

# Systems thinking for a circular economy

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# Background

## Context

- Circular economy (CE) is often termed an umbrella concept, encompassing many ideas and fields.
- Thus there a wide range of stakeholders, without a common view.
- ‘Systems Thinking’ is an approach to help understand complexity and often cited as critical to delivering a CE.

## Problem

- Need for coordination recognised for a transition to CE<sup>1,2</sup>, but lacking systemic framing to integrate ideas and ensure consensus on the underlying cause and effect relationships.

## Question

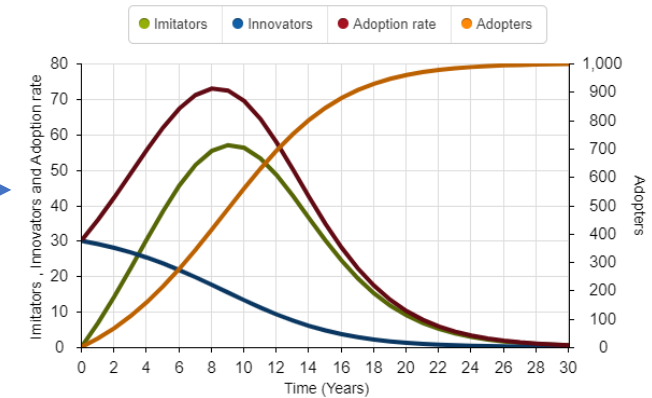
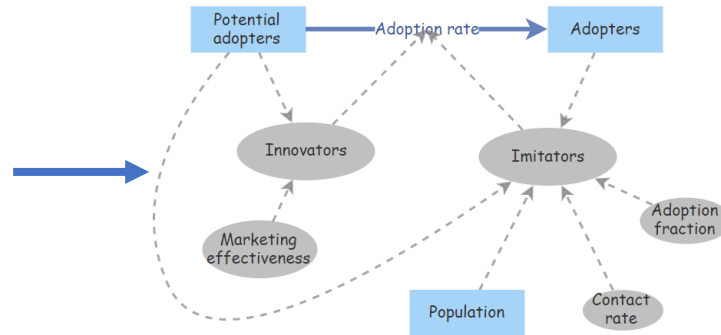
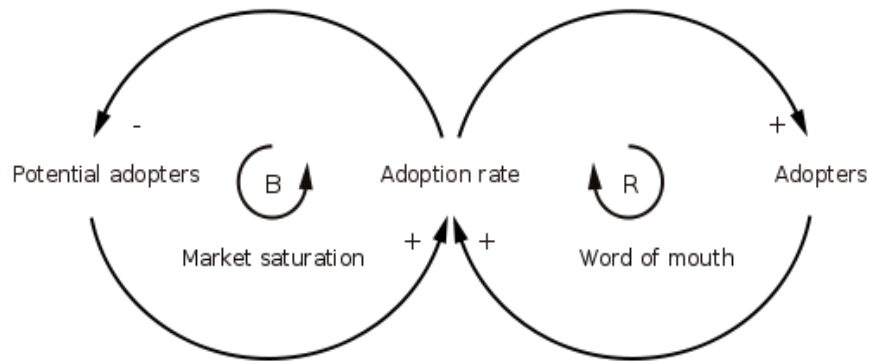
- Can we use systems thinking to integrate concepts to describe the system structure and identify leverage points, where solutions can change behaviour?

# Methods (I)

## Causal loop diagrams (CLDs)

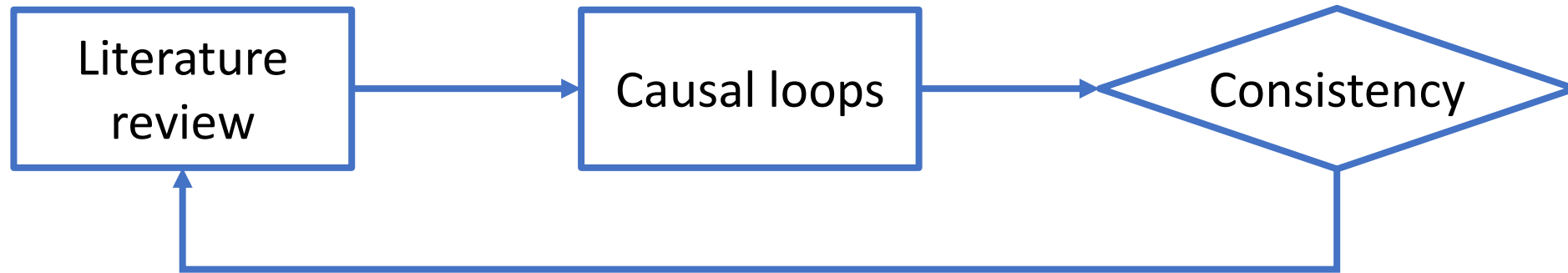
- Foundational tool used in systems thinking to show how cause and effect relationships occur between different variables.
- CLDs aid in discerning the key feedback structure of systems and to identify the leverage points.

### Example: Innovation adoption model

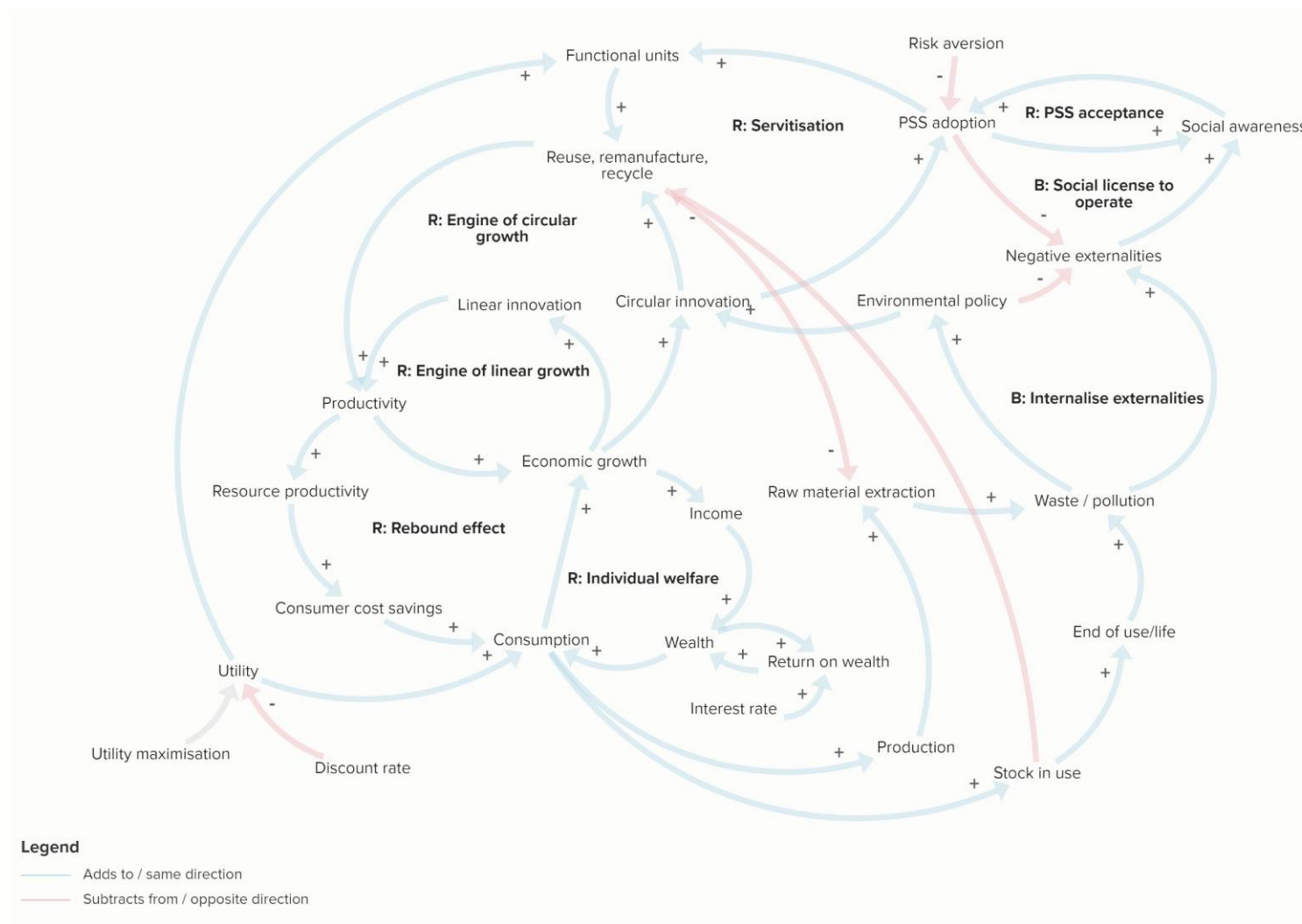


# Methods (II)

- Wide literature review conducted to develop causal loops including the following topics: *CE definitions, CE indicators, CE business model innovation, material flow assessments, system dynamics, behavioural economics.*
- Multiple iterations to ensure consistency:



# Results



# Implications

- Unsurprisingly, *consumption* and *economic growth* are key leverage points. *Circular innovation* shows promise.
- Utility maximising principle leads people to consume more as they get richer: *sufficiency vs maximisation?*
- Buffering by stock-building nature of the economy limits the *circular engine of growth*; current policy measures are unlikely to have the desired scale of impact.
- Currently relatively weak or balancing forces acting on firms to invest in large transition to adopt servitised models.

# Conclusions

- This exploratory study shows CLDs are helpful in conveying the complexity of key forces acting on an economic system transitioning to CE.
- Where current policy signals act, they are likely be far too small to cause meaningful change in system structure.
- While helpful, the qualitative nature of CLDs means the magnitude of feedback and nonlinear behaviour modes are not always easy to discern.
  - Ideally convert CLDs to a system dynamics model to quantify outputs and provide a deeper level of insight.

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