

Systems Thinking

Alberta CoLab Info Sheet



Systems thinking is a way to approach complexity - messy contexts with lots of diverse parts. Thinking and acting with systems in mind helps people see how different parts interact to form a whole, and how the whole interacts with its wider context.

What is a System?

A **system** is a set of interacting or connected parts that is organized in such a way that it achieves something - a function or a purpose. A system is both its individual parts and the product of how those parts interact. Every system has **boundaries**, **hierarchies**, and **interconnectivities** that cause it to behave in certain ways.



Boundaries are the **boxes** we put things in. There are different **types** of boundaries related to time, space, and ideas. Where we draw the boundaries around a system impacts what's inside the system and what's outside it - people, places, organizations, and ideas. Where we place boundaries impacts the connections and the possibilities that we see. For this reason, we must **zoom in and out** - we need to play with different boundaries to test the implications of how we define a system. How we define a system strongly influences the decisions we make and the actions we take.



Hierarchies are how we **organize** the boxes we've put things in. How we organize ourselves influences how we work together - hierarchies are important for understanding relationships. Understanding how sub-systems **nest** within systems helps us to identify **patterns** of behaviour, which is useful for identifying **leverage points** - the places in a system where we can exert the least effort for the greatest impact.



Interconnectivities are what happens in the **in-between spaces** - anything that links elements, boundaries, boxes, and hierarchies. They can be causal relationships, flows of information or other resources, or unintended consequences. Existing in-between elements, interconnectivities can be more challenging to see. The more we understand these connections, the better we can **anticipate** the effects a change in one area of a system may have in another.

Types of Systems

There are **four** fundamental types of systems:

- **Natural Systems**, e.g. a biological organism – your body is a system
- **Designed Physical Systems**, e.g. a building – your home is a system
- **Designed Abstract Systems**, e.g. a mathematical equation – calculus is a system
- **Human Activity Systems**, e.g. a team working on a task – an organization is a human activity system

Systems theorists view **human activity systems** differently from the other three types. While the other types can be described objectively, human activity systems are understood differently by the various 'human actors' involved in them, who attribute different meanings to what they perceive. As long as each is logically consistent, it is valid for the person making it. There is no right or wrong way to understand a human activity system - and no one or correct way to set boundaries.

Remember: you are part of the system - you are part of many systems! We can change how we see systems and our place in them by changing our **boundaries** (the scope of what we look at) and our **perspective** (the vantage point from which we look).

Let's Practice!

Turn the page for some activities you can try to build systems thinking into your work.

Learn More

Our favourite books on systems thinking include:

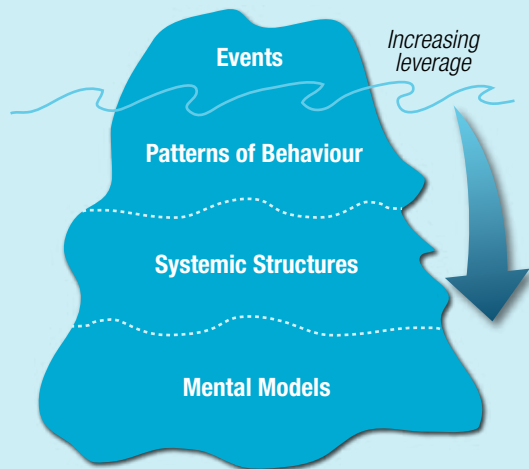
- *Thinking in Systems* by Donella Meadows
- *Growing Wings on the Way* by Rosalind Armson
- *The Fifth Discipline* by Peter Senge

Try This: System Mapping

Mapping helps people explore and understand a messy situation in context. It gives people a starting place for working with complexity without imposing an artificial order too early in a systemic design process.

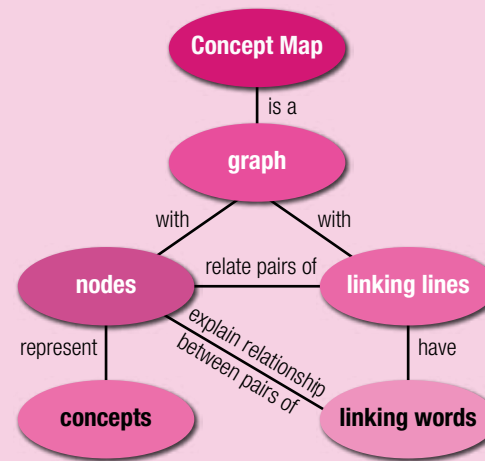
Maps enable people to explore the complementary nature of different perspectives and build shared understanding. They enable people to name and show relationships between the different parts of a system and to communicate nesting relationships, feedback loops, and patterns of influence.

Here are five different types of systems maps that you can try. Each provides a different vantage point on a system.



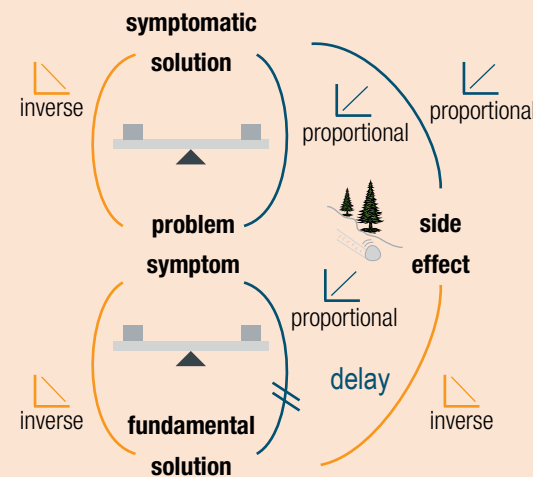
Iceberg Diagram

- Brainstorm events (what has happened?)
- Identify patterns (what continues to happen?)
- Recognize structures (what maintains the pattern?)
- Surface mental models (what assumptions or beliefs created the structure?)
- Look at your iceberg: where are the leverage points for change?



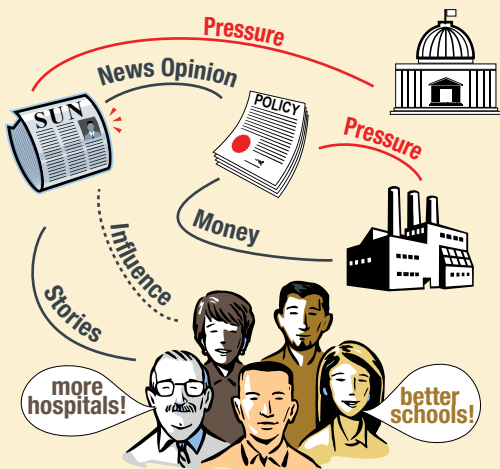
Concept Map

- Brainstorm a list of key concepts
- Put the most important concept in the middle of your map
- Add new, linked concepts
- Draw arrows and write 1-2 words describing the relationship
- Tell the story of what your map means



Causal Loop Diagram

- Write variables and show influences with arrows
- Label the influences as proportional or inverse
- Mark time delays with parallel lines
- Count the number of inverse relationships in each loop
- Draw either a balance (even) or snowball (odd) icon in each loop



Rich Picture

- Sketch the system actors and elements
- Draw and label relationships
- Show abstract ideas metaphorically
- Include yourself in the picture
- Name your rich picture
- Tell the story



Systems Bubble Map

- Blob lines represent boundaries
- Every system and subsystem has a name
- Important influences on the main system are shown outside its boundary
- Bubbles within the system are subsystems, which may have subsystems
- Bubbles common to both subsystems may overlap