



GST 77 – System Behaviour

Formal Description

System behaviour is the observable pattern of changes in the state of a system through time resulting from its organised causal interactions and its interactions with its environment.

System behaviour may be continuous or discontinuous, predictable or unpredictable, stable or unstable, depending upon the organisation of the system and the influences acting upon it.

Plain English Explanation

Systems do not usually remain in exactly the same state. Their properties change as they interact internally and with their environments.

The pattern of these changes through time is called system behaviour.

A system's behaviour is observed by comparing its state at different points in time. For example, the temperature of a room may rise and fall, the speed of a vehicle may increase and decrease, or the population of a town may grow or decline. Each of these represents a pattern of changing states.

Behaviour arises because systems are organised causal organisations. Their components continually interact with one another, while simultaneously exchanging matter, energy and information with their environments. These interactions produce changes in the system's properties, and it is these changing states that we observe as behaviour.

Some systems exhibit highly regular behaviour. The motion of a clock pendulum or the daily cycle of daylight follows predictable patterns. Other systems, such as financial markets, ecosystems or human societies, often exhibit more complex and less predictable behaviour because many interacting processes influence their states simultaneously.

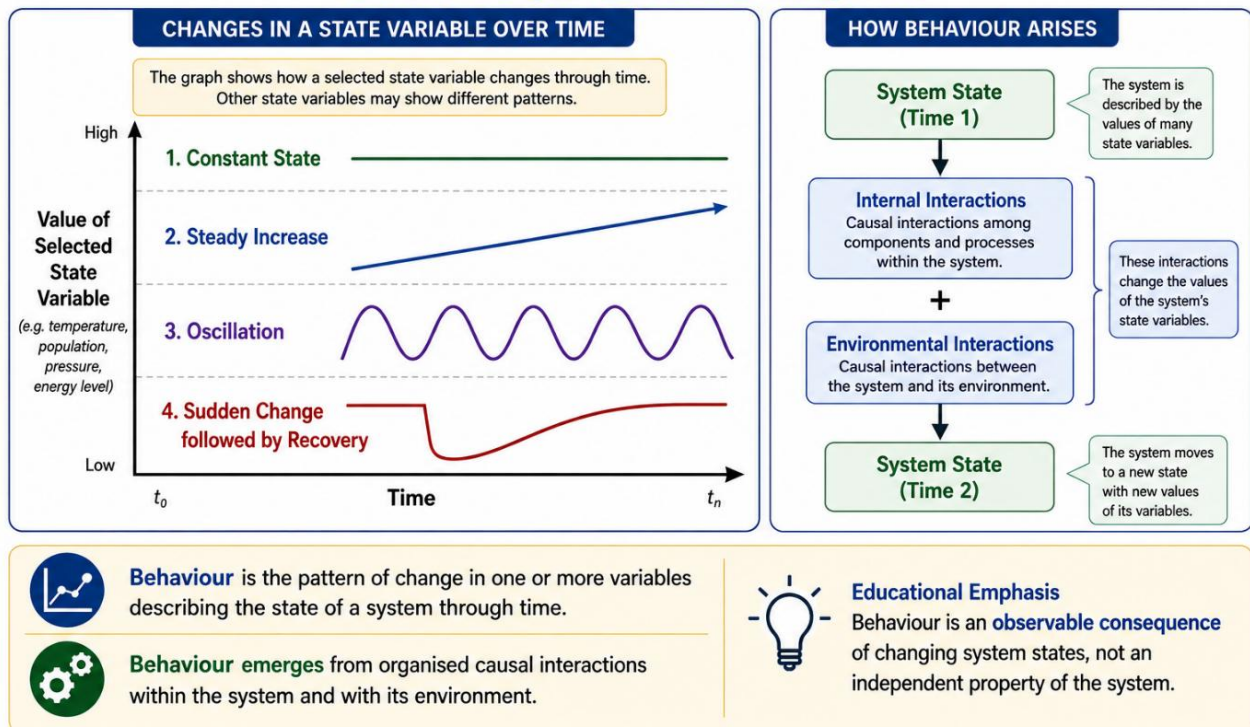
Behaviour may also occur at different levels within a systems hierarchy. A subsystem exhibits its own behaviour while simultaneously contributing to the behaviour of its parent system. The behaviour observed at one level therefore both influences and is influenced by behaviour occurring at other levels of organisation.

Understanding system behaviour allows us to move beyond describing what a system is towards understanding how it changes through time. In the next module we shall examine system dynamics, which seeks to explain the causal mechanisms that generate these patterns of behaviour.



SYSTEM BEHAVIOUR

Patterns of Change in State Variables Through Time



Examples

The behaviour of a central heating system can be observed by measuring the changing temperature of a room over time. As the heating switches on and off, the system passes through a sequence of different states, producing a characteristic pattern of behaviour.

The behaviour of a woodland ecosystem may be observed through seasonal changes in plant growth, animal populations and nutrient cycling. These patterns arise from the interactions of many subsystems operating over different timescales.

The behaviour of a business may be observed through changes in sales, staffing, profitability and customer satisfaction. These changes reflect both internal organisational processes and interactions with the wider economic environment.

Provenance and Links

System behaviour has long been recognised as a central concept within General Systems Theory, cybernetics and systems dynamics. Behaviour is commonly understood as the changing state of a system through time. Within General Systems Theory, these changes arise from organised causal interactions both within the system and between the system and its environment, making behaviour an observable manifestation of the system's underlying causal organisation.



Practical Exercise

Choose a familiar system such as a household, a business, a biological organism or a transport system.

Identify three properties whose values change over time.

For each property:

- Describe how its value changes.
- Explain what internal interactions contribute to these changes.
- Explain what environmental interactions influence these changes.

Finally, describe the overall behaviour of the system and explain how it can be understood as a sequence of changing system states rather than as a collection of isolated events.