Definition and Propositions Master List

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Important Note

Please note that this list will be updated from time to time as papers in the General and Social Systems Theory series are published.

PART 1 – GENERAL SYSTEMS THEORY (GST)

GST 01 – Philosophical Foundations of General Systems Theory

Definitions

D1.1 – Cognitive Physicalism

A philosophical position that assumes:

1. everything that exists is physical and located in space–time, and
2. human perception and cognition are limited, requiring simplified representations or models of reality.

Cognitive Physicalism therefore recognises that knowledge of reality is necessarily mediated through cognitive processes that operate within physical systems.

D1.2 – Critical Realism

A philosophical approach which holds that:

1. reality exists independently of human thought or perception (realism), and
2. knowledge of that reality is always mediated by social, cultural, and conceptual frameworks (critical).

Critical Realism distinguishes between three domains:

- **the real** – structures and causal mechanisms that exist independently of observation
- **the actual** – events that occur when those mechanisms operate
- **the empirical** – events as experienced or observed.

D1.3 – Epistemology

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The branch of philosophy concerned with knowledge: its nature, sources, limitations, justification, and validity. Epistemology therefore addresses the conditions under which informational states become beliefs or knowledge.

D1.4 – Ontology

The branch of philosophy concerned with the nature of existence and the kinds of things that exist. Ontology addresses what exists in reality, independent of whether those entities are known or observed.

D1.5 – Epistemic Reflexivity

The property of a theoretical or cognitive system by which it recognises itself as part of the reality it describes. In systems theory, epistemic reflexivity denotes the understanding that knowing, modelling, and theory formation are themselves physical and systemic processes operating within the world they seek to explain.

Propositions

P1.1 – Compatibility Proposition

Cognitive Physicalism and Critical Realism are compatible philosophical positions. Cognitive Physicalism asserts that everything is physical and exists in space–time, while Critical Realism asserts that reality exists independently of our knowledge of it. Together they establish a realist ontology grounded in the physical nature of reality.

P1.2 – Epistemic Complementarity Proposition

Cognitive Physicalism and Critical Realism are epistemologically complementary. Cognitive Physicalism highlights the cognitive limitations of perception and modelling, while Critical Realism emphasises the social and conceptual mediation of knowledge. Together they provide a framework that recognises both the physical basis of knowledge and its interpretive limitations.

P1.3 – Ontological Subset Proposition (GST)

The epistemic domain is a proper subset of the ontological domain. Knowledge, thought, and perception are themselves physical processes occurring in space–time. When accurate, these processes function as internal models of other physical processes, encoding within their informational organisation aspects of the causal structure of the external world.

P1.4 – Probabilistic Future Proposition (GST)

The future is probabilistic rather than predetermined. System trajectories unfold within constraint-defined possibility spaces through branching pathways shaped by contingent interactions among systems and their environments. In systems possessing agency, reflexive decision-making further expands and reshapes these possibility spaces.

GST 02 - The Ontological Foundations of General Systems Theory

Definitions

D2.1 – Space-Time

A single continuum comprising three dimensions of space and one of time.

D2.2 – Physical

Anything that exists within, or constitutes, space-time, including matter, energy, and the fields and structures that occupy or define it.

D2.3 – Metaphysical

Not existing in space-time, i.e. not physical.

D2.4 – Entity (Updated)

Any identifiable portion of physical reality, including objects, fields, relationships, and events.

D2.5 – Boundary

A demarcation that separates an entity from what is not the entity.

D2.6 – Concrete Entity (Object)

A physical entity that occupies a bounded region of space-time and can, in principle, be apprehended as a single entity.

D2.7 – Abstract Entity

A physically instantiated configuration distributed across space-time that cannot be apprehended in its entirety at a single moment. Such entities may be understood either as sets of instances or as characteristics defining those instances.

D2.8 – Collection (Updated)

A plurality of entities considered together on the basis of a shared feature, circumstance, or condition of selection.

D2.9 – Set (Updated)

A collection represented as a single entity.

D2.10 – Aggregation

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The conversion of a collection into a set.

D2.11 – Disaggregation

The conversion of a set into a collection.

D2.12 – Set Duality (Updated)

The principle that the same plurality of entities may be represented either as a collection of constituent entities or as a single set, depending upon analytical perspective.

D2.13 – Configuration (Updated)

The overall spatial, temporal, or spatio-temporal arrangement of a plurality of entities.

D2.14 – Structure (Technical) (Updated)

The overall pattern exhibited by the causal organisation of an assembly or system.

D2.15 – Static Structure (Updated)

Structure that changes little over the period of observation.

D2.16 – Dynamic Structure (Updated)

Structure that changes through time while maintaining an identifiable pattern.

D2.17 – Randomness

Randomness describes variation without recurring organisation. Randomness may occur in the spatio-temporal arrangement of entities or in the causal networks connecting them.

D2.18 – Information (Ontological)

Recurring causally organised structure or recurring organised configuration.

D2.19 – Relationship (Updated)

A physically instantiated circumstance in which one entity may be described with reference to another through either their relative configuration or the transfer of matter, energy, or information between them.

D2.20 – Configurational Relationship

A relationship arising from the configuration (arrangement) of entities in space-time, without transfer.

D2.21 – Causal Relationship

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A physically instantiated process involving the transfer of matter, energy, or information between entities.

D2.22 – Event (Updated)

A temporally bounded causal interaction, or organised set of causal interactions, treated as an identifiable entity.

D2.23 – Network

A group of causally interconnected entities or relationships.

D2.24 – Characteristic (Property)

A feature common to entities used to classify or distinguish them.

D2.25 – Variable (Updated)

A property of an entity whose position on a property dimension may differ between entities or change through time.

D2.26 – State (Updated)

The set of properties and associated values that apply to an entity at a specified time.

D2.27 – Change of State (Updated)

A change in one or more of the properties or values that apply to an entity between specified times.

D2.28 – Continuous Change of State (Updated)

A change of state in which a variable passes progressively through intermediate positions on a property dimension.

Propositions

P2.1 – Space-Time Existence Proposition

Everything that exists does so in a region or regions of space-time.

P2.2 – Empirical Closure Proposition

There is no empirical evidence of any non-physical entity interacting with the physical universe. All observed entities, relationships, and events are mediated through physical processes within space-time.

P2.3 – Abstract Entity Proposition

Abstract entities are physical in existence but cognitively abstract due to the distributed nature of their instantiation and the limits of perception and representation.

P2.4 – Relationship Proposition

Relationships may be configurational or causal; both forms contribute to the organisation of systems.

P2.5 – Transfer Proposition

A causal relationship involves the transfer of matter, energy, or information between entities.

P2.6 – Relationship Ontology Proposition

Relationships are physically instantiated within space-time.

P2.7 – Causal Relationship–Disposition Proposition

A causal relationship involves transfer, whereas configuration does not.

P2.8 – Event Proposition

Every event is a causal relationship actualised in time, but not every relationship is confined to a single event.

P2.9 – Dual Representation of Causality Proposition

Causal processes may be represented either as transfers between systems (process-transfer-process, PTP) or as transformations within systems involving inputs and outputs (transfer-process-transfer, TPT). These are complementary representations of the same causal structure.

P2.10 – Hierarchical Causality Proposition

A causal relationship or process, whether represented in PTP or TPT form, may be decomposed into component causal relationships or processes, which may themselves be represented in PTP or TPT form.

P2.11 – Causal Relationship Composition Proposition

A causal relationship consists of participating entities and the matter, energy, or information transferred between them, forming a physically instantiated process in space-time.

GST 03 The Ontology of Randomness, Structure and Information

Definitions

D3.1 – Pattern

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The observable manifestation of recurring causal organisation, whether structural or configurational. Unless otherwise stated, pattern refers to causal pattern.

D3.2 – Information (Epistemic)

Information as interpreted, processed, or understood by a system, arising from the detection and transformation of physical structure.

D3.3 – Spatio-temporal arrangement

The disposition of entities relative to one another in space-time.

D3.4 – Organised Configuration

The spatio-temporal arrangement of entities arising from causal interaction between them.

D3.5 – Dynamic Configuration

A configuration in which the arrangement of entities changes in a recurring and organised way over time.

D3.6 – Artificial Pattern

A recurring configuration generated through the causal intervention of an agent.

D3.7 – Causal Pattern

A recurring causal network.

D3.8 – Configurational Pattern

A recurring configuration generated by causal relationships between components and constituting a specific manifestation of causal pattern.

D3.9 – Constraint or Condition

Constraints and conditions are complex causal networks delivering multiple enabling or inhibiting inputs to a system, thereby defining the range of behaviours in which the system can or cannot engage. The precise causal mechanisms involved are often unknown, distributed, or analytically impractical to specify directly, requiring simplification through the concepts of constraint and condition. These do not denote fundamentally different ontological categories, but different emphases within organised causal systems. In the case of constraints, the emphasis lies on the range of behaviours excluded or limited. In the case of conditions, it lies on the range of behaviours enabled or permitted.

Propositions

P3.1 – Configuration Possibility Proposition

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A given set of entities may be arranged in multiple configurations within the configurational constraints of space-time.

P3.2 – Randomness Proposition

Randomness consists of variation in configuration or causal organisation that does not give rise to recurring pattern.

P3.3 – Structure Emergence Proposition

Structure arises when entities within a configuration become connected through causal relationships.

P3.4 – Structure–Interaction Proposition

Structure defines the pathways through which causal interactions and transfers of matter, energy, or information may occur between entities.

P3.5 – Organised Configuration Proposition

Organised configurations arise where causal interactions between entities produce recurring or stable configurational arrangements.

P3.6 – Recurrence–Causality Proposition

Recurring pattern requires causal organisation. Configurations can recur only where causal relationships or causal constraints exist that produce their reappearance in space-time.

P3.7 – Pattern Proposition

Pattern is the observable manifestation of recurring causal organisation, whether expressed structurally or configurationally.

P3.8 – Information Proposition

Information consists of recurring causally organised structure or configuration.

P3.9 – Structure–Information Distinction Proposition

Not all structure or organised configuration constitutes information; only recurring structure or organised configuration qualifies as information.

P3.10 – Dynamic Structure Proposition

Structure may persist through recurring configurational or causal change as well as through static continuity.

P3.11 – Information Objectivity Proposition

Information, as recurring causally organised pattern, exists independently of observation, interpretation, or meaning.

P3.12 – Ontological–Epistemic Distinction Proposition

Epistemic information arises through the interpretation of physical information by a system and is distinct from information as an objective feature of physical reality.

P3.13 – Configurational Dependence Proposition

Configurational patterns depend upon underlying causal organisation, even where such organisation is not directly observable.

GST 05 – Foundational Systems Theory

Definitions

D5.1 – Property Dimension

An epistemic representation of the possible positions that entities may occupy with respect to a selected property.

D5.2 – Value

The symbolic representation of the position attributed to an entity on a property dimension at a specified time.

D5.3 – Change

A difference in physical reality through time.

D5.4 – Discrete Change of State

A change of state in which an entity is represented as moving between distinguishable positions or states without intermediate positions being represented.

D5.5 – Interaction

Participation by two or more entities in a causal relationship involving the transfer of matter, energy, or information between them.

D5.6 – Process

An organised causal transformation in which inputs of matter, energy, or information are acted upon to produce outputs of matter, energy, or information.

D5.7 – Transfer

The physical passage or transmission of matter, energy, or information through a causal relationship.

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D5.8 – Assembly

An identifiable entity comprising a plurality of causally interacting constituent entities.

D5.9 – Pre-Systemic Assembly

An assembly possessing organisation and structure but not exhibiting identifiable emergent properties, behaviours, or outputs.

D5.10 – System

An organised assembly exhibiting identifiable emergent properties, behaviours, or outputs and recognised and represented as a whole.

D5.11 – Organisation (Generic)

The network of relationships or interactions that brings entities together into a recognisable whole. This applies equally to aggregates, configurations, assemblies and systems.

D5.12 – Structure (Generic)

The overall pattern or arrangement exhibited by a network of relationships or interactions. Again, this applies throughout the hierarchy.

D5.13 – Organisation (Technical)

The network of causal interactions between the constituent components or processes of an assembly or system.

D5.14 – Static Organisation

Organisation that changes little over the period of observation.

D5.15 – Dynamic Organisation

Organisation whose constituent entities, relationships, or interactions change through time while maintaining an identifiable overall organisation.

D5.16 – System of Interest

The system selected and represented for investigation according to the purpose of the enquiry.

D5.17 – Component

An identifiable entity, process, assembly or system represented as contributing to the organisation, behaviour or outputs of a larger assembly or system.

D5.18 – Sub-system

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A system that forms part of a larger system.

D5.19 – Super-system

A system containing one or more sub-systems.

D5.20 – Parent System

A system containing one or more sub-systems.

D5.21 – Emergence

The process by which the organisation and causal interaction of components gives rise to properties, behaviours, outputs, or causal capabilities that are not exhibited by the components considered in isolation.

D5.22 – Emergent Property

A property arising through emergence.

D5.23 – Emergent Behaviour

A behaviour arising through emergence.

D5.24 – Emergent Output

An output arising through emergence.

D5.25 – System Boundary

The epistemic representation that distinguishes a system of interest from its environment for the purposes of investigation.

D5.26 – Internal

Situated within the boundary of the selected system of interest.

D5.27 – External

Situated outside the boundary of the selected system of interest.

D5.28 – Environment

The set of external causal networks, including assemblies and systems, capable of causal interaction with a system of interest.

D5.29 – Component Environment

The external causal networks capable of interacting with a component.

D5.30 – Parent Environment

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The environment of the component's parent system within which the parent system itself interacts.

D5.31 – Coupling

The degree to which the continued functioning of a subsystem depends upon causal inputs originating within a parent system rather than from other external causal networks.

D5.32 – Close or Tight Coupling

A high degree of dependence upon causal inputs generated within a parent system.

D5.33 – Loose Coupling

A relatively low degree of dependence upon causal inputs generated within a parent system, with greater dependence upon other external causal networks.

D5.34 – Input

Matter, energy, information, components, assemblies, systems, or processes that become available to participate in the causal organisation of a system.

D5.35 – Output

Matter, energy, information, components, assemblies, systems, or processes that become independently available to participate in causal interactions beyond the internal organisation from which they arise.

D5.36 – Internal Process

A process represented as occurring within the boundary of a selected system and participating in its causal organisation.

D5.37 – Input–Process–Output (IPO) Representation

A simplified representation of a system that describes its causal organisation in terms of inputs, internal processes, and outputs, providing a purposeful causal compression of the underlying organisation.

D5.38 – System State

A representation of the condition of a system at a specified time obtained from the values of selected system variables.

D5.39 – System State Change

A change in the representation of a system resulting from changes in the values of one or more selected system variables.

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D5.40 – Behaviour

A representation of the characteristic patterns of state change exhibited by a system through time.

D5.41 – System Dynamics

A representation of the trajectories and longer-term patterns of system behaviour through time.

D5.42 – Stability

A representation of the tendency of a system to maintain or return to characteristic patterns of behaviour following disturbance.

D5.43 – Persistence

A representation of the continued existence of an identifiable causal organisation through time.

D5.44 – Open System

A system that participates in causal interactions with its environment through the exchange of matter, energy, information, components, assemblies, systems, or processes.

D5.45 – Closed System

A system in which one or more forms of causal interaction with the environment are absent or sufficiently restricted for the purposes of analysis.

D5.46 – Isolated System

A system that exchanges neither matter, energy nor information with its environment.

D5.47 – Experimental Closure

The deliberate restriction or control of causal interactions between a system and its environment in order to investigate selected causal mechanisms under defined conditions.

D5.48 – Analytical Closure

The deliberate restriction of the causal interactions represented within an explanation in order to simplify analysis while preserving those relationships considered relevant to the analytical purpose.

D5.49 – Relative Openness

The extent and character of the causal interactions between a system and its environment with respect to particular forms of exchange and a specified analytical purpose.

D5.50 – Outcome

A resulting state or condition arising from the participation of one or more outputs in subsequent causal interactions.

D5.51 – Function

The contribution made by the activity of a component, process, or system to the behaviour, persistence, capabilities, or outcomes of a wider organisation.

D5.52 – Functional Relationship

A causal relationship by which the activity of a component, process, or system contributes to the behaviour, persistence, capabilities, or outcomes of a wider organisation.

D5.53 – Intrinsic Purpose

A desired future state or outcome represented by an agent and used to guide behaviour intended to realise that state or outcome.

D5.54 – Attributed Purpose

A purpose assigned to a system by an observer as an explanatory or interpretative representation, irrespective of whether the system itself has that purpose.

D5.55 – Purposeful System

A system capable of representing one or more desired future states or outcomes and modifying its behaviour in an attempt to realise them.

D5.56 – Representational Role

A representational role is the manner in which an entity or process is represented within a particular investigation, such as the system of interest, a subsystem or a component. Representational roles depend upon the explanatory purpose of the investigation and do not alter the underlying causal organisation of reality.

Propositions

P5.1 – Ontology and Representation
Systems theory distinguishes between ontological causal organisations existing independently of observation and the epistemic representations used to describe and investigate them.

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P5.2 – System–Process Equivalence
A system and a process may represent the same causal organisation viewed from different analytical perspectives. A system emphasises organisation, while a process emphasises causal interaction and transformation.

P5.3 – Ontological Primacy
Physical reality consists of entities and the relationships between them. Systems theory represents this organisation rather than creating it.

P5.4 – Progressive Organisation
Collections, configurations, assemblies, organisations and systems represent progressively greater degrees of organisation.

P5.5 – Progressive Representation
General Systems Theory represents progressively richer organisation through progressively richer conceptual representations.

P5.6 – Emergent Systems
A system emerges when organised causal interactions produce properties, behaviours or outputs that are not exhibited by its interacting components in isolation.

P5.7 – Emergent Causation
Emergence gives rise to new causal capabilities that are not available to the interacting components considered in isolation.

P5.8 – Recursive Organisation
Systems are recursively organised such that they may comprise interacting subsystems while simultaneously functioning as components of larger systems.

P5.9 – Analytical Perspective
The same portion of reality may be represented as a collection, configuration, assembly, component, subsystem, process or system according to the analytical purpose of the investigation and the causal organisation relevant to that investigation.

P5.10 – Boundary Relativity
System boundaries are analytical representations selected for a specified purpose rather than intrinsic features of reality.

P5.11 – Environmental Relativity
The environment of a system comprises the external causal networks capable of interacting with it and is represented relative to the boundary and analytical purpose of the investigation.

P5.12 – Relative Openness
Openness and closure depend upon the particular exchanges being considered rather than applying uniformly to all interactions.

P5.13 – Coupling Principle
The degree of coupling of a subsystem determines the relative importance of the external causal networks upon which its continued functioning depends and therefore influences the most appropriate representation of its environments.

P5.14 – Functional Emergence
Functions arise from organised causal interactions and therefore belong to systems rather than isolated components.

P5.15– Purposeful Behaviour
Purposeful behaviour occurs only in systems capable of representing desired future states and modifying their behaviour accordingly.

P5.16 – Representational Selection Principle

The representation of an entity within a systems investigation should be chosen according to the explanatory relevance of its emergent properties, behaviours or outputs to the system of interest.

P5.17 – Ontological Invariance Principle

Changing the representation of an entity from system to subsystem or component does not alter the underlying reality. It changes only the level of causal organisation explicitly represented within the investigation.

GST 06 Foundational Causality

Definitions

D6.1 – Cause and Effect
Cause and effect are epistemic roles attributed to causal phenomena when portions of causal reality are represented for explanatory purposes.
The same causal phenomenon may therefore be represented as an effect in relation to preceding causality and as a cause in relation to subsequent causality.

D6.2 – Necessary Cause
A necessary cause is a causal contribution without which a specified process or effect cannot occur.

D6.3 – Sufficient Cause
A sufficient cause is a causal contribution, or combination of causal contributions, that provides everything required for a specified process or effect to occur in the absence of sufficient inhibition.

D6.4 – Enabling Cause or Enabler
An enabling cause is a causal contribution that allows a process to operate or an effect to occur.

D6.5 – Inhibiting Cause or Inhibitor
An inhibiting cause is a causal contribution that prevents, restricts or disrupts a process that would otherwise be capable of operating.

D6.6 – Causal Chain
A causal chain is a sequence of causally connected causes and effects in which an effect may subsequently become a cause of a further effect.

D6.7 – Causal Network
A causal network is an interconnected causal organisation of processes and transfers in which causal pathways may branch, converge and interact. It is a physically connected organisation extending through space and time, rather than merely a logical arrangement of causes and effects.

D6.8 – Direct Causation
Direct causation occurs when a cause influences an effect through an identifiable causal interaction without an intervening causal system or event.

D6.9 – Indirect Causation
Indirect causation occurs when causal influence passes through one or more intermediate processes or systems before producing the effect under consideration.

D6.10 – Process–Transfer–Process (PTP) or Event-based Perspective
PTP is an epistemic representation that places a conceptual boundary around two processes and the causal transfer connecting them, thereby foregrounding causal interaction, transfer and change.

D6.11 – Transfer–Process–Transfer (TPT) or Systems-based Perspective
TPT is an epistemic representation that places a conceptual boundary around a process together with its incoming and outgoing transfers, thereby foregrounding the transformation of inputs into outputs.

D6.12 – Causal Structure
An epistemic representation of a recurring pattern of causal organisation recognised within causal networks.

D6.13 – Linear Causality
Linear causality is a causal structure in which a cause produces an effect through a single causal pathway.

D6.14 – Causal Tree
A causal tree is a causal structure in which one cause gives rise to several effects through branching causal pathways.

D6.15 – Causal Root
A causal root is a causal structure in which several causal pathways converge upon a single effect.

D6.16 – Domino Causality
Domino causality is a sequential causal structure in which each effect becomes the cause of the next effect in the sequence.

D6.17 – Cyclic Causality
Cyclic causality occurs when a sequence of causal relationships repeatedly recreates the same types of causes and effects.

D6.18 – Mutual Causality
Mutual causality occurs when two entities or processes causally influence one another.

D6.19 – Feedback
Feedback occurs when an output from a process or system returns, directly or indirectly, as an input that influences the subsequent operation of that process or system.

D6.20 – Cascading Causality
Cascading causality is a causal chain in which each successive stage produces both the next stage in the chain and an additional contribution to a common accumulating effect.

D6.21 – Propagating Causality
Propagating causality occurs when causal effects spread through a connected network, producing further effects that initiate additional causal pathways elsewhere in the network.

D6.22 – Relational Causality
Relational causality occurs when an effect depends upon a relationship or difference between the states of two or more entities rather than upon the state of either considered alone.

D6.23 – Threshold Causality
Threshold causality occurs when an effect is produced only when a relevant variable reaches or crosses a particular value.

D6.24 – Transient Causal Network
A transient causal network is a causal organisation associated with a particular causal episode that develops and subsequently largely ceases to operate.

D6.25 – Persistent Causal Network
A persistent causal network is a causal organisation that continues to operate over an extended period despite changes in its constituent matter, energy, information, processes or components.

D6.26 – Circumstance

A feature of the causal context within which an event or process occurs, which may function as a condition or constraint in relation to that event or process.

D6.27 – Differential Coupling
Differential coupling occurs where causal interactions are more frequent, stronger or faster among some processes than between those processes and others within the wider causal network.

D6.28 – Causal Leverage
Causal leverage occurs where a relatively small causal input of matter, energy or information modifies a process or constraint that regulates a larger independently available causal flow. Leverage may operate through enablement, inhibition or control.

D6.29 – Causal Mechanism
The causal organisation of processes, transfers, conditions and constraints through which a particular effect or behaviour is produced, sustained, modified or inhibited.

D6.30 – Causal Hypothesis
A causal hypothesis is a provisional epistemic representation of possible causal organisation that may account for an observed or anticipated phenomenon and can be tested against causal reality.

D6.31 – Causal Explanation
A causal explanation is an epistemic representation of causal organisation considered sufficiently well supported to account for how or why a phenomenon occurs.

D6.32 – Causal Theory
A causal theory is an epistemic representation of causal organisation believed to recur across a class of phenomena.

Propositions

P6.1 – Physical Instantiation of Causality
Causal influence between separate processes is physically instantiated through transfers of matter, energy or physically embodied information. No causal influence can pass between separate processes without a physical transfer connecting them.

P6.2 – Causal Continuity
Causal reality forms continuing causal networks in which effects may become

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subsequent causes; individual cause-and-effect relationships are therefore portions of a wider causal organisation rather than necessarily independent causal units.

P6.3 – Transfer-Level Necessity
Necessity and sufficiency attach most fundamentally to the causal transfers required by recipient processes: a required transfer remains necessary irrespective of the source from which it originates.

P6.4 – Alternative Source Proposition
Where alternative source processes can provide equivalent necessary transfers, no individual source need be necessary even though the transfer itself remains necessary.

P6.5 – Sufficiency of Complete Enabling Inputs
Where the complete set of necessary enabling transfers is present and no sufficient inhibitor prevents operation, their combination is sufficient for the recipient process to occur and produce the specified effect.

P6.6 – Causal Precedence of Sufficient Inhibition
Sufficient inhibition takes causal precedence over sufficient enablement: a sufficiently inhibiting causal contribution can prevent or limit a process even when its complete set of enabling inputs is present.

P6.7 – Epistemic Probabilism Proposition
An observed probabilistic causal relationship may arise from incomplete knowledge of other necessary enabling or inhibiting causal contributions and therefore does not necessarily imply intrinsically probabilistic underlying causation.

P6.8 – Intervention Opportunity Proposition
As the number of intermediate causal interactions in an indirect causal pathway increases, the number of opportunities for that pathway to be enabled, inhibited, redirected or interrupted also increases.

P6.9 – Causal Representation Proposition
The underlying causal organisation exists independently of its representation, while the causes, effects, boundaries and level of causal detail represented depend partly upon the purpose and granularity of observation.

P6.10 – Alternating Causal Organisation
Extended causal reality can be represented ontologically as an alternating organisation of processes and transfers: … **P → T → P → T → P** ….

P6.11 – Structural Equivalence of Cause and Effect
Because the same causal phenomenon may occupy the relational role of effect with respect to preceding causality and cause with respect to subsequent causality, causes

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and effects within a continuing causal representation should possess compatible causal structure.

P6.12 – Shared-Component Causal Continuity
Successive PTP cause-and-effect units maintain causal continuity by sharing a process, whereas successive TPT cause-and-effect units maintain continuity by sharing a transfer.

P6.13 – PTP Necessity and Sufficiency Proposition
PTP provides the most direct representation of necessary and sufficient causation because causal pathways converge upon recipient processes, allowing required transfers and their alternative sources to be distinguished.

P6.14 – PTP–TPT Systems–Causality Bridge
PTP provides an event-based perspective upon causal interaction, while TPT provides a systems-based perspective upon process functioning; together they provide complementary representations that bridge causal theory and systems theory.

P6.15 – Causal Cognition Hypothesis
TPT may facilitate recognition of recurring patterns in process behaviour, whereas PTP may facilitate explicit logical analysis and decompression of the causal networks through which those behaviours arise.

P6.16 – Persistent Causal Context Proposition
Persistent causal networks provide part of the causal context within which transient events occur and may establish circumstances, conditions, constraints and continuing causal possibilities.

P6.17 – Configuration–Realisation Proposition
Configuration establishes potential causal pathways, while processes and transfers realise particular pathways within those possibilities.

P6.18 – Differential Coupling and System Recognition
Differential coupling can produce relatively coherent concentrations of causal organisation that may be recognised as systems or subsystems despite continuing causal interaction across their boundaries.

P6.19 – Emergence Proposition
Emergent properties arise from the organisation and causal interaction of components and are not exhibited by those components considered independently.

P6.20 – Emergent Entity Transfer Proposition
Entities produced through the organised causal interactions of a source system may themselves be transferred as organised wholes and subsequently participate in further causal interactions.

P6.21 – Causal Leverage Proposition
The causal significance of an input depends upon its location and effect within causal organisation rather than simply upon its physical magnitude; relatively small inputs may therefore produce disproportionately extensive consequences by enabling, inhibiting, controlling or redirecting larger causal flows.

P6.22 – Physical Basis of Agency
Agency can be understood physically as the capacity of an organised system to generate causal transfers that selectively influence subsequent causal pathways.

P6.23 – Causal Decompression Proposition
Causal investigation can progressively decompress recognised associations by identifying and testing the processes, transfers, conditions and constraints through which the represented phenomena are causally connected.

P6.24 – Epistemic Representation Proposition
Hypotheses, explanations and theories are epistemic representations of selected causal organisation rather than causal reality itself; they differ principally in epistemic status, purpose and scope.

P6.25 – Partial Revision Proposition
Because causal hypotheses, explanations and theories represent decomposable causal organisation, evidence may support some components while contradicting others, allowing representations to be progressively revised rather than accepted or rejected only as indivisible wholes.

P6.26 – Recurrence and Explanatory Power
The explanatory reach of a theory depends partly upon the extent to which the causal organisation it represents recurs across instances of reality.

P6.27 – Cross-Domain Explanatory Transfer
Where sufficiently similar causal organisation recurs in different types of system, a theory developed in one domain may contribute to explaining phenomena in another.

P6.28 – Recursive Ontology–Epistemology Proposition
Causal reality gives rise to epistemic representations which, when physically instantiated within agents or other information-processing systems, may themselves participate in causal networks and contribute to subsequent changes in causal reality.

P6.29 – Systems–Causality Reciprocity
Causal organisation helps explain what systems are and how they operate, while systems provide persistent organisations through which causality is realised, maintained and amplified.

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GST 07 – Emergence

GST 08 – Assembly Theory and the Formation of Complex Systems

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GST 09 – Nested Systems and Hierarchical Organisation

GST 10 – Constraints and System–Environment Dynamics

Definitions

DY.x – Viability

Viability is the capacity of a system to maintain its structure and processes and/or proliferate over time under prevailing constraints, through the continued receipt and integration of sufficient causal inputs.

DY.x – Freedom

A freedom is the absence or reduction of inhibiting constraints, permitting a system process or behaviour to occur.

DY.x – Sustainable

A system is sustainable when its interactions with its environment maintain or restore sufficient constraint alignment over time to support its continued viability.

DY.x – Unsustainable

A system is unsustainable when its interactions with its environment progressively reduce constraint alignment, leading to declining viability over time.

DY.x – Configurational Constraints

Configurational constraints define the limits on how entities may be arranged in space-time. They operate at the level of configuration and determine what arrangements are physically possible.

DY.x – Spatial Exclusion Constraint

A constraint whereby no two entities may occupy the same region of space-time simultaneously.

DY.x – Spatial Extension Constraint

A constraint whereby entities occupy finite regions of space-time and therefore possess size and shape.

DY.x – Contiguity Constraint

A constraint whereby causal interaction between entities depends on their proximity in space-time.

DY.x – Topological Constraint

A constraint on the possible relational arrangement of entities, including connectivity, separation, and enclosure, independent of precise spatial distance.

DY.x – Continuity/Discreteness Constraint

A constraint arising from whether entities and configurations are continuous or discrete, affecting how they may be arranged and transformed.

DY.x – Kinematic Constraint

A constraint on how configurations may change over time, including limits on motion and transition.

DY.x – Dimensional Constraint

A constraint arising from the dimensional structure of space-time, limiting possible arrangements and orientations.

DY.x – Boundary Constraint

A constraint whereby entities are defined by boundaries that separate them from their surroundings.

DY.x – Compositional Constraint

A constraint on how entities may be combined or assembled into larger configurations.

DY.x – Causal Constraint

A causal constraint is a causal mechanism that operates on a system through the transfer of matter, energy, or information, enabling or inhibiting particular processes or behaviours.

DY.x – Structural Constraints

Structural constraints regulate the occurrence, form, and persistence of interactions between entities. They operate at the level of structure and determine how causal processes unfold.

DY.x – Threshold Constraint

A constraint whereby a causal interaction occurs only when certain conditions or levels are reached.

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DY.x – Rate Constraint

A constraint on the speed or frequency of causal interactions.

DY.x – Capacity Constraint

A constraint on the quantity or throughput of matter, energy, or information transfer.

DY.x – Directionality Constraint

A constraint on the direction of causal transfer between entities.

DY.x – Feedback Constraint

A constraint arising when the outputs of a process are reintroduced as inputs, influencing subsequent behaviour.

DY.x – Coupling Constraint

A constraint on the strength and organisation of interactions between components.

DY.x – Stability Constraint

A constraint determining whether a structure persists or dissolves over time.

DY.x – Transformation Constraint

A constraint on how inputs are converted into outputs within a causal process.

Propositions

PY.x – Constraint Formation Proposition

Constraints arise from patterns in causal transfers, rather than from individual transfers considered in isolation.

PY.x – Constraint States

Constraints may exist in different states depending on their degree of activation, stability, and influence on system viability:

- **Absent** – not present and no influence
- **Latent** – not active but may arise under certain conditions
- **Precarious** – present but unstable and sensitive to change
- **Entrenched** – stable and persistent over time

PY.x – Constraint-Behaviour Determination

System behaviour is determined by the configuration of constraints acting upon it.

PY.x – Constraint Effectiveness Proposition

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A characteristic of the environment constitutes a constraint only insofar as it effectively alters causal inputs to a system in a way that influences its viability.

PY.x – System–Environment Constraint Transformation Proposition

Systems operate on their environment through the absorption of inputs and the emission of outputs, thereby potentially altering the constraint states of that environment and influencing future system viability.

PY.x – Constraint Dynamics Proposition

Constraints may shift between absent, latent, precarious, and entrenched states as a result of system–environment interactions, thereby altering system viability over time.

PY.x – Constraint Emergence Proposition

Constraints may arise, transform, or become entrenched as a result of system–environment interactions over time.

GST 12 – The Thermodynamics of Information

GST 13 – Energy Landscapes, Configuration Spaces and State Spaces

Definitions

DY.x – Attractor
An attractor is a region or pattern within a system's configuration or state space toward which the system tends to evolve and within which it remains relatively stable over time.

Propositions

PY.x – Constraint–Landscape Proposition

The constraints and freedoms acting on a system determine the structure of its state space, including the location and stability of attractors and the ease of transition between them.

GST 14 – Stability, Resilience and Viability in Systems

GST 15 – System Lifecycle and Evolutionary Dynamics

GST 04 – Systems Linguistics: Representation, Compression, and Productive Coordination

Definitions

D4.1 – Representation
A physical or symbolic state that stands for, models, or corresponds to aspects of reality, enabling a system to recognise, communicate, or reason about them.

D4.2 – Configurational Cognition
The recognition and interpretation of recurring patterns, states, or arrangements without necessarily identifying the causal relationships that generate them.

D4.3 – Causal Cognition
The recognition and interpretation of recurring causal relationships, interactions, transfers, constraints, and processes.

D4.4 – Compression
The simplification of information through the representation of recurring structures, patterns, or relationships in cognitively manageable form.

D4.5 – Causal Compression
The representation of recurring causal organisations in simplified conceptual form.

D4.6 – Configurational Compression
A specialised form of causal compression in which recurring causal organisations are represented through recurring entities, states, or configurations.

D4.7 – Linguistic Compression
The omission or implicit representation of information within language, relying upon contextual reconstruction by the listener or reader.

D4.8 – Linguistic Divergence
The tendency for cultures, disciplines, and individuals to develop different symbolic representations for similar or overlapping concepts.

D4.9 – Hidden Convergence
The persistence of common underlying structures, patterns, or causal organisations beneath apparently divergent representations or terminologies.

D4.10 – Systems Linguistics (Updated)
The systematic study of how systems structures are represented within language and other symbolic forms, including the linguistic structures through which entities, processes, transfers, constraints, feedbacks, and other causal relationships are expressed.

Propositions

P4.1 – Representation Proposition
Representational systems evolve because they assist organisms in recognising, predicting, and responding to recurring aspects of reality.

P4.2 – Evolutionary Reasoning Proposition

Configurational (P), Process–Transfer–Process (PTP), and Transfer–Process–Transfer (TPT) reasoning may represent successive developments in the evolutionary and cognitive representation of causality. P reasoning emphasises recurring entities, states, and spatio-temporal configurations. PTP reasoning emphasises events and interactions and is reflected in much human language. TPT reasoning makes transfers, flows, and transformations explicit and is reflected in systems-theoretical representations of causality.

P4.3 – Compression Proposition
Human understanding depends upon compression because the complexity of reality exceeds the direct processing capacity of cognitive systems.

P4.4 – Configurational Compression Proposition
Configurational compression is a specialised form of causal compression in which underlying causal relationships are represented through recurring entities, states, or patterns.

P4.5 – Emergence–Compression Proposition

Configurational compression frequently corresponds to recurring emergent organisations within reality. The ability of observers to represent complex systems as identifiable entities reflects the tendency of interacting components to form higher-level emergent structures.

P4.6 – Compression Hierarchy Proposition

Causal compression is the more general form of cognitive compression because it represents recurring patterns of interaction, transfer, constraint, and transformation. Configurational compression is a specialised form of causal compression in which recurring causal organisations are represented through relatively stable entities, states, or emergent organisations.

P4.7 – Linguistic Divergence Proposition
Linguistic divergence arises naturally as cultures, disciplines, and individuals develop specialised compressions adapted to different purposes and contexts.

P4.8 – Hidden Convergence Proposition
Despite linguistic divergence, recurring structures within reality and cognition tend to generate recurring representational patterns, producing hidden convergence beneath surface differences.

P4.9 – Translation Proposition
Translation becomes possible where hidden convergence exists between apparently different symbolic systems.

P4.10 – Productive Coordination Proposition
The capacity for productive coordination increases when participants can identify, compare, translate, and integrate complementary representations of shared realities.

GST 04b – Human Comprehension of Complexity (Summary of Part of GST 04)

No New Definitions or Propositions

GST 04c – Productive Coordination

Definitions

D4.11 – Perspective

A perspective is a compressed representation of reality comprising concepts, assumptions, relationships, and explanatory frameworks through which a system interprets, communicates, and reasons about particular aspects of reality.

D4.12 – Systems Translation

The process of translating a proposition, model, or perspective into a common systems idiom by identifying its entities, processes, transfers, constraints, feedback structures, functions, environments, and emergent phenomena where appropriate.

D4.13 – Systems Idiom

A common representational framework used to express systems structures through concepts such as entities, processes, transfers, constraints, feedbacks, functions, environments, and emergence.

Propositions

P4.11 – Perspective Proposition

All perspectives constitute compressed representations of reality that emphasise certain structures, relationships, or processes while omitting others.

P4.12 – Systems Translation Proposition

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Translation into a common systems idiom facilitates comparison by reducing the influence of disciplinary terminology and making underlying causal structures more explicit.

P4.13 – Structural Comparison Proposition

Perspectives that differ in terminology, concepts, or explanatory conventions may be systematically compared through their underlying entities, processes, transfers, constraints, feedback structures, functions, scales, and temporal horizons.

P4.14 – Productive Co-ordination Outcome Proposition

Systematic comparison of perspectives may reveal relationships of equivalence, complementarity, nesting, difference of level, contradiction, or independent utility.

P4.15 – The Scaling Principle of Productive Co-ordination
As social systems increase in scale and specialisation, component coupling generally becomes looser and knowledge becomes increasingly fragmented. Consequently, maintaining system viability depends upon progressively more sophisticated forms of productive co-ordination.

GST 16 (Prev SST 03f) – Hypothesis Testing

GST 17 (New) – Foundational Systems Linguistics

GST 18 (New) – A General Methodology for Investigating Complex Systems: from Symptoms to Leverage Points

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GST 19 (New) – Validation of General Systems Diagnostics Through Comparison with Mature Investigative Disciplines

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PART 2 – SOCIAL SYSTEMS THEORY (SST)

SST 01 – The Enhanced Morphogenetic Cycle

Definitions

D1.1 – Morphogenetic Cycle

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The Morphogenetic Cycle is a temporally sequenced process through which social structures and cultural systems condition social interaction, and through which the outcomes of that interaction either reproduce existing arrangements (morphostasis) or transform them (morphogenesis).

D1.2 – Morphostasis

Morphostasis refers to the reproduction or maintenance of existing structural and cultural arrangements through social interaction.

D1.3 – Morphogenesis

Morphogenesis refers to the elaboration, modification, or transformation of structural and cultural arrangements arising from social interaction.

D1.4 – External Constraint

An external constraint is a constraint arising from circumstances in a system's external environment, including physical, material, energetic, social, and natural environmental conditions, that define the conditions required for a system to maintain viability.

D1.5 – Structural Constraint

A structural constraint is a constraint arising from the organisation of a system that affects what actions or processes can or cannot occur.

D1.6 – Cultural Constraint

A cultural constraint is a constraint arising from shared symbolic systems (including norms, values, beliefs, knowledge, and symbols) that affects what agents should or should not do.

D1.7 – Need

A need is a condition that must be satisfied for the continuation of processes required to maintain system viability. Needs arise when viability depends on ongoing causal inputs.

D1.8 – Satisfier

A satisfier is a process-maintaining causal input that contributes to the persistence or proliferation of a system. Different satisfiers may fulfil the same underlying need depending on context.

D1.9 – Contra-satisfier

A contra-satisfier is a process-inhibiting causal input that degrades, destabilises, or prevents the persistence or proliferation of a system.

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D1.10 – Alignment

Alignment refers to the condition in which external, structural, and cultural constraints remain broadly compatible, enabling interactions that generate predominantly stabilising feedback.

D1.11 – Misalignment

Misalignment refers to the condition in which external, structural, and cultural constraints conflict or diverge, generating interactions that produce destabilising feedback.

D1.12 – Defensive Filtering

Defensive filtering refers to the psychological process through which agents reinterpret, suppress, or ignore feedback that threatens important needs, identities, or institutional commitments.

D1.13 – Overlapping Social Systems

Overlapping social systems are partially intersecting fields of social interaction in which agents simultaneously participate in multiple structural and cultural environments.

D1.14 – Hierarchical Social Systems

Hierarchical social systems are multi-level organisational structures in which coordinated patterns of interaction emerge at progressively larger scales.

D1.15 – Multi-Scalar Agency

Multi-scalar agency refers to the capacity for coordinated interpretation and action to occur at multiple levels of social organisation, including individuals, organisations, institutions, and societies.

D1.16 – Enhanced Morphogenetic Cycle

The Enhanced Morphogenetic Cycle (EMC) is a systems-based refinement of the classical morphogenetic framework in which social stability and transformation arise through the interaction of external, structural, and cultural constraints, mediated by feedback arising from satisfiers and contra-satisfiers and interpreted by agents operating across multiple organisational scales.

Additional Definitions (Internal Morphogenetic Cycle)

D1.17 – Internal Morphogenetic Cycle

The Internal Morphogenetic Cycle (IMC) is the process through which an individual reflexively evaluates feedback arising from their interactions with the environment and adjusts beliefs, dispositions, or behavioural strategies accordingly.

D1.18 – Behavioural Disposition

A behavioural disposition is a stored pattern of beliefs, habits, expectations, and behavioural tendencies that guide an individual's automatic responses to recurring situations.

D1.19 – Reflexive Evaluation

Reflexive evaluation is the conscious process through which an individual examines the outcomes of their actions and the assumptions underlying their behavioural dispositions.

D1.20 – Positive Feedback

Positive feedback occurs when an individual's behaviour has produced satisfiers or successfully avoided contra-satisfiers.

D1.21 – Negative Feedback

Negative feedback occurs when an individual's behaviour has produced contra-satisfiers or failed to obtain expected satisfiers.

D1.22 – Internal Morphostasis

Internal morphostasis refers to the maintenance of existing behavioural dispositions when feedback indicates that they continue to produce satisfactory outcomes.

D1.23 – Internal Morphogenesis

Internal morphogenesis refers to the modification or replacement of behavioural dispositions following reflexive evaluation of feedback indicating unsatisfactory outcomes.

D1.24 – Automatic Behavioural Response

An automatic behavioural response is an action triggered by previously learned behavioural dispositions without conscious deliberation.

Propositions

P1.1 – Constraint Interaction Proposition

Social stability and transformation arise from the interaction of external, structural, and cultural constraints mediated through social interaction among agents.

P1.2 – Alignment–Morphostasis Proposition

When structural feasibility and cultural legitimacy remain broadly aligned within external limitations, interactions tend to generate satisfiers that reinforce existing structural and cultural arrangements, producing morphostasis.

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P1.3 – Misalignment–Morphogenesis Proposition

When external, structural, and cultural constraints become misaligned, interactions are more likely to generate contra-satisfiers that create pressures for structural or cultural transformation.

P1.4 – Feedback Interpretation Proposition

The effects of satisfiers and contra-satisfiers depend upon how agents interpret the feedback generated through social interaction and whether they trigger reflexive evaluation.

P1.5 – Defensive Filtering Proposition

When feedback threatens important needs or commitments, agents may employ defensive filtering that sustains existing beliefs and institutional arrangements despite the presence of systemic tension.

P1.6 – Overlapping Systems Proposition

Morphogenetic processes occur within overlapping networks of social systems, allowing structural and cultural changes originating in one domain to propagate into others.

P1.7 – Hierarchical Propagation Proposition

Morphogenetic processes propagate across levels of social organisation through hierarchical structures that transmit constraints and institutional arrangements between levels.

P1.8 – Multi-Scalar Agency Proposition

Agents operating at multiple organisational scales, including individuals, organisations, and institutions, participate in morphogenetic processes through coordinated interpretation and action.

P1.9 – Internal Learning Proposition

At the level of the individual, morphogenetic dynamics manifest as a learning process in which feedback generated through interaction leads to adjustments in beliefs, habits, and behavioural strategies.

P1.10 – Organisational Learning Proposition

At the level of organisations and institutions, morphogenetic dynamics manifest as institutional learning processes in which decision structures interpret feedback and implement structural or strategic adaptations.

P1.11 – Multi-Level Morphogenesis Proposition

Social transformation emerges through the interaction of morphogenetic processes operating simultaneously at multiple levels of organisation.

P1.12 – Evolutionary Extension Proposition

The Enhanced Morphogenetic Cycle represents the form taken by adaptive processes once reflexive agency emerges, extending earlier evolutionary mechanisms based on variation and selection through the incorporation of reflexive interpretation and coordinated action.

Additional Propositions (Internal Morphogenetic Cycle)

P1.13 – Automatic Behaviour Proposition

Individuals typically respond to recurring situations through automatic behavioural responses derived from stored behavioural dispositions.

P1.14 – Feedback Generation Proposition

Behavioural responses generate feedback in the form of satisfiers acquired, contra-satisfiers avoided, or failures to avoid contra-satisfiers.

P1.15 – Reflexive Trigger Proposition

Negative feedback, unexpected satisfiers, or repeated failures to obtain expected satisfiers increase the likelihood that individuals will engage in reflexive evaluation.

P1.16 – Internal Morphostasis Proposition

When feedback consistently comprises satisfactory outcomes, individuals tend to retain existing behavioural dispositions, resulting in internal morphostasis.

P1.17 – Internal Morphogenesis Proposition

When reflexive evaluation reveals that existing behavioural dispositions produce repeated contra-satisfiers or fail to secure expected satisfiers, individuals may modify or replace those dispositions, resulting in internal morphogenesis.

P1.18 – Learning Proposition

Learning occurs through repeated cycles of behavioural action, feedback reception, reflexive evaluation, and adjustment of behavioural dispositions.

P1.19 – Defensive Filtering Proposition (Internal)

When feedback threatens important needs, identities, or commitments, individuals may employ defensive filtering that prevents reflexive modification of behavioural dispositions.

P1.20 – Social Feedback Proposition

Because feedback arises primarily through social interaction, individual learning processes are embedded within broader social morphogenetic dynamics.

P1.21 – Morphogenetic Learning Proposition

Morphogenetic learning occurs across multiple levels of organisation, including individuals, organisations, and societies, through the interpretation of feedback arising from interaction with structural, cultural, and physical environments.

SST 02 – The Evolutionary Basis of the Enhanced Morphogenetic Cycle

Definitions

D2.1 – Constraint (Functional Definition)

A constraint influences system behaviour by altering the probability, availability, or effectiveness of causal inputs (including satisfiers and contra-satisfiers), thereby affecting system viability.

D2.2 – Constraint Regulation

Constraint regulation is the process by which systems alter constraint configurations affecting access to satisfiers and exposure to contra-satisfiers.

This may involve:

- Constraint reduction on satisfiers
- Constraint imposition on contra-satisfiers

D2.3 – Agency

Agency is the capacity of a system to regulate constraints affecting its own behaviour in ways that affect its viability.

D2.4 – Reflexive Agency

Reflexive agency is the capacity of a system to recognise and deliberately regulate external, structural, and cultural constraints affecting its own viability.

Propositions

The propositions developed in SST Paper 1 may be understood as domain-specific expressions of the more general principles of constraint regulation described here.

P2.1 – Viability Constraint Proposition

Systems persist and proliferate only insofar as their organisation regulates constraints on satisfiers and contra-satisfiers sufficiently to maintain viability.

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P2.2 – Needs Emergence Proposition

Needs emerge when the persistence of a system depends on ongoing access to satisfiers required for the continuation of viability-maintaining processes.

P2.3 – Constraint Regulation Proposition

Systems whose organisation reduces constraints on satisfiers and imposes constraints on contra-satisfiers are more likely to persist and proliferate.

P2.4 – Emergence Proposition

Emergent properties persist when they alter constraint configurations in ways that improve system viability.

P2.5 – Evolutionary Constraint Regulation Proposition

Evolutionary development proceeds through the successive emergence of properties that enable increasingly effective constraint regulation.

P2.6 – Agency Emergence Proposition

Agency emerges when systems acquire the capacity to regulate constraints affecting their own behaviour.

P2.7 – Reflexive Agency Proposition

Reflexive agency emerges when systems acquire the capacity to recognise and regulate cultural constraints, and thereby to modify structural and external constraints affecting their own viability.

P2.8 – Social Emergence Proposition

Social systems emerge when constraint regulation occurs through coordinated interaction between multiple agents.

P2.9 – Cultural Evolution Proposition

Cultural morphogenesis enables the cumulative modification of cultural constraints affecting system viability.

P2.10 – Evo-Socio Correspondence Proposition

Human organisms and human societies exhibit corresponding organisational properties because both emerged through the progressive regulation of external, structural, and cultural constraints affecting viability.

P2.11 – Morphogenetic Cycle Evolution Proposition

The morphogenetic cycle is the latest evolutionary expression of constraint regulation in reflexive social systems.

P2.12 – Societal Viability Proposition

Societal stability depends on the continued effectiveness of constraint regulation affecting satisfiers and contra-satisfiers. Failure of constraint regulation leads to instability or decline.

P2.13 – Cultural-Biological Evolution Coupling Proposition

Cultural morphogenesis may alter the selective environments affecting biological evolution.

P2.14 – Universal Constraint Regulation Proposition

The regulation of constraints on satisfiers and contra-satisfiers is a universal principle governing the persistence and proliferation of viable systems.

SST 03 – Constraint Analysis: A Causal Framework for Understanding and Influencing Complex Systems

Definitions

D3.1 – Constraint Presence and Absence

Constraint effects arise both from presence (existing enablers or inhibitors) and absence (missing enablers or missing inhibitors), each of which has distinct causal implications.

D3.2 – System-Specific Constraint

A constraint is system-specific, meaning that its enabling or inhibiting effect depends on the nature, structure, and level of organisation of the system to which it is applied.

D3.3 – Constraint Domain

Constraint domains are analytical categories of constraint within social systems comprising:

- external (environmental and resource conditions),
- structural (organisational and interactional arrangements),
- cultural (shared meanings, norms, and knowledge).

Biogenic constraints, which arise from the biological nature of system components and define their fundamental needs and capacities, are treated as a subset of external constraints.

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In addition, agentic constraints operate within agents at the level of decision-making, shaping how conditions are interpreted and actions selected. While not treated as a separate analytical domain, they are conceptually distinct and mediate between biogenic and cultural constraints in shaping behaviour.

D3.4 – Biogenic Constraint

Biogenic constraints are internal constraints arising from the biological nature of system components, defining the needs, capacities, and limits required for their continued functioning. They are typically relatively stable over the timescales of social analysis, although variation across agents or populations may be significant in shaping system behaviour.

D3.5 – Biogenic Constraint Variation

Biogenic constraint variation refers to differences in biological needs, capacities, or limitations across individuals or populations that influence their ability to participate in, respond to, or sustain system processes.

D3.6 – Agentic Constraint

Agentic constraints are internal constraints governing the processes of perception, interpretation, evaluation, decision-making, and action selection within agents. They mediate between biogenic needs, cultural meanings, and structural conditions, shaping how agents respond to the constraints acting upon them.

D3.7 – Agentic Constraint Variation

Agentic constraint variation refers to differences in cognitive capacity, reflexivity, interpretive frameworks, or decision-making processes across agents that influence how they respond to constraints and engage in system interactions.

D3.8 – Epistemic Constraint

An epistemic constraint is a constraint that operates through information and its interpretation, enabling or inhibiting the formation, organisation, or transmission of knowledge.

D3.9 – Internal Constraint Profile

The internal constraint profile of an agent is the combined configuration of its biogenic and agentic constraints, which together shape its capabilities, needs, and patterns of action within a system.

D3.10 – Constraint Intensity (Amplitude)

Constraint intensity is the relative strength of a constraint in shaping system behaviour.

D3.11 – Constraint Rate of Change

Constraint rate of change refers to the speed at which a constraint evolves over time.

D3.12 – Constraint Frequency of Change

Constraint frequency of change refers to how often a constraint is altered.

D3.13 – Attractor (Constraint-Based Interpretation)
In social systems, an attractor may be understood as a relatively stable pattern of system behaviour sustained by a coherent configuration of constraints.

D3.14 – Constraint Analysis

Constraint analysis is a method for understanding system behaviour by identifying and analysing the causal constraints, both external and internal, that enable or inhibit its processes.

D3.15 – Emerging Attractor

An emerging attractor is a potential future stable configuration defined by a coherent arrangement of constraints.

D3.16 – Constraint Reconfiguration

Constraint reconfiguration is the deliberate modification of constraints to alter system behaviour and improve alignment and viability.

Constraint regulation and constraint reconfiguration represent different modes of system adaptation: regulation involves ongoing adjustment within an existing structure, whereas reconfiguration involves deliberate restructuring of the constraint landscape.

D3.17 – Reflexive Constraint Modification

Reflexive constraint modification is the process by which agents identify, interpret, and deliberately alter the constraints that shape their own knowledge or behaviour.

Reflexive constraint modification is the operational expression of reflexive agency, through which agents analyse and deliberately alter the constraints shaping their behaviour.

Propositions

P3.1 – Causality-Constraint Equivalence

Constraints are causally effective conditions that enable or inhibit system processes, either through direct causal transfers of matter, energy, or information, or through configurations that shape the possibility and structure of such transfers.

P3.2 – Enabler-Inhibitor Duality

All system behaviours depend on a combination of enabling conditions and inhibiting constraints.

P3.3 – Presence-Absence Proposition

The absence of enabling conditions is causally distinct from the presence of inhibiting constraints and must be analysed separately.

P3.4 – System Specificity Proposition

A constraint only exists as such in relation to a defined system and level of organisation.

P3.5 – Domain Interaction Proposition

Constraint domains (external, structural, cultural, biogenic, and agentic) interact to shape system behaviour and cannot be analysed in isolation.

P3.6 – Alignment-Stability Proposition

Constraint alignment across domains, together with compatible internal constraints within agents, produces stable attractors characterised by coherent and co-operative system behaviour.

P3.7 – Misalignment-Instability Proposition

Constraint misalignment across domains, or between external and internal constraints, produces instability, conflict, and increased likelihood of transition between attractors.

P3.8 – Temporal Misalignment Proposition

Differences in the rate and frequency of constraint change are a primary source of constraint misalignment.

P3.9 – Asymmetry Diagnostic Proposition

A predominance of lost enabling conditions and accumulating inhibiting constraints is indicative of system stress or transition.

P3.10 – Attractor Transition Proposition

Transitions between attractors occur when changes in constraint configurations disrupt existing alignment and establish new configurations.

P3.11 – Agency Constraint and Alignment Proposition
Constraint changes in social systems may arise from both elite-driven processes, such as institutional decisions or policy interventions, and population-driven processes, such as distributed behavioural or cultural change. Alignment between these sources supports coherent system adaptation, while misalignment contributes to instability and contested outcomes.

P3.12 – Constraint Dominance Proposition

Constraints differ in intensity, and dominant constraints disproportionately shape system behaviour.

P3.13 – Landscape Interpretation Proposition

System behaviour can be understood as movement within a constraint-defined landscape comprising attractors and transitional regions.

P3.14 – Cooperation-Constraint Proposition

Co-operation arises from the exchange of enabling conditions (satisfiers), while conflict arises from the exchange of inhibiting constraints (contra-satisfiers), as agents, through their agentic constraints, seek to satisfy their needs under constraint.

P3.15 – Viability Proposition

System viability depends on maintaining sufficient constraint alignment, through interactions with the environment, to support both stability and adaptability over time.

P3.16 – Open System Proposition

Social systems are open and embedded within larger systems, and their constraints are influenced by external conditions.

P3.17 – Non-Predictive Proposition

Constraint analysis identifies conditions of possibility rather than precise outcomes.

P3.18 – Intervention Proposition

Effective intervention requires the reconfiguration of constraints to restore alignment across external, structural, and cultural domains, taking into account the internal biogenic and agentic constraints that shape behaviour.

P3.19 – Epistemic Attractor Proposition

Epistemic systems exhibit attractors corresponding to stable configurations of knowledge, belief, or interpretation sustained by aligned constraints.

P3.20 – Reflexivity Proposition

In epistemic systems, agents can reflect on and deliberately modify constraints, introducing recursive dynamics in which knowledge influences the conditions of its own formation.

P3.21 – Biogenic Viability and Misalignment Proposition

Biogenic constraints define the fundamental requirements for system viability. Misalignment between these internal constraints and external, structural, or cultural conditions constitutes a direct threat to system stability, as it reflects a failure to sustain the processes necessary for the continued functioning of system components.

P3.22 – Cross-Domain Applicability Proposition

Constraint analysis applies across physical, social, and epistemic systems, with domain-specific constraints emerging from the organisation of each system type.

P3.23 – Agent-level – System-level Constraint Proposition

System behaviour arises from the interaction between constraints operating at the level of the system and internal constraints operating within agents.

P3.24 – Internal Constraint Influence Proposition

Variation in the internal constraint profiles of agents, including both biogenic and agentic constraints, contributes to variation in behaviour, participation, and interaction within social systems.

P3.25 – Biogenic Variation Proposition

Differences in biogenic constraints across agents influence their capacity to satisfy needs and sustain participation in system processes.

P3.26 – Agentic Variation Proposition

Differences in agentic constraints influence how conditions are perceived, interpreted, and acted upon.

P3.27 – Participation Asymmetry Proposition

Variation in agents' internal constraint profiles leads to asymmetries in participation and engagement within system processes.

P3.28 – Constraint Sensitivity Proposition

Agents with different internal constraint profiles respond differently to the same system-level constraints.

P3.29 – Internal Constraint Relevance Proposition

Variation in agents' internal constraint profiles becomes analytically significant where it affects access to satisfiers, system participation, or overall system behaviour and stability.

P3.30 – Aggregation Proposition

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System-level patterns emerge from aggregation of differing agents' internal constraint profiles

P3.31 – Influence and Power Proposition

Variation in agentic constraints contributes to asymmetries in influence and control within social systems, forming a micro-level basis for differences in power.

P3.32 – Interaction Mediation Proposition

Agentic constraints mediate the effects of biogenic, cultural, and structural constraints by shaping how agents interpret and respond to them.

P3.33 – Cultural Transmission Proposition

Cultural constraints are transmitted and reproduced through the structured interactions between system components, as the exchange of information between agents provides the causal mechanism by which shared meanings, norms, and expectations are maintained and propagated.

SST 03b – Social Destabilisation Recurring Patterns of Constraint Misalignment

Definitions

D3.18 — Social Destabilisation

Social destabilisation is the process by which a social system experiences declining viability due to the misalignment of external, structural, cultural, agentic, or biogenic constraints.

D3.19 — Destabilising Mechanism

A destabilising mechanism is a recurring pattern of constraint interaction that tends to reduce system viability by generating or amplifying constraint misalignment.

D3.20 — Constraint Misalignment

Constraint misalignment is a condition in which two or more constraint domains become insufficiently coordinated to support the continued viability of the system.

D3.21 — Constraint Regulation Failure

Constraint regulation failure is a reduction in the ability of a system to accurately perceive, interpret, and respond to changing constraints.

D3.22 — Differential Constraint Change

Differential constraint change is the process by which constraint domains evolve at different rates, generating temporary or persistent misalignment.

D3.23 — Constraint-Mechanism Causality

Constraint-mechanism causality is a form of causal explanation in which recurring patterns of interaction between constraints influence the stability, adaptability, and trajectory of a system.

Propositions

P3.34 — Constraint Misalignment Proposition

Social instability tends to increase as the degree of misalignment between major constraint domains increases.

P3.35 — Differential Change Proposition

Differences in the rate of change between constraint domains tend to generate periods of instability until a new alignment is established or the system loses viability.

P3.36 — Regulatory Capacity Proposition

The ability of a system to maintain viability is positively related to its capacity to perceive, interpret, and regulate changing constraints.

P3.37 — Complexity Regulation Proposition

Increasing structural complexity tends to generate additional coordination requirements, and instability is likely when complexity grows faster than regulatory capacity.

P3.38 — Resource Depletion Proposition

Systems that consume enabling constraints faster than they replenish them tend to experience declining resilience and increasing instability over time.

P3.39 — Feedback Distortion Proposition

As feedback distortion increases, the effectiveness of constraint regulation tends to decline and the risk of maladaptive decision-making tends to increase.

P3.40 — Cultural Coherence Proposition

A viable social system requires sufficient cultural coherence to support productive coordination while retaining sufficient diversity to support adaptation.

P3.41 — Role Allocation Proposition

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The viability of a social system depends upon the continued performance of essential functions through an appropriate allocation and reproduction of roles.

P3.42 — Destabilisation Interaction Proposition

Major social crises typically involve multiple destabilising mechanisms operating simultaneously and interacting across constraint domains.

P3.43 — Constraint-Mechanism Proposition

Recurring patterns of interaction between constraints constitute higher-order causal mechanisms capable of influencing system trajectories, stability, and transformation.

P3.44 — Constraint Regulation Lag Proposition

Social instability tends to increase when the rate of change within one or more constraint domains exceeds the system's capacity for effective constraint regulation.

SST 03d – Social System Diagnostics

Definitions

D3.24 – Systemic Diagnostics

Systemic Diagnostics is a top-down process for assessing system condition through the use of diagnostic indicators and viability dimensions in order to identify areas requiring further investigation.

D3.25 – Diagnostic Indicator

A diagnostic indicator is an observable characteristic of a system that provides information regarding its condition, viability, or performance and may indicate the need for further investigation.

D3.26 – Viability Dimension

A viability dimension is a broad analytical category used to assess a particular aspect of system viability. In this framework, Potential, Flow, Capability, and Flexibility constitute the primary viability dimensions.

D3.27 – Diagnostic Expansion

Diagnostic expansion is the process of progressively disaggregating a general concern regarding system condition into increasingly specific viability dimensions, indicators, and areas requiring investigation.

Propositions

P3.45 – Diagnostic Expansion Proposition

Effective diagnosis proceeds through the progressive disaggregation of concerns regarding system viability into increasingly specific dimensions and indicators capable of directing further investigation.

P3.46 – Diagnostic–Explanatory Complementarity Proposition

Systemic Diagnostics and Constraint Analysis are complementary processes. Diagnostics identifies areas requiring investigation, while Constraint Analysis identifies the constraints and constraint components responsible for observed conditions.

P3.47 – Viability Disaggregation Proposition

Because viability cannot be directly observed, assessment of system viability requires the use of diagnostic dimensions and indicators that provide indirect evidence regarding system condition.

SST 03e – From Diagnosis to Constraint Analysis

SST 03c – Social Systems: Intervention, Governance and Viability

Definitions

D3.28 Intervention

Intervention is the deliberate modification of one or more constraints with the intention of influencing the future behaviour or outcomes of a system.

D3.29 Governance

Governance is the regulation of constraints affecting collective behaviour within a system.

D3.30 Meta-Governance

Meta-governance is the regulation of the constraints affecting governance processes.

D3.31 Viability Principle

The viability principle is the evaluative principle according to which interventions are assessed in terms of their effects on the long-term viability of the systems they affect and the wider systems with which those systems interact.

Propositions

P3.48 Constraint Modification Proposition

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Interventions influence system behaviour primarily through the modification of constraints.

P3.49 Governance Proposition

Governance operates through the regulation of constraints affecting collective behaviour.

P3.50 Governance Function Proposition

The primary function of governance is to regulate constraints in ways that support the viability of the systems it governs and the wider systems with which those systems interact.

P3.51 Reflexive Intervention Proposition

Because intervening agents are themselves components of social systems, effective intervention requires reflexive consideration of the constraints acting upon the intervention process.

P3.52 Multi-Level Viability Proposition

The viability of a system depends not only upon its own persistence and adaptability but also upon the viability of constituent and interacting systems.

P3.53 Leverage Proposition

Relatively small interventions may produce disproportionately large effects when they modify constraints that regulate larger flows of matter, energy, or information within a causal network.

SST 04 – The Emergence of Constraints

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