Introduction to Systems Thinking

Lesson 1.1: Introduction to Causal Loop Diagrams

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Overview

Read this to learn how causal loop diagrams can support systems thinking.

Article: "Guidelines for Drawing Causal Loop Diagrams"

This short but important article from The Systems Thinker explains what causal loop diagrams are and how they relate to systems thinking. Ten guidelines help the new systems thinker with this exciting concept.

Read "Guidelines for Drawing Causal Loop Diagrams."

Key Points

- Causal loops are useful in seeing how various elements, or variables, in a system interact.
- When constructing a causal loop, several important considerations should be taken into account:
  - The central theme or issue
  - The timeframe, or time horizon, over which the interactions occur
  - Behavior Over Time (BOT) diagrams, which can reveal key variables
  - Boundaries of the problem, where to draw a line
  - How detailed, or how aggregate, the diagram should be
  - Any significant delays and how they affect outcomes

Article: "Anatomy of a Reinforcing Loop"

This short article by Kellie Wardman explains reinforcing loop diagrams.

Read "Anatomy of a Reinforcing Loop."

Key Points

- Causal loops often include reinforcing loops, which occur when a change in one variable causes a change in the same direction, positive or negative, in another variable.
- Reinforcing loops are self-reinforcing, meaning that they continue to add change in one direction over time.
- Reinforcing loops can lead to either growth or decline.
- When a system includes exponential growth or decline, there is a reinforcing loop at work.

Article: "Balancing Loop Basics"

This short article by Kellie Wardman explains balancing loop diagrams.

Read "Balancing Loop Basics."

Key Points

- Causal loops often include balancing loops, which occur when a change in one variable causes a change in the opposite direction, positive or negative, in another variable.
- A balancing loop involves a goal of some sort and the activity needed to reach that goal, bringing the process into equilibrium.

Article: "Fine-Tuning Your Causal Loop Diagrams—Part 1"

This short article by John Sterman improves on basic knowledge about causal loop diagrams. Important ideas included here are

Read [Fine-Tuning Your Causal Loop Diagrams – Part I:]

Key Points

When creating causal loop diagrams, follow these guidelines:

- Label links as positive (one variable causes the same change in a second variable) or negative (one variable causes the opposite change in a second variable).
- Determine if the loop as a whole is reinforcing or balancing. An even number of negative links means the loop is reinforcing. An odd number of negative links means the loop is balancing.
- Make the goal of a balancing loop clear or explicit.
- Represent causes, not correlations.

Loopy: A Tool for Thinking in Systems

Loopy is a highly engaging, open-source, online tool that creates animations to understand causal loop diagrams and make systems easier to analyze. Very intuitive even for a novice, Loopy clarifies authentic, real-world systems.

Go here to access LOOPY: a tool for thinking in systems . If you like, play around with the examples and try creating some causal loop diagrams of your own. You will see some Loopy examples in this course.

Correlations and Causations

One more concept is important as you begin to think systemically, that correlation and causation are very different and must be considered. This short article by Stephen Mills explains the distinction.

Read "Common Thinking Traps: Correlation and Causation."

Key Point

- When creating causal loop diagrams, be careful to diagram only causes, not correlations. That is diagram cases where A causes B, not cases where A merely happens and B also happens.

Attributions and References

Attribution

Case, N. (n.d.). *Loopy: A tool for thinking in systems*. From https://ncase.me/loopy/

References

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