graphic in this section: Welsh 2000. See also Welsh and Carr 1999.**



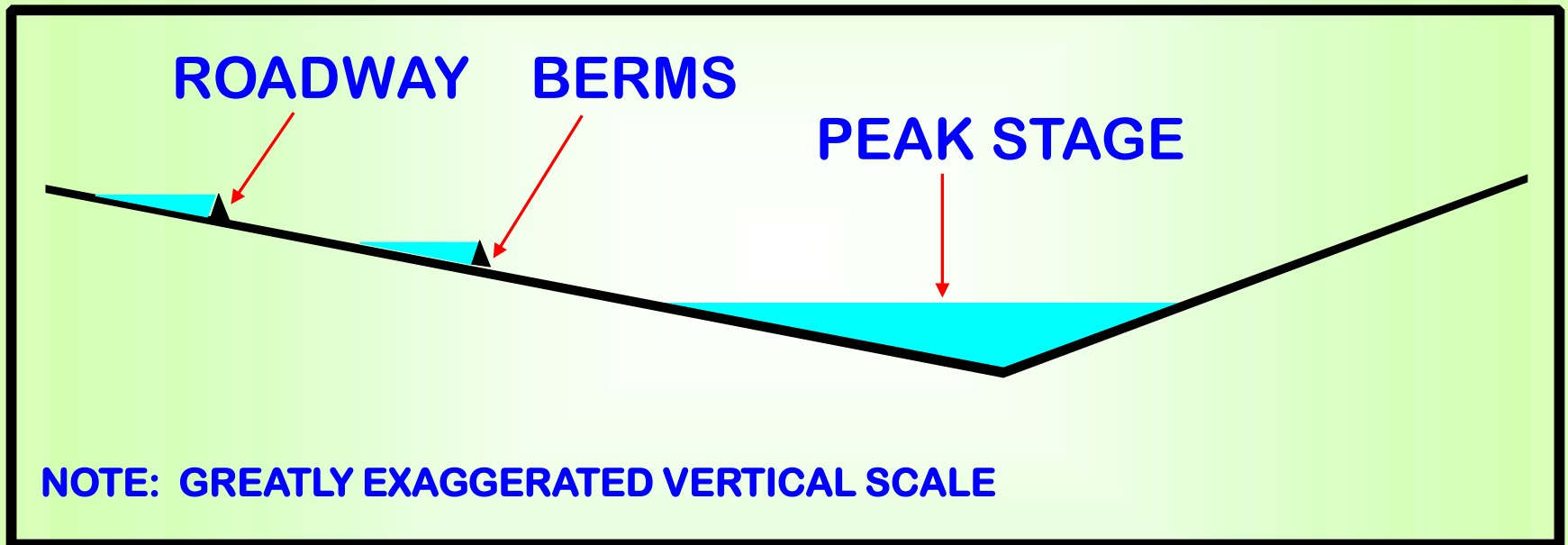
# Take a new point of view: Redefine the problem

Stormwater out of control



# Where to store the stormwater?

Answer: On the street and,  
as needed, below the street



Strategic placement of berms and flow regulators along a street facilitates use of the street's capacity to temporarily and in a controlled fashion store stormwater.

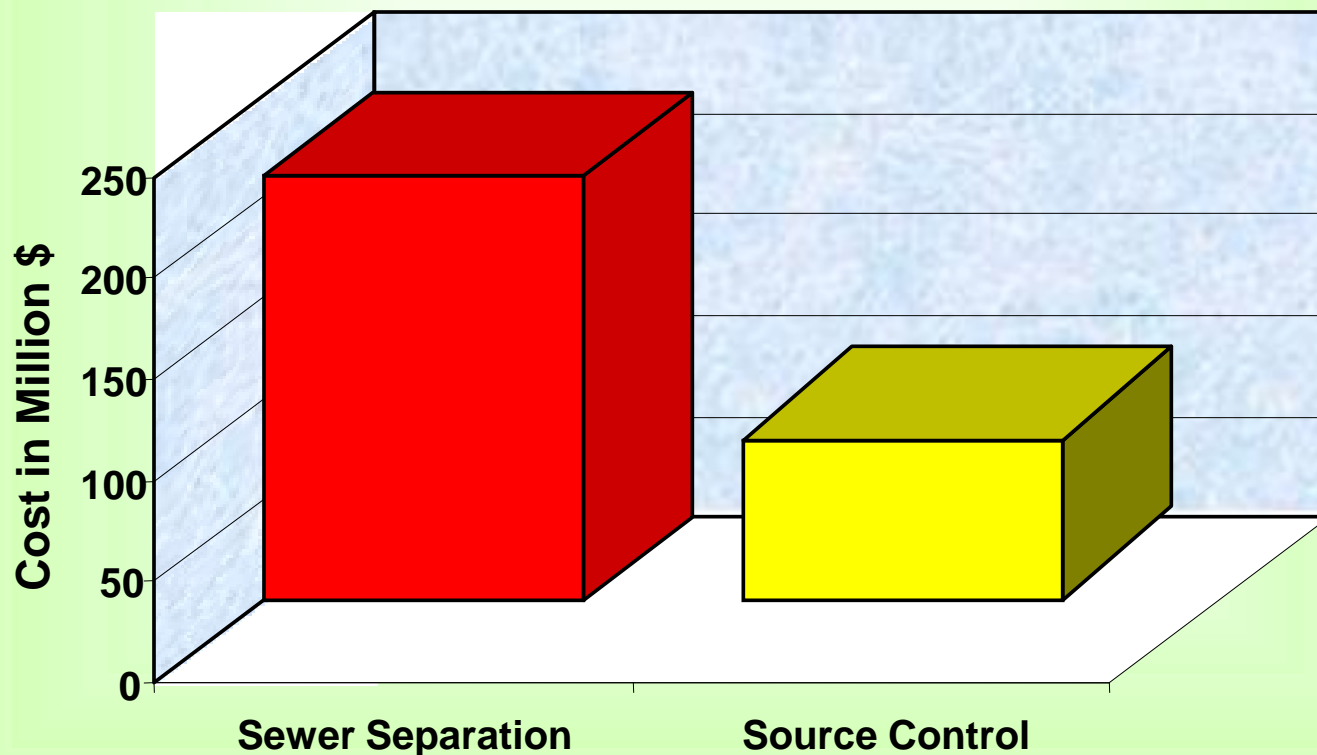
# One of 871 street berms



***Purpose:***  
**Direct the flow  
of stormwater**

# Phased construction over three combined sewer districts: 1983-1999

Capital costs in 1999 dollars:







# PROBLEMS AND IDEAS MEETINGS



# PROBLEMS AND IDEAS MEETINGS





**STIMULATING ENVIRONMENT**

# Ideas for a stimulating environment

- An open space
- Studios, laboratories, and workshops
- Displays of individual and team achievements
- Visual art
- Plants
- Music
- ?

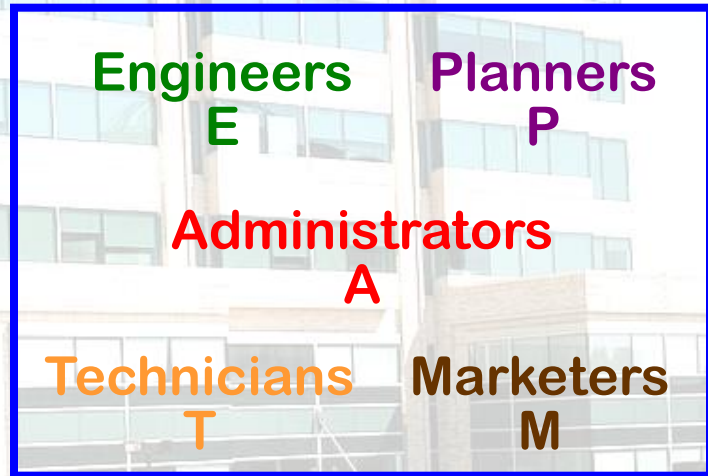
Encourage  
questioning

Allow  
(expect?)  
mistakes

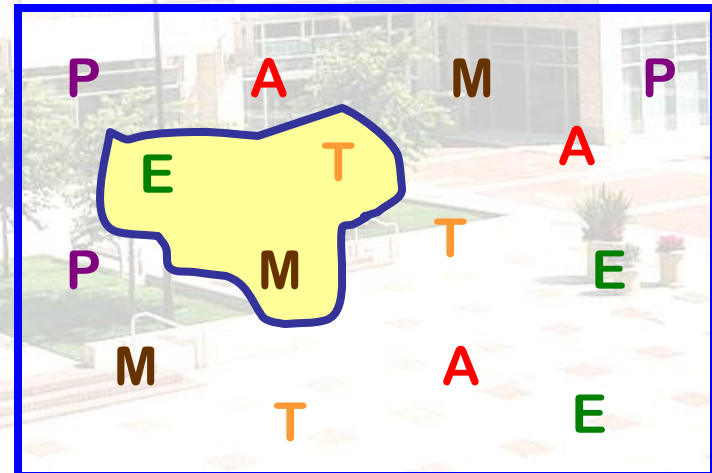


# Arrange the office “illogically”

Logical



Illogical  
(Or is it?)



**Biomimicry**

**Borrowing Brilliance**

**Brainstorming**

**Delphi Technique**

**Fishbone Diagramming**

**Freehand Drawing**

**Medici Effect**

**Mind Mapping**

**Multivoting**

**New Points of View**

**Ohno Circle**

**Problems & Ideas Meetings**

**Process Diagramming**

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**Puzzles**

**Six Thinking Caps**

**Stimulating Environment**

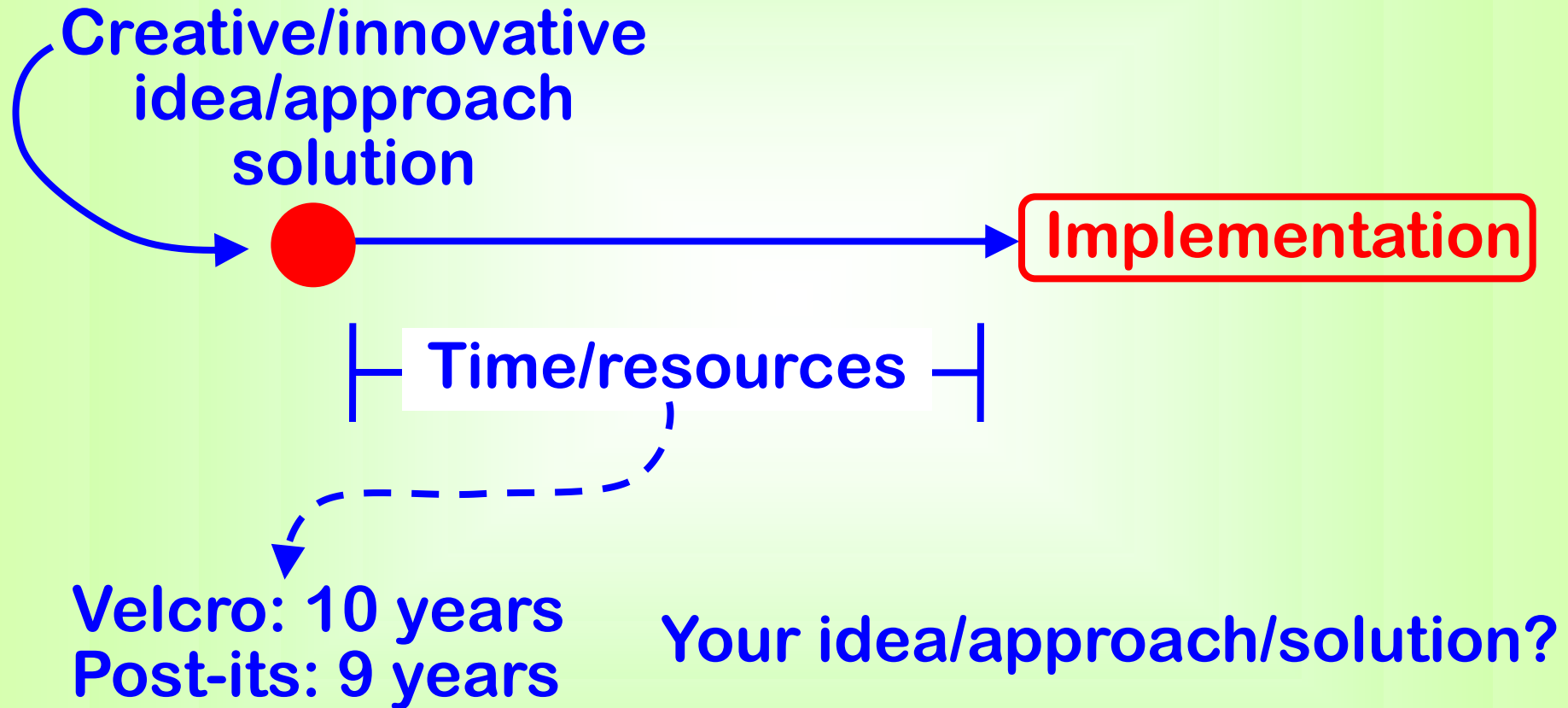
**Swiss Army Knife**

**SWOT**

**Synectics**

**Take a Break**

# Implementing the creative/innovative idea/approach/solution



Sources: Wikipedia, 2011

**Benefit:**

**New tools/applications**

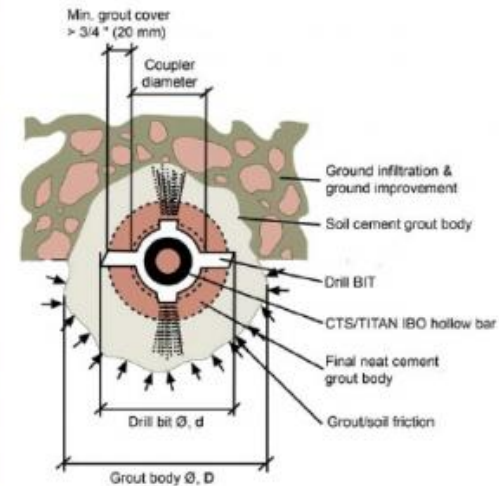
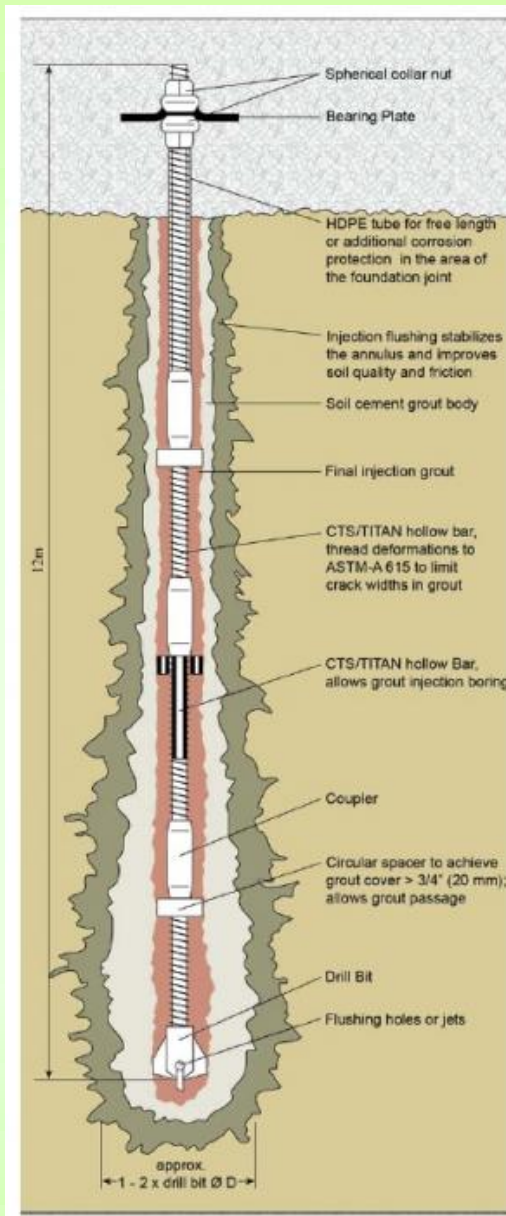




**Dr. Fernando Lizzi**  
**Civil Engineer**

**Source of Photo: Bennett 2012**

# Micropile



Source: Bennett and Hothem 2010

# BREAK OUTS



**WORKING MORE CREATIVITY/INNOVATIVE  
INTO ENGINEERING PRACTICE:  
DEVELOPING THE CULTURE**



**Assumption:** You are open to suggestions for establishing a more creative/innovative culture in your organization...

...because it could enhance employee capabilities, strengthen your organization, and add value for those you serve

# **Benefits of taking a creative/innovative approach:**

Improved personal productivity

Historic global impact

Reduced cost of public works

Increased profitability

Improved health and welfare

Reduced public impact during construction

New tools/applications

Minimization of claim costs

Conquered commoditization

# Are you



# killing or

# cultivating



# creativity/innovation?

**Ideacide**



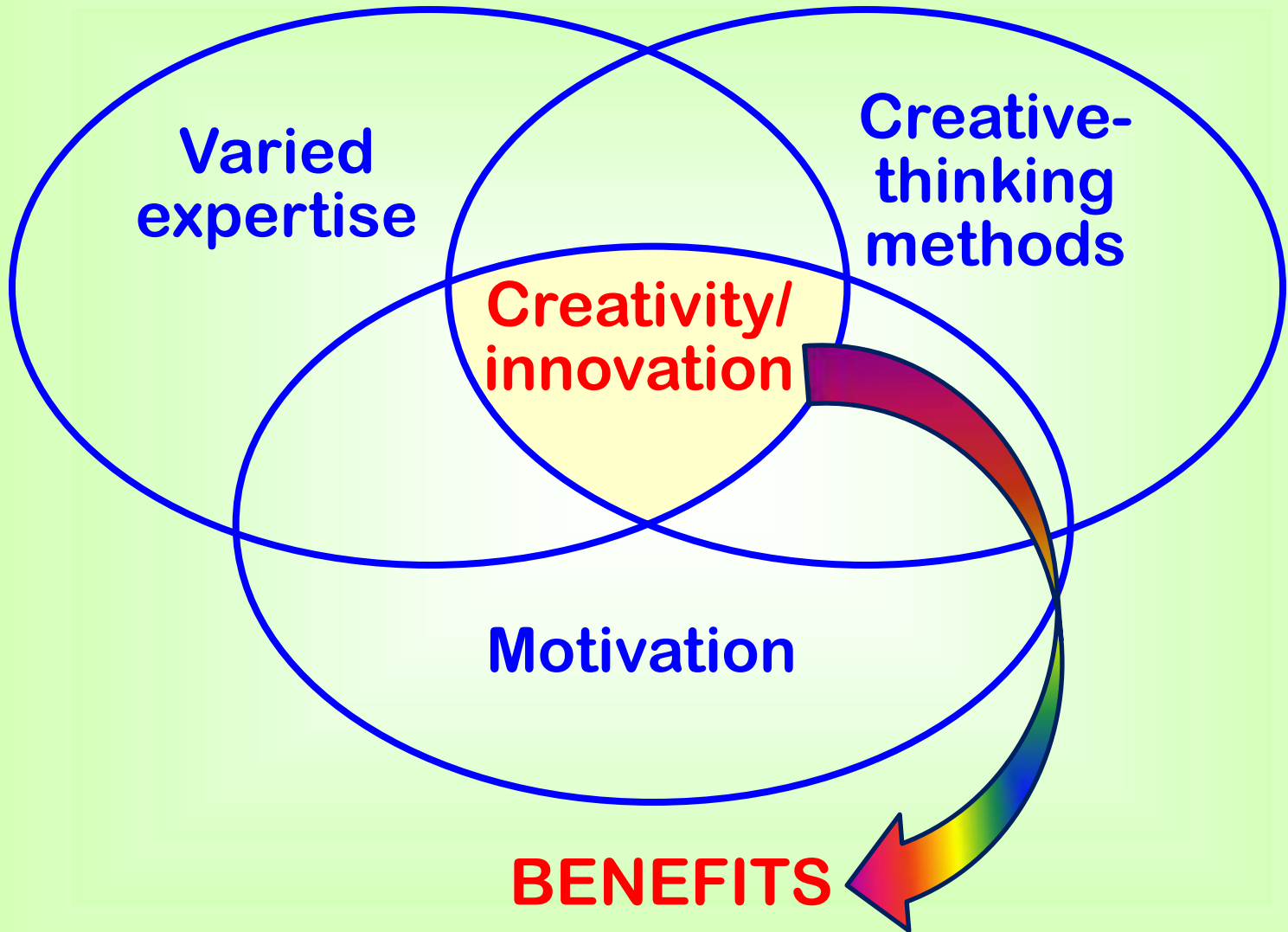


# Killing creativity: 14 ways

1. Play it safe
2. Know your limitations
3. Remind yourself: it's just a job
4. Make skepticism your middle name
5. Be the tough guy
6. Respect history
7. Stop the madness before it can get started
8. Use experience as a weapon
9. Keep your eyes closed
10. Tell yourself there is no problem
11. Underestimate your customers
12. Give sound advice
13. Be suspicious of the creatives, the lunatic fringe
14. When all else fails, act like a grown-up

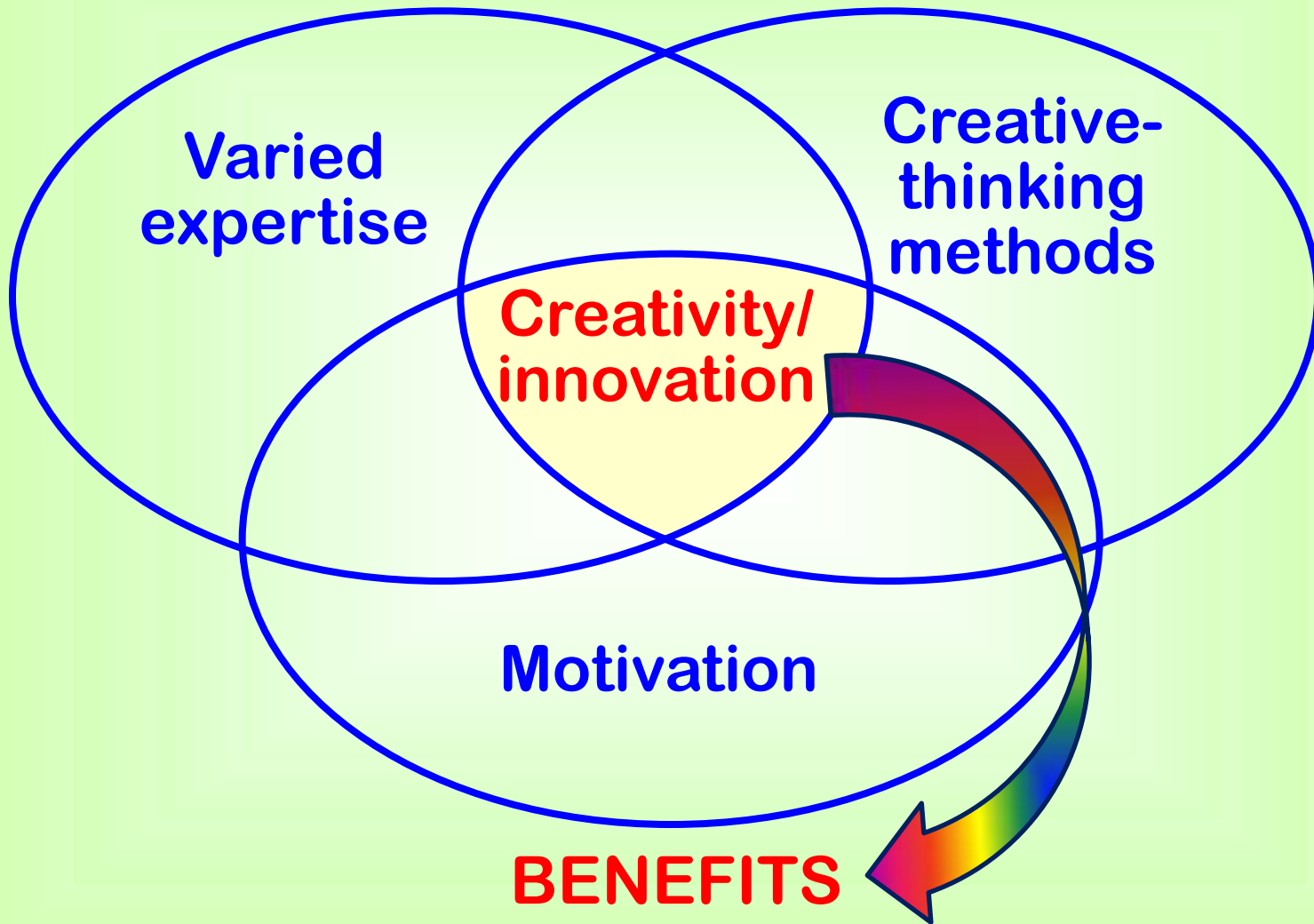
Source: May 2010

# Cultivating creativity/innovation



Source: Adapted from Johnson 2011

# The **employer** plays a key role in all three components



Source: Adapted from Johnson 2011

# Possible leadership and management practices

- Conduct **education and training** to provide fundamentals and tools for creative/innovative thinking
- Lead **problems and ideas** meetings
- Establish a **stimulating environment**—physically and culturally
- Challenge individuals and teams by giving them **major** issues to resolve, problems to solve, or promising opportunities to exploit



- Offer as much **autonomy** as possible concerning the options considered in addressing the problems and opportunities
- Provide adequate **resources**, mainly time and money
- **Get out of the way**
- **Celebrate** in-process successes and **tolerate** set-backs
- **Walk the talk**

# Some organizations **will not** embrace creativity/innovation

- Distract “troops
- Diminish billable time
- Discomfort with change
- Other?

But...

# Key ideas

- We can learn how to be more creative/innovative
- If we do, we, our organizations, and those we serve will benefit
- What do you think?

~~Half  
empty?~~



Half  
full!



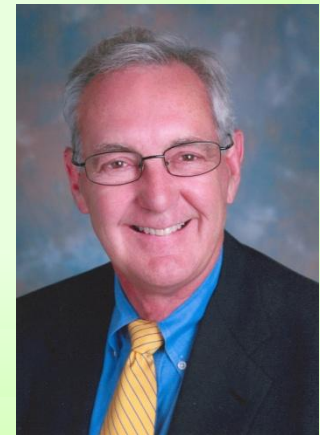
**Questions**

**Comments**

**Critiques**

**Tips**

**Suggestions**



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# Presenter's Biographical Sketch

Dr. Stuart G. Walesh, PE provides management, engineering, education/training, and marketing services. He draws on more than 40 years of engineering, education, and management experience in the government and private sectors to help individuals and organizations engineer their futures. Walesh has functioned as a project manager, department head, discipline manager, marketer, professor, and dean of an engineering college.

Representative clients: include ASCE; Boston Society of Civil Engineers; BSA Life Structures; Castilla La Mancha University; CDM; Clark Dietz; Daimler Chrysler; DLZ; Earth Tech; Harris County (TX) Flood Control District; Hinshaw & Culbertson; Indiana Department of Natural Resources; Indiana Department of Transportation/Purdue University; J. F. New; Leggette, Brashears & Graham; Midwest Geosciences Group; MSA Professional Services; PBS&J; Town of Pendleton, IN; Pennoni Associates; Taylor Associates; City of Valparaiso, IN; University of Wisconsin Engineering Professional Development; and Wright Water Engineers.

Walesh authored *Urban Surface Water Management* (Wiley, 1989), *Flying Solo: How to Start an Individual Practitioner Consulting Business* (Hannah Publishing, 2000), *Managing and Leading: 52 Lessons Learned for Engineers* (ASCE, 2004), and *Managing and Leading: 44 Lessons Learned for Pharmacists* (ASHP, 2008, co-authored with Paul Bush, Pharm.D), and *Engineering Your Future: The Professional Practice of Engineering* - Third Edition (Wiley and ASCE Press, 2012). Walesh is author or co-author of over 200 publications and presentations and has facilitated or presented over 200 workshops, seminars, webinars, and meetings throughout the U.S.

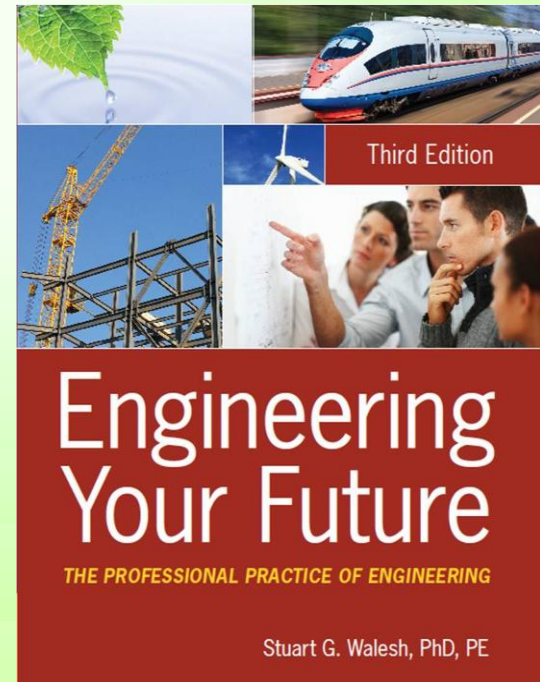
Walesh is a member of ASCE's Committee on Academic Prerequisites for Professional Practice, was Special Issues Editor for ASCE's Committee on Publications, and chaired several national committees. In 1995, he received the Public Service Award from the Consulting Engineers of Indiana; in 1998, the Distinguished Service Citation from the College of Engineering at the University of Wisconsin; in 2003, the Excellence in Civil Engineering Education Leadership Award presented by ASCE; in 2004, he was elected an Honorary Member of ASCE; in 2005, he was elected a Diplomate of the American Academy of Water Resource Engineers; in 2007, he was named Engineer of the Year by the Indiana Society of Professional Engineers and received a Distinguished Service Award from the National Society of Professional Engineers; in 2008, he received the William H. Wisely American

Civil Engineer Award from ASCE for leadership in promoting engineering as a profession; in 2009, he received the George K. Wadlin Distinguished Service Award from the Civil Engineering Division of the American Society for Engineering Education; and, in 2010, he was named a Fellow Member of the National Society of Professional Engineers.

Walesh received his BSCE degree from Valparaiso University, his MSE from The John Hopkins University, and his PhD from the University of Wisconsin-Madison.

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