WORKFORCE CONNECTIONS

Labor Market Assessment Tools:

Causal Loop Modeling[1]

Why is this tool important?

Emerging from the field of systems dynamics and used in fields ranging from business, to engineering, to environmental science, to international development, causal loop models help us to make explicit our understanding of how different factors are interacting to cause specific results in a system. This tool, which has been adapted and simplified for the purposes of this toolkit, can be used to identify root causes of problems, in order to spur a thinking process about a system. The act of building a causal loop model and recognizing the root causes and patterns can help policymakers and implementers identify potential places to effect change in a system.

How does this tool help me understand information?

A Causal Loop Model creates a visual image of how elements in a system interact with one another. Mapping the causes and results of variables in a system can help policymakers decide where to implement changes. However, a Causal Loop Model can only reflect the perspectives of those creating it. Thus, it may not reduce biases, but it can make them explicit.

How do I use this tool?

When constructing a causal loop model in your own context, the following the three *Principles of Causal Loop Modeling* will help you to map system dynamics:

> **Principle #1:** Never show someone a model they have not helped to develop. Causal loop modeling is about the process, and everyone should be a part of the process to share ownership of the model.
>
> **Principle #2:** Systems thinking and causal loop modeling is not about EITHER/OR, it is about BOTH/AND thinking. This inclusive strategy will identify solutions that holistically address a problem instead of focusing on a single cause, and reduce the skewing effect of unequal power dynamics within the group modeling the causal loop.
>
> **Principle #3:** Most systems are complex as they are based on human and social elements. Complexities within the system can be structural (system size, number of parts, connectivity), dynamic (behavioral), evaluative, and adaptive. As a result, causal loop models are likely to be messy, and will always be unique.

[1] This tool was produced through the Workforce Connections project funded by the USAID Office of Education and managed by FHI 360 under the FIELD-Support Leader with Associates, with the assistance of Alyson Matthews. See http://www.wfconnections.org for more information. Draft version: 9/24/2015.

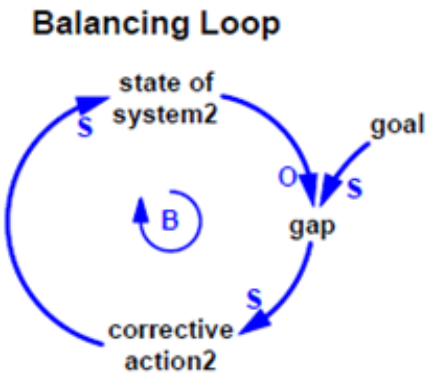
Causal Loop Models exhibit several key characteristics:

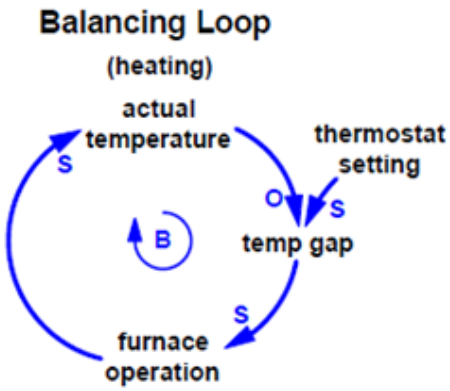
Feedback Loops are interconnected stabilizing forces of inputs and outputs between different components of a system. They are affected by *delays***,** which stagnate progress between the current state and desired state of the system. There are two types of feedback loops, balancing and reinforcing.

Balancing Loops occur when variables change in opposite directions. Balancing loops attempt to move a current state (status quo) to a desired state (an objective or goal) through some action (to reach the goal). For example, it's 65 degrees in my living room but I want it to be 70 degrees, so I adjust the thermostat, which turns up the furnace output, which eventually (with a delay) brings the room temperature up to 70 degrees. When the room reaches 70 degrees, there is no longer a gap between the current state and the desired state, and the furnace only puts out enough energy to keep the room at that temperature.

Examples of Balancing Loops:

Structure	**Behavior**	**Examples**	**Policy Advice**
Balancing Loop	• Goal seeking • Regulates system behavior • Opposes system change from set target or goal	• Heating or cooling system, setting thermostat to regulate room temperature • Economic growth; Federal Reserve modifying interest rates to meet growth target	• Recognize that balancing loops regulate the system to provide stability and, on the other hand, resist change



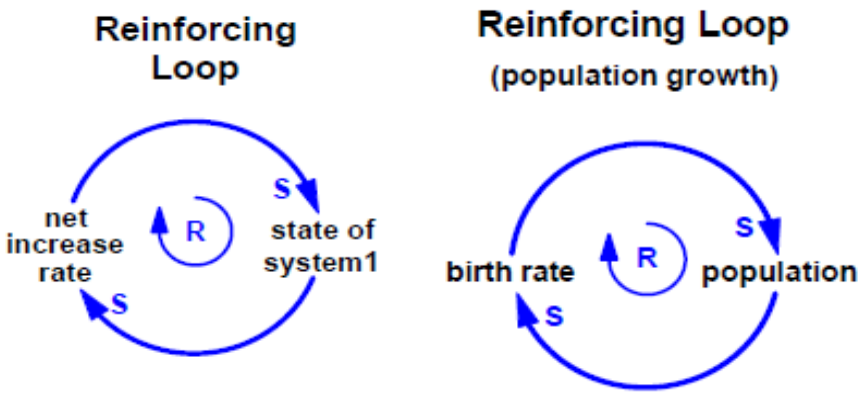


Source: Continuous Improvement Associates, "Systems Thinking Archetypes," 2003

Reinforcing Loops occur when there is a causal relationship between two variables that move in the same direction. That is, an action produces a result which causes more of the same action, which leads to a growth or decline. For example, an increase in a country's population (all else equal) leads – perhaps after a delay - to an increase in the birth rate, which leads to a further increase in the population.

Examples of Reinforcing Loops:

Structure	**Behavior**	**Examples**	**Policy Advice**
Reinforcing Loop	• Growth or decline of the "state of the system"	• Population growth or decline • Sales growth or decline • Microphone feedback	• Recognize that reinforcing feedback creates exponential growth that can bring on pressures to retard growth • They are two-edged swords that can work for us or against us

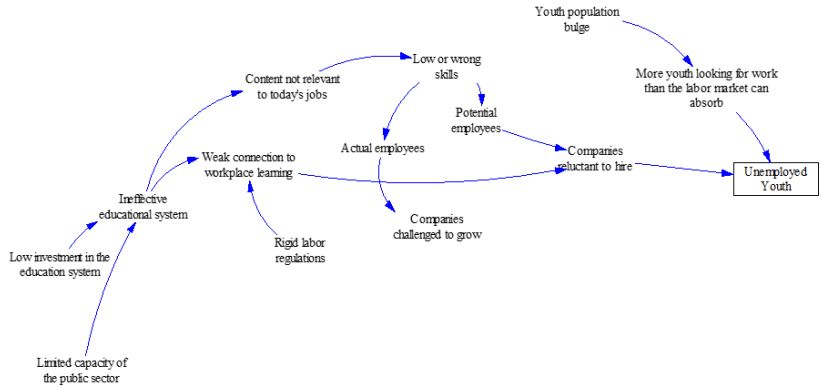


Source: Continuous Improvement Associates, "Systems Thinking Archetypes," 2003.

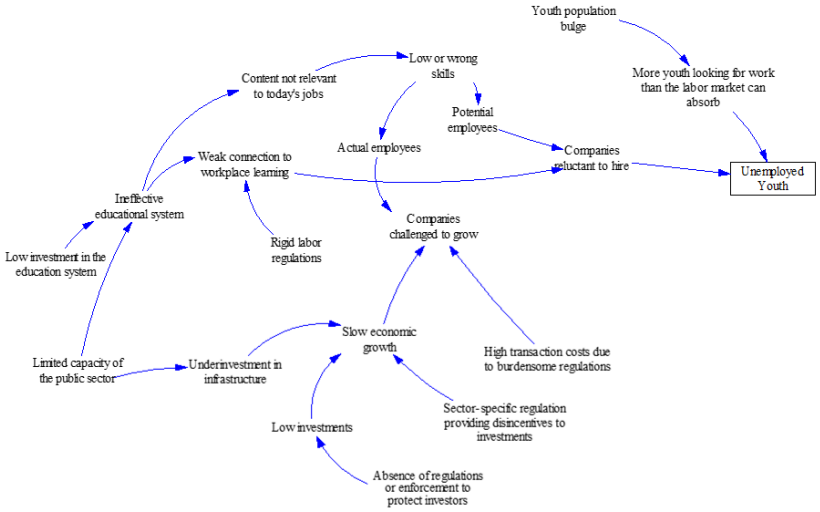
Example of Causal Loop Model in Workforce Development:

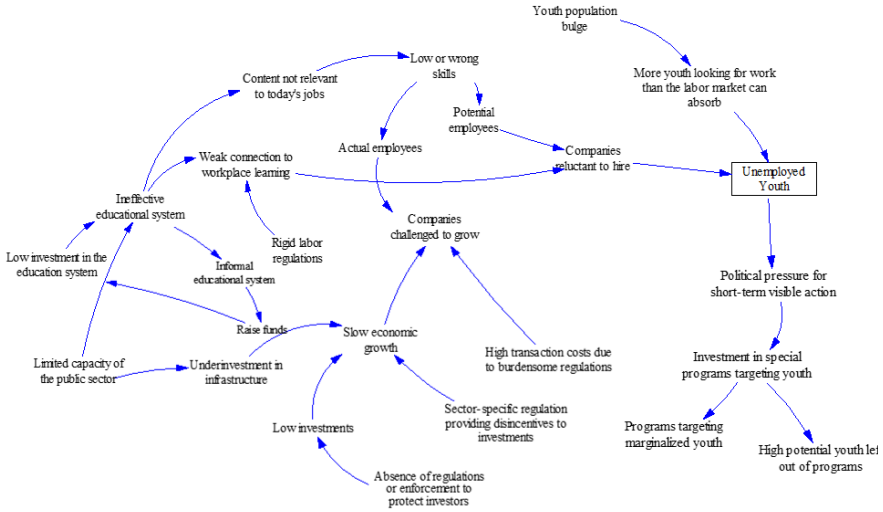
The sequence of images below shows the building of a causal loop model in the context of labor market assessment and workforce development programming, from left to right and top to bottom. The below does not show balancing and reinforcing loops, but can be used as a basis to develop them.

1. Identification of issue (in box) and first round of factors, interactions, and pathways

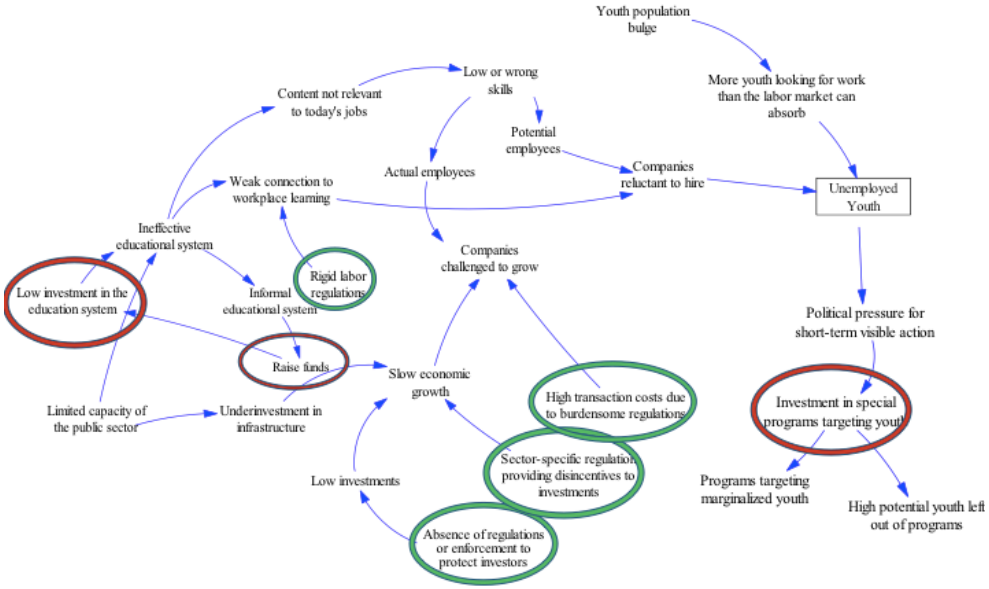


2. Further identification of factors, interactions, pathways





3. Further identification of factors, interactions, pathways



4. Identification of root causes (green circles) and archetype patterns that result in outcomes (red circles)

Identifying root causes and emerging patterns once loops have been drawn out will allow those constructing the model to identify relevant and related issues and imagine how to change current interactions within the system. Root causes are the most interconnected issues to the system as a whole, and will generally be those with the most arrows stemming from and going to other causes. Each system will have multiple root causes affecting the system. Patterns are the way in which interactions happen and how to reasonably develop interventions to change outcomes.

▶ Where can I find more information?

Background on systems dynamics, causal loop modeling and its uses

Meadows, D. H., & Wright, D. (2008). *Thinking in systems: A primer*. Chelsea Green Publishing.

Mostashari, A. (2013). Systems Thinking in International Development. USAID Training, October 9-11.

Williams, B., & Hummelbrunner, R. (2010). *Systems concepts in action: a practitioner's toolkit*. Stanford University Press.

How-to instructions for drawing causal loops

Kim, D. H. (1992). Guidelines for drawing causal loop diagrams. *The Systems Thinker, 3*(1), 5-6.

Details on causal loop structures and archetypes

Continuous Improvement Associates. (2003). "Systems Thinking Archetypes (Generic Structures)." http://www.exponentialimprovement.com/cms/uploads/ArchetypesGeneric02.pdf

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Broadway Business.