The future of design education:
Preparing for practice
in the mid-21st century

Hugh Dubberly

The source of value creation shifts along a series of learning curves

Quality

Best

World Class

National Class

Average

Product Quality

*Software, Services, and Integration*

Data

AI

Time (Investment)
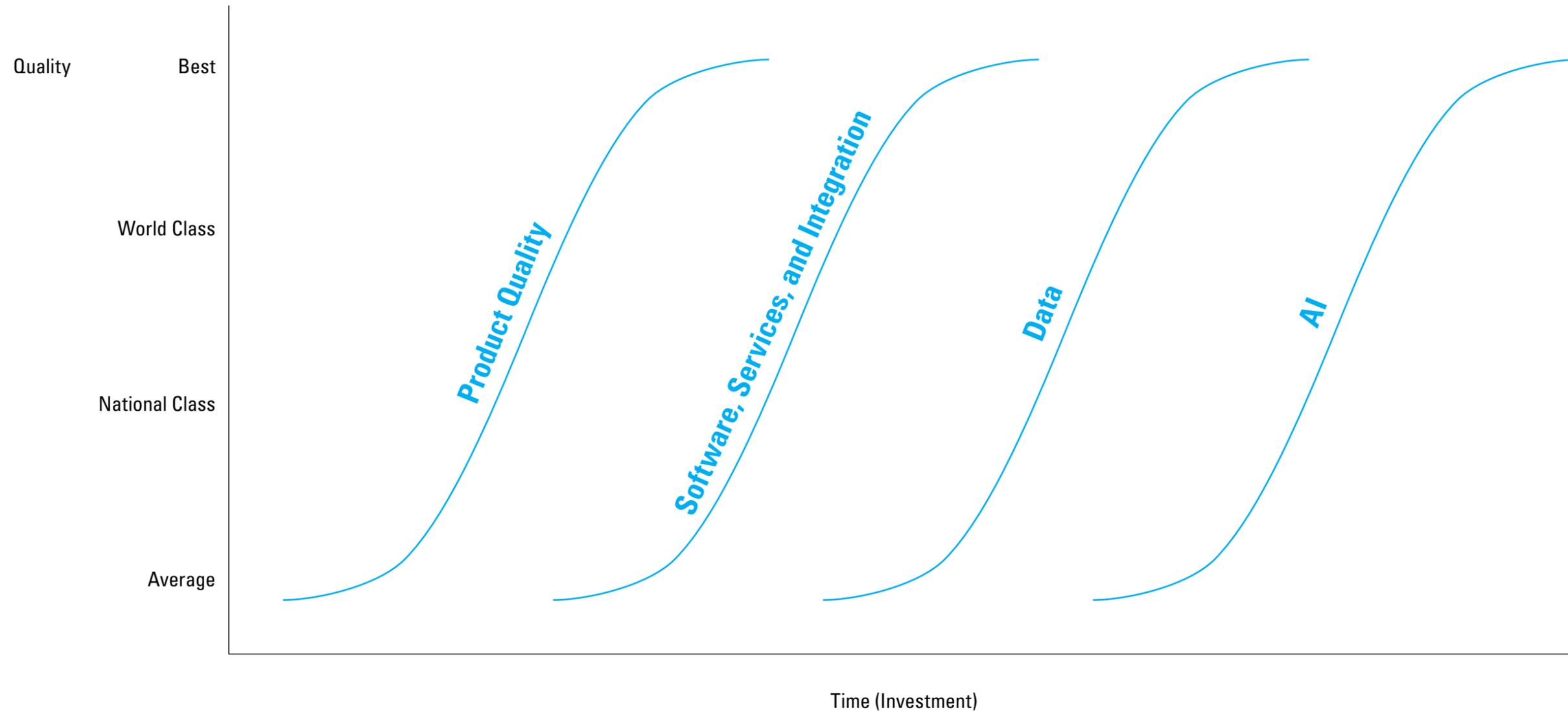
The current learning curve includes:

- Sensors revolution
  (everything generates data)
- Smart-connected products
  (ubiquitous computing)
- Cloud computing + edge computing
  (on-demand)
- AI [ML, DL, NLP, CV]

In the 1980's, computers emerged as a **tool** for designing —
a way to produce variations, iterations, and specifications more quickly.
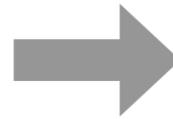
By 2000, the internet emerged as a **medium** for designing — print, radio, and TV were replaced by the web and then smartphones.
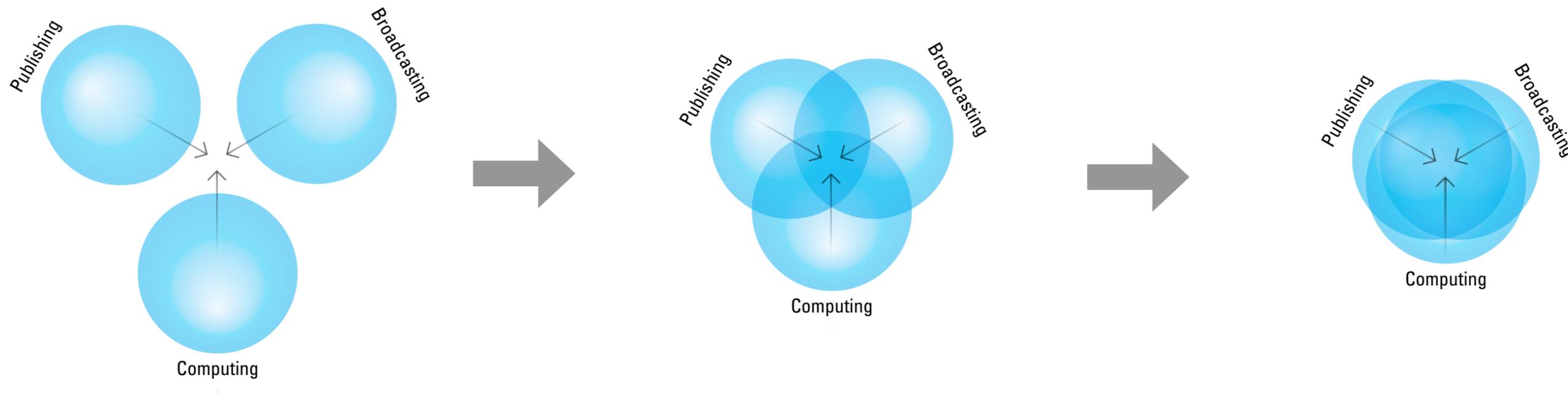

— after Nicolas Negroponte's convergence diagram

In the 2020s, data + algorithms are emerging as a **material** for designing — key building blocks of almost everything.

— after Xavier Barrade
https://xavier-barrade.squarespace.com/waymoexperience/
https://www.youtube.com/watch?v=B8R148hFxPw
https://www.youtube.com/watch?v=o8rCOKSDMcg

Today, data + algorithms are the **main source of value** in the economy.
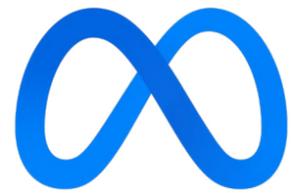
| $480 B | $625 B | $972 B | $1,200 B | $1,900 B | $2,389 B |
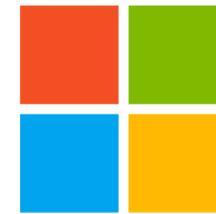
A core activity is building and applying **digital twins** to services and systems.

1. Data lake — Gather histories
Sensors make a series of point-in-time measurements. As measurements accumulate, an historical record emerges.
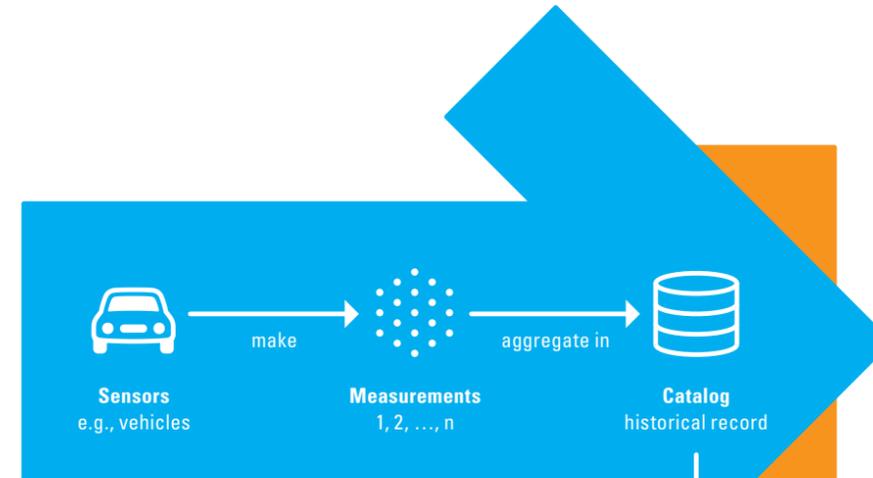
2. Data refinery — Derive models
Sufficient historical data enable analysts to discover patterns and relationships— these are codified in models.

3. Digital twin — Predict futures
Once trained, new measurements are fed through the model to predict the future— enabling us to act today.

Sensors e.g., vehicles — make → **Measurements** 1, 2, …, n — aggregate in → **Catalog** historical record

enables

Machine Learning

yields

Sensors e.g., vehicles — make → **New Measurements** n+1 — feed → **Models** — yield → **Predictions** — drive → **Actions**
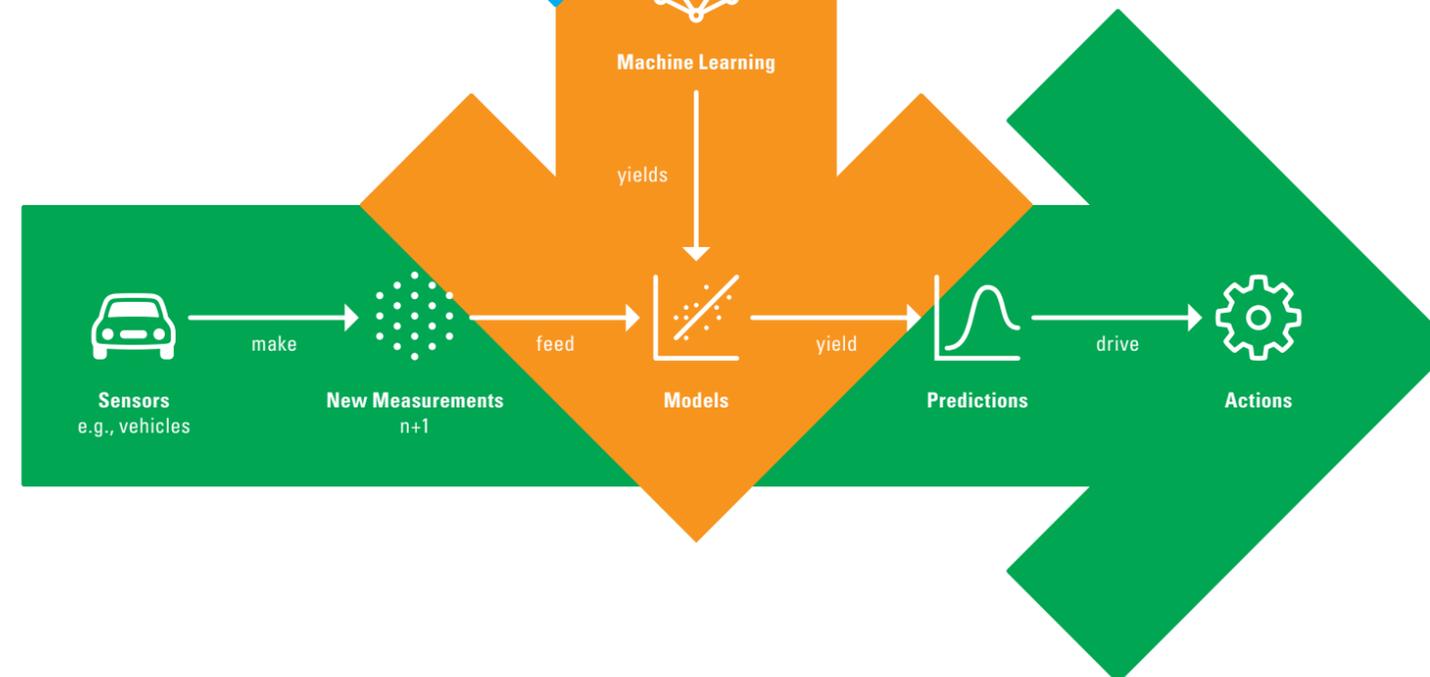
Advances in generative AI, particularly **large language models** (LLMs) are disrupting the search ecosystem and cascading across the economy.

- **auto-completion widgets**
  become
- **explanation oracles** (the new 'search' interface)
  become
- **personal assistants** within a domain (e.g., Co-Pilot for programmers)
  become
- **agents** acting with autonomy on our behalf

If Walter Gropius were to reform the Bauhaus School curriculum for today, he might replace

# the old 20th century materials...   with the new 21st century materials.
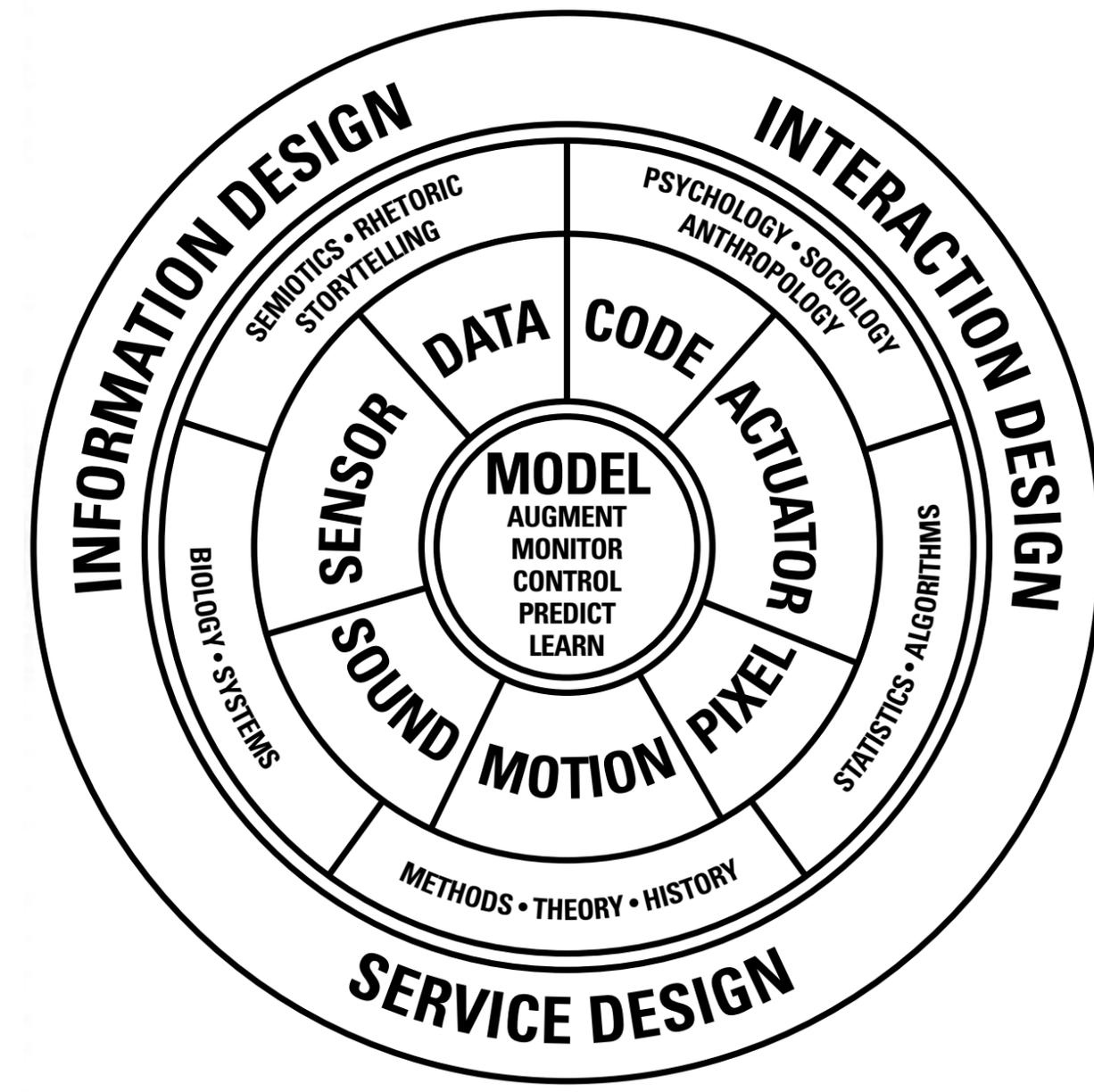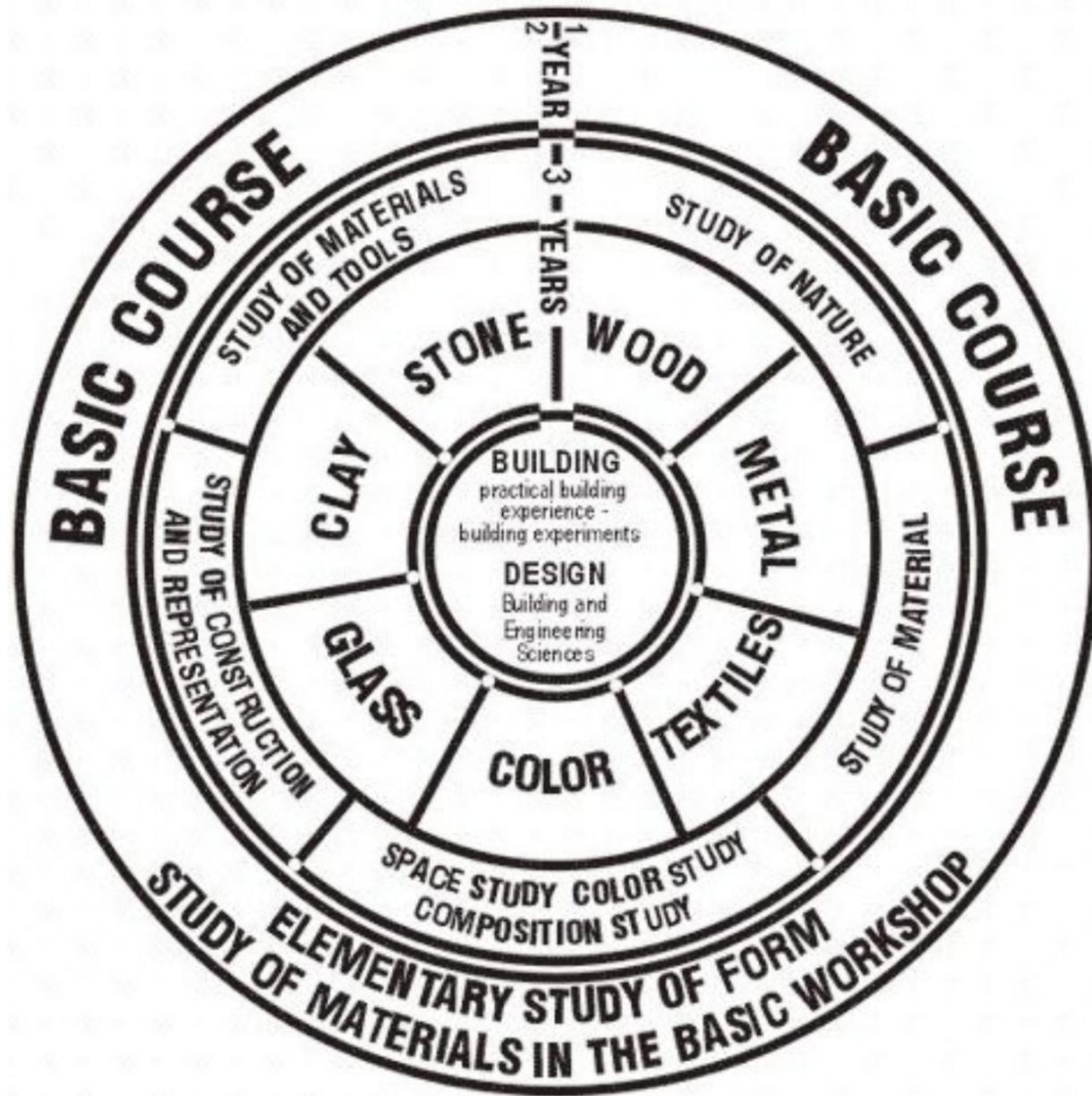
Principles of Organization

	Mechanical-object	Organic-systems
Economic era	Industrial age	Information age
Paradigm author	Newton	Darwin
Metaphor	Clock-works	Ecologies
Values	Seek simplicity	Embrace complexity
Control	Top-down	Bottom-up
Development	From outside	From inside
	Externally-assembled	Self-organizing
	Made	Grown
Designer as	Author	Facilitator
Designer's role	Deciding	Building agreement
Client as	Owner	Steward
Relationship	Request for proposal	Conversation
Stopping condition	Almost perfect	Good enough for now
Result	More deterministic	Less predictable
End-state	Completed	Adapting or evolving
Tempo	Editions	Continuous updating

— Hugh Dubberly,
"Design in the Age of Biology: Shifting from a Mechanical-Object Ethos to an Organic-Systems Ethos."
Interactions Magazine, 2008

DVF has to be interpreted more broadly, as "mindful practice" to include:

- Staff well-being and growth
- Broader issues of social justice
- Externalities and long-term sustainability
- Other ethical issues

What's Desirable

What's Feasible
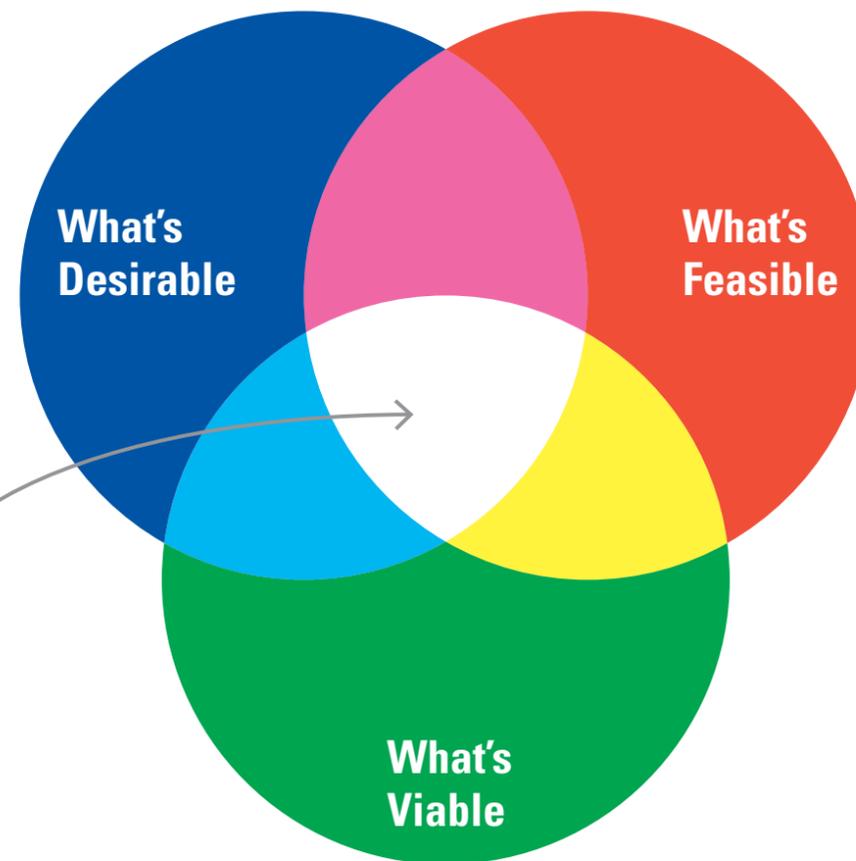
What's Viable

At the intersection is
what's Desirable and Viable and Feasible (DVF),
simultaneously satisfying the requirements
and constraints of each.

Direction of change in design practice

Why are we making this?
Context/Need
Pragmatic

Team
Explicit
Shared

What are we making?
Meaning/Definition
Semantic

How are we making it?
Form/Grammar
Syntactic

Individual
Intuitive
Idiosyncratic

Object
Component

System
Systems of components
Organism

Ecosystem
Systems of systems
Community
Market
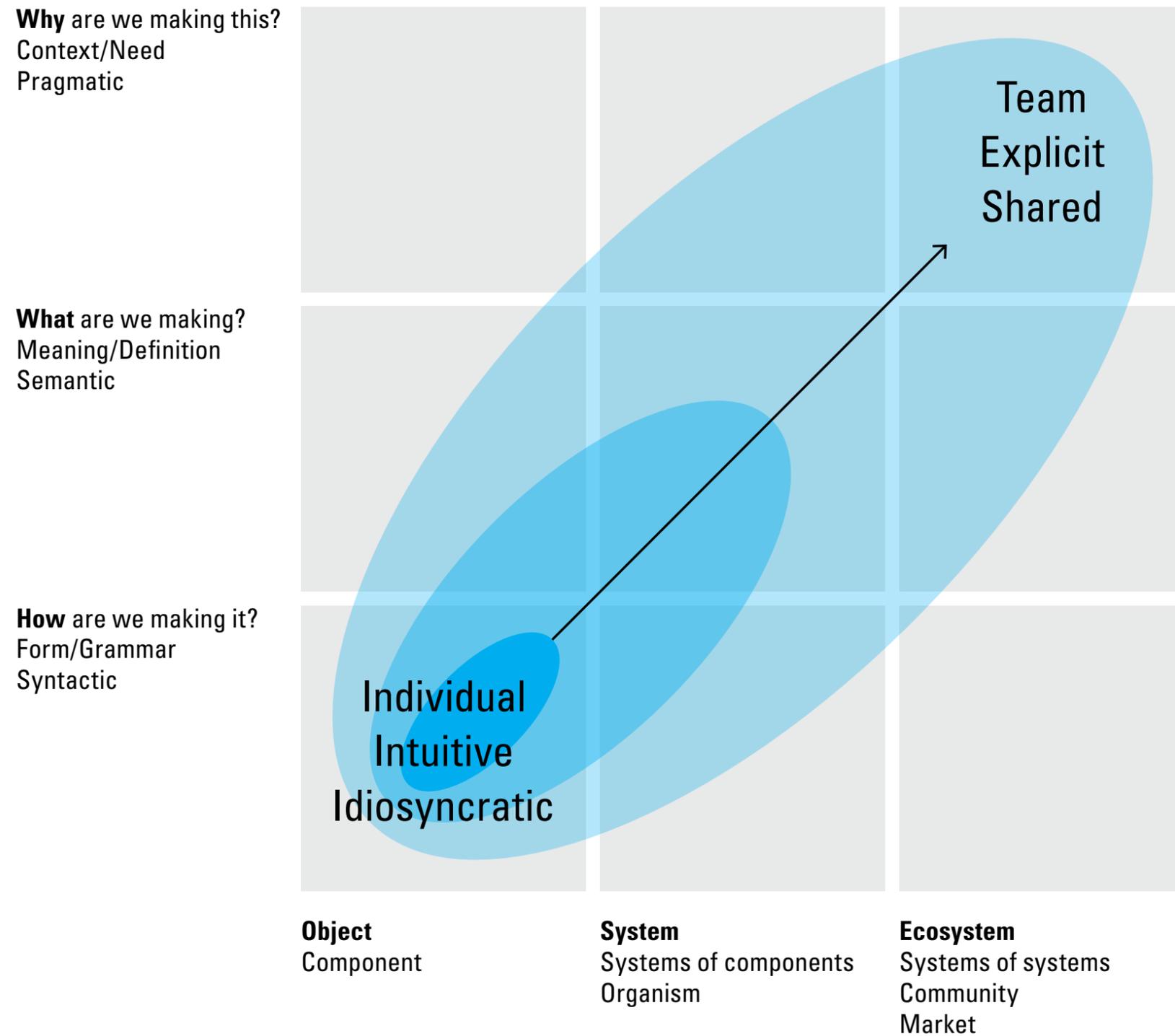
— after Morris + Doblin

Pace Layering: 6 distinct time scales

Faster layer
learns
proposes
absorbs shocks
discontinuous
innovates

Fashion

Commerce

Infrastructure

Governance

Culture

Nature

Slower layer
remembers
disposes
integrates shocks
continuous
stabilizes
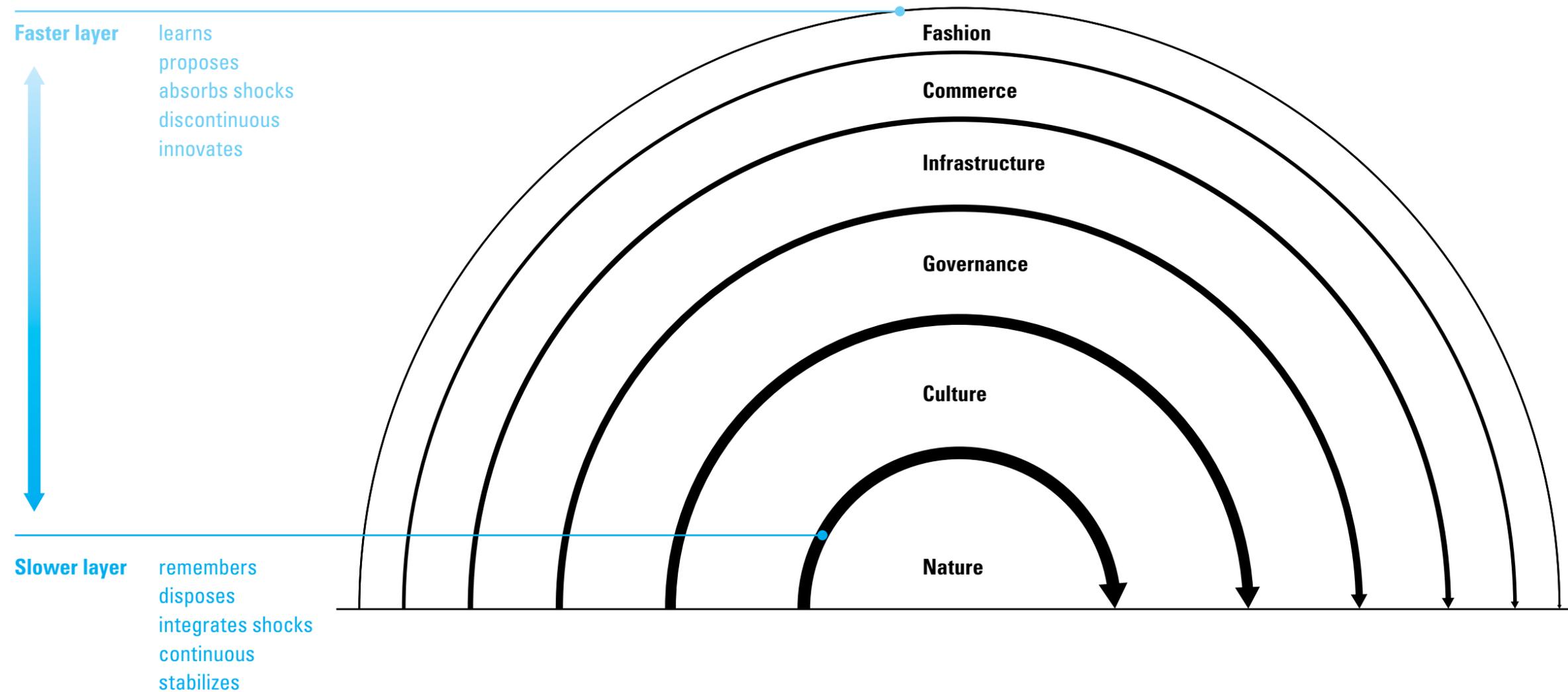
— Stewart Brand, *The Clock of the Long Now: Time and Responsibility,* 1999

Organizations need mechanisms for evolving both quickly + slowly.

**Faster
More Volatile**

Form — User interfaces through which people interact with products and services—where structure is articulated...

Structure — The relationships between particular semantic elements that will inform end products and services.

Designers tend to operate in these layers

Governance — How the organization shapes itself to implement its strategy. The rules and means of engagement...

Strategy — How the organization aspires to do things differently to strive towards its purpose; how it's going to compete.

**Slower
More Stable**

Purpose — Why the organization, team, or product exists. An aspiration, not a goal since it can never be achieved...

Cf. Jorge Arango, "Living in Information," 2018.

Four-field Framework for Design

The agenda of Profit drives the realm of Commercial Design

Selling goods and services in a market
"Solving problems" and meeting so-called "human needs"
Ultimate goal of maximizing shareholder value

The agenda of Justice drives the realm of (socially) Responsible Design

Helping under-served people and the planet's living systems
"Design Justice" and "Sustainable Design"

The agenda of Knowledge ("Truth" and "Beauty") drives the realm of Experimental Design

Exploring (new) possibilities with materials, tools, or processes
Inquiring into aesthetic, conceptual, or perceptual issues on a continuum from play to work

The agenda of Reflection drives the realm of Discursive Design

Creating artifacts that question assumptions and tell stories about alternative futures
(other social structures + technologies in order to provoke response and initiate debate)
"Design Fictions" and "Speculative Design"

— Bruce and Stephanie Tharp, *Discursive Design,* 2018

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