GST 96 — Processes and Changing Causal Networks

Formal Description

This module explains how transfers connect causal interactions into processes, and how those processes can change the organisation on which later activity depends. A process can receive inputs from its surroundings and produce effects or outputs that become inputs to other processes.

Connected interactions can follow several patterns. In a linear sequence, an output from one stage feeds the next. Several inputs can converge on a stage, or an output can branch towards several recipients. A cyclic pathway brings material, energy or information back to an earlier stage. Feedback occurs when a returning influence changes the activity of an earlier stage.

As material passes through a system, it may become temporarily incorporated, undergo a change and then be released. The released material may become an input elsewhere. The components and relationships that organise these stages can persist while successive inputs pass through them.

We can represent the same causal network in two complementary ways. A process–transfer–process (PTP) description follows processes connected by transfers. A transfer–process–transfer (TPT) description follows transfers connected by the processes that receive one input and produce a subsequent output.

Where the operations and conditions are clear enough, a causal algorithm can describe when each pathway is followed. If activity changes the components or their connections, then we may need to revise the algorithm to match what the system can then do.

By the end, the learner should be able to trace a causal pathway, describe it from both perspectives and explain how a change in organisation affects subsequent activity.

Plain English Explanation

Causal Networks

Imagine a small water recycling installation. A pump draws water from a collection tank and sends it through a filter. The filtered water can go to a holding tank for later use or, when a return valve opens, flow back to the collection tank for another pass. This simplified example gives us several pathways to follow.

Pumping supplies a flow of water to the filter. Filtering removes some of the suspended material and sends water onwards. The filter's output can therefore become the holding tank's input. This time order helps us follow the example, but it is the transfer of water that connects the stages.

Several inflows can converge in the collection tank. At the outlet from the filter, water can branch towards the holding tank or return to th collection tank. The return route is cyclic because it allows water to pass through the pump and filter again. Alternatively, a signal reporting that the holding tank is full can cause the pump to stop. This is feedback: a change downstream affects an earlier operation.

Some inputs also become temporary components. In an enzyme reaction, for example, a molecule binds to an enzyme and becomes part of a temporary assembly. The interaction facilitates a chemical change. The products are then released, and the enzyme can participate in another reaction. A released product can become an input to a later process.

Now return to the filter. Over successive passes, particles may collect in it. The deposit changes the filter's internal arrangement and can restrict later flow. The process therefore changes the conditions under which it will operate again. If cleaning removes the deposit, then it can restore a flow path that had become restricted.

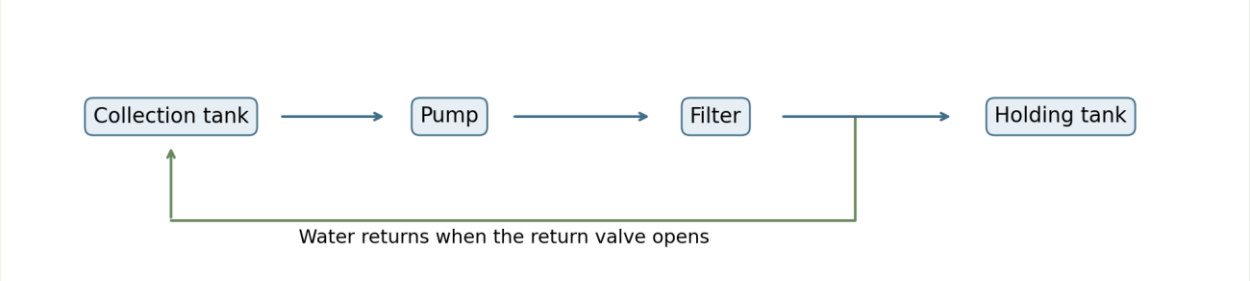
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This shows why a network diagram is a description of causal organisation at a specified time or under specified conditions. We can keep the same diagram when only the current flow changes. If a connection is added, blocked or removed, then a diagram of available pathways may need to change as well.

Describing the Conditions for Each Pathway

A simple causal algorithm might say: if the pump is running and the route to storage is open, then water can pass through the filter to the holding tank. If the return route is open instead, then water can return to the collection tank. If the tank sends a stop signal to the pump controller, then the controller stops the pump in this example.

These statements describe conditions and operations. The actual transfers depend on the pump, valves, connections and controls. If a pipe is removed or a filter becomes blocked, then we may need to revise the description. An algorithm is useful where it captures current relevant behaviour; but it may not capture changes in behaviour due to changes in circumstances.



The arrows show water transfers. The upper route leads to storage. The lower route allows another pass. The diagram omits the control signals so the water pathways are easy to follow.

Examples

Consider the route from the pump, through the filter, to the holding tank. Assume that the pump is running and the route to the tank is open. We can describe what happens in two ways.

PTP or Event-based causality. First, the pump transfers water to the filter. Second, the filter transfers filtered water to the holding tank. Each is a complete event: it includes the source, the water transferred and the recipient. The filtering process connects the two events. So we can say: **The pump's delivery of water to the filter causes the filter to deliver filtered water to the holding tank.** The first transfer event as a whole is the cause, and the second transfer event as a whole is the effect.

TPT or Systems-based causality. Now consider what happens within the filter and within the holding tank. The filter receives water, retains suspended particles and sends filtered water onwards. The holding tank receives that water and accumulates it. So we can say: **Filtering of the water causes filling of the holding tank.** Here, the cause and effect are both processes connected by the transfer of water. The filtered water leaving the filter is the output of the first process and the input to the second.

Both accounts describe the same causal network. In the event-based account, **a process connects two delivery events**. In the systems-based account, **a transfer connects two processes**.

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Provenance and Links

Foundational Causality provides the account of physical transfers connecting sources and recipients, including the PTP and TPT perspectives. *Causal Assembly Theory: Assembly and Disassembly as Causal Processes* applies that account to temporary incorporation and to changes in the organisation supporting later activity (Challoner, 2026b, 2026a).

The water recycling example is a simplified teaching model. It shows how the same system can support a sequence, a branch, a return route and feedback, and how operation can alter future pathways. Representing such activity as a causal algorithm is a proposal for suitable cases.

Challoner, J. A. (2026a). Foundational causality. Rational Understanding. https://rational-understanding.com/efgst/

Challoner, J. A. (2026b). Causal assembly theory: Assembly and disassembly as causal processes. Rational Understanding. https://rational-understanding.com/efgst/

Practical Exercise

Trace a parcel of water from the collection tank to storage. Mark one transfer connecting two processes. Then describe that part of the network in PTP form. Choose one process and describe its incoming and outgoing transfers in TPT form.

Add a signal from the holding tank to the pump controller. Explain what this feedback changes and how it differs from returning water to the collection tank.

Suppose the filter gradually becomes blocked. Explain how earlier activity has changed the conditions for later activity. Revise your diagram to show what remains connected and which route has become restricted. How would the automation of cleaning change your description?

Finally, choose a process from your own experience. Identify a transfer, the activity that produces it and the activity that receives it. Consider whether any part of the process changes the organisation on which later activity depends.

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