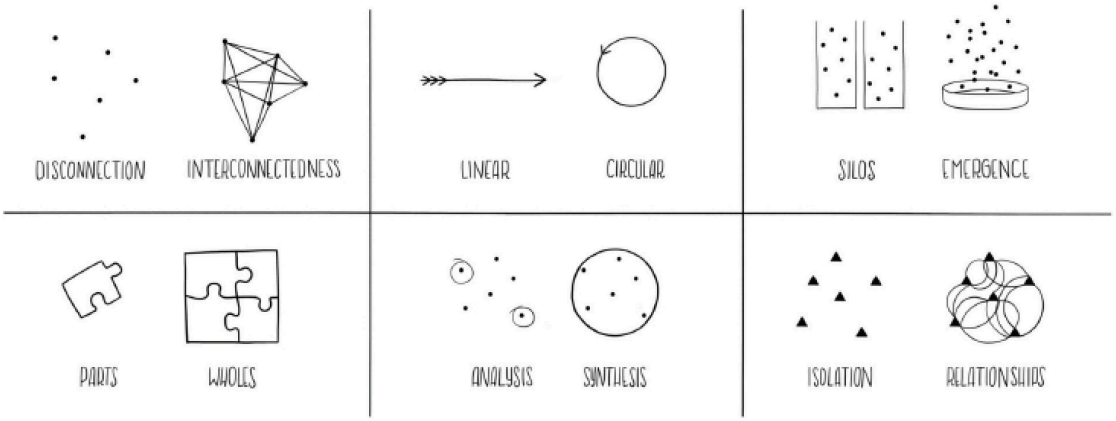
TOOLS OF A SYSTEM THINKER



1. Interconnectedness

Systems thinking requires a shift in mindset, away from linear to circular. The fundamental principle of this shift is that everything is interconnected. We talk about interconnectedness not in a spiritual way, but in a biological sciences way.

Essentially, everything is reliant upon something else for survival. Humans need food, air, and water to sustain our bodies, and trees need carbon dioxide and sunlight to thrive. Everything needs something else, often a complex array of other things, to survive.

Inanimate objects are also reliant on other things: a chair needs a tree to grow to provide its wood, and a cell phone needs electricity distribution to power it. So, when we say 'everything is interconnected' from a systems thinking perspective, we are defining a fundamental principle of life. From this, we can shift the way we see the world, from a linear, structured "mechanical worldview' to a dynamic, chaotic, interconnected array of relationships and feedback loops.

A systems thinker uses this mindset to untangle and work within the complexity of life on Earth.

In many cases when you take one part of the system away it ceases to function, such as taking the wheels off a car or removing a vital organ from a body. It's the interconnectedness that makes a system work, and one of the best examples of interactive systems design is nature—it is composed of many individual parts working together to create the dynamic whole that is the planet.

When you disconnect a system, it becomes a lifeless heap. This can be applied to to human made systems, such as your cell phone. Without electricity, the primary function that motivated its creation is now removed and it becomes a functionless heap of metal, held together by glass (with the potential to feed a recycling system, but often ends up locked in people's drawers). But once you plug it into the complexity of a constantly flowing electrical distribution system, power and functionality are reinstated.

Systems are made up of interconnected parts that when put together create a complex whole. Think about a jigsaw puzzle—the individual parts may or may not make immediate sense, but placed together, the entire whole is the obvious outcome of the parts.

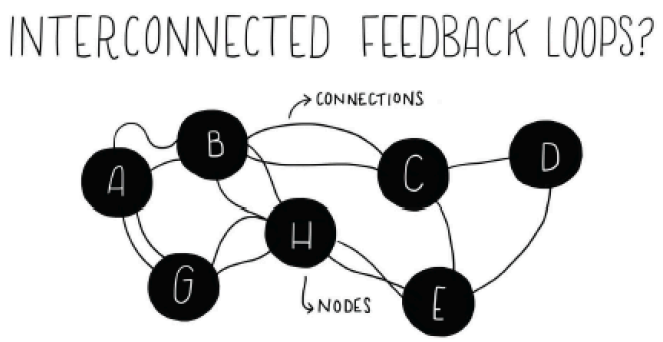
The reality is that everything is interconnected, but everything can also be defined by a function, purpose or potential in some way. A tree's system boundary can be defined by its bark and its myriad of ecosystem services/functions: to produce oxygen and store water, it is dynamically connected to the ecosystem that it draws energy and nutrients from, and provides resources back into. Likewise, we are defined by our own skin. Inside our bodies, we are a complex array of systems that are all beautifully functioning to keep us alive. At the same time, are also connected to the same ecosystems that keep the tree alive.

2. Synthesis

In general, synthesis refers to the combining of two or more things to create something new. When it comes to systems thinking, the goal is synthesis, as opposed to analysis, which is the dissection of complexity into manageable components. Analysis fits into the mechanical and reductionist worldview, where the world is broken down into parts.

But all systems are dynamic and often complex; thus, we need a more holistic approach to understanding phenomena. Synthesis is about understanding the whole and the parts at the same time, along with the relationships and the connections that make up the dynamics of the whole.

Essentially, synthesis is the ability to see interconnectedness.



3. Emergence

From a systems perspective, we know that larger things emerge from smaller parts: emergence is the natural outcome of things coming together. In the most abstract sense, emergence describes the universal concept of how life emerges from individual biological elements in diverse and unique ways.

Emergence is the outcome of the synergies of the parts; it is about non-linearity and self-organization and we often use the term 'emergence' to describe the outcome of things interacting together.

A simple example of emergence is a snowflake. It forms out of environmental factors and biological elements. When the temperature is right, freezing water particles form in beautiful fractal patterns around a single molecule of matter, such as a speck of pollution, a spore, or even dead skin cells.

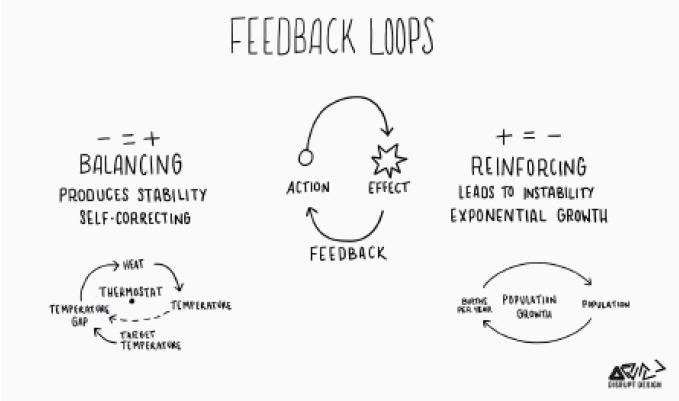
Conceptually, people often find emergence a bit tricky to get their head around, but when you get it, your brain starts to form emergent outcomes from the disparate and often odd things you encounter in the world.

4. Feedback Loops

Since everything is interconnected, there are constant feedback loops and flows between elements of a system. We can observe, understand, and intervene in feedback loops once we understand their type and dynamics.

The two main types of feedback loops are *reinforcing* and *balancing*. What can be confusing is a *reinforcing* feedback loop is not usually a good thing. This happens when elements in a system *reinforce* more of the same, such as population growth or algae growing exponentially in a pond. In *reinforcing* loops, an abundance of one element can continually refine itself, which often leads to it taking over.

A *balancing* feedback loop, however, is where elements within the system *balance* things out. Nature basically got this down to a tee with the predator/prey situation—but if you take out too much of one animal from an ecosystem, the next thing you know, you have a population explosion of another, which is the other type of feedback—*reinforcing*.



5. Causality

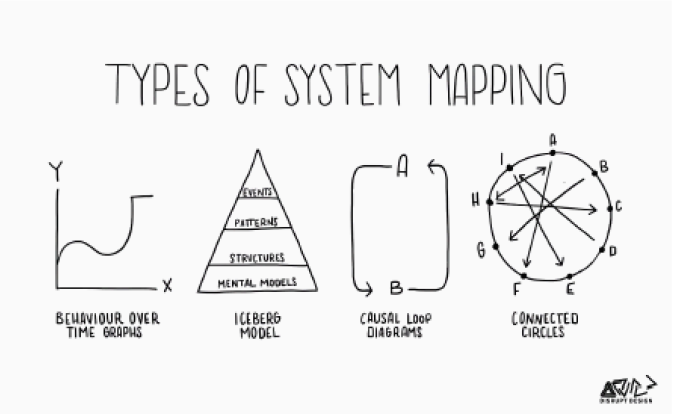
Understanding feedback loops is about gaining perspective of causality: how one thing results in another thing in a dynamic and constantly evolving system (all systems are dynamic and constantly changing in some way; that is the essence of life).

Cause and effect are pretty common concepts in many professions and life in general—parents try to teach this type of critical life lesson to their young ones, and I'm sure you can remember a recent time you were at the mercy of an impact from an unintentional action.

Causality as a concept in systems thinking is really about being able to decipher the way things influence each other in a system. Understanding causality leads to a deeper perspective on agency, feedback loops, connections and relationships, which are all fundamental parts of systems mapping.

6. Systems Mapping

Systems mapping is one of the key tools of the systems thinker. There are many ways to map, from analog cluster mapping to complex digital feedback analysis. However, the fundamental principles and practices of systems mapping are universal. Identify and map the elements of 'things' within a system to understand how they interconnect, relate and act in a complex system, and from here, unique insights and discoveries can be used to develop interventions, shifts, or policy decisions that will dramatically change the system in the most effective way.



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