



GST 74 – Coupling

Formal Description

Coupling describes the extent to which a subsystem depends upon a single parent system, rather than the parent system's environment, for the matter, energy and information required for its continued functioning and viability.

Subsystems that obtain most of their essential inputs from the single parent system are closely coupled, whereas those obtaining a greater proportion of their essential inputs directly from the parent system's environment are more loosely coupled.

Plain English Explanation

Systems do not simply exchange inputs and outputs with their environments. They also differ in where those essential inputs come from.

This dependence is described by the concept of coupling.

In much of the systems literature, coupling is described as the degree of interaction or interdependence between systems. While useful, the present treatment adopts a more specific definition. Here, coupling refers to the degree to which a subsystem depends upon a single parent system rather than upon the parent system's environment for the matter, energy and information required for its continued functioning.

A closely coupled subsystem obtains most of its essential resources from a single parent system. An organ within the human body, for example, receives oxygen, nutrients, hormones and control signals through the body itself. Its continued viability depends almost entirely upon the parent system.

A loosely coupled subsystem obtains a greater proportion of its essential resources directly from the wider environment. An independent business, for example, receives customers, materials, finance and labour primarily from the wider economy rather than from a parent organisation. Although it may interact with many other organisations, its viability depends principally upon the external environment.

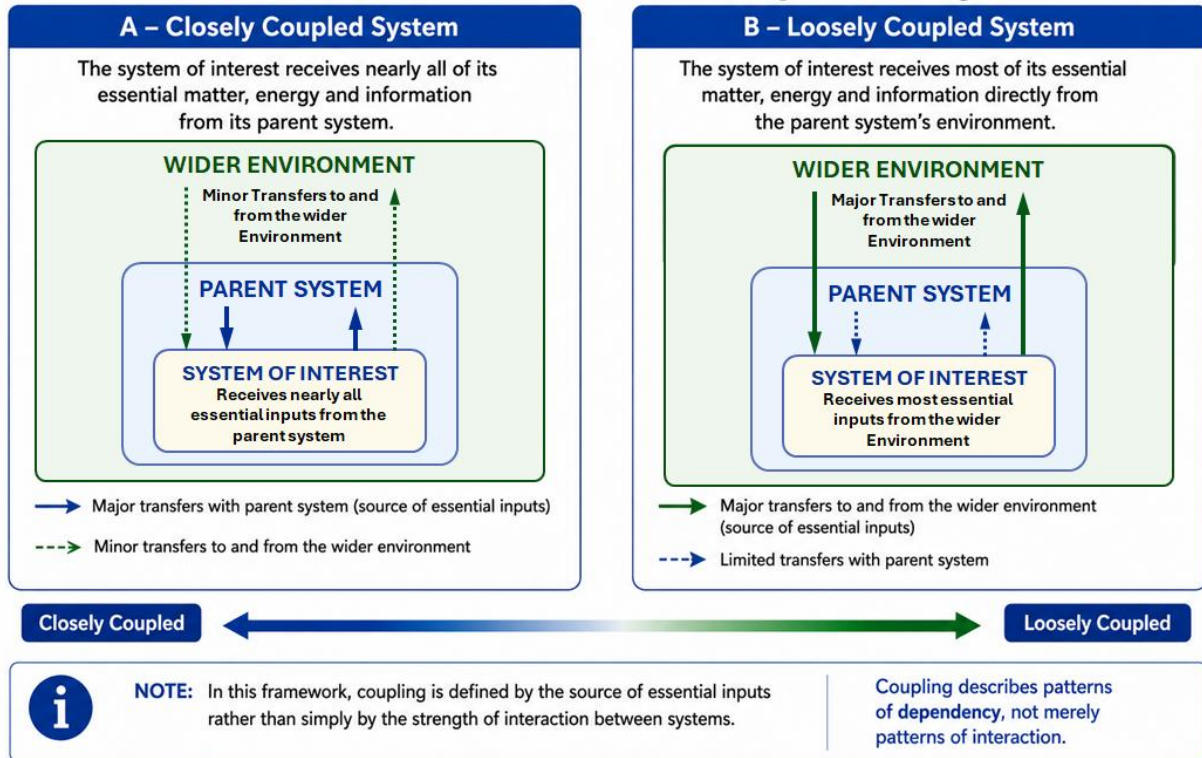
Coupling therefore forms a continuum rather than a simple classification. Some systems are highly dependent upon their parent systems, while others operate with considerable independence. Most systems lie somewhere between these extremes.

Understanding coupling helps explain why different systems respond differently to change. Closely coupled subsystems are often strongly influenced by changes within their parent systems, whereas more loosely coupled systems may be more resilient to changes in their parent systems but more sensitive to changes occurring within the wider environment.

This concept becomes particularly important when investigating social systems, where patterns of dependence frequently determine how organisations, communities and institutions respond to changing economic, cultural and political conditions.



COUPLING: Patterns of Dependency



Examples

A human heart is closely coupled to the body. It receives oxygen, nutrients, hormones and neural control through the body's circulatory and nervous systems. Its continued operation depends directly upon the parent system.

An independent retail business is comparatively loosely coupled. Although it interacts with customers, suppliers and regulators, it obtains most of the resources required for its continued operation directly from the wider economic environment rather than from any parent organisation.

Provenance and Links

Coupling has traditionally been described within systems theory and cybernetics as the degree of interaction or interdependence between systems. The definition adopted here differs by focusing on the source of the essential inputs required for system viability. This interpretation provides a more direct representation of a subsystem's dependence upon its parent system and is particularly useful when analysing nested biological, engineered and social systems.



Practical Exercise

Choose three subsystems from a familiar organisation or biological system.

For each subsystem:

- Identify the essential matter, energy and information required for its continued functioning.
- Determine whether these are obtained primarily from the parent system or from the parent system's wider environment.
- Assess whether the subsystem is closely coupled, moderately coupled or loosely coupled.

Finally, explain how changes within the parent system and within the wider environment would be expected to affect each subsystem differently.