GST 80 – The Generality of Systems Theory

Formal Description

The generality of General Systems Theory arises from the observation that the same fundamental principles of organised causal organisation recur across diverse entities, systems, disciplines and levels of organisation. General Systems Theory therefore provides a common conceptual framework for understanding, describing and investigating systems regardless of their physical form, scale or domain of application.

Plain English Explanation

Throughout this course we have developed a set of concepts that describe how systems are organised and how they behave. We have seen that systems consist of interacting components organised into causal processes that generate emergent properties, behaviours and functions. We have also seen that these organisational principles recur at many different levels of organisation.

One of the most important conclusions is that these principles are not limited to any particular discipline.

The same concepts can be applied when studying atoms, biological organisms, engineering systems, businesses, ecosystems, economies or societies. Although the components, processes and environments differ, the underlying principles of organised causal interaction remain recognisably similar.

This does not imply that every system is identical or that the specialist knowledge of individual disciplines becomes unnecessary. Each discipline studies phenomena with its own unique characteristics and often develops specialised concepts, methods and terminology to do so effectively.

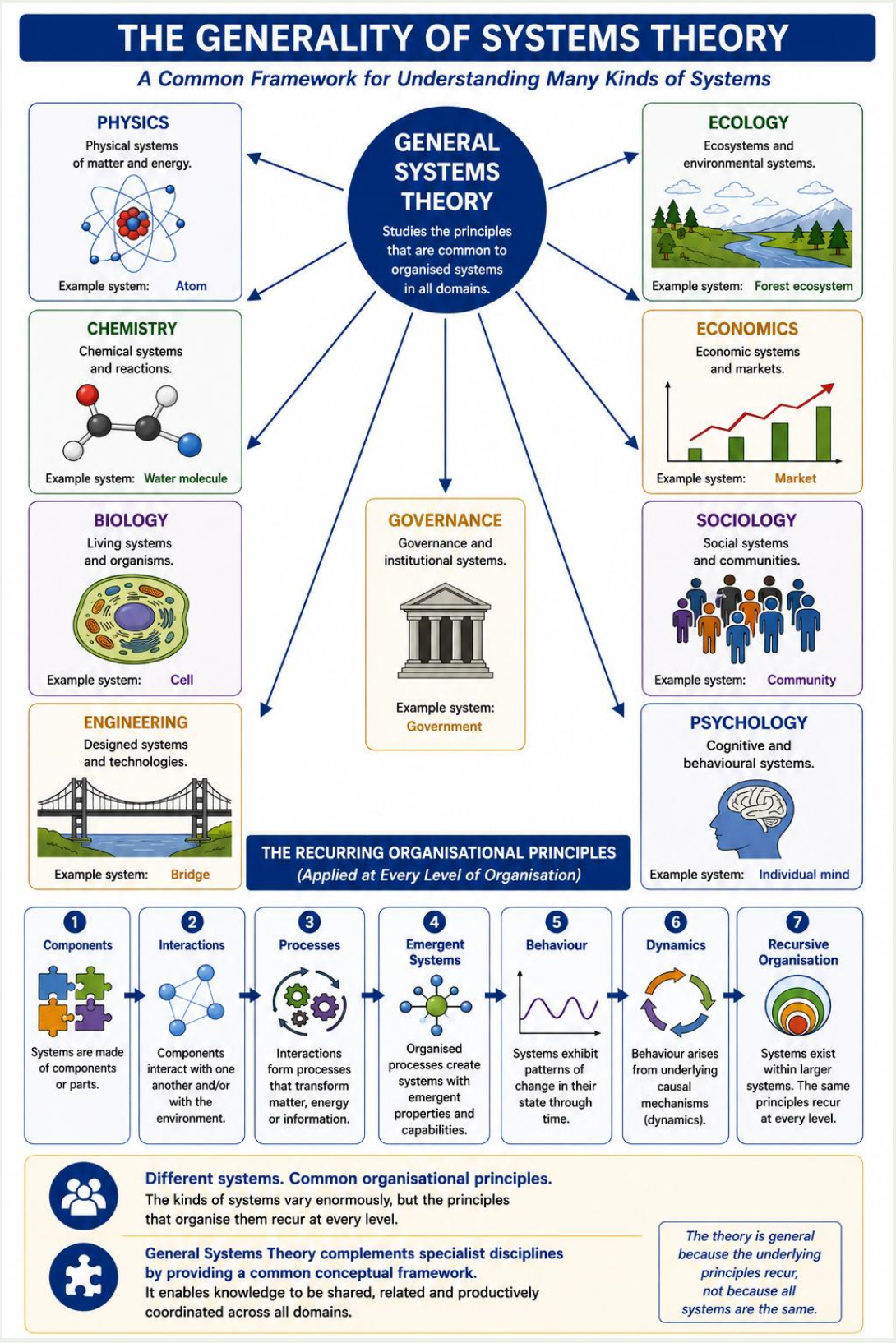
General Systems Theory complements rather than replaces these disciplines. It provides a common language for describing their shared organisational principles while allowing each discipline to retain the specialist knowledge required for its particular subject matter.

Because these common principles recur across many domains, understanding systems in one field can often provide valuable insights into another. Engineers may recognise organisational principles that also occur in biology. Ecologists may identify patterns that resemble those found in economics. Social scientists may discover causal structures similar to those observed in complex technological systems.

General Systems Theory therefore promotes productive communication between disciplines by identifying what they have in common while respecting the differences that make each discipline unique.

Perhaps its greatest contribution is that it encourages us to look beyond specialised terminology and focus instead upon the underlying causal organisation of the systems being investigated. By doing so, it provides a coherent framework for understanding complexity across the natural, engineered and social worlds.

This concludes the foundations course. The concepts introduced here provide a basis for more advanced studies of systems investigation, diagnosis, modelling, governance and interdisciplinary research.



Examples

The concept of feedback may describe temperature regulation in the human body, automatic control within an engineering system, predator-prey interactions in an ecosystem or policy responses within government. Although the systems differ greatly, each involves organised causal interactions that influence subsequent behaviour.

Similarly, the idea of emergence applies across many domains. Individual electronic components produce the behaviour of a computer, individual musicians produce the performance of an orchestra, and individual citizens collectively generate the behaviour of a society. In every case, new properties and capabilities arise from organised interactions rather than from the individual components acting alone.

Provenance and Links

General Systems Theory was established during the twentieth century as an interdisciplinary approach to understanding the common organisational principles found across diverse systems. While individual disciplines continue to develop specialised theories and methods, General Systems Theory provides a shared conceptual framework that facilitates comparison, communication and the transfer of ideas between fields of study.

Practical Exercise

Choose two systems from different disciplines, for example a biological organism and a business, or a transport network and an ecosystem.

For each system:

- Identify its principal components.
- Describe the main causal interactions.
- Explain how emergent properties arise.
- Describe one example of system behaviour.
- Identify one aspect of its dynamics.

Finally:

- Identify the organisational principles that the two systems have in common.
- Explain how General Systems Theory helps you compare these systems without ignoring the important differences between them.
- Reflect on how a common systems language might improve communication between specialists working in different disciplines.