GST 30 – Causal Cognition

Formal Description

Causal cognition is the cognitive process by which organisms identify interactions, relationships, and mechanisms that generate observed patterns and outcomes. It enables explanation, prediction, learning, and intervention by supporting an understanding of how and why events occur.

Plain English Explanation

Recognising a pattern is useful. Understanding why it occurs is often even more valuable.

A doctor may recognise a disease from a familiar pattern of symptoms. However, effective treatment requires understanding the biological processes that produce those symptoms. An engineer may recognise that a structure is deteriorating, but preventing failure requires understanding the causes of the deterioration.

This ability to identify and reason about causes is known as causal cognition.

Where configurational cognition focuses on recognising what is happening, causal cognition focuses on understanding why it is happening.

Causal cognition seeks to identify the interactions and relationships that connect events and outcomes. It allows organisms to move beyond simple recognition and begin explaining, predicting, and influencing the world around them.

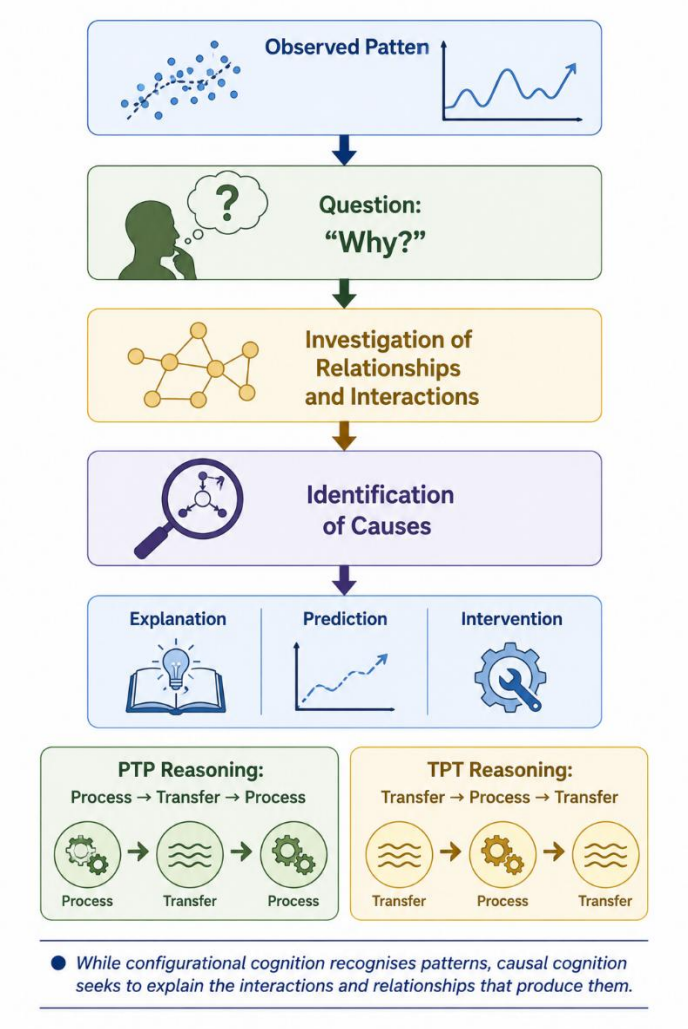
Within the framework developed in this series, causality involves transfers of matter, energy, or information between processes. These causal relationships may be represented using simple structures such as Process–Transfer–Process (PTP) and Transfer–Process–Transfer (TPT).

PTP reasoning focuses on events and actions. It corresponds closely to everyday language, where one process acts upon another.

TPT reasoning focuses on the transfers that connect processes. It is particularly important in systems science because it highlights flows, exchanges, and transformations that may not be immediately visible.

Both forms of reasoning contribute to causal understanding. They allow individuals to identify why patterns occur, anticipate future outcomes, and evaluate possible interventions.

Causal cognition therefore provides the foundation for explanation, prediction, learning, science, and problem solving.



Example 1 – Medicine
A physician recognises a pattern of symptoms indicating infection. Causal cognition then investigates the biological processes producing those symptoms and identifies appropriate treatments.

Example 2 – Road Traffic
A driver recognises that congestion exists. Causal cognition examines the interactions, constraints, and flows responsible for creating the traffic jam.

Example 3 – Engineering
An engineer observes cracking in a structure. Configurational cognition recognises the pattern, while causal cognition investigates loads, material behaviour, and environmental influences to determine the cause.

Example 4 – Social Systems
A community experiences rising crime. Configurational cognition identifies the trend. Causal cognition investigates the economic, social, cultural, and institutional factors contributing to the increase.

Provenance and Links

The concept of causal cognition draws upon philosophy, psychology, systems theory, and the sciences.

Relevant contributors include:

- David Hume – philosophical analysis of causation.
- Daniel Kahneman – analytical and reflective reasoning.
- Karl Popper – explanation, prediction, and scientific reasoning.
- Herbert Simon – problem-solving and causal understanding.
- Ludwig von Bertalanffy – systems and interactions.
- Jay Forrester – feedback, flows, and system dynamics.

Related topics include causality, systems science, explanation, prediction, feedback, modelling, and scientific reasoning.

Practical Exercise

Choose a situation in which an important outcome occurred.

Examples might include:

- a business success or failure,
- a traffic accident,
- a sporting result,
- a social or political event,
- a technical failure.

1. Describe the outcome.
2. Identify the pattern or situation that was observed.
3. List possible causes and contributing factors.
4. Draw a simple causal chain linking causes to outcomes.
5. Consider what interventions might have altered the outcome.

Reflect on the difference between recognising the outcome and understanding the processes that produced it.