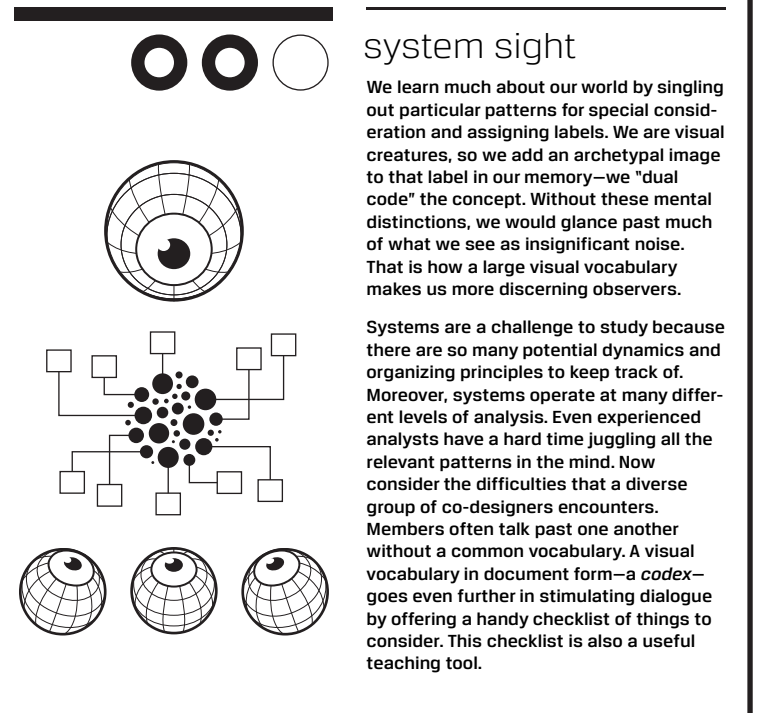
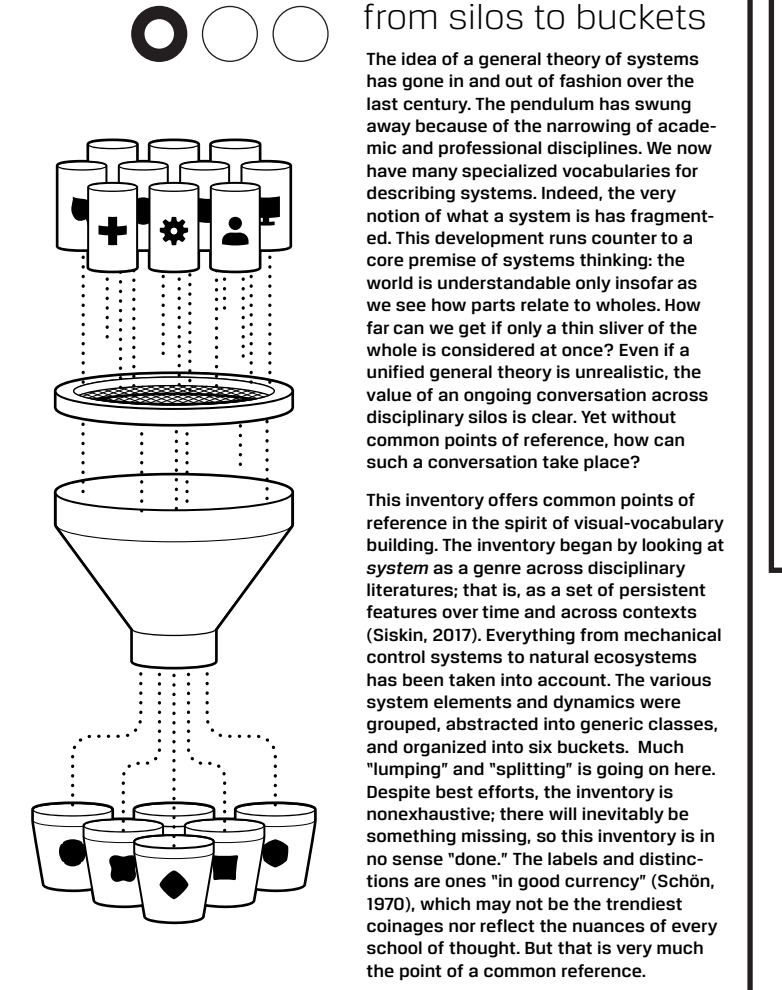


SYSTEM TAXONOMY
 A system element cut across the various literatures about systems. Any holistic discussion of system should touch on each of them.

TYPES OF SYSTEM
 System elements are grouped loosely into three broad categories. The groups are additive (cumulative) and includes simple, complex includes all items.

- 01 DRIVER**
- 02 SIGNAL**
- 03 SHAPE**
- 04 BOUNDARY**
- 05 RETENTION**
- 06 DOMAIN**

- SIMPLE**
- COMPLICATED**
- COMPLEX**



design

- The inventory icons follow a set of visual tropes and stylistic rules. A trope is a non-literal signifier of something. Many of the tropes used are common to both visual and spatial representations. For example, arrows are used for forces, causes, flows, and the like. As another example, the shapes are used for sets. The stylistic rules add further consistency across the set. For example, drivers have a different color and border than boundaries. Plus signals and time delays have different colors. The design rules help maintain coherence as others add to, and adapt, the inventory. The icon building blocks are shown to the left (methodological notes available separately).
- The design begins with outline shapes for each of the six categories. The contrast between shapes is maximized while maintaining equivalent optical volume so that interaction between shapes is similar. Each category represents a major organizing theme running across the system literature. Those who think of systems primarily in terms of "stocks and flows," or "networks and organizing principles," or "signals and boundaries," or "control and perspective" might not find all categories equally useful. That's fine. But users are invited to broaden their conceptual repertoire.
- Each interior icon is not a stand-in for the concept but an evocative instantiation, a prototype, or goal; how it is resolved, balanced, or otherwise ignored affects system.
- CATEGORIES**
- Primitives
 - Complications
 - Lines
 - Frames

usage scenarios

The visual vocabulary has several applications for diverse teams of designers working together through dialogic processes. The "Teamwork Assistant" is a free-form conversation in which everyone can express their own perspective on a system. Several activities can jump-start these conversations and help them grapple with any multifaceted system.

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- ATTRACTOR**
An object that draws other objects toward itself, a bias in favor of an appealing position, object, or state, the value in a growth pole.
- PROXIMATE DRIVER**
A necessary and sufficient cause that directly affects another variable; a cause that is immediately evident in time and space.
- ENABLER**
A contributory cause; can encourage change (promotes), consolidate gains (reinforces) or reduce resistance (enforces).
- CYCLE**
A repeating process or iterative effort towards a goal; a process that recycles or recycling of elements within a system loop.
- OPPOSER**
A factor discouraging or resisting change; counteracting or counterbalancing action; an antibody; an anti-threshold force.
- GENERATOR**
The original impetus or trigger of a sequence of events; a process that initiates or stimulates; a foundational event or seed object.
- MOTIVE**
Underlying motivation of an agent to seek a goal; can be internal (instinct, need) or external (incentive, persuasion, inducement).
- LAG**
A time delay or perceived delay between cause and effect that has implications for system behavior; looseness of timing; latency time.
- OUTLIER**
An atypical case that a system has to handle; a rare edge case; an improbable occurrence or deviation from the norm.
- BRANCHING**
The divergent path of an agent or process; a bifurcation point; a point where factors act in concert or with similar timing.
- DISRUPTOR**
A factor causing a system to change; an external internal contradiction or outside perturbation (Leifvick); a process that disrupts the status quo.
- INFLECTION**
A turning point or critical juncture; a change in direction; a shift in circumstance or a change in perspective; a pivot.
- RECURSION**
Complicated activities broken down into smaller, iterative, repeating actions; propagation through self-referencing repetition.
- ENTRAINMENT**
Changes to an actor apply to a related sub-set of objects; actors caught up in another actor's activities (or aftermath); direct following.
- DISTAL DRIVER**
An indirect, ultimate cause of a changing variable; a "big picture" cause that is evident at a high-level of abstraction.
- CASCADE**
A sequence of knock-on effects; a chain reaction; a succession of second-order, third-order (and so on) shifts.
- GOAL EFFECT**
Evolving objectives or targets, including leading sight of reason d'être, an end state, or a goal.
- DIFFUSION**
A multiplicative effect or diffuse spread; a ripple or visual effect; a widespread distribution of an element throughout a system.
- TENSION**
An opposing tendency or trade-off between two or more goals; how it is resolved, balanced, or otherwise ignored affects system.

- REPELLER**
An object that pushes other objects away from itself; an aversion to an undesirable position, object, or state; a feared driver or harm.
- GOAL SEEKING**
The objective or target of a part of the system; the system itself; even when designed systems, goals may not align perfectly.
- AMPLIFIER**
A combination of factors or process that increases the magnitude of an effect; a source of leverage; to reduce or accentuate.
- DAMPENER**
A combination of factors or process that reduces the magnitude of an effect; a verification; an indicator of error; proof, or momentum.
- ANTICIPATION**
An expectation or prediction of a future happening; an imagined future or scenario; may itself trigger actions, including self-triggering ones.
- CONDUIT**
A path along which actors are expected to move; the medium through which information or possession of qualities needed for interpretation.
- CONTROL POINT**
Control between a subject and an object; a point of influence can be exerted; a time and place where direction is expected.
- SIDE EFFECT**
An indirect result of an action, often unintended, an externality, with benefits or harms not accruing to the causal agent.
- INTERFERENCE**
Signals competing for attention; confusion caused by mixed or conflated signals; potentially harmful dis- and misinformation.
- KLUDGE**
A work-around or coping strategy used to overcome a blockage; a temporary makeshift over-engineering.
- NAVE**
Unevenness (surge or flux) in activity occurring without a combination or set of compensating factors acting in concert or with similar timing.
- PARALLELISM**
Concurrent processes that act in concert; a division of tasks into sub-tasks that are handled simultaneously or concurrently.
- EQUIFINALITY**
Multiple activities lead to the same outcome because of a system dynamic or arrangement of constraints; affect system activity.
- DERIVATION**
Predictable result from a combination or set of compensating factors acting in concert or with similar timing.
- AGGREGATE AGENT**
An indirect, ultimate cause of a changing variable; a "big picture" cause that is evident at a high-level of abstraction.
- CONFOUND**
An unexpected, unwelcome factor persisting in a system; a free radical or ghost in the system; unplanned-for or adaptive difficulties.
- MULTI-CAUSALITY**
An object that may produce different outcomes depending on the state of the system or contextual factors.
- FIELD**
Influence projected from an object that diminishes over space; an intermediate force that acts on others from a distance.
- OBJECTILE**
An object that changes state; a goal; a target; a point of focus; a point of attention; a point of continuation of variation.

- STOCK**
A discrete collection of consumable or expendable resources for future use; the process of developing a new attribute.
- CAPACITY**
The finite ability to handle a particular quantity of activity or items; the optimal volume(s) at which a function operates.
- LOAD**
A stock of items being moved under containment conditions; the controlled transportation or distribution of objects.
- REUNDANCY**
Multiple stockpiles or parallel sub-systems that act as a back-up, safety, or extended capacity.
- ASSEMBLY**
Building blocks with which a system structure is formed; explicitly but not necessarily by design; the integration of materials and components of a system.
- ORDERING**
Putting items into a formal arrangement that serves the function of sequencing or prioritizing items in a process.
- LOAD BALANCING**
Restructuring activity or items to even out capacity in use across a system; shifting burden from over- to under-utilized subsystems.
- EROSION**
The decay of an object due to repeated exposure to a force; a process that wears and tear.
- STANDBY**
Capacity held in reserve until it is needed; often a back-up in or case of surging demand; readiness for activation.
- FAULT**
A malfunction or error that impedes system activities; a problem identification; often unnoticed or creates symptoms elsewhere.
- ECHO**
Inadvertent signal generated by actions; residual signs of presence and activity that get transmitted; data exhaust.
- DIVERSITY WITHIN DIFFERENCES**
Differences within a particular category of object; variation of shared attributes within an otherwise homogeneous group.
- SCALABILITY**
The ability to expand capacity; the construction of increasing capacity to handle volume of processing or traffic.
- ACCUMULATION**
The build-up of items or processes over time; can affect system gradually or once the build-up reaches a threshold; a memory bank.
- TOLERANCE**
Permissible variation in precision or accuracy allowing continued operation; ability to cope with anomalies or faults without interruption.
- MUTATION**
A configuration of an object that is not a direct result of an error or exogenous factor; usually a change that bestows an advantage or disadvantage.
- SEPARATION**
The division of a part into two or more parts; a discrete, conceptual elements from a mixture.
- REPLICATION**
When an object is copied, reproduced, or divided into two or more analogous objects.
- CRITICALITY**
The threshold beyond which a dynamic becomes self-sustaining; a point of no return; necessary for an activity to take place.
- OBJECTILE**
An object that changes state; a goal; a target; a point of focus; a point of attention; a point of continuation of variation.

- TRANSITION**
Changing from one state to another; a change in phases or stages of change; the process of developing a new attribute.
- CONTAINER**
A boundary that groups and isolates objects or a restriction of movement to a confined space or domain.
- SEMI-PERMEABLE**
A barrier that blocks some objects or substances while allowing others to pass through; a filter.
- GATE**
A controlled opening in a barrier; a barrier opening that allows passage of objects that meet certain criteria.
- PROTECTOR**
A barrier preventing damage to an object by blocking or reflecting unwanted forces.
- GAP**
Spatial separation of objects; a distance that prevents mutual exposure or interaction.
- TERRITORY**
The boundaries between control structures; the tendency of like actors to affiliate with like actors through self-organization or management.
- EXPULSION**
Removal of materials, forces, or energy from a bounded space; disposal; exile.
- BUFFER**
A boundary or zone that diminishes, delays, or otherwise alters a driver or its impact while passing through.
- REACTIVE BOUNDARY**
A boundary that responds to forces and acts as an agent in its own right; a boundary of activity.
- LAYER**
The combination of two or more complementary components, each of which may have different functional qualities.
- ABSORPTION**
A barrier that allows passage through at a gradual rate based on a capacity to process or make use of; a process of integration.
- BOUNDARY SHIFT**
The movement or negotiation of a fixed boundary; the expanded handle volume of processing or traffic.
- COMPARTMENT**
Some dynamics within a system are contained in sub-systems or modules, with constrained dynamics across modules; partition.
- BOUND POSSIBILITY**
A mental shift within sub-set of possible states due to material or physical limits; phase states unexplored or deemed prohibitive.
- PERMISSIONS**
The control of activity within a bounded space; formal and informal conditions of access to a domain; bounded activity.
- SCALABILITY**
The ability to expand capacity; the construction of increasing capacity to handle volume of processing or traffic.
- ACCUMULATION**
The build-up of items or processes over time; can affect system gradually or once the build-up reaches a threshold; a memory bank.
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- CLUSTER**
Elements defined as a group by virtue of proximity and coexistence; a neighborhood or conglomeration.
- GROUP**
An affiliated collective of actors that binds patterns of behavior or thinking; a collective acting according to a shared logic (herd).
- DOMINATION**
The continual exertion of power and control over a set of objects or actors; over-riding power across part of domain or system.
- DIFFERENTIATION**
A contrast between other items or actors in a system; exists; attempts to create a niche; progressive specialization.
- INTERSECTION**
The point of contact between two entities; the cross-roads at which actors, forces, ideas, or processes meet.
- COORDINATION**
The orchestration of tasks in the execution of tasks; the tendency of like actors to affiliate with like actors through self-organization or management.
- CHECK**
Cross-regulating actors; keeping activity of opposing actor within an acceptable range (limiting access or bottling deficiency).
- COMPETITION**
Striving in self-interested pursuit of a goal shared by others; acquiring power, status, or resources.
- PROXIMITY**
The process by which affiliated actors become more alike over time; the homogenization produced by self-organizing processes.
- TRADE**
The exchange of something for something else; a trade-off; the connection point between conduits that can be traversed.
- DIRECTED BOUNDARY**
A boundary that functions differently depending on what side it is facing; boundary sides with different qualities.
- COMPARTMENT**
Some dynamics within a system are contained in sub-systems or modules, with constrained dynamics across modules; partition.
- BOUND POSSIBILITY**
A mental shift within sub-set of possible states due to material or physical limits; phase states unexplored or deemed prohibitive.
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- MUTUALISM**
A relationship whereby both parties benefit; reciprocity, or beneficial cooperation; a relationship characterized by positive-sum gains.
- RANK**
The hierarchical status bestowed on an object or actor; vertical ordination based on criterion deemed salient to system operation.
- JOINT**
Capable of compatible connection or transfer between two parts of a system; a functional interface; interoperability.
- SET**
The complete collection of components for a functional assembly; a group of objects necessary for an organizational unit.
- COMMENSALISM**
An arrangement in which one party benefits and the other is unaffected; a relationship in which one party benefits and the other is unaffected.
- HOMOPHILY**
The self-sorting of actors into homogeneous groups; the tendency of like actors to affiliate with like actors over time.
- ASYMMETRY**
Imbalance of power, risk, resources, access, or opportunity; unevenness can cause realignment within the system.
- NITRITY**
A situation whereby one actor copies or simulates the behavior of another; using one type of system as a model for another.
- NETWORK**
An arrangement of interconnected parts that interact directly through common linkages; the connectivity of a system.
- COUPLING**
The tightness or looseness of ties between parts of a system; the degree of freedom of a particular actor in a relationship.
- MEDIATION**
The mitigation or reconciliation of conflicts between parties; adjudication, referee, or resolve tensions in a relationship.
- ALIGNMENT**
Disparate agents or activities given a common direction but not necessarily full synchronization.
- CROWDING OUT**
When the prevalence of one activity or process in a group occupies the finite space that fills capacity.
- FALLOUT**
Recovering from use by others; a process of recovery for an interval; reaccumulation of depleted resources; re-entrainment.
- GOAL SHAPING**
The way an environment influences the goals of actors within, context, and objectives.
- CIRCUMSTANCE**
The conflation of contextual factors and conditions that affect system activities; exigencies to be dealt with in the moment.
- ENTROPY**
The existence of disorder or chaos in a system; sources of disorder within a system and the extent to which they hold sway.
- CROSS-DOMAIN RISK**
A driver in one domain has a knock-on effect resulting in a vulnerability in another domain due to complex inter-connections.
- UNCERTAINTY**
Aspects of a domain that remain unknown or poorly known; outstanding questions that need to be resolved about an aspect of the system.
- CONDITION SHOCK**
Circumstances at the edge of a system that are most important; asking these questions, the hope is to identify blind spots and create new techniques for better expressing systems thinking.
- CRUFT**
The build-up of additions, patches, and work-arounds, many of which cut-off an original purpose; legacy parts or sub-routines.

systems thinking

"It's all very simple," we often told about our messy world just before a clear claim is offered of a chronic problem is "boiled down" and assigned a three-step "solution" by a well-meaning "fixer" or a pundit who has "not" that suddenly turns into a confident read of the situation. All that to say, we become familiar with their qualities. That is how we tune our gaze. It's a daunting task, to be sure. It's easy to get lost in the details. The hope is that this codex makes that learning a little easier.

Before proceeding, it helps to stipulate what is meant by "system." As Donella Meadows puts it, "A system is a set of things—people, cells, molecules, or whatever—interconnected in such a way that they produce their own pattern of behavior over time" (Meadows, 2008). She adds that there is a coherent organization to this set, one intended to achieve something (a function or purpose). This codex surveys many schools of thought on the subject, each with their own definitions. Nonetheless, Meadows' conception is a big enough tent to encompass the various theories, schools, and disciplines that talk about systems.

I started by pooh-poohing the crude simplifications we habitually reach for to explain our world. I should clarify one: the analytical priorities of this codex. I do not have anything against paper-circles and boxers are the products of various systems. Many of systems' difficulties are entangled in far less predictable systems that interact in ways we scarcely understand. The dynamics seem both paradoxical and intricate, perhaps even mysterious. These "wicked problems" are enough to make us throw up our hands in exasperation and settle for long-sighted coping strategies in ways we scarcely understand. This is our attempt to properly tune our way of seeing to adequately grasp how systems affect our lives.

This codex starts from the premise that understanding systems is possible. However, if you are looking for quick and easy guide, you've

visualizing systems

Complex systems are difficult to understand without the aid of visuals. There are too many moving parts to mentally keep track of. The parts interact in too many ways. The whole system is cognitively overwhelming insofar as it cannot be absorbed in its entirety. By asking these questions, the hope is to identify blind spots and create new techniques for better expressing systems thinking.

The reverse side of this codex presents an example of the visual vocabulary in action. The point is to provide a detailed example of how the inventory can be used to analyze a realistic design case. The hope is to further clarify the potential usage scenarios for visualizing systems. The examples will even invite others to use the vocabulary to explore other subjects.

Learn more about the Systemix project and download materials at: www.systemixv.com

The Visual Vocabulary of Systems was designed to complement the Visual Vocabulary of Culture, part of the Culture Reviv project. To learn more visit: www.culturereviv.com

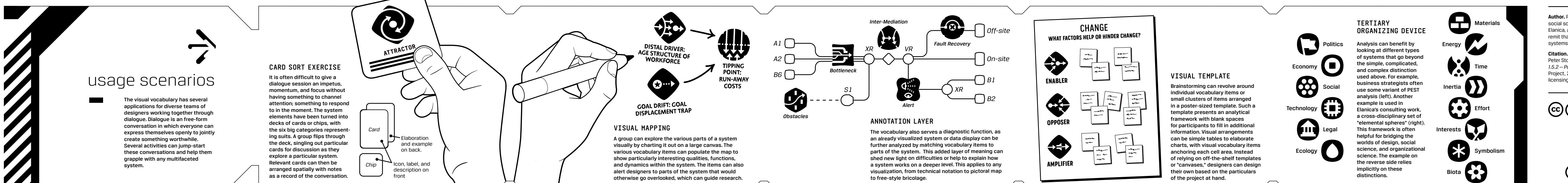
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The visual vocabulary icons, icons labels, and basic descriptions can be used freely by others in compliance with a Creative Commons license. The license only requires attribution, which can be specified as follows: Peter Stoyko, Systemix Visual Vocabulary (www.systemixv.com). Failure to do so is not a violation of the license and is not a condition of use. A package can be downloaded at www.systemixv.com. It contains the icons in vector formats and in high resolution. It also includes a list of icons and their descriptions. It is intended for bridging the worlds of design, science, education, and organizational science. The example on the reverse side illustrates implicitly on these distinctions.

usage scenarios

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