Thinking Approaches

Presented by Dr. David Gould

Purpose

To present several approaches to *thinking*….

Applications include everyday thinking, reading, writing, and listening.

Contents

- Models
- Computational Thinking
- Critical Thinking
- Creative Thinking
- Systems Thinking
- Theory
- Standards
- Frameworks
- Evidence
- Adjourn

Models

- Representations of Reality
- Types
  - Symbolic: y = mx + b
  - Graphical: mindmap, concept map, Gantt Chart
  - Business: Subscription, research, operations,
  - 3D Models: Model car, airplane, …
  - Wireframe: Physical object outline, TOC
  - Mental models: Ideas, beliefs, perspectives, ….

Computational Thinking

- Computational thinking is thinking about problems and solutions to them in terms of a set of steps or algorithm(s).
- Thus, an agent rather human or computer could execute the steps for a solution.
- Basic steps include assigning a value to a constant or variable, iteration, or if-then-else type logic.

Critical Thinking

Critical thinking is the disciplined art of ensuring that you use the best thinking you are capable of in any set of circumstances.

Paul, R., & Elder, L. (2014) *Critical thinking: Tools for taking charge of your learning and your life*. Upper Saddle River, NY: Prentice-Hall.

Mental Models

(values, beliefs, ideas, … that shape and filter our thinking)

- Anthropological
  - Cultural practices, mores, and taboos
- Biological
  - Biology and neurology influence
- Economic
  - Economic influences in our lives
- Ideological / political
  - Structure of power and its use by interest groups around us
- Theological
  - Religious beliefs and attitudes
- Ethical
  - Our minds are influenced by the extent to which we behave in accordance with our obligations
- Intellectual
  - Our minds are influenced by the ideas we hold, by the manner in which we reason and deal with abstractions and abstract systems
- Philosophical
  - Personal philosophy influences
- Sociological
  - Our minds are influenced by social groups to which we belong

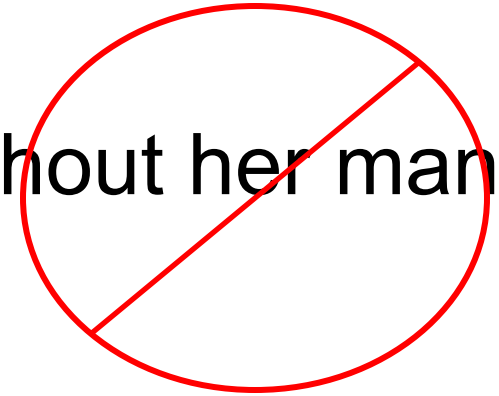
A Puzzle

Woman without her man is nothing

Woman, without her, man is nothing

Woman without her man, is nothing

Woman without her man is nothing



Critical Thinking

- Points of view
  - Frame of reference, perspective, orientation
- Purpose of the thinking
  - Goals, objectives
- Question at Issue
  - What is the problem?
- Assumptions
- Concepts
  - Theories, definitions, axioms, laws, principles, models
- Information
  - Data, facts, observations, experiences
- Inferences
  - Interpretations, conclusions, solutions
- Implications and consequences

Intellectual Standards

- Clarity
  - Is the sentence, paragraph, concept, or paper clear? Do I understand it? Would an example help me to understand? Would anything help me understand it?
- Accuracy
  - Is this sentence, paragraph, concept, or paper true? How could the sentence, paragraph, concept, or paper be supported, justified, confirmed, or falsified?
- Precision
  - Is this sentence, paragraph, concept, or paper precise or specific, or is it more of an abstract generality? What could make this sentence, paragraph, concept, or paper more specific and more meaningful to the reader? What details could be included to improve precision?
- Relevance
  - Is this sentence, paragraph, concept, or paper related in some way to the topic under discussion? What improvement might be included to bring it into alignment?

Paul, R., & Elder, L. (2001) *Critical thinking: Tools for taking charge of your learning and your life*. Upper Saddle River, NY: Prentice-Hall.

Intellectual Standards

- Depth
  - Does this sentence, paragraph, concept, or paper cover the topic in sufficient depth or does it just provide a high-level perspective that while interesting, may be essentially meaningless?
- Breadth
  - Does this sentence, paragraph, concept, or paper cover the topic in sufficient breadth or does it just provide a narrow perspective?
- Logic
  - Is this sentence, paragraph, concept, or paper logical and make any sense? Is there any supporting evidence? Does one element follow another or are these elements a sort of jumbled mess? Or is this pure fantasy?
- Significance
  - Does this sentence, paragraph, concept, or paper address the “so what” question? Is it important to include or is it filler? Would anyone, anywhere really care?

Paul, R., & Elder, L. (2001) *Critical thinking: Tools for taking charge of your learning and your life*. Upper Saddle River, NY: Prentice-Hall.

Reporters Questions

Who?
(stakeholders)

What?
(content)

Where?
(geography)

Why?
(purpose / reason)

When?
(time)

How?
(process)

Fallacies (Mistakes in Reasoning)

- Some types
  - Ad hominem (Attacking the Person)
  - Ad verecuniam (Appeal to Authority)
  - Appeal to Emotion
  - Begging the Question (circular argument)
  - False Dilemma (either / or)
  - Slippery Slope

Paul, R., & Elder, L. (2001) *Critical thinking: Tools for taking charge of your learning and your life*. Upper Saddle River, NY: Prentice-Hall.

An Exercise

- Apply the intellectual standards to
  - The problem to be researched in this study is to understand why annual employee turnover has increased from 30% three years ago to 45% today at the ABC company.
  - My study will prove hypothesis A.
  - The problem to be researched in this study is to examine the relationship between writing a dissertation and mathematics.

Creative Thinking

SCAMPER

- **S**ubstitute something
- **C**ombine with something else
- **A**dapt something to it
- **M**odify or **M**agnify it
- **P**ut it to some other use
- **E**liminate something
- **R**everse or **R**earrange it

Michalko, M. (2006). *Tinkertoys* (2nd ed.). Berkeley, CA: 10 Speed Press.

An Exercise

Think of an object and its attributes.
Apply the SCAMPER framework to create a new object.

Present your findings in this seminar.

- Take 5 minutes

Systems Thinking

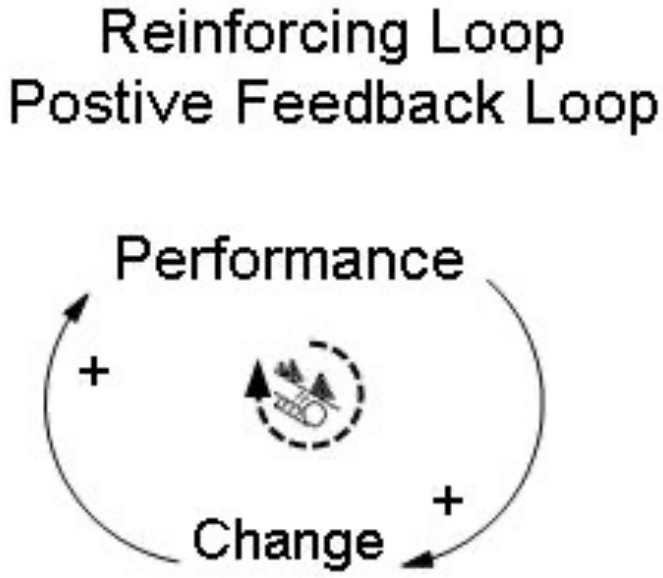
A System

- A system is a set of interacting, interrelated, and interdependent components that form a complex and unified whole.
  - Source: Peter Senge
- A system is a network (nodes and links), generally with inputs, internal processes, outputs, and external behaviors
  - Types
    - Static structures (patterns, arrangements of objects, …)
    - Open (organizations, society, …)
    - Complex adaptive (organizations, society, …)

Positive Feedback Loop

A positive feedback loop is also called a reinforcing or amplifying loop and is designated with an R or a growing snowball

The behavior of a positive feedback loop is the growth / decline of the systems state.

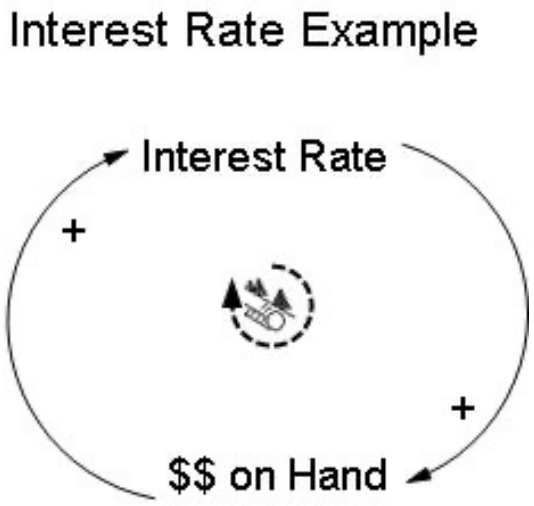


Senge, P. (2006). *The fifth discipline*. New York, NY : Doubleday.

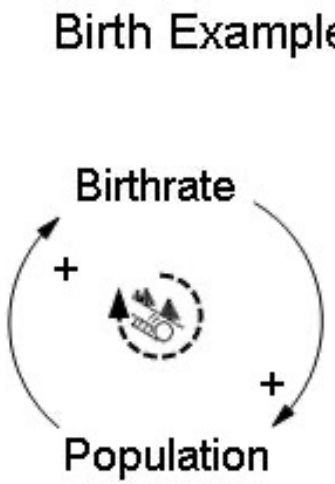
Positive Feedback Loop

Examples

Example of a positive feedback loop in economics



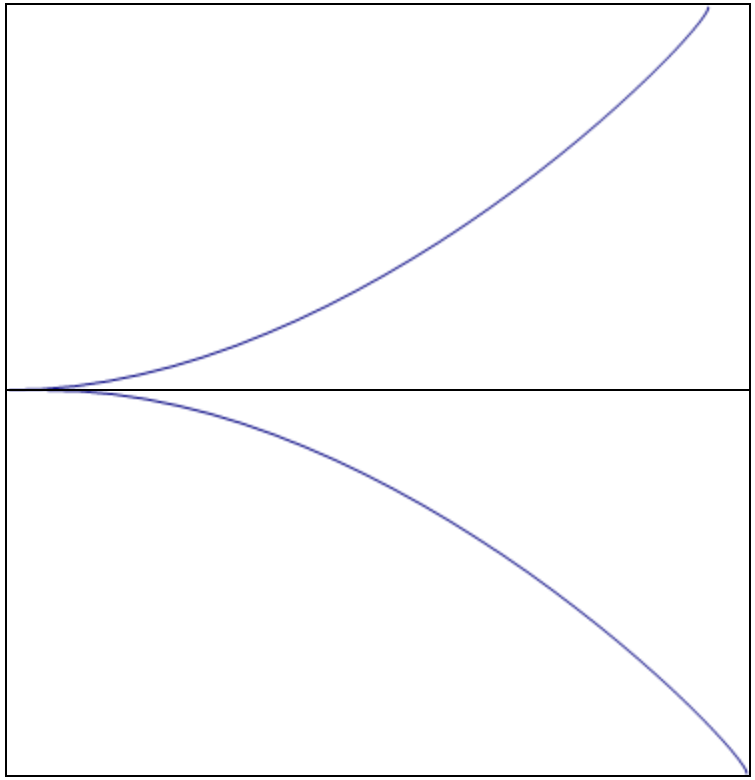
Example of a positive feedback loop in populations



Note: The state of the system will continue to grow or decline unless some intervention occurs.

Senge, P. (2006). *The fifth discipline*. New York, NY : Doubleday.

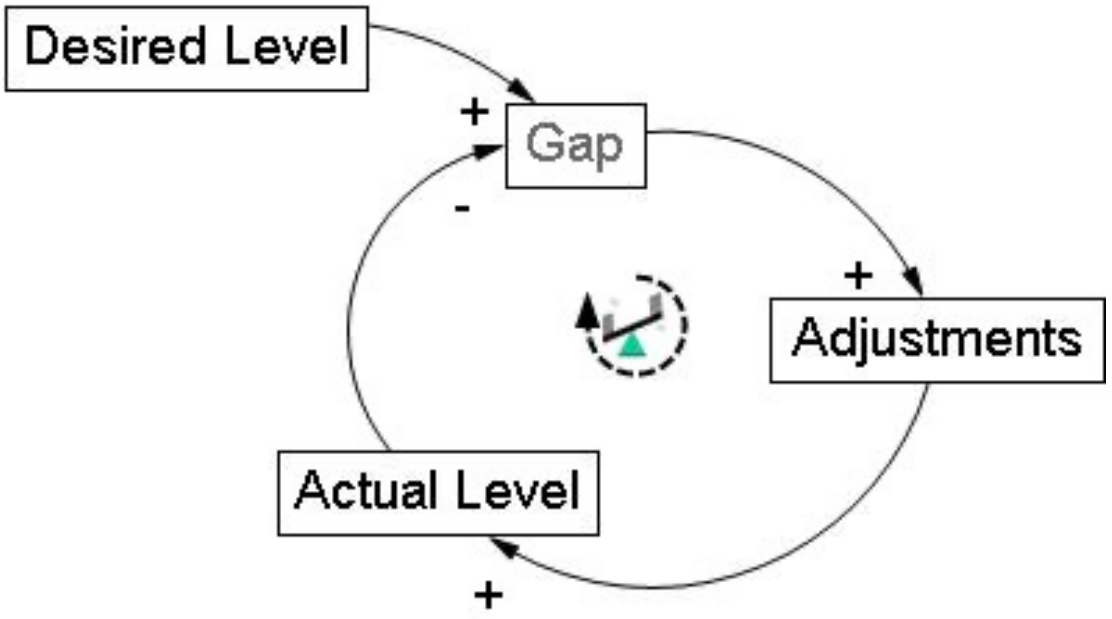
Positive Feedback



Virtuous or Vicious Cycles

Negative Feedback Loop

Negative feedback or a balancing loop is a goal seeking behavior or systems regulation behavior. A generic model is provided below.



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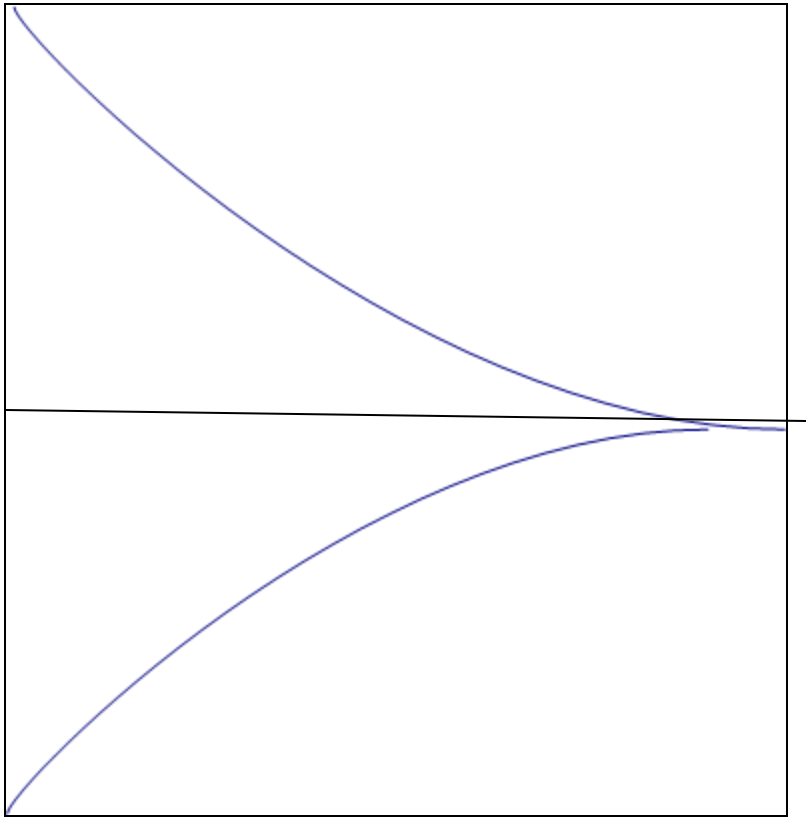
Negative Feedback



Goal Seeking

Systems Archetypes

- Archetypes describe commonly observed patterns in natural, social, or artificial systems
- Examples
  - Limits to success
  - Tragedy of the commons
  - Escalation
  - Shifting the burden
  - Success to the successful

Limits to Success

- At some point, growth slows due to limiting factors and depending on circumstances overshoots and flattens, collapses, or oscillates around some equilibrium.
- Examples of limiting factors of a population include the average lifespan and the carrying capacity of the environment such as the availability of food or water

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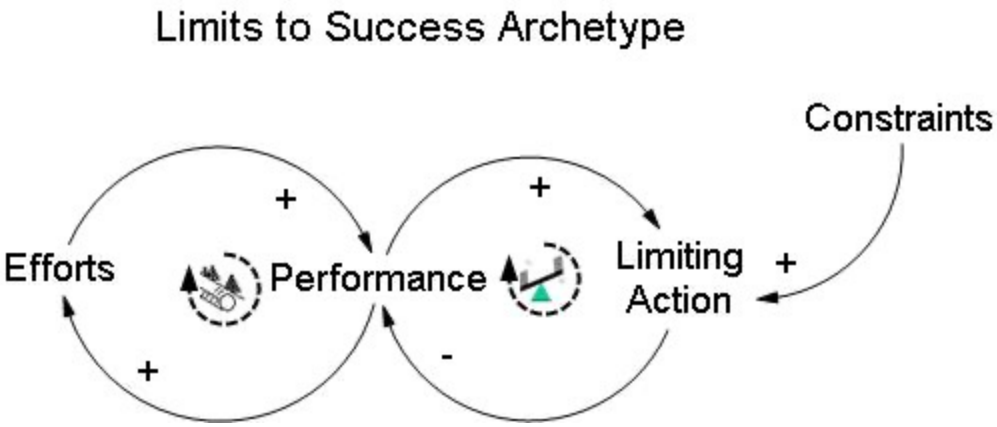
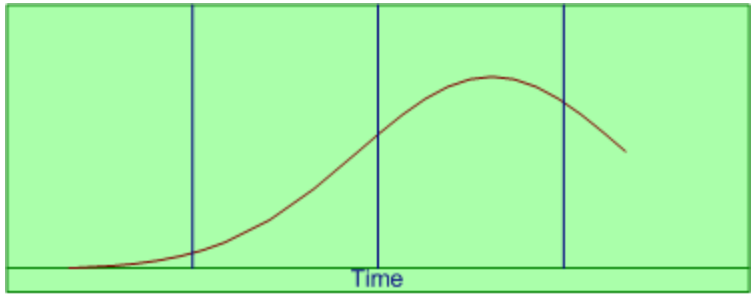
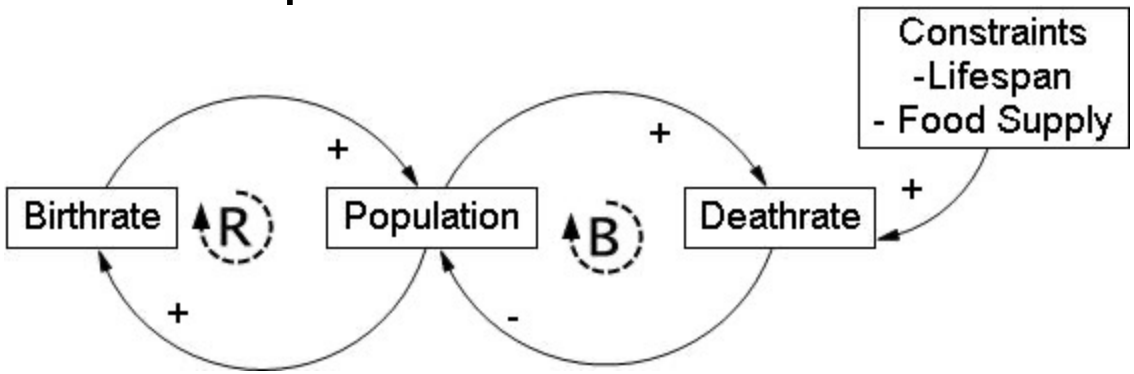
Limits to Success

Generic Structure





Example



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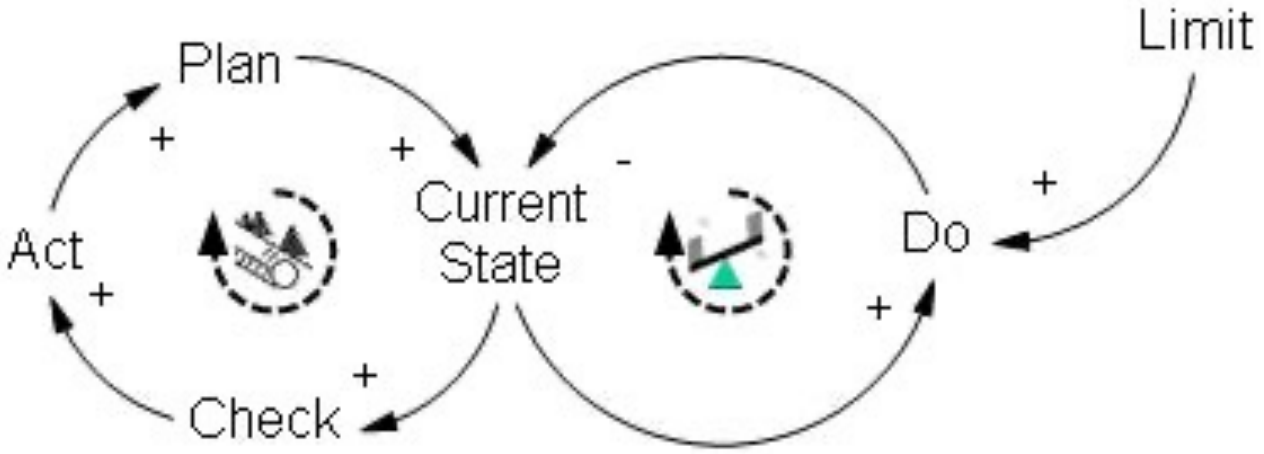
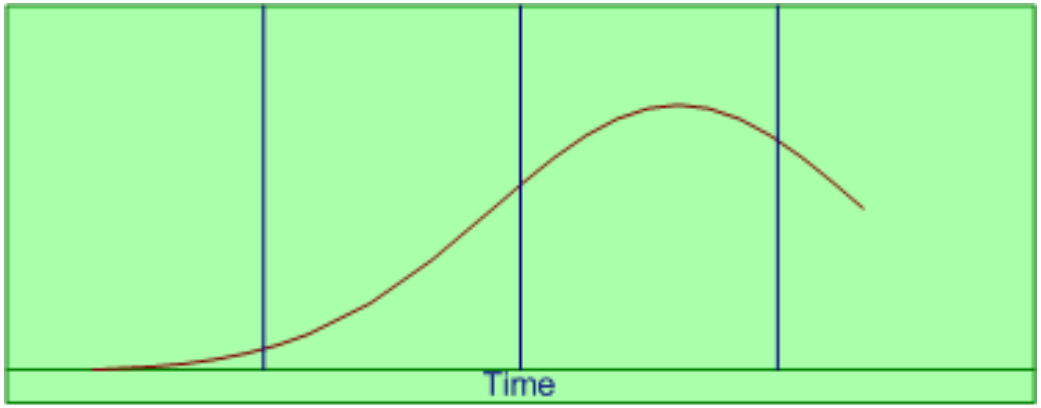
PCDA – Limits To Success Model



There are limits to improvement such as the laws of physics, investment capital, time, mental models, interest ….

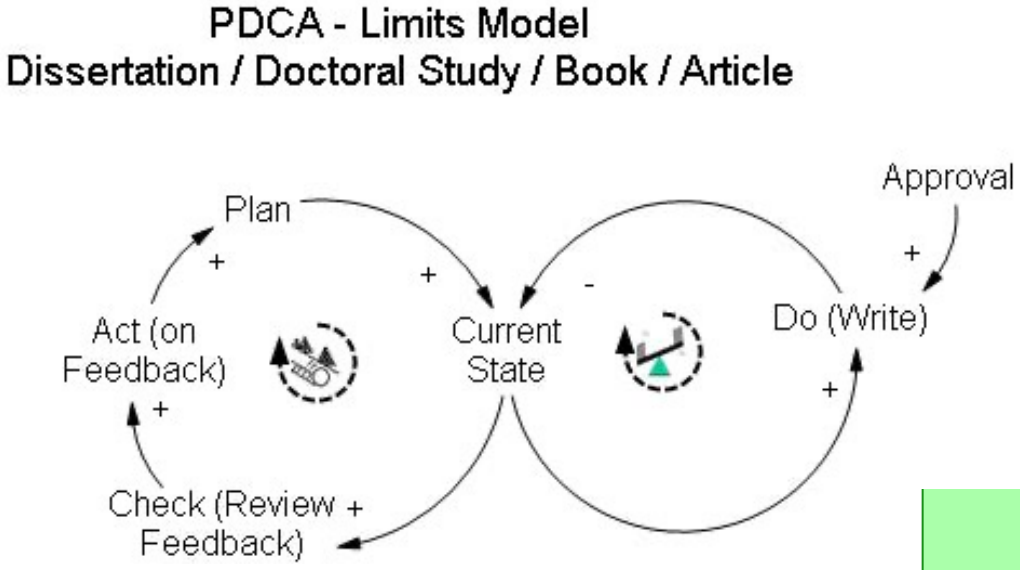
PDCA Behavior Over Time



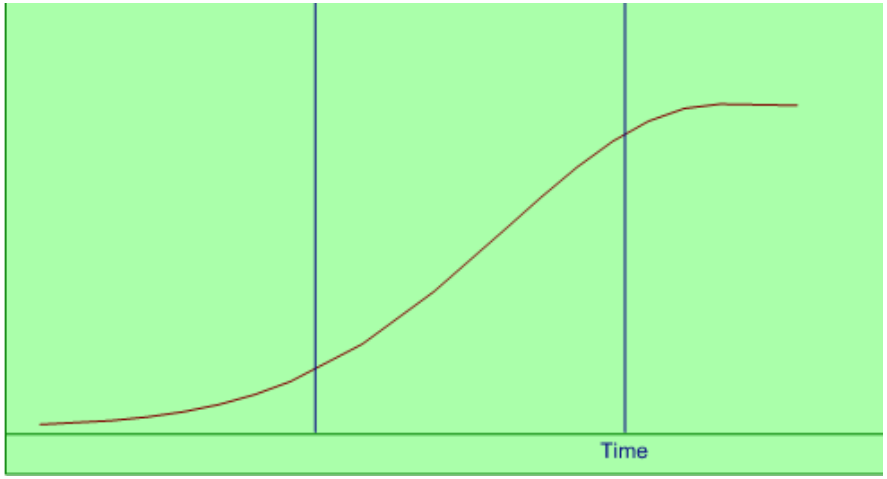
Improvements may start slow, speed up, slow to stop, oscillate about a line, or even decline as limits to improvements are reached

Any thoughts here?

PDCA with Applications



Behavior of Writing Progress

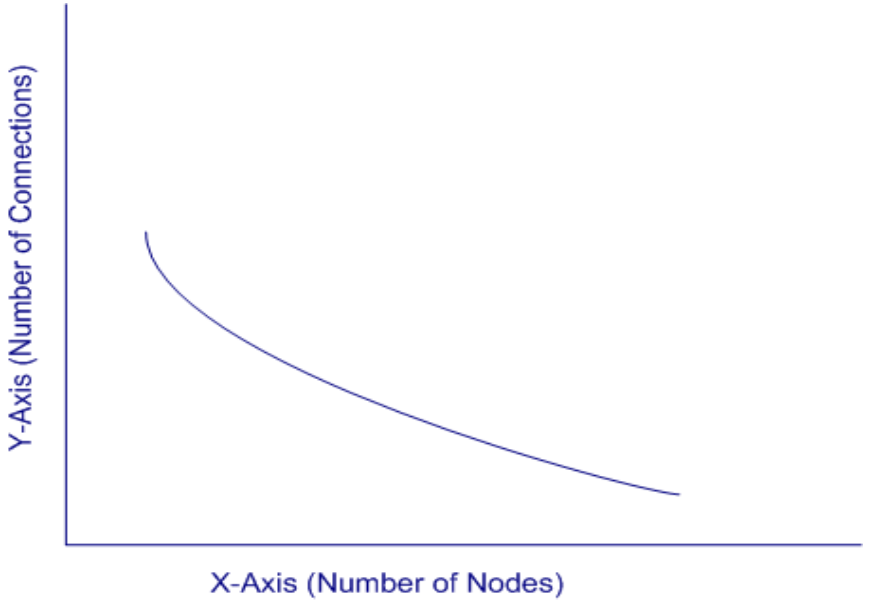


Scale Free Networks

Scale free networks are characterized by a few nodes having large numbers of connections while most nodes have considerably fewer connections. This distribution follows a power law.

Examples of scale free networks include social networks, the Internet, and ecological networks.

Scale free networks are robust against accidental or random failure; however, they are vulnerable to targeted destruction.

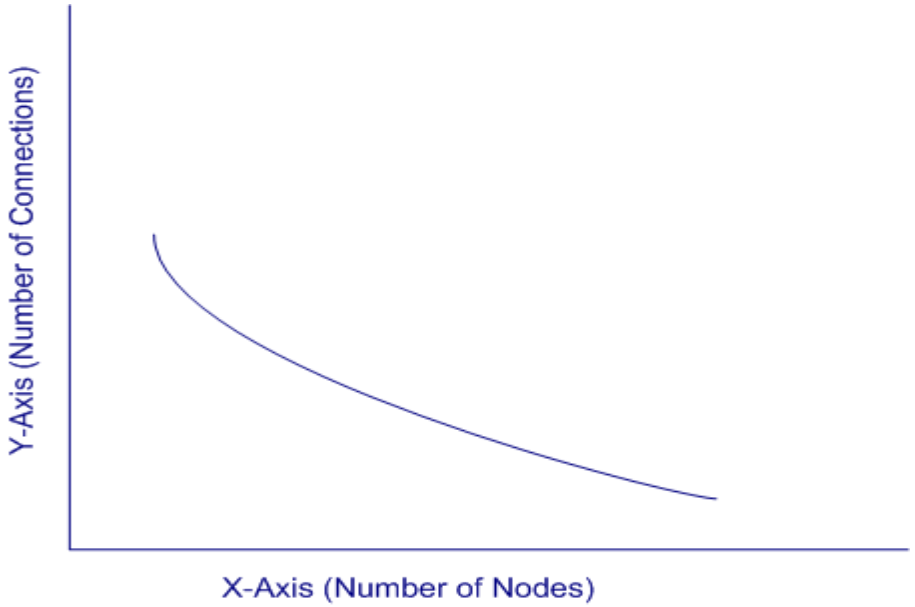


Buchanan, M. (2002). *Nexus: Small worlds and the groundbreaking science of networks*. New York: W.W. Norton & Company

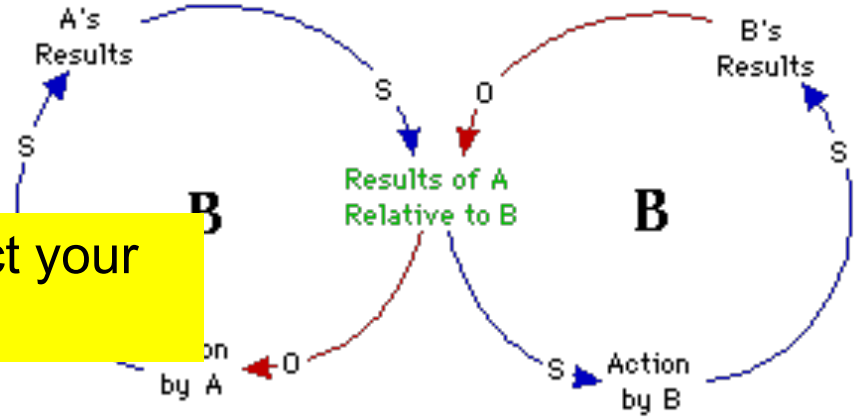
Scale Free Networks

This graph represents the power law or a scale free network distribution.

In terms of human populations, non-behavioral attributes such as height or weight typically follow a bell shaped curve, while behavioral attributes such as wealth accumulation, popularity, and such follow the power law.



Success to the successful Archetype



Thought experiment: How might this affect your organization, your community, or you?

Buchanan, M. (2002). *Nexus: Small worlds and the groundbreaking science of networks*. New York: W.W. Norton & Company

Theory

What is a theory?

Why do I care?

What's in it for me?

How does it relate to my dissertation?

A theory is a body of knowledge that explains and predicts phenomena

Examples:

- Disruptive Innovation Theory
- Learning Organization Theory
- Need Theory
- Systems Theory
- Theory of Evolution
- Theory of Relativity

Cooper, D.R., & Schindler, P.S. (2003). *Business research methods* (8th ed.). New York, NY: McGraw-Hill.

What Good is Theory?

The best way to make accurate sense of the present, and the best way to look into the future, is through the lens of theory

Theories are independent of time and space

Christensen, C.M., Anthony, S.D., & Roth, E.A. (2004). *Seeing what's next: Using the theories of innovation to predict industry change*. Boston, MA: Harvard Business School

Standards

Standards

- A set of rules, requirements, guidelines, products, processes, or other objects agreed to, or accepted, by an organization or organizations.
- Types of standards
  - De facto Standards
    - Public or marketspace acceptance, custom, or convention (QWERTY, MP3, ..)
  - De jure Standards
    - Products or processes approved by a Standards body (e.g., APA, ISO26000)
  - Organizational Standards

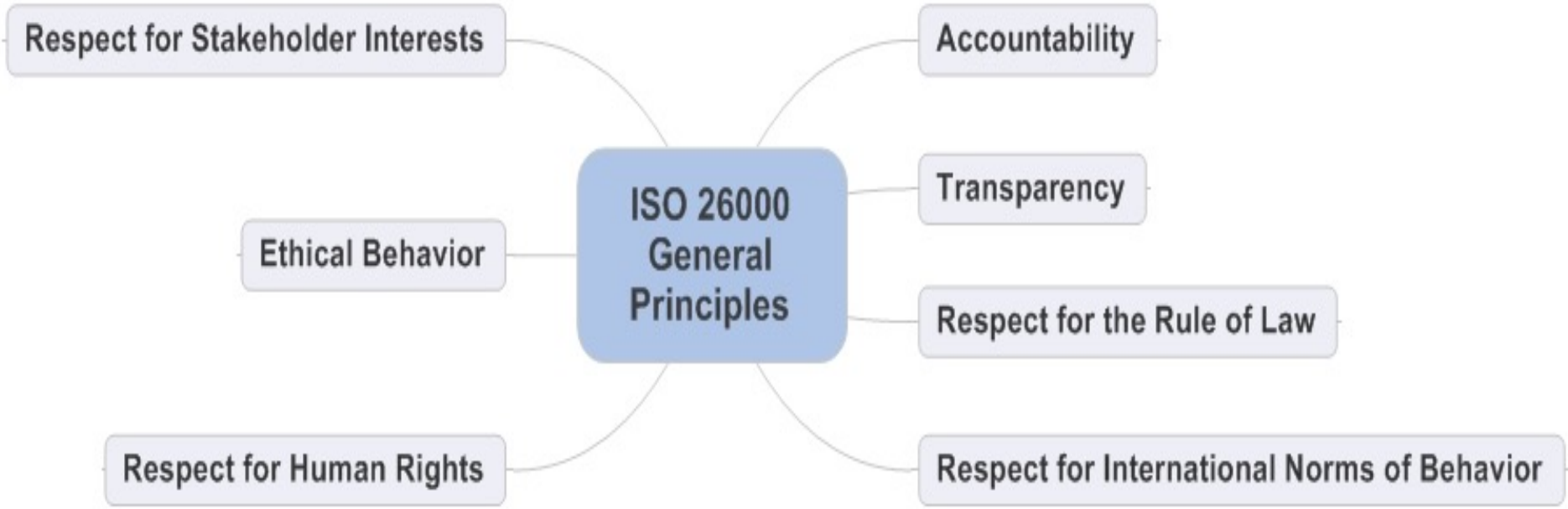
See the history of the screw!

ISO 26000

ISO 26000 is a voluntary guidance standard that attempts what no other global standard on social responsibility has: to consolidate in one place, the fundamental expectations of organizations regarding their responsibility to society.

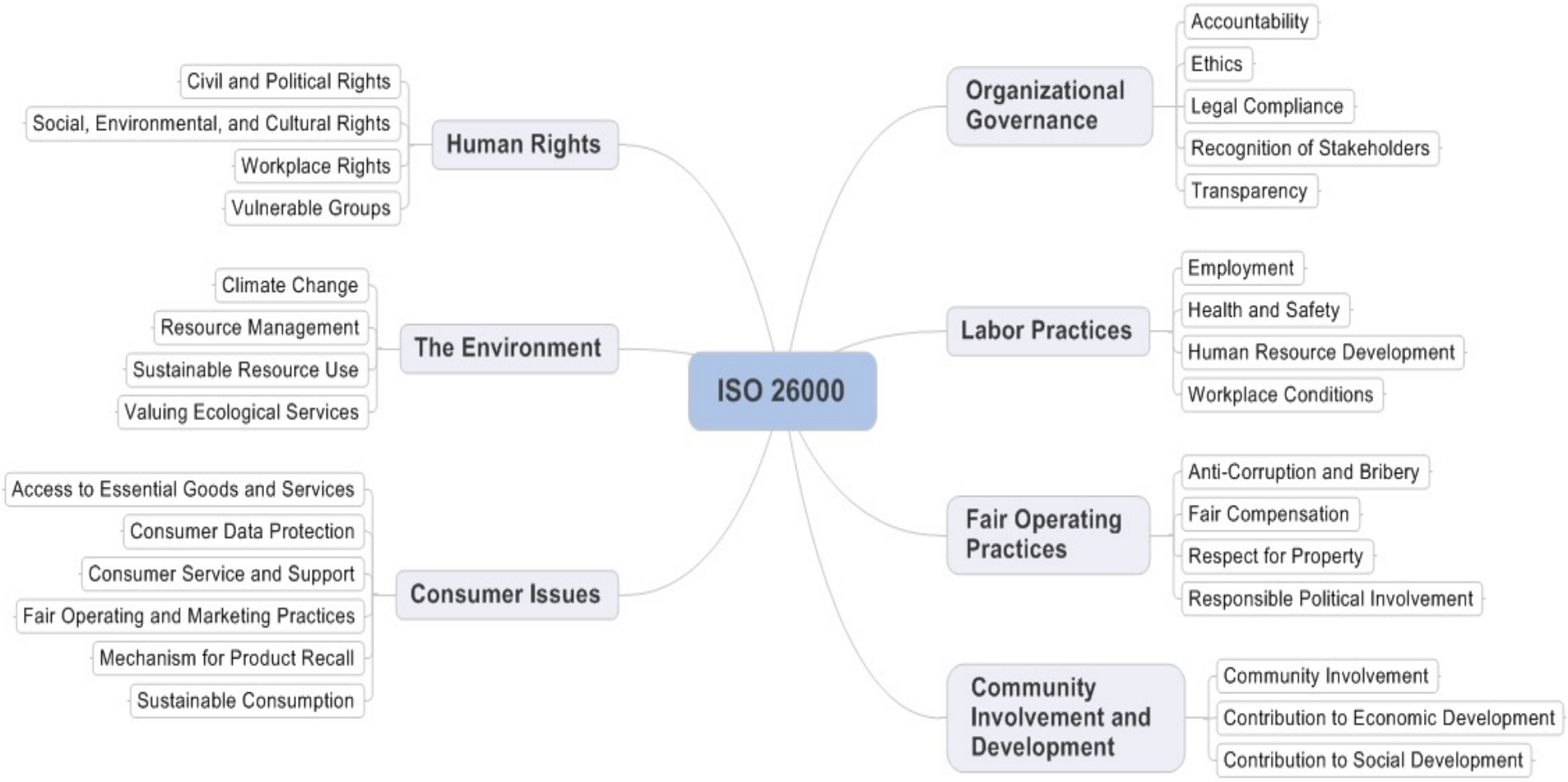
Bernhart, M. S., & Maher, F. J. (2011). *ISO 26000 in practice: A user guide*. Milwaukee, WI: Quality Press

ISO 26000: General Principles



Bernhart, M. S., & Maher, F. J. (2011). *ISO 26000 in practice: A user guide*. Milwaukee, WI: Quality Press

ISO 26000: Seven Core Subjects



Bernhart, M. S., & Maher, F. J. (2011). *ISO 26000 in practice: A user guide*. Milwaukee, WI: Quality Press

Frameworks

Frameworks

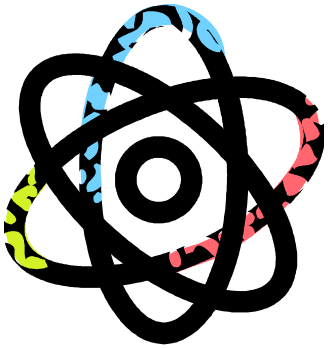
- Frameworks are structures for containing details
- Examples
  - Dissertation Template
  - Futures Study Framework
    - (Economics, Technology, Society / Demographics. Government-Military-Legal, Physical Environment)
  - Performance
    - (People, Processes, Technology)
  - Porter's Value Chain
  - Zachman Framework for Information Systems Architecture

Others?

Evidence

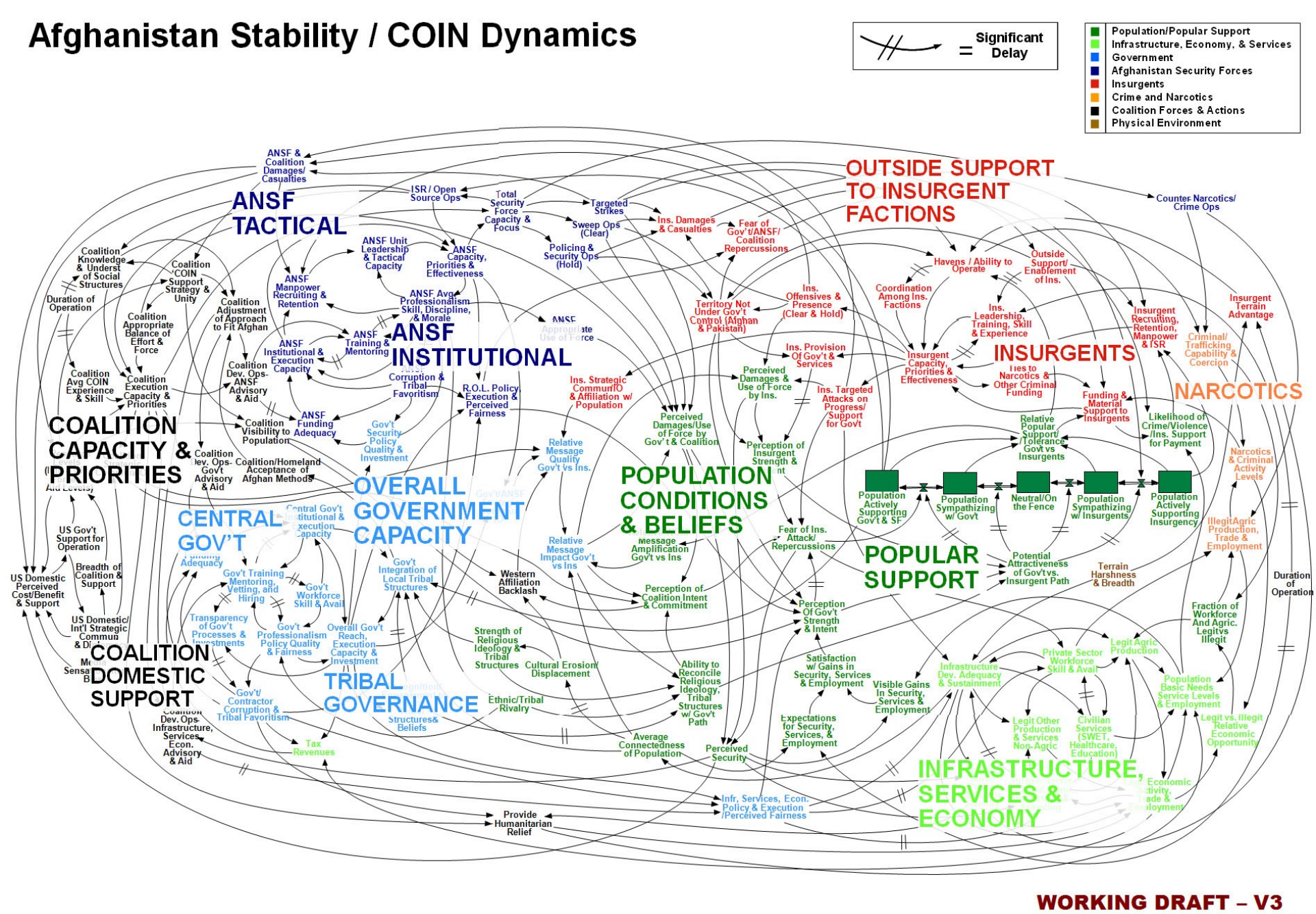
Evidence

- Proposition
  - A statement about phenomena
  - May or may not be testable
- Evidence
  - Anything that increases the probability of the truthfulness of the proposition
  - A basis for belief or disbelief
- Types of Evidence
  - Experience
  - Statistical or other analysis of data
  - Historical documentation
  - Experimental evidence



Faculty Insights

Afghanistan Stability / COIN Dynamics



WORKING DRAFT – V3

Mahalo!

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Schwarze, S., & Lape, H. (2001). *Thinking Socratically: Critical thinking about everyday issues*. Upper Saddle River, NJ: Prentice Hall.

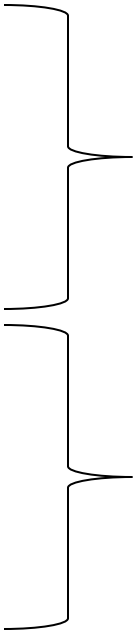
http://www.criticalthinking.org

Websites

- Acceleration Studies Foundation
  - http://www.accelerating.org
- Chaos Theory
  - http://library.thinkquest.org/3493/noframes/chaos.html
- MapSys Software
  - http://www.simtegra.com

Blooms Taxonomy

- Level 1: Knowledge
- Level 2: Comprehension
- Level 3: Application
- Level 4: Analysis
- Level 5: Synthesis
- Level 6: Evaluation



Doctoral Thinking

Blooms Taxonomy (cont)

- **Level 5: Synthesis (what? How?)**
  The ability to combine existing elements in order to create something original.
  - Communicate ideas
  - Plan projects
  - Form hypotheses
  - Draw conclusions
  - Create
  - Revise

Blooms Taxonomy (cont)

- **Level 6: Evaluation**
  The ability to make a judgment about the value of something by using a standard. For example, evaluate and select a research method and design for your dissertation
  - Make generalizations
  - Develop criteria
  - Judge accuracy
  - Make decisions
  - Identify values
  - Appraise
  - Justify

Universal Structures of Thought

Whenever you are reasoning,

you are trying to accomplish some *purpose*,

within a *point of view*,

using *concepts* or *ideas*.

You are focused on some *question*, *issue* or *problem*,

using *information*,

to come to *conclusions*, based on *assumptions*,

All of which has *implications*.

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The Five Why's

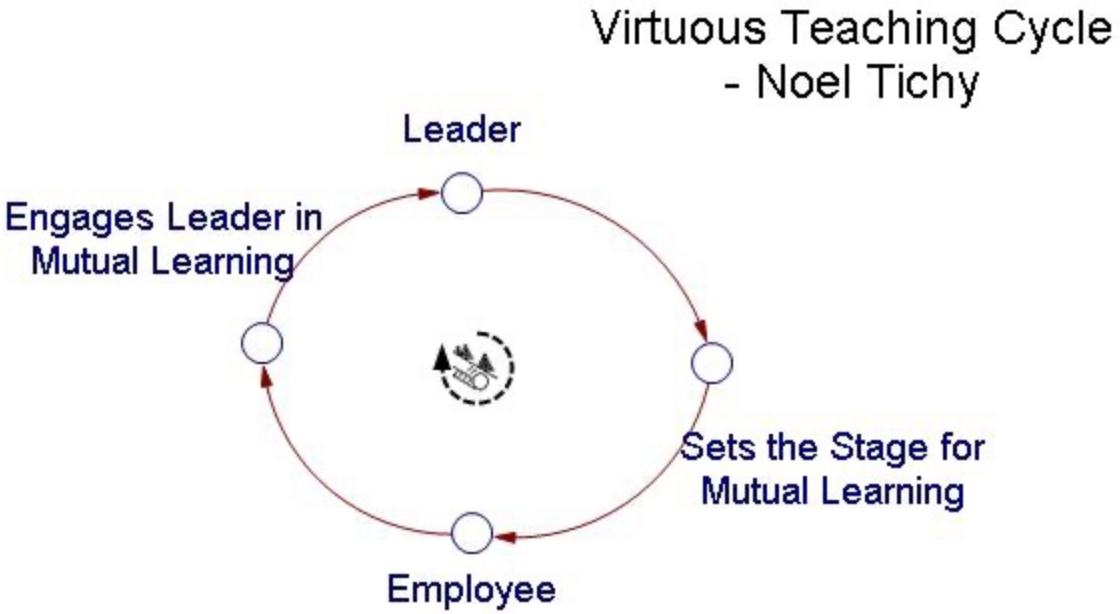
- Why?
  - Why?
    - Why?
      - Why?
        - Why?

Purpose – to drill down to root cause

Positive Feedback Loop

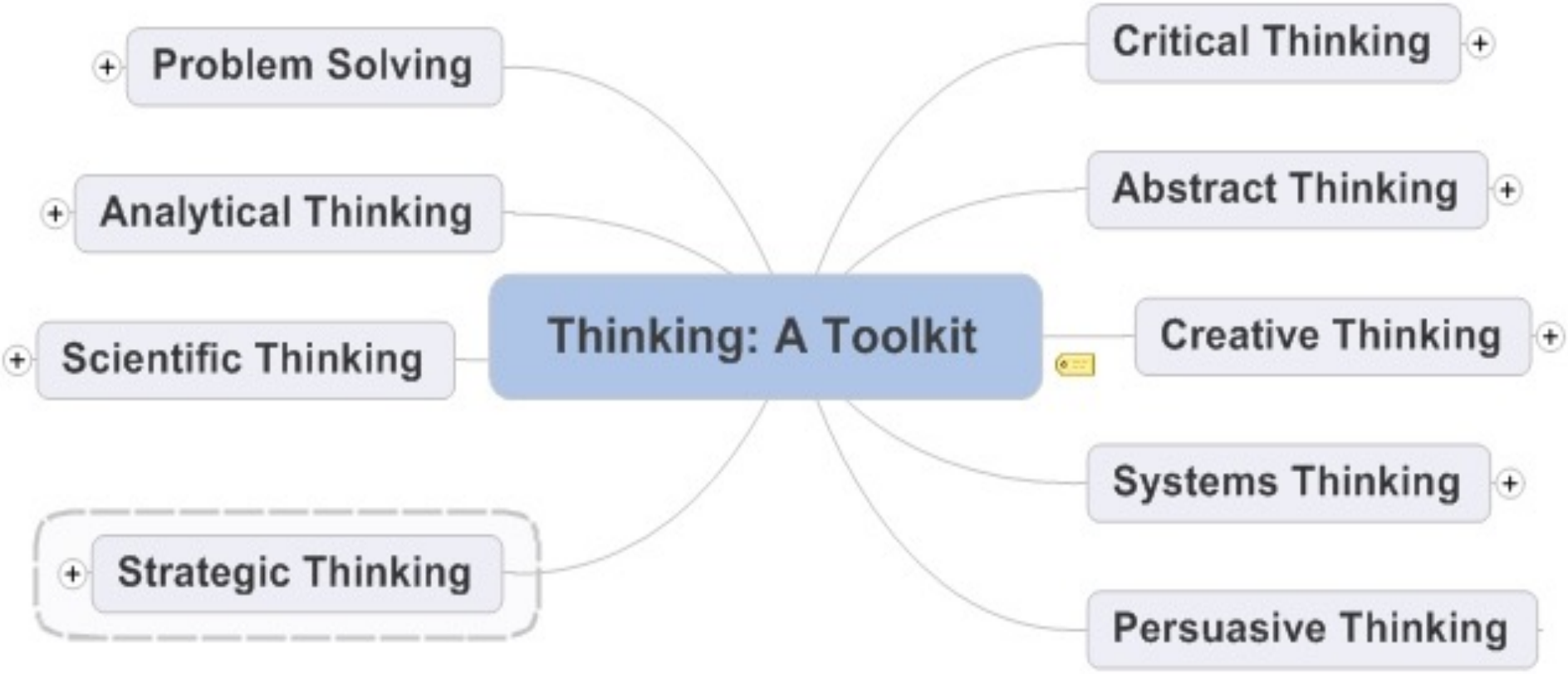
Examples

Example of a positive feedback loop in leadership or management



Note: The state of the system will continue to grow or decline unless some intervention occurs.

Tichy, N. (2002). *The cycle of leadership.* New York, NY : Harper Business.


Thinking: A Toolkit
Problem Solving
Analytical Thinking
Scientific Thinking
Strategic Thinking
Critical Thinking
Abstract Thinking
Creative Thinking
Systems Thinking
Persuasive Thinking