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Information Architecture Workshop

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Presentation posted at
presentations.dubberly.com/informationarchitecture.pdf

PART ONE

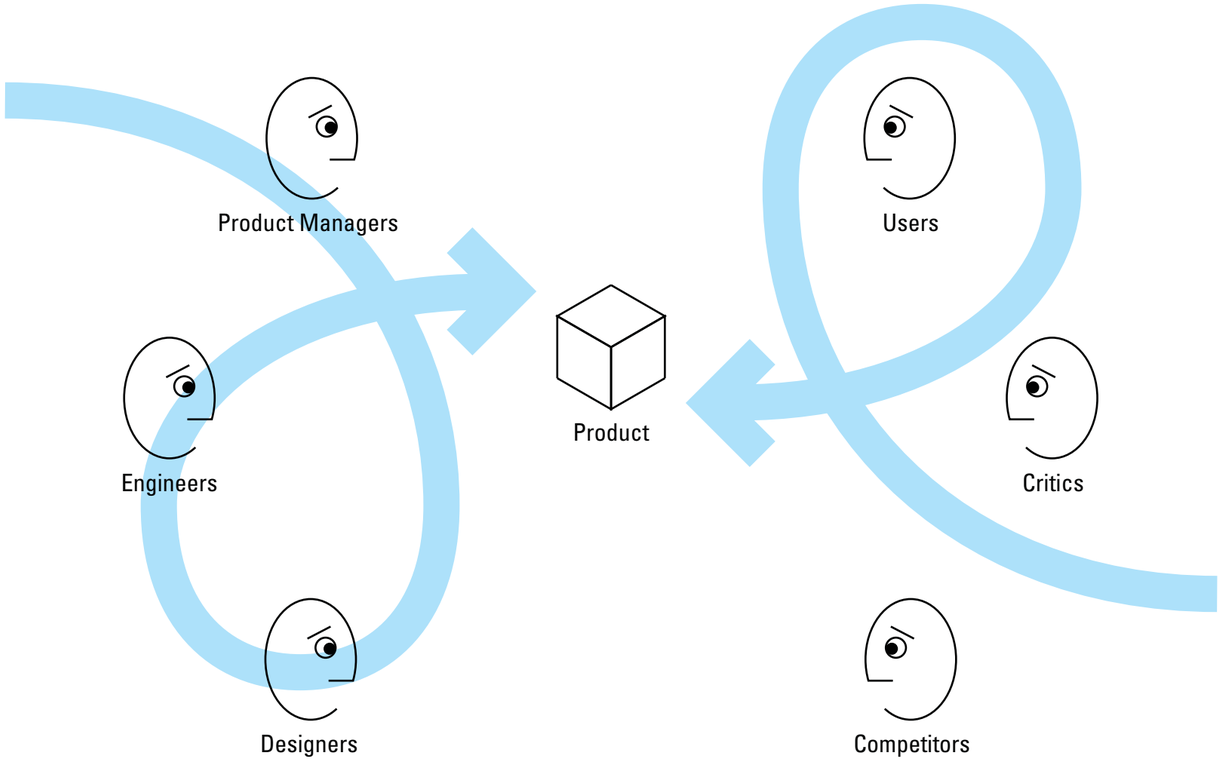
Why modeling is increasingly important in design

Great products come from iteration; they evolve—or more precisely, they co-evolve with changing internal and external environments.

That is to say: **all products are the result of conversations.**
A new product teaches its environment. The environment also teaches the product.

Some conversations are with the product team.

Those conversations cannot be controlled, but they can be supported. That is, managers, engineers, and designers can create conditions in which the right conversations flourish.



Some conversations are with the marketplace.

Those conversations are difficult to manage, though smart, connected products are creating new possibilities.

The partnership between Steve Jobs and Jony Ive is famous. What's rarely discussed is what it means, what we can learn from it.

It was an on-going conversation that built a relationship and trust.

"We had lunch together pretty much every day.

He would spend many afternoons a week in the design studio, and we became very close friends."

—Jony Ive, *Financial Times*, March 13, 2015

The Jobs-Ives conversation is not unique; pretty much everywhere that you find really great design, you find such conversations.

Steve Jobs + Jonathan Ive = Apple

Ed Catmull + John Lasseter = Pixar

Tom Watson, Jr. + Eliot Noyes = IBM

Walter Paepke + Herbert Bayer = Container Corp.

Adriano Olivetti + Marcello Nizzoli = Olivetti

Artur & Erwin Braun + Dieter Rams = Braun

Max Dupree + George Nelson = Herman Miller

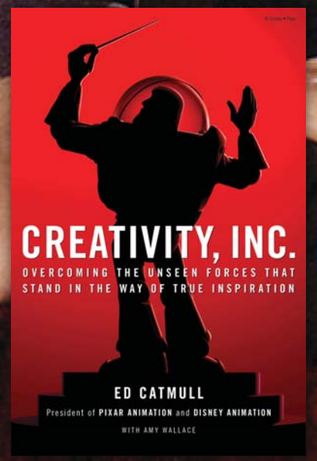
William Paley + William Golden = CBS

Frank Stanton + Lou Dorfsman = CBS

Hans Knoll + Florence Schust = Knoll

Martha Stewart + Gael Towey & Eric Pike = Martha Stewart

Pixar has made 15 hit movies—in a row—by design, not luck. Founder Ed Catmull explains how in his book, *Creativity, Inc.*




Story meetings at Pixar—conversations, without laptops,
supported by a dedicated war room, lots of sketches,
a high-info-density physical environment.

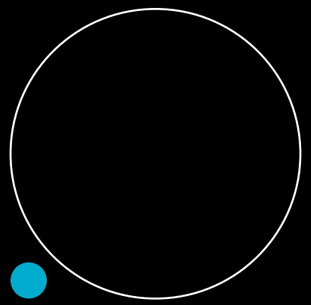
Increasingly, venture capital (VC) and business consulting firms are bringing senior designers into their conversations.

- Google Ventures named Braden Kowitz “Design Partner”
- Khosla hired Irene Au, former head of design at Google
- Kleiner-Perkins hired John Maeda, former RISD President

- Accenture bought European service design firm Fjord.
- Deloitte bought design planning firm Doblin Group.
- McKinsey bought SF product design firm Lunar.

These firms didn’t hire these designers to make wireframes;
they hired them to change the nature of their conversations.

The quality of the conversation depends on the relationship between a design group and the organization that it supports.

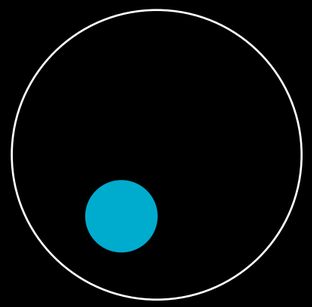


Separate

Design as external resource

Design thinking and methods have no continuous presence in the organization.

They are add-ons, limited to traditional problems: form, communication, function.

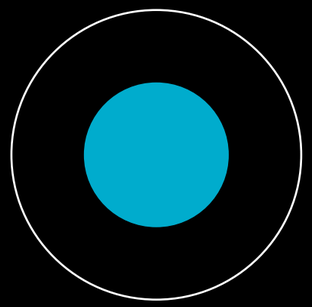


Peripheral

Design as part of the organization

Design thinking and methods practiced somewhere within the organization.

They apply to specific products and services.

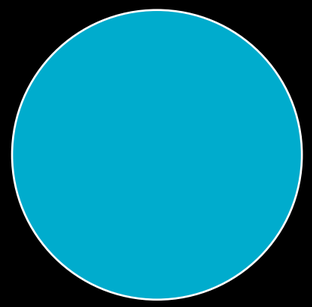


Central

Design at the core of the organization

Design thinking and methods are highly visible and take a central position.

They unify products and services across an organization; apply to corporate design and brand strategy.



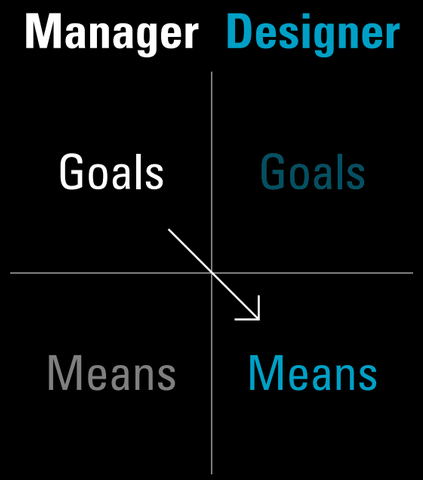
Integrated

Design integral to all aspects of the organization

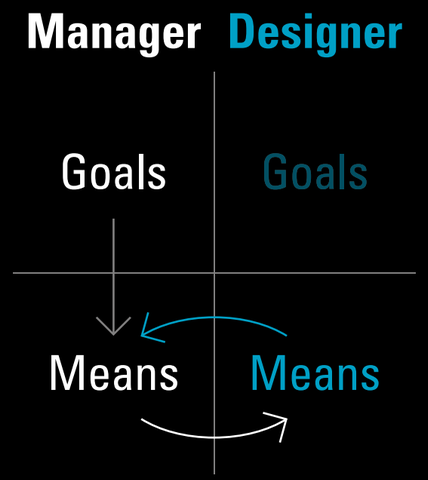
Design thinking and methods are being applied at an organization's top level as means to inquire into a wide range of organizational problems with the aim to develop integrated solutions.

— Sabine Junginger, 2009

Traditional, industrial age management is hierarchical. Designers *add style after* a product has been engineered.

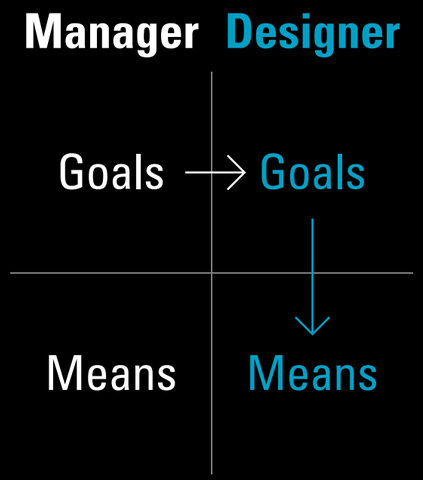


Controlling:
Manager tells designer what to do + how to do it; designer executes.

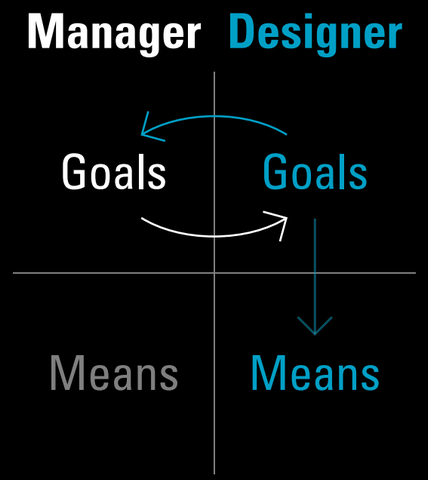


Mentoring:
Manager sets goals but discusses means with designer.

Emerging, information age management is more collegial. Designers *participate throughout* the entire development cycle.

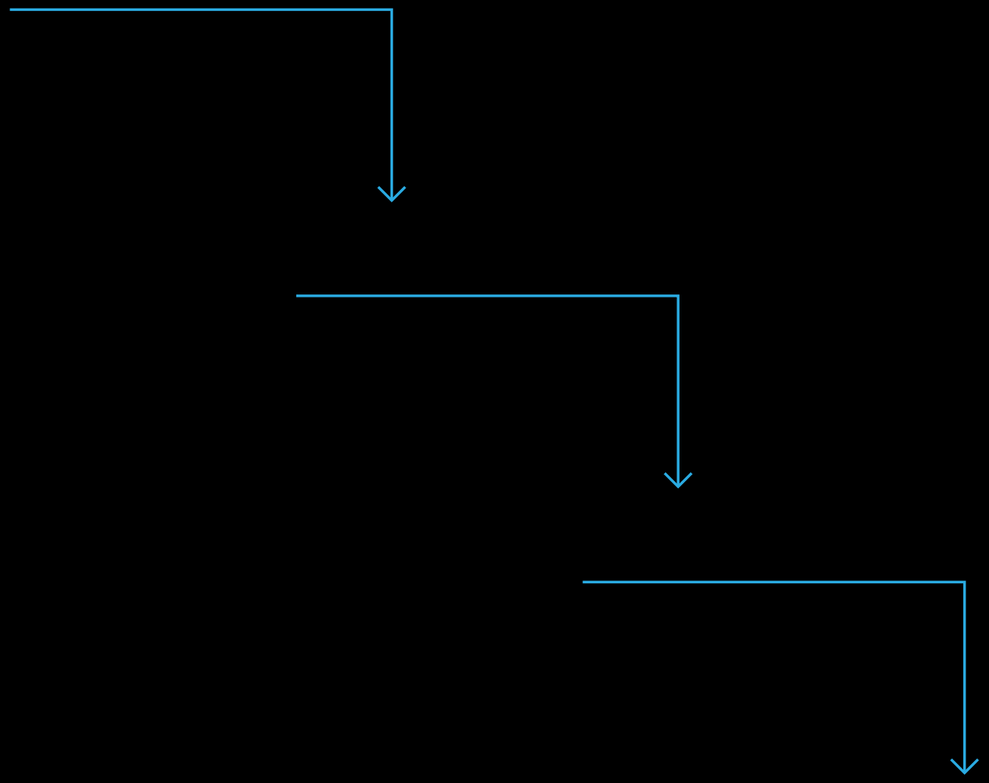


Delegating:
Manager sets goal but leaves means to the designer.



Collaborating:
Manager and designer set goals together.

Sophisticated managers operating in an agile manner, avoid waterfall handoffs and include designers in daily scrums.



But agile managers often fall into the trap of focusing on wireframes, without building the necessary foundation.

If your designer isn't producing wireframes fast enough, it may be because you didn't make time to build the right scaffolding.

That is, you may not be having the right conversations.

The right conversations iterate shared vision and conceptual structures. That's where effectiveness, efficiency, and engagement are born.

"At its heart, software design is about creating virtual worlds in which users work, learn, and play.

Virtuality has two aspects:
1. Conceptual structure—the ideas and how they unfold, connect, and lodge in the mind
2. Feel—how things look and the other sensations we experience (crude or slick, bumpy or smooth, warm or cool)

The real issue is designing a consistent conceptual structure, one that fits the domain as much as possible, as comprehensively and comprehensibly as possible.

Consistency, completeness, and clarity are the objectives."

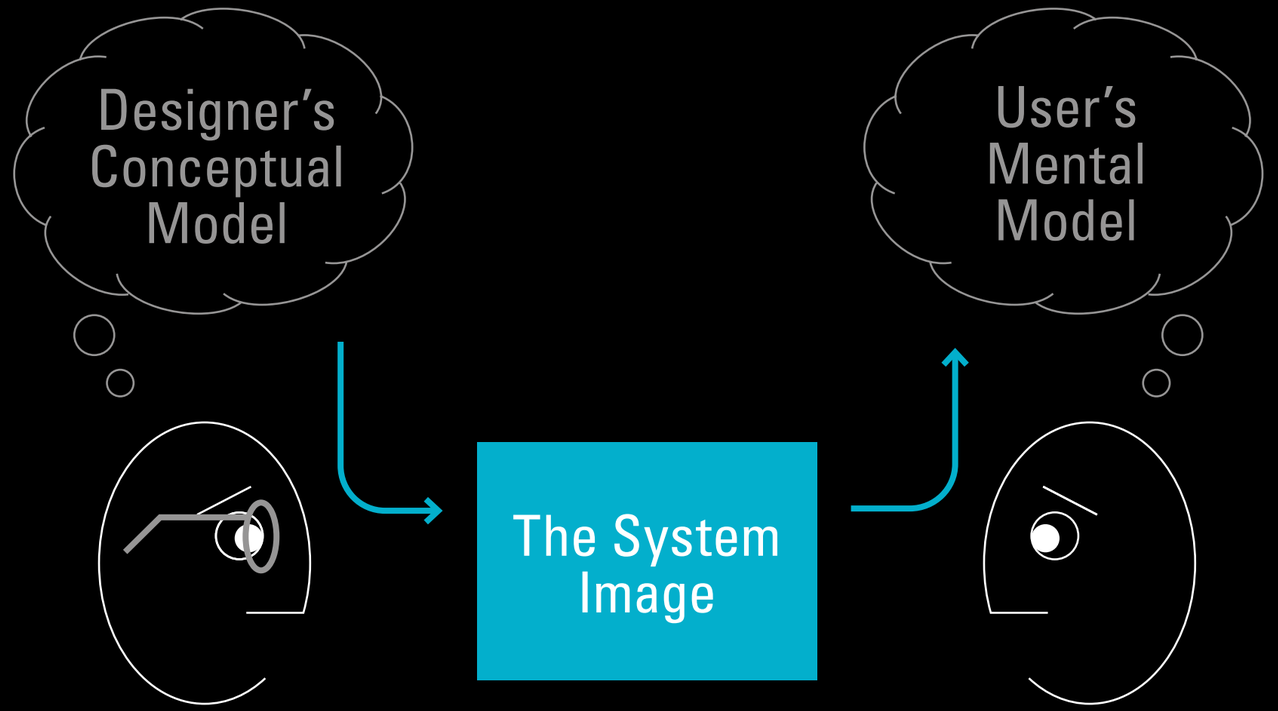
— Ted Nelson, the inventor of hypertext

"For people to use a product successfully, they must have the same mental model (the user's model) as that of the designer (the designer's model). But the designer only talks to the user via the product itself, so the entire communication must take place through the 'system image': the information conveyed by the physical product itself."

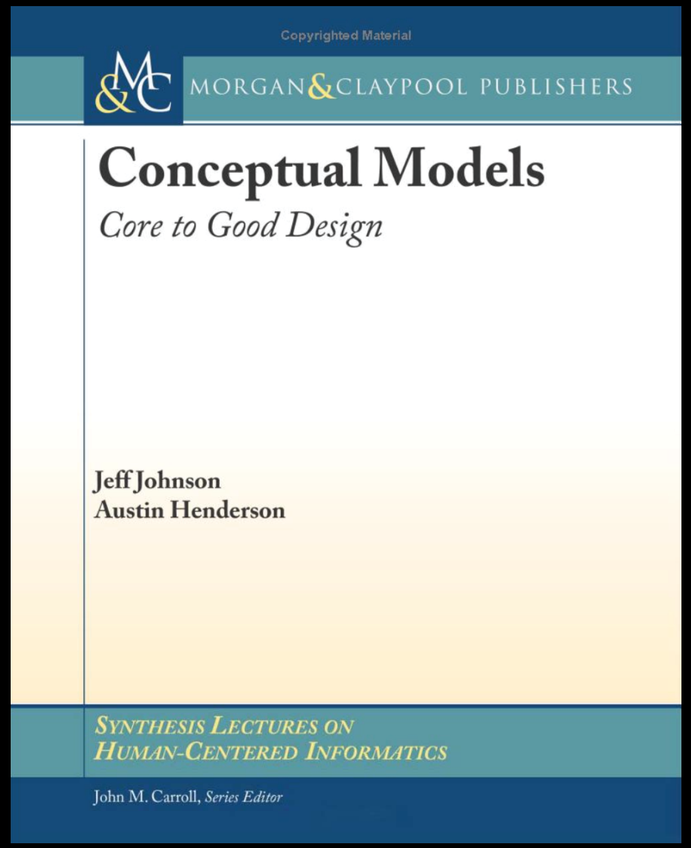
— Don Norman, *The Design of Everyday Things*, 1988

“...most digital systems fail when they fail to provide a story, when there is a poor conceptual model.”

— Don Norman



How to make conceptual models is explained in a wonderful new book *Conceptual Models: Core to Good Design,* by Johnson & Henderson



A conceptual model describes what a user needs to know in order to use your application successfully.

"A conceptual model is a high-level description of an application. It enumerates all concepts in the application that users can encounter, describes how those concepts relate to each other, and how those concepts fit into tasks that users perform with the application."

— Jeff Johnson + Austin Henderson, *Conceptual Models: Core to Good Design*, 2012

As an example of a conceptual model Johnson + Henderson describe an alarm clock.

The clock **stores** the **current time** of day,
continually **updating** it to track the passage of time.

It **displays** the current time constantly.

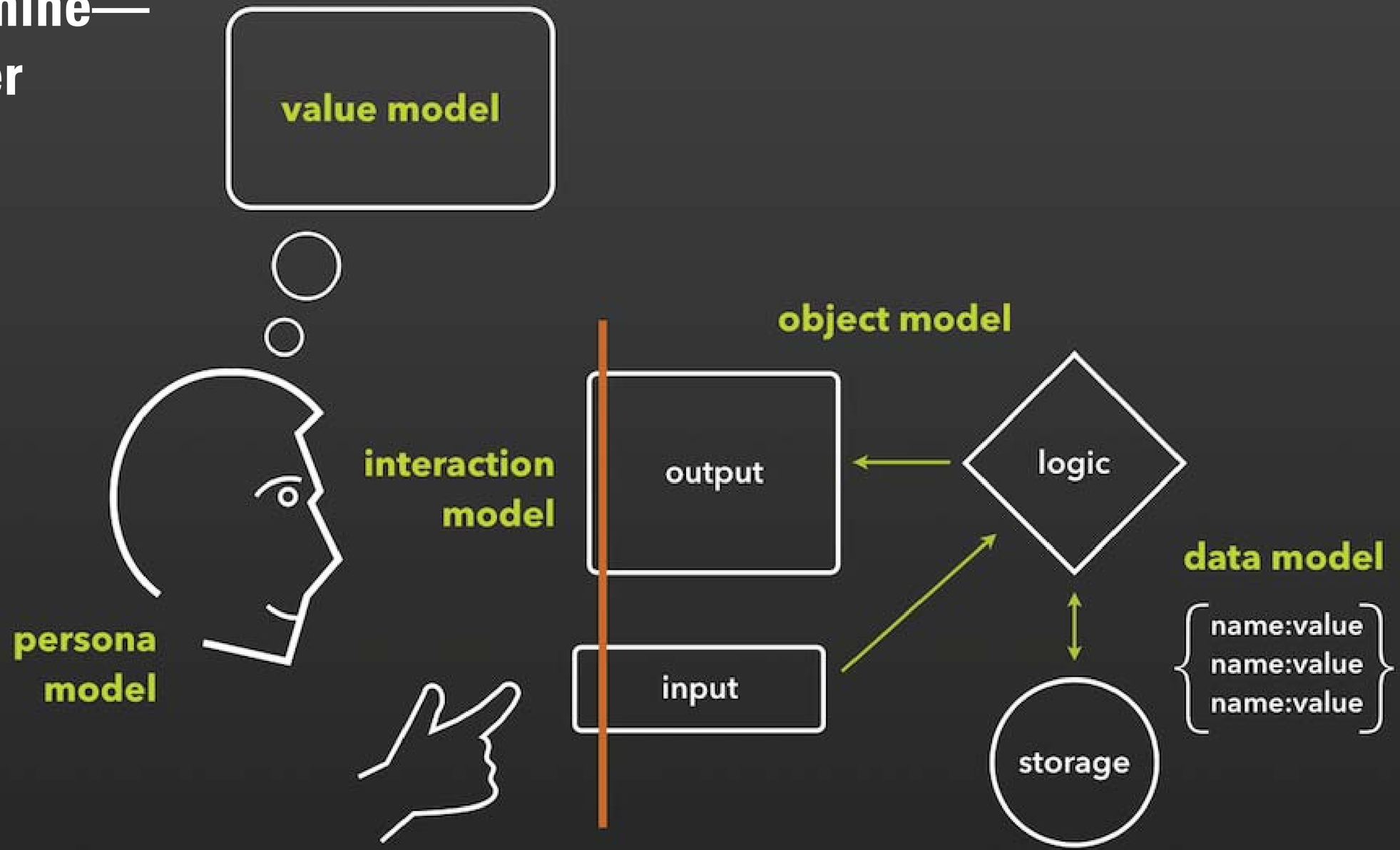
Users can **set** the current time.

Users can set an **alarm** at a **specified time,** or no alarm.

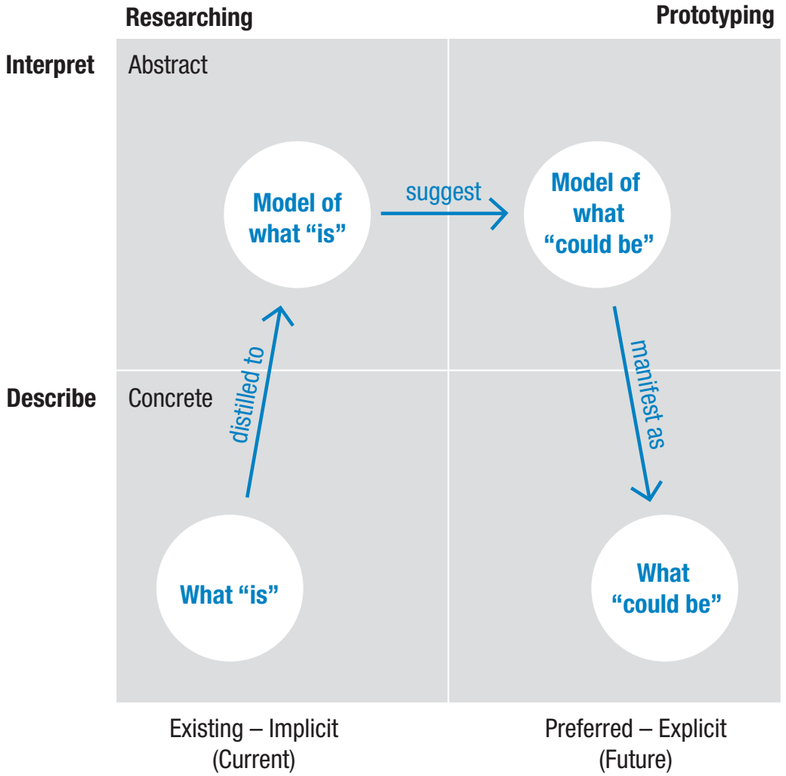
When an alarm is set and the current time equals the set **alarm time,**
the **alarm** is triggered.

Users can **turn off** an alarm.

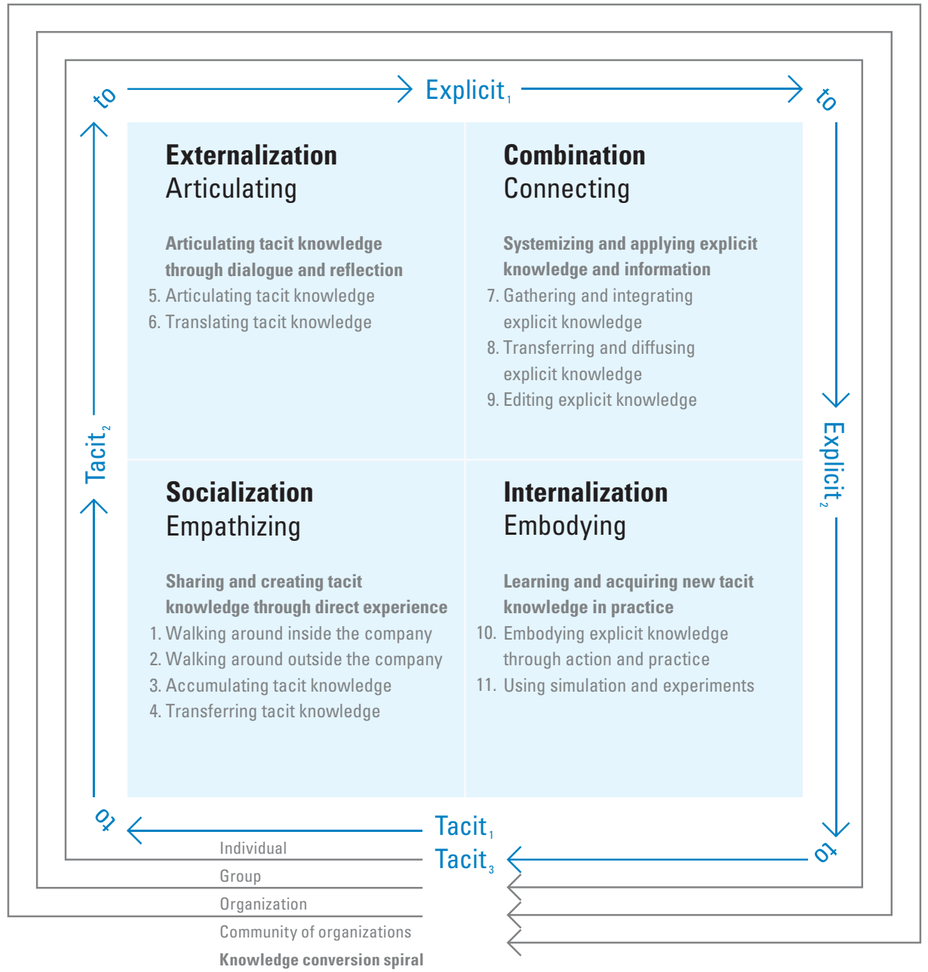
Digital Machine—
Tim Scheiner



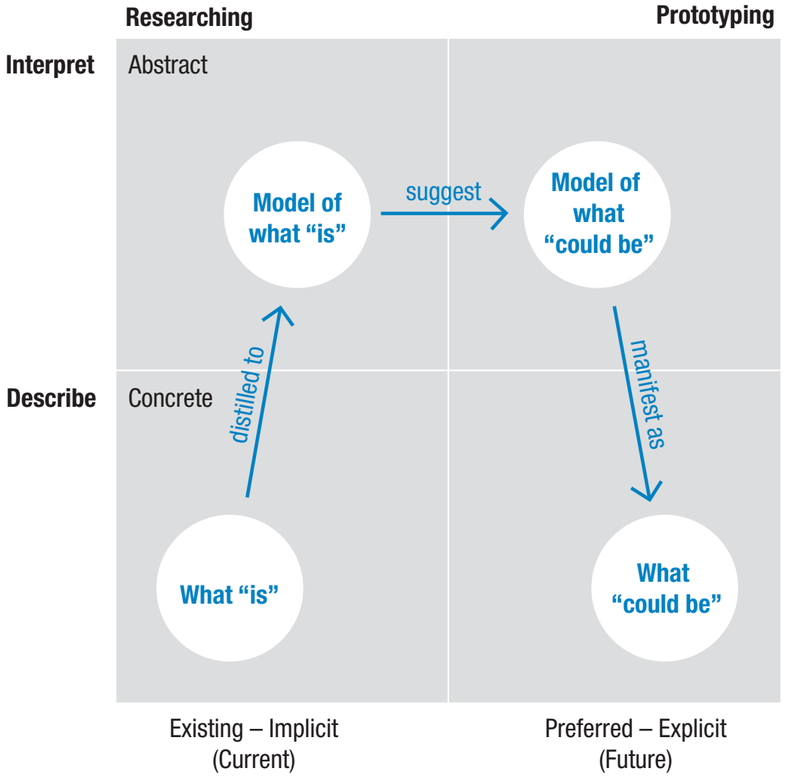
The Analysis-Synthesis Bridge Model shows how design crosses the gap between *what is* and *what should be*.



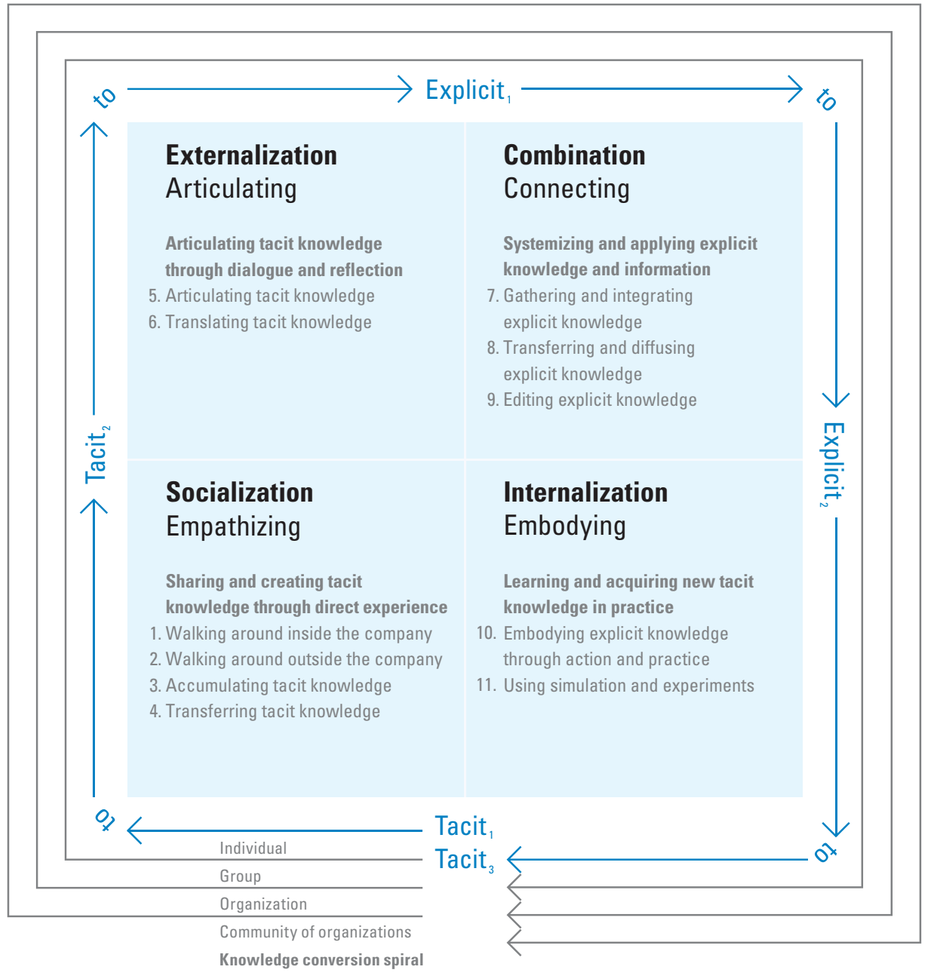
The SECI Model shows how organizations turn tacit knowledge into explicit knowledge, create new knowledge, and deploy it in operations.



Both models have the same basic structure—iterative loops—suggesting that designing *is* learning.



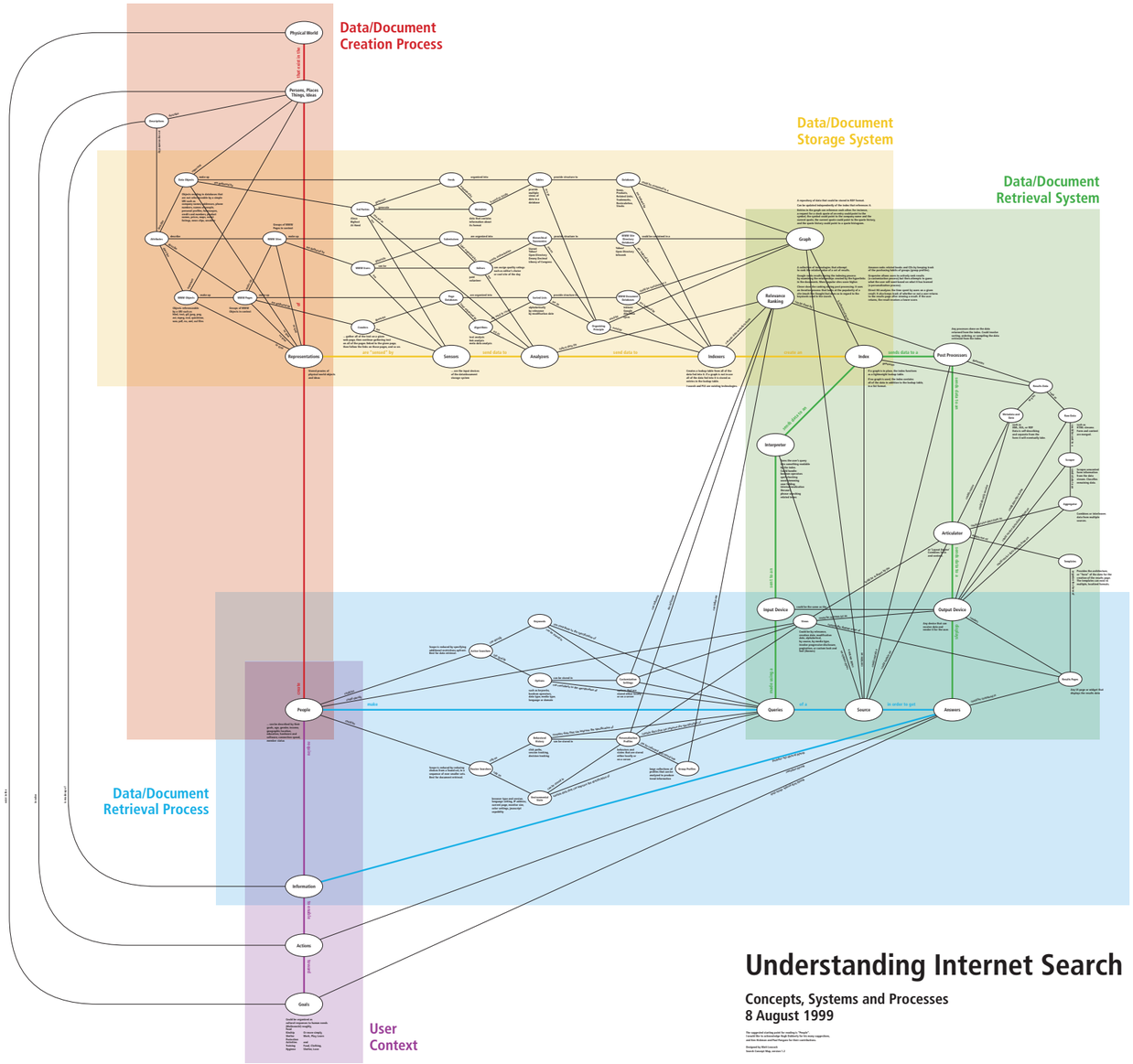
Analysis-Synthesis Bridge Model
Dubberly, Evenson & Robison (2008)



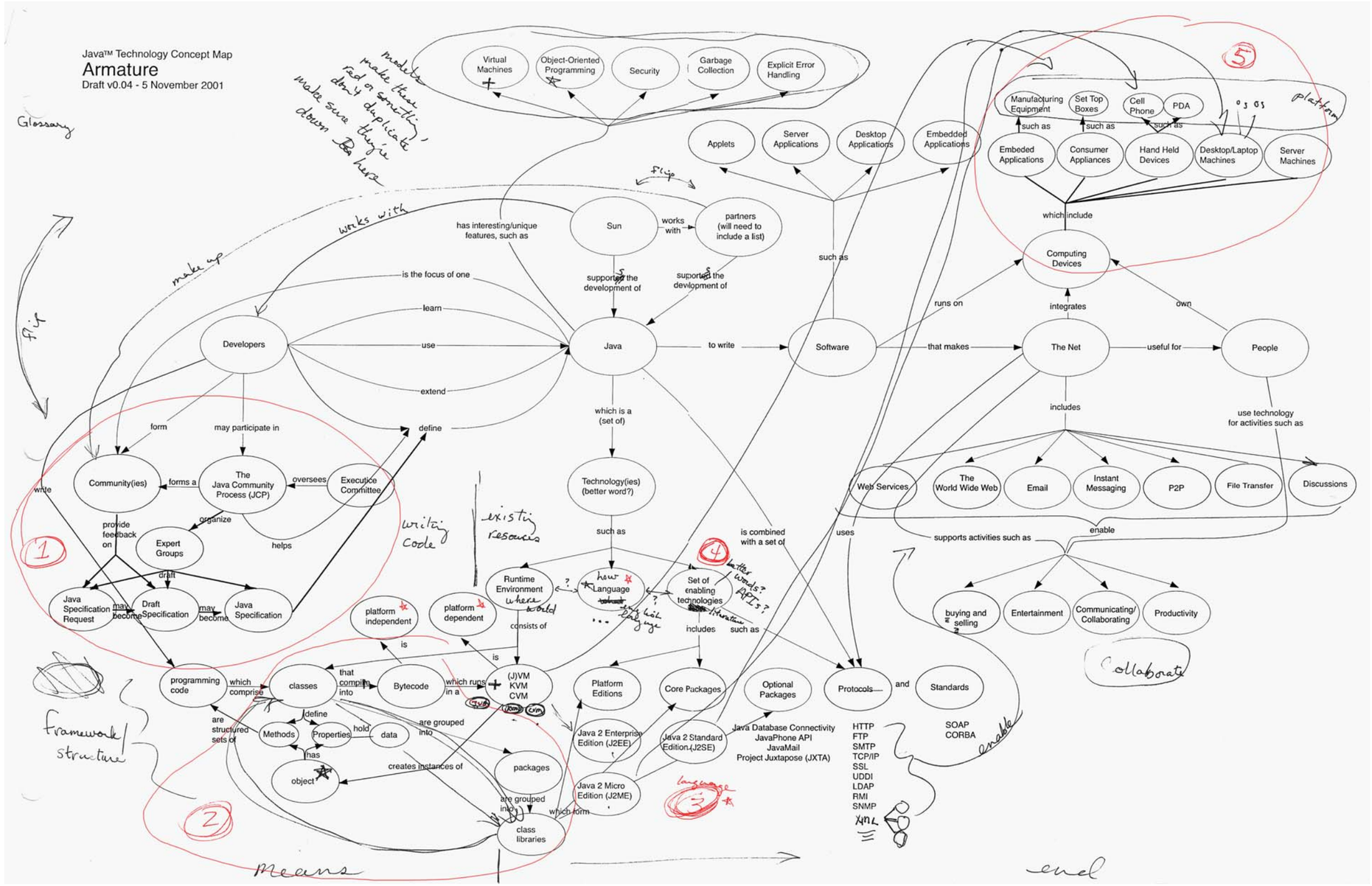
SECI model of knowledge create
Ikujiro Nonaka (1995)

Case Studies

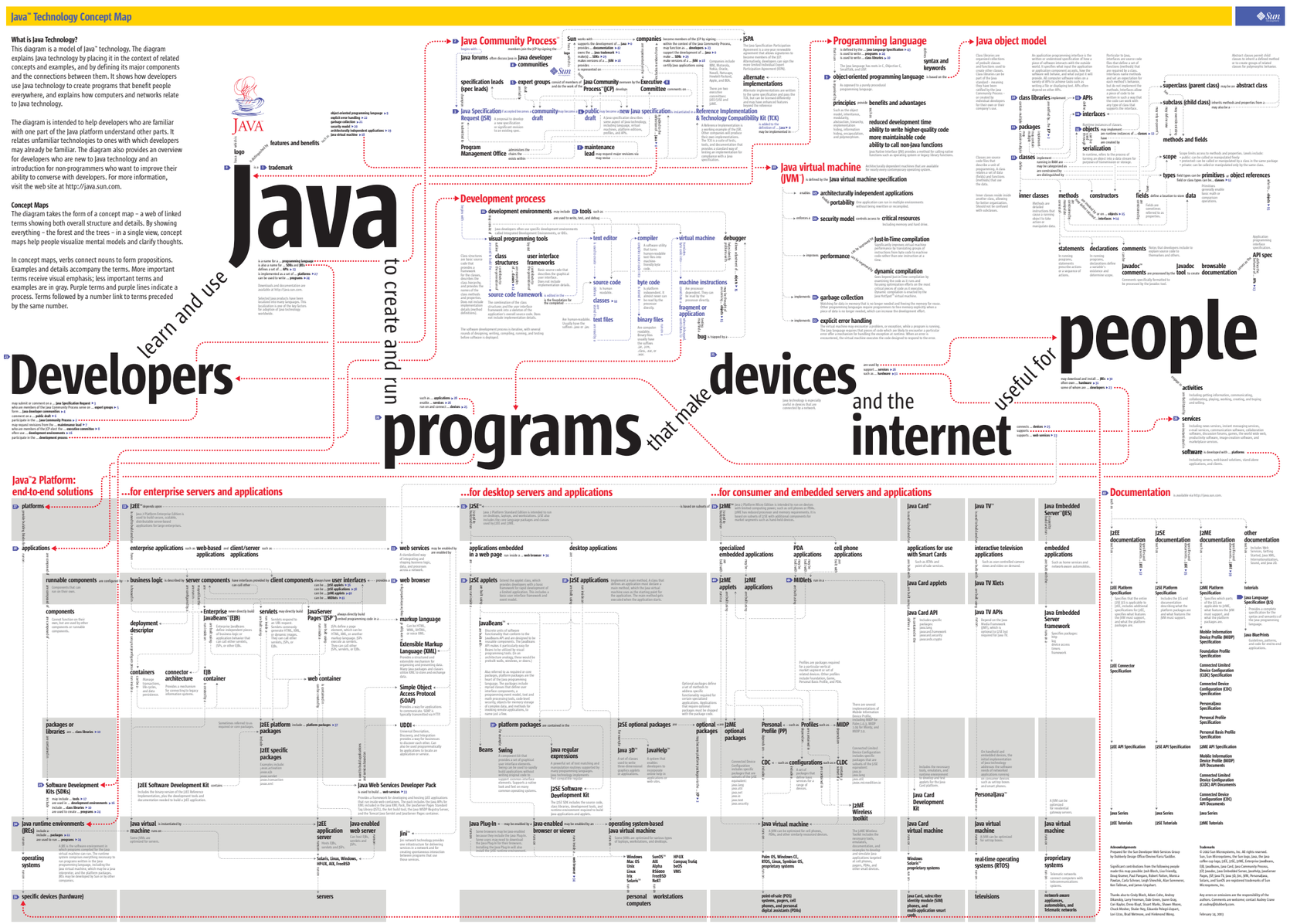
Understanding Internet Search Concept Map



Java Technology Concept Map—Draft

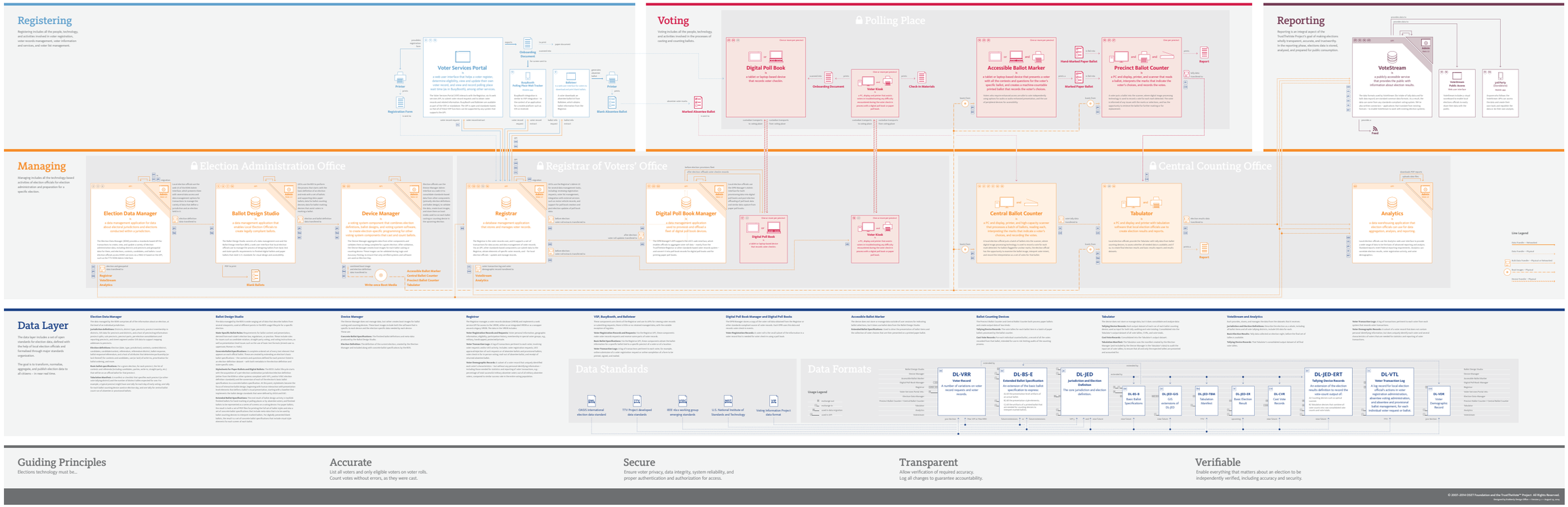


Java Technology Concept Map—Final



Election Technology Framework—Components

Introducing the Election Technology Framework—
Because We All Deserve a Better Voting Experience



Data Layer

The data layer includes a set of open standards for election data, defined with the help of local election officials and formalized through major standards organizations.

The goal is to transform, normalize, aggregate, and publish election data to all citizens — in near-real time.

Election Data Manager
The data managed by the EDM is under ongoing set of rules that describe ballots from the perspective of a single voter, and different points in the NIST Image Lifecycle for a specific election.

Jurisdiction and Districts: All districts, district types, jurisdictions, precincts and districts, GIS data for precincts and districts, and a host of preexisting information; precinct splits, sub-precincts, precinct parts, jurisdictions consolidations and reporting precincts, and street segment and/or GIS data to support mapping and districting processes.

Election definitions: Election dates, types, jurisdiction(s), contests, contest districts, candidates, candidate(s) selected, referendum, referendum district, ballot response, referendum wording, and other information that describes the election process. Can be used forward for contests and candidates, and also for reference, post-finalized for ballot ordering, and more.

Basic ballot specifications: For a given election, for each precinct, the list of contests and referenda (including candidates, parties, write-in, straight party, etc.) that will be on an official ballot for that precinct.

Tabulation Manifest: A manifest or checklist that specifies each precinct (or other tabulation group) and the ballots that are to be tabulated for that group. For example, a typical precinct might have one ballot, for head of state, voting, one tally for each ballot counting device used on election day, and one tally for vested ballot count out of absentee or provisional ballots.

Ballot Design Studio
The data managed by the BDS is under ongoing set of rules that describe ballots from the perspective of a single voter, and different points in the NIST Image Lifecycle for a specific election.

State-Specific Ballot Rules: Requirements for ballot content and presentation, derived from each state's election law, regulations, or practices. These include rules for clean-record, as-established rotation, straight party voting, and voting instructions, as well as requirements for ballot layout (such as the use of basic hand formats), printed count or uppercase, Romans vs. Arabic).

Concrete Ballot Specifications: A complete or detail set of every text element that appears on a ballot for a specific election. These are created by combining an election's basic ballot specifications with the election's contests and candidates. Can be derived from an election definition, or otherwise. —with basic templates of the election definition and state-specific rules.

Highchemis for Paper Ballots and Digital Ballots: The NIST's ballot lifecycle starts with a concrete ballot specification. Paper ballots are printed and digital ballots are rendered from the XHTML or other systems-ecosystem with HTML + audio or XHTML definition standards) and the conversion out of the electronic basic ballot specifications by a standard ballot specification. At this point, stylesheets become the primary mechanism for defining the look and feel of the ballot, and the ballot's structural elements that define a ballot's visual presentation, starting with a baseline that implements the ballot design standards that were defined by AIGA and AIGA.

Automated Ballot Specifications: The end result of ballot design activity is machine-readable ballot definitions. The ballot definitions are used by the ballot printing and ballot marking devices in voting machines as a series of screens on a voting device. For paper ballots, the result is both a set of PDF files for printing the full set of ballot styles and also a machine-readable ballot definition that describes the ballot. For ballot marking devices to interpret machine-readable ballots, the digitally presented basic ballots, the result is a set of concrete ballot specifications that include visual style elements to track screens of each ballot.

Device Manager
The Device Manager does not manage data, but rather creates boot images for ballot marking devices. Each device has a unique boot image, which is a function of the device's specific in-each device and the election-specific data needed by each device. These are:

Concrete Ballot Specifications: The finished ballot definitions and voter data produced by the Ballot Design Studio.

Election Definitions: The ballot definitions of the voter interfaces, created by the Election Manager, and included along with covered ballot specifications by the BDS.

Registrar
The Registrar manages a voter-centric database (VRDB) and implements a web-based UI for voter registration. The VRDB is designed to be compliant with NVRA in an envelope and and a Voting's VRDB. The data in the VRDB includes:

Voter Registration Records and Requests: Voter personal information, geographic information, eligibility, participation history, membership in special voter groups, (e.g., military), hands-signature, preferred locations.

Election Definitions: The ballot definitions of the current elections, created by the Election Manager, and included along with covered ballot specifications by the BDS.

Voter Transaction Logs: A log of all transactions performed by each voter from each point of interaction, including registration requests or online applications of a form to be printed, signed, and mailed.

VSP, BusyBooth, and Ballotseer
These components are clients of the Registrar and use its API's for viewing voter records and for updating them. In some cases, there is little or no permanent managed data, with the exception of logging data.

Voter Registration Records and Requests: Via the Registrar API, these components make voter records requests and receive some parts of voter records.

Basic Ballot Specifications: Via the Registrar API, these components obtain the ballot information for a specific ballot tied to a specific precinct of a voter or of a location.

Voter Transaction Logs: A log of transactions performed by each voter, for example, registration requests, registration updates, or online application of a form to be printed, signed, and mailed.

Digital Poll Book Manager and Digital Poll Books
The DPB Manager stores a copy of the voter roll data extracted from the Registrar or VRDB. It also manages the assignment of voter records. Each DPB stores the data and records voter check-in events.

Voter Registration Records: A voter roll is the set of subset of the information in a voter record that is needed for voter check-in using a poll book.

Accessible Ballot Marker
The device does not store or manage data outside of user sessions for indicating voter choices. Ballot definitions are loaded from the Election Manager.

Automated Ballot Specifications: Used to store the presentation of ballot choices and the selection of voter choices that are then presented on a printed paper ballot.

Ballot Counting Devices
The Precinct Ballot Counter and Central Ballot Counter both process paper ballots and produce electronic records of votes.

Cast Vote Records: For each individual counted ballot, a record of all the votes recorded from that ballot, intended for use in risk limiting audits of the counting process.

Tabulator
The tabulator does not store or manage data, but it does consolidate and analyze data.

Tallying Device Records: Records equivalent to Cast Vote Records, but produced by tallying devices that are not ballot counting devices. For example, the Tallybot's output is a stream of cast vote tallies, CVRs, and vote totals.

Cast Vote Records: Consolidated vote for Tabulator's output stream.

Tabulation Manifest: The tabulator scans the manifest created by the Election Manager (and included by the Device Manager in the Tabulator's data) to audit the inputs of cast tallies, to ensure that all vote-ally have expected votes are processed and accounted for.

VoteStream and Analytics
Each provides, stores, and manages the data from the datasets that it receives:

Jurisdiction and Election Definitions: From the election device, or a vendor, including the election definitions, districts, and other information about the election.

Basic Election Results: Tally data collected on election night, before the final set of CVR's is available.

Tallying Device Records: Post-Tabulator's consolidated output dataset of all final vote tallies.

Voter Transaction Logs: A log of transactions performed by each voter from each point of interaction, including registration requests or online applications of a form to be printed, signed, and mailed.

Voter Demographic Records: A subset of a voter record that uniquely identified each voter's characteristics — but without any personal identifying information — including those needed for statistics and reporting of voter transactions, e.g., precinct, age, party, race, ethnicity, gender, and more. Used in all ballots, absentee voters, compared to similar counties and re-branches using populations.

Data Standards

- OASIS international election data standard
- ITF Project developed data standards
- IEEE 1622 working group emerging standards
- U.S. National Institute of Standards and Technology
- Voting Information Project data format

Data Formats

Guiding Principles

Elections technology must be...

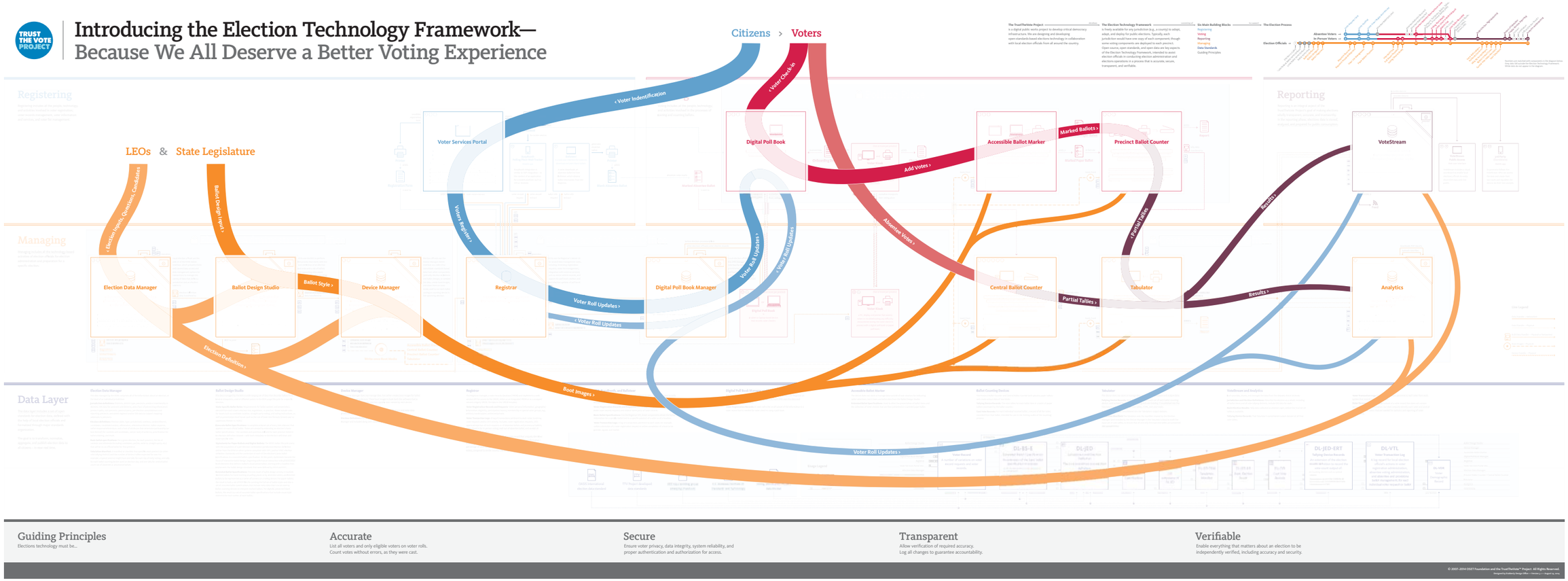
Accurate
List all voters and only eligible voters on voter rolls.
Count votes without errors, as they were cast.

Secure
Ensure voter privacy, data integrity, system reliability, and proper authentication and authorization for access.

Transparent
Allow verification of required accuracy.
Log all changes to guarantee accountability.

Verifiable
Enable everything that matters about an election to be independently verified, including accuracy and security.

Election Technology Framework—Process



PART TWO

Information Structures

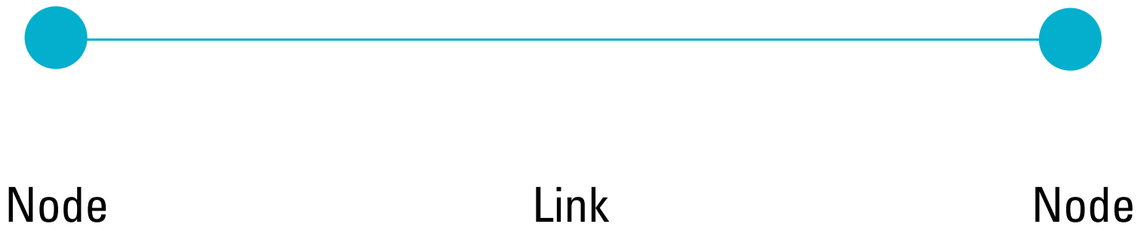
Primitives:

- Name-Value Pairs
- Nodes + Links
- Array
- Matrix
- Tree
- Web

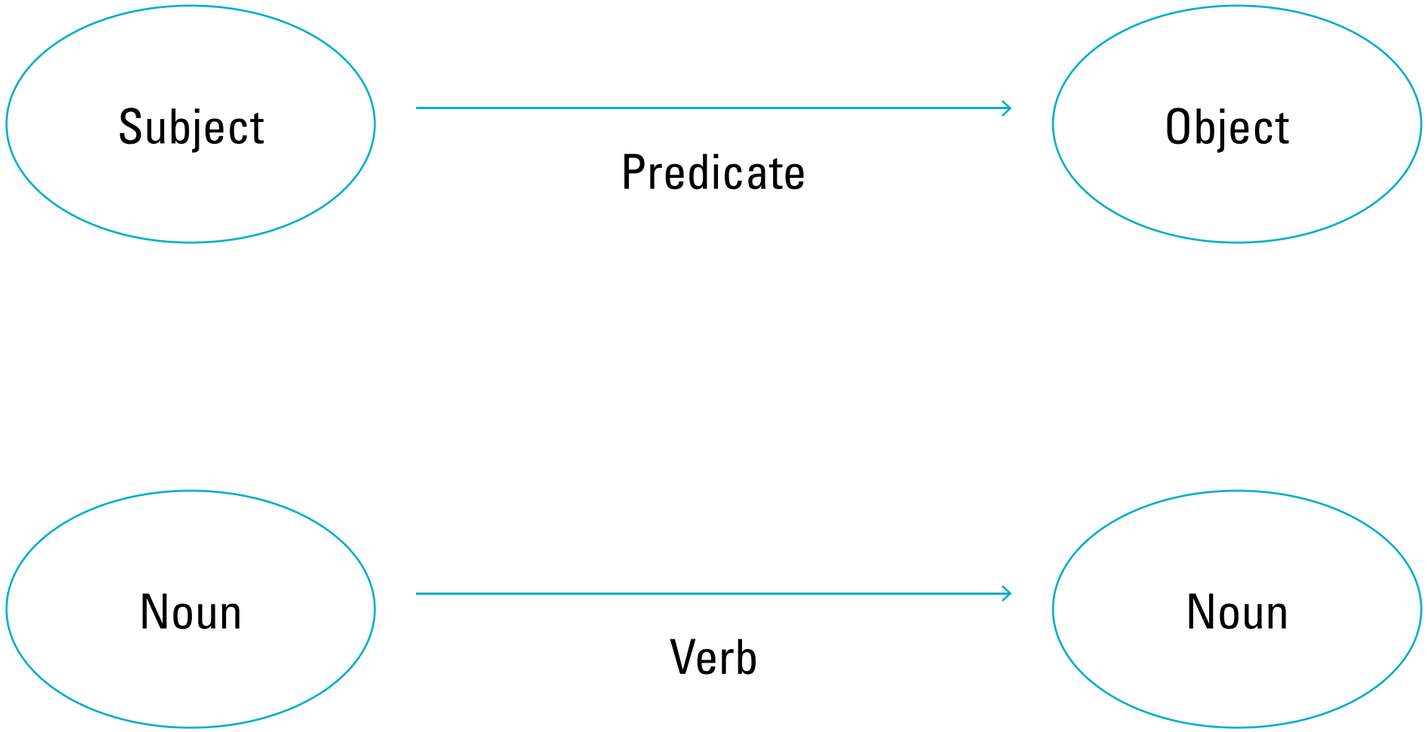
Name-Value Pairs

Key	Value
firstName	Bugs
lastName	Bunny
location	Earth

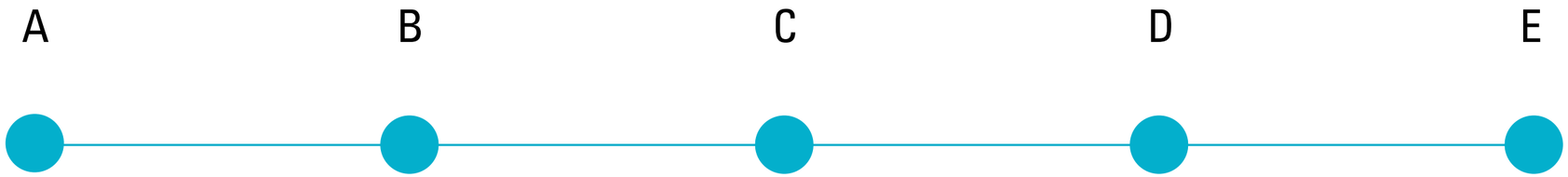
Nodes + Links—also entities + relationships



RDF example

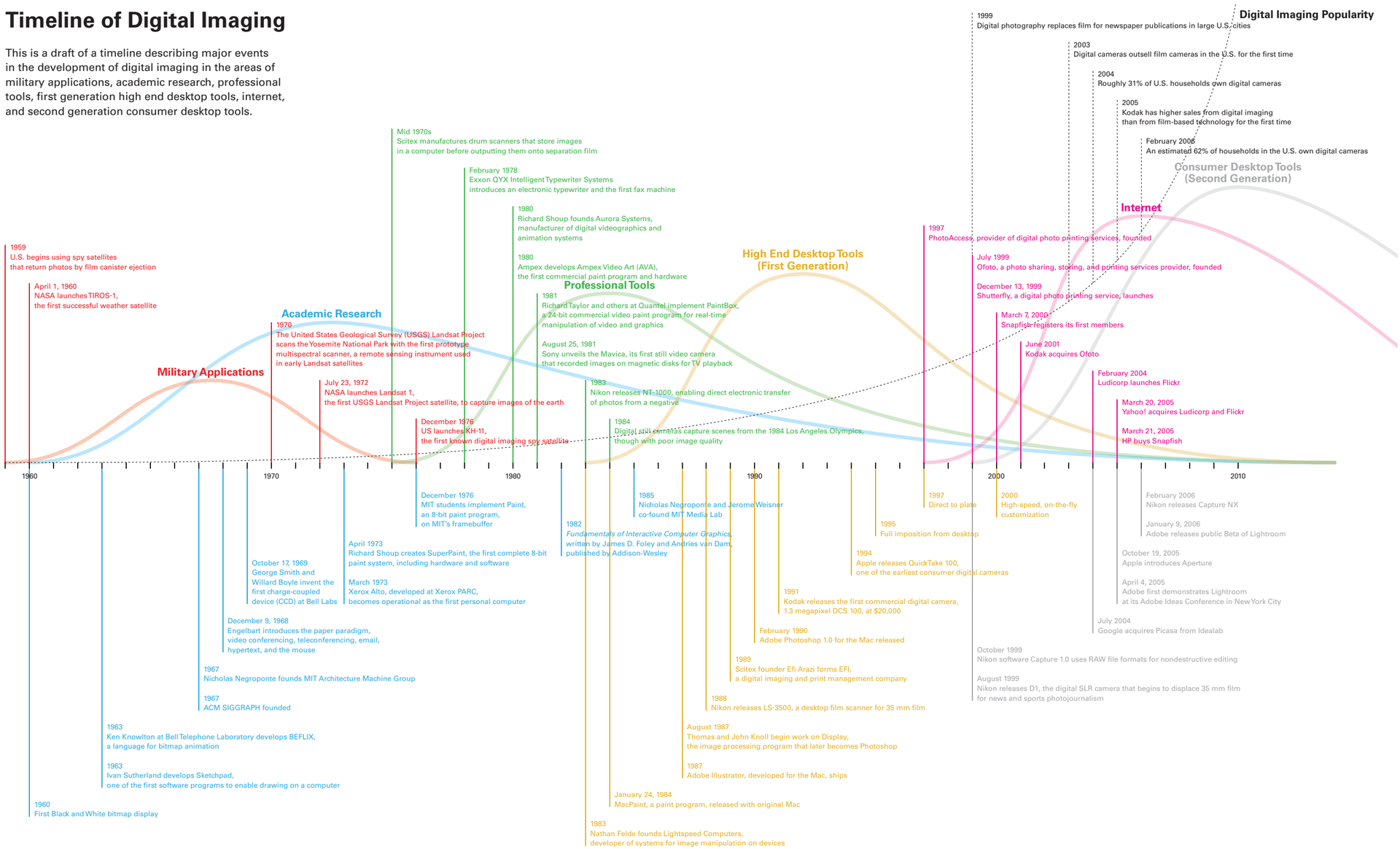


Array—also list, stack



Timeline of Digital Imaging

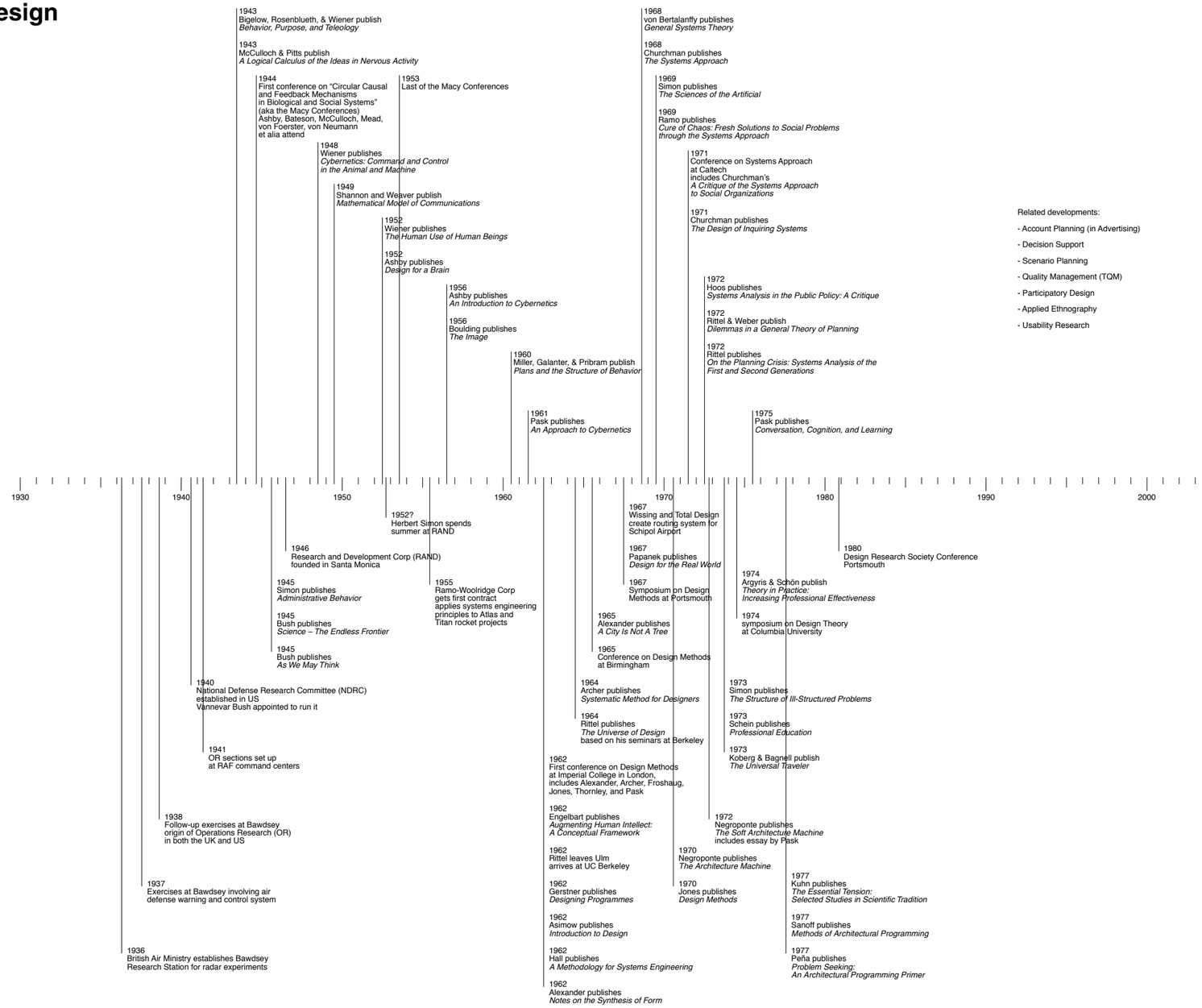
This is a draft of a timeline describing major events in the development of digital imaging in the areas of military applications, academic research, professional tools, first generation high end desktop tools, internet, and second generation consumer desktop tools.



Version 1.3
Dubberly Design Office
March 9, 2006

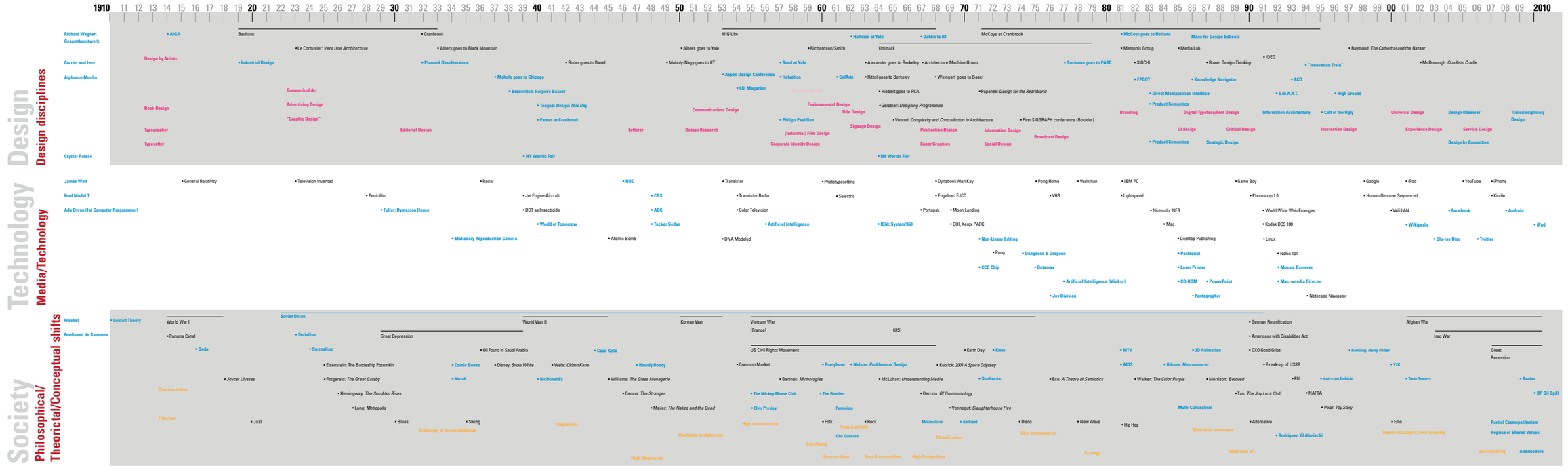
Cybernetics and Systems Design Timeline

This timeline describes major events in the development of cybernetics, operations research, systems analysis, systems engineering, and systems design (compiled in 2002).

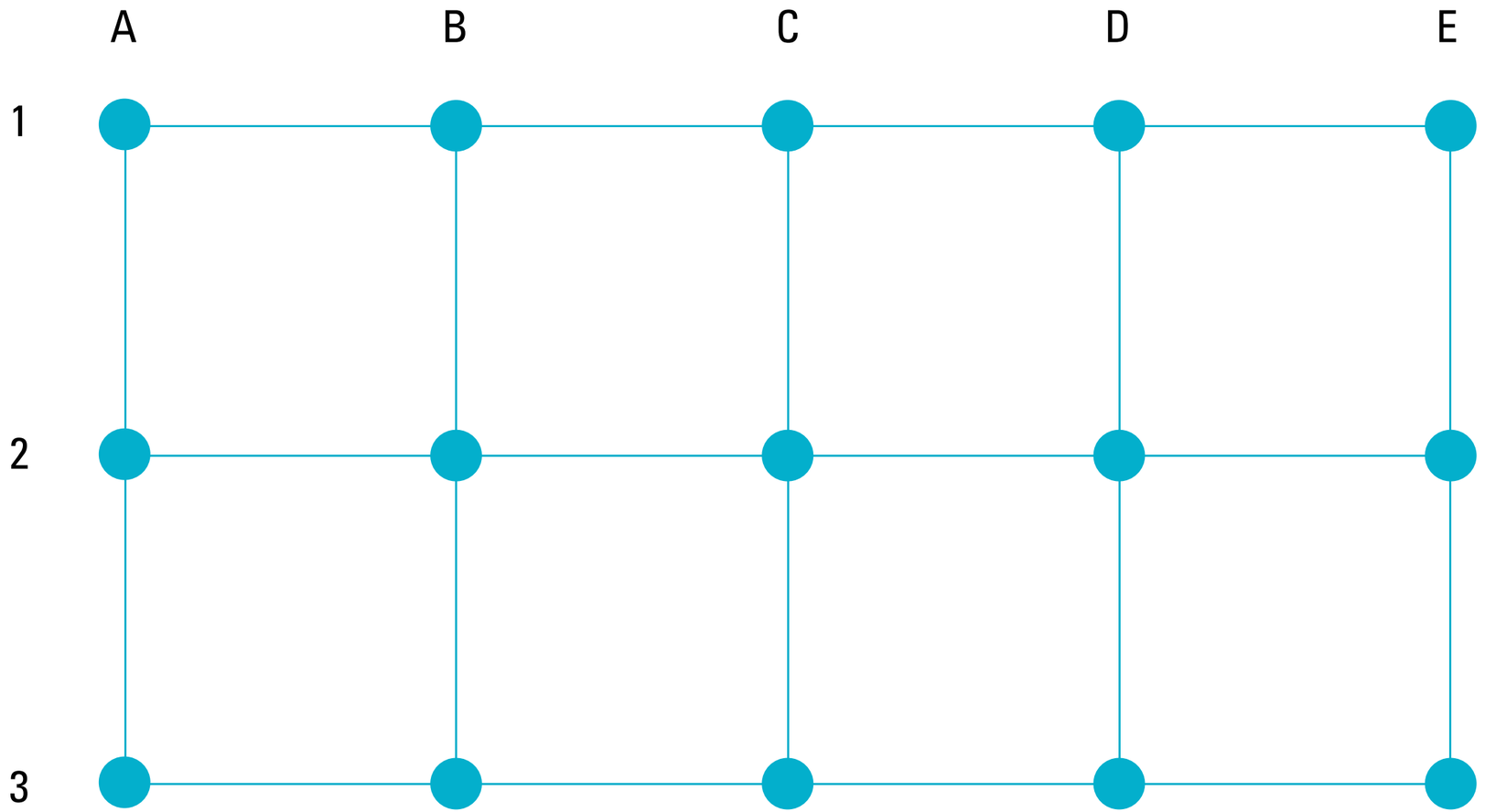


Parallel timelines

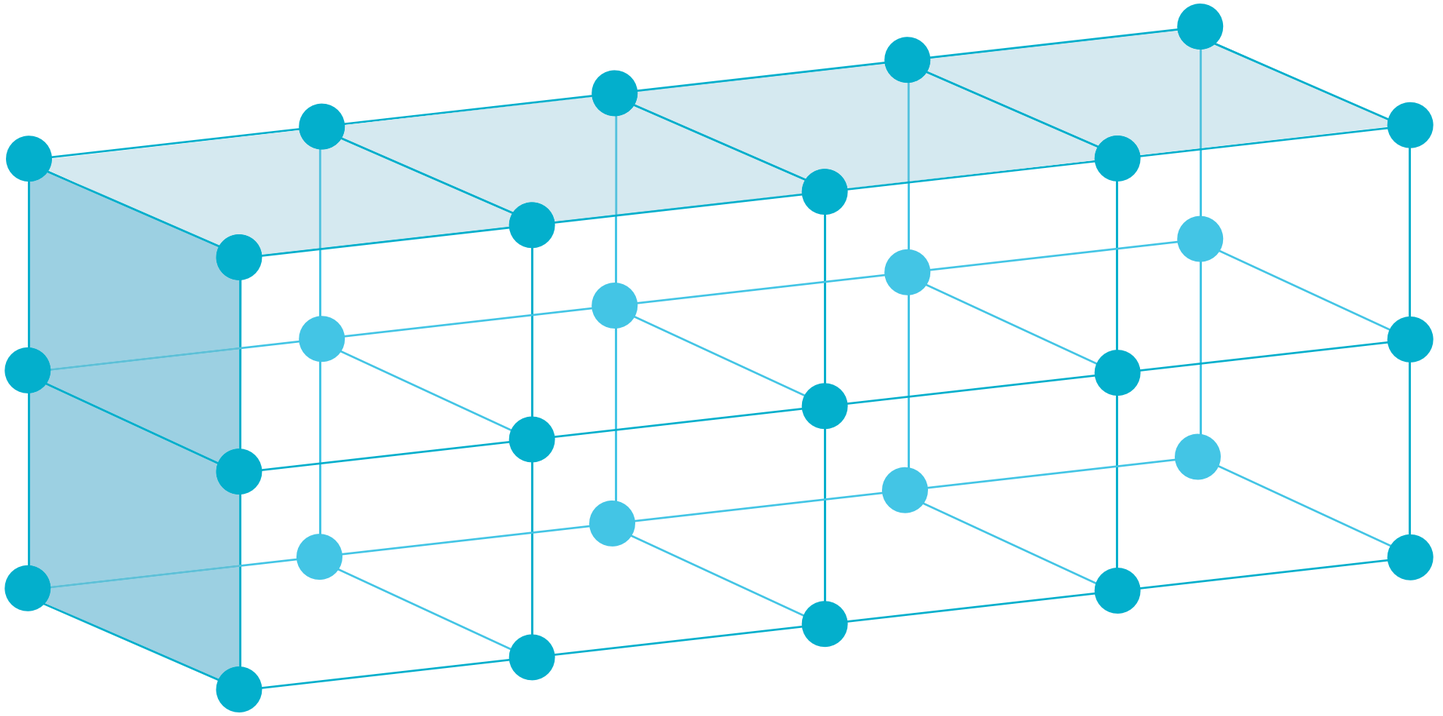
The Past 100 Years



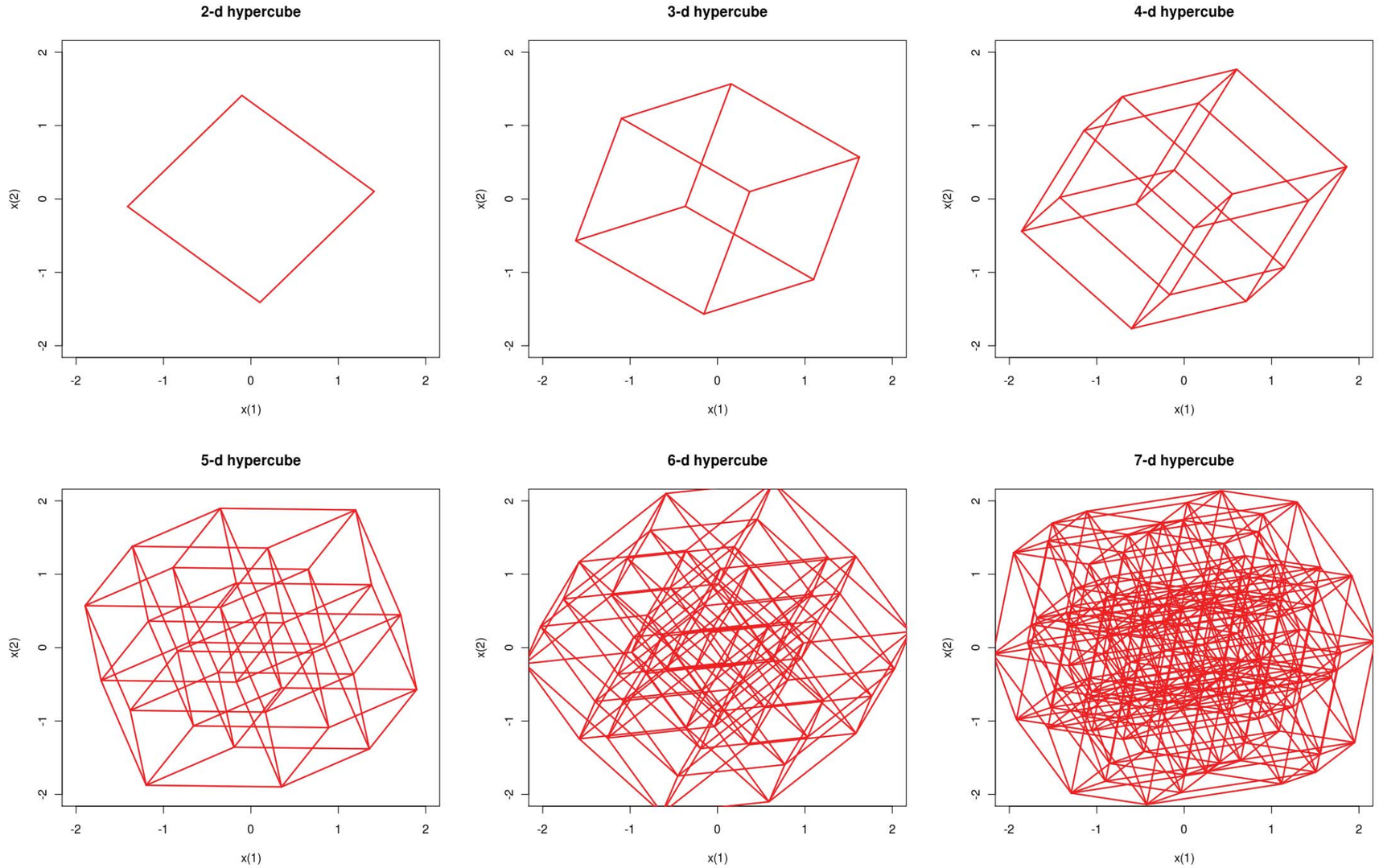
Matrix—also table



maybe 3D



or 4D or more Ds

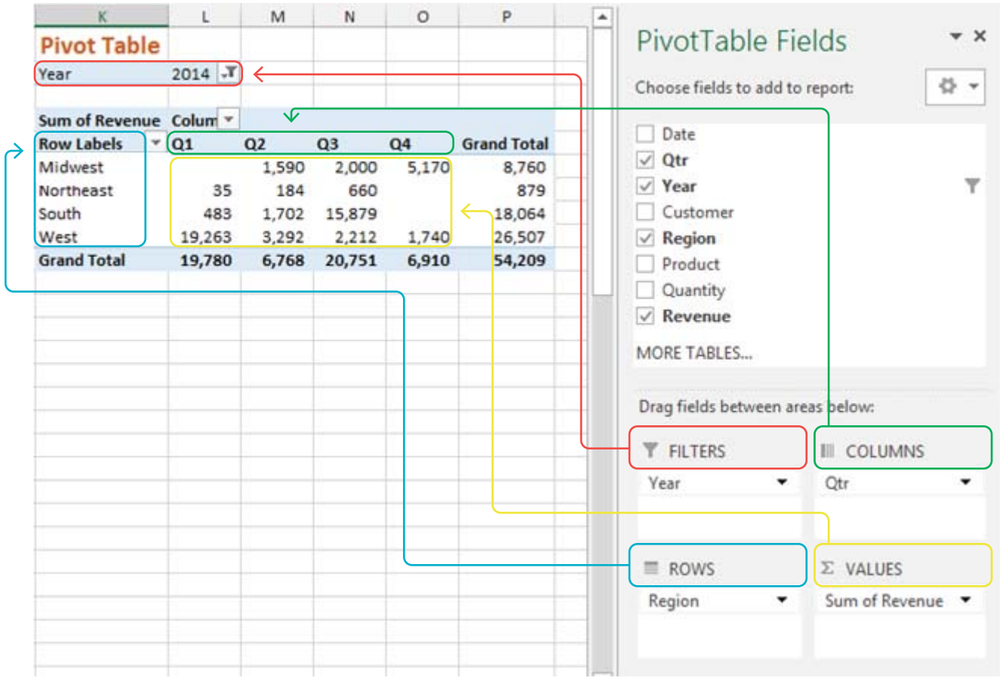


E.g., Stockroom

Pivot tables

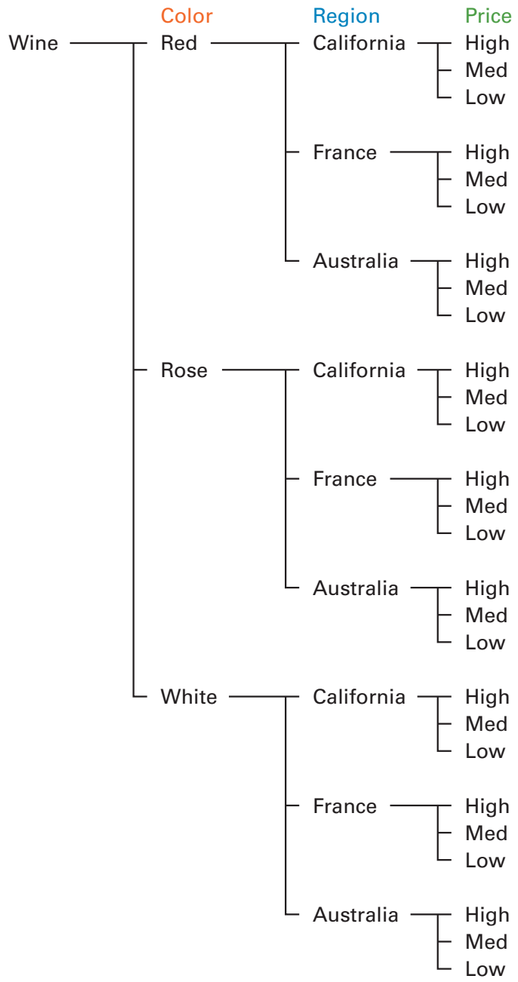
A tool that allows you to summarize and explore large sets of data into a meaningful report.

	A	B	C	D	E	F	G	H
1	Source Data for Pivot Table							
2	Date	Qtr	Year	Customer	Region	Product	Quantity	Revenue
3	01/05/13	Q1	2013	Customer 4	West	Product 9	15	270
4	03/12/13	Q1	2013	Customer 1	Midwest	Product 3	20	200
5	03/14/13	Q1	2013	Customer 6	West	Product 8	25	1,150
6	03/27/13	Q1	2013	Customer 3	West	Product 1	14	100
7	04/14/13	Q2	2013	Customer 6	Northeast	Product 7	16	400
8	04/16/13	Q2	2013	Customer 7	Midwest	Product 5	40	510
9	04/25/13	Q2	2013	Customer 6	South	Product 3	20	70
10	04/28/13	Q2	2013	Customer 6	Midwest	Product 6	10	92
11	07/03/13	Q3	2013	Customer 2	West	Product 7	29	350
12	07/06/13	Q3	2013	Customer 6	Midwest	Product 7	10	128

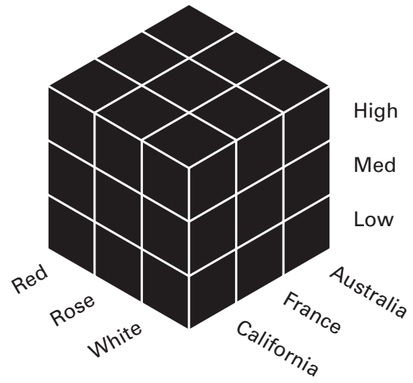


All Wine

Tree



Cube



Interface

Criteria:

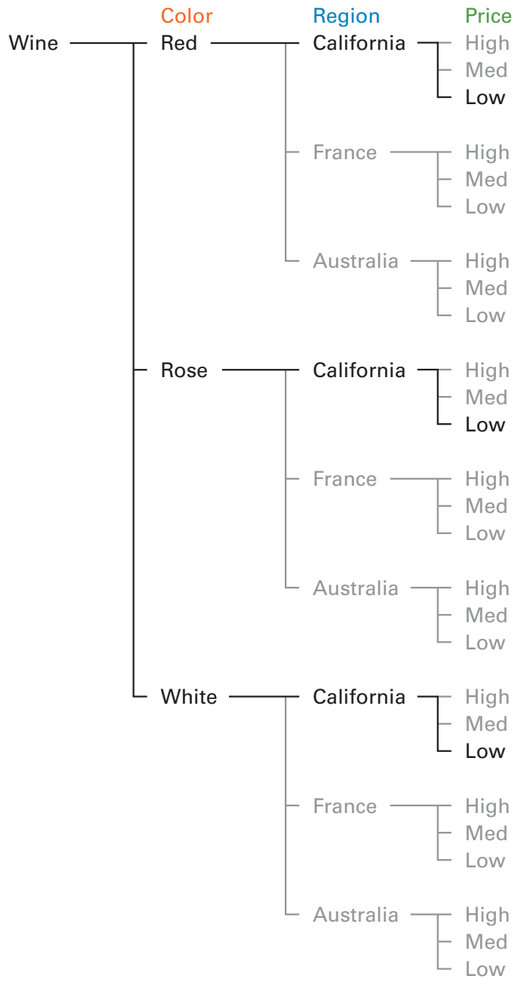
☑ Red	☑ California	☑ High
☑ Rose	☑ France	☑ Med
☑ White	☑ Australia	☑ Low

Result:

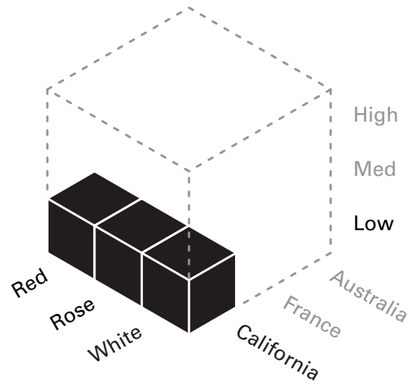
27 Bottles
1) Joseph Phelps Insignia
2) Chateau St. Jean Cabernet Sauvignon Sonoma
3) Beaulieu Vineyards Cabernet Sauvignon
4) Chateau Lafite Rothschild
5) Chateau Leoville Barton
6) E. Guigal Cotes du Rhone
7) Penfold's Grange
8) Hewitson L'Oizeau Shiraz
9) Thorne Clarke Shotfire Ridge Shiraz
10) Palmina "Botasea" Rosato

California/Low/All Colors

Tree

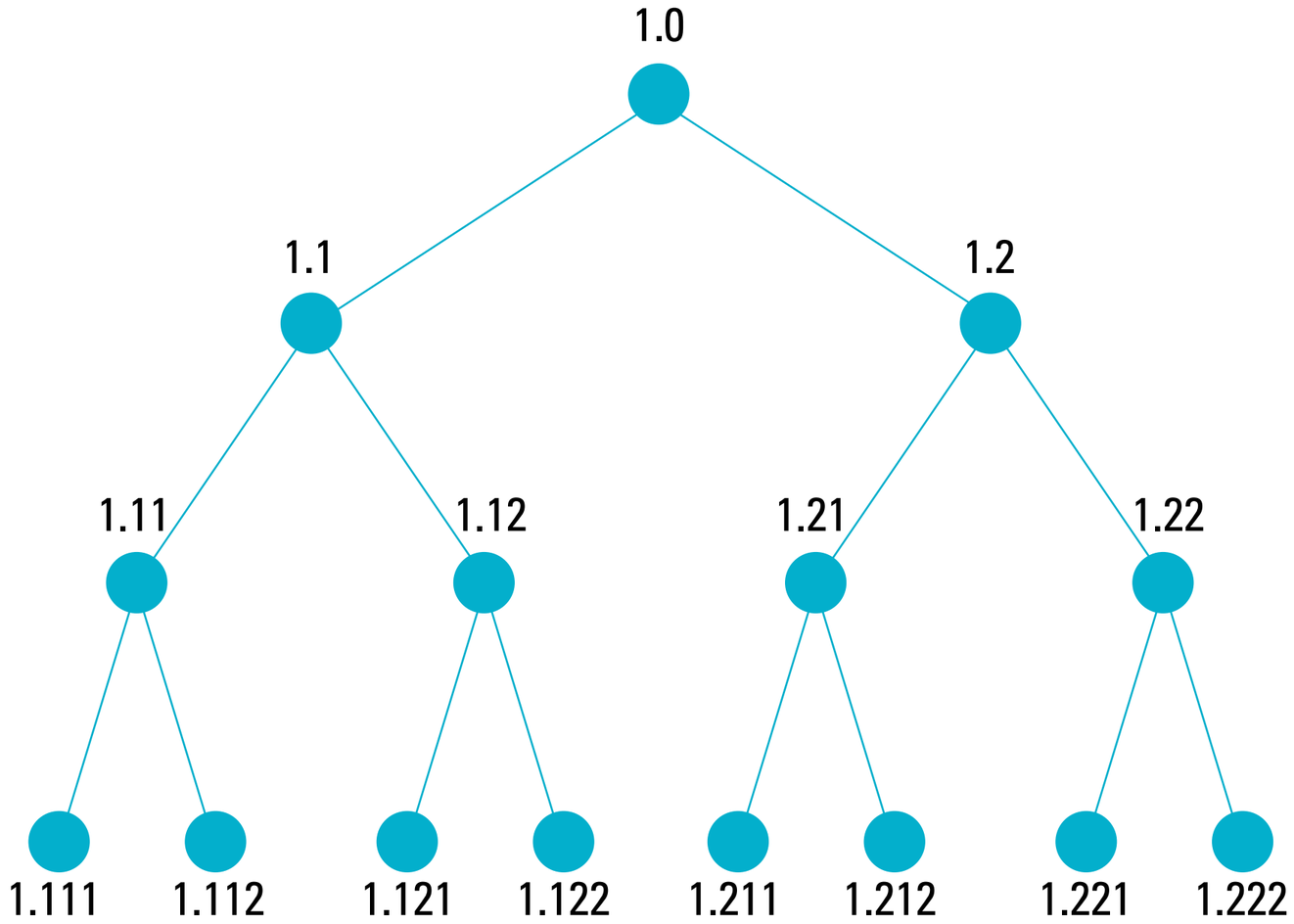


Cube

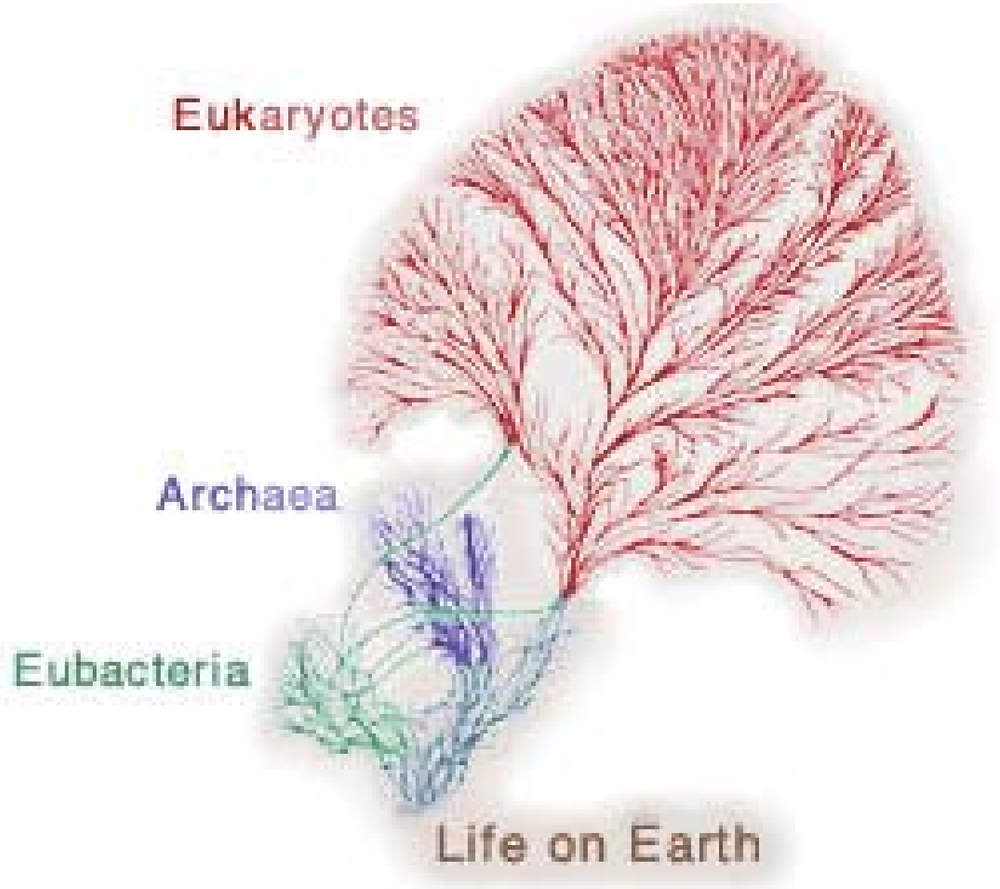


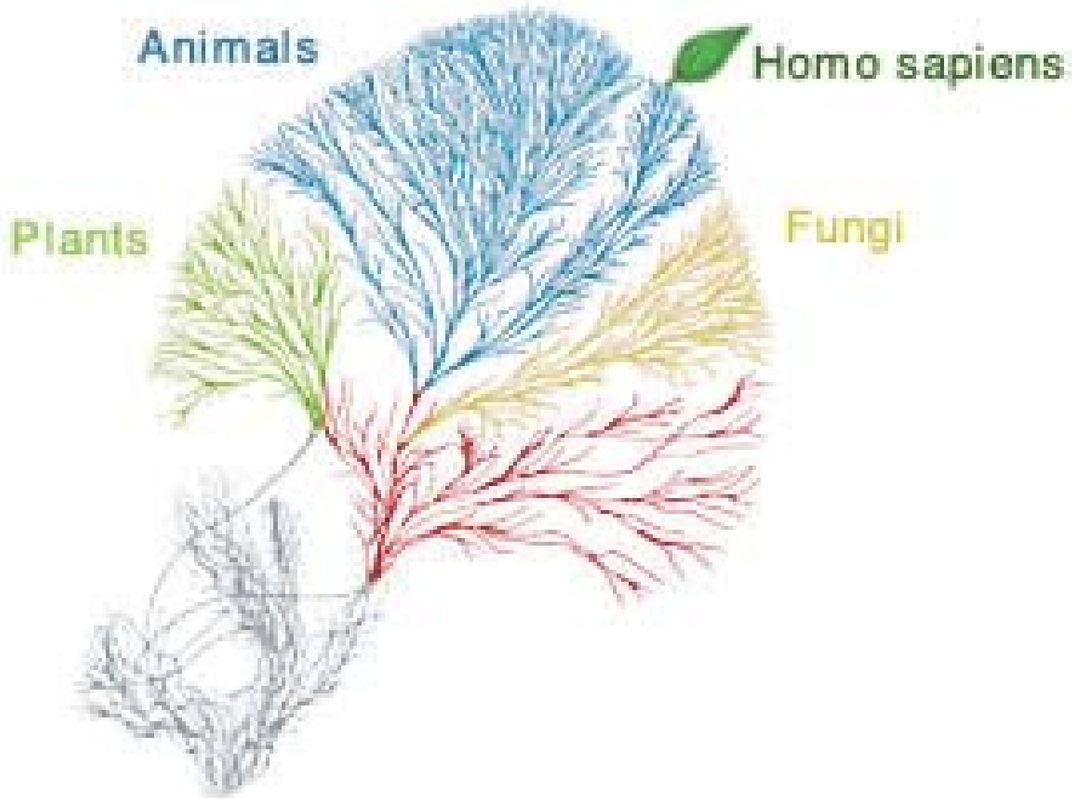
Interface

Tree—also hierarchy, taxonomy

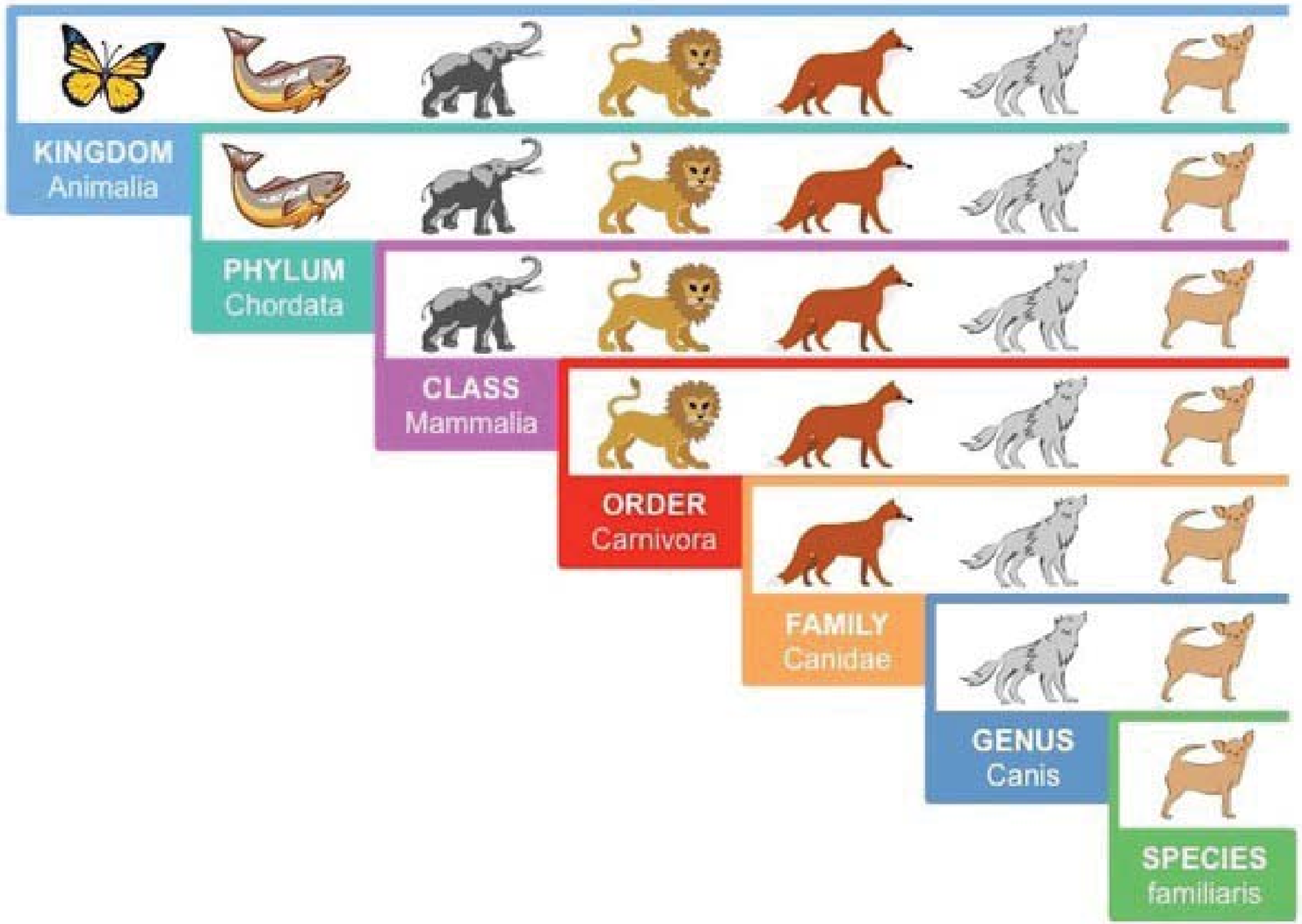


Tree of life


Eukaryotes
Archaea
Eubacteria
Life on Earth


Animals
Homo sapiens
Plants
Fungi

Taxonomy


KINGDOM
Animalia
PHYLUM
Chordata
CLASS
Mammalia
ORDER
Carnivora
FAMILY
Canidae
GENUS
Canis
SPECIES
familiaris

An outline

1.0 Title

1.1 Section

1.11 SubSection

1.111 Paragraph

1.112 Paragraph

1.12 SubSection

1.121 Paragraph

1.122 Paragraph

1.2 Section

1.21 SubSection

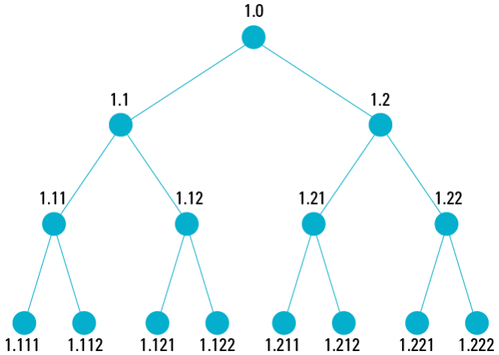
1.211 Paragraph

1.212 Paragraph

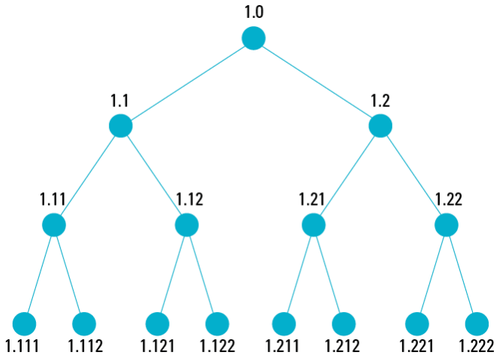
1.22 SubSection

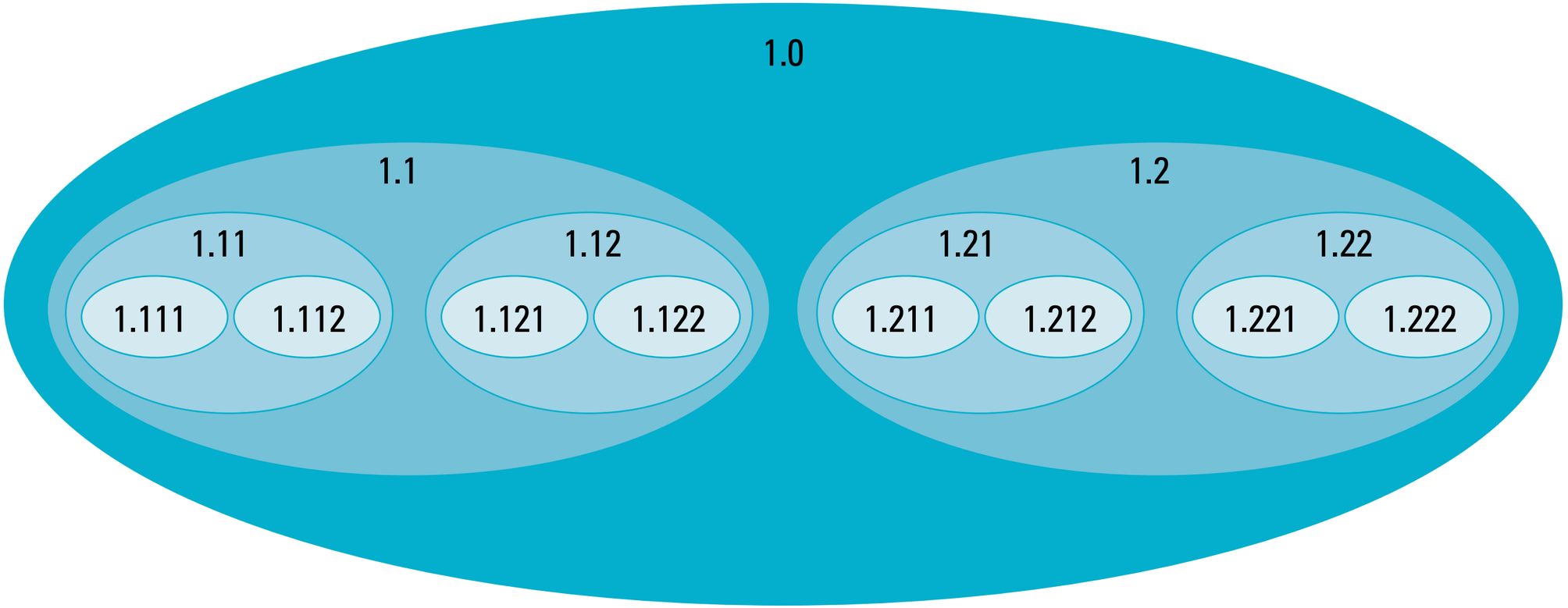
1.221 Paragraph

1.222 Paragraph

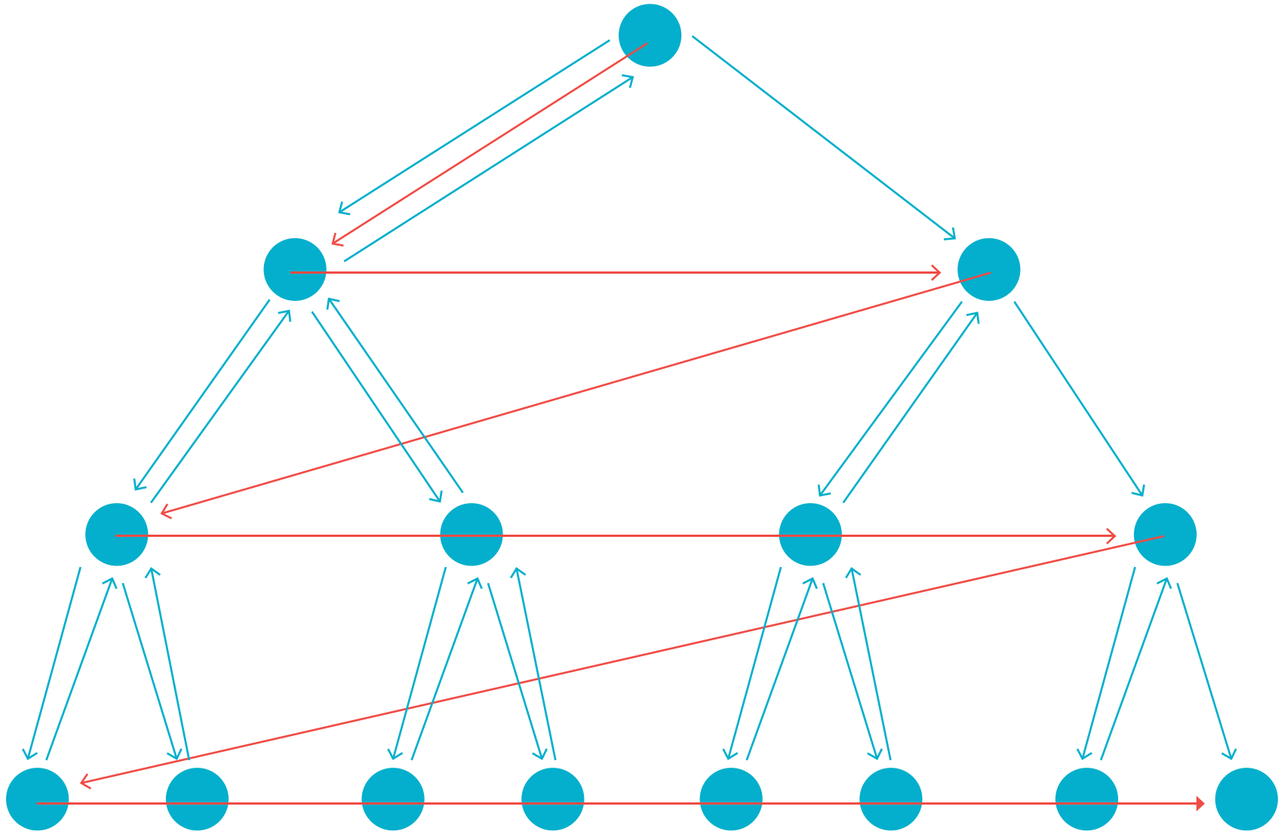


Trees can also be represented as Venn diagrams

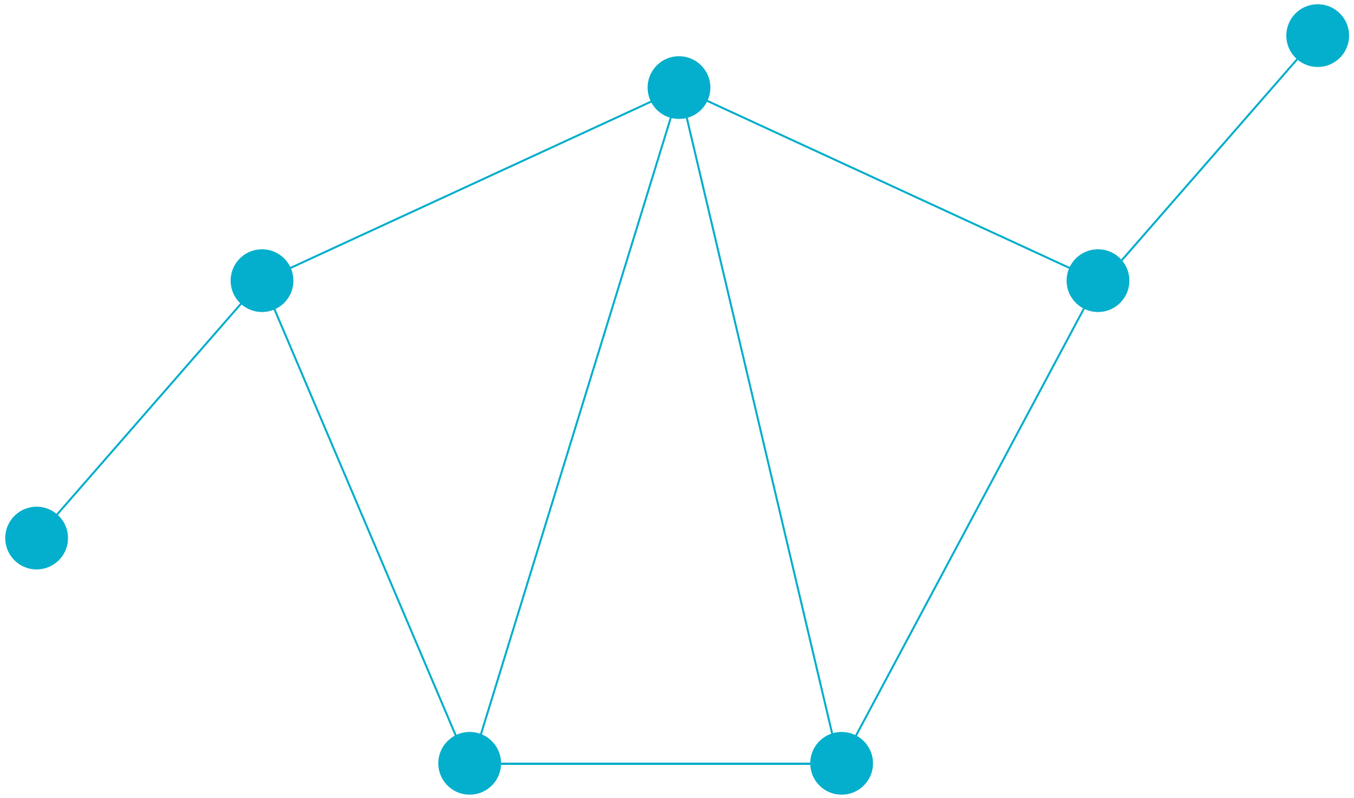




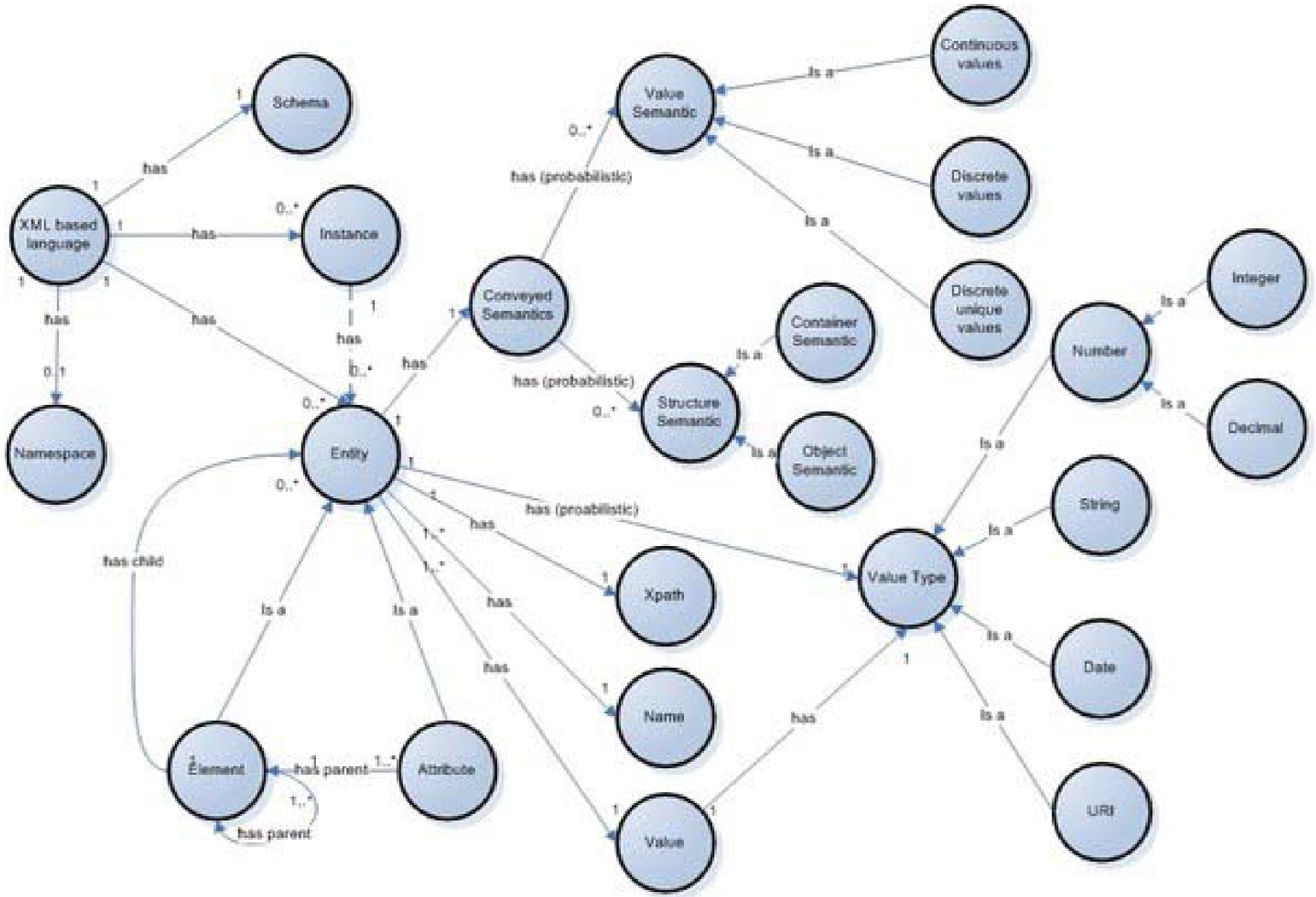
Trees can be traversed breadthwise or depthwise



Web—also graph, network, ontology



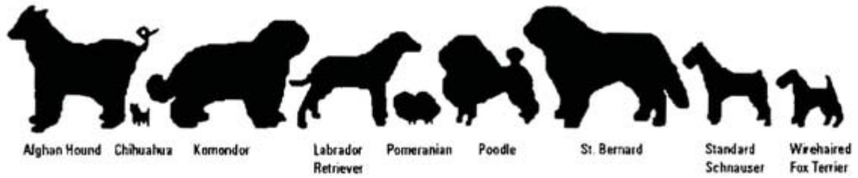
Ontology


Schema
has
XML based language
has
Instance
has
has
has
Namespace
Entity
has
Conveyed Semantics
has (probabilistic)
Value Semantic
Is a
Continuous values
Is a
Discrete values
Is a
Discrete unique values
has (probabilistic)
Structure Semantic
Is a
Container Semantic
Is a
Object Semantic
has (proabilistic)
Value Type
Is a
Number
Is a
Integer
Is a
Decimal
Is a
String
Is a
Date
Is a
URI
has child
Is a
Is a
has
Xpath
has
Name
has
Value
has
Element
has parent
Attribute
has parent

LATCH

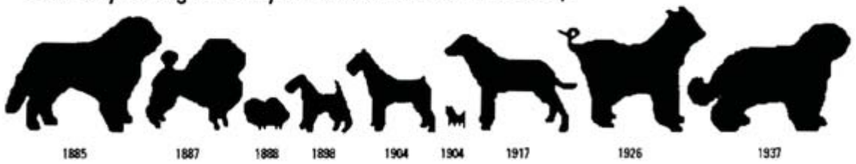
Location, Alphabet, Time, Category, or Hierarchy

I could organize these dogs alphabetically…

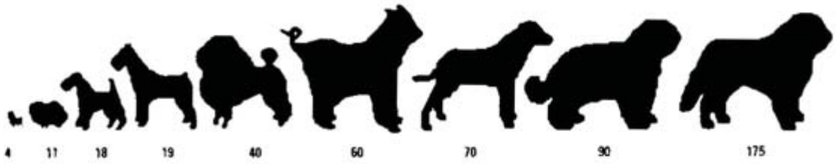


or by category (country of origin, for example)

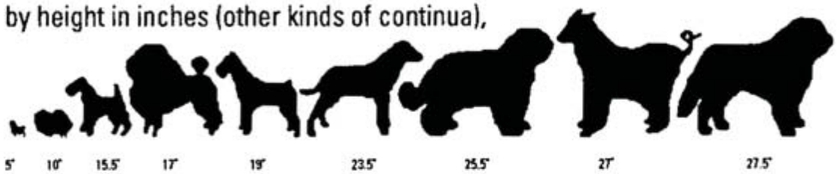
or by time (for instance, according to the year in which the breed was officially recognized by th American Kennel Club).



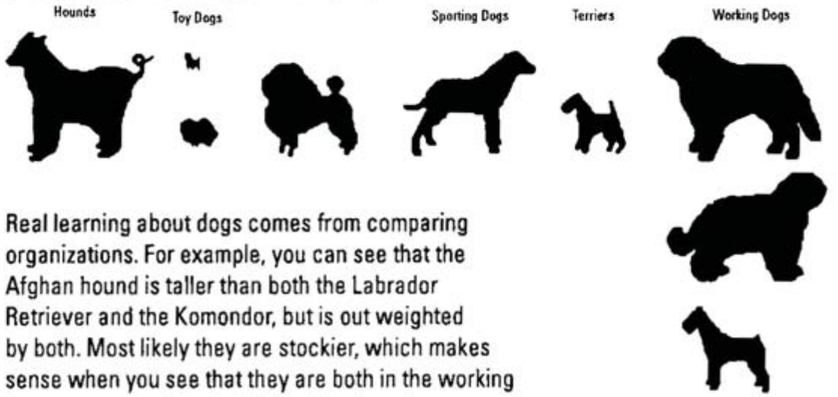
Then again, I might arrange then by weight in pounds,



by height in inches (other kinds of continua),



or by breeds as categorized by the American Kennel Club.



Real learning about dogs comes from comparing organizations. For example, you can see that the Afghan hound is taller than both the Labrador Retriever and the Komondor, but is out weighted by both. Most likely they are stockier, which makes sense when you see that they are both in the working dogs category while the Afghan is a hound.

Wurman, Richard Saul, *Information Anxiety,* Double Day, NewYork NY (1989) pg.71-72

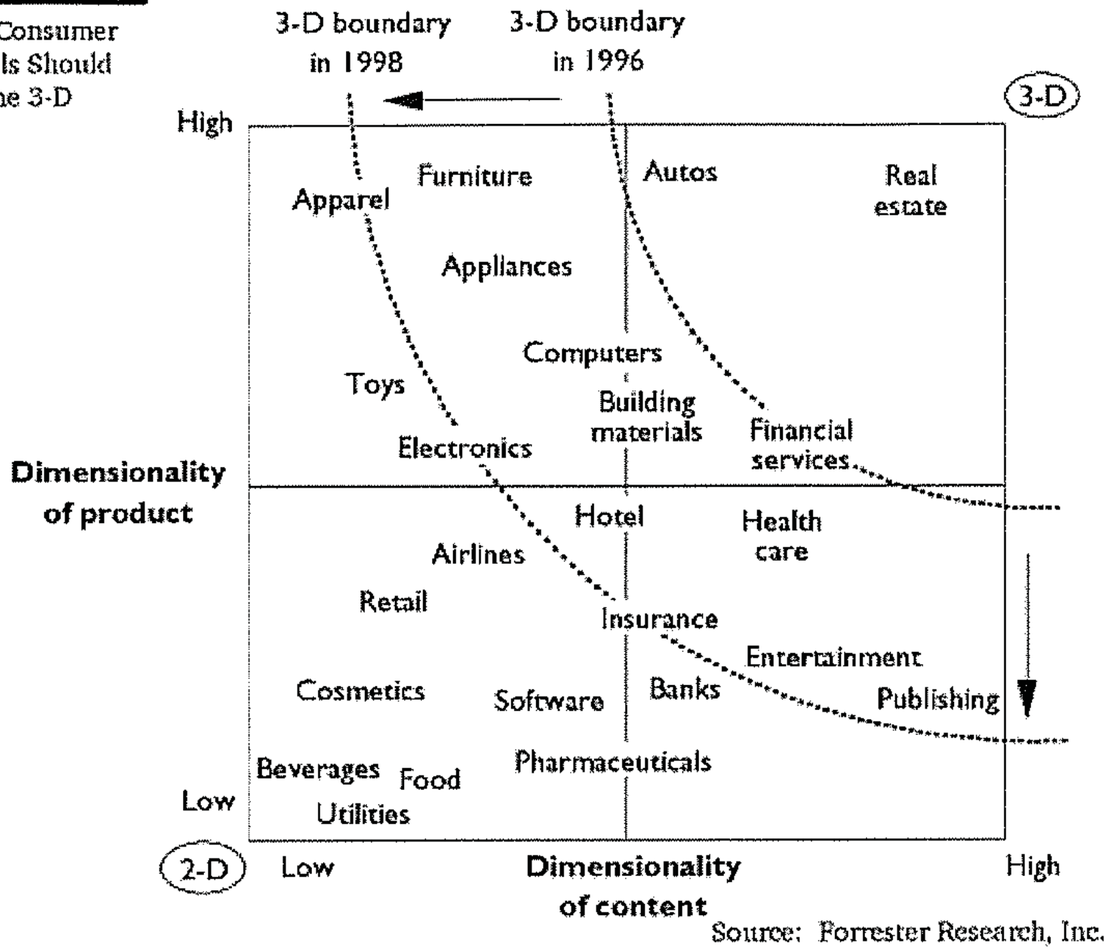
Ethnographic Frameworks (or Mnemonic Devices)

AEIOU	POEMS	Ax4
Activity	People	Actors
Environment	Objects	Activities
Interaction	Environment	Artifacts
Object	Messages	Atmosphere
User	Services	

Perceptual Mapping/2 x 2 Positioning Map

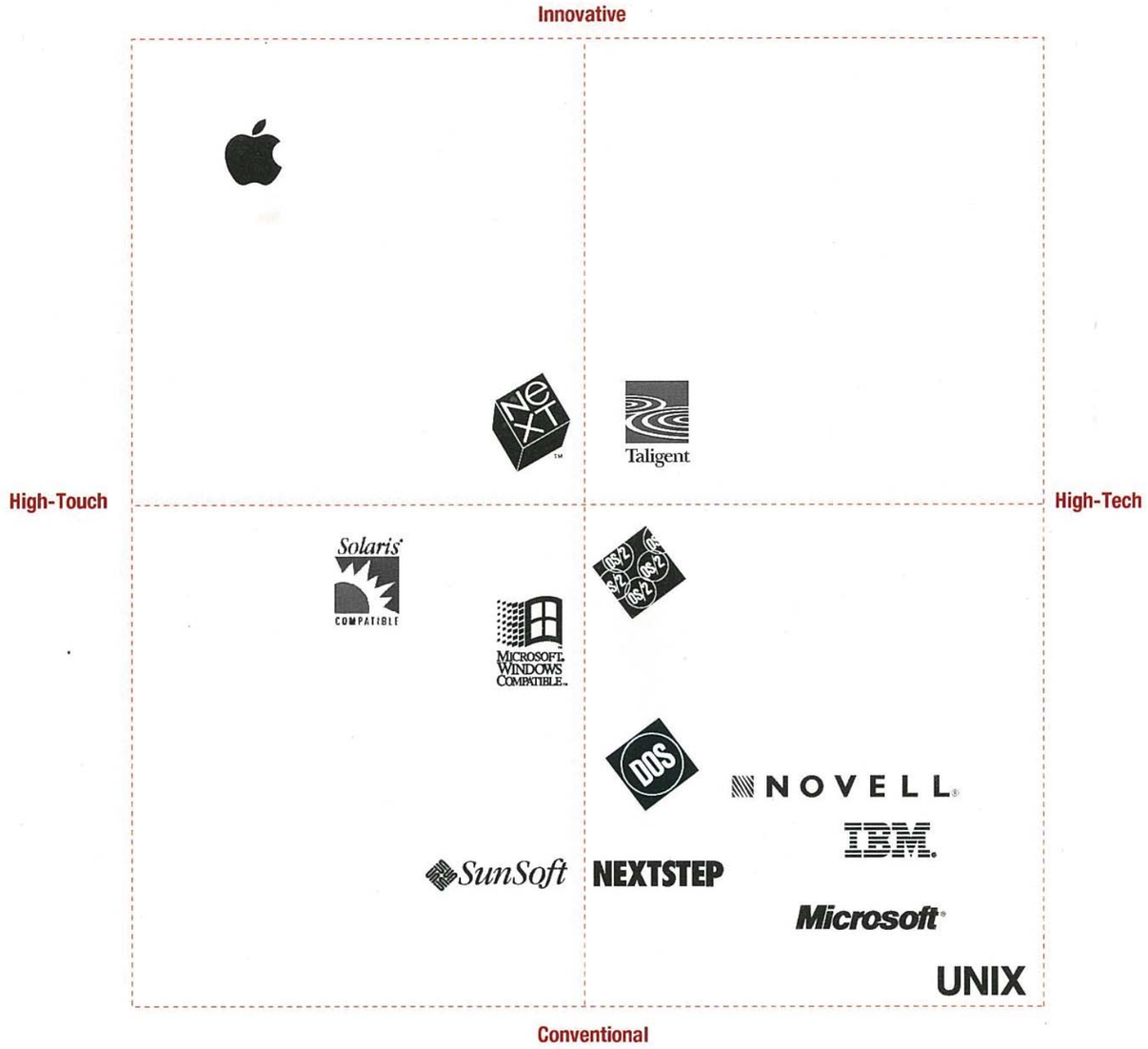
Figure 7

When Consumer Verticals Should Examine 3-D



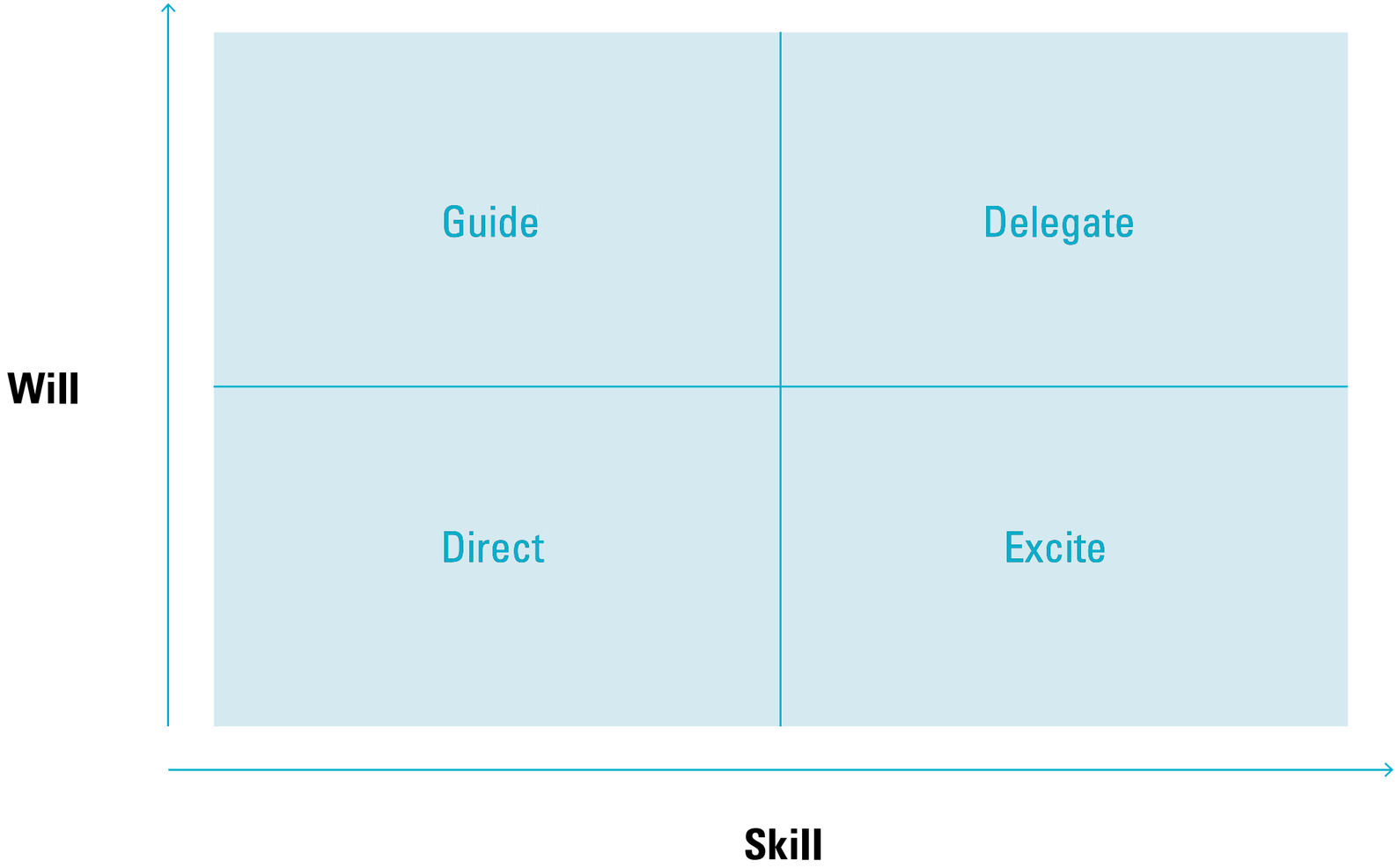
Source: Forrester Research, Inc.

Perceptual Mapping/2 x 2 Positioning Map

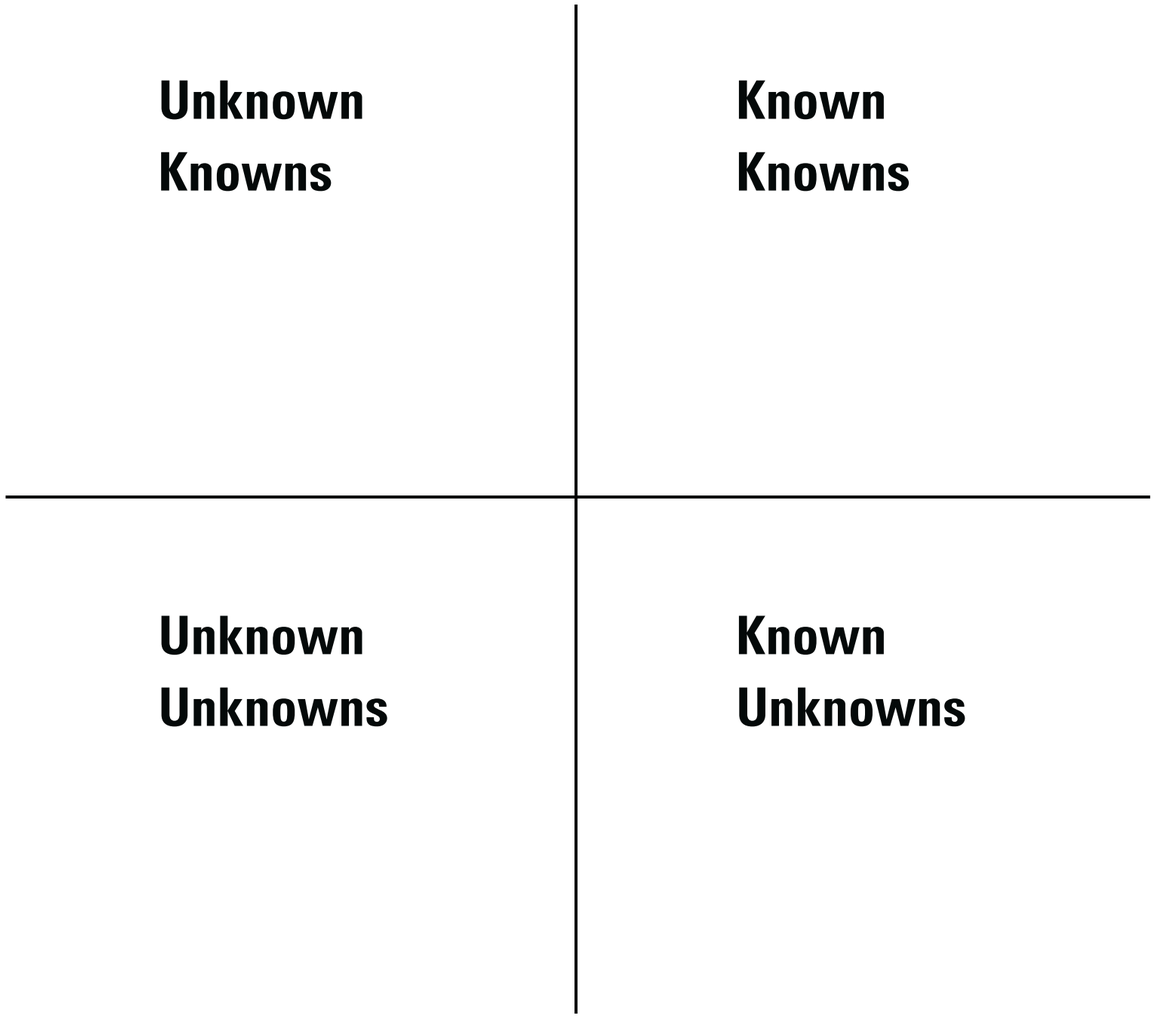


2 x 2: Willingness vs Ability—Managerial Responses

2 x 2: Skill vs Will—Managerial Responses



Known/Unknown 2 x 2



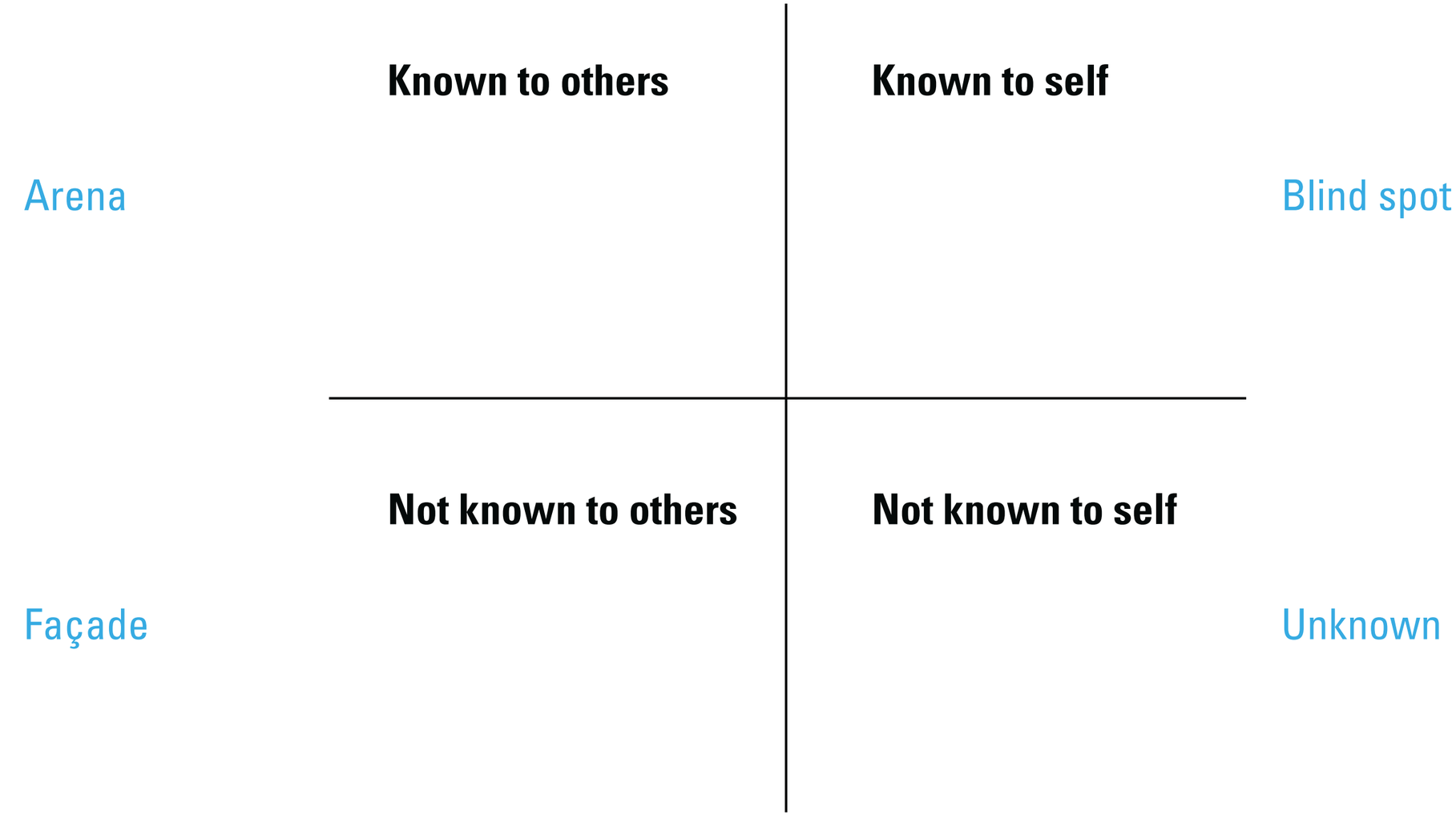
Data thrown off by operations, but not used

What we are already measuring

Correlations that might be discovered

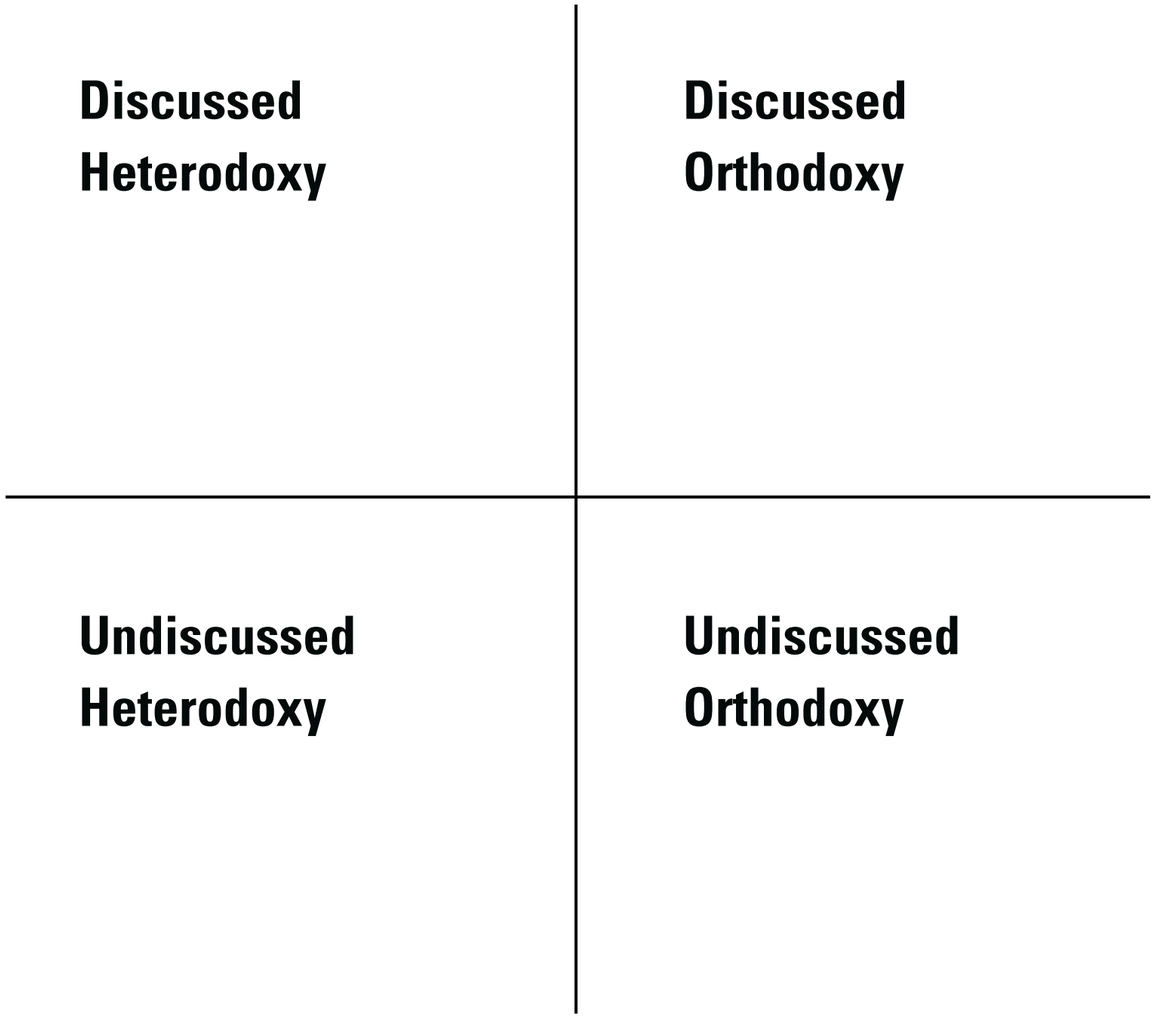
What we are planning to measure (or is not worth the cost)

Johari window, Joseph Luft & Harrington Ingham, 1955



“Doxa”, Pierre Bourdieu, 1972

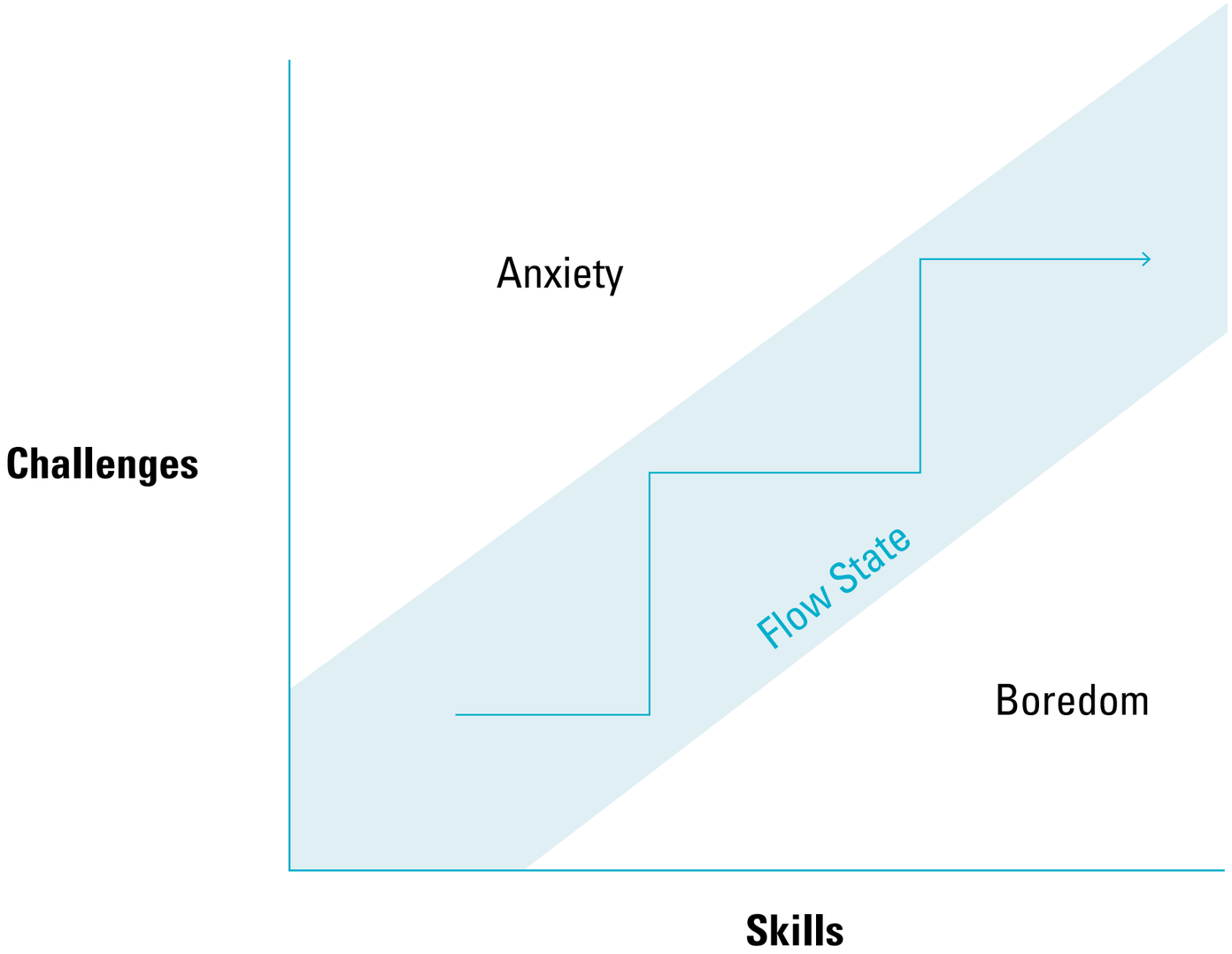
The universe of discourse



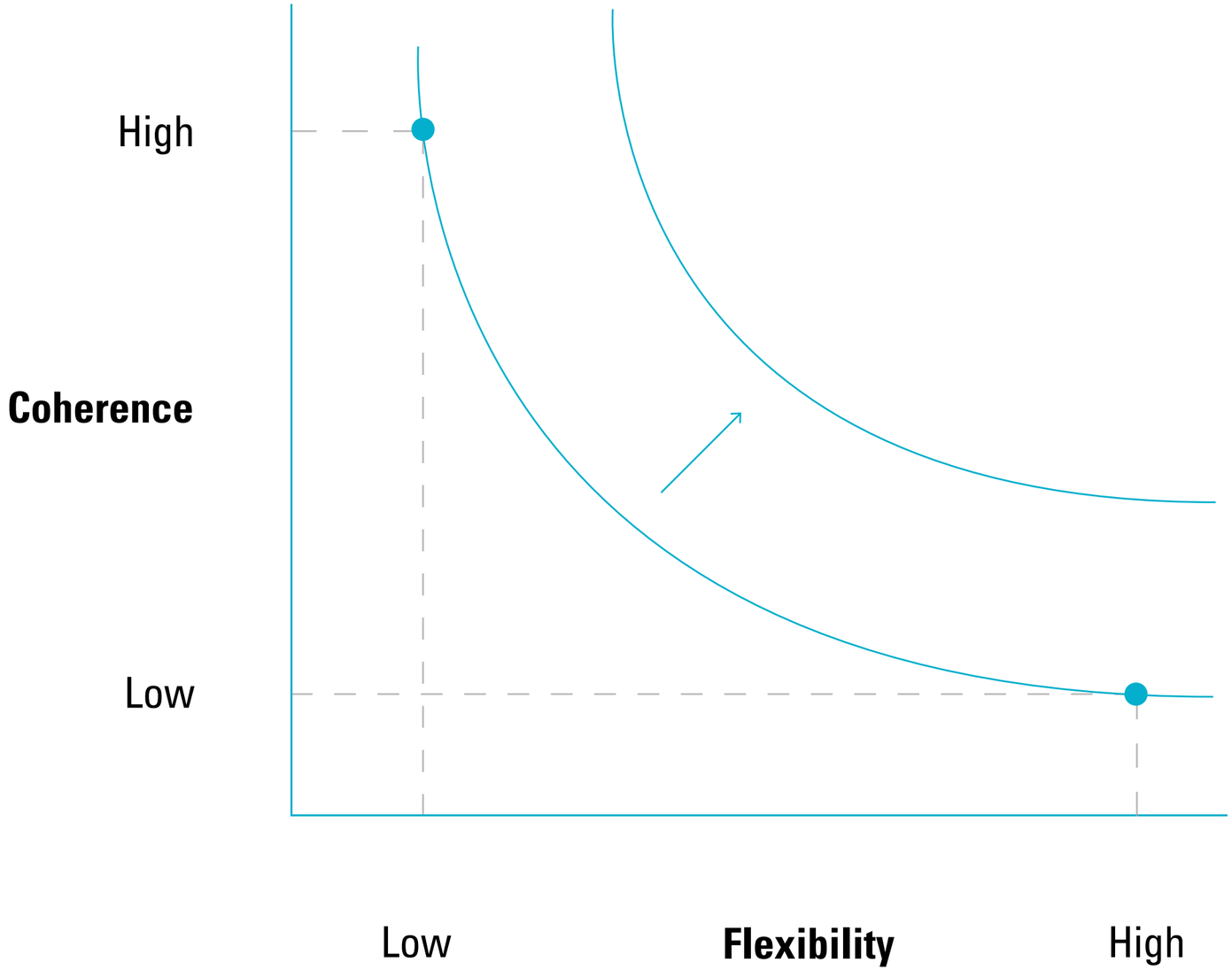
What we see in the press; what’s taught in schools

The universe of the undiscovered

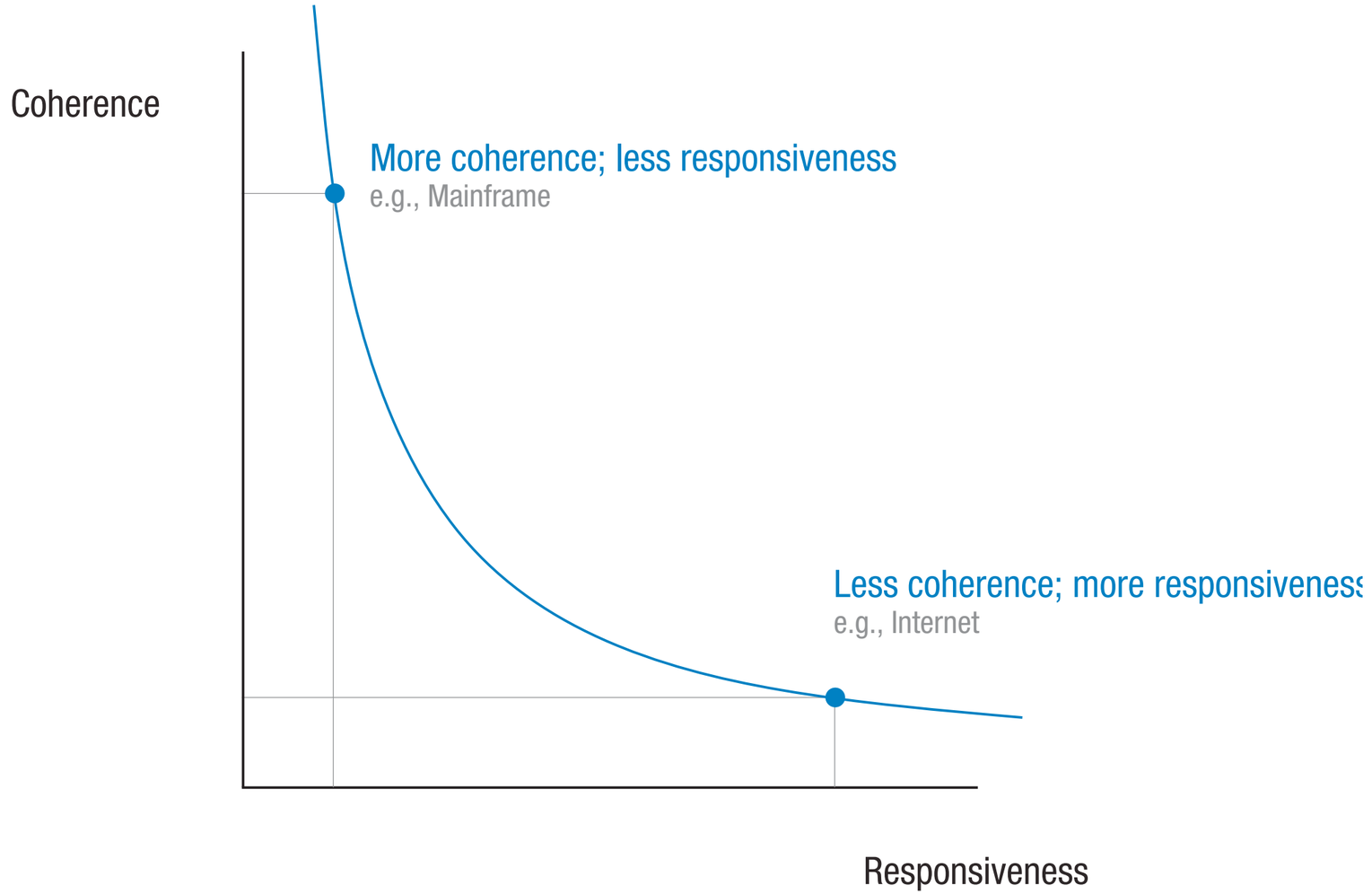
2 x 2 Flow



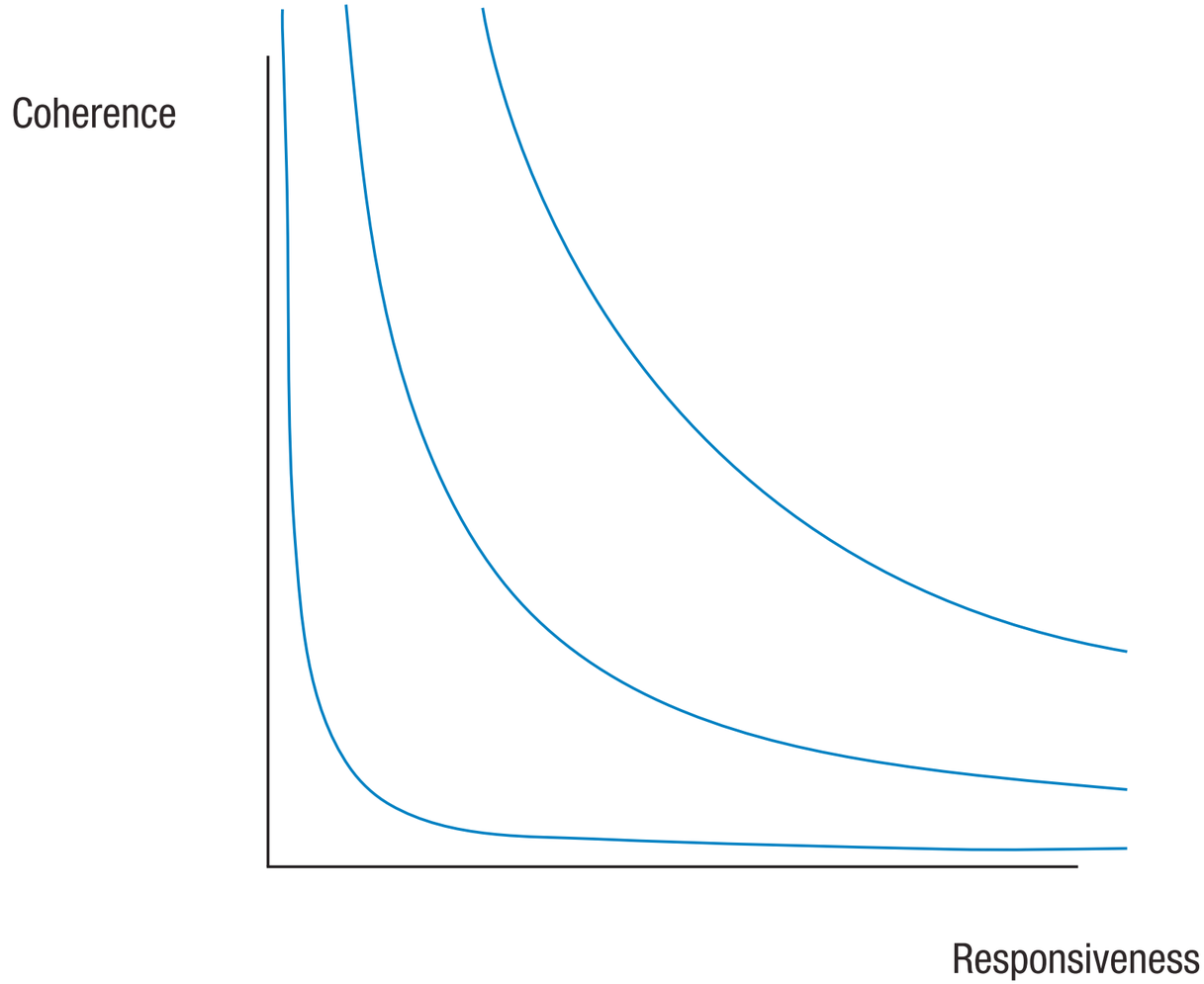
Pliant Systems—Austin Henderson



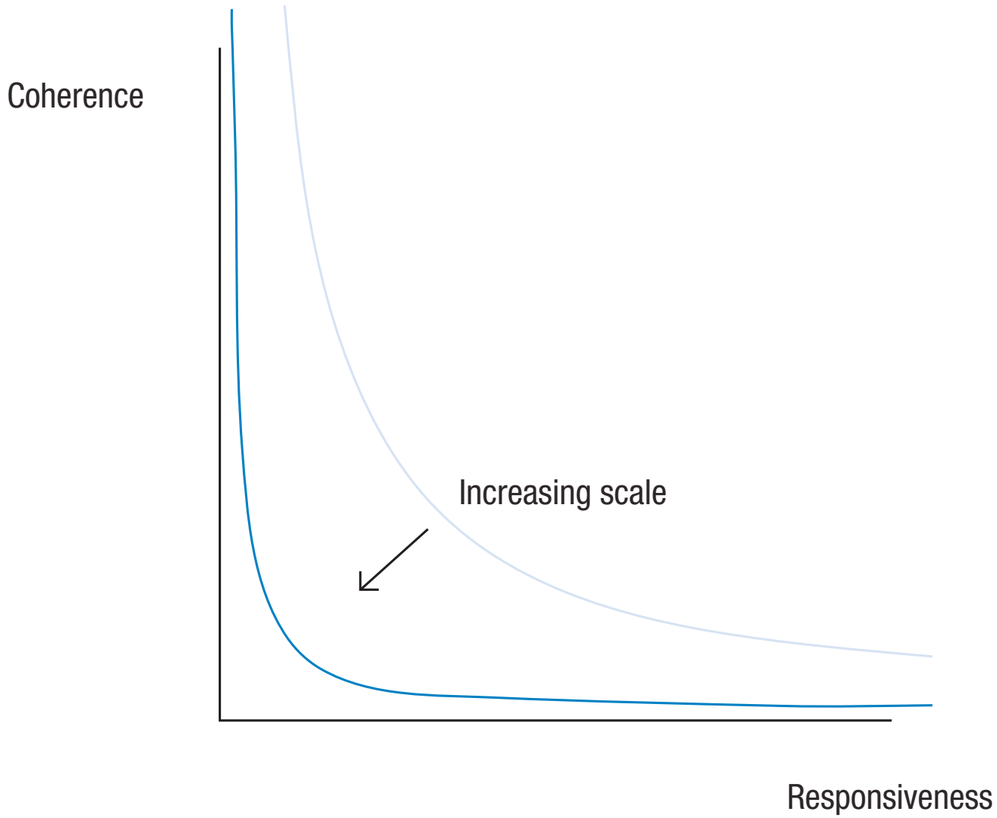
Tension between responsiveness and coherence (2 dimensions)



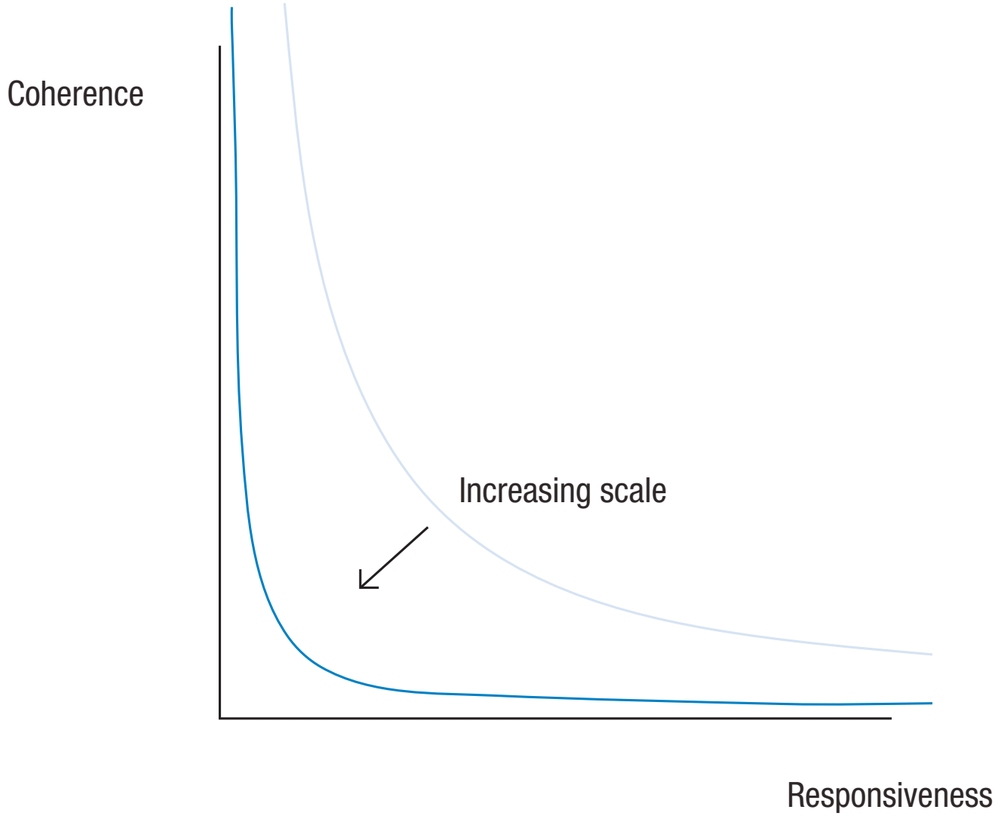
A family of trade-off curves

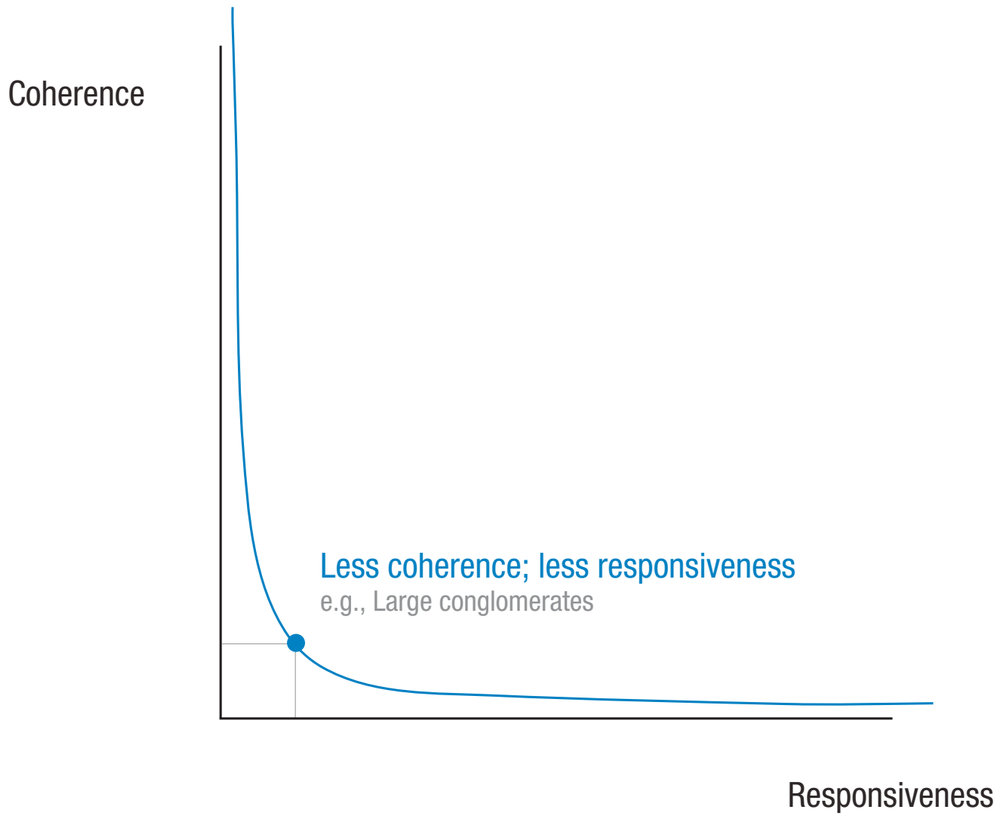


Moving to a less desirable trade-off curve

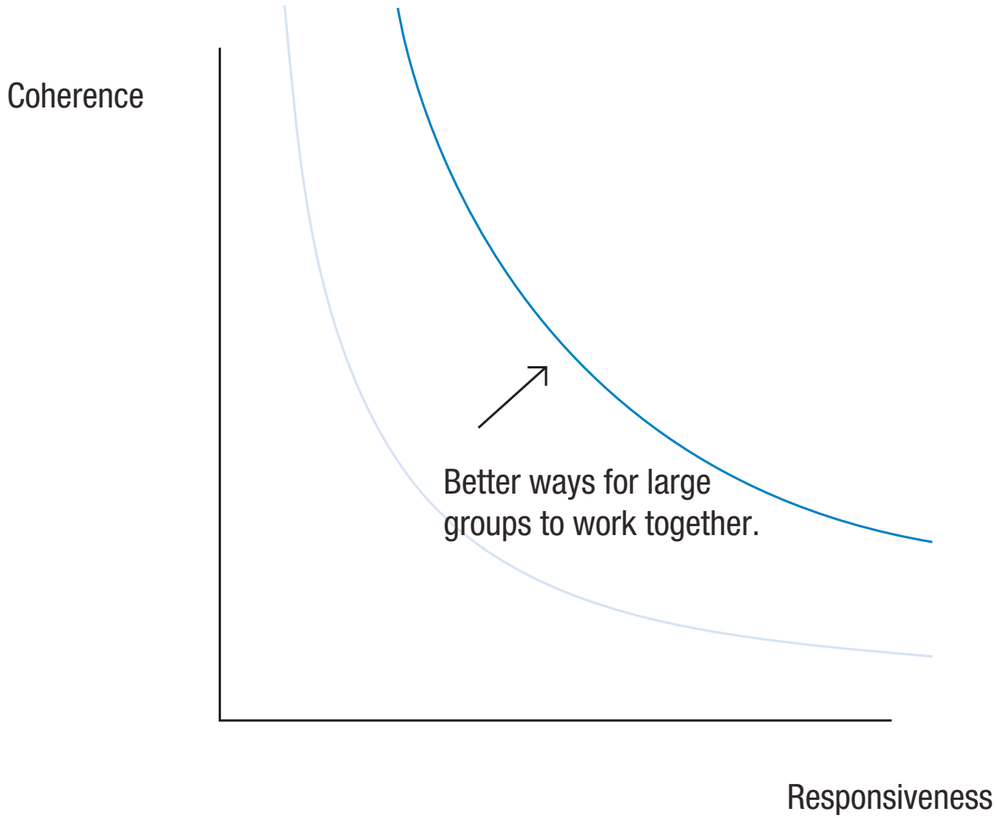


E.g., as organizations grow, getting things done may become more difficult and take longer

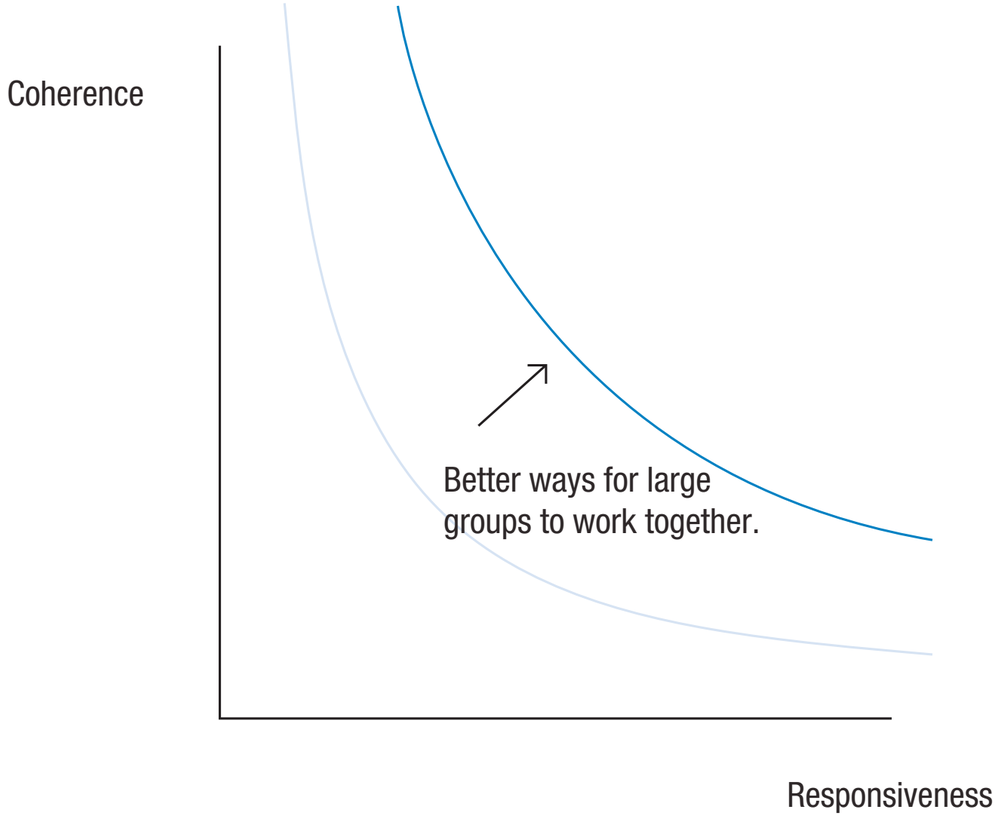


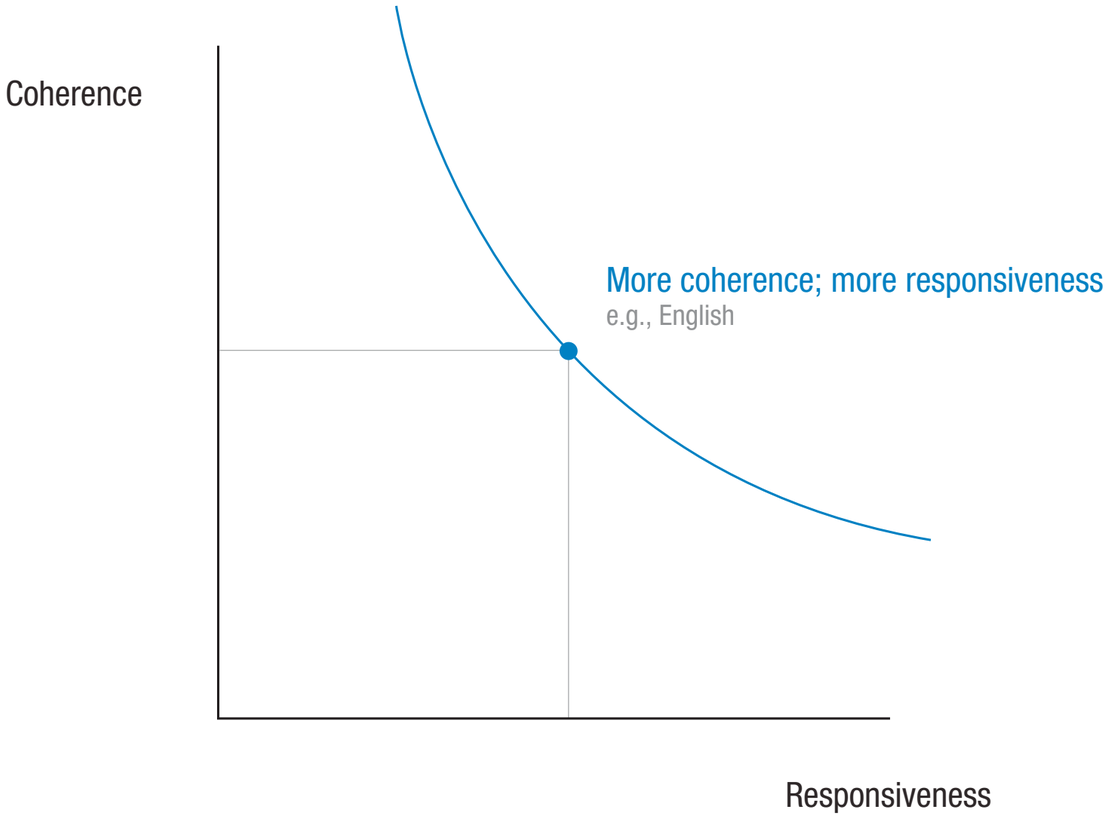


Moving to a more desirable trade-off curve



E.g., Google's PageRank search algorithm sits on a higher trade-off curve than early Internet navigation systems such as Yahoo's original directory





Special thanks to
Jon Pittman
Mickey McManus
Jamie Ikeda

hugh@dubberly.com

Presentation posted at
www.dubberly.com/presentations/informationarchitecture.pdf