



Technology Diffusion Strategies to Promote Pollution Prevention

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Myth: The Advantages of P2 are so Obvious that People will Rush to Adopt it

- Waste Reduction
- Cost Savings
- Improved Compliance
- Improved Efficiency
- Reduced Liability





Reasons for Slow P2 Adoption Rate

- Preventive Innovation
- Change Agents Identity
- Emphasis on Awareness
- Innovation Characteristics
- Optional Decision
- Blame the Customer Mentality

→ Market Failure





Innovation Characteristics that Affect Diffusion

- Relative Advantage over the idea it supersedes
- Compatibility with existing values, past experiences and needs of potential adopters
- Complexity -- perception with respect to difficulty to understand and use the innovation
- Observability -- the degree to which the results of an innovation are visible to others
- Trialability -- the degree to which an innovation can be experimented with on a limited basis





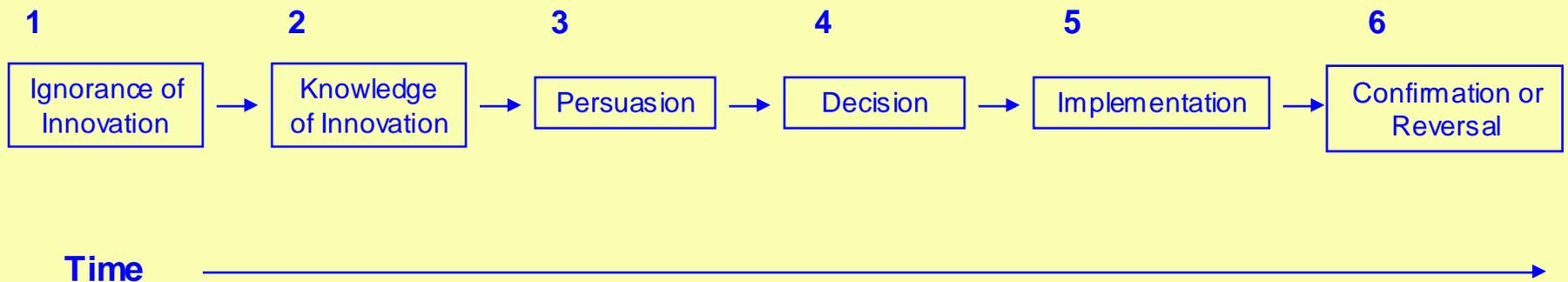
3 Types of Innovation Knowledge

- *Awareness Knowledge* -- information that an innovation exists
- *Principles Knowledge* -- information dealing with the function principles underlying how the innovation works
- *How-to Knowledge* -- information necessary to use an innovation properly





Stages in Adoption of an Innovation



Adapted from E.M. Rogers, *Diffusion of Innovations*, The Free Press, New York, 1995.





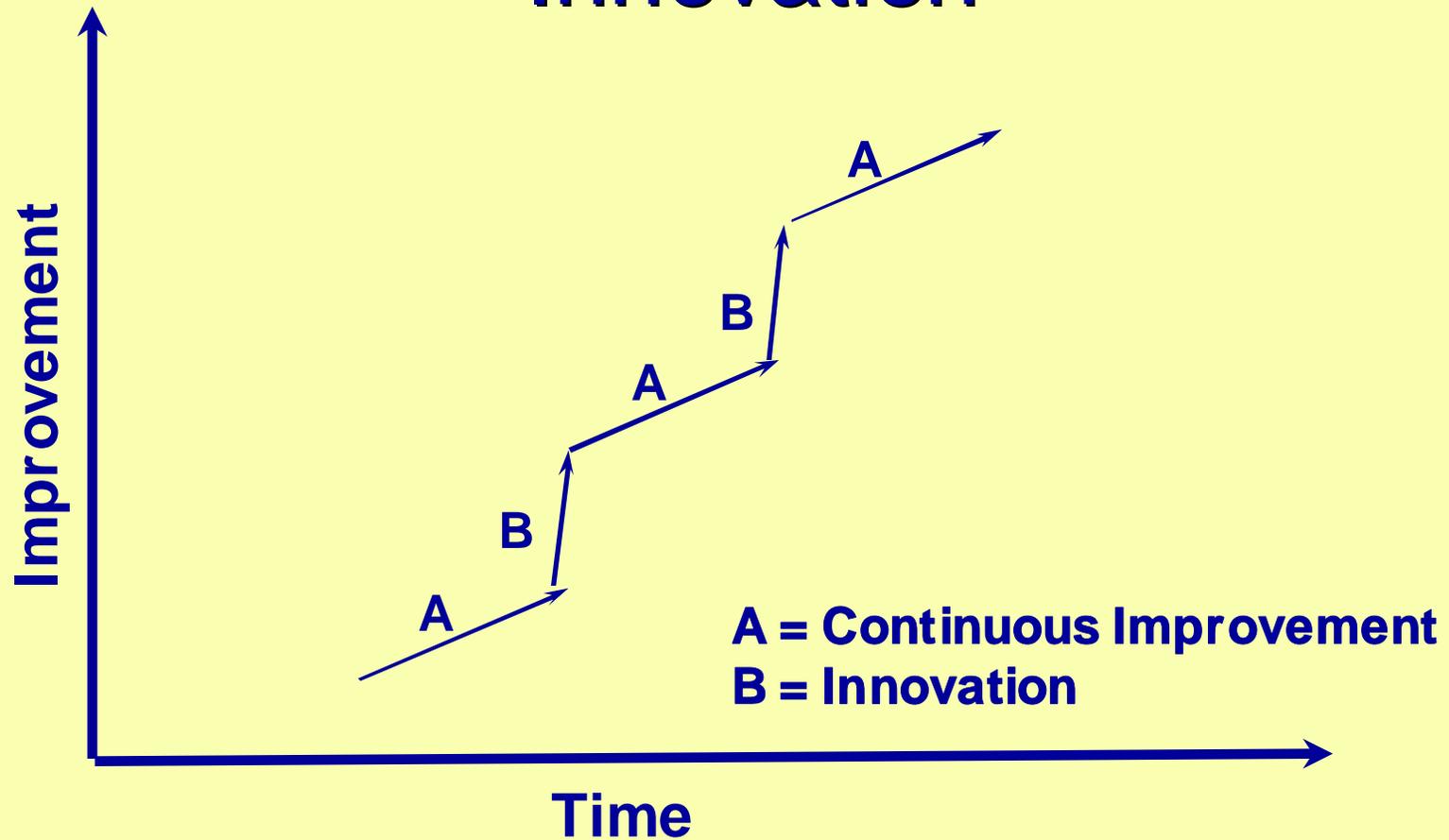
Information Requirements for Implementing Environmentally Conscious Manufacturing

- Compliance and Waste Treatment
 - Require mostly external (out of process) information
 - Internal information requirements include only Quantity and Concentration
- Pollution Prevention
 - Requires mostly internal (in-process information)
 - Adds to compatibility/complexity issues



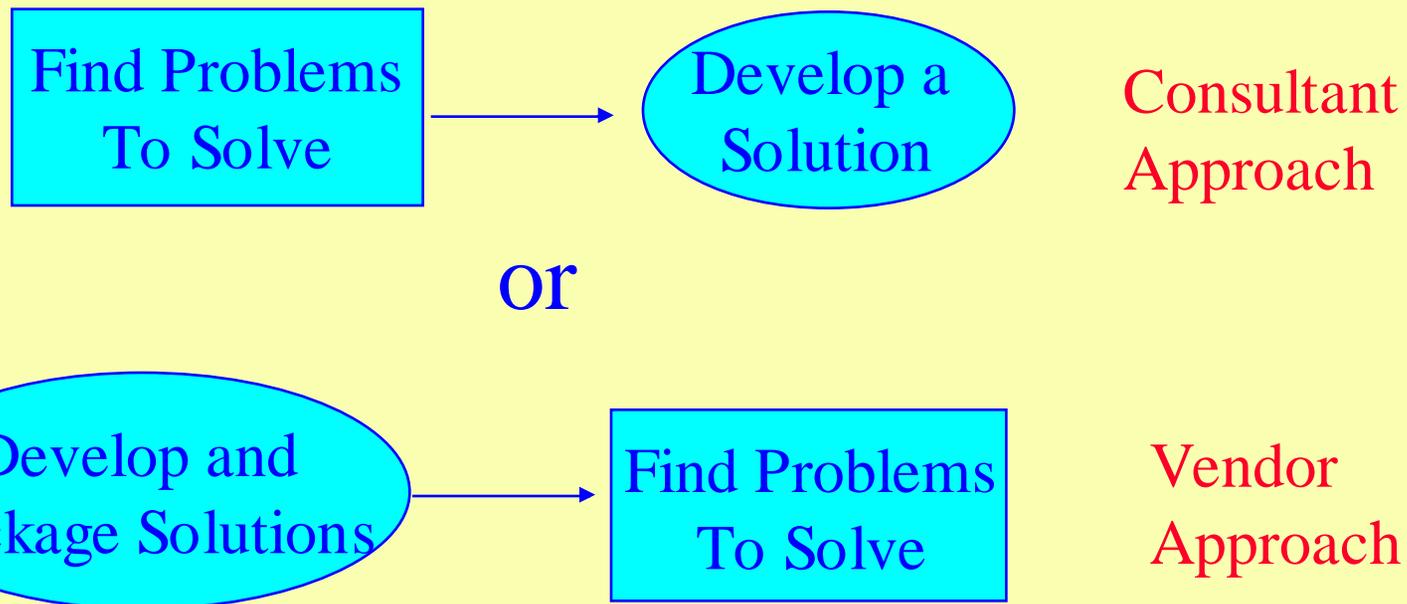


Continuous Improvement vs. Innovation





Traditional Technology Diffusion Approaches

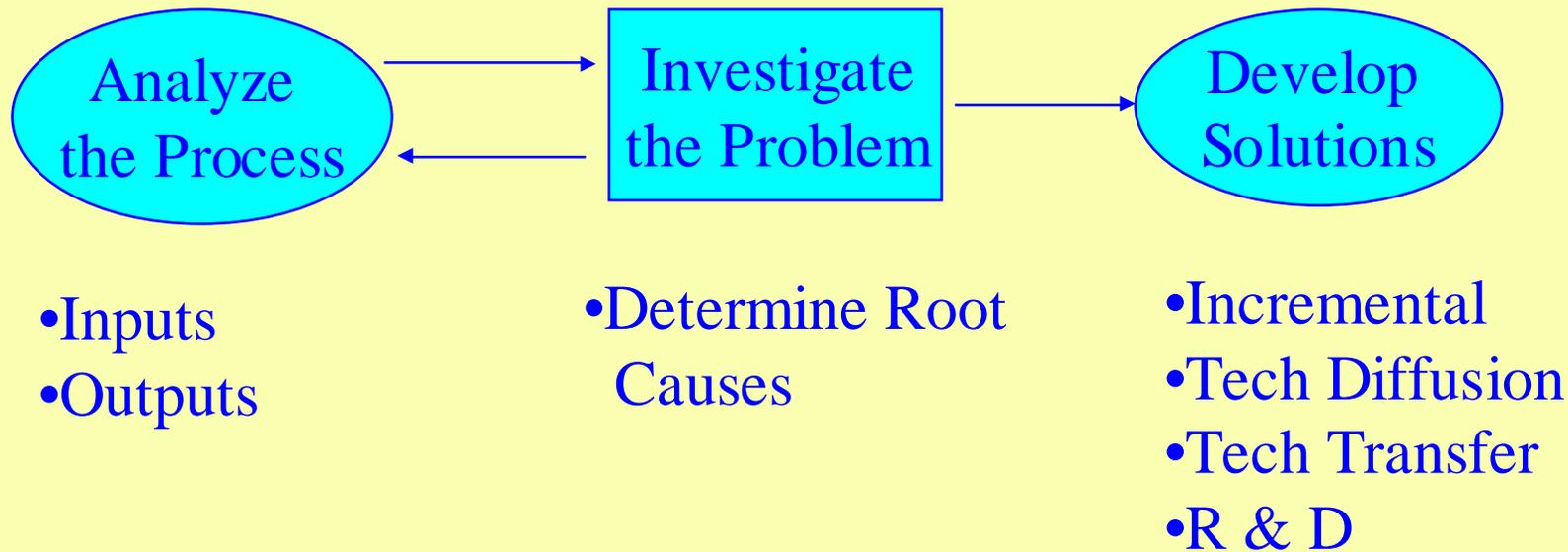


Consequence: May end up solving the wrong problem
May end up with wrong solution





WMRC Approach





Incremental Example

Perceived
Problem



Too much
oily Wastewater

Traditional
Solution



Build treatment
system

WMRC
Solution



Don't dump
diesel fuel
down drain





Technology Diffusion Example

Perceived
Problem



Excessive VOC
Emissions (paint)

Traditional
Solution



Control Pollution
By Incinerating
Paint Fumes

WMRC
Solution



Adopt new Powder
Coating process



**Doing Things Right
vs.
Doing the Right Things**

“It doesn’t matter how fast you climb
the ladder of success if it is leaning
against the wrong wall”

Stephen Covey

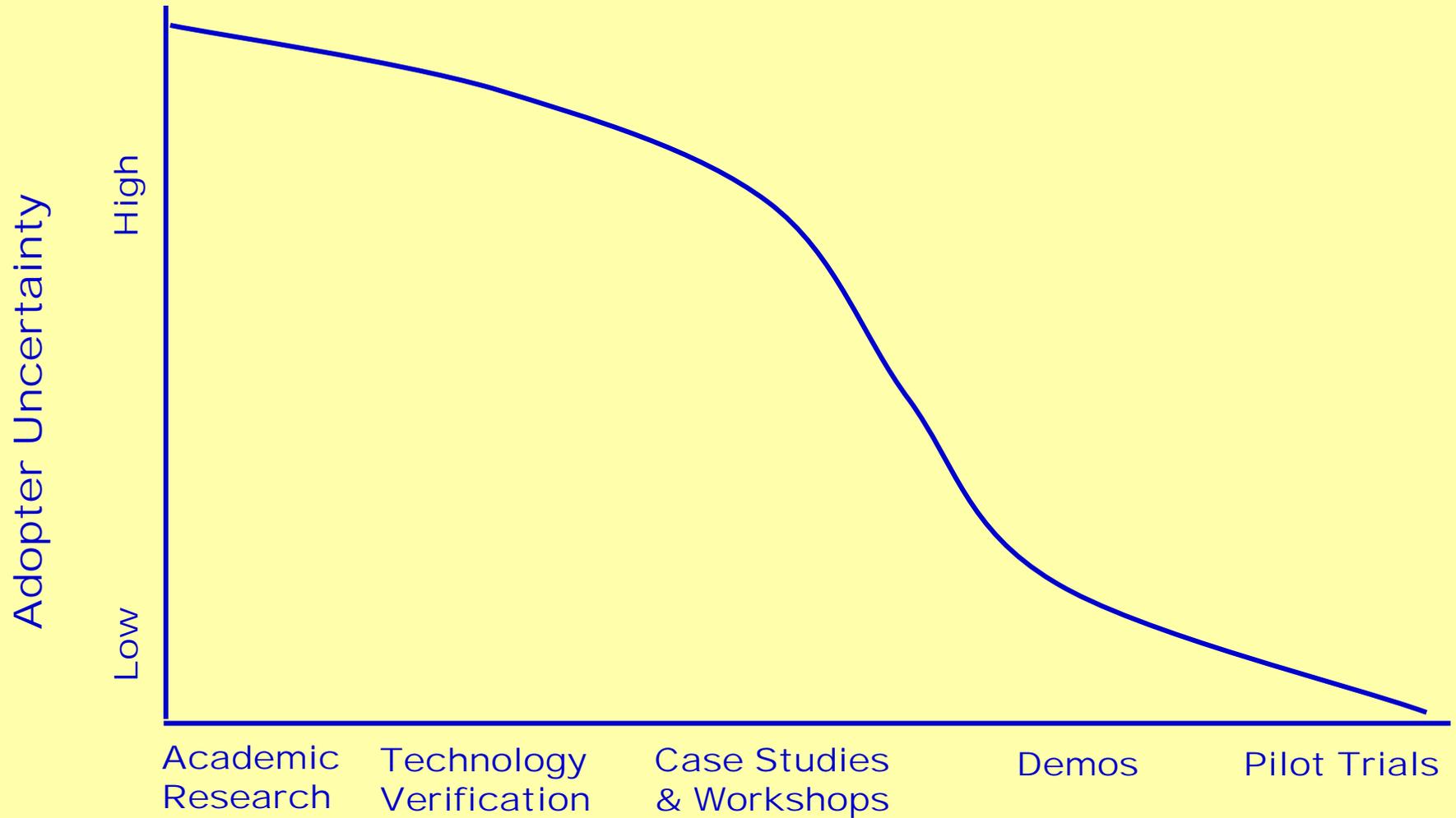


Need to “Test Drive” P2 Technologies

- “Awareness” information isn’t enough
- “Demonstrations” can increase interest
- Pilot Trials Reduce Uncertainty
 - Resolve compatibility issues
 - Reduce perceived complexity
 - Give “Champions” the information they need



Adopter Uncertainty Reduction



"Principles Knowledge"



"Awareness Knowledge"



"How - To Knowledge"



Accelerated Diffusion of Pollution Prevention Technologies

ADOPT²

- Program Goals

- Extend effectiveness of existing programs that promote P2 awareness
- Focus on issues associated with P2 technical principles and “how to” implement them
- Reduce uncertainty regarding the complexity and compatibility of P2 technologies





Key ADOP²T Activities

- Identify customer problems
- Demonstrations of proven practices and technologies by mentors
- Extended Pilot trials to reduce uncertainty
- Identification of information gaps that prevent technology adoption
- Success is measured by implementation





ADOP²T Model is Driven by Customer Problems

- TQM approach differs from almost all other technology diffusion programs
- Most other programs develop/evaluate solutions (technologies) then look for problems to solve
 - Can result in solving the wrong problem
 - Can result in “doing the wrong things”



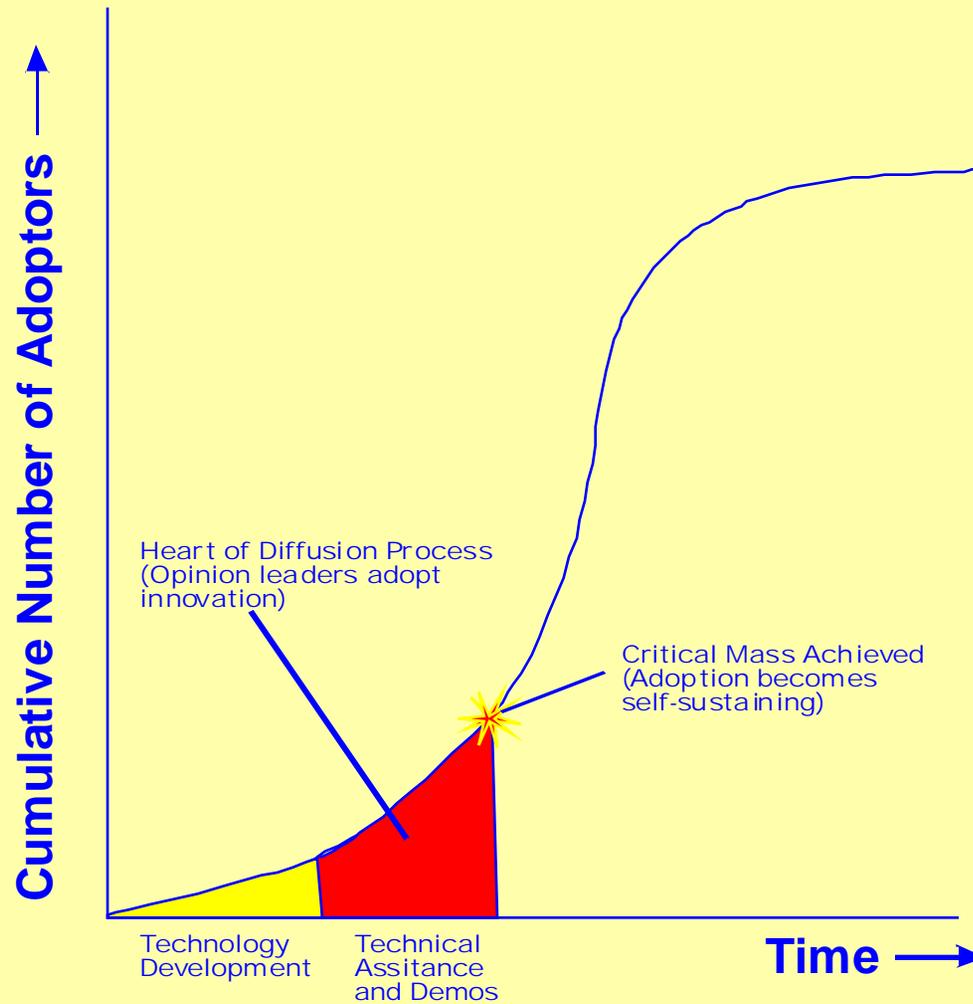


Current ADOP²T Initiatives

- Metal Finishing
- Machining
- Printed Wiring Boards
- Chemical Manufacturing



Innovation Diffusion Curve





Technology Diffusion in Green Chemistry

- *Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.*
- *Green chemistry is a highly effective approach to pollution prevention because it applies innovative scientific solutions to real-world environmental situations.*



The Binational Strategies Green Chemistry project

*Will utilize the ADOP²T model to
diffuse green chemistry into the Great
Lakes Binational Toxics Strategy*



***Strategic Partner:
Koppers International, Inc.
Stickney, Illinois***

- Manufacturer of phthalic anhydride (used in roofing materials)
- Raw materials – naphthalene & xylene
- Pollutants
 - Naphthalene
 - PAHs
 - Benzo [a] Pyrene





Project Approach

- *Identify sources of PBT emissions*
- *Recommend new processes/chemistries;*
- *Work with Koppers to implement greener processes/chemistries;*
- *Document the results.*





ADOP²T Partners

- WMRC
- MWRDGC Illinois EPA
- USEPA - Region V
- USEPA - DFE
- USEPA – GLNPO
- USEPA - ORD
- NIST MEP



**Tell me, I forget
Show me, I remember
Involve me, I understand**

Ancient Chinese Proverb