

How do you handle conditional causal relationships in a CLD? | System mapping – Part 1

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Why some causal relationships seem logical, yet conceal important systemic conditions

In the first part of this series on system mapping, we explore a common challenge: causal relationships that appear logical, but do not fully hold up in practice. This is especially common in complex circular systems, where multiple factors interact at the same time.

Take this quote from a recent ReX case study concerning heat pumps:

‘Greater acceptance of ReX among end customers leads to greater availability of use phase data.’

At first glance, that connection seems logical. Yet use phase data aren't generated automatically as soon as end customers accept ReX. Additional conditions are required to make data actually available.

Why this relationship isn't quite right

Accepting ReX helps, but it isn't enough. Other factors also determine whether use phase data are actually made available. For example:

- Product identification and tracking
- Understanding failure modes and reasons for returns
- Availability of IT infrastructure and sensors
- Data logging and interoperability
- Agreements on data ownership and use

A simple causal arrow therefore often conceals an underlying system structure.

Make the system structure explicit

A well-structured causal loop diagram (CLD) makes that structure visible.

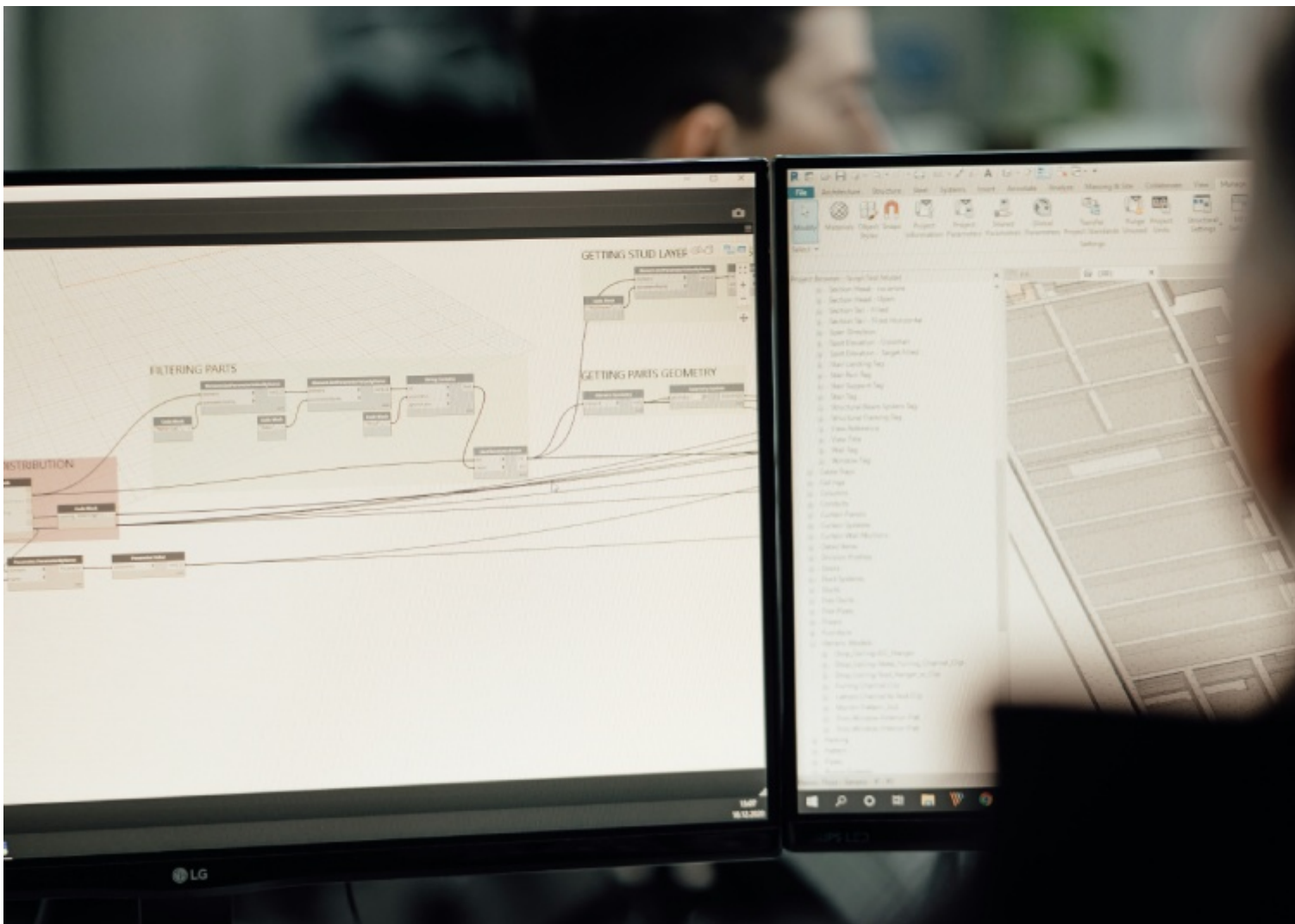
For example:

- Acceptance of ReX ? willingness to share data
- Willingness to share data ? actual data sharing

In addition, you should consider other system factors that affect the actual sharing of data, such as:

- Tracking and identification options
- Available IT and data infrastructure
- Legal frameworks for the secure use of data
- Interoperability standards

This makes it clear that the system doesn't operate through a single, straightforward cause-and-effect relationship, but rather through the interplay of multiple drivers.



From linear to systemic thinking

This is a typical turning point in system mapping. You move from linear thinking to systemic thinking. Rather than identifying a single direct cause-and-effect relationship, you examine how different factors reinforce or counteract one another, or make them dependent on other conditions. This helps to avoid so-called 'magic arrows': causal relationships that appear logical but conceal

important systemic conditions. At the same time, it becomes clear where interventions will really make a difference. In terms not just of customer acceptance, but of data infrastructure, governance and standardisation.

A quick check for your CLD

Are you unsure about a causal relationship in your system diagram? Then ask yourself this question: If this factor increases but the underlying conditions remain weak, will the effect still occur?

- Yes ? the causal relationship is probably correct
- No ? part of the system is still missing

Just thinking about this helps to reveal hidden dependencies more quickly.

Why this is important

In circular value chains, many crucial outcomes arise at the intersection of multiple systems. This applies, for example, to ReX for heat pumps, machinery or industrial components.

Failing to make that underlying system structure explicit often means underestimating the complexity of the transition. Doing so means spotting the real levers more quickly. And that's precisely where system mapping makes the difference.

Get started with system mapping yourself

Would you like to explore how system mapping can strengthen your ReX programme? Our experts will be happy to help you make systemic interconnections visible, identify levers and develop scenarios for scalable circular solutions.

Discover the HEATReX Living Lab

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Discover the other parts on system mapping

Part 1: How do you handle conditional causal relationships in a CLD? ?

Part 2: [Combining stock and flow variables in a CLD](#)

Part 3: [System equilibrium and why systems get stuck](#)

Part 4: [How detailed should your system map be?](#)

Part 5: Combining methods and tools in a pragmatic approach (coming soon)

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