



Depths of Knowledge, Heights of Innovation

# **Rethinking Evaluation Theory: Implications from Complex Adaptive Systems**

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# Purpose of Presentation

- Not a tutorial on complex adaptive systems
- Further dialogue on implications of CAS for evaluation
- Provide examples of how CAS
  - Challenges traditional evaluation theory
  - May help increase power of evaluation theory
- Emphasis on
  - Causation
  - Measurement
  - System Dynamics

# Outline

1. Why is CAS important in evaluation?
2. Causation
  - Identify, explain a CAS phenomenon
  - Example
  - Implications for evaluation
3. Measurement
  - Identify, explain a CAS phenomenon
  - Example
  - Implications for evaluation
4. System dynamics
  - Identify, explain a CAS phenomenon
  - Example
  - Implications for evaluation

# Why the Complex Adaptive Systems View is Important for Evaluation

# Good News: Program Theory as Usual is Powerful

- Assumptions about relationships are often correct
- Improves design
  - Methodology
  - Metrics
  - Time lines
  - Identify data sources
- Stakeholder agreement
  - What will be evaluated
  - Meaning of findings
- Improves interpretation
  - Why patterns are observed
  - What they mean
  - How to improve

# Bad News About Evaluation Theory: It Often Fails

- Using it as a guide, we sometimes get
  - Inadequate methodology to cope with observed change
  - No satisfying way to interpret observations
  - Difficulty in reaching common understandings with stakeholders

# Problem Transcends Diligence & Hard Work

- Usual advice – try harder
  - Better job of understanding how a program works
  - More work to assure design/execution fidelity
  - Different mix of methodologies
  - Improve measurement and data collection
- Implication from CAS
  - This advice is *theoretically* insufficient
  - Not that we don't work hard enough. We *cannot* work hard enough

# CAS as an Organizing Framework

- CAS issues are familiar to evaluators, e.g.
  - Unintended consequences
  - Incomplete specificity of programs and treatments
  - Changing environments
  - Multiple causal paths
  - Non-linear interactions
- We usually work these issues one by one
- CAS provides a coherent framework
  - Why problems occur
  - Relationships among them

# Implications of Complex Adaptive Systems for Thinking about Causality

# Emergent Behavior

- Many agents, interacting through simple rules, produce system-level behavior
- Example:
  - Red and blue families in a neighborhood
  - Families move based on 3 rules
    - Two immediate neighbors must be my color
    - Color of other neighbors is irrelevant
    - Proportion of reds and blues in the area is irrelevant
  - Simulate: After a few iterations, neighborhood segregates

# Implications for Evaluation

- Typical efforts to reduce segregation may target
  - Bank redlining
  - Realtor behavior
  - Racist beliefs
- Logic model would link these efforts to attitudinal and behavioral changes
- Suppose the driving force is emergence
  - Evaluation would correctly document program failure
  - The model would
    - Not capture root cause
    - Be useless in explaining results or guiding change

# Auto-catalysis

- Self-reinforcing interaction between two reacting elements
  - Slow start
  - Rapid increase
  - Slowing and equilibrium based on environment and boundary conditions

# Example

- Networking, e.g. email, file sharing to facilitate collaboration:
  - Low message cost
  - High information density
  - Fast transmission
- As each party provides faster response & denser information, others respond in kind
  - Slow increase as people learn the technology
  - Rapid change with expertise and awareness of value.
  - Equilibrium as natural limits are reached, e.g. time to do analysis, competing demands

# Implications for Evaluation

- Traditional logic models can but seldom do depict such patterns
  - Are these patterns absent in our business?
  - Do evaluators and stakeholders not think in these terms, not see what is there?
- Consequences for
  - Measuring pattern of change over time
  - Data needed to detect self-reinforcement
  - Inclusion of variables to understand equilibrium

# Implications of Complex Adaptive Systems for Thinking about Measurement

# Basins of Attraction and Strange Attraction

- “Space” where movement is confined and tends toward a specific location, e.g.,
  - Perturb an object in orbit, it returns to orbit
  - Disrupt a classroom, the kids settle
- Strange attraction:
  - Space is well defined
  - Movement confined within the space
  - Movement does *not* tend toward a specific location. No central tendency

# Example: Total Quality Management

- Self directed empowered teams
- Teams not centrally directed
  - General mission – improve cost, quality, time
  - No specific objectives
  - Don't know precisely what a team will do

# Implications for Evaluation

- Attractors make sense in evaluation theory.
  - e.g., parameters and distributions around them
- With a strange attractor
  - Its possible to define only the boundaries
  - Within that space, no repeating patterns from one time to another

# Implications for Evaluation

- Any activity will predictably impact cost, quality, time
- Overall assessment is easy. Measure company wide change in cost, quality, time
- But how to measure change by individual teams?
  - We cannot know in advance what they will do
  - None of the efforts will be the same
  - What a team does once may not predict what it does again
- We can't make a traditional logic model to
  - Identify metrics
  - Link lower level change to higher level change

# Implications of Complex Adaptive Systems for Thinking about System Dynamics

# System Dynamics: Co-evolution

- “Co-evolution” refers to a condition in which interacting systems adapt as each changes
- The process is uncertain because as each system changes, the other has a range of response choices

# Example of Co-evolution

- Sales improves responsiveness to customers
  - More, and more diverse orders to Manufacturing
  - Pressure for shorter order fulfillment times
- Manufacturing has two choices
  - Increase inventory
    - Greatest impact on delivery time
  - Become more agile
    - Minor impact on delivery time
    - Major impact on product customization
- Reputation develops, fast response or customization
  - Sales adjusts interaction with customers and Manufacturing
- Cycle continues with numerous variables affecting decisions at each choice point

# Implications for Evaluation

- Logic models cannot identify actions or consequences of action in advance
- Methodologies cannot be identified in advance