



GST 53 – Causal Relationships

Formal Description

A causal relationship exists when one entity, event or process influences another through the transfer of matter, energy or information. In a later module it will be explained that information has physical form. Unlike configurational relationships, which describe how entities are arranged or associated, causal relationships explain how changes occur. They therefore form the basis for understanding interactions, processes and the behaviour of systems.

Plain English Explanation

Many relationships simply describe how entities are connected or arranged. Causal relationships go a step further by explaining how one entity influences another.

Consider a kettle placed on a switched-on electric hob. The kettle is related to the hob because it rests upon it. However, when heat is transferred from the hob to the kettle, a causal relationship exists because one entity is changing the state of another. The water inside the kettle gradually becomes hotter because energy is transferred from the hob.

The same principle applies in many different situations. Rain falling on a hillside causes water to flow into a river. A teacher explaining a new idea transfers information to students. Fuel burned in an engine releases energy that causes a vehicle to move. In each case, one entity influences another through the transfer of matter, energy or information.

Understanding causal relationships allows us to move beyond describing reality towards explaining it. Rather than simply observing that two events occur together, we seek to understand how one contributes to bringing about the other. This ability to explain change lies at the heart of science, engineering and systems theory.

Most systems are networks of many interacting causal relationships. The behaviour of the system emerges because numerous transfers occur simultaneously between its components.

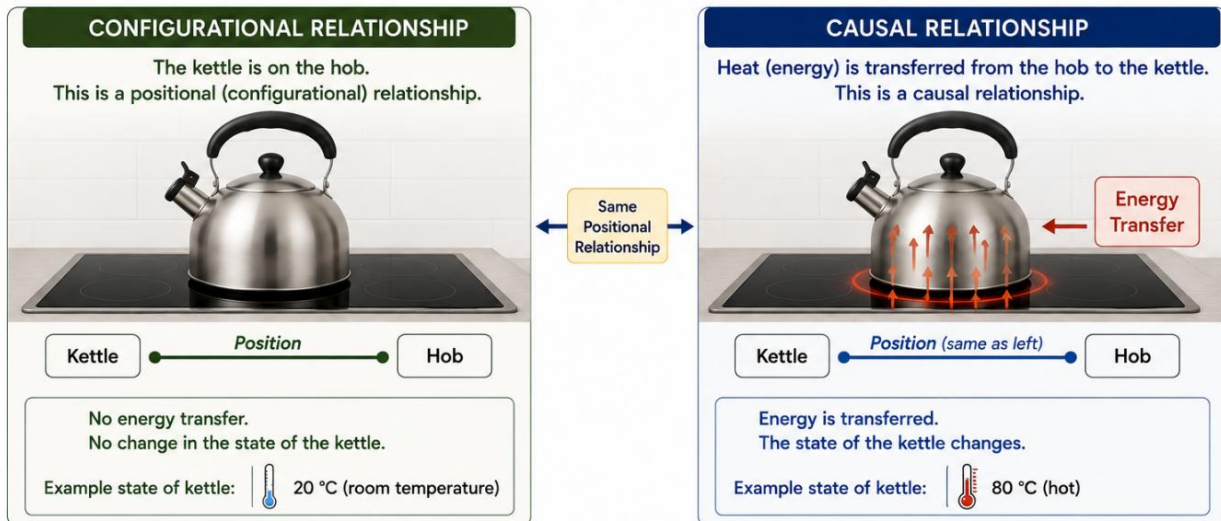
Understanding these causal relationships enables us to explain why systems behave as they do and how they may respond to change.



CONFIGURATIONAL vs CAUSAL RELATIONSHIPS

Both situations involve the same positional relationship.

A causal relationship exists only when energy is transferred and the state changes.



KEY POINT

- The positional (configurational) relationship exists in both cases.
- The causal relationship exists only when energy is transferred (or other causal interaction occurs).
- Causal relationships can change the state of an entity; configurational relationships do not.

Examples

A book resting on a table has a configurational relationship with the table because of its position. If someone lifts the book, however, energy is transferred from the person's muscles to the book, causing its position to change. The lifting action therefore represents a causal relationship. Similarly, two businesses may compete in the same market because they produce similar products. This is a configurational relationship describing their shared circumstances. If one business reduces its prices and customers begin moving from one business to the other, information and economic resources are transferred, creating causal relationships that influence both organisations.

Provenance and Links

The study of causality has a long history in philosophy and science. Aristotle developed one of the earliest systematic treatments of causes, while David Hume investigated how causal relationships are recognised through regular patterns of experience. Modern science has increasingly explained causality in terms of physical processes and mechanisms. Within General Systems Theory, causal relationships are understood as connections through which matter, energy or information are transferred, allowing changes to propagate throughout organised systems. This concept provides the foundation for later studies of interactions, processes, feedback and emergence.



Practical Exercise

Choose a familiar activity, such as making a cup of tea, riding a bicycle, watering a garden or sending an email.

Identify at least five causal relationships involved in the activity. For each relationship, explain:

- what entities are involved,
- what is transferred (matter, energy or information),
- how the transfer changes the state of another entity.

Finally, identify one configurational relationship involved in the same activity and explain why it is descriptive rather than causal.