7ES Framework Systems Glossary

Core System Definition

System
An organized arrangement of components exhibiting input acquisition, output generation, internal processing, behavioral constraints, state information flow, boundary mediation, and environmental context. A system is distinguished from random collections of objects by the presence of all seven fundamental elements working in coordination to create emergent properties and behaviors.

The Seven Universal Elements

Input
Resources, signals, energy, or information that enter a system from its environment, initiating or modifying internal processes. Inputs provide the raw materials or stimuli that enable system function. In biological systems, inputs include nutrients and oxygen. In economic systems, inputs comprise capital, labor, and raw materials. In quantum field systems, inputs consist of particles and energy states entering interaction domains.

Output
The results, products, actions, or signals that a system generates and transmits to its environment or to other systems. Outputs may be tangible products, behavioral actions, information flows, or state transformations. Outputs often become inputs for other systems, creating cascading relationships across scales.

Processing
The transformation or manipulation of inputs within a system to produce outputs. This includes metabolic pathways in biological systems, computational algorithms in digital systems, gravitational dynamics in astrophysical systems, and decision-making processes in organizational systems. Processing represents the core operational mechanism through which systems create value, transform energy, or generate information.

Controls
Mechanisms within a system that guide, regulate, or constrain behavior to achieve desired outcomes or maintain operational parameters. Controls may be internal governance mechanisms or external regulatory constraints. Controls differ from feedback in temporal orientation—controls are proactive constraints embedded in system design, whereas

feedback is reactive information derived from outcomes.

Feedback
The existential or operational state of a system that confirms, regulates, or challenges its coherence and viability. It is the necessary information about a system's relationship with its own operational constraints, manifesting in two distinct modes:

- **Active (Dynamic) Feedback**: An explicit signal or data loop used for correction or amplification (e.g., a thermostat reading, proprioception, a financial report)
- **Passive (Implicit) Feedback**: The mere persistence of the system's structure and function, which serves as continuous confirmation that its processes are within viable parameters

Interface
The boundaries, touchpoints, or interaction modalities between a system and its environment or between subsystems within a larger system. Interfaces mediate exchanges, enforce compatibility standards, and determine whether interaction is possible across system types. Interfaces exist at every scale, from molecular binding sites to cosmic horizons.

Environment
All external conditions, systems, and contexts that interact with or influence the system under analysis. The environment provides resources, constraints, perturbations, and opportunities for system evolution. The environment provides the contextual field in which the system operates and from which it derives meaning and purpose.

Framework Properties

7ES Framework
A universal architecture for analyzing any functional system through seven fundamental elements that collectively describe system structure and behavior. The framework synthesizes existing systems theory concepts into a complete, memorable, and operationalizable structure that applies across all scales and domains.

Fractal Hierarchy
The recursive property of the 7ES Framework where each of the seven elements can itself be understood as a subsystem governed by the same seven-element structure. This creates nested systems within systems, enabling analysis at any chosen level of granularity while maintaining structural coherence.

Recursive Property
The principle that each element within a system can be analyzed as a complete 7ES system in its own right. This enables continuous auditability across scales, from quantum fields to cosmic structures, and provides a mechanism for understanding how micro-level

interactions generate macro-level patterns.

Universal Applicability
The property that all functional systems necessarily contain all seven elements, from the smallest quantum interactions to the largest cosmic structures. This universality claim enables cross-disciplinary analysis using a common functional language.

Mathematical Formalization

7ES Calculus
The mathematical formalization of the framework where a system S is defined as a 7-tuple: S = (I, O, P, C, F, N, E), representing Input, Output, Processing, Controls, Feedback, Interface, and Environment respectively.

Complexity Index (CI)
A metric quantifying a system's organizational complexity, calculated as CI(S) = (number of multi-subsystem elements) / 7. This ranges from approximately 0.57 (for fundamental cosmic systems like the CMB) to 1.00 (maximum observed complexity).

Evolutionary Potential (Φ)
A comprehensive metric measuring a system's capacity for development and adaptation, calculated as Φ(S) = CI(S) × [weighted sum of input diversity, processing efficiency, control stability, feedback responsiveness, interface connectivity, and environmental richness].

Fundamental Principles

Alden Asymmetry Hypothesis (AAH)
The proposition that optimal asymmetries, rather than perfect balance or extreme imbalance, constitute the fundamental creative principle underlying complexity emergence across all natural and engineered systems. Perfect symmetry leads to structural collapse while extreme asymmetry leads to dominance collapse.

Optimal Asymmetry
The specific degree of imbalance or differential organization within a system that maximizes its functionality, resilience, and evolutionary potential. This represents the "goldilocks zone" between stagnant equilibrium and destructive chaos.

Baryon Asymmetry
The fundamental matter-antimatter imbalance in the universe ($\eta \approx 6\times10^{-10}$) that serves as the primordial control parameter enabling all subsequent complexity. This asymmetry represents the universe's first and most fundamental control constraint.

System Types and States

Viability
The capacity of a system to exist independently, adapt to its environment, and manage complexity while thriving in unpredictable conditions. Viable systems maintain their fit with the environment through continuous learning, adaptation, and self-organization.

Viability Set
The set of all states where a system maintains structural and functional integrity. The system's continued existence within this set constitutes passive feedback of its operational coherence.

Autopoiesis
The self-making process through which living systems create and recreate themselves, maintaining their own identity as distinct organisms or organizations. This emphasizes the autonomy and self-organizing nature of living systems.

Complex Adaptive System
A collection of diverse, interconnected entities that adapt and interact with each other, leading to emergent behaviors and patterns. These systems are characterized by their ability to evolve and self-organize in response to environmental changes.

Analytical Concepts

Emergent Properties
Characteristics of a system that arise from the interactions among its parts and could not be predicted or explained solely by examining the parts in isolation. These properties are the product of relationships between elements, not a sum of individual actions.

Leverage Points
Specific areas within a system where focused efforts can achieve the greatest return in relation to objectives. These represent locations of maximum impact potential within the system architecture.

POSIWID
"The Purpose Of a System Is What It Does" - the principle that a system's true purpose can be determined by observable behavior rather than stated intentions. This concept suggests analyzing what systems actually accomplish rather than their designed goals.

Systems Integration
The process of understanding how the seven elements work together as integrated wholes,

recognizing their interdependencies and emergent behaviors rather than treating them as separate components.

Applied Framework Terms

KOSMOS Framework
A comprehensive methodology for systems transformation that integrates the 7ES Framework with regenerative economics principles. KOSMOS provides both analytical tools and practical approaches for creating systems that enhance rather than degrade their environment.

Regenerative Economics
An economic paradigm that designs systems to restore, renew, and revitalize their own sources of energy and materials, operating within planetary boundaries while meeting human social foundations.

Safe and Just Space
An economic operating system that places human wellbeing at its center, operates within planetary boundaries, creates conditions for life to thrive, distributes resources equitably, and regenerates the living world.

Systems Grammar
The 7ES Framework's function as a universal analytical language that enables precise communication about system structure and behavior across disciplines, similar to how grammatical rules enable communication across different topics.

Methodological Terms

Element Mastery
The foundational skill of accurately identifying and analyzing each of the seven elements within any system, understanding their individual functions and characteristics.

Recursive Analysis
The practice of applying 7ES thinking across multiple system scales, examining how elements at one level become systems at another level, enabling multi-scale intervention design.

Subsystem Analysis
The process of determining whether identified elements represent single unified functions, multiple parallel subsystems, multiple sequential subsystems, or hybrid combinations.

Dual-Mode Feedback Analysis

The examination of both active (explicit signals) and passive (systemic persistence) feedback mechanisms within a system to understand its self-regulatory and self-confirming processes.

Legacy and Foundational Terms

The following terms from classical systems thinking remain relevant within the 7ES Framework:

Agency
The ability of an individual or organization to act independently and make decisions that affect themselves or others, representing the capacity for autonomous action within system constraints.

Boundary
The demarcation that separates a system from its environment, determining where control action can be taken and establishing system identity. Boundaries are observer-dependent and purpose-driven.

Dynamics and Loops
The shift from linear cause-and-effect relationships to circular, interconnected ones, emphasizing feedback loops where elements influence each other reciprocally over time.

Holism
An approach that emphasizes viewing systems as whole entities rather than collections of separate parts, enabling understanding of emergence and emergent properties through synthesis rather than analysis.

Mental Model
An individual's cognitive representation of how something works, serving as an internal map of reality created through personal experiences, perceptions, and understandings.

Nested Systems
A hierarchical configuration where smaller systems (subsystems) are embedded within larger ones, creating a tiered organization with systems arranged across various levels of scale.

Pattern
A recurring solution that addresses a specific problem within a particular context, serving as a tool to externalize and share tacit knowledge across various domains.

Perspective
The specific viewpoint from which an individual observes and interprets a system, inherently tied to one's position or context and influencing how elements and relationships are perceived.

Relationship
The connections between system elements—whether causal, correlational, feedback loops, direct, or indirect—that define and shape the elements they link, representing the focus of systems thinking.

Structure
The arrangement of parts within a system, including relationships among them and the rules, laws, procedures, and policies that govern their interactions.

This glossary represents the foundational vocabulary for understanding and applying the 7ES Framework across all domains of system analysis and design.