Framing design as conversations about systems
For much of the twentieth century and beyond, much of design was about giving form to objects.
“In most people’s vocabularies, design means veneer. It’s interior decorating. It’s the fabric of the curtains and the sofa.

But to me, nothing could be further from the meaning of design.

Design is the fundamental soul of a man-made creation that ends up expressing itself in successive outer layers of the product or service.”

Steve Jobs
Fortune, January 24, 2000
“...a building cannot be viewed simply in isolation...

In other words structures make sense as parts of larger systems that include human components and the architect is primarily concerned with these larger systems; they (not just the bricks and mortar part) are what the architect designs.”

— Gordon Pask,
“The Architectural Relevance of Cybernetics,”
Architectural Design, 1969
“Design has also evolved from the design of objects both physical and immaterial, to the design of systems, to the design of complex adaptive systems. This evolution is shifting the role of designers; they are no longer the central planner, but rather participants within the systems they exist in.

This is a fundamental shift—one that requires a new set of values.”

— Joi Ito
Director, MIT Media Lab
We are in the midst of a fundamental shift in how we view the world—how we explain it—and how we operate in it.
from Nodes, Nouns Objects, Products to Links, Verbs Relations, Systems
from

Linear causality

e.g., a hand crank generator

to

Cascades, feedback

e.g., cell signaling pathway
from 

**Tree of life**

— Charles Darwin, 1859

**to**

**Web of life**

— V. Kunin, L. Goldovsky, N. Darzentas, and C. A. Ouzounis, 2005

— Manuel Lima, TED Talk, March 2015

http://www.ted.com/talks/manuel_lima_a_visual_history_of_human_knowledge#t-164372
from Hierarchical and closed
to Distributed and open

— See Eric Raymond’s essay, “The Cathedral and the Bazaar”
from Mechanical to Biological
from Industrial age to Information age
This shift encourages us to think in terms of systems—to consider objects, relationships, and wholes.
A system is a set of elements that someone sees as related in some way, often creating emergent properties.

Systems can be

Static or Dynamic

which can be Linear or Closed-loop

which can be Recirculating or Self-regulating

which can be First-order or Second-order

which can be Self-adjusting or Learning

— After Kenneth Boulding
“Synergy means behavior of whole systems unpredicted by the behavior of their parts.”

Buckminster Fuller
Systems are all around us—facts of life we encounter everyday.
The human body is comprised of systems.

- Integumentary system (Skin)
- Skeleton + Muscle systems
- Nervous + Endocrine systems
- Digestive system
- Circulatory + Lymphatic systems
- Urinary system
- Respiratory system
- Reproductive system

Not pictured:
- Immune system
- Metabolic system
The body’s systems are richly connected—in a system of systems.
Systems may be categorized in many ways—
By domain or “content type.”
Systems may be categorized in many ways—
By scale—small or large.
Designers tend to think of systems in formal terms, a theme and rules for variation and extension.
Modernism’s formal principles were codified in a series of books—the classics of design education tend to be systems oriented.
Designers also looked to natural systems for form and structure, producing a growing literature and practice.

Bionics
Biomimetics
Biomimicry
Bio-inspired Engineering
Bio-inspiration
Biognosis
Advances in systems science led to the design methods movement—a direct predecessor of “design thinking.”
The scope of design practice is expanding.

- **Context**: Why are we making this? (Pragmatic)
- **Structure**: What are we making? (Semantic)
- **Form**: How are we making it? (Syntactic)

**Objects**
- Giving form to objects
- Codifying design methods
- Creating systems of rules

**Systems**
- Systems of components (Organisms)
- Spreading design thinking
- Learning from nature (biomimicry)

**Ecologies**
- Systems of systems
- Communities
- Markets

Dubberly Design Office · Framing design as conversations about systems · 21 January 2016
Taking a whole systems approach can make design more resilient.
Stewart Brand connected design and systems.
Stewart Brand connected design and systems—creating a great reading list for grad students.
The shift to systems requires—
not just a new set of values—
but also a **new vocabulary**
and a **new way of working**.
<table>
<thead>
<tr>
<th></th>
<th>from</th>
<th>to</th>
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</thead>
<tbody>
<tr>
<td>Values</td>
<td>Seek simplicity</td>
<td>Embrace complexity</td>
</tr>
<tr>
<td>Designer’s role</td>
<td>Expert/Deciding</td>
<td>Collaborator/Facilitating</td>
</tr>
<tr>
<td>Construction</td>
<td>Direct</td>
<td>Mediated</td>
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<tr>
<td>Stopping condition</td>
<td>Almost perfect</td>
<td>Good enough for now</td>
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<tr>
<td>Result</td>
<td>More deterministic</td>
<td>Less predictable</td>
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<tr>
<td>End state</td>
<td>Completed</td>
<td>Adapting, growing</td>
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</tbody>
</table>
Systems affect many dimensions of design.

- **Connecting** products + services
- **Integrating** across products
- Creating and managing (networked) **services**
- Building a seamless **brand experience**
- Communicating with **consistency**
- Supporting **learning** systems
- Creating **sustainable** businesses (green design)
Products are increasingly **connected to**: 

- Embedded **software**
- The **internet** and web-based applications
- Human **services**
- The **organizations** which develop and deliver the products and services
- **Communities** for which they provide infrastructure
- The **ecologies** in which they cooperate and compete
Thinking in terms of whole systems means:

– Building **relationships** between products
e.g., roadmaps, product lines, platforms, APIs

– **Continuous change** + dynamic development
e.g., stocks, flows, lags, oscillation

– Enabling **feedback**
e.g., goal-action-measure-compare loops

– Adopting **metaphors from nature**
e.g., ecology, evolution, emergence
Three systems ideas you can use tomorrow morning—
in your life, on the job, and in your community.

Dynamic equilibrium

Self regulation

Boot-strapping
Dynamic equilibrium is a state of balance—a resource that stays at the same level even as it flows through a system.
Self regulation is a process of maintaining balance—using feedback to control the resource level, e.g., governing how much flows in or out.
Bootstrapping is a process of self-improvement—studying a basic process to improve it and in turn studying the improvement process to improve it.
A final thought:
The design process can be represented by many forms.
Design is also a process of learning from one another—not just a decision tree, but also a web of conversations.
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