UNIVERSITY OF KWAZULU-NATAL ™

INYUVESI YAKWAZULU-NATALI

SYSTEM THINKING IN HEALTHCARE MANAGEMENT

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Introduction

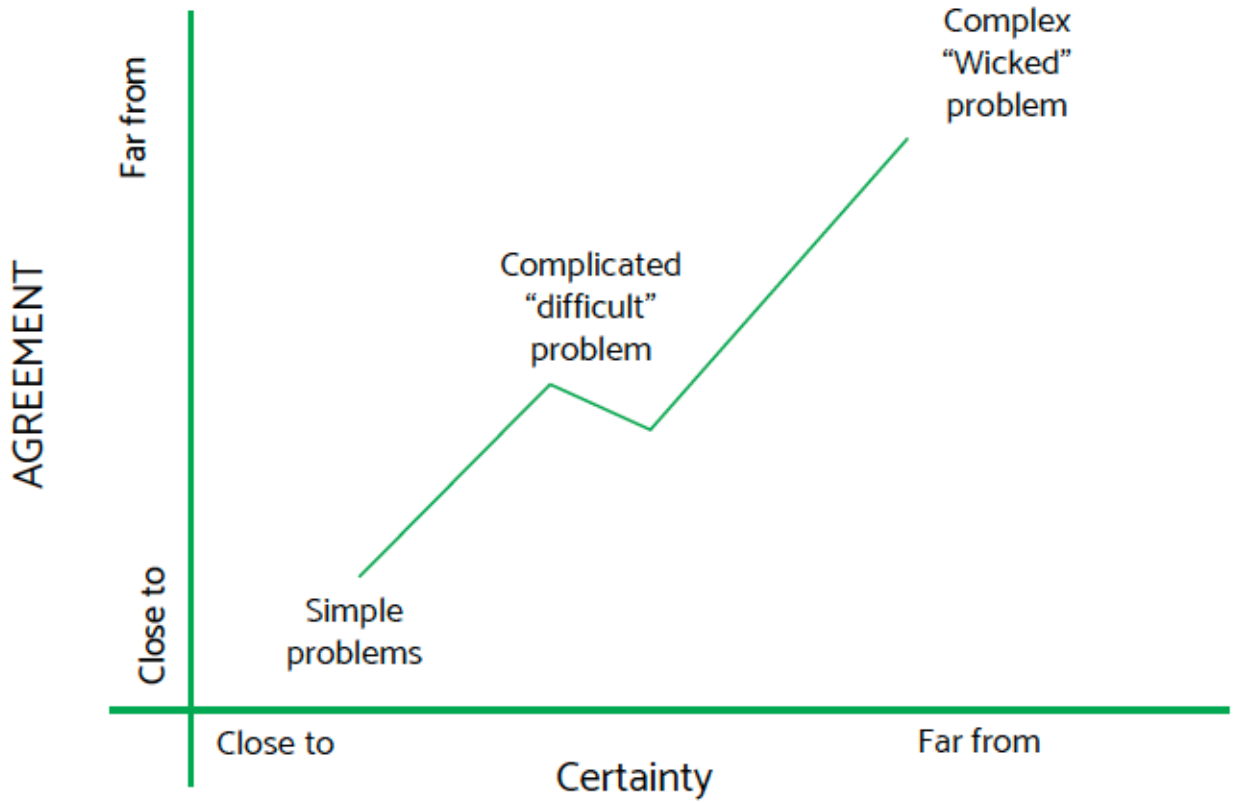
- Health care provision has become a priority for many governments.
- Significant amount of public money is allocated to the health care sector.
- Health care systems have not yet delivered the expected improvements and populations
- Consumers are becoming dissatisfied with the quality of health care services provided.

The Issue in Healthcare

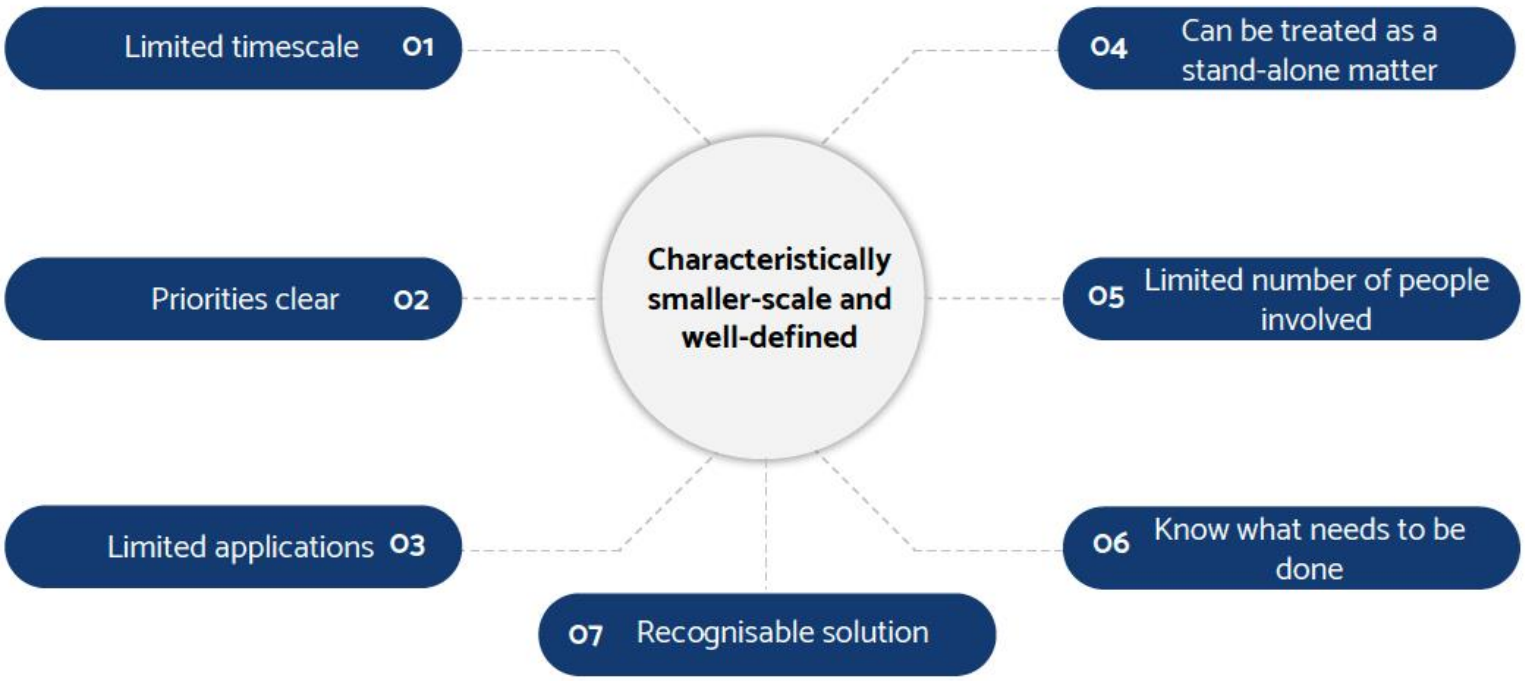
- We understand what we do, but not how we do it
- Fail to see problems within their context
- Fail to understand the processes
- Jump to solutions before understanding the problem

The universal dilemma

We are all tasked:	despite:
☞ do more	✓ dedication
☞ with less	✓ enthusiasm
☞ faster	✓ strong effort
against increasing:	results still:
✵ complexity	✘ not satisfactory
✵ constraints	✘ not scalable
✵ consequences	✘ not sustainable


AGREEMENT
Far from
Close to
Complex
"Wicked"
problem
Complicated
"difficult"
problem
Simple
problems
Close to
Certainty
Far from

Difficult problems

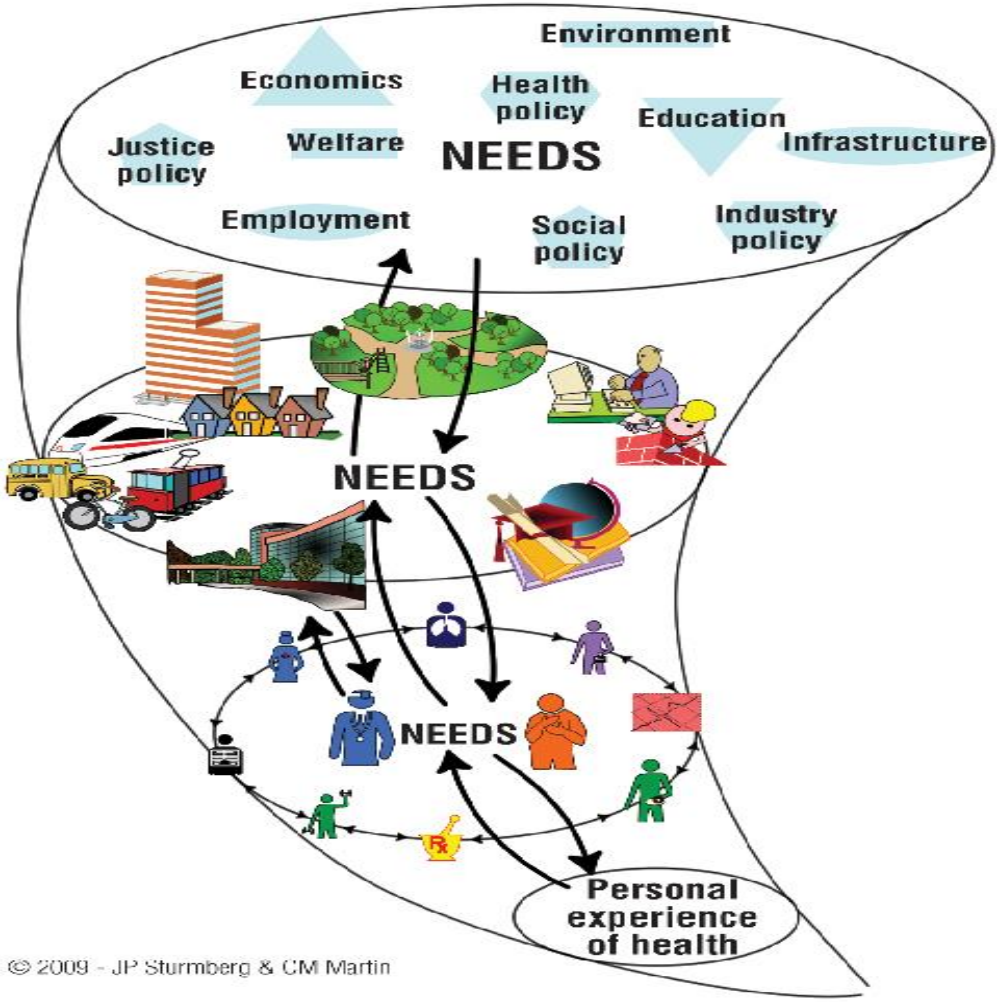


Wicked problems

Mechanical versus adaptive

- **Mechanical** system- results will occur in response to a given stimulus can be predicted, usually in great detail and under different circumstances
- **Adaptive**- have the freedom to respond to different stimuli in different and unpredictable ways and are interconnected with the actions of other parts of a system

Health system= Complex Adaptive system



Dynamic Complexity

- Dynamic complexity arises when:
  - the short and long term consequences of the same action are dramatically different;
  - the consequence of an action in one part of the system is completely different from its consequences on another part of the system, and;
  - obvious well-intentioned actions lead to non-obvious counter-intuitive results
- Understanding dynamic complexity is a mean to identifying the leverage points in a system to improve its performance and avoid policy resistance.

Effect of dynamic complexity

- High levels of dynamic complexity adversely affect human decision-making
- "**Bounded rationality**" stipulates that humans suffer from two bounds of rationality.
  - limited information processing capabilities of the human mind
  - second bound of rationality is due to the cognitive skills and memory limitations of the human mind
- Misperception of feedback
  - Humans ignore feedback structures, do not appreciate time delays between actions and consequences, and are insensitive to the non-linearities between a system's elements as the system evolves over time

What makes Health system a CAS?

- ***Adaptable elements***.
  - Learn and change themselves.
  - Change can happen from within.
- ***Context***.
  - Exist within systems, and this context matters, because one part of a system affects another.
  - Changing the financing system may change availability and performance of health workforce, the use of other inputs, and the relationship with patients.

What makes Health system a CAS?

- *Inherent order.*
  - Systems can be orderly even if there is no central control, often because they self-organize.
  - Health systems are self-organizing; different types of provider organizations, associations, and behaviours emerge continually, either formally or informally.

What makes Health system a CAS?

- *Not predictable in detail*:
  - Changes are not linear or easily predictable.
  - For example, a large health program may have little impact, but a rumour may spark a strike or a riot at a clinic.
  - Forecasting and modeling in health systems can be done to predict effects on health and poverty, but they are not predictable in detail because the elements and relationships are changeable and nonlinear, often in creative ways.

Health systems are dynamic and complex- Why?

- Health systems involve many interacting feedback loops
  - health systems involve feedback structures, which make them highly dynamic and complex
- Health systems decisions involve many delays- cause and effect in these systems are not close in time and space.
  - consequences of actions are not immediately visible, decision makers tend generally to take dysfunctional actions while trying to restore the system to a desirable state

Health systems are dynamic and complex- Why?

- Health care systems involve many non-linear relationships-
  - response of an element in the system to an input (action) can be completely different from what may be intended or predicted because the response will depend on the system's current conditions
- Health systems involve "hard" and "soft" elements –
  - health systems involve a strong human element and the "soft" variables that represent aspects of human behaviour and responses must be taken into account.

To deal with complex or 'wicked' problems which

Go beyond range of any one organization to manage them

Are often characterised by disagreement about causes, and how to tackle them

Recognize the need to change behaviour or practice at multiple levels and scales (individuals to organizations)

Require innovative solutions that can be adapted in the light of experience and feedback

There are four revolutions currently underway that will transform health and health systems. These are the revolutions in: a) life sciences; b) information and communications technology; c) social justice and equity; and d) ***systems thinking to transcend complexity***.

Source: *Frenk J. "Acknowledging the Past, Committing to the Future". Delivered September 5, 2008.*

Systems Thinking

Traditional analysis focuses on the individual pieces of what is being studied. **Systems thinking** focuses on how the things being studied interact with the other constituents of the system.

Instead of isolating smaller and smaller parts of the system being studied, systems thinking works by expanding its view to consider larger and larger numbers of interactions as an issue is being studied.

Image Source: Flickr Creative Commons, by erwlas

When do you use system thinking?

- Problems that are ideal for a systems thinking intervention have the following characteristics:
  - The issue is important.
  - The problem is chronic, not a one-time event.
  - The problem is familiar and has a known history.
  - People have unsuccessfully tried to solve the problem before.

Linear Thinkers	Systems Thinkers
Break things into component pieces	Are concerned with the whole
Are concerned with content	Are concerned with process
Try to fix symptoms	Are concerned with the underlying dynamics
Are concerned with assigning blame	Try to identify patterns
Try to control chaos to create order	Try to find patterns amid the chaos
Care only about the content of communication	Care about content but are more attentive to interactions and patterns of communication
Believe organizations are predictable and orderly	Believe organizations are unpredictable in a chaotic environment

System thinking approach

Usual approach	Systems thinking approach
Static thinking	**Dynamic thinking**
Focusing on particular events	Framing a problem in terms of a pattern of behaviour over time
Systems-as-effect thinking	**System-as-cause thinking**
Viewing behaviour generated by a system as driven by external forces	Placing responsibility for a behaviour on internal actors who manage the policies and "plumbing" of the system
Tree-by-tree thinking	**Forest thinking**
Believing that really knowing something means focusing on the details	Believing that to know something requires understanding the context of relationships
Factors thinking	**Operational thinking**
Listing factors that influence or correlate with some result	Concentrating on causality and understanding how a behaviour is generated
Straight-line thinking	**Loop thinking**
Viewing causality as running in one direction, ignoring (either deliberately or not) the interdependence and interaction between and among the causes	Viewing causality as an on-going process, not a one-time event, with effect feeding back to influence the causes and the causes affecting each other

Seeks to understand the big picture

A systems thinker "steps back" to examine the dynamics of a system and the interrelationships among its parts. S/he sees the forest, rather than the details of any one tree.

Questions to ask...

"How can I maintain balance between the big picture and important details?"

"What time frame should be considered as I view the system?"

"Am I keeping my focus on areas of influence, rather than on areas of concern that I cannot influence?"

Image Source: Waters Foundation

Recipe for Systems Thinking

- understand big picture (internally, externally)
  - examine from multiple perspectives
  - employ appropriate abstraction & hierarchy
  - challenge & verify all assumptions & models
- understand behavior & interrelationships
  - observe & analyze data (patterns, trends)
  - identify all dependencies
    - linear (cause-effect) & circular (feedback)

Observes how elements within systems change over time, generating patterns and trends

Dynamic systems are made up of interdependent elements, the values of which change over time. A systems thinker may use a tool such as a behavior-over-time graph to record and observe the patterns and trends those changes generate. The graphs can provide insight into the interdependence of the elements and the structure of the system.

Questions to ask…
"What important elements have changed in the system?"

"How have the elements changed over time?"

"What changing elements represent amounts and how quickly/slowly are they increasing or decreasing?"

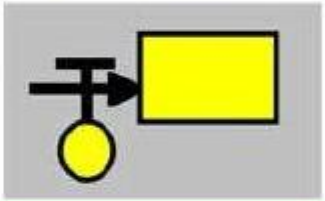
"What patterns or trends have emerged over time?"

Image Source: Waters Foundation

Recognizes that a system's structure generates its behavior

A systems thinker understands that blame is not an effective practice to bring about lasting change to a complex system. Rather, focusing on the structure of the system facilitates an understanding of the outcomes of the system.

A systems thinker realizes that to effect change within a system, s/he must use knowledge of the system's structure.



Questions to ask...
"How do parts affect one another?"

"How does the organization and interaction of the parts create the behavior that emerges?"

"When things go wrong, how can I focus on internal causes rather than dwell on external blame?"

Image Source: Waters Foundation

Changes perspectives to increase understanding

To understand how a dynamic system actually works, a systems thinker looks at the system from a variety of different angles and from differing points of view, perhaps in collaboration with others.

Questions to ask...
"Am I open to other points of view?"

"How do different points of view influence the way I understand the system?"

"Who should I approach to help me gain new perspectives on an issue?"

"As I learn about new perspectives, am I willing to change my mind?"

Image Source: Waters Foundation

Considers an issue fully and resists the urge to come to a quick conclusion

A systems thinker is patient. S/he will take time to understand the system's structure and its behaviors before recommending and implementing a course of action. A systems thinker also understands that succumbing to the urge for a quick solution can create more problems in the long term. S/he is aware of the tension created when a resolution is not immediately implemented and is able to hold that tension while a deeper understanding of the system is developed.

Questions to ask...
"How much time do we need to allow for the consideration of this issue?"

"How can we manage the tension that exists when issues are not resolved immediately?"

"How can I help others be patient while living with unresolved problems?"

Image Source: Waters Foundation

Considers both the short- and long-term consequences of actions

Before taking action to change a dynamic system, a system thinker weighs the possible short and long-term outcomes of the action. This practice increases the probability of the chosen action producing the desired outcomes.

Questions to ask...
"Are we examining the effects of actions within a logical time frame?"

"Are we considering long-term effects even though this long view may seem unimportant?"

"Are we willing to accept 'short-term pain for long-term gain' and recognize that short-term gain can lead to long-term pain?"

Image Source: Waters Foundation

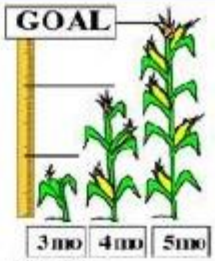
Checks results and changes actions if needed: "successive approximation"

By definition, dynamic systems are constantly changing over time. A systems thinker, therefore, monitors and evaluates the behavior of the system and takes action when needed to assure the system continues to produce the desired results. For example, initially it may be difficult to determine a 'best solution' to a perceived problem. By trying a solution and then assessing the results, understanding of the issue will increase. Over time, each cycle or successive approximation, of checking results and changing actions if needed, will move the system closer to a desired goal.

Questions to ask...

"What indicators will we expect to see as we look for progress?"

"Have we scheduled time to pause, assess the effects of our current plan and take necessary action?"

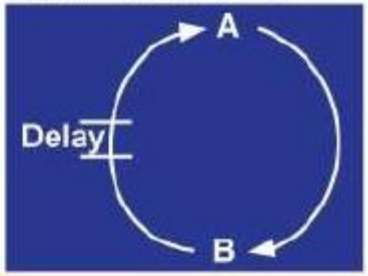


"When considering changes, are we accessing other systems thinking habits?"

Image Source: Waters Foundation

Recognizes the impact of time delays when exploring cause and effect relationships

A systems thinker recognizes that when an action is taken within a complex, dynamic system, the outcome of the action may not be seen for some time. A systems thinker will account for the impact these delays may have within the system.



Questions to ask...

"If we make a change to the system, how long before we see the results that we desire?"

"How can we identify the role of time delays in the effects we expect to see?"

"Will the change we propose show immediate results or will we need to wait to see improvement? If we need to wait, for how long?"

Image Source: Waters Foundation

Uses understanding of system structure to identify possible leverage points

Based on an understanding of the structure, interdependencies, and feedback within a system, a systems thinker implements the leverage action that seems most likely to produce desirable outcomes. According to Senge (1990), leverage is "...seeing where actions and changes in structure can lead to significant, enduring improvements."

Questions to ask...
"Where might a small change have a long-lasting, desired effect?"

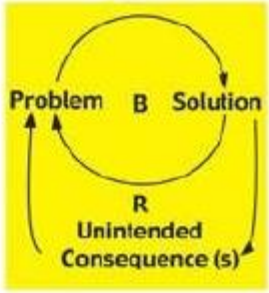
"How can we use what we know about the system to identify possible leverage actions?"

"Are there other small changes that we have not yet considered that could bring us desirable results?"

Image Source: Waters Foundation

Finds where unintended consequences emerge

Before any action is taken to change the outcomes of a dynamic system, a systems thinker uses proven strategies (e.g. systems archetypes or a system dynamics model) to anticipate unintended consequences. If it is determined that probable unintended consequences are unacceptable, another course of action is explored.



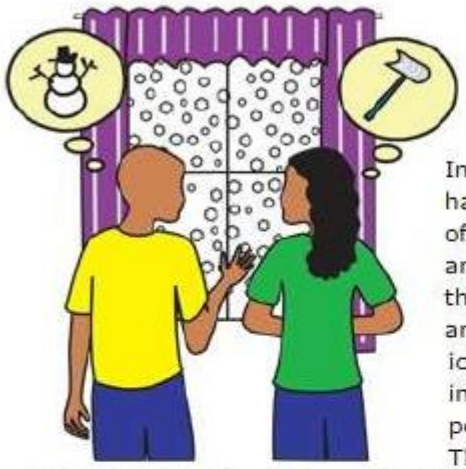
Questions to ask...

"What are the possible consequences of the proposed actions?"

"What are the trade-offs of each identified consequence?"

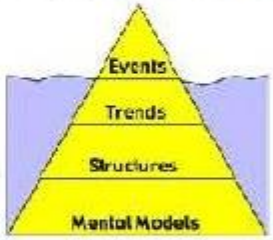
"Are there unintended consequences that could lead to new actions?"

Image Source: Waters Foundation



Considers how mental models affect current reality and the future

In any given situation, an individual perceives and interprets what is happening, thus creating a picture, or mental model, of some aspect of the world. Mental models are comprised of assumptions, beliefs, and values that people hold, sometimes for a lifetime. A systems thinker is aware of how these mental models influence perspectives and ultimately actions taken. The diagram below, referred to as the iceberg, illustrates that mental models influence the creation of structures (e.g. policies, laws, and physical structures). The mental models are at the base, as an underpinning to the structures that individuals create. These structures then generate patterns of change over time as well as the discrete events that occur. A systems thinker is aware that changing a mental model about an issue, problem, or other situation will change current actions and thus future results.



Questions to ask...
"How are the current mental models advancing our desired results?"

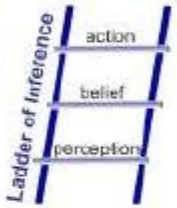
"How are the current mental models hindering our efforts in this area?"

"How am I helping others see the influence that mental models have on our decision-making?"

Image Source: Waters Foundation

Surfaces and tests assumptions

A systems thinker will rigorously examine assumptions in order to gain insight into a system. Insight put into action can lead to improved performance. The Ladder of Inference (shown at right) is a visual tool that helps people consider how and why assumptions are made, beliefs are developed, and actions are taken based on perceived data.



Questions to ask…
"How do my past experiences influence the development of my theories and assumptions?"

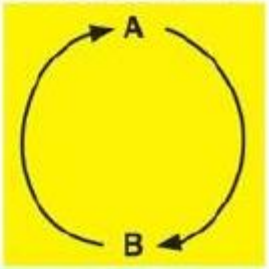
"How well does my theory or model match the system under study?"

"When considering a possible action, do I and those I work with ask 'What if' questions?"

Image Source: Waters Foundation

Identifies the circular nature of complex cause and effect relationships

A systems thinker knows that the cause-effect relationships within dynamic systems are circular rather than linear. Complex cause and effect relationships include balancing feedback, in which the system is trying to reach and maintain a goal (e.g. the heating system in a house or cruise control on a car). There also may be reinforcing feedback, such that the more you start with the more it increases over time (e.g. population or investments). To increase understanding of complex cause and effect relationships, systems thinkers use causal loop diagrams, connection circles, and stock/flow maps.



Questions to ask…
"How do parts affect one another?"

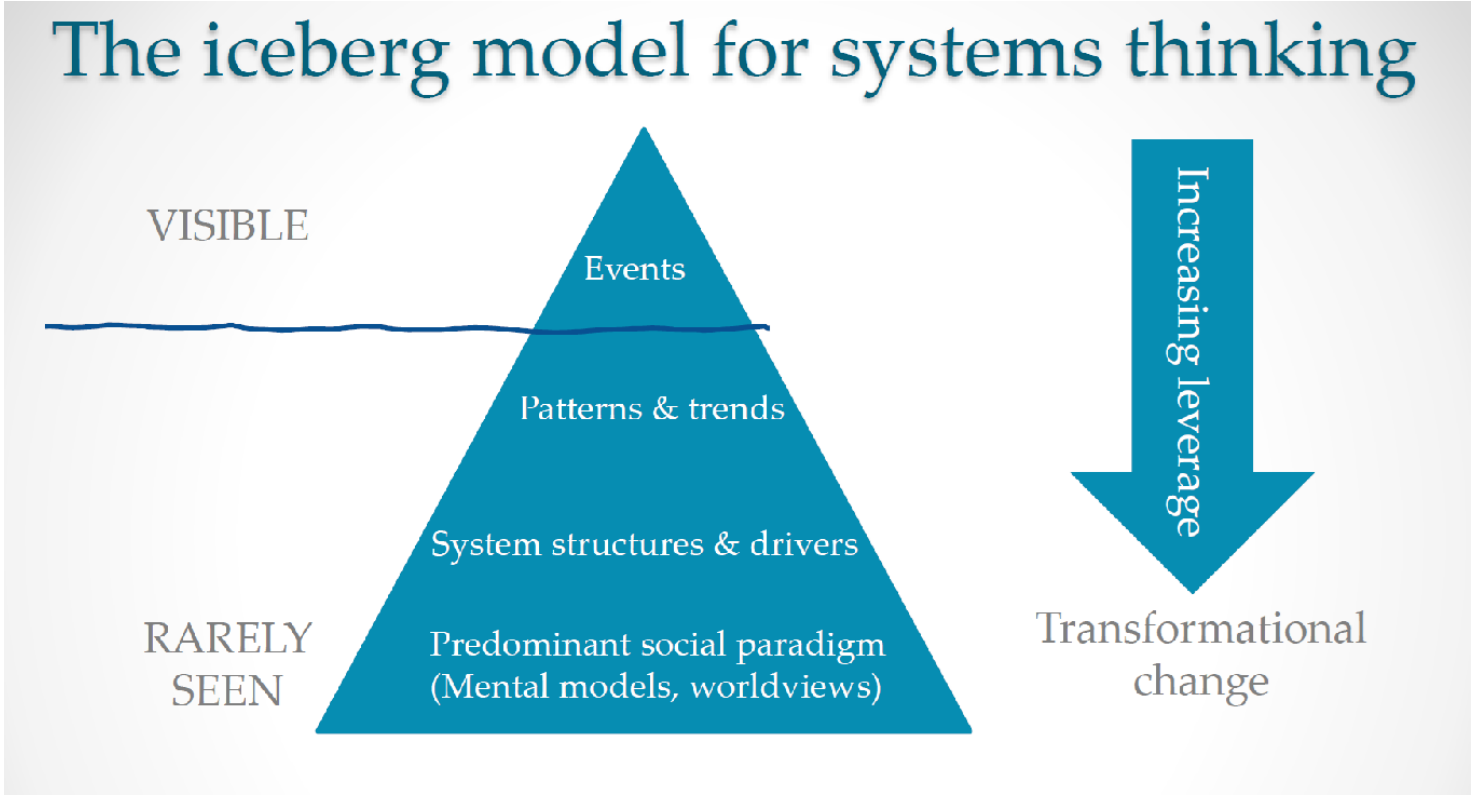
"Where does circular causality/feedback emerge?"

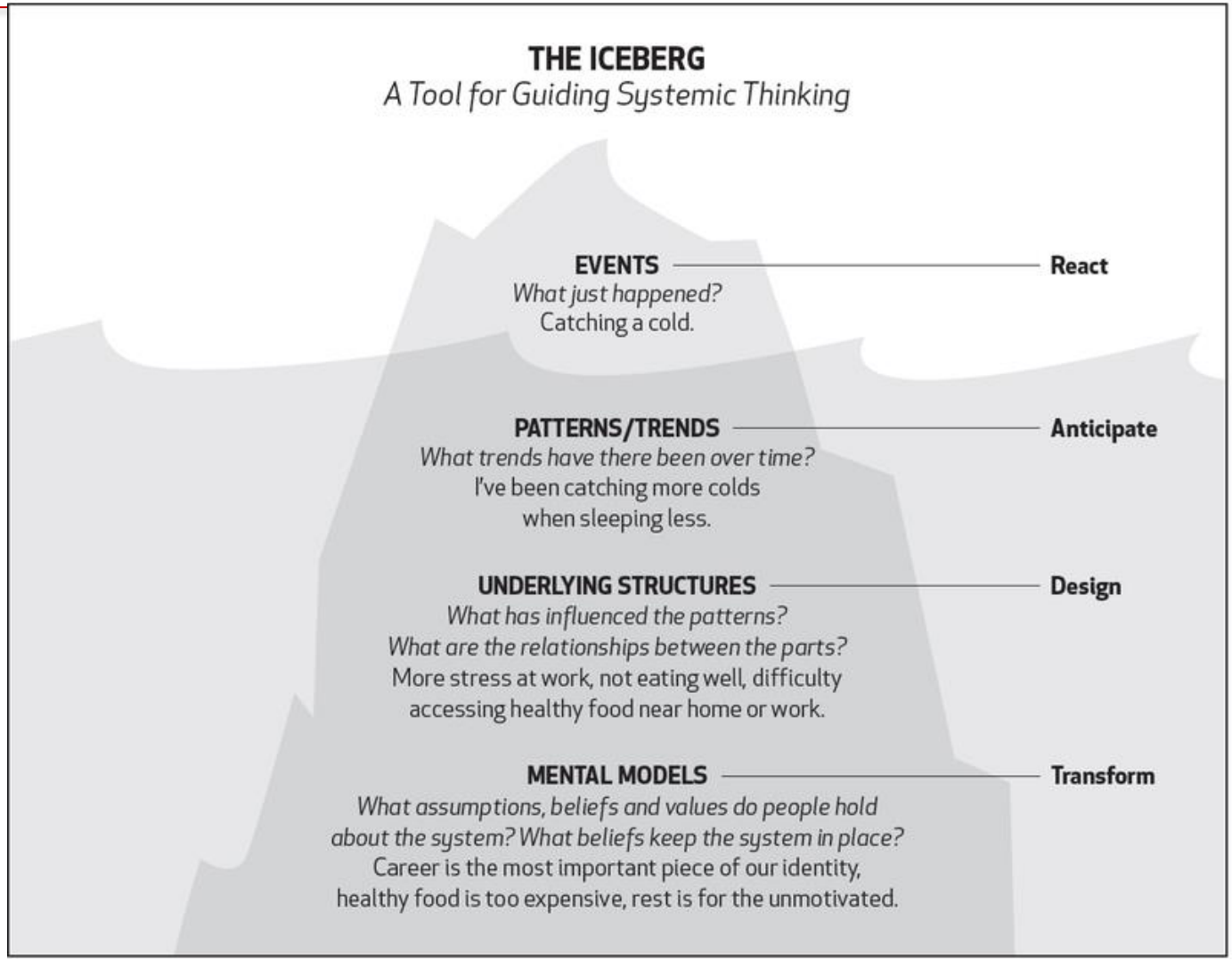
"Is one feedback loop more influential over time than another? If yes, how?"

Image Source: Waters Foundation

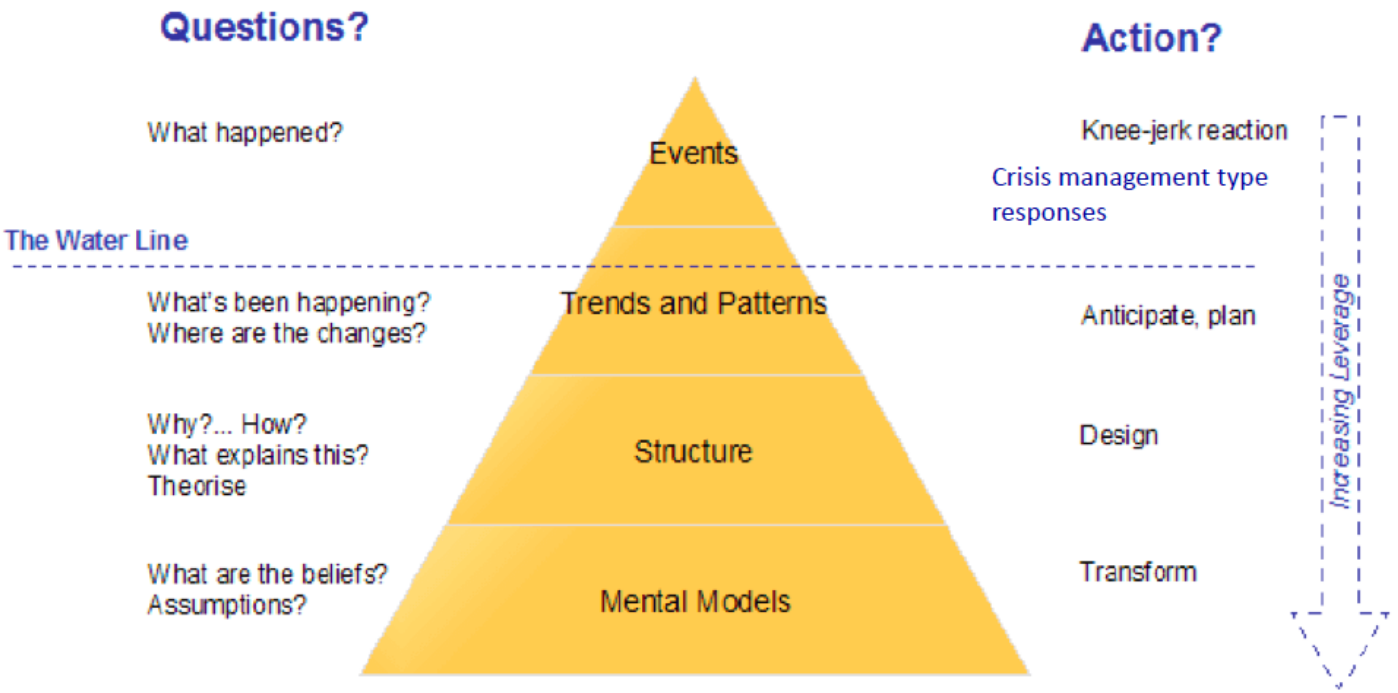
Different systems require different management

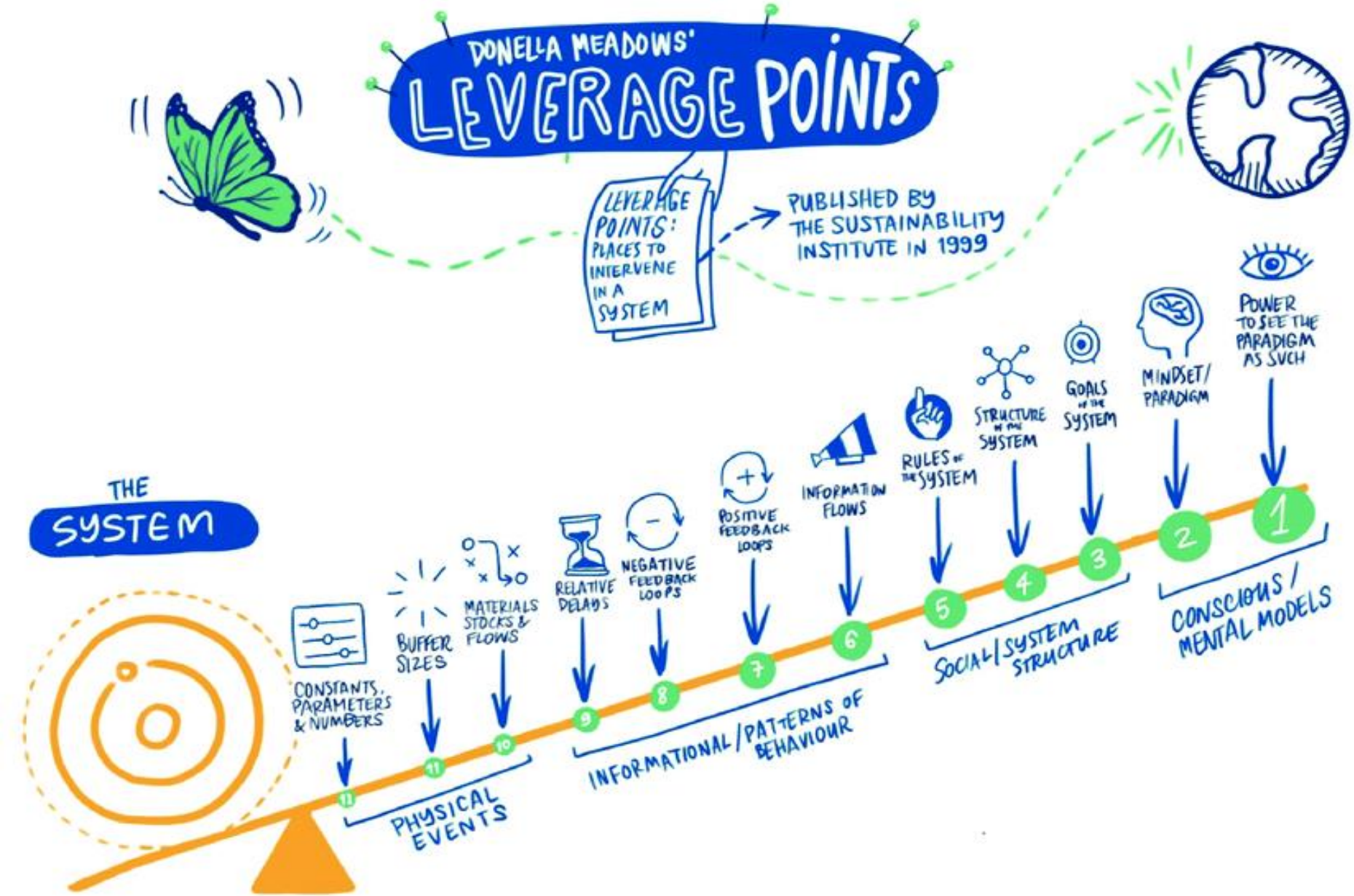
Managing a complicated system	Managing a complex adaptive system
• Develop explicit plans	• Look for divergence
• Plan then act	• Act, learn, and plan at the same time
• Look for agreement & clear outcome	• Use minimum specifications
• Limit types of approaches & actions	• Work on multiple leverage points
• Set targets	• Be creative with opportunities at the boundaries
• Drive implementation	• Build on what emerges and grows


The iceberg model for systems thinking
VISIBLE
Events
Patterns & trends
System structures & drivers
RARELY SEEN
Predominant social paradigm (Mental models, worldviews)
Increasing leverage
Transformational change

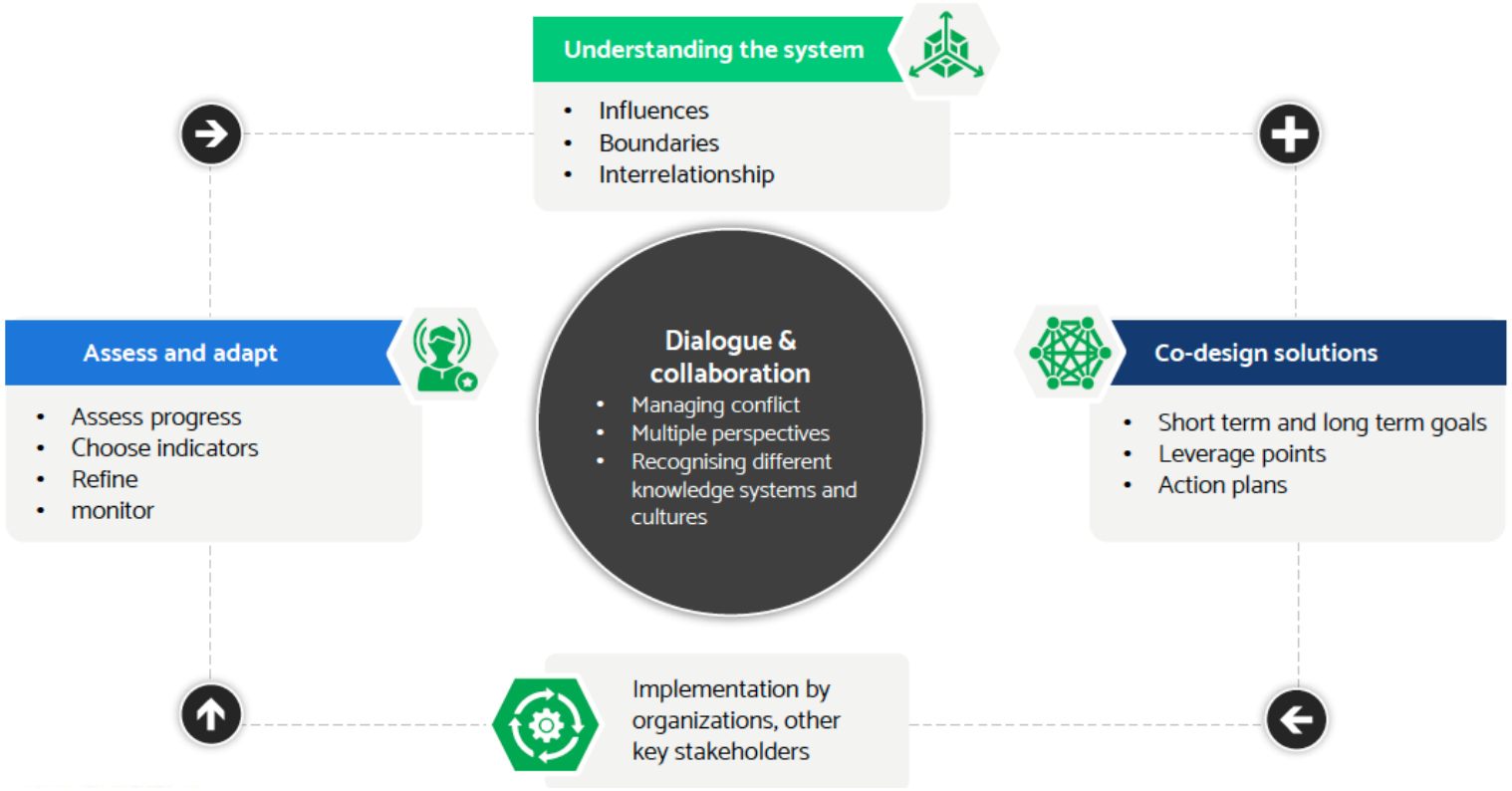

THE ICEBERG
A Tool for Guiding Systemic Thinking
EVENTS
What just happened?
Catching a cold.
React
PATTERNS/TRENDS
What trends have there been over time?
I've been catching more colds
when sleeping less.
Anticipate
UNDERLYING STRUCTURES
What has influenced the patterns?
What are the relationships between the parts?
More stress at work, not eating well, difficulty
accessing healthy food near home or work.
Design
MENTAL MODELS
What assumptions, beliefs and values do people hold
about the system? What beliefs keep the system in place?
Career is the most important piece of our identity,
healthy food is too expensive, rest is for the unmotivated.
Transform

We can use systems thinking tools such as the Iceberg to help ask the right questions towards understanding the best places to "leverage change" in a system.




DONELLA MEADOWS'
LEVERAGE POINTS
LEVERAGE POINTS: PLACES TO INTERVENE IN A SYSTEM
PUBLISHED BY THE SUSTAINABILITY INSTITUTE IN 1999
THE SYSTEM
CONSTANTS, PARAMETERS & NUMBERS
BUFFER SIZES
MATERIALS STOCKS & FLOWS
RELATIVE DELAYS
NEGATIVE FEEDBACK LOOPS
POSITIVE FEEDBACK LOOPS
INFORMATION FLOWS
RULES OF THE SYSTEM
STRUCTURE OF THE SYSTEM
GOALS OF THE SYSTEM
MINDSET/ PARADIGM
POWER TO SEE THE PARADIGM AS SUCH
12
11
10
9
8
7
6
5
4
3
2
1
PHYSICAL EVENTS
INFORMATIONAL/PATTERNS OF BEHAVIOUR
SOCIAL/SYSTEM STRUCTURE
CONSCIOUS/ MENTAL MODELS

Key systems thinking components



Ten steps to system thinking

I: Intervention Design

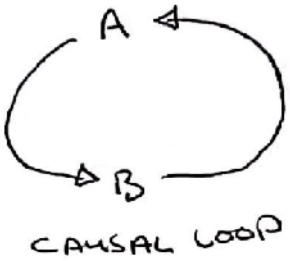
1. **Convene stakeholders:** Identify and convene stakeholders representing each building block, plus selected intervention designers and implementers, users of the health system, and representatives of the research community
2. **Collectively brainstorm:** Collectively deliberate on possible system-wide effects of the proposed intervention respecting systems characteristics (feedback, time delays, policy resistance, etc.) and systems dynamics
3. **Conceptualize effects:** Develop a conceptual pathway mapping how the intervention will affect health and the health system through its sub-systems
4. **Adapt and redesign:** Adapt and redesign the proposed intervention to optimize synergies and other positive effects while avoiding or minimizing any potentially major negative effects.

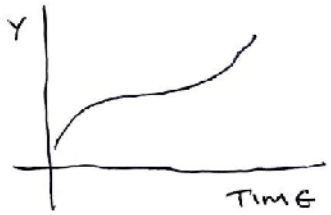
II: Evaluation Design

5. **Determine indicators:** Decide on indicators that are important to track in the re-designed intervention (from process to issues to context) across the affected sub-systems
6. **Choose methods:** Decide on evaluation methods to best track the indicators
7. **Select design:** Opt for the evaluation design that best manages the methods and fits the nature of the intervention
8. **Develop plan and timeline:** Collectively develop an evaluation plan and timeline by engaging the necessary disciplines
9. **Set a budget:** Determine the budget and scale by considering implications for both the intervention and the evaluation partnership
10. **Source funding:** Assemble funding to support the evaluation *before* the intervention begins.

Understanding the system - tools for seeing things

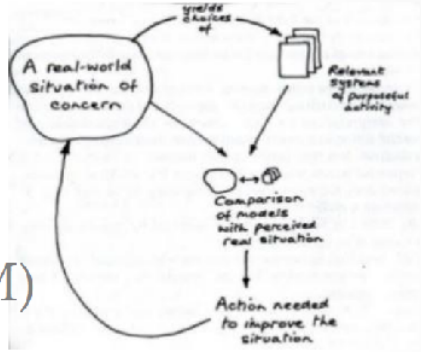
- Timelines
- Trend analysis
- System archetypes
- Rich pictures
- Cynefin framework/Stacey diagram
- Concept mapping
- Social network analysis
- Causal loop diagrams
- Bayesian belief networks
- Computer models
- etc

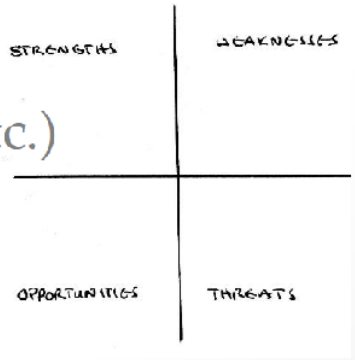




Understanding the system - tools for thinking strategically

- CATWOE
- Iceberg model
- System archetypes
- Soft Systems Methodology (SSM)
- Scenarios and visioning
- Problem structuring methods
- SWOT/TOWS analysis
- STEEP (PEST, PESTLE, STEP, etc.)
- etc





Dialogue & collaboration – tools for involving the right people include:

Not just who you could get to come at the time
Source: http://weird-vintage.com

- Stakeholder analysis
- Engagement planning
- Networking
- Relationship building & management

Dialogue & collaboration
tools for working together

Use multiple methods and always have a plan. Tools include:


Facilitation


Kitchen workshops and meetings


Informal conversations


Networks

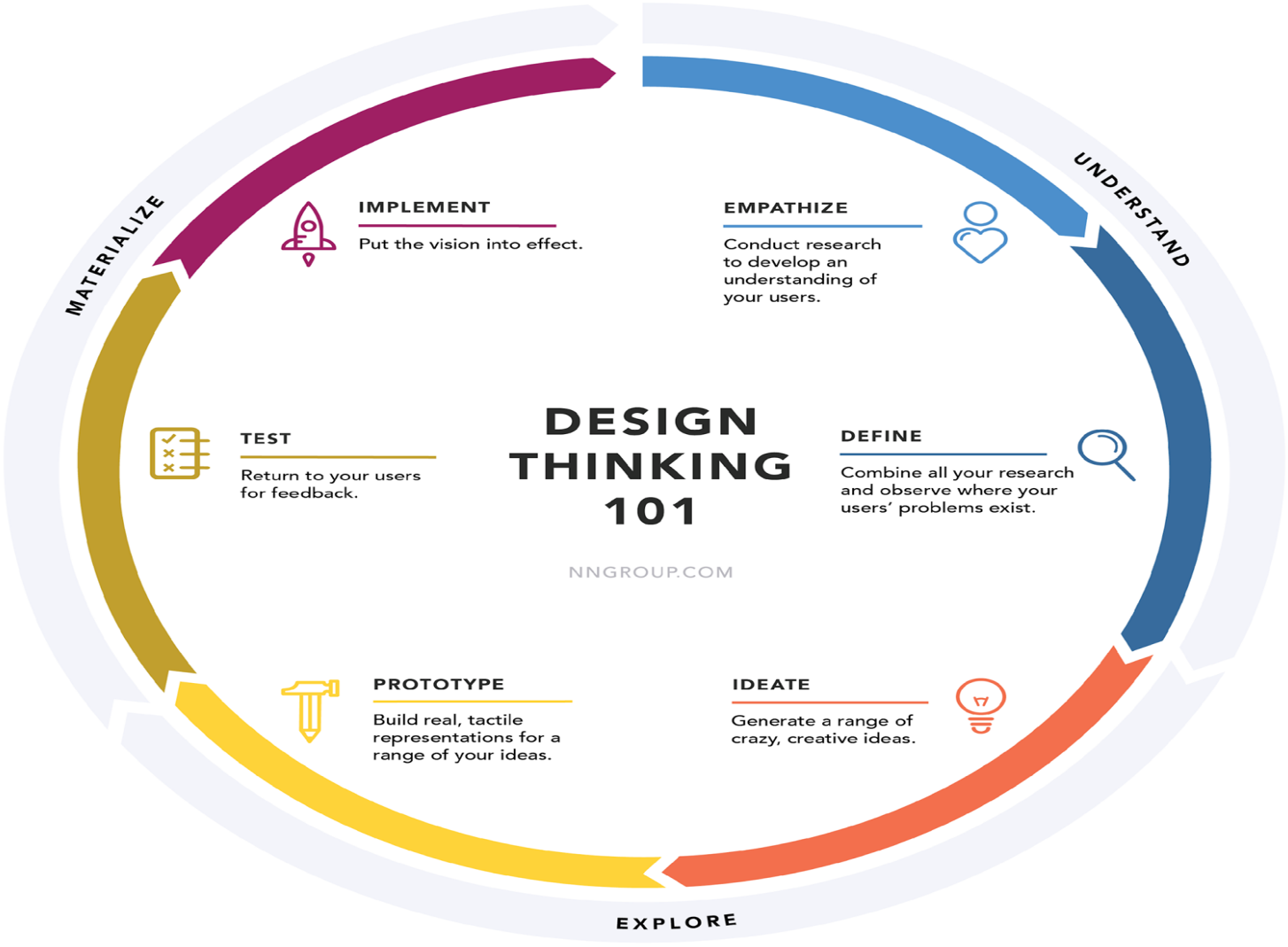

Social media


Active listening, appreciative inquiry

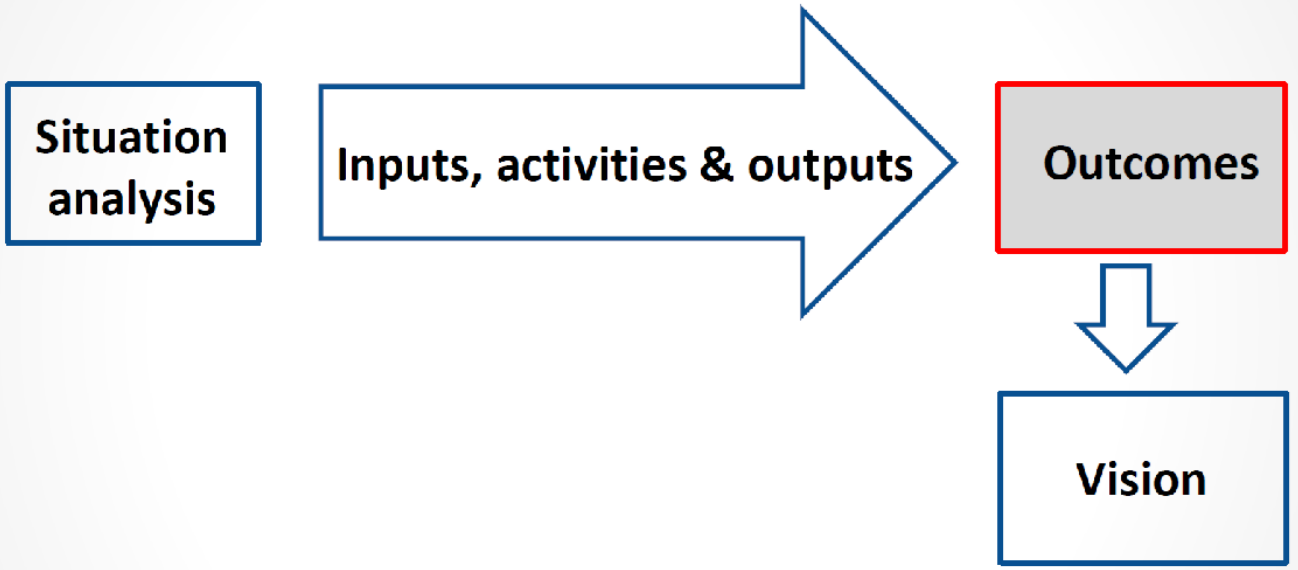
Tools for co-design – finding desirable solutions

Usually both a product and a process. Approaches include:

- Agile planning (scrums & sprints) …. as opposed to waterfalls
- The five stages of Design Thinking (Empathise, Define – the problem, Ideate, Prototype, and Test)
- Along with a whole host of methods …. problem structuring methods (PSMs), conceptual models, scenario development, (participatory) system dynamic modelling and simulation, etc.

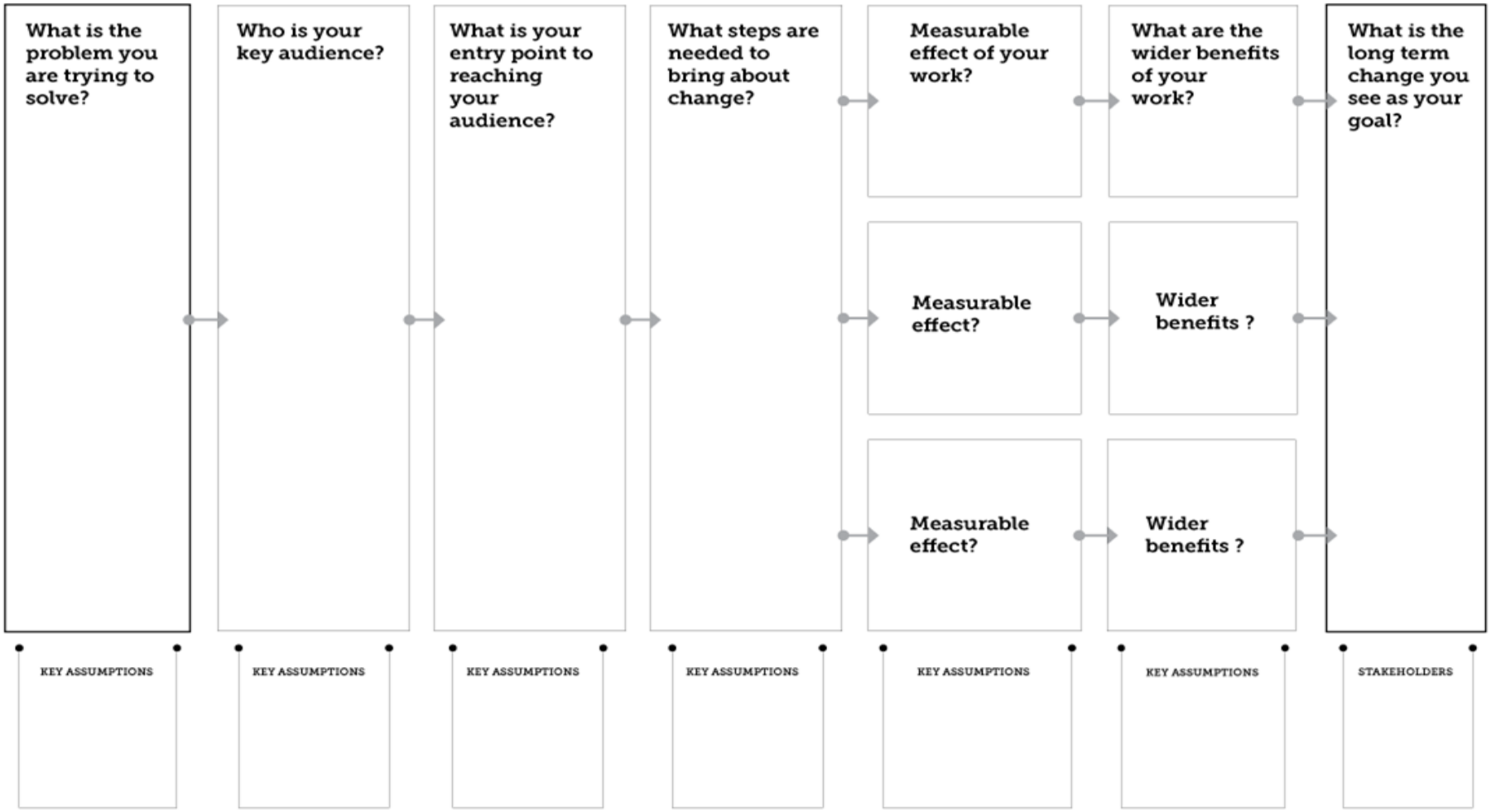

DESIGN THINKING 101
NNGROUP.COM
UNDERSTAND
EMPATHIZE
Conduct research to develop an understanding of your users.
DEFINE
Combine all your research and observe where your users' problems exist.
EXPLORE
IDEATE
Generate a range of crazy, creative ideas.
PROTOTYPE
Build real, tactile representations for a range of your ideas.
MATERIALIZE
TEST
Return to your users for feedback.
IMPLEMENT
Put the vision into effect.

Tools for co-design – outcomes modelling [Theory of Change (ToC) and logic models]



I want to clarify my priorities
by defining my goals and the path to reach them

THEORY OF CHANGE

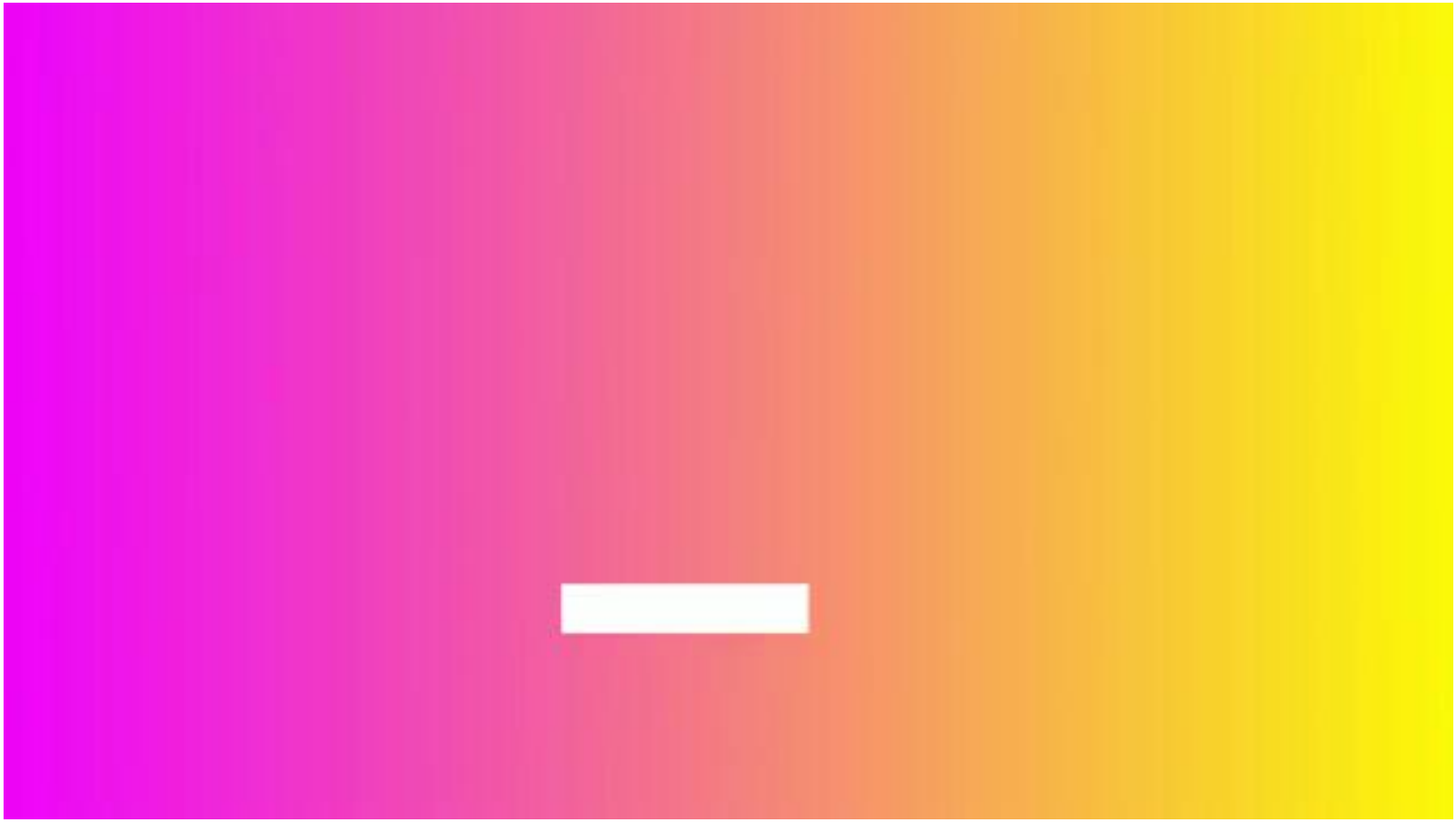


References

- **Health Care Management: The Contribution of Systems Thinking-** Dr Reda M Lebcir BEng, MSc, PhD, DIC
- System thinking for Health system strengthening

What is system thinking?

- https://youtu.be/GPW0j2Bo_eY
- https://youtu.be/V38HrPnYkHI



Value of System Thinking

- https://youtu.be/Fo3ndxVOZEo