Understanding change from the perspective of complexity science

A Shift in Worldview

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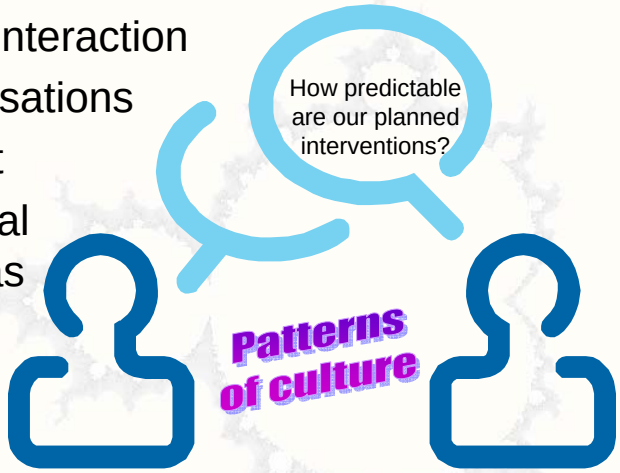
Boids – flocking (loose, not tight, linkage)

- Rules – ***react*** to those **close by**
  - Cohesion: move to where others are going
  - Separation: maintain distance from others
  - Alignment: match velocity with others
- Variability
  - Avoidance with obstacles
  - Random behavior – noise
  - Emergent leader thru V-formation with others
  - Self-organized goal through collective input

- http://blog.soulwire.co.uk/flash/actionscript-3/as3-flocking-steering-behaviors/
- http://www.red3d.com/cwr/boids/
- http://www.kfish.org/boids/

Impact on Change – Organizational Drivers

- Group interaction
- Conversations
- Conflict
- Personal agendas



Ability to Control vs. Influence → What are the Simple Rules?

Topics Covered

- Complexity illustrated
  - Simple rules produce complex behavior
  - Lack of cause-effect foresight (non-linearity)
  - Patterns seen through Holistic Thinking
- Complexity Science Worldview
  - Cynefin Model (known, knowable, complex, chaotic)
  - Theory to Practice for Change Leadership
  - Traditional vs. Complexity Worldview
- Language of Complexity

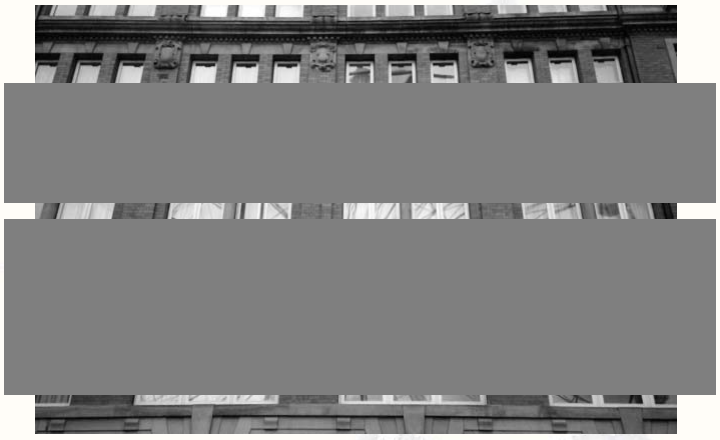
Overview – Organizational Complexity

- Not yet theory, but metaphor or analogy
  - Mathematics, physics, chemistry, biology
  - Multiple opinions on application to social organizations
- Complexity viewpoint – Takeaway
  - A possible scientific explanation for commonly accepted best practices
  - Ideas for consideration (logical foundation)

Making sense of the whole (15% seen)

Making sense of the whole (30% seen)

Making sense of the whole (50% seen)



Making sense of the whole (65% seen)

Making sense of the whole (75% seen)

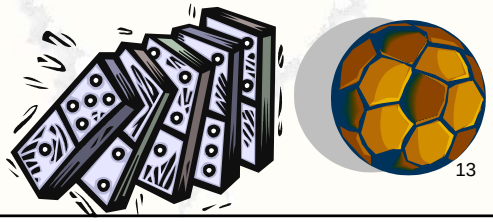
Making sense of the whole (95% seen)

Making sense of the whole

Source: http://jech.bmj.com/content/59/5/394.full

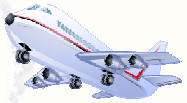
Complexity vs. Complicatedness

- Complicated
  - Predictable chain of cause-effect impacts
  - Linear relationships
- Complexity
  - Outcome understood in hindsight
  - Non-linear relationships
  - Emergence (whole greater than sum of parts)
  - Understanding comes from its patterns



Complexity vs. Complicatedness

- Complicated – Airplane, redundant backup
  - Approach with a toolbox – nothing happens
- Complex – Airplane, cascading failures
  - Weather, metal fatigue, pilot error, etc.
  - Understandable in hindsight



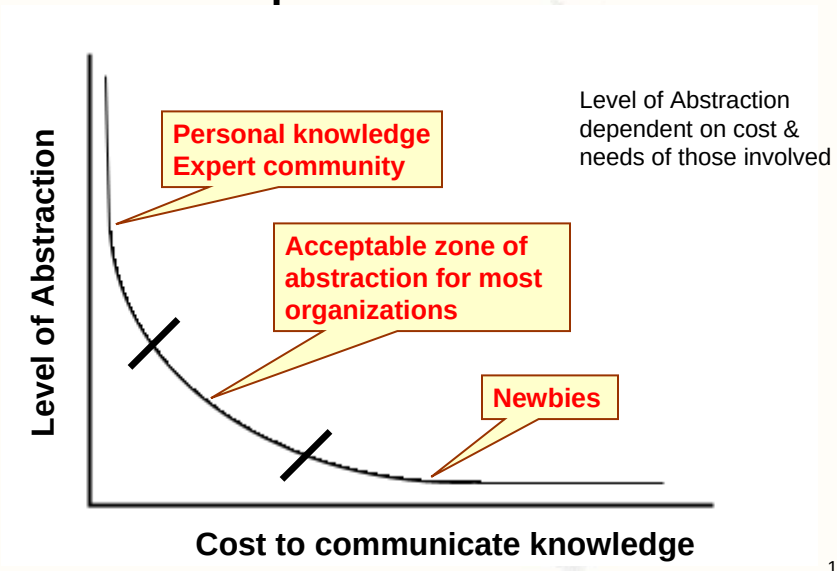
- Complexity - Rumor of a reorganization!
  - Human systems and relationships mutate
  - New patterns form in anticipation
  - Expected, but not predictable with accuracy

Social Complexity is driven by

- Language & Knowledge
  - How we make sense and communicate understanding
  - Knowledge has to be volunteered, not demanded
  - Know more than we tell & tell more than we write down
  - Knowledge is deeply contextual
- Personal Identity
  - We exist in multiple identities (father, son, brother) similar, but different under different context

Reference: Snowden (2002)

Language & Knowledge
Zone of Acceptable Abstraction



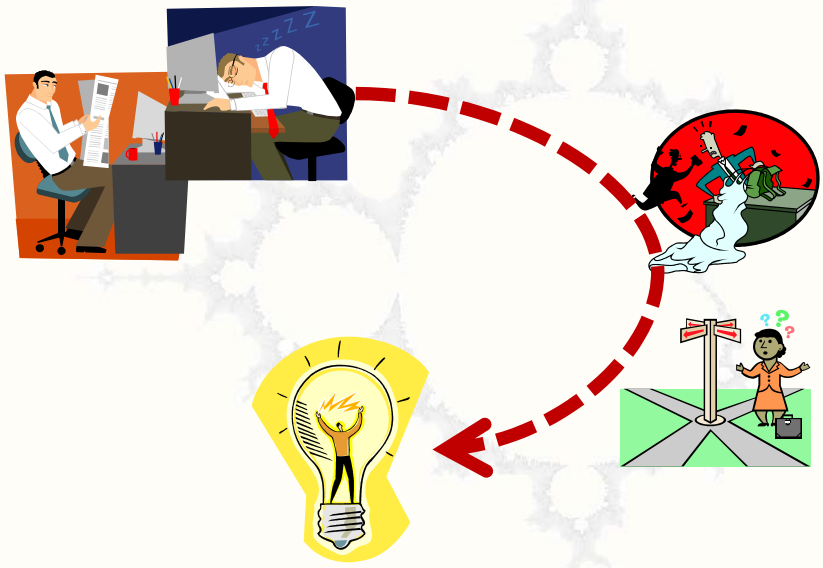
Level of Abstraction dependent on cost & needs of those involved

Reference: Snowden (2002)

Working at the Edge of Chaos

- Stability – Equilibrium
  - Easy to do Long Range Planning
  - Complacency – low ability to change if needed
- Edge of Chaos
  - Stability broken – innovation thrives
- Chaos – looks Random, but with patterns
  - Cause-Effect seen in hindsight
  - Difficult to gain alignment for change
  - Illustrated with nonlinearity
    - Chaotic example $x_t = \text{const} * x_{t-1} * (1 - x_{t-1})$

Working at the Edge of Chaos



Complex Adaptive Systems (CAS)

- Structure emerges without prior design
  - Self-organized stability, but unpredictable patterns
  - Regulated by general acceptance of simple rules
  - System-wide control is not possible
    - Best to influence small effects that cascade (Power Law & impact of small differences in initial conditions – butterfly flapping its wings)

Cynefin (kun-ev'in) Model

Cynefin (kun-ev'in), Welsh
No direct translation to English.

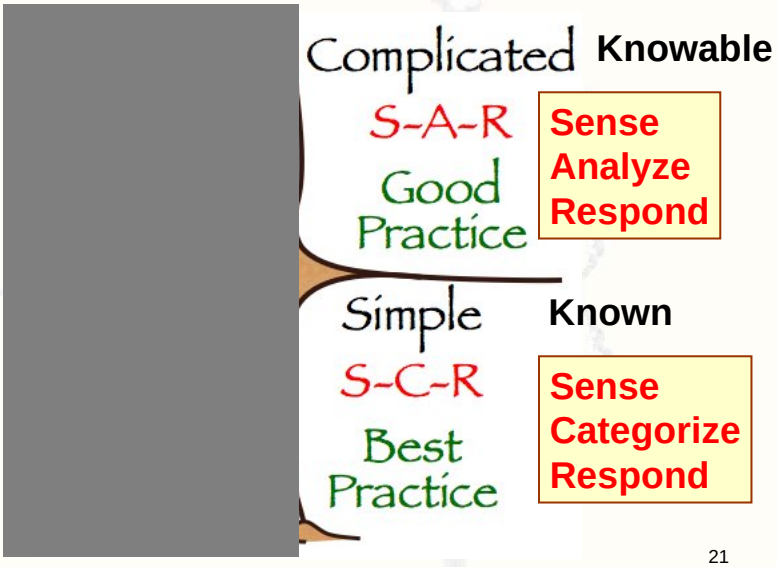
Roughly, place or habitat that we understand because we were born to it and live it.

Known

Sense
Categorize
Respond

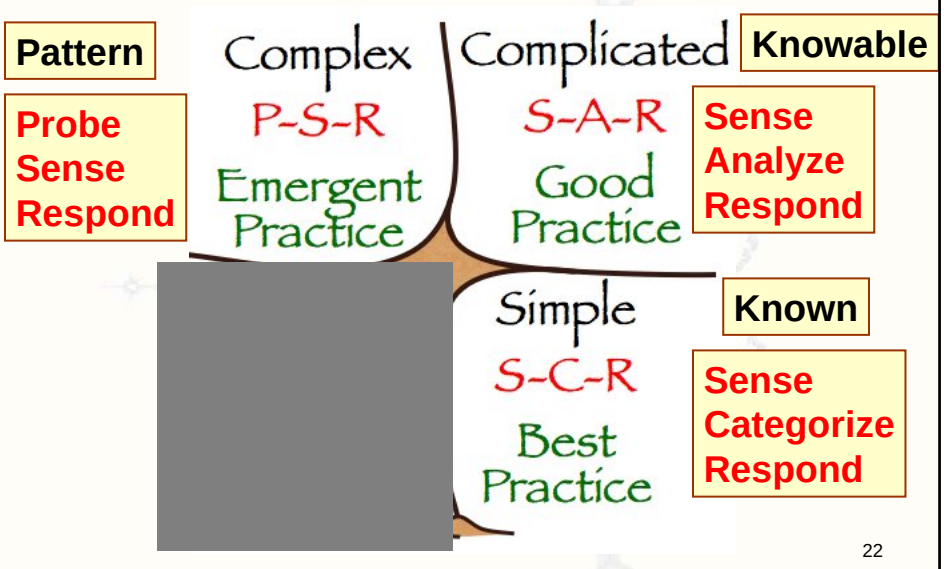
Cynefin (kun-ev'in) Model

Domains, not quadrants

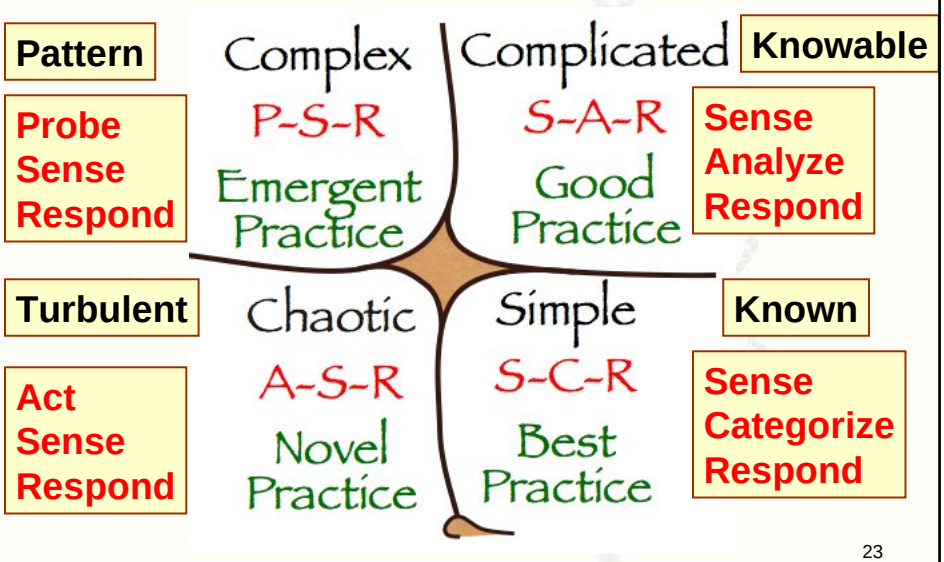


Cynefin (kun-ev'in) Model

Domains, not quadrants



Cynefin (kun-ev'in) Model



Reference: Snowden (2002)

Default (*not purposeful*) Leadership Style

- Simple – Known
  - Feudal – control via resource allocation (budgets)
- Complicated – Knowable
  - Oligarchic requiring consent of elders (experts)
- Complex – Pattern driven
  - Entrepreneurial often tending toward patriarchal
- Chaotic – Turbulent
  - Charismatic or tyrannical, imposing order in crisis

Challenge is to move the organization to benefit from all four domains

Application to Change Leadership

All four domains have value Key is to help move the organization to take advantage of what each has to offer.

JIT Knowledge Mgt.
- Build communities
- Expertise locator

Disrupt entrained thinking
- cross-mix experts
- ritual of imposed chaos
- scenario planning

Design new patterns
- stimulate new networks

Document practices
- establish efficiencies if stable

Reference: Snowden (2002)

Broader Application of Complexity

- Use Simple Rules for alignment
  - Avoid complicated, inflexible rule structures
- Direction emerges from Shared Vision
  - Focus on progress, not size of the gap
  - Vision continues to evolve collectively (no end)
- Enable people to acquire skills & interact
  - All change is local
  - Master planning is less effective
- Encourage many small tests
  - Nurture success (or quickly discard)
  - Diffusion of knowledge through networking

"The layer of self-organized complexity that lies at the edge of chaos could only emerge if individuals were ***free*** to interact and ***capable*** of interacting, and if their interactions were facilitated by ***appropriate rules*** that command popular support."

Rihani & Geyer, 2001, p. 242

Self-organization – emergence of structure

- Collective action with no direct planning
- Examples within social organizations
  - Emergency evacuation – generally orderly, helping each other, self-leadership
    - Panic (chaos) if pushed too far, too quick
  - Self-directed Work Teams, driven by goals
  - Students in lunch room – affinity groups, empty table, cultural norms
  - Acculturation in an organization – on-boarding, observation of behavior, rewards/punishment

Worldview – Connections

- Independence
- Boundary permits study of single unit
- Analyze parts to understand whole
- Sufficient information is available
- Success driven by efficiency, resource allocation, & reducing uncertainty

Classic approach

- Interdependence
- Open system with permeability
- Interaction of parts creates new behavior
- "Control" comes through feedback
- Success driven more by goal alignment with adaptive adjustment

Complexity viewpoint

Worldview – Origin of Order

- Equilibrium is normal, change is disruptive
- Unfreeze, shift in state, refreeze
- Goal of management is to plan, organize, and control to increase stability

Classic approach

- Transformation is normal
- New structure emerges at interface of order & disorder
- Goal of management is to increase capacity to collectively learn & self-organize

Complexity viewpoint

Worldview – Origin of Change

- Clear relationship of cause & effect
- Outcome can be predicted & controlled
- Control is centralized in top management
- Consensus on norms & values maintain the status quo

Classic approach

- Outcome sensitive to initial conditions
- Outcomes are unpredictable
- Top control is impossible
- Simple rules drive complex behavior – amplifying differences drive new patterns

Complexity viewpoint

Language of Complexity – metaphors

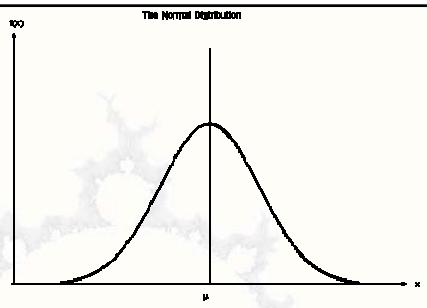
- Whole greater than sum of its parts
- Attractor
- Nonlinearity
- Power Law
- Butterfly effect
- Tipping point
- Edge of chaos
- Fractal – self-similarity
- Bifurcation

Attractor – at the edge of chaos

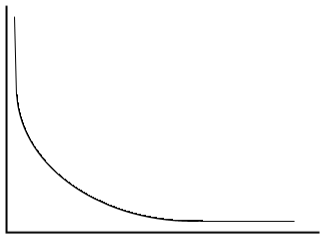
- Stability, equilibrium
  - Closed system, no new resources (information)
  - Bathtub filled with water, tap and drain closed
- Chaos
  - Open system, but no discernable pattern
  - Bathtub with tap running
- Attractor at the edge of chaos
  - Patterns exist, but are not stable
  - Bathtub with drain open, self-organizes a stable vortex

Event Distribution

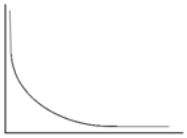
- Normal Distribution
  - Height, intelligence
  - Daily sales



- Power Law
  - Group membership
  - People actively involved
  - Links on web page
  - Success of change initiatives



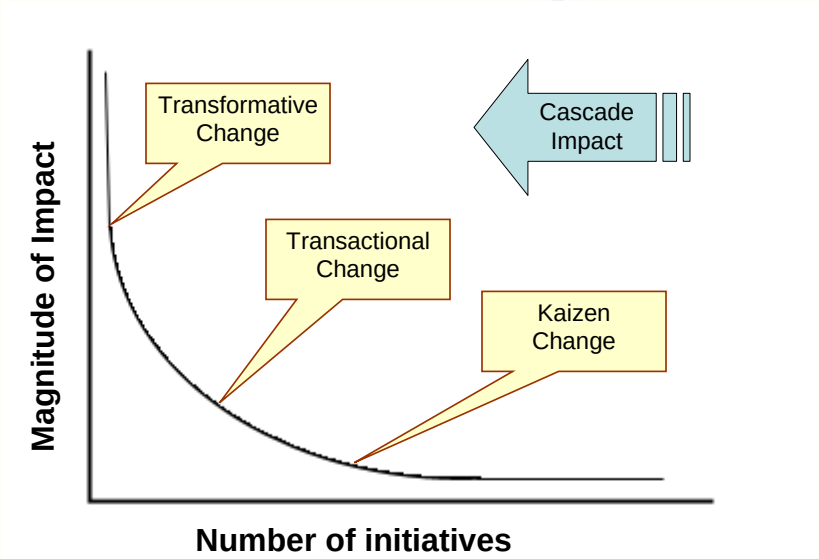
Power Law – impact of small actions



- Frequency of small efforts
- Avalanche – Hourglass
  - Most “actions” have no or little impact
  - Once triggered – cascading actions
  - Magnitude not a predictable event
  - “Butterfly effect”

- Tipping Point
  - Straw that broke the camel’s back

Distribution of Change Initiatives

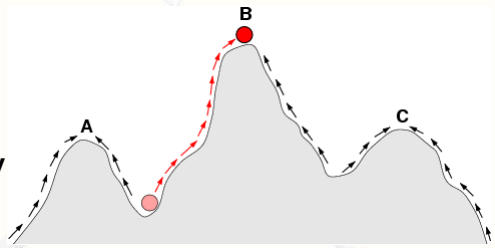


Punctuated equilibrium

- Minor variation triggers a dramatic change in state (between long periods of equilibrium)
  - Apparent stability of communism in Eastern Europe followed by sudden collapse
- Complexity as an evolutionary process
  - Survive long enough to the next event impact
  - Adapt in response to changing conditions
    - Have a reservoir internal variety to draw upon
  - Complexity increases, but may not be optimal

Fitness Landscape

- Full landscape is unseen
- Optimal point may only be Local, not Global



- Further improvement at “A” or “C” comes from “testing” a disruptive jump
  - Move back is less fit

Establish likely chain reactions

- Impact of each activity triggers another
  - Loosely connected engagement of many
    - Adjust emphasis, timing, and feedback
    - Influence toward commitment, not command toward compliance
  - Communicating a message that resonates and is passed along to others
    - Not one-to-many communication that is repeated, but many-to-many-to-many through social networks

Miscellaneous Topics – complexity

- Fractal – self-similarity
- Bifurcation
- NK Degree of Complexity

"Current development efforts are founded on an implicit belief that benefits from economic development will trickle down to uplift the fortunes of most members of the population. A view of development founded on complexity would turn that argument on its head. It maintains that no development is possible unless most members of the population are in a position to drive that effort forward."

Rihani, 2002, p. 139

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