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The Third Era of Design:
Systems—Data, Code, + Conversation

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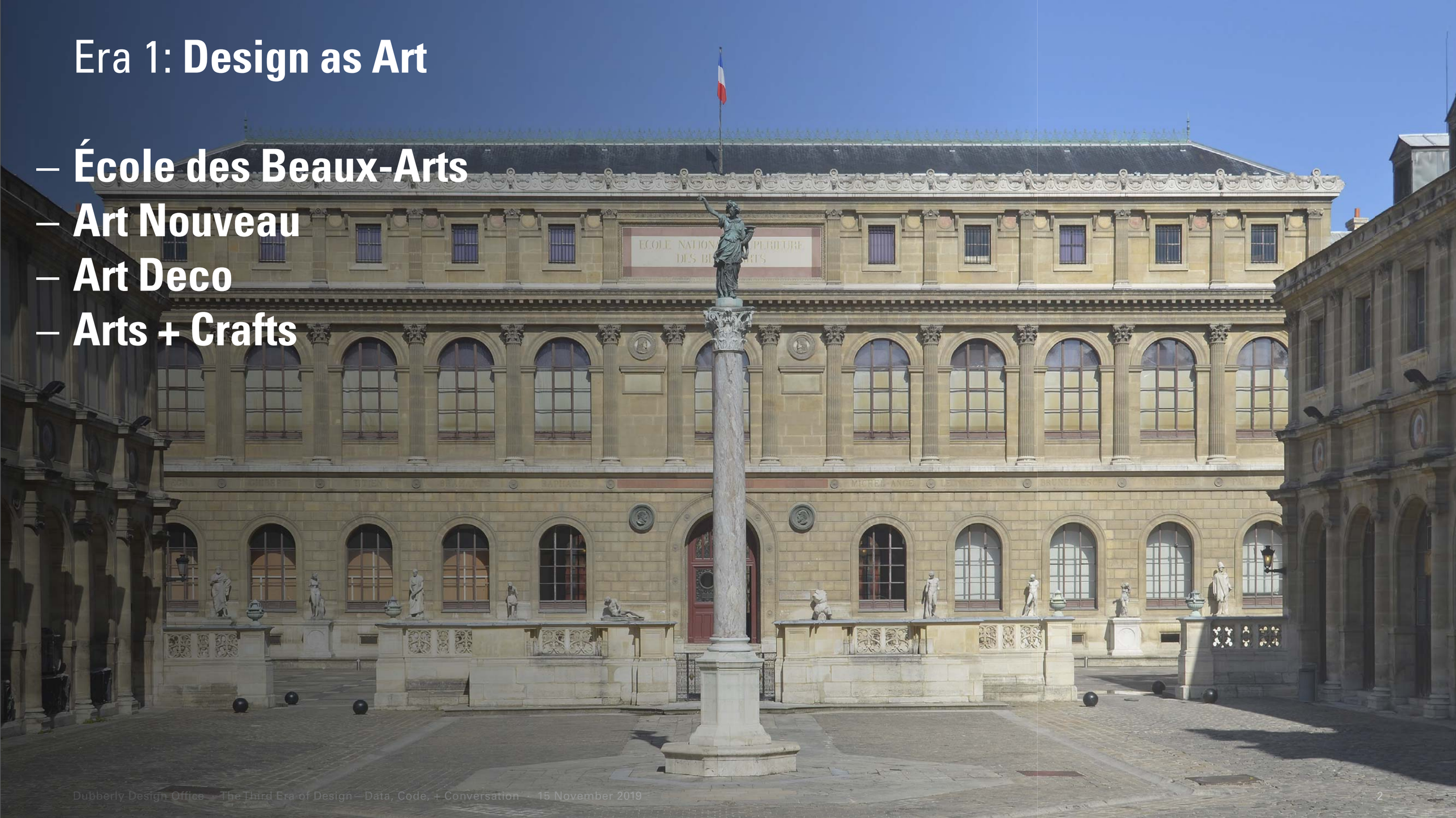
Presentation posted at
http://presentations.dubberly.com/thirdera.pdf

Era 1: **Design as Art**

– **École des Beaux-Arts**
– **Art Nouveau**
– **Art Deco**
– **Arts + Crafts**



Era 2: **Design as Science**

- **Futurism, *Neue Sachlichkeit***
- **Deutscher Werkbund**
- **Bauhaus, Vkutemas, HfG Ulm**
- **Problem Solving / Way Finding**
- **Design Methods / Design Thinking**
- **Design Research / Human-centered Design**

Era 3: **Design as Systems**

- **Smart-connected Products**
- **Platforms, Stacks**
- **Product-service Ecologies**
- **Computational Design**

But Google is not a school.
(Nor is Amazon or Facebook.)

And most design schools are rooted in the last century.

So: Where might be the future of design?

Why not here?


EDITH O'DONNELL
ARTS AND
TECHNOLOGY
BUILDING
EDITH O'DONNELL
ARTS AND
TECHNOLOGY
BUILDING

PART ONE

Origins of Design as Science

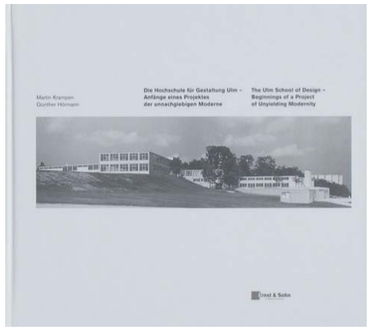
Early modernism began to pose as “objective”.

“The new art is founded not on a subjective, but on an objective basis. This, like science, can be described with precision and is by nature constructive. It unites not only pure art, but all those who stand at the frontier of the new culture. The artist is companion to the scholar, the engineer, and the worker.”

— **El Lissitzky and Illya Ehrenberg**, Statement by the editors of the journal *Veshch,* 1922

The turn to "objectivity" reached a zenith at HfG Ulm.

"In all of us [at HfG Ulm], especially myself, there was a deep dissatisfaction with a didactics (and a design activity) that had appealed only to intuition. In this context an increasing interest in disciplines ... with a heuristic function such as 'problem-solving' and 'decision-making' [showed up]. We were very curious about anything moving in the world that was concerned with scientific questions."



— **Tomás Maldonado**, "Looking Back and Forward: Interview," 2002 [241]

In the 1960s, the frame of "design-as-science" emerged—"problem solving".

"Everyone designs
who devises courses of action
aimed at changing existing situations
into preferred ones."

— **Herbert Simon**, *Sciences of the Artificial*, 1969

Lab coats symbolized “objective” professionalism.

“Unimark designers were the clinicians, diagnosing a client’s problems and then solving them.... Design was scientific and not a messy artistic process. The white lab coat transformed us all into a well-organized team of consistent precise professionals without individuality and quirky intuitions, biases and emotions. Lab coats kept us “clean,” like the “clean” design solutions we sought.”

— **Katherine McCoy,** 2019

Massimo Vignelli + Team (In Lab Coats)

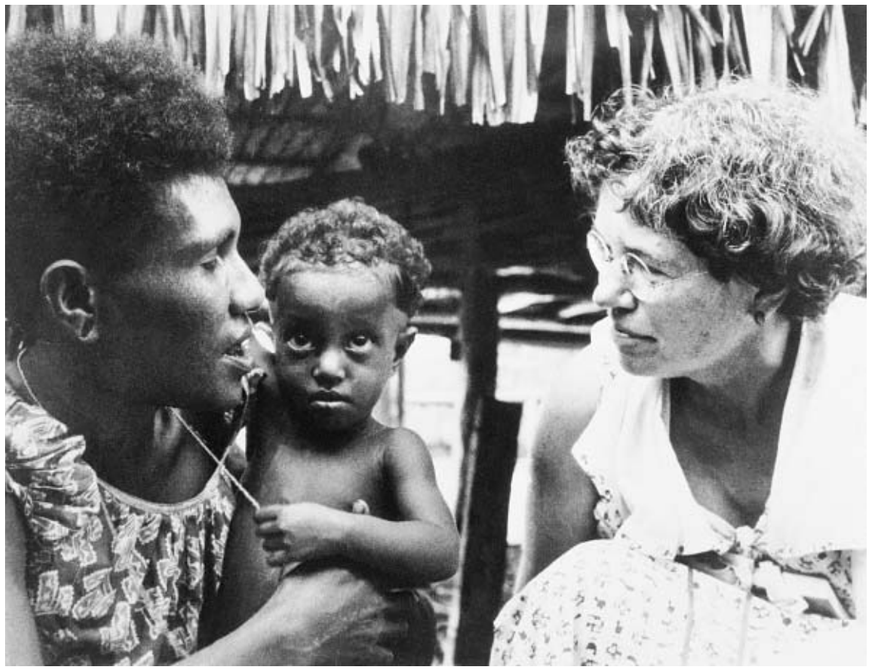
The problem with problems is:

Whose “problem” is it?
Who defines the problem?
Who frames the situation?

Auteur Model of Designing
Doctor – Patient
Master – Apprentice

vs.

Facilitator Model of Designing
Recognizing a “symmetry of ignorance”
Conversation about what we value



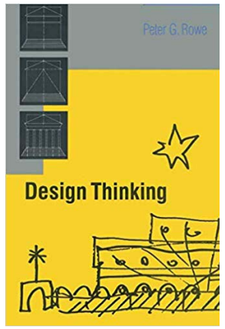
Margaret Mead interviewing a subject.

Not all “problems” are created equal:

Simple: Already defined; need solving — also tame, benign
e.g., 2+2=?, put a man on the moon

Complex: Need definition — also common
e.g., what should we build?

Wicked: Cannot agree on a definition — also mess, tangle
e.g., poverty, Palestine



— **Peter Rowe**, after Horst Rittel

— **Peter Rowe**, *Design Thinking,* 1987 [39]

By the 1970s, critics were writing about the social context of design. The frame of "design-as-rhetoric" began to appear.

"... wicked-problem solving must be understood as an argumentative process: one of raising questions and issues towards which you can assume different positions, with evidence gathered and arguments built for and against these different positions."

— **Horst Rittel**, "On the Planning Crisis: Systems Analysis of the 'First and Second Generations,'" 1972

PART TWO

Origins of Design as Systems

"... a building cannot be viewed simply in isolation.
It is only meaningful as a human environment.
It perpetually interacts with its inhabitants,
on the one hand serving them
and on the other hand controlling their behavior.

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 architects design."

— **Gordon Pask**, *The Architectural Relevance of Cybernetics,* 1967

A matrix of design: the six types

Jay Doblin, 1987

Tangible objects and messages	Sets of coordinated products and the people who operate them	Competing unisystems
Appearance Products Christmas ornaments Medals Trophies	**Appearance Unisystems** Restaurant environment South Street Seaport Disneyland	**Appearance Multisystems** The fashion industry
Performance Products Crowbars Paper clips	**Performance Unisystems** Compact kitchen NASA space mission United Airlines	**Performance Multisystems** The airline industry The computer industry

From “A Short, Grandiose Theory of Design,” STA Design Journal

Era analysis: evolution of design

Joi Ito, 2017

Objects (physical and immaterial)

Systems

Complex Adaptive Systems

"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**, "Design and Science," January 11, 2016

John Maeda has offered a sort of era analysis.

1 **Classical Design**

There is a right way to make what is perfect, crafted, and complete.

2 **Design Thinking**

Because execution has outpaced innovation, and experience matters.

3 **Computational Design**

Design for billions of individual people and in real time, is at scale and TBD.

—Design in Tech Report, 2018

Stephen Anderson says, "The future of design is complexity + computation."

Design 1.0
Product

Design 2.0
Experience

Design 3.0
Outcomes

—https://medium.com/@stephenanderson/the-future-of-design-computation-complexity-a434d2da3cd5

Richard Buchanan proposed “four orders of design.“

1 **Communications** —
a focus on meaning and symbols

2 **Artifacts** —
a focus on form and things

3 **Interactions** —
a focus on behavior and action

4 **Fourth order** —
a focus on “environments and systems in which all other orders exist“

Levels of Systems

the level of **Frameworks**	Only the geography and anatomy of the subject is described and analyzed; a kind of system of static relations. [Most architecture and graphic design systems are of this type.]
the level of **Clockworks**	Machines that are determined.
the level of **Thermostats**	The level of control in mechanical and cybernetical [sic] systems.
the level of the **Cell**	As an open and self-maintaining system, having a throughput that transforms unpredicted inputs into outputs [what Maturana, Varela, and Uribe later called an “autopoetic” system].
the **Genetic** and **Societal** level	Of plants and accumulated cells.
the level of the **Animal**	Specialized receptors, a nervous system, and an “image”.
the **Human** level	All of the previous six—plus self-consciousness. The system knows that it knows, and knows that it dies.
the level of the **Social Organism**	The unit at this level is a role, rather than a state; messages with content and meaning exist, and value systems are developed.
the level of **Transcendental** systems	The “ultimates” and “absolutes” and the “inescapables” with systematic structure.

— Kenneth Boulding, 1956

What is Computational Design?

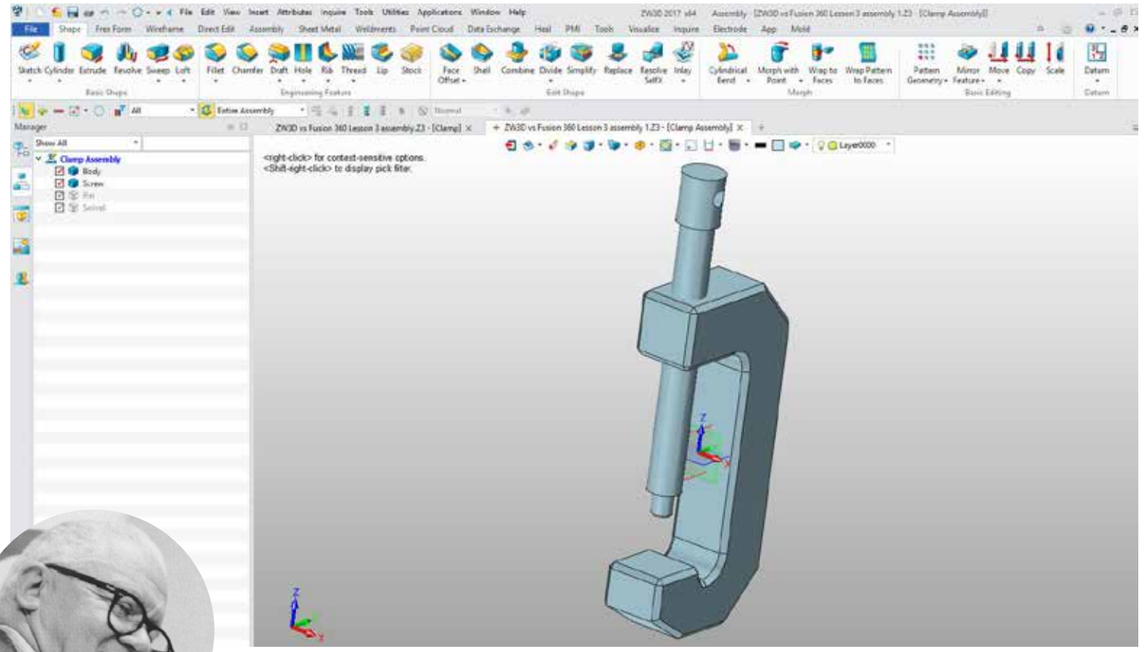
Computing as Designing Programmes, for coherence + flexibility.

Also known as Design Systems
e.g., Google's "Material Design" (System)

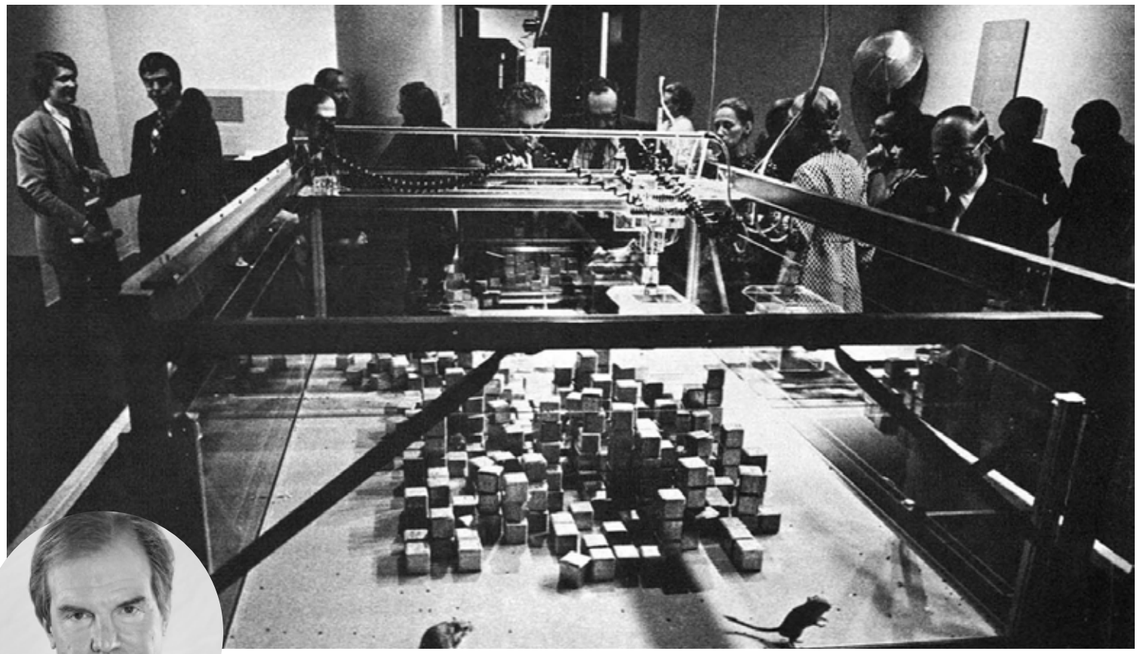
Theme and variation
Elements and rules (for relating the elements)
And meta-rules for adding elements
And meta-meta-rules for changing the rules.

More on Design Systems in a few minutes...

Computing as Tool, augmenting the design process.



Paul Rand

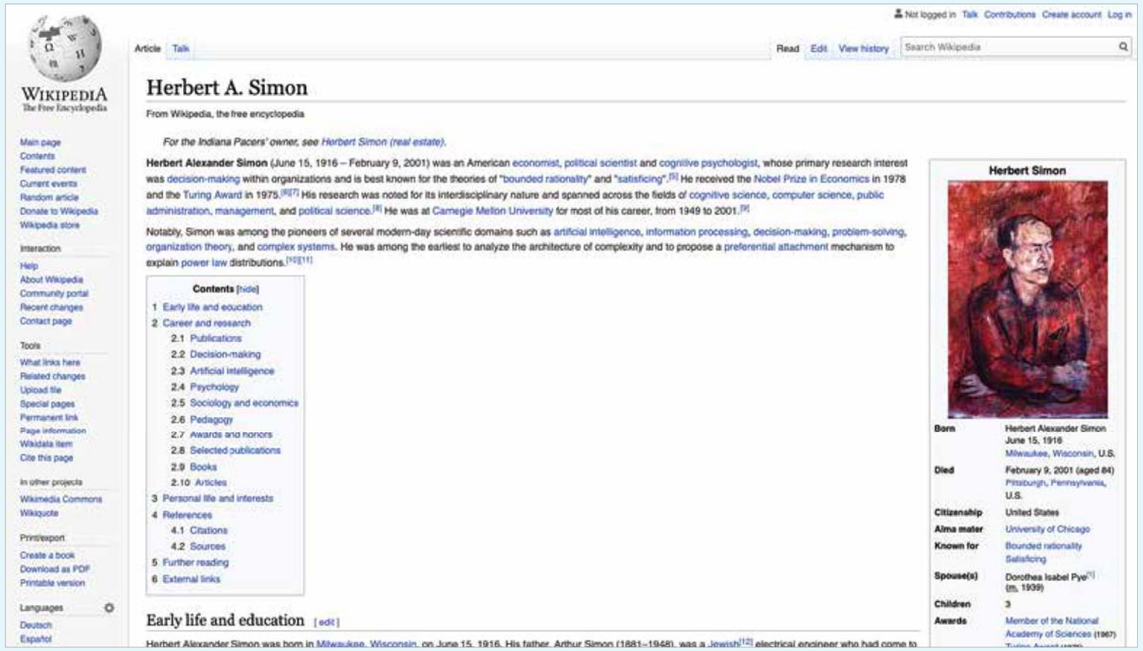


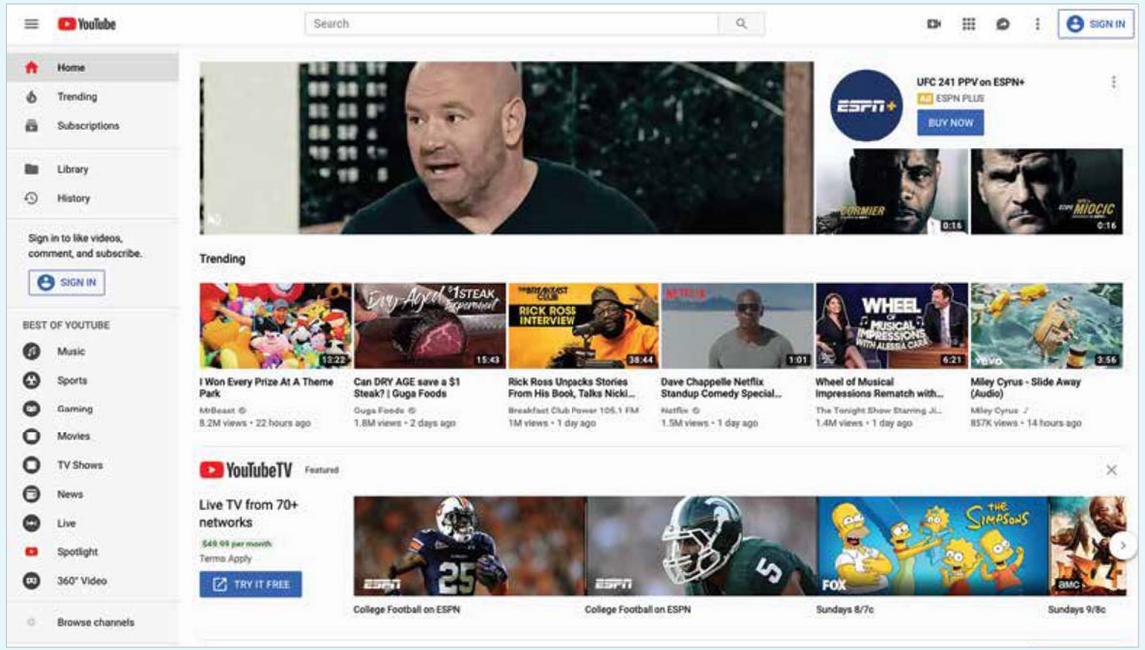
Nicholas Negroponte

From production tool, e.g. AutoCAD

To collaboration partner, e.g. the Architecture Machine

Computing as Medium, for sharing information.

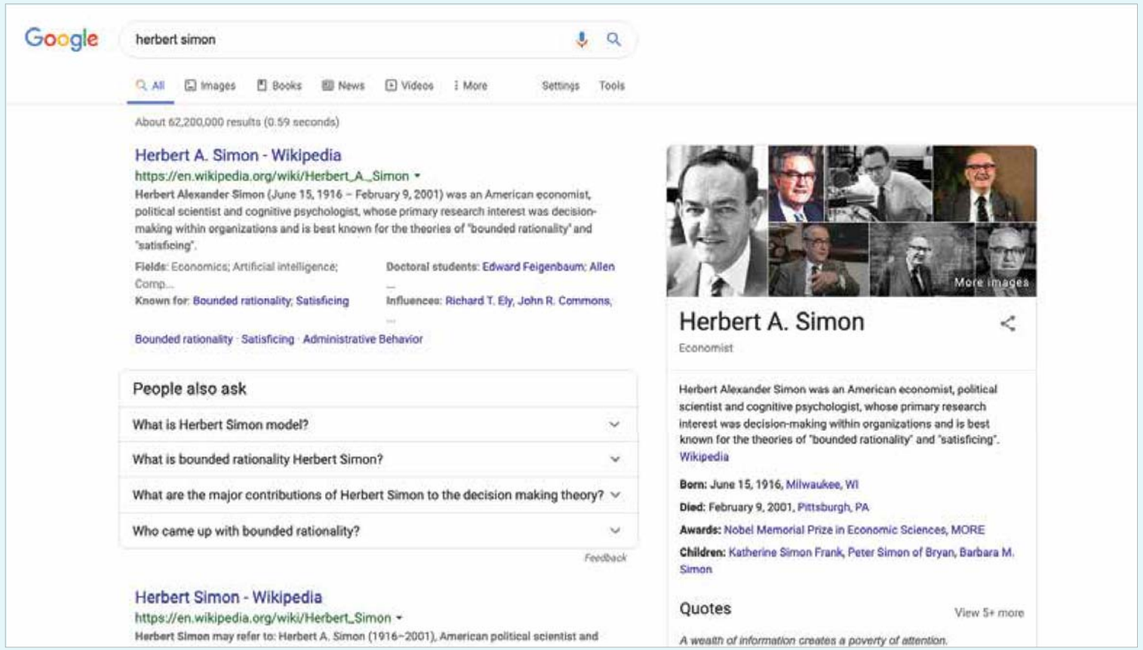




For education

And for entertainment

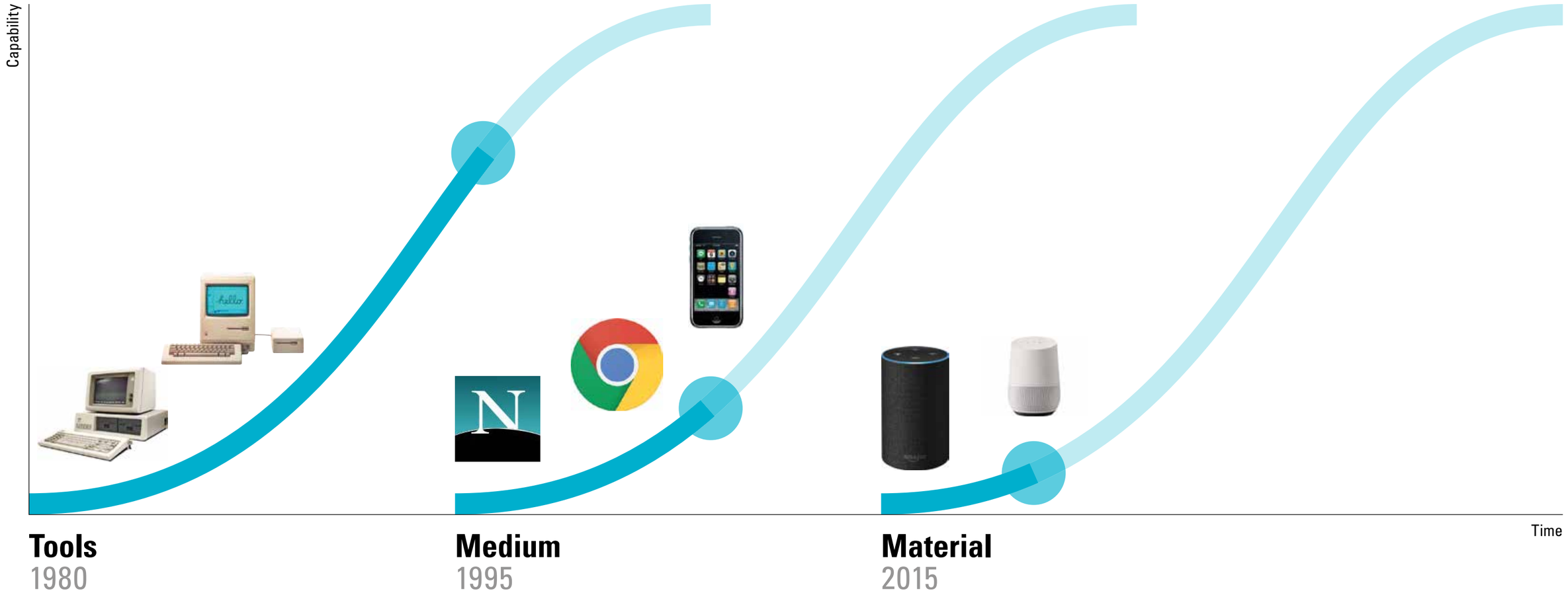
Computing as Material, to be shaped into products.



For good

And for evil

Each of these “digital transformations” is at a different stage.



What is Computing as Material?

– Predictive Analytics
– Anticipatory Computing
– Design for Conversation
– Solution Space Modeling
– Generative Design

Predictive Analytics is pattern-finding software—algorithms making sense of measurements:

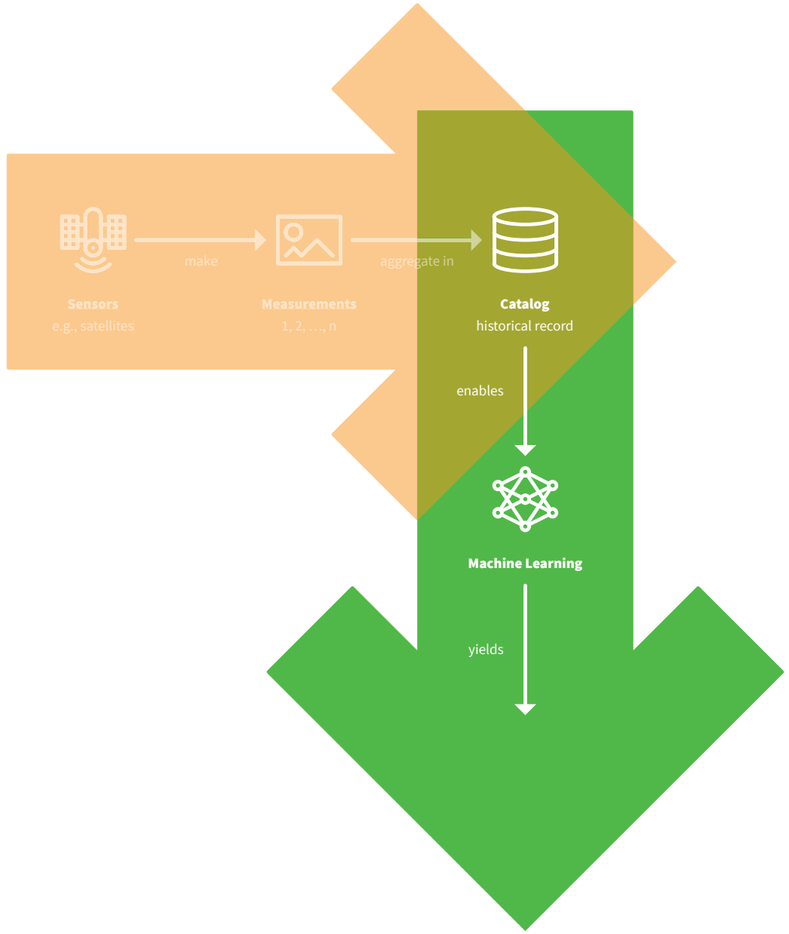
- Classical Methods of Statistics
- Artificial Intelligence (so-called AI)
- Deep Learning (DL)
- Machine Learning (ML)
- Computer Vision (CV)
- Natural Language Processing (NLP)

Predictive Analytics—collecting old data.

1. Gather histories

Sensors make a series of point in time measurements. As measurements accumulate, a historical record emerges.

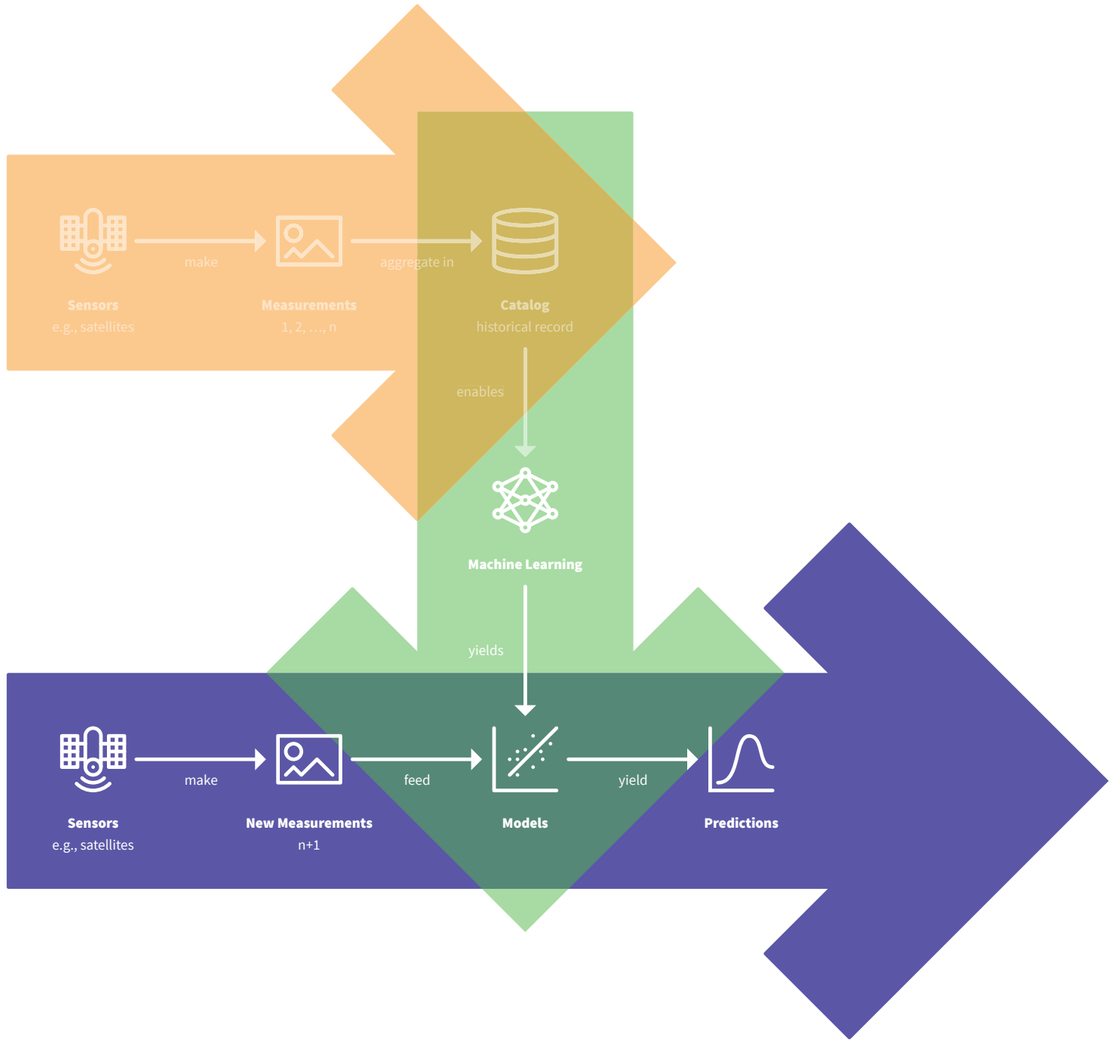
Predictive Analytics—training the system.



2. Derive models

Sufficient historical data enables analysts to discover patterns and relationships—these are codified in models.

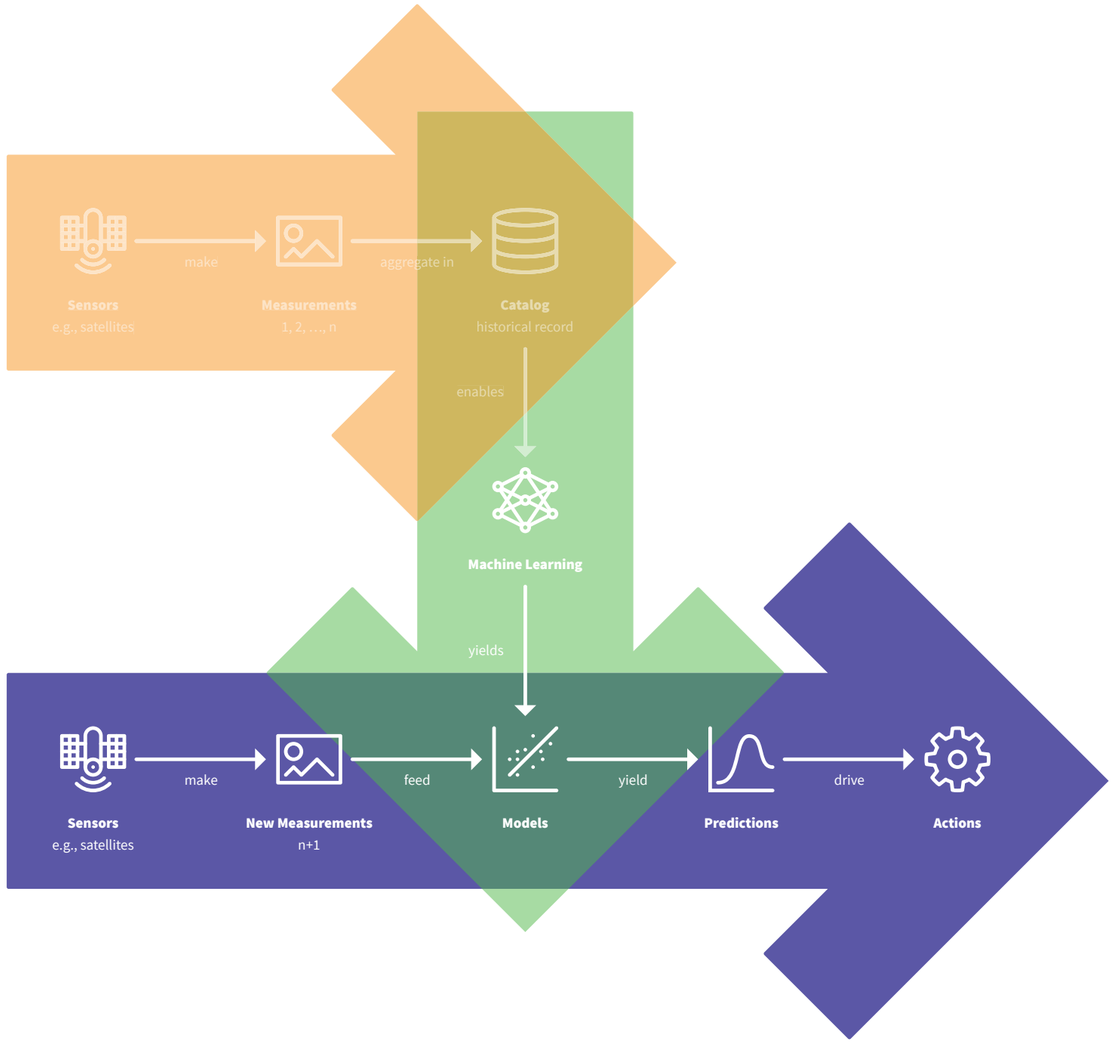
Predictive Analytics—analyzing new data.



3. Predict futures

Once trained, new measurements are fed through the model to predict the future—enabling us to act today.

Anticipatory Computing—acting on the prediction.

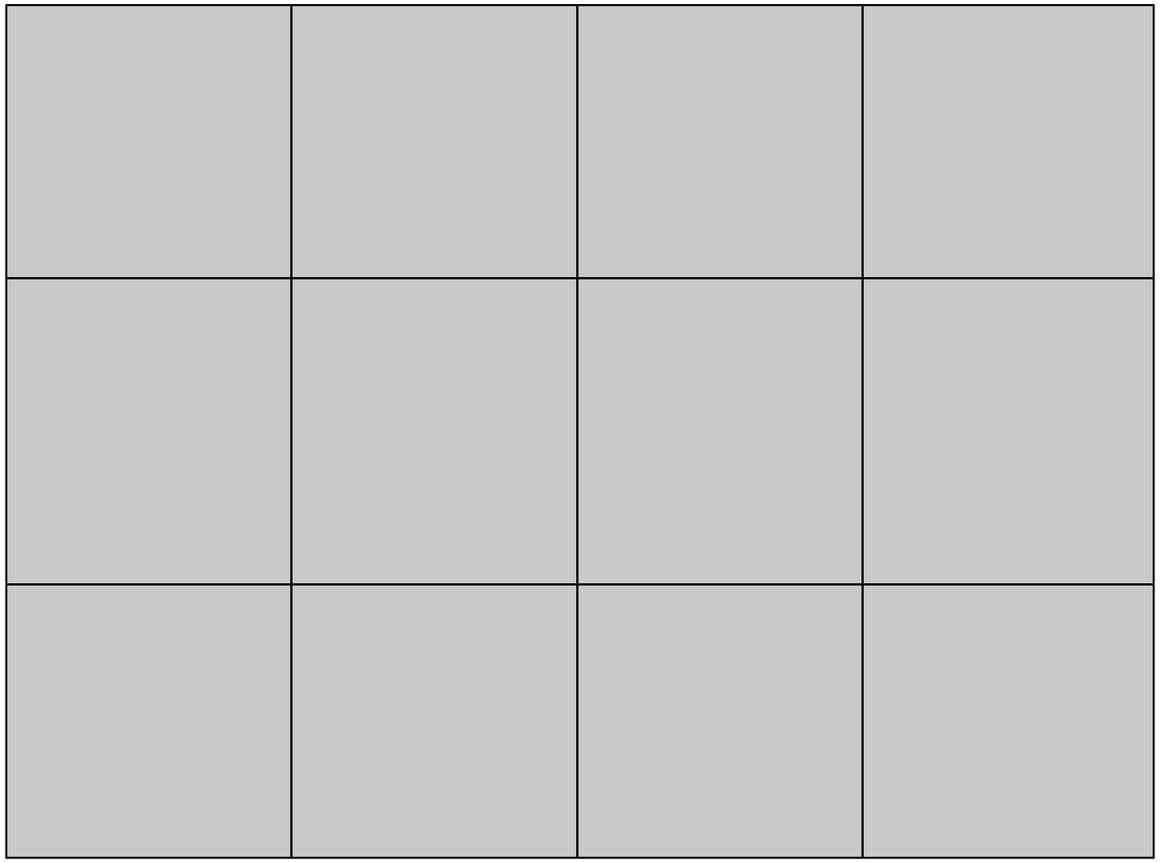


3. Predict futures

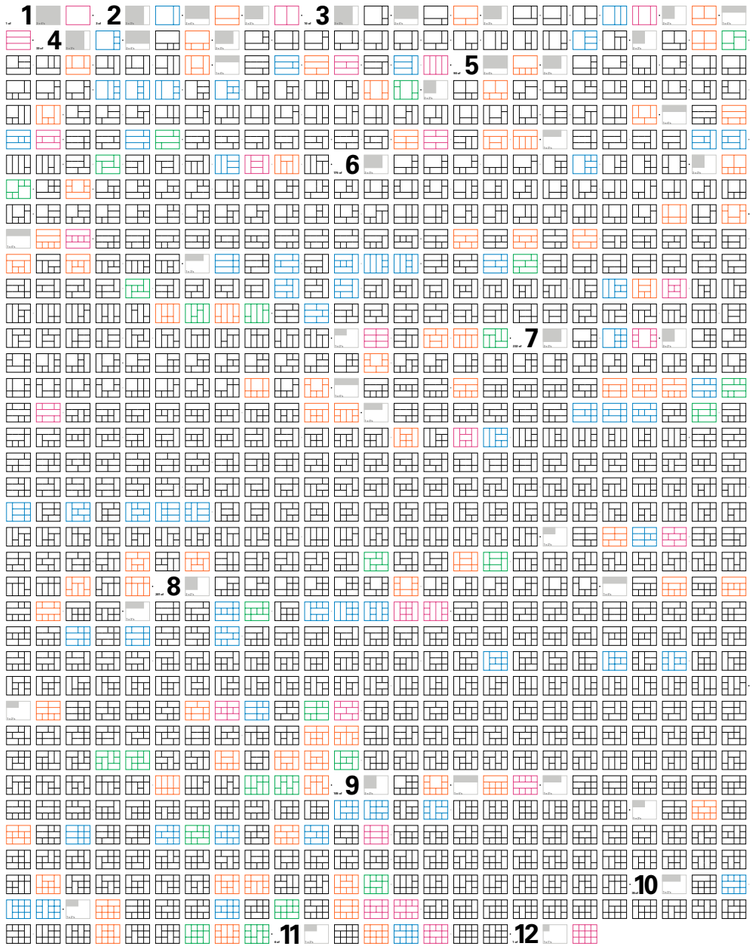
Once trained, new measurements are fed through the model to predict the future—enabling us to act today.

Design for Conversation—e.g., Negroponte's Architecture Machine

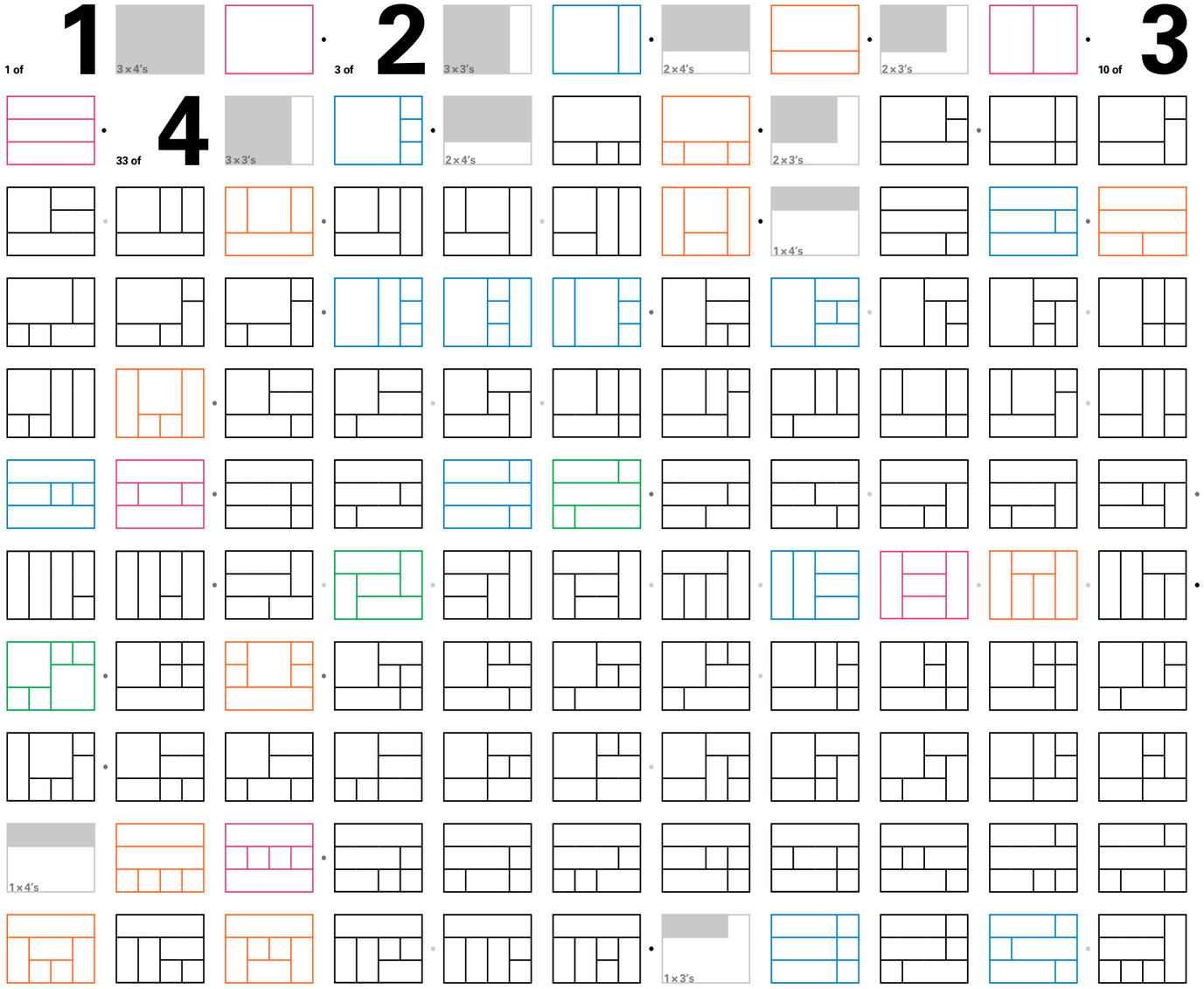
Solution Space Modeling—e.g., 3x4 grid permutations



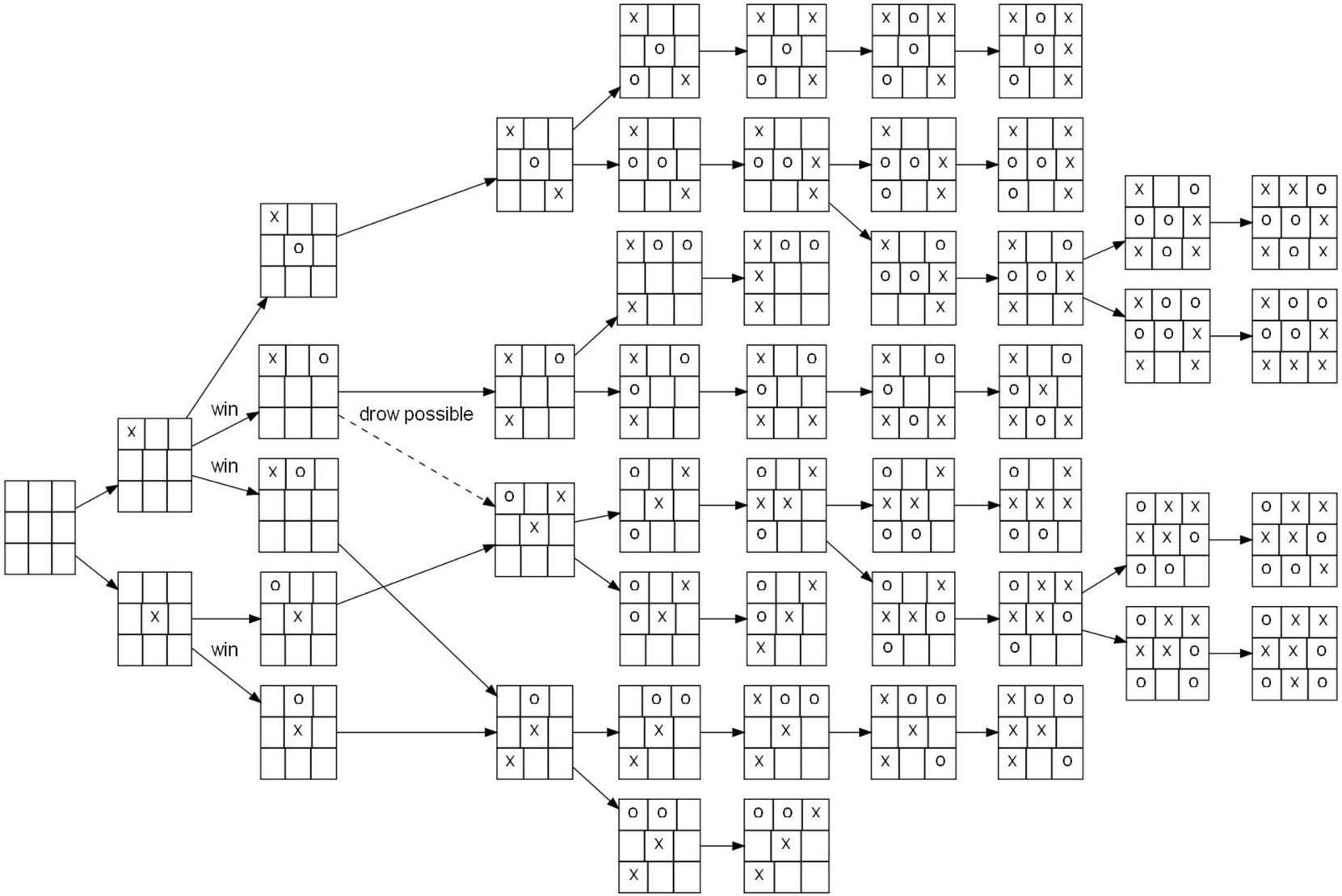
Solution Space Modeling



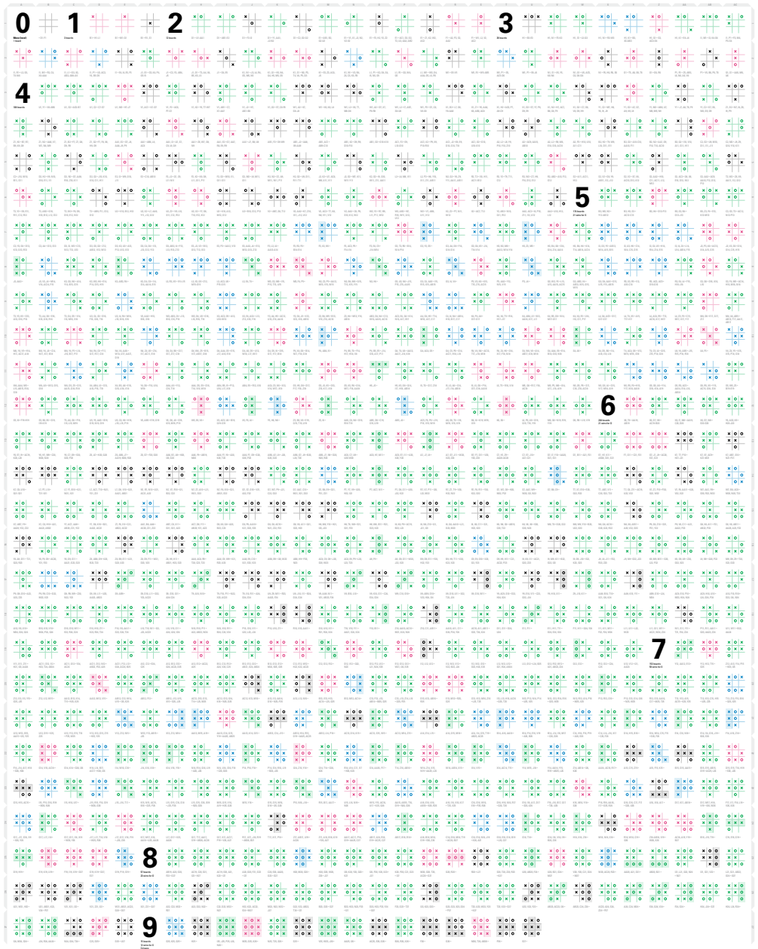
The 892 unique ways to partition a 3×4 grid



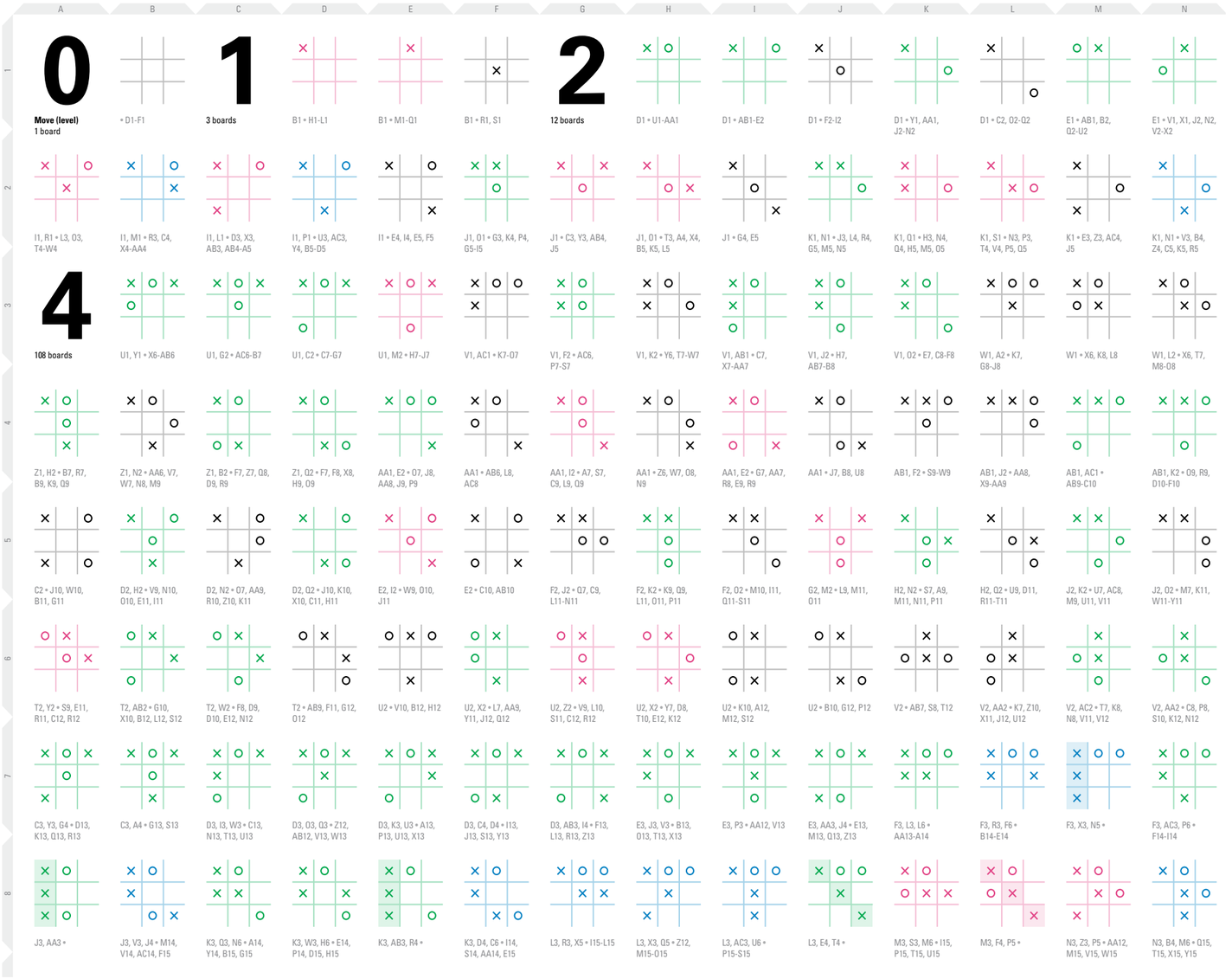
Solution Space Modeling—e.g., Tic-Tac-Toe



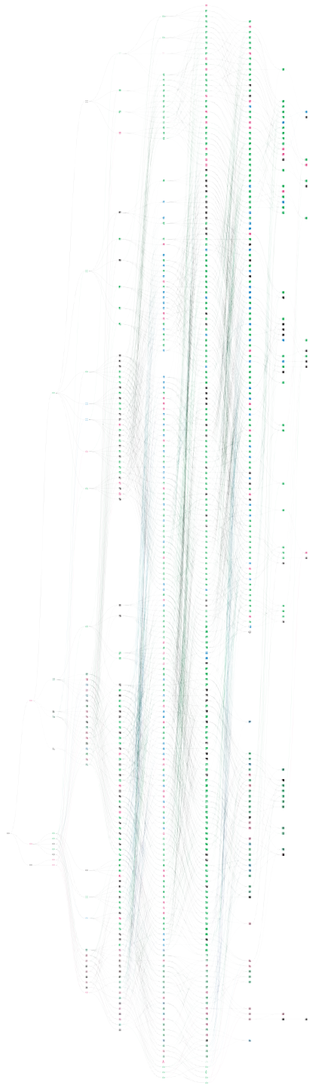
Solution Space Modeling

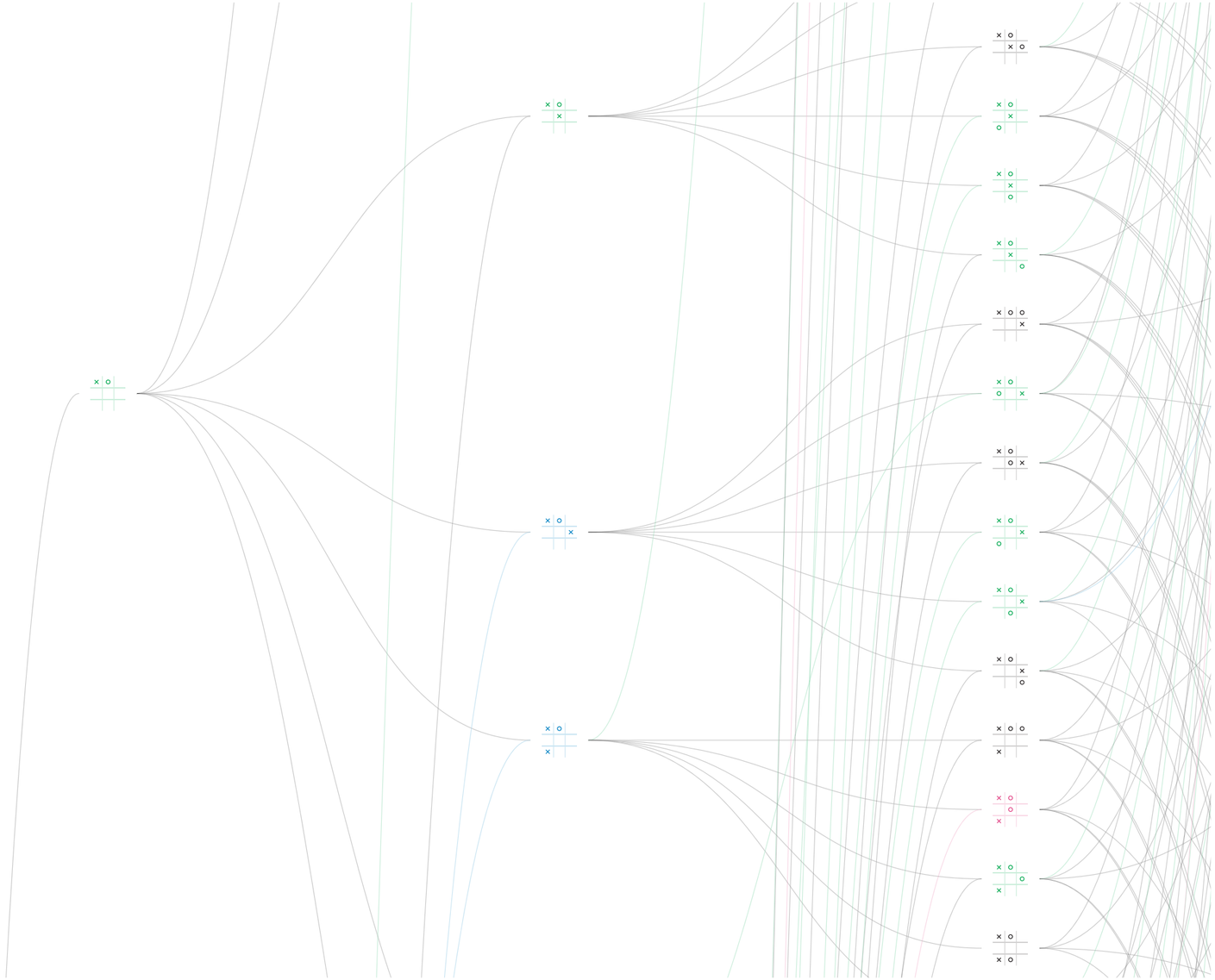


The tic-tac-toe solution space

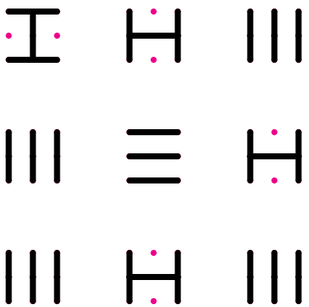


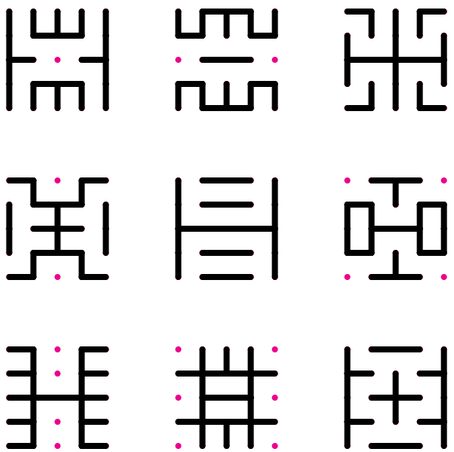
Solution Space Modeling

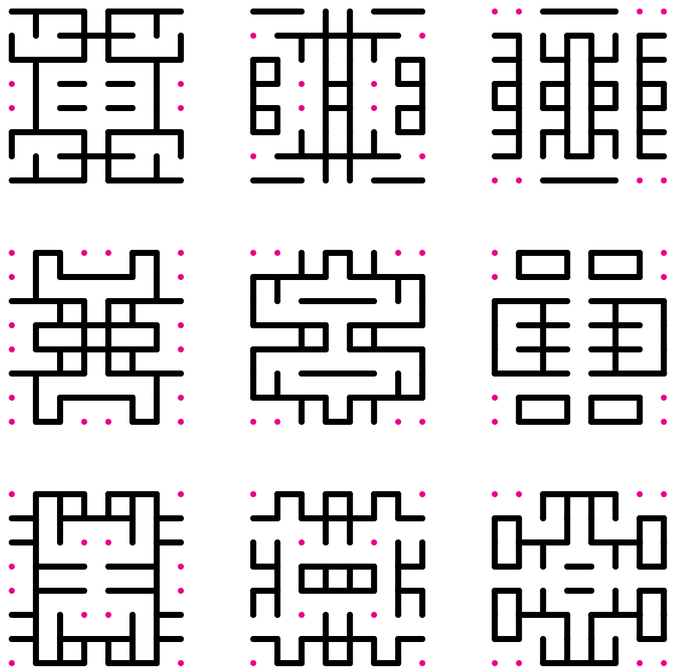




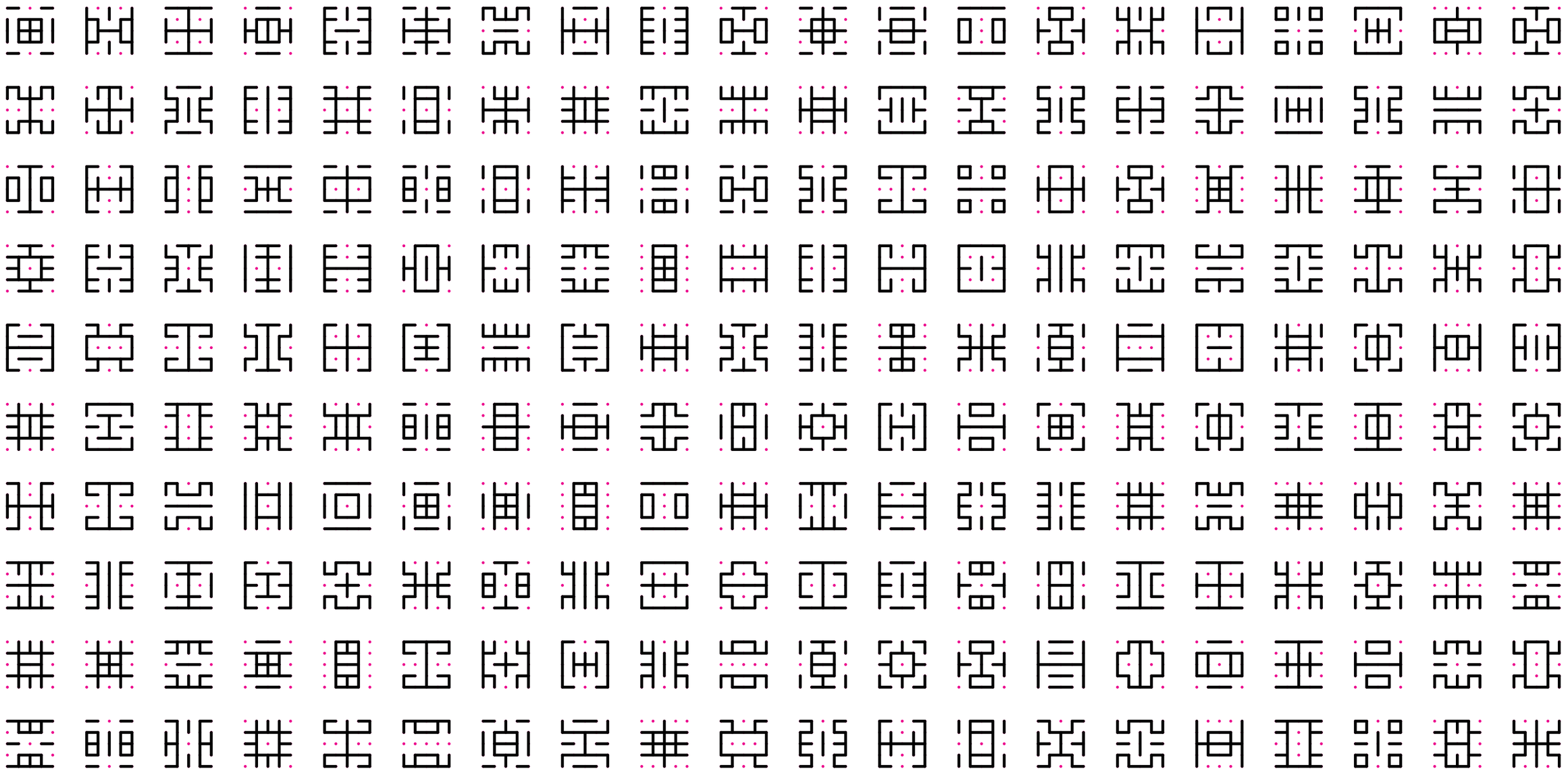
Generative Design—Grid Studies







Generative Design—Grid Studies



Generative Design—Grid Studies

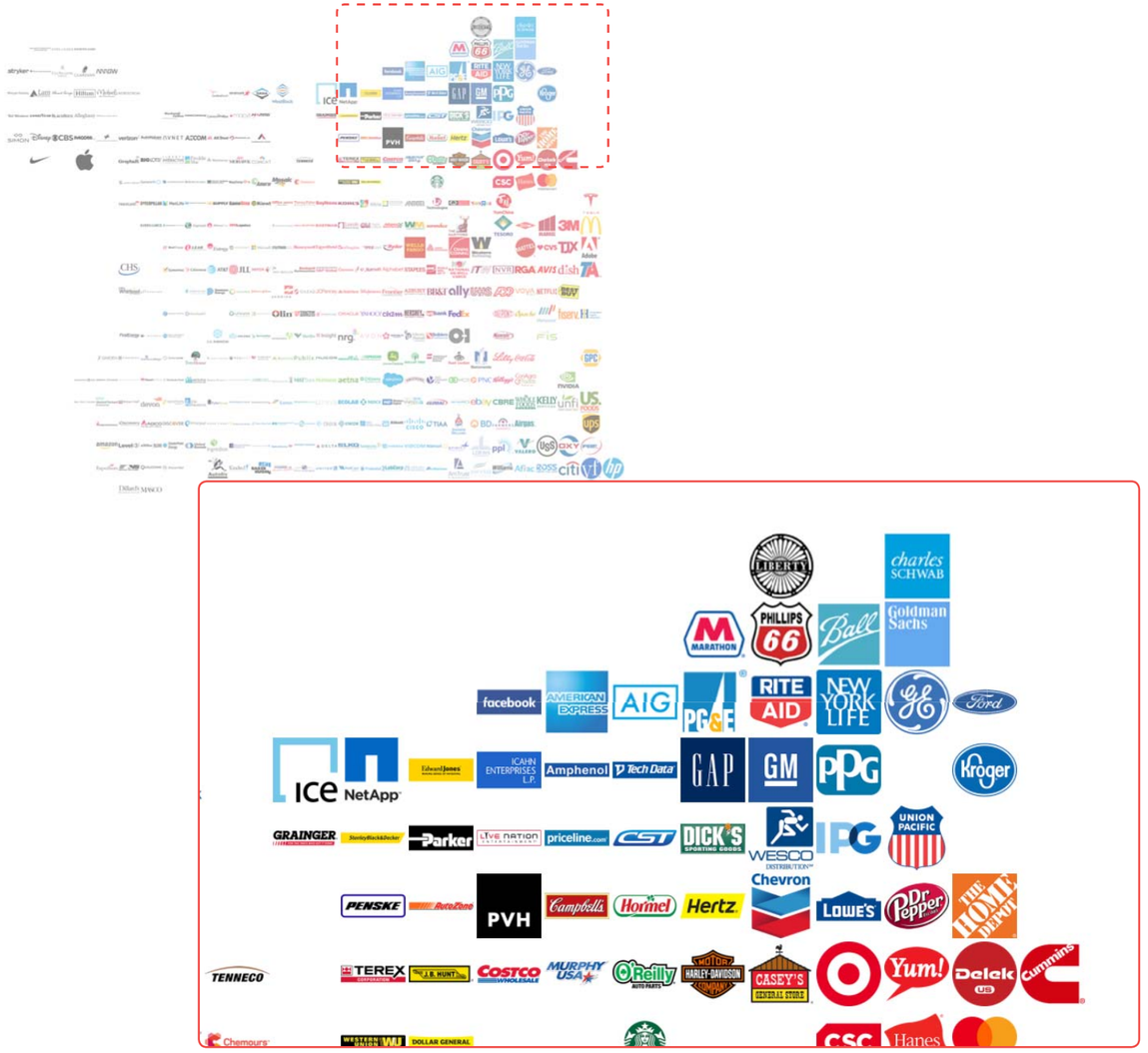
Rules:

- Horizontal symmetry
- Vertical symmetry
- 50% line utilization (rounded down to nearest even number)

https://github.com/knutsynstad/dots-and-lines

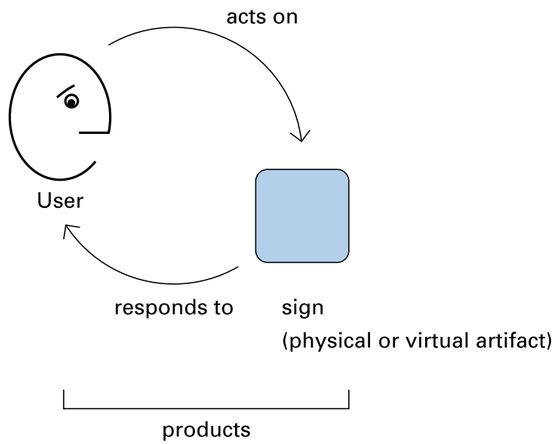
Generative Design—Fortune 500 Logos Grouped by Form and Color

Generative Design—Fortune 500 Logos Grouped by Form and Color



Creating conditions in which others may design.

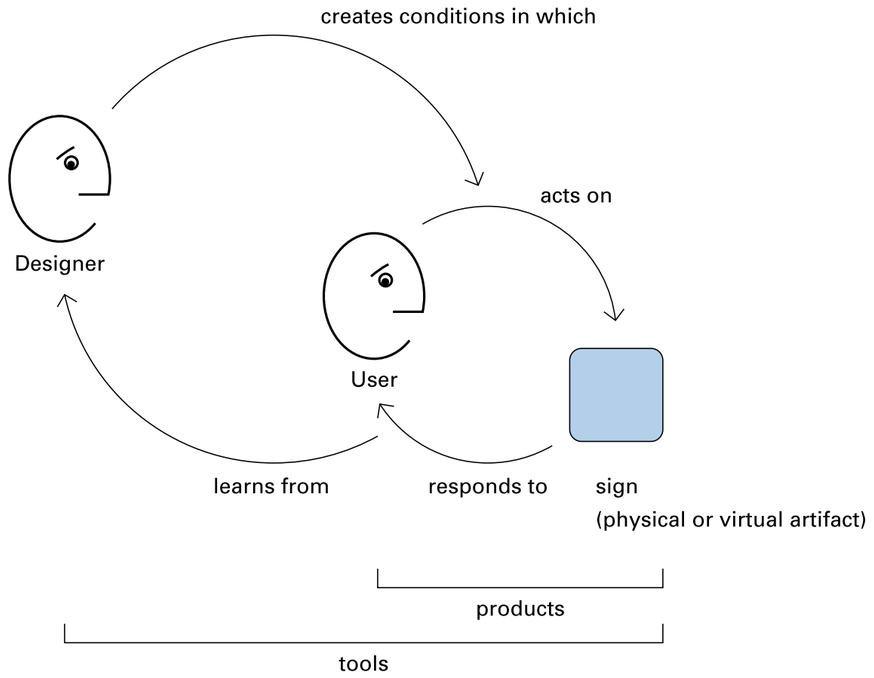
User interacting with an artifact.



Creating conditions in which others may design.

Designer interacting with...

User interacting with an artifact.

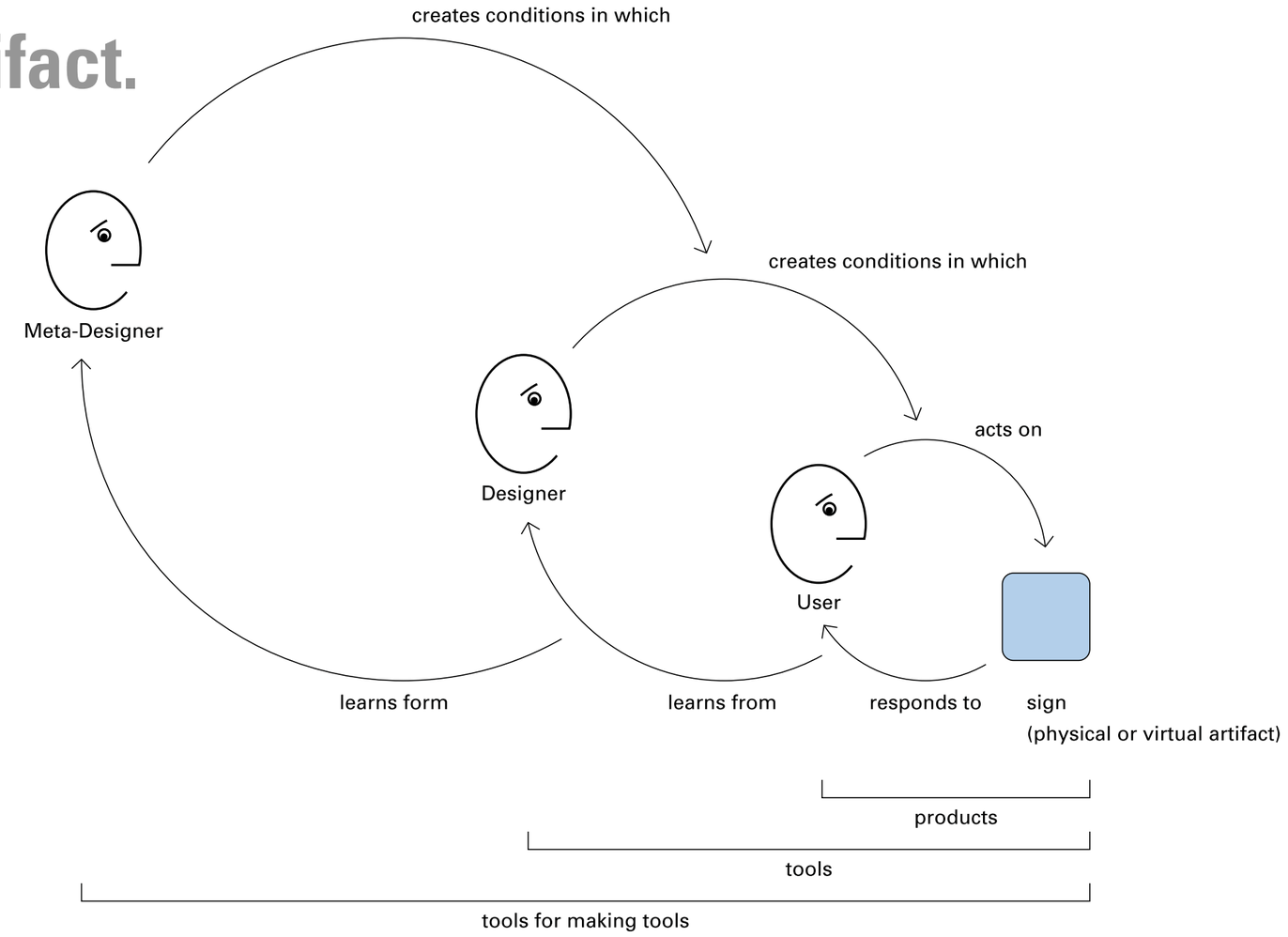


Creating conditions in which others may design.

Meta-designer interacting with...

Designer interacting with...

User interacting with an artifact.



"[Winograd and Flores] go to the heart of the matter concerning design: 'We encounter the deep questions of design when we recognize that in designing tools we are designing ways of being'.... 'We create and give meaning to the world we live in and share with others.... we design ourselves (and the social and technological networks in which our lives have meaning) in language.'"

— **Gui Bonsiepe**, *Interface an Approach to Design,* 1994 [115]

(quoting from *Understanding Computers and Cognition,* 1986)

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