SST-22 Types of Constraint

Consider the same organisation introduced in the previous Module, but now look more closely at what is shaping behaviour.

Some constraints are easy to see. The organisation has a formal structure: reporting lines, procedures, and decision-making processes. These influence how work gets done and who is able to act.

Other constraints are less visible. Shared expectations about what is acceptable behaviour influence how people interact. For example, employees may avoid challenging decisions, even when they recognise problems.

There are also material conditions. Budgets, resources, and external pressures affect what the organisation is able to do.

Finally, individuals differ. People vary in their skills, motivations, and how they interpret situations and make decisions.

Taken together, these different kinds of constraint shape how the organisation behaves. To analyse them effectively, it is useful to distinguish between different types of constraint.

Formal Description

Constraint analysis distinguishes between different types of constraint based on their origin and mode of operation.

At the level of the system and its environment, three primary domains are identified:

- **Material constraints**, arising from physical and environmental conditions, including the availability of resources and other external factors;
- **Structural constraints**, arising from the organisation of interactions within the system, including roles, relationships, communications and material exchanges;
- **Cultural constraints**, arising from shared meanings, norms, values, beliefs, and knowledge that shape interpretation and behaviour.

In addition, constraints operate within system components (agents):

- **Biogenic constraints**, arising from the biological nature of agents, defining needs, capacities, and limits required for their functioning;
- **Agentic constraints**, governing perception, interpretation, evaluation, and decision-making processes, mediating how agents respond to other constraints.

These internal and external constraints interact to shape system behaviour and cannot be analysed in isolation. However, in practice, system-level analysis often focuses on material, structural, and cultural constraints, with biogenic and agentic constraints becoming more important at finer levels of analysis.

Plain English Explanation

To understand how a system behaves, it helps to look at different kinds of constraint and to recognise that different kinds of constraint are operating at the same time. These constraints shape what is possible, what is likely, and what is prevented.

Material constraints are the practical conditions surrounding a system, such as resources, tools, infrastructure, and the external environment. They determine what is physically possible. If resources are limited or conditions are unfavourable, certain actions may simply not be achievable, regardless of intentions.

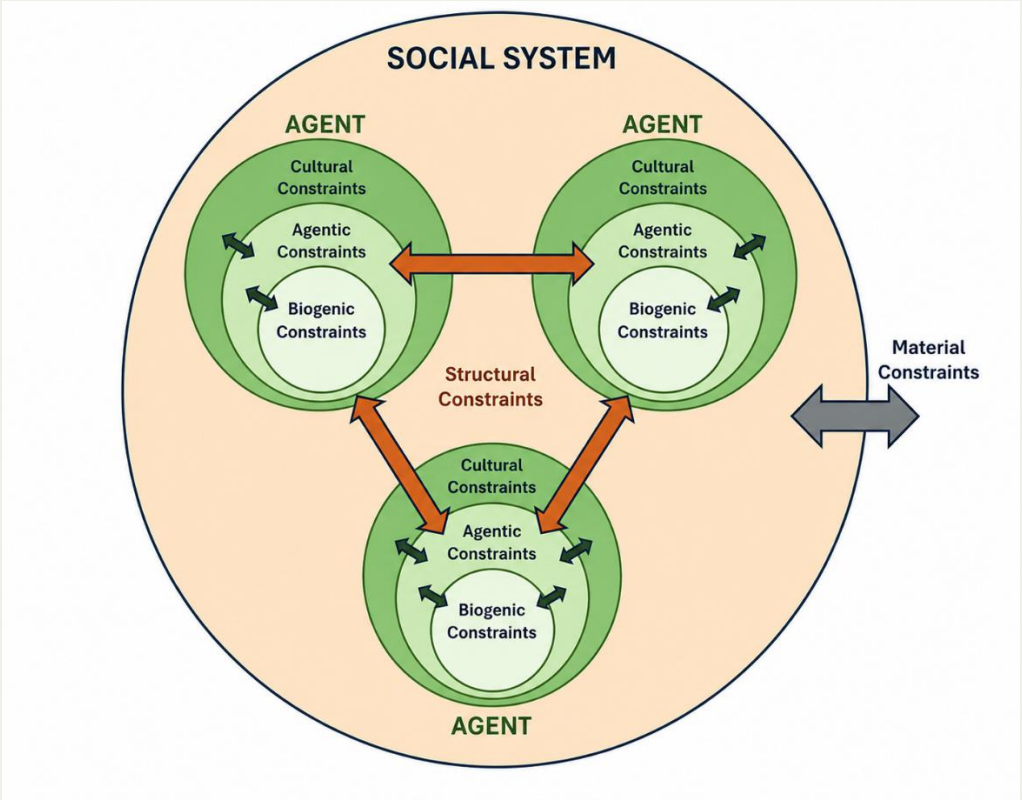
Structural constraints arise from how a system is organised. They include roles, hierarchies, procedures, and patterns of interaction. Structural constraints shape how system components interact by influencing the pathways through which matter, energy, or information can be exchanged. In this way, they affect how actions are coordinated and how processes unfold within the system.

Cultural constraints consist of shared meanings, norms, values, and beliefs. They shape how people interpret situations and what they consider appropriate or acceptable behaviour. Even when resources and structures allow certain actions, cultural expectations may encourage or discourage them.

Biogenic constraints relate to individuals as biological beings. They include needs, capacities, and limitations such as health, energy, and physical or cognitive capability. These constraints affect what individuals are able to do and the conditions required for their continued functioning.

Agentic constraints relate to how individuals perceive, interpret, evaluate, and make decisions. They influence how people respond to the conditions around them. Different individuals may interpret the same situation differently and act in different ways, leading to variation in behaviour within the system.

Taken together, these different types of constraint shape how a system behaves. No single type of constraint is sufficient on its own. Instead, behaviour emerges from the way these constraints combine and interact.



Example 1 – Healthcare System
A hospital introduces a new patient care protocol:

- **Material**: modern equipment is available (enabler)
- **Structural**: complex procedures and approval steps slow implementation (inhibitor)
- **Cultural**: established practices and professional norms discourage deviation from familiar routines (inhibitor)
- **Agentic**: clinicians interpret the protocol differently based on experience and judgement (variation)

Result:
→ Patient care practices vary, not because of a single issue, but due to the interaction of different constraint types

Example 2 – Transport System
A transport network experiences delays:

- Material: limited infrastructure capacity
- Structural: scheduling system creates bottlenecks
- Cultural: norms about priority or usage
- Agentic: operator decisions under pressure

Result:
→ Delays emerge from combined constraint domains

Provenance and Links

This module builds on:

- The constraint framework developed in *Constraint Analysis: A Causal Framework for Understanding and Influencing Complex Systems (Chaloner, 2026)*
- General systems theory (e.g. Ludwig von Bertalanffy)
- Sociological traditions distinguishing structure and culture
- Psychological traditions that integrate internal constraints (biogenic and agentic)

Related concepts:

- Constraint domains
- Internal vs external constraints
- Constraint interaction

Practical Exercise

Think of a system you are familiar with. What is its primary function?

1. Identify one example of each type of constraint and whether it is present or absent:
    - Material constraint
    - Structural constraint
    - Cultural constraint
    - Biogenic constraint (N.B. Biogenic constraints become functional constraints when components are groups)
    - Agentic constraint (N.B. Groups also display agentic behaviour)
2. Briefly describe how each affects behaviour in the system.
3. Reflect:
    - Which type of constraint seems most influential?
    - Do some constraints reinforce or conflict with others?