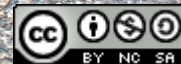


Theoretical Grounds, Pragmatic Grounds: Methods for Reordering our Priorities through Systems Changes Learning

David Ing,
with cofounders
Zaid Khan, Dan Eng, Kelly Okamura
<http://systemschanges.com>

Systems Changes Learning Circle
Systems Thinking Ontario
October 2020

Image CC-BY Mike Cassano (2009) Most Interesting Pothole



systemschanges.com, 2020

Welcome (to a facilitated group, not the Systems Thinking Ontario participants)

After 6 slides, we'll break into groups, and then pause for 3 minutes to think

Which name do you go by?
For which whereabouts (district, neighborhood, place) will you speak?



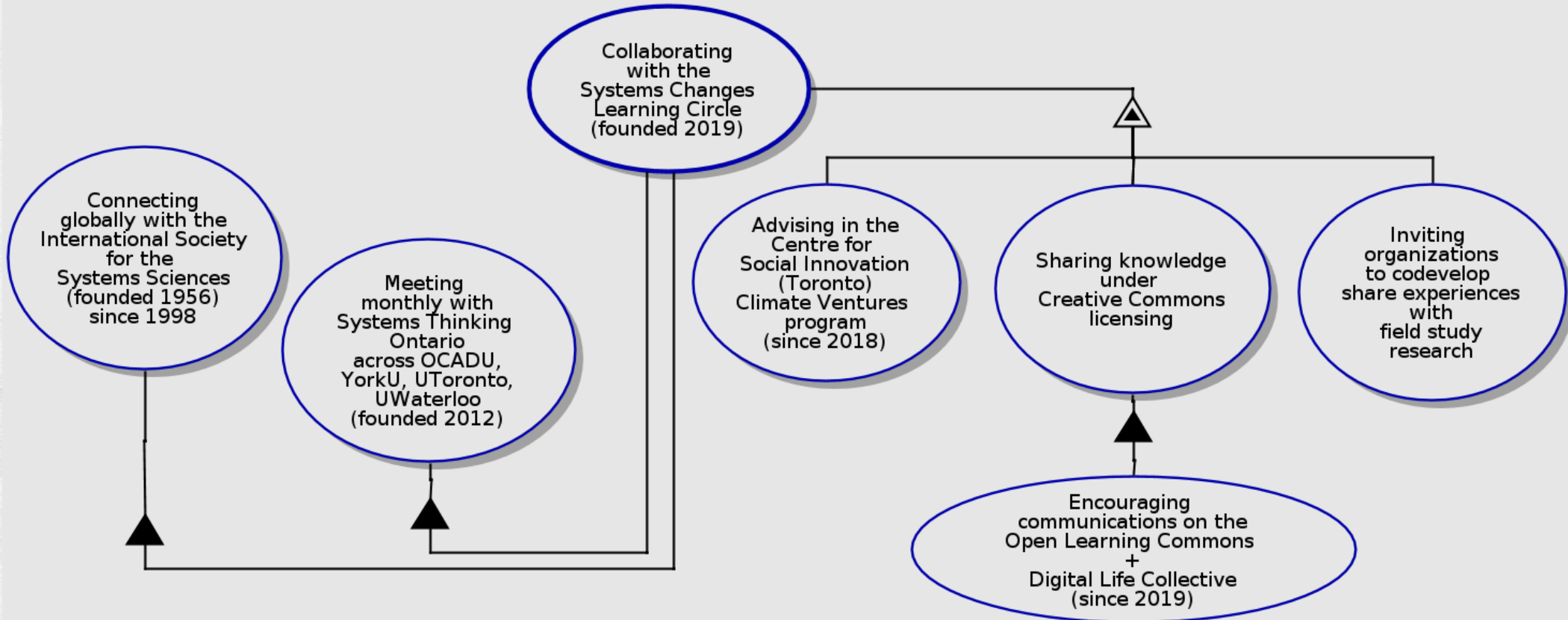
Sources:
"Name Tag" CC-BY-NC 2011 Enokson;
"Spinning Orbit Stars" by NASA



**Which three (3) systems changes
are most present
for your whereabouts?**

Who initiated this?

We invite collaborators to join the core members of the *Systems Changes Learning Circle*, now in year 2 of a 10-year mission



Reifying methods aims to synthesize (i) reliability + validity via the scholarly, and (ii) reproducibility + replicability in field deployment use

Evolving Theoretical Grounds (*"This is logical"*)



Evolving Pragmatic Grounds (*"This works"*)

Scientists ... follow **common principles** to conduct their work:

- the use of **ideas, theories, and hypotheses**;
- reliance on **evidence**;
- the use of **logic and reasoning**; and
- the **communication of results**, often through a scientific article.

National Academies of Sciences, Engineering, and Medicine. 2019. *Reproducibility and Replicability in Science*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25303>.

Pragmatism ... asks "Grant an idea or belief to be true," it says, "**what concrete difference will its being true make in anyone's actual life?**" How will the truth be realized?

What experiences will be different from those which would obtain if the belief were false? What, in short, is the truth's cash-value in experiential terms?"

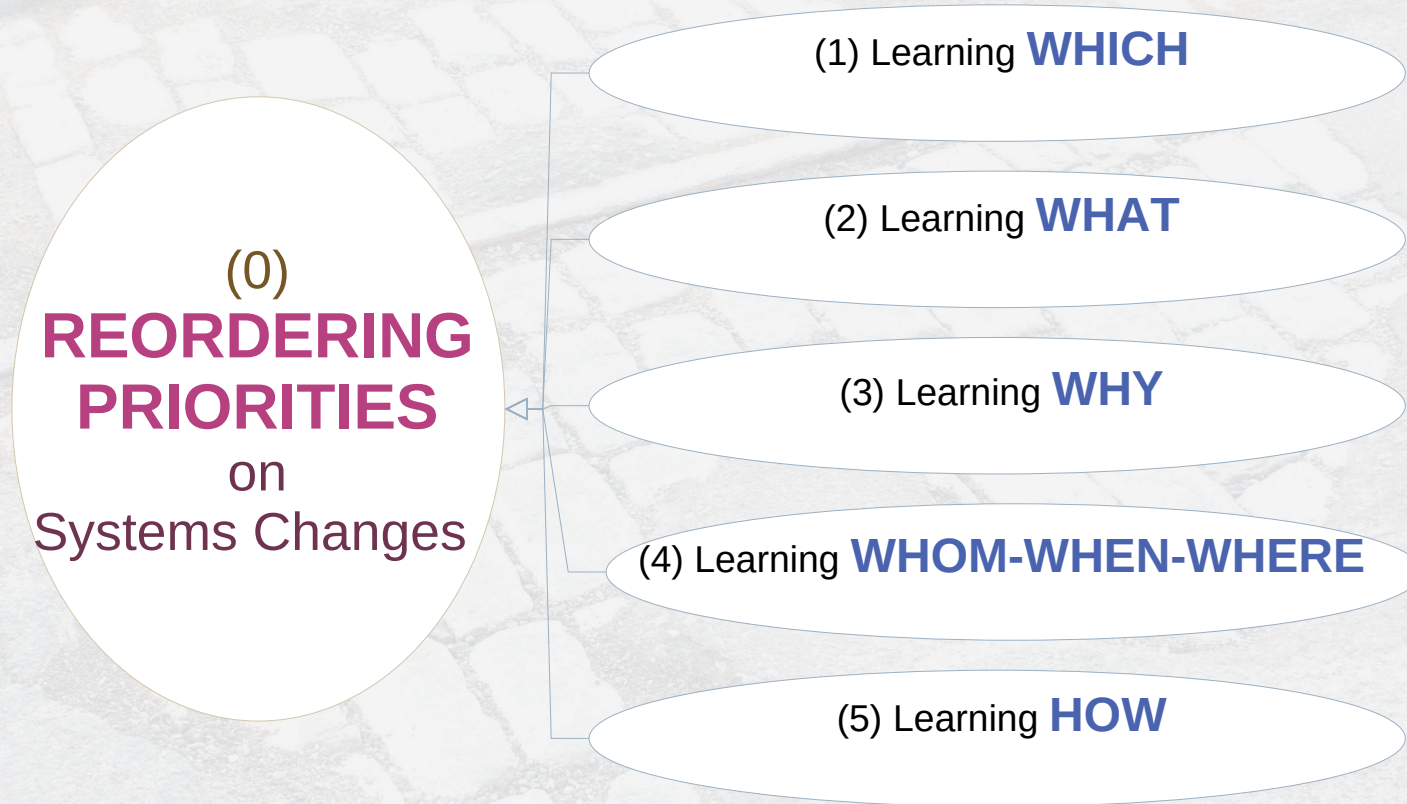
True ideas are those that we can assimilate, validate, corroborate and verify.

False ideas are those that we cannot.

That is the practical difference it makes to us to have true ideas; that, therefore, is the meaning of truth, for it is all that truth is known-as.

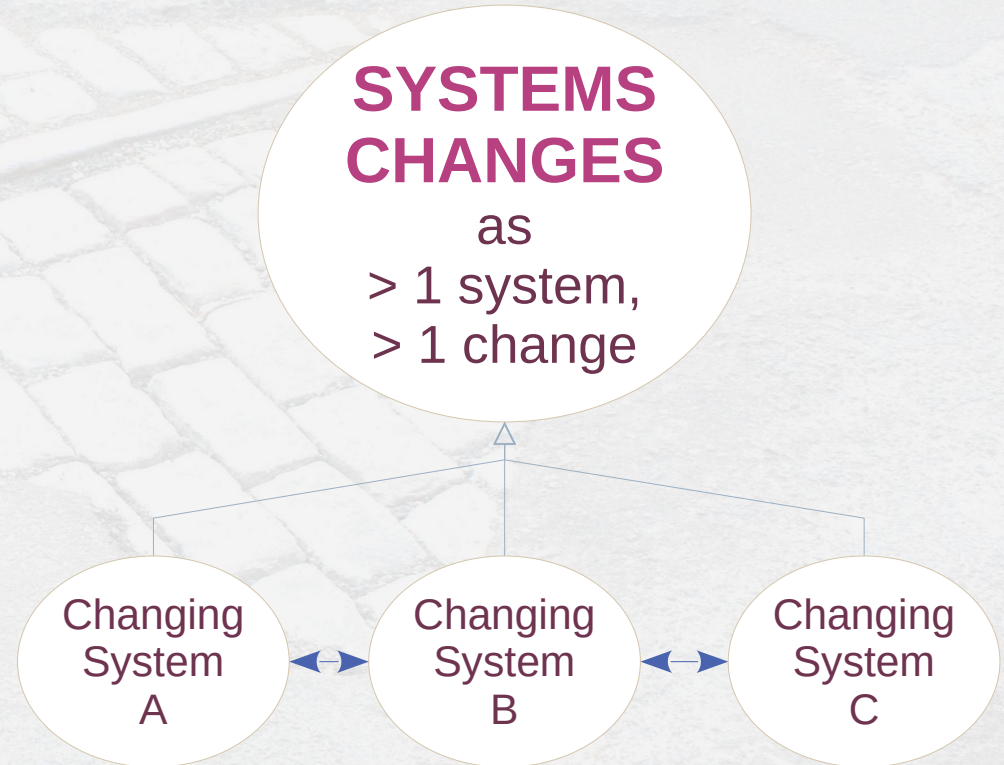
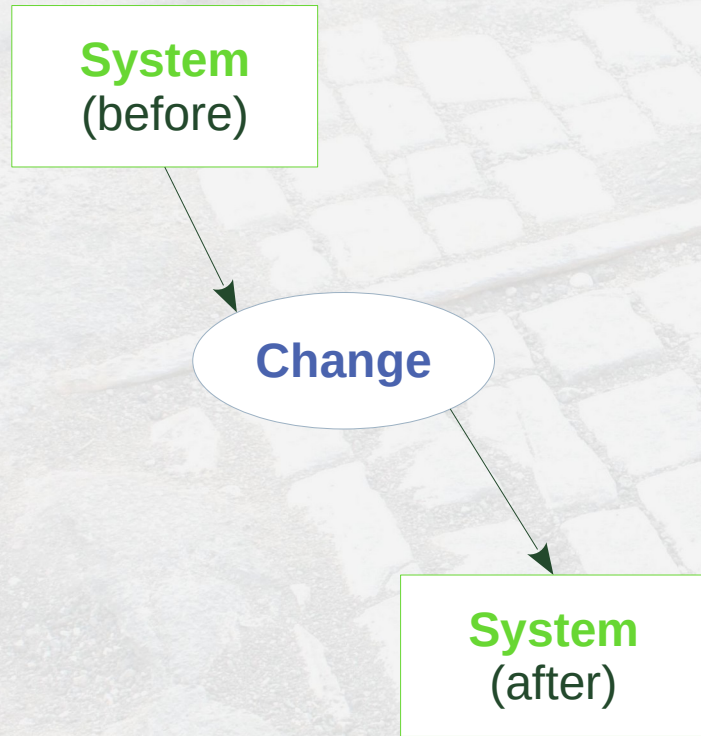
James, William. 1907. "Lecture VI. — Pragmatism's Conception of Truth." In *Pragmatism: A New Name for Some Old Ways of Thinking*. Project Gutenberg. http://www.gutenberg.org/files/5116/5116-h/5116-h.htm#link2H_4_0008.

An aim of *reordering priorities* is briefly introduced, looking forward towards deepening via five learnings posed as questions



Systems Changes a first-class concern ...

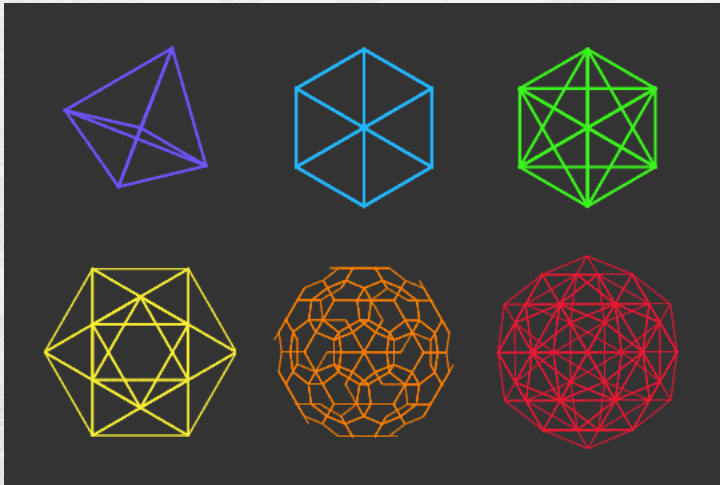
As an alternative to “*system change*” as structure + time, we reify wicked messes with “*systems changes*” as process, first class



Two ways of seeing nature, since ~500 BCE, have set how humans beings negotiate with themselves and in their world(s)

Reality as a **changelessness state**

- Parmenides of Elea, Confucius
- Shift → stability → sustainable
- Analytic paradigm



Hyper Platonic, by Nathan P. Seddig (natpbs.tumblr)

Reality as a **state of change, not a change of state**

- Heraclitus of Ephesus, Laotse
- Beauty of dynamic (c.f. protection of static)
- Contextual appreciation



Walking, by Dominique Taswell (strawberrylicorice.tumblr)

Hawk, David L. 1999. "Changelessness, and Other Impediments to Systems Performance." In *Proceedings of the Conference to Celebrate Russell L. Ackoff, and the Advent of Systems Thinking*, edited by Matthew J. Liberatore and David N. Nawrocki. Villanova University.
<http://davidhawk.com/wp-content/uploads/2018/09/Ackoff-Birthday-Conference.pdf#page=59> .

Agenda

- | | | |
|---------------------------|------------------------|---|
| A. Orientation | A1. <i>Framing</i> : | Systems changes, most present? |
| | A2. <i>Situating</i> : | Timing as: urgent ↔ important?
Relation as perceived:
local-direct ↔ distant-represented? |
| B. Possibilities | B1. <i>Framing</i> : | Synthesizing parts and wholes |
| | B2. <i>Situating</i> : | Unfolding nature, fixing problems and/or making history? |
| C. Action
(next steps) | C1. <i>Framing</i> : | Realizing Δ scale, scope and/or speed |
| | C2. <i>Situating</i> : | Joining <i>the circle</i> on five learnings |

Appendix

Theoretical foundations

Your participation is invited

Let's break into groups. Individually, think for 3 minutes.
Then, each of us can share for 1 minute

Which name do you go by?
For which whereabouts (district, neighborhood, place) will you speak?



**Which three (3) systems changes
are most present
for your whereabouts?**

Sources:

"Name Tag" CC-BY-NC 2011 Enokson;

"Spinning Orbit Stars" by NASA

Your responses?

Name	Systems Changes most present
	<ul style="list-style-type: none">•••
	<ul style="list-style-type: none">•••
	<ul style="list-style-type: none">•••
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Name	Systems Changes most present
	<ul style="list-style-type: none">•••
	<ul style="list-style-type: none">•••
	<ul style="list-style-type: none">•••
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Name	Systems Changes most present
	<ul style="list-style-type: none">•••
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	<ul style="list-style-type: none">•••
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Appendix

Theoretical foundations

Differentiating systems changes ...

Parsing shifts differentiates between (i) shifts between states;
(ii) shifts in behaviors; and (ii) shifts of regimes



Shifts between states

- Falling asleep ↔ waking up



Shifts in behaviors

- Living carefree ↔ minding health



Shifts of regimes

- Enjoying normalcy → alert on edge

Images from Flickr: "Sleepy" CC-BY 2017 Blondinrikard Fröberg; "Blood Pressure Checks" CC-BY 2011 The Coop Group; "Nepal – Earthquake Lessons" CC-BY 2015 Water Sanitation Collaborative Council

Differentiating systems changes ...

Parsing shifts differentiates between (i) shifts between states;
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Shifts between states

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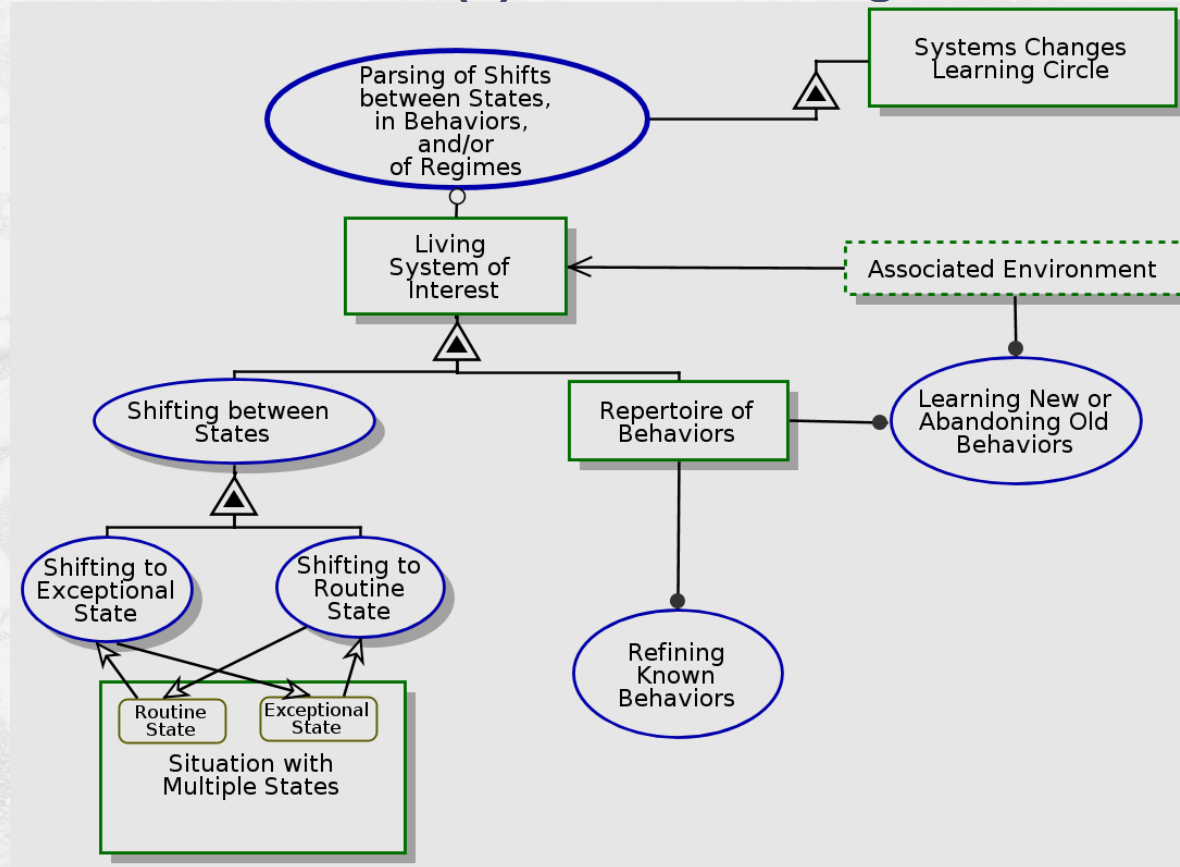
Shifts of regimes

- Enjoying normalcy → alert on edge

Images from Flickr: "Sleepy" CC-BY 2012 Paul Sableman; "Cycling Cardio Exercise" CC-BY 2017 Thoroughly Reviewed; "Cave Fire, Santa Barbara" CC-BY 2019 Glenn Beitz

Differentiating systems changes ...

Parsing shifts differentiates between (i) shifts between states;
(ii) shifts in behaviors; and (ii) shifts of regimes



Systems changes along two dimensions ...

Consider systems changes in a matrix along two dimensions:
(i) urgent – important, and (ii) local – distant

Distant

Local

Urgent

Important



Situating systems changes along one dimension ...

In balancing priorities, Eisenhower said that
“The urgent are never important, and the important are never urgent”



Urgent ... but not important?



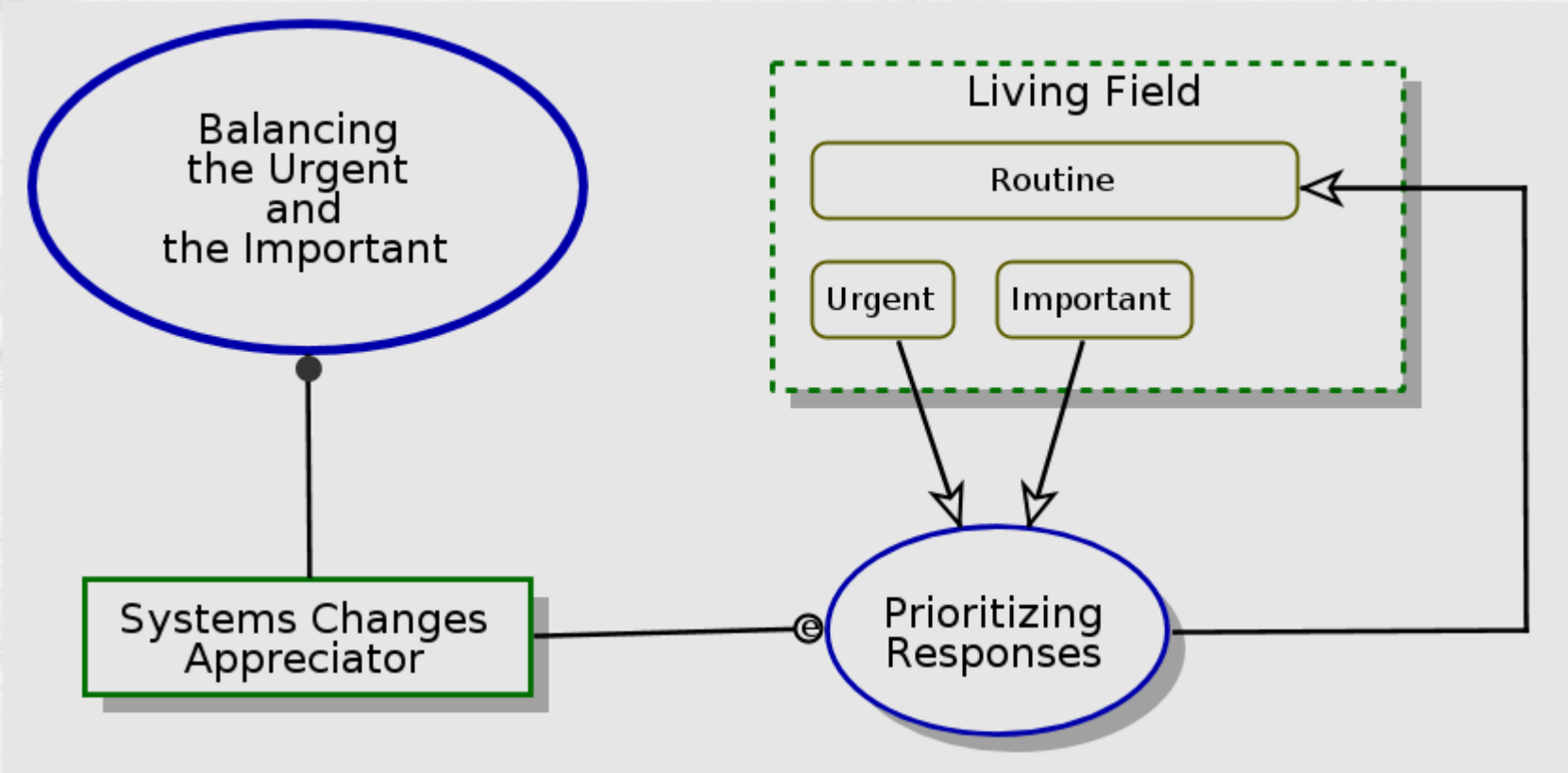
Important ... but not urgent?

Image from Giphy: “Ringing Telephone” 2015 BY Phillippa Rice. Image from Flickr; “Inner Levee Breach” CC-BY 2015 Infrogmation of New Orleans

Situating systems changes along one dimension ...

In balancing priorities, Eisenhower said that

“The urgent are never important, and the important are never urgent”



Situating systems changes along a second dimension ...

Systems changes may be with relations perceived as (i) *local* in direct interaction, or (ii) *distant* through representations with equivocality



Local in direct interaction

- Co-responding alongside



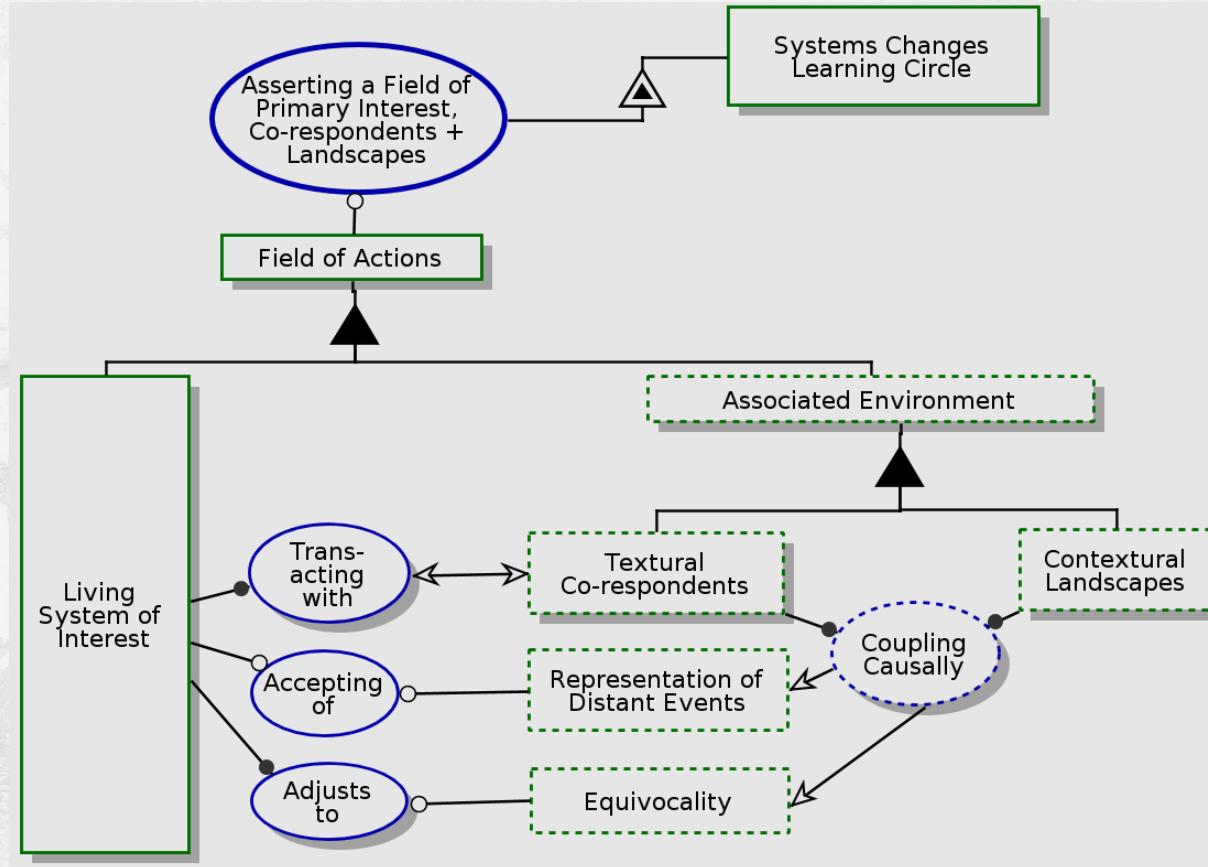
Distant through representations with equivocality

- Mediated with a contextural landscape

Images from Flickr: "Hand in Hand" CC-BY 2009 Carrie Kellenberger; "USFK Commander and ROK CJCS" CC-BY 2017 Chairman of the Joint Chiefs of Staff

Situating systems changes along a second dimension ...

Systems changes may be with relations perceived as (i) *local* in direct interaction, or (ii) *distant* through representations with equivocality



Mapping systems changes most present, personally ...

As an exercise, map the (3) systems changes most present to each of us in two dimension of (i) urgent – important, and (ii) local - distant

Distant

Local

Urgent

Important



Agenda

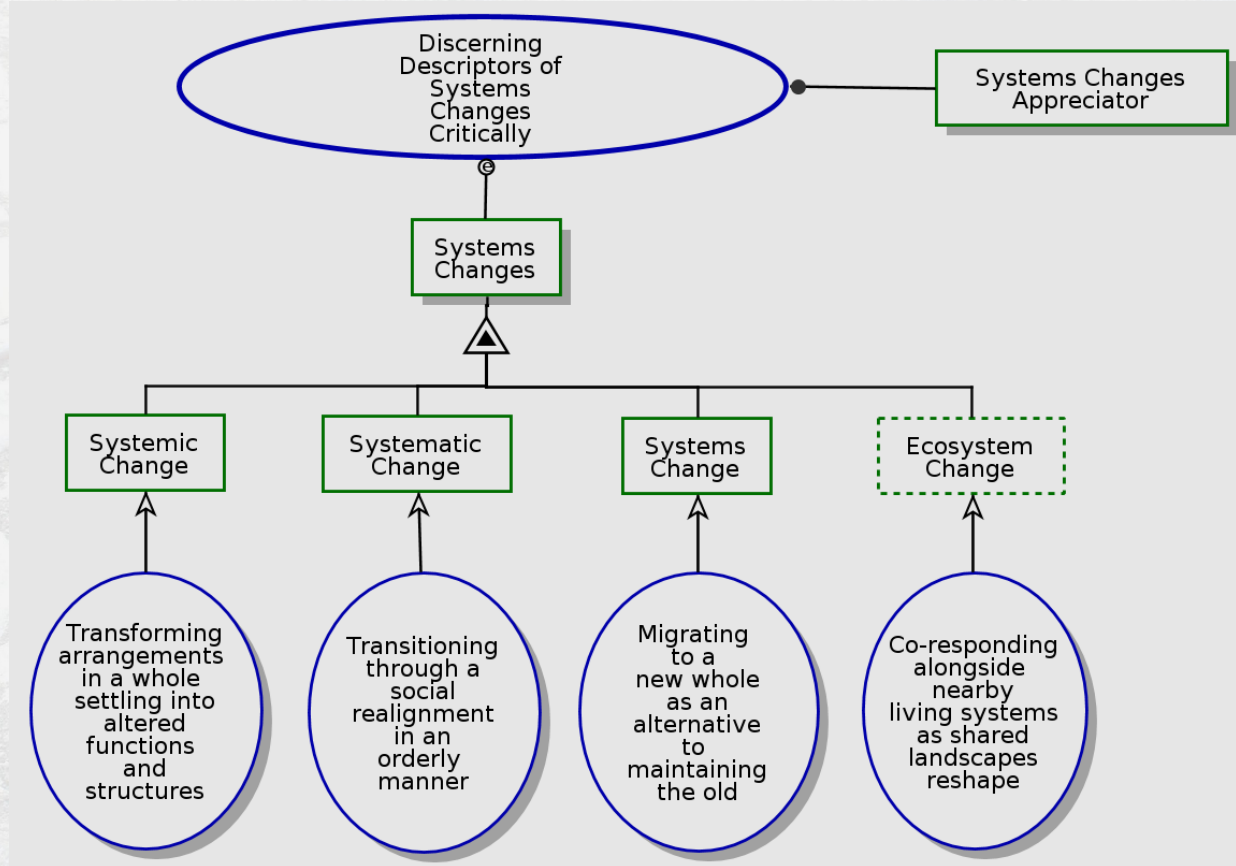
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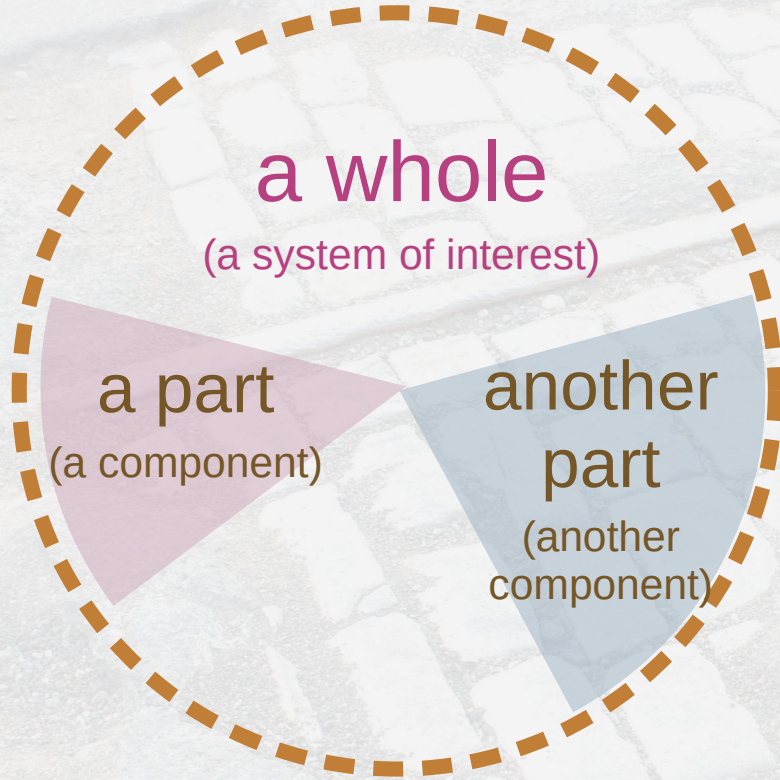
Theoretical foundations

Discerning system(s) change(s)

Critically examining *systems changes*, we see: (i) systemic change; (ii) systematic change; (iii) systems change; and (iv) ecosystem change



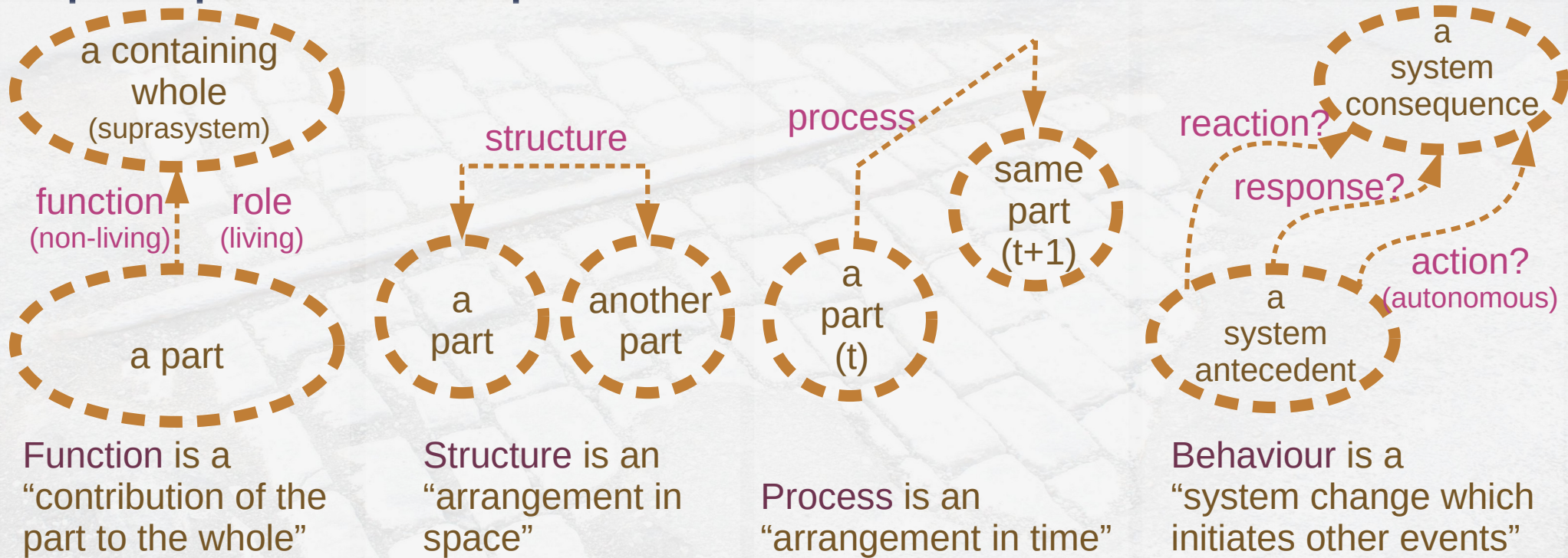
A system is a whole that cannot be divided into independent parts



- (1) Every part of a system has properties that it loses when separated from the system.
- (2) Every system has some properties – its essential ones – that none of its parts do.

Ackoff, Russell L. 1981. *Creating the Corporate Future: Plan or Be Planned For*. New York: John Wiley and Sons, p. 15

Systems thinking is a perspective on parts, wholes, and their relations



Ing, David. 2013. “Rethinking Systems Thinking: Learning and Coevolving with the World.” *Systems Research and Behavioral Science* 30 (5): 527–47.

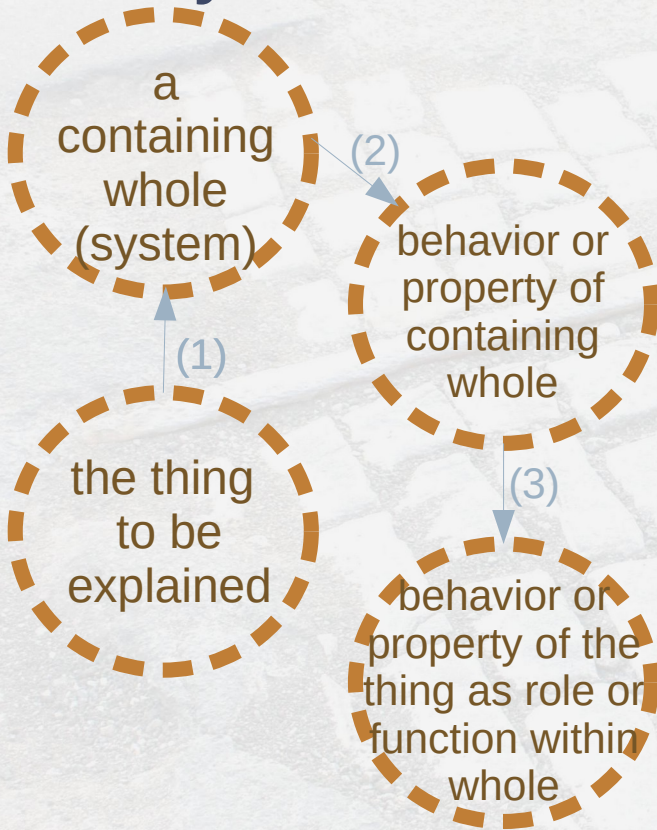
Gharajedaghi, Jamshid. 1999. *Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture*. Elsevier

Ackoff, Russell L. 1971. “Towards a System of Systems Concepts.” *Management Science* 17 (11): 661–671.

In authentic systems thinking, synthesis precedes analysis and the containing whole is appreciated

Synthesis precedes analysis

1. Identify a **containing whole** (system) of which the **thing to be explained** is a part.
2. Explain the **behavior or properties** of the **containing whole**
3. Then explain the **behavior or properties** of the **thing to the explained** in terms of its **role(s) or function(s)** within its containing whole.



Ackoff, Russell L. 1981. *Creating the Corporate Future: Plan or Be Planned For*. New York: John Wiley and Sons, p. 16

Modes for systems changes ...

Taking action recognizes modes of systems changes, as
(i) unfolding nature; (ii) fixing problems; and (iii) making history



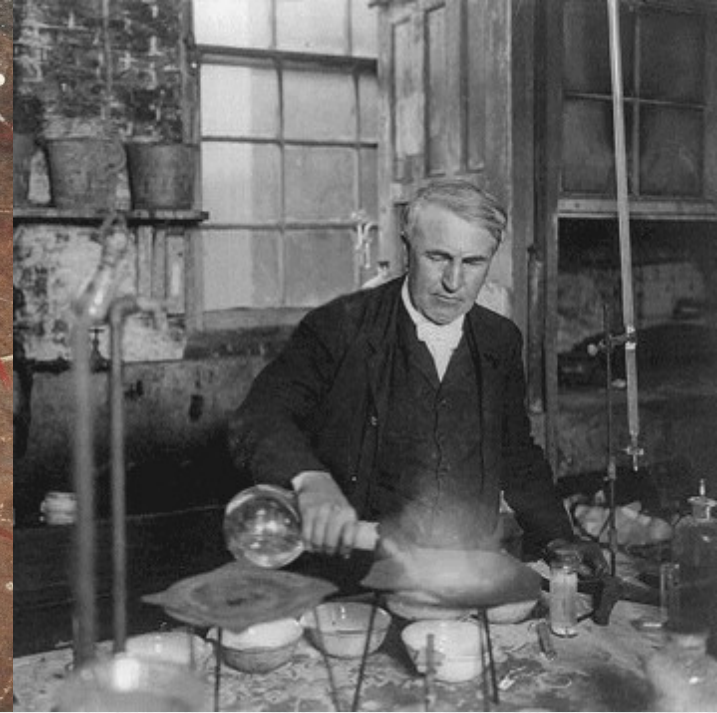
Unfolding nature

- Systems generating systems



Fixing problems

- Solution (engineering resilience)

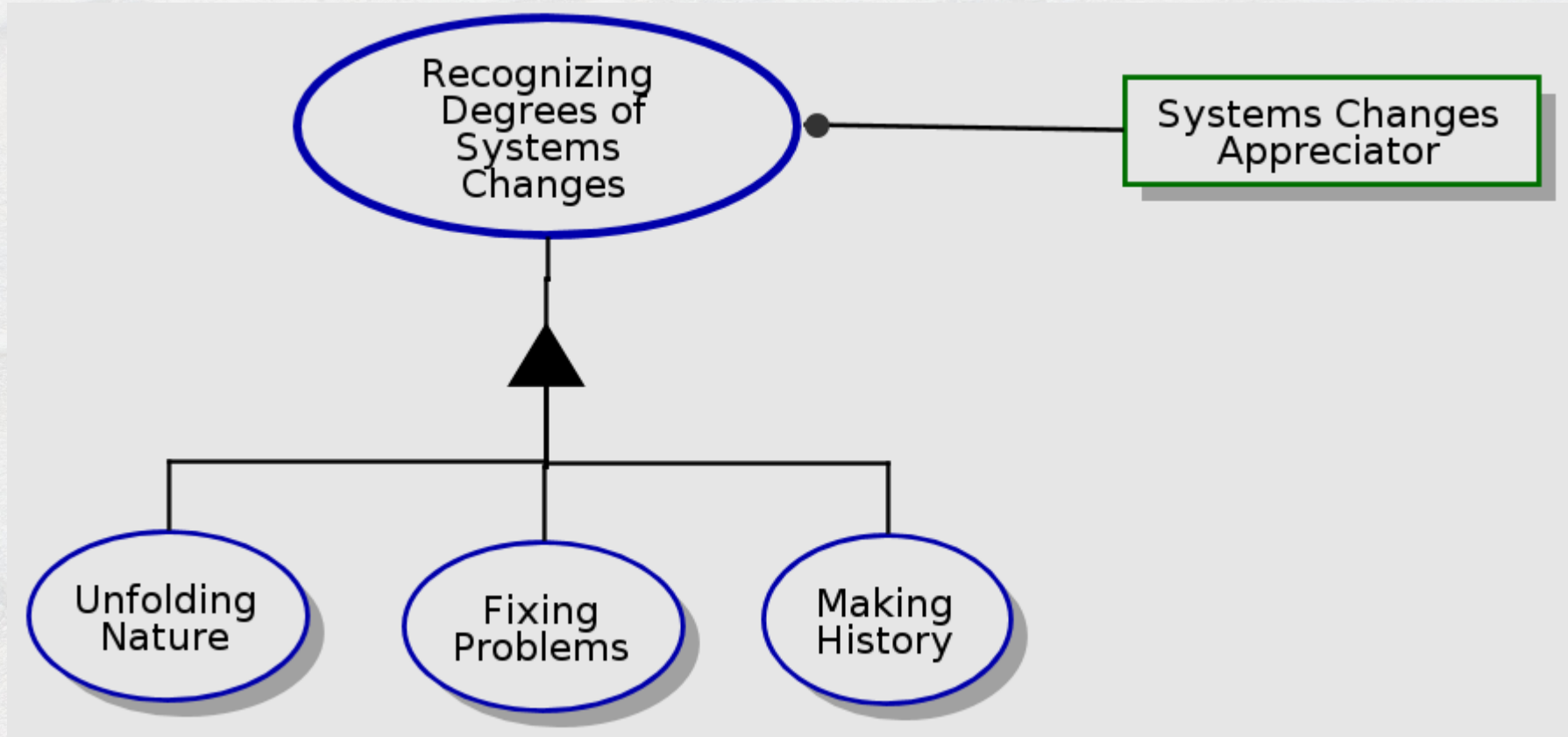


Making history

- Disclosing new worlds

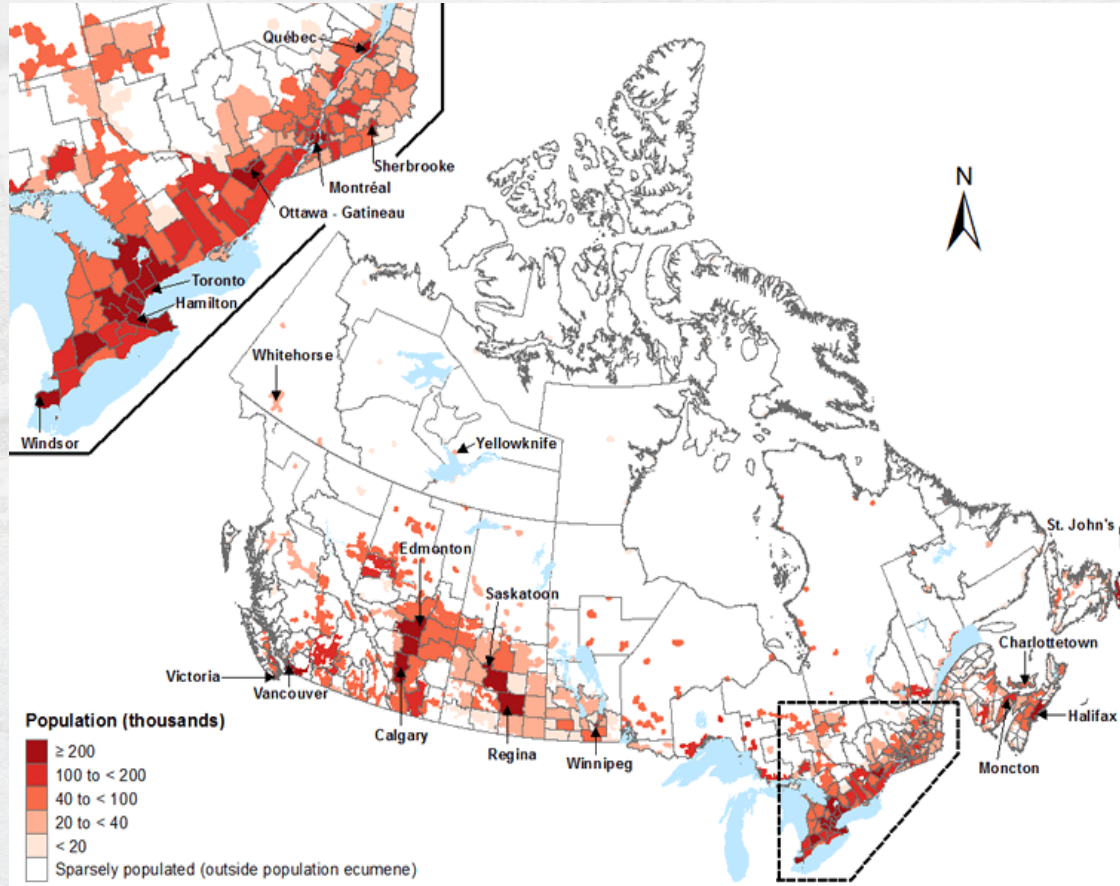
Images from Giphy: "Summer Grow" Kristy Good; "DIY Tools" BY Reuben Armstrong; "Thomas Edison" BY General Electric

Taking action recognizes modes of systems changes, as
(i) unfolding nature; (ii) fixing problems; and (iii) making history



Conversations for possibilities ...

In each team, if granted an opportunity to allocate \$35M – \$1 for each citizen in Canada – which course of decision-making would you take?



Source: Statistics Canada, Demography Division, Map 4.1 Population distribution as of July 1, 2014 by census division (CD), Canada

Synthesizing within groups ...

Returning to the breakout groups, can we synthesize a map that prioritizes systems changes most present, along two dimensions?



What did we learn in trying to synthesize our priorities?



Agenda

- | | | |
|---------------------------|------------------------|---|
| A. Orientation | A1. <i>Framing</i> : | Systems changes, top of mind? |
| | A2. <i>Situating</i> : | Timing as: urgent ↔ important?
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local-direct ↔ distant-represented? |
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Appendix

Theoretical foundations

Pragmatic constraints to redesigning systems ...

Redesigning a system for right now, as neither ideal nor utopian, heeds three requirements + assumes reality comes with change



Technologically feasible

- Doesn't preclude innovation, nor require economic feasibility



Operationally viable

- Capable of working and surviving if brought into existence



Capable of learning + adapting

- Gains from experience, can improve or be improved by others

Reference: Ackoff, Russell L. 1994. *The Democratic Corporation*. New York: Oxford University Press, pp. 79-80

Images from Flickr: "3rd Stage" CC-BY 2019 B Mauro; "Greenhouse 2" CC-BY 2010 A.S. Morton; "Lakeview Park Sunflower Garden" CC-BY 2020 David Ing

34 ReOrdering our Priorities through Systems Changes Learning

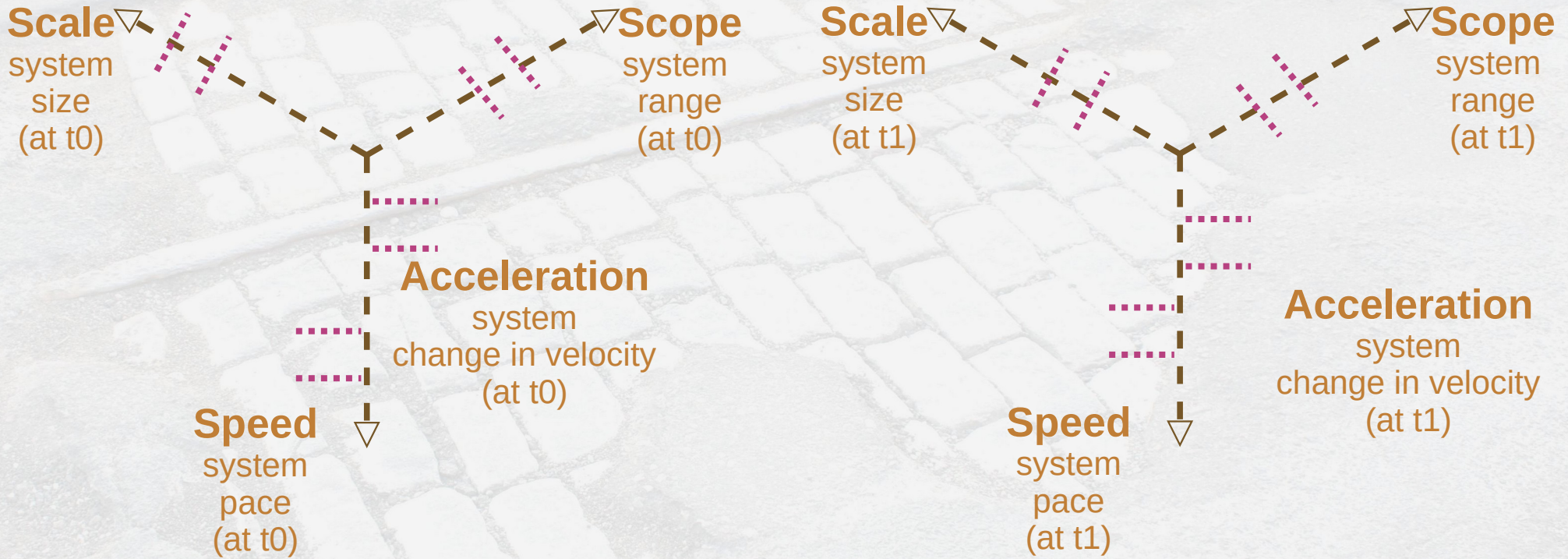
October 2020



systemschanges.com, 2020

Realizing systems changes ...

Shifting from t0 to t1, systems changes may be exhibited as shifts in the scale, scope and/or speed of operations



Errors in decision-making may come from gaps in knowledge

There are two possible types of decision-making mistakes, which are not equally easy to identify.



(1) **Errors of commission:**
doing something that should
not have been done.

(2) **Errors of omission:**
not doing something that
should have been done.

Accounting systems are able to
identify errors of commission,
even though they often fail to do so.

Decisions not to do something are
seldom a matter of record.



Ackoff, Russell L. 1994. "It's a Mistake!" *Systems Practice* 7 (1): 3–7. <https://doi.org/10.1007/BF02169161>.

Images: CC-BY Mike McBey (2010) "Pisa"; CC-BY Robert Couse-Baker (2017) "This Way or That"

If they can get you asking the wrong questions, they don't have to worry about answers (Thomas Pynchon)

Type 1 error **False positive:**
finding a (statistical) relation that isn't real

Type 2 error **False negative:**
missing a (statistical) relation that is real

Type 3 error **Tricking ourselves:**
Unintentional error of solving wrong problems precisely (through ignorance, faulty education or unreflective practice)

Type 4 error **Tricking others:**
Intentional error of solving wrong problems (through malice, ideology, overzealousness, self-righteousness, wrongdoing)

Ian I. Mitroff and Abraham Silvers. 2010. *Dirty Rotten Strategies: How We Trick Ourselves and Others into Solving the Wrong Problems Precisely*. Stanford University Press.

In which ways is this different?

When direct immediate interventions fail, *Systems Changes Learning* incorporates five philosophical schools as an open system of inquiry

	Schools of Philosophy	
	←	→
	Which? (phenomena, perception)	
	What? (ontos, becoming)	
	Why? (episteme, science)	
	Whom, when, where? (phronesis, situated action)	
	How? (techne, skills + tools)	



In which ways is this different?

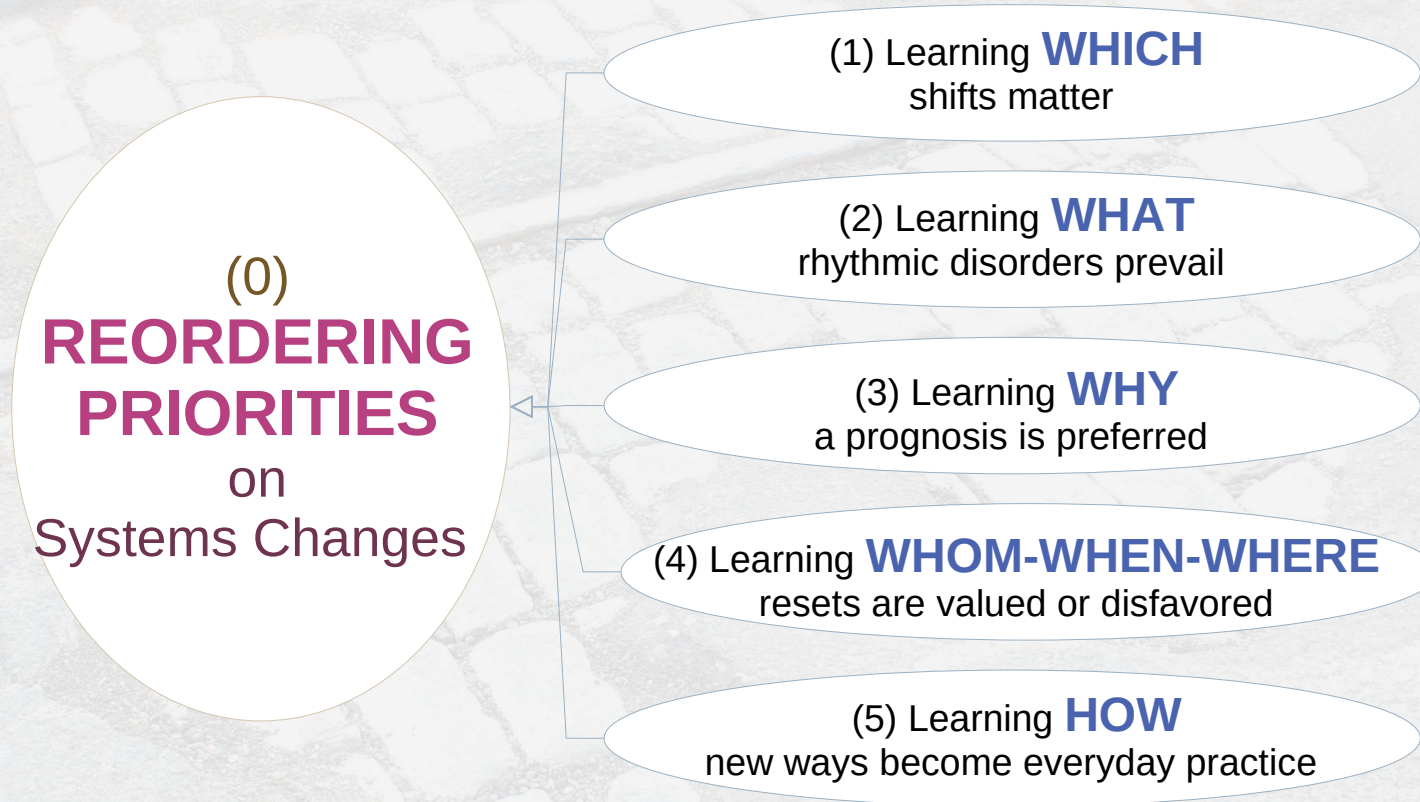
When direct immediate interventions fail, *Systems Changes Learning* incorporates five philosophical schools as an open system of inquiry

Systematic, self-referential closed loop, self-sealing logic	<i>Linear-Sequential Logical Positivism</i>	Schools of Philosophy	<i>Systems Changes Learning</i>	Omissions? Open system sweeping in multiple paradigms
	Intention <ul style="list-style-type: none">• Solution ← problem	Which? (phenomena, perception)	Attending/attention <ul style="list-style-type: none">• Wicked messes	
	Human will <ul style="list-style-type: none">• Machines, linear causes	What? (ontos, becoming)	Living beings <ul style="list-style-type: none">• Fluid course of nature	
	Dynamic equilibria <ul style="list-style-type: none">• Engineering resilience	Why? (episteme, science)	Regime shifts <ul style="list-style-type: none">• Ecological resilience	
	Scaling technocracy <ul style="list-style-type: none">• Lawful order	Whom, when, where? (phronesis, situated action)	Practical wisdom <ul style="list-style-type: none">• Negotiated order	
	Unfreeze-Δ-freeze <ul style="list-style-type: none">• Behavior (collective?)	How? (techne, skills + tools)	Social practice <ul style="list-style-type: none">• Affordances	

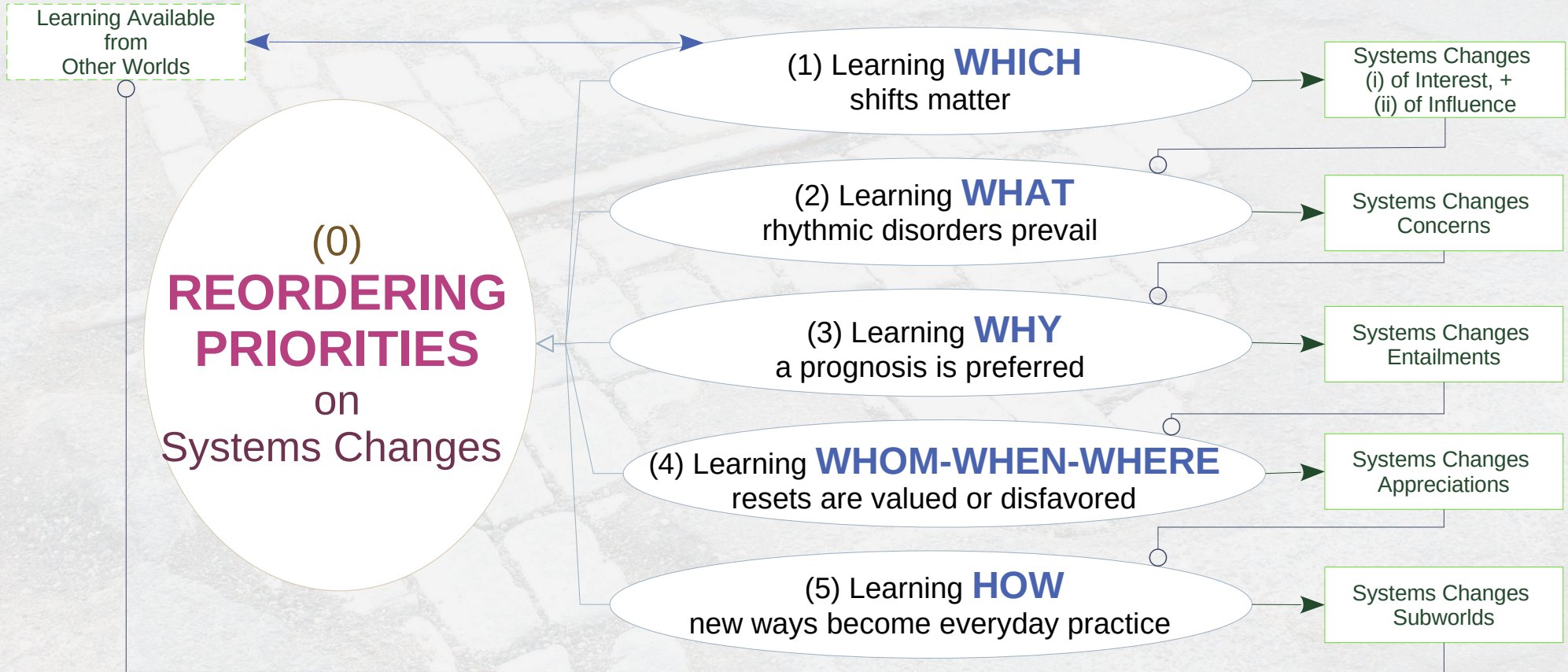
Appropriate action may go beyond science as a search for better answers, with philosophy as a search for better questions



Precise framing of five learnings poses questions sequenced for deeper understanding of conditions, alternatives and options



Methods involve not on the processes of learning, but also artifacts on which progress can be marked



Systems Changes



In which *systems* would you like to see *changes* occur?

Systems Changes is an open collaborative community, initiated with a learning circle in Toronto, Canada. A call for participation was launched in January 2019 at the monthly Systems Thinking Ontario meeting. The web site will evolve as contributions and knowledge are added.

The plurals in the program name are significant.

- There are multiple **systems** simultaneously at play, not just a single system.
- **Changes** include those within a field that individual and groups can influence, and those in an extended environment that are beyond our abilities.

The program is initially facilitated by David Ing. Collective learning is encouraged with the cooperation of Systems Changes Learning Circle members.

The header image of cobblestone and rail tracks underneath a "[Most interesting pothole](#)" is CC-BY [Mike Cassano](#) 2009.

Welcome to the Open Learning Commons










The Open Learning Commons is an electronic medium where members mutually share questions and findings as a community of mutual support. We welcome learners to [join us](#) online as individuals, or as teams.

A variety of technologies enable conversations, ranging from slower-deliberate pacing to a faster-ephemeral pacing. Cooperation can be conducted in public, or in semi-private spaces.



	<i>Call for participation</i>	<i>Function</i>	<i>Via web browser</i>	<i>Via apps</i>	<i>Software</i>	<i>Visibility (read)</i>	<i>Edit privileges</i>	<i>Content licensing</i>	<i>Where to ask for help?</i>
<i>Slowest changing tool</i>	openlearning.cc for public cooperation in an <i>open commons</i>	1. Orienting landing site	openlearning.cc	<input type="checkbox"/>	Grav ⓘ	Open Internet	OLC stewards	CC-BY-SA	Open Learning Commons: Ask the OpenLearning team in the Basecamp channel ; or Message a moderator in discussion ⓘ
		2. Evolving card collections across diverging and converging perspectives	wiki.openlearning.cc ⓘ	<input type="checkbox"/>	Federated Wiki ⓘ	Open Internet	OLC invited member can claim wiki subdomains(s)	CC-BY-SA	
		3. Sensemaking on categorized threads of posts and responses	discuss.openlearning.cc ⓘ	[on Google Play] [on Apple App Store]	Discourse ⓘ	Open Internet	OLC invited members	CC-BY-SA	

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Topic		Replies	Views	Activity
<p>📌 About the Systems Changes category</p> <p>The Systems Changes category on discuss.openlearning.cc is one of the online resources for an ongoing open access research project. The main landing site for the Systems Changes research program is at https://systemsch... read more</p>		0	73	Jun '19
<p>Anna Karenina principle in science</p> <p>■ science</p>		0	8	6d
<p>Lawful order, legal order, negotiated order</p> <p>■ order</p>		3	14	13d
<p>Beavers as ecosystem engineers</p> <p>■ ecosystems</p>	 Z	1	31	13d
<p>What is the question that I should be asking?</p> <p>■ questions ■ philosophy</p>	  	3	28	13d
<p>How Can We Plan for the Future in California?</p> <p>■ opm ■ governance ■ ecological ■ climate-change</p>		0	17	26d
<p>Lack of anticipation, and reductiveness</p> <p>■ anticipatory-systems</p>	 G	1	28	Aug 11

Agenda

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(next steps)
 - C1. *Framing*: Realizing Δ scale, scope and/or speed
 - C2. *Situating*: Joining *the circle* on five learnings

Appendix

Theoretical foundations

This workshop contributes towards open sourcing research

Research

Consulting

Many-to-many

Pooled knowledge community

relation

One-to-one

Focused bandwidth

Open sourcing

Creative Commons licensing

visibility

Private sourcing

Trade secrets, copyrights

Free (as in liberty)

Non-exclusionary

access

Privileged (permissioned)

Negotiated conditions

Free (as in gratis)

Shared investment

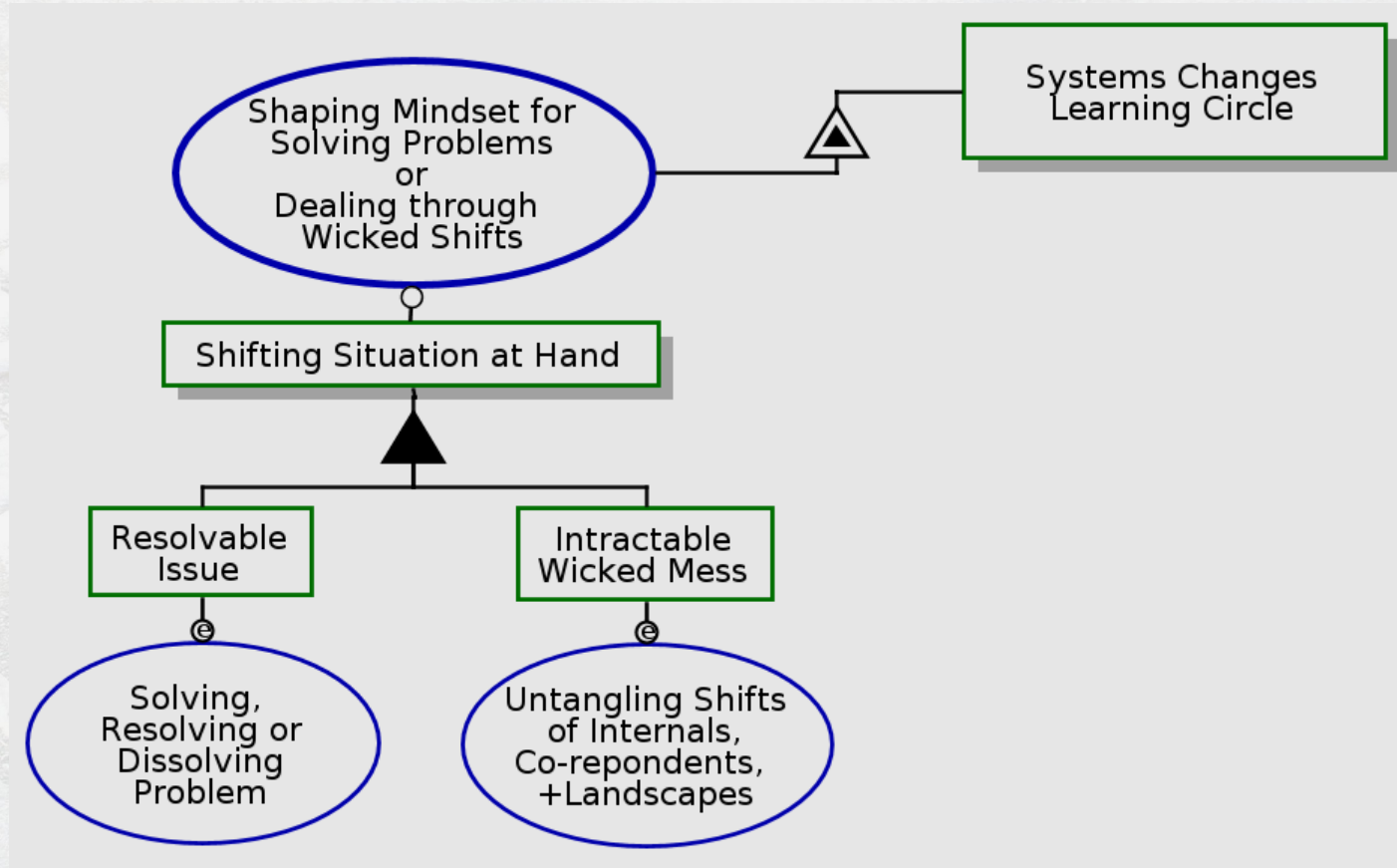
economics

Fee (for consideration)

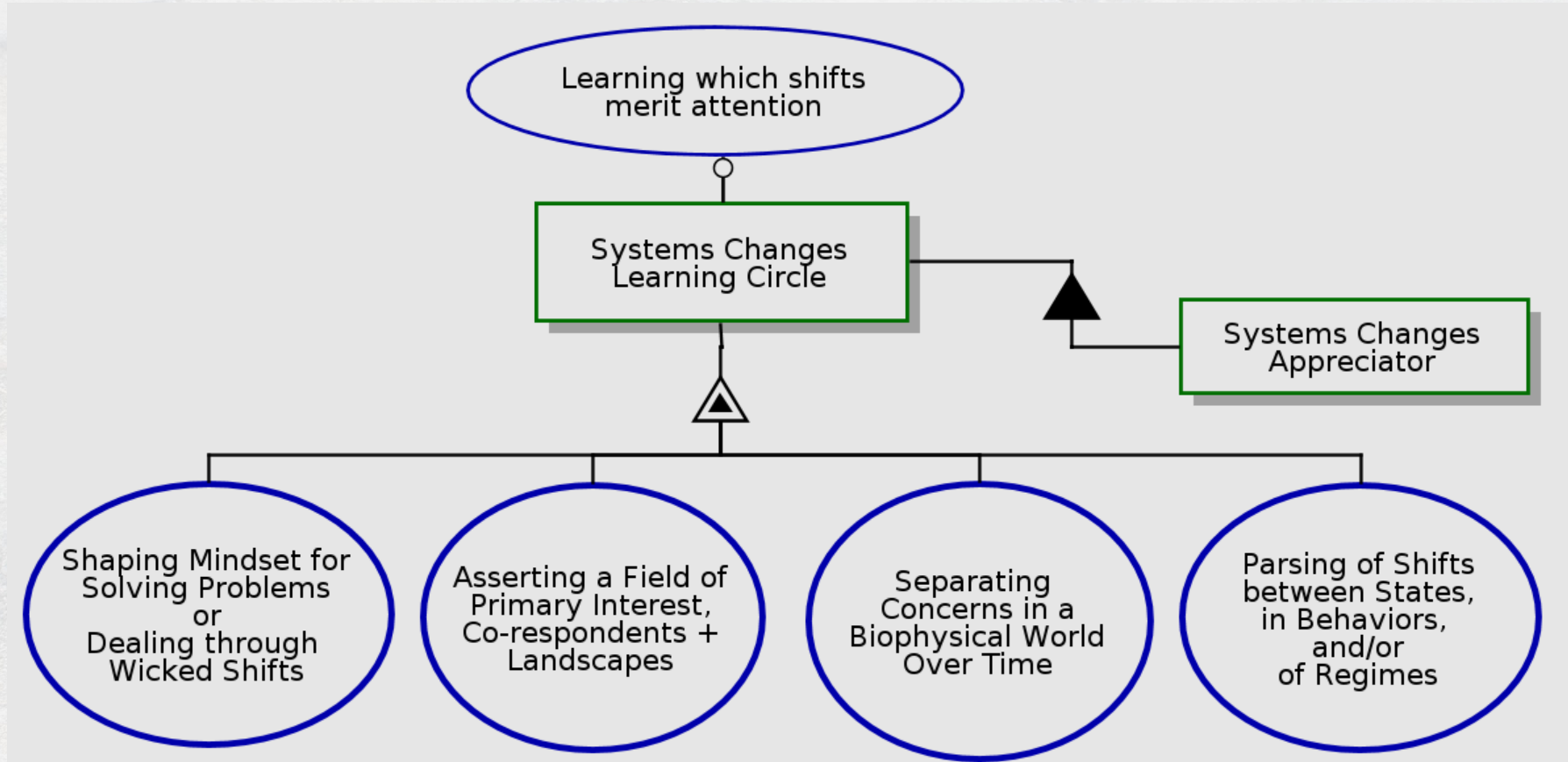
Gradient in value

Problems versus wicked messes (problematiques)...

When solving problems is insufficient, dealing with wicked shifts involves internals, co-respondents and landscapes

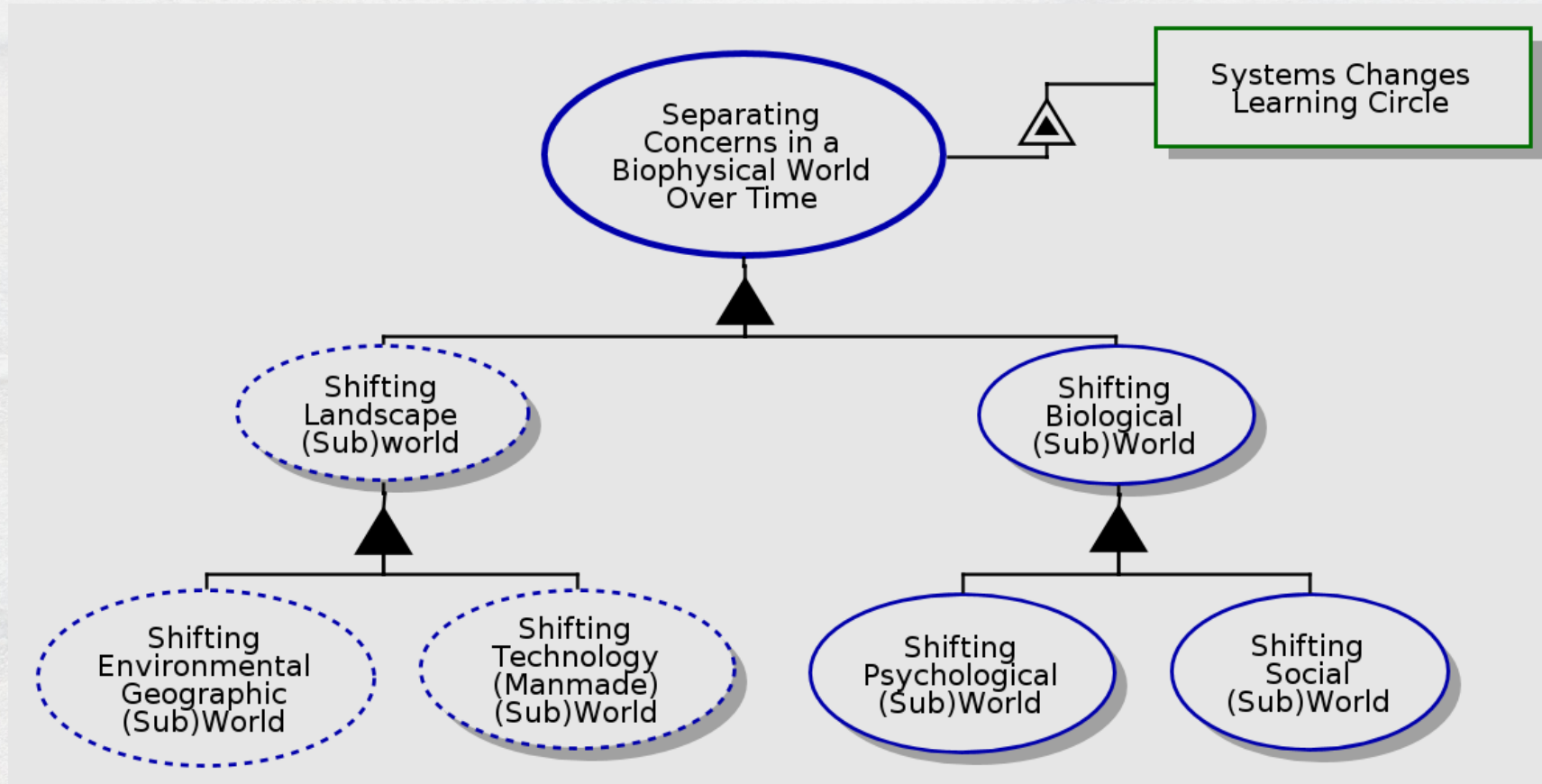


Exploring which shifts merit attention involves (i) shaping mindset; (ii) asserting a field; (iii) separating concerns; and (iv) parsing of shifts



Systems overlap in subworlds ...

Separating concerns in a biophysical world over time sees shifts in subworlds of (i) psychological, social, technological, and geographic



Metabolism involves anabolism (building up) and catabolism (breaking down)

Overview of metabolism

Cells are constantly carrying out thousands of chemical reactions needed to keep the cell, and your body as a whole, alive and healthy. These chemical reactions are often linked together in chains, or pathways. All of the chemical reactions that take place inside of a cell are collectively called the cell's **metabolism**.

Anabolic and catabolic pathways

The processes of making and breaking down glucose molecules are both examples of metabolic pathways. A **metabolic pathway** is a series of connected chemical reactions that feed one another. The pathway takes in one or more starting molecules and, through a series of intermediates, converts them into products.

Metabolic pathways can be broadly divided into two categories based on their effects. Photosynthesis, which builds sugars out of smaller molecules, is a "building up," or **anabolic**, pathway. In contrast, cellular respiration breaks sugar down into smaller molecules and is a "breaking down," or **catabolic**, pathway.

Khan Academy. 2020. "Overview of Metabolism". In *High School Biology*.
<https://www.khanacademy.org/science/high-school-biology/hs-energy-and-transport/hs-introduction-to-metabolism/a/overview-of-metabolism>

Metabolic pathways

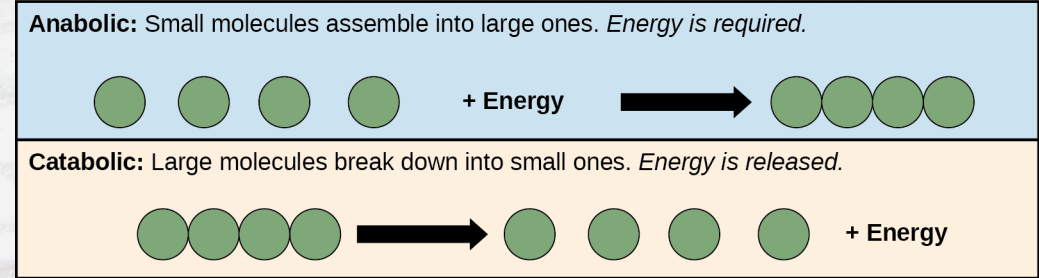


Figure 6.5 Anabolic pathways are those that require energy to synthesize larger molecules. Catabolic pathways are those that generate energy by breaking down larger molecules. Both types of pathways are required for maintaining the cell's energy balance.

Reference: Clark, Mary Ann, Matthew Douglas, and June Choi. 2018. "Energy and Metabolism." In *Biology 2e*. Houston, TX: OpenStax.
<https://openstax.org/books/biology-2e/pages/6-1-energy-and-metabolism>

Anabolic pathways build complex molecules from simpler ones and typically need an input of energy. Building glucose from carbon dioxide is one example. Other examples include the synthesis of proteins from amino acids, or of DNA strands from nucleic acid building blocks (nucleotides). These biosynthetic processes are critical to the life of the cell, take place constantly, and use energy carried by ATP and other short-term energy storage molecules.

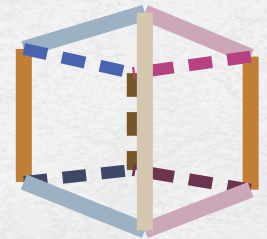
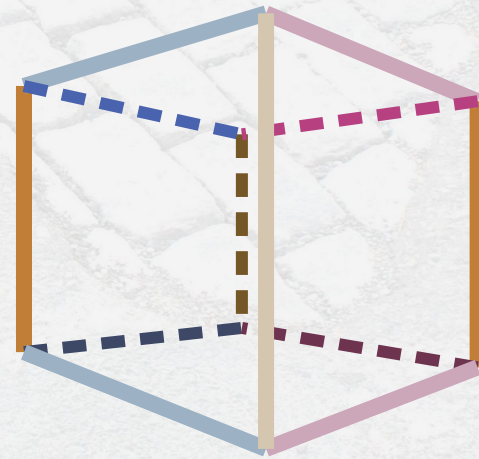
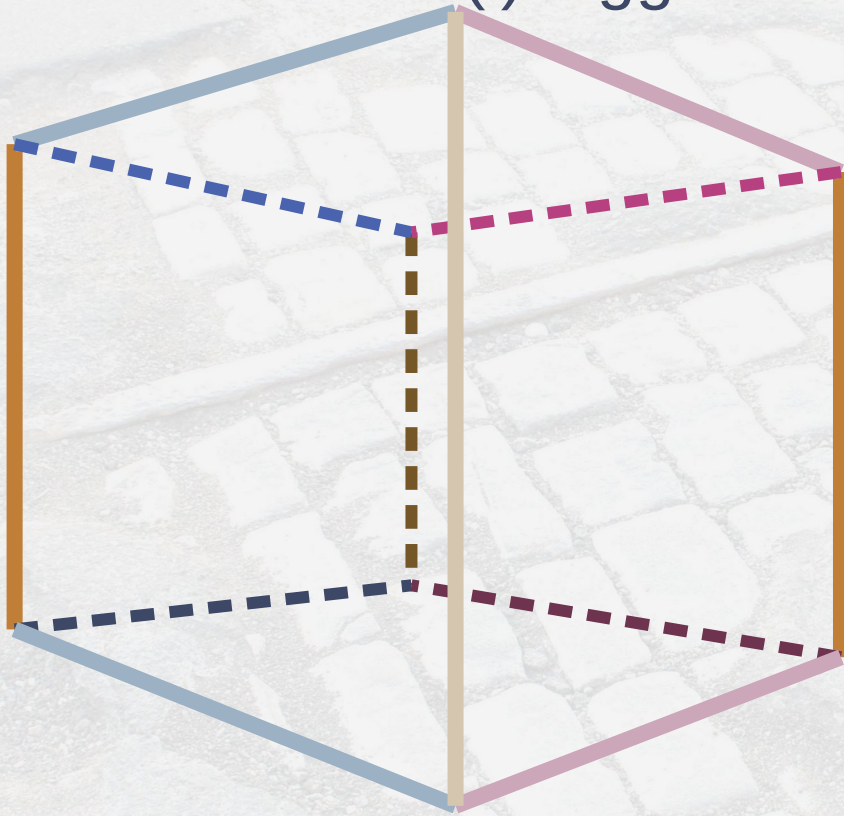
Catabolic pathways involve the breakdown of complex molecules into simpler ones and typically release energy. Energy stored in the bonds of complex molecules, such as glucose and fats, is released in catabolic pathways. It's then harvested in forms that can power the work of the cell (for instance, through the synthesis of ATP).

Three principal concerns of systems changes relate to three perspectives, and logical categories of learning

Concern	Perspectives	Learning
Taskscape-Landscape Concern		Redefining the System and Taskscape-Landscape Trito-learning
Ecological-Functional Concern	Availing or Removing Affordances	Deutero-learning
Behavioral-Processual Concern	Building up or Breaking down Capacities (Metabolic Reserves)	Proto-learning



Changing the system of interest can be approached a system of influence that is (i) bigger-slower or (ii) smaller-faster



Allen, Timothy, and Mario Giampietro. 2014. "Holons, Creations, Genons, Environs, in Hierarchy Theory: Where We Have Gone." *Ecological Modelling, Systems Ecology: A Network Perspective and Retrospective*, 293 (December): 31–41. <https://doi.org/10.1016/j.ecolmodel.2014.06.017>.

(De-)complexifying or (de-)complicating ...

Complexifying systems increases efficiencies at higher gain;
complicating systems improves sustainability at lower gain



Complexifying ~ beating eggs

- Leads to synergy: properties in the whole, not in the parts
- Requires higher energy to maintain
- More efficient, lower variety



Complicating ~ assembling machines

- Leads to redundancy: easy replacement of parts, resilient to breakdown of whole
- Requires less energy to maintain
- More sustainable, higher variety

Images from FirstWeFeast 2018 "How to Make a French Omelette at Home": Konstatin (2015) "How to Build a Computer in 30 Minutes" on makeagiv

Changing scales (de-)complexifies or (de-)complicates

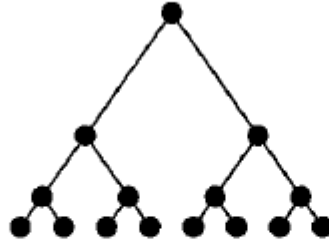
Complexity

Elaboration of organization

Behavior gets simpler

Hierarchy gets deeper

- Hierarchical complexity
- Spectral complexity
- Elaboration across scales
- Increased certainty from samples



Complicatedness

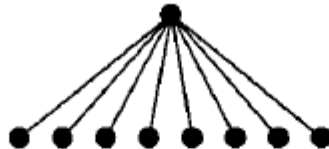
Elaboration of structure

Behavior gets more complicated

Hierarchy gets flatter

More degrees of freedom

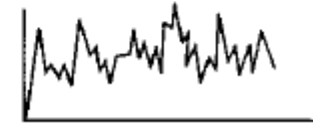
- Diversity
- Graph theoretic connectedness
- Information theory–Uncertainty



Behavior

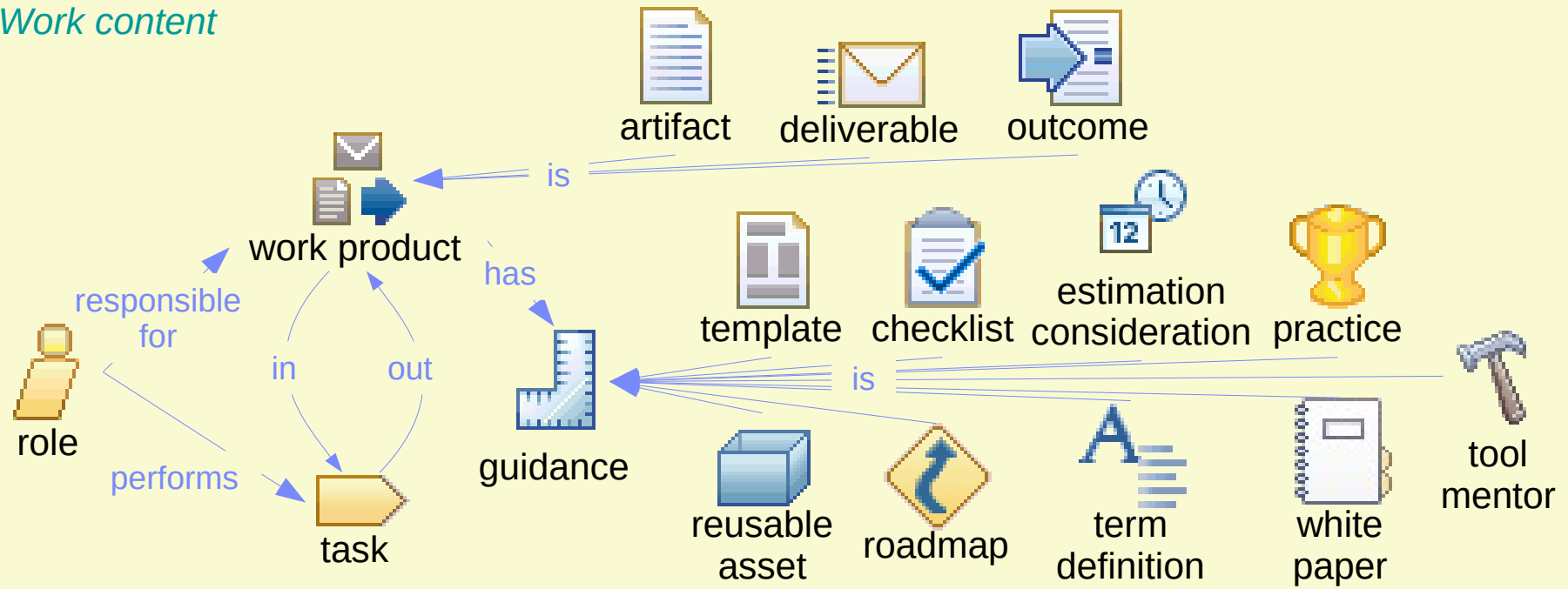
Becomes more elaborate
e.g. Chaotic or Random

- Algorithmic complexity

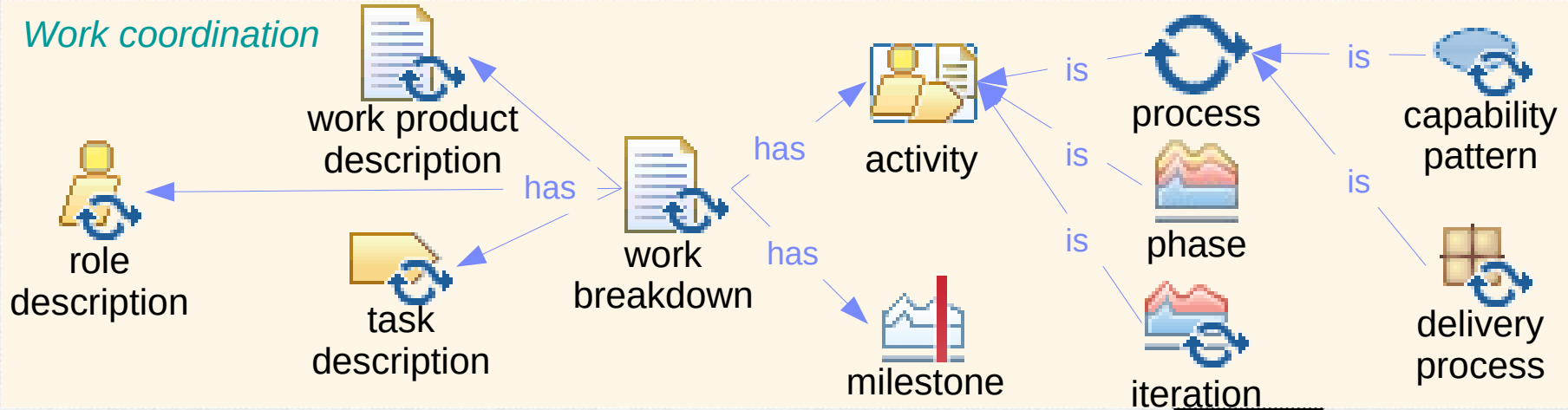


Allen, Timothy F. H., Joseph A. Tainter, and Thomas W. Hoekstra. 1999. "Supply-Side Sustainability." *Systems Research and Behavioral Science* 16 (5): 403–27.
[https://doi.org/10.1002/\(SICI\)1099-1743\(199909/10\)16:5<403::AID-SRES335>3.0.CO;2-R](https://doi.org/10.1002/(SICI)1099-1743(199909/10)16:5<403::AID-SRES335>3.0.CO;2-R).

Work content



Work coordination



Configurable DEVELOPMENT PROCESSES

*Keeping the focus
on what is being
produced.*

JOHN CAMERON

THE DIVERSITY OF IT PROJECTS FRUSTRATES ANY DIRECT ATTEMPT TO SYSTEMATIZE THE PROCESSES USED FOR THEIR DEVELOPMENT. ONE SIZE JUST WON'T FIT ALL. EVEN THREE OR FOUR SIZES AREN'T ENOUGH BECAUSE THE SET OF PROJECTS DOESN'T NEATLY DIVIDE INTO THREE OR FOUR SIMPLE CATEGORIES. A MORE FLEXIBLE AND CONFIGURABLE APPROACH TO PROCESS GUIDANCE IS NEEDED, A WAY OF TAILORING THE PROCESS TO THE NEEDS OF EACH PARTICULAR PROJECT.

To make processes configurable there must be some concept of modularity. It must be possible to select different subsets of the available modules and put them together in a coherent way. The scheme proposed here is very simple. The main focus is on the tangible things produced. They are identified (at a certain level of granularity) as "work products" and a descriptive module created for each distinct type. The modules, called Work Product Descriptions (WPDs), describe what the work product is, why and when it is needed, and how it is produced. The WPDs comprise an important subset of the configurable process framework. The process is configured to a particular situation by deciding which work products need to be produced and then making choices about sequencing and phasing.

Work products cover the full range of project work including project management, business process design, organizational change, requirements, usability, architecture, design, construction, and testing. Figure 1, for example, shows work products associated with the application development part of the framework.

The dynamic stability model [4] provides a management consultant's perspective on this approach to configuration. This model classifies industrial production processes into invention (meaning each product is uniquely designed and built), mass production, continuous improvement, and mass cus-

tomization. To achieve the generally desirable goal of mass customization, in which product and process are both customized to the customer's needs, it is necessary to have modular processes and a means of configuring them. Similarly, the sense-and-respond model of business organization [1], whose goal is responsive, adaptive enterprises, also relies on modular descriptions of capabilities.

Experience at IBM

The work product approach was first developed and used at IBM by the Object-Oriented Technology Center, a group since disbanded, but whose mission from 1994–96 was to support internal OO projects. One of the main reasons for their emphasis on WPDs was the difficulty they found in reaching consensus on the process aspects of development. They found it easier to agree on the artifacts that have to be produced; their work is described in [3].

Since 1996 a number of other IBM working groups have adopted the approach. The scope has been substantially extended, for example to cover project management, various consulting methodologies, and a wide range of specialist technical disciplines. Over 300 WPDs are in use, most of them shared by many groups. The approach has been standard in most of IBM Global Services since September 2000.

Figure 1. List of 96 WPDs used in IBM custom application development (v1.1).

Acceptance Test Plan	Configuration Management Procedures	IT Readiness Assessment and Issues	System Context Diagram
Analysis Class Descriptions	Cost-Benefit Impact Analysis	Logical Data Model	System Management Plan
Analysis Class Diagram	Current IT Infrastructure	Nonfunctional Requirements	System Test Plan
Analysis Guidelines	Current Software Evaluation	Object/Event Table	Technical Prototype
Analysis Interaction Diagram	Customer View and Requirements	Operational Model	Test Case
Analysis State Chart Diagram	Decision Framework	Organization Change Readiness Assessment and Issues	Test Results
Application Program Interface	Deployment Plan	Package Technical Criteria	Training and User Support Approach
Architectural Decisions	Deployment Unit	Physical Database Design	Transaction Descriptions
Architectural Template	Deployment Unit Modules	Physical Packaging	Usability Design and Evaluation Plan
Architectural Overview Diagram	Design Class Descriptions	Process Model (data flow diagrams)	Usability Requirements
As-Is Organization Assessment	Design Class Diagram	Process/Flow Usage Matrix	Usability Test Plan
As-Is Organization Description	Design Guidelines	Program Module Invocation Model	Usability Test Report
As-Is Process Definition and Assessment	Design Interaction Diagram	Program Module Specification	Use Case Model
Build procedures	Design State Chart Diagram	Project Estimates	Use Case Validation Report
Business Context Diagram	Early Usability Evaluation	Project Goals	User Interface Architecture
Business Event List	Education and Training Plan	Project Tracking Businesscase	User Interface Conceptual Model
Business Object Model	End User Training Materials	Project Workbook Outline	User Interface Design Guidelines
Business Process Model	End User Training Specifications	Reference Architecture Fit/Gap Analysis	User Interface Design Specification
Business Rule Catalog	Envisioned To-Be Business Goals	Release Plan	User Interface Prototype
Code/Database Asset Loc. Change Cases	Executables	Request for Information	User Profiles
	Glossary	Request for Vendor Proposal and Response	User Support Materials
Classified Business Terms	Increment Goals	Service Level Characteristics Analysis	Vendor Qualifications
Coding Guidelines	Information Technology Standards	Software Distribution Plan	Viability Assessment
Component Model	IT Organization Skills Gap Analysis	Source Code	Visual Resources

ment Approach section of the WPD is not sufficient. They can differentiate the use of the same WPD in different contexts.

Within IBM the term "engagement model" is used for all the material needed to describe a certain class of project. An engagement model consists of a set of WPDs, a WBS, a set of role descriptions, and a set of techniques. The management of the process framework is quite complicated. Engagement models and a few of the specialist elements they contain are managed by the groups that do the projects they describe. Other groups manage the WPDs, roles, and other reusable components.

THE WORK PRODUCT APPROACH TO CONFIGURABLE PROCESSES IS AN ATTEMPT TO STRUCTURE AND MANAGE THE KNOWLEDGE IN A VERY COMPLEX DOMAIN, KNOWLEDGE ABOUT HOW TO DO IT PROJECTS.

valuable part of any method. So, more is needed than just WPDs.

The Rest of the Process Framework

The process framework scheme used by IBM has four main components:

- Work Product Descriptions, classified by subject matter, with associated dependency diagrams, as described here.
- Work Breakdown Structures (WBS) describe the temporal structure of a project. A WBS is a skeleton plan, which divides the project into a hierarchical structure of major and minor checkpoints each with exit criteria and a description of the work needed to reach the checkpoint.
- Roles describe sets of skills. They are associated with WPDs and with elements in the WBS.
- Techniques are used for detailed guidance on building a work product or group of work products, when the terse summary in the Develop-


Configuring the Process Framework

Configuration plays a central role in methods based on WPDs. This represents a psychological shift in the role of method. All too often, deviation from a standard methodology is seen as an imperfection, as an unwelcome compromise (despite the fact it always happens!). This attitude is sometimes encouraged by methodologists who, as a group, are not noted for their flexibility. Instead, adapting to particular circumstances should be the norm, and should be an integral part of any method and of the way it is taught.

The usual context for configuration is a project. As the project starts key members of the project team configure the method to their needs and circumstances. The early and central question is, "What work products are needed on this project?" not just, of course, what is to be delivered, but also what is to be produced along the way. Tailoring or configuration work is done early during the proposal phase and revised when the project starts. If there is a well-established matching engagement model, the simplest approach is to amend the associated list of WPDs. Work products are usually selected or deselected in groups. Dependency diagrams help people visualize the impact of their decisions.

Figure 3 shows the form of a spreadsheet that can be used to record the results of the configuration. The spreadsheet starts from a standard list of WPDs, either the full list or the WPDs associated with an engagement model. Some groups also use a standard

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 OpenUP [Glossary](#) | [Feedback](#) | [About](#) [Print](#)


Where am I | Tree Sets |

Team

- Introduction to OpenUP
- Getting Started
 - Understanding OpenUP
 - Basic Process Concepts
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 - Resources for Customizing Methods
- Delivery Processes
- Practices
- Roles
- Work Products
- Tasks
- Guidance
- Tools
- Release Info

Getting Started > Understanding OpenUP

Understanding OpenUP

 OpenUP is a lean Unified Process that applies iterative and incremental approaches within a structured lifecycle. OpenUP embraces a pragmatic, agile philosophy that focuses on the collaborative nature of software development. It is a tools-agnostic, low-ceremony process that can be extended to address a broad variety of project types.

[Expand All Sections](#) [Collapse All Sections](#)

Relationships

Contents	
	<ul style="list-style-type: none"> OpenUP Roadmap Who Should Use OpenUP Core Principles Minimal, Complete, and Extensible

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Agenda

- | | | |
|---------------------------|------------------------|---|
| A. Orientation | A1. <i>Framing</i> : | Systems changes, most present? |
| | A2. <i>Situating</i> : | Timing as: urgent ↔ important?
Relation as perceived:
local-direct ↔ distant-represented? |
| B. Possibilities | B1. <i>Framing</i> : | Synthesizing parts and wholes |
| | B2. <i>Situating</i> : | Unfolding nature, fixing problems and/or making history? |
| C. Action
(next steps) | C1. <i>Framing</i> : | Realizing Δ scale, scope and/or speed |
| | C2. <i>Situating</i> : | Joining <i>the circle</i> on five learnings |

Appendix

Theoretical foundations



Image CC-BY Mike Cassano (2009) *Most Interesting Pothole*