



GST 73 – The Input–Process–Output (IPO) Representation

Formal Description

The Input–Process–Output (IPO) representation is a simplified representation of a system that depicts transfers entering a system boundary as inputs, the organised causal transformations occurring within the boundary as the process, and transfers leaving the boundary as outputs. The IPO representation provides a convenient means of representing system function but does not attempt to describe the detailed internal organisation of the system.

Plain English Explanation

As systems become more complex, it is often useful to represent them in a simplified way. One of the simplest and most widely used representations is the Input–Process–Output (IPO) representation.

The IPO representation divides a system into three parts.

- Inputs represent the matter, energy and information entering the system.
- The process represents the organised causal interactions that transform those inputs.
- Outputs represent the matter, energy and information leaving the system.

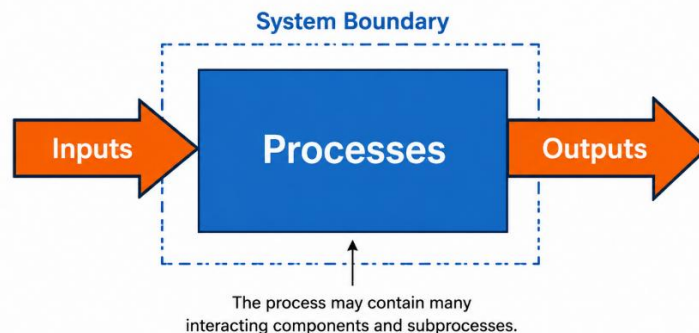
This representation is useful because it focuses attention upon what enters the system, what transformations occur, and what results are produced.

For example, a water treatment plant receives untreated water, energy and control information as inputs. Within the plant, a series of organised processes remove contaminants and produce potable water. The treated water, waste products and operational information then leave the system as outputs.

The IPO representation is intentionally simple. It does not show the detailed interactions between components, feedback mechanisms, internal subsystems or hierarchical organisation. These may require more detailed representations depending upon the purpose of the investigation.

The IPO representation should therefore be regarded as one representation of a system rather than the system itself. Like every representation, it highlights some aspects of reality while simplifying others.

In the next module we shall examine coupling, which considers how systems depend upon inputs obtained from their parent systems and wider environments.



Transfers are real. Inputs and outputs are descriptions of transfers relative to a chosen system boundary.

Examples

A bakery receives flour, water, yeast, electrical energy and recipes as inputs. Through mixing, fermentation and baking, these inputs are transformed into bread, waste materials and heat, which become the outputs.

A university receives students, staff, funding and educational resources as inputs. Through teaching, research and administration, these are transformed into graduates, new knowledge and professional services.

Provenance and Links

The Input–Process–Output representation has been widely used in systems theory, engineering, management and computer science as a simple means of representing functional transformations. Within General Systems Theory it provides a convenient representation of how systems transform transfers entering their boundaries into transfers leaving them, while recognising that more detailed representations may be required for complex systems.

Practical Exercise

Choose a familiar system.

Draw a simple IPO representation.

Identify:

- the principal inputs;
- the principal transformation(s);
- the principal outputs.

Then identify three important aspects of the real system that are **not** shown by the IPO representation.

Finally, explain why the IPO representation remains useful despite these simplifications.