UNIVERSITY OF CALIFORNIA, BERKELEY
SCHOOL OF INFORMATION

The Discipline of Organizing: A Framework for Achieving {Organizational Benefits, the Benefits of Organizing}

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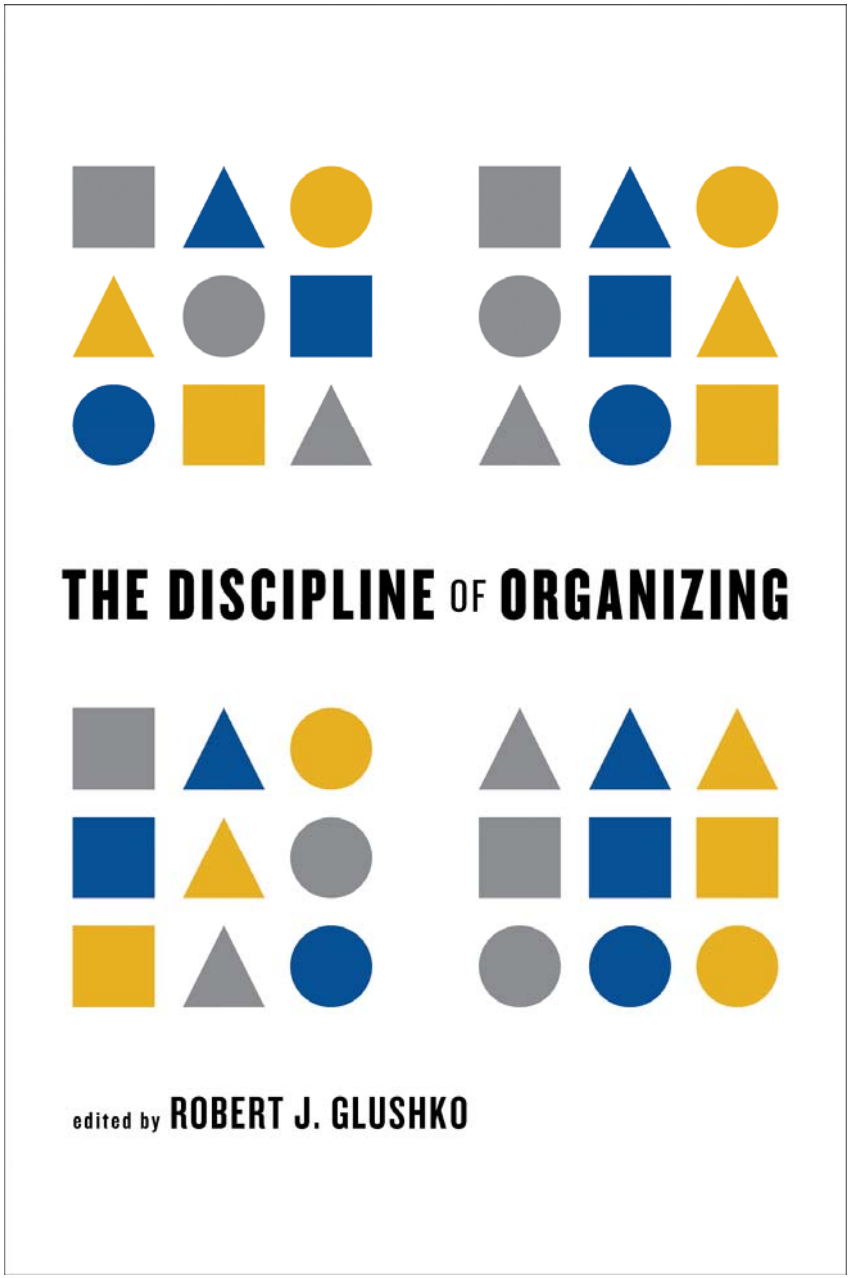
21 July 2016
Singapore



Plan for the Talk

- Motivating a new discipline of organizing
- Key concepts and methods for this new discipline
- Applying this higher-level framework to design innovative organizing systems

Organizing

Creating capabilities by intentionally imposing order and structure

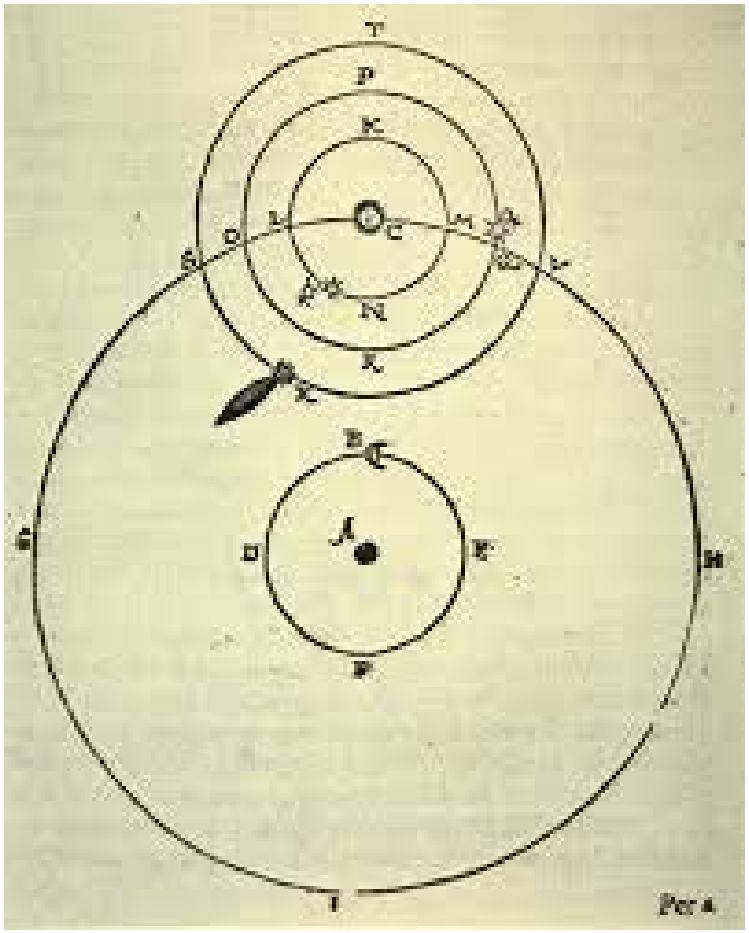
For thousands of years, even before the invention of written language, people have systematically collected things, information about those things, and observations of all kinds to understand how their world works

Babylonian Astronomy

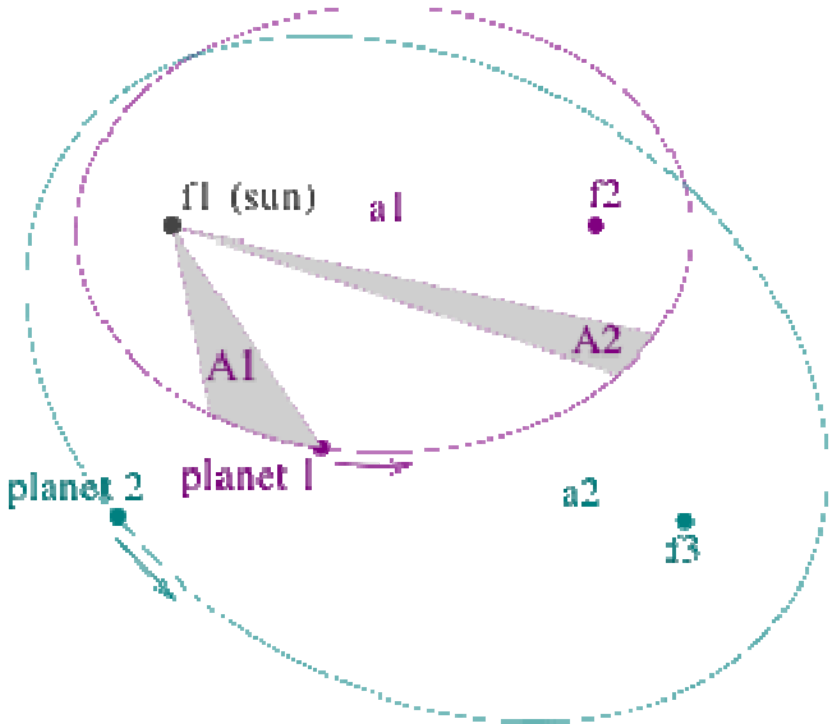
Ancient Egyptian Hydrology – Nile Flood Records

- ***"People organize to make sense of equivocal inputs and enact this sense back into the world to make it more orderly" - (Weick 2005)***
- ***These efforts to impose meaning on experience by recording, analyzing, organizing, and reorganizing observations can be collectively called "sensemaking"***
- ***The highest level of sensemaking is the creation of scientific theories, with a preference for "more organized" or simpler explanations for the observations***

Tycho Brahe vs. Johannes Kepler
same data, different theories



Reconciling data with a geocentric organizing principle makes the Tychonic system complex



Heliocentric elliptical orbits follow “Kepler’s Laws” – simple and elegant theory

Everything is Organized

- In our daily lives organizing is a fundamental cognitive activity that we often do without thinking much about it
- It is also an important part of most business and professional activities
- Organizing in any context can be more effective and satisfying if we are more self-aware and systematic about how we organize

The Organizing We Do

- Categorization (Creating “equivalence classes” of resources that we treat the same)
- Classification (Creating models for assigning resources to existing categories)
- Integration (Combining categories)
- Segmentation (Discovering categories computationally, assigning resources to them)
- Recommendation (Identifying “matching” resources in different categories)
- …

We Organize:

- Things
- Information
- Information about Things
- Information about Information
- Information about (Information about Things)
- Information about (Information about Information)
- …

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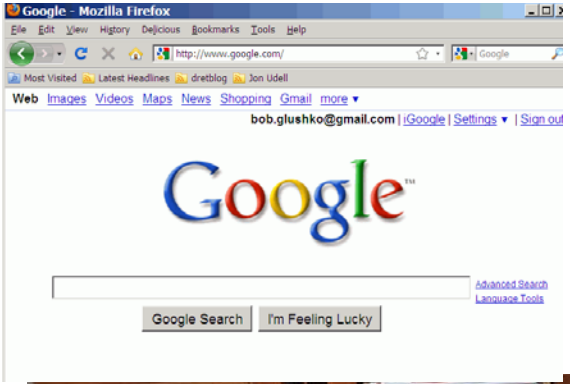
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Español
La enciclopedia libre
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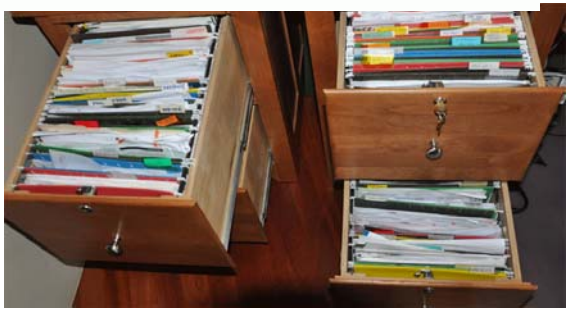


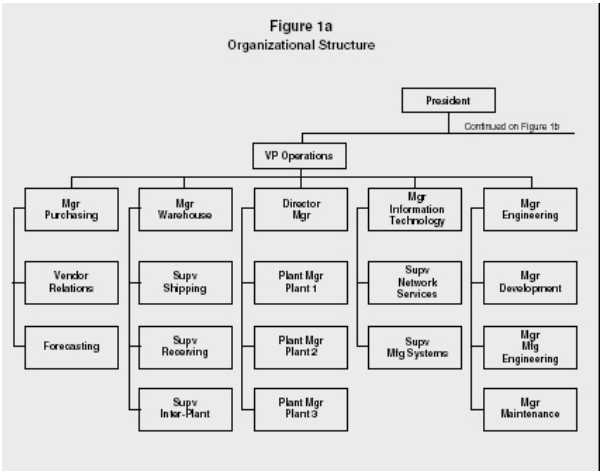


Figure 1a
Organizational Structure
President
Continued on Figure 1b
VP Operations
Mgr Purchasing
Mgr Warehouse
Director Mgr
Mgr Information Technology
Mgr Engineering
Vendor Relations
Supv Shipping
Plant Mgr Plant 1
Supv Network Services
Mgr Development
Forecasting
Supv Receiving
Plant Mgr Plant 2
Supv Mfg Systems
Mgr Mfg Engineering
Supv Inter-Plant
Plant Mgr Plant 3
Mgr Maintenance

We Organize…

- Libraries, museums, business information systems, scientific data… and other institutional resource collections
- Different types of documents
- Personal information and artifacts of all kinds in our kitchens, closets, personal computers, smartphones…
- People

Focus on Commonalities, Not Differences!

- These are all “Organizing Systems”

A collection of resources
intentionally arranged
to enable some set of interactions

The Organizing System [1]

- RESOURCES are “anything of value that can support goal-oriented activity”
- A COLLECTION is a group of resources that have been selected for some purpose

The Organizing System [2]

- INTENTIONAL ARRANGEMENT - organizing requires explicit or implicit acts by human or computational AGENTS
- These arrangements follow or embody one or more ORGANIZING PRINCIPLES, ideally expressed in an ***implementation-neutral*** manner

Organizing Principles (1)

- Resource arrangements follow one or more ORGANIZING PRINCIPLES
- ORGANIZING PRINCIPLES use properties or DESCRIPTIONS that are associated with the resources
- Almost any property of a resource might be used as a basis for an organizing principle, and multiple properties are often used simultaneously

Organizing Principles (2)

- For physical resources the properties are often perceptual, material ones, or task-oriented ones
- For information resources the properties are often semantic ones
- Some principles are domain-specific, but others can apply generally
- Properties can be selected, extracted, or inferred

Organizing Shirts
by Color and Sleeve Length

Organizing Books By Content

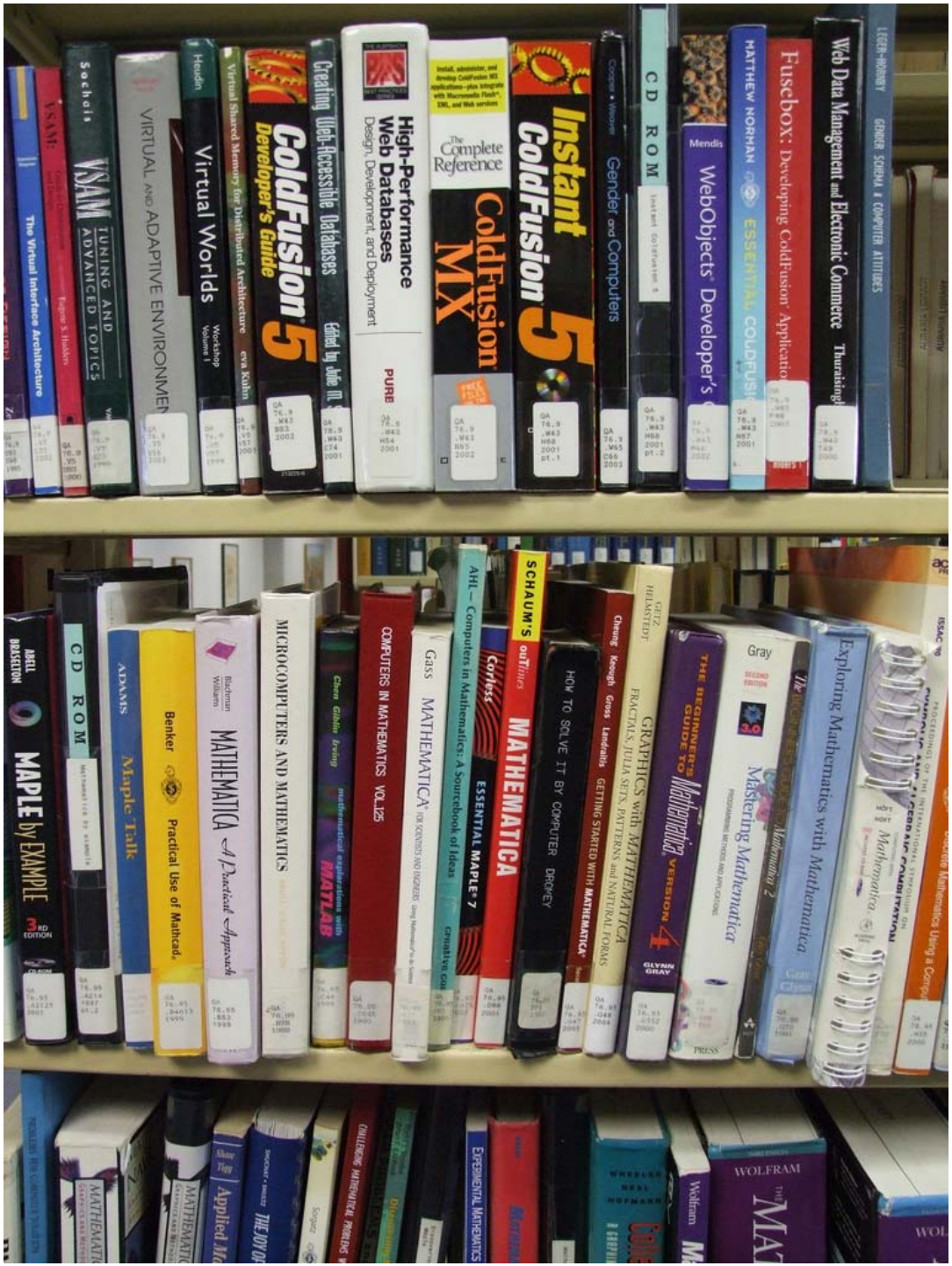


Photo by Jeffrey Beall (http://www.flickr.com/photos/denverjeffrey/304220561) Creative Commons CC BY-ND 2.0

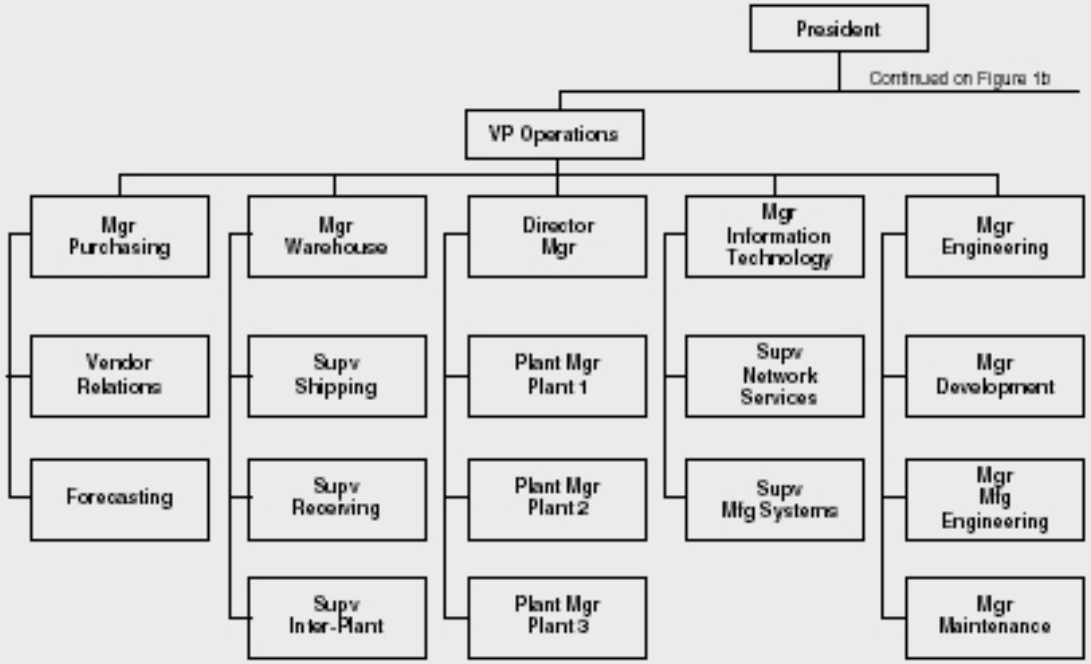
Organizing Spices by Cuisine

Organizing Principles (3)

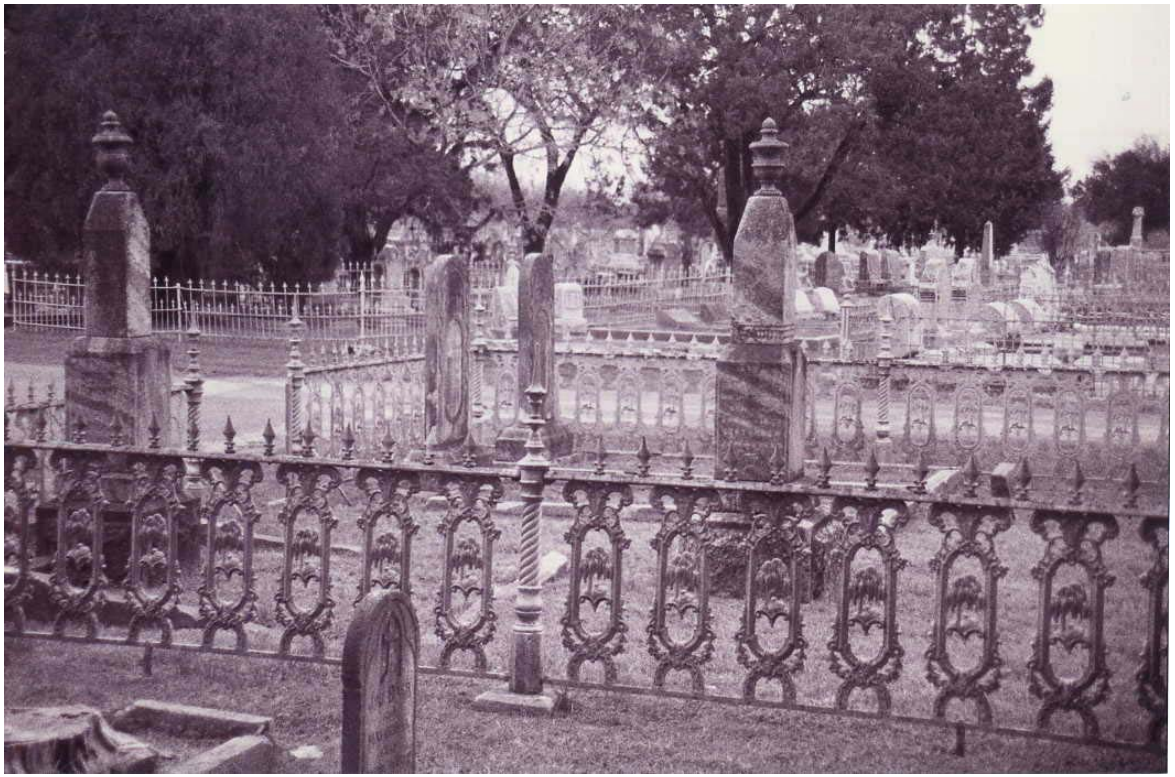
- Other typical arrangements are based on ownership, origin, taxonomic, or behavioral properties (usage frequency, correlated usage)
- Any resource with a orderable name or identifier can have alphabetic or numeric ordering
- Any resource with an associated date (creation, acquisition) can have chronological ordering

Organizing People by Work Role

Figure 1a
Organizational Structure



Organizing People by Family, Religion, Class, Race, Year of Death…



A DJ Organizes His Records – Beats per Minute

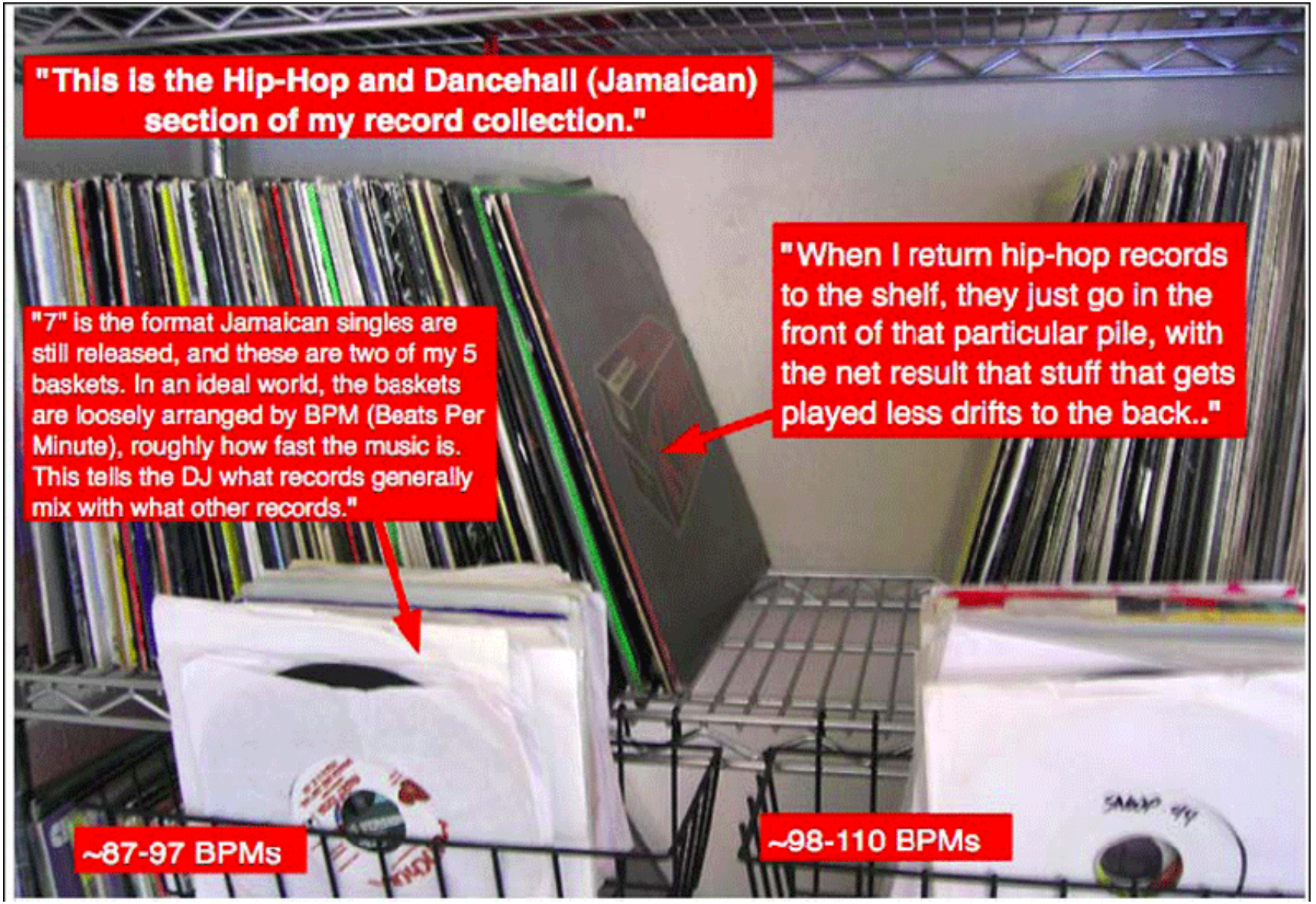
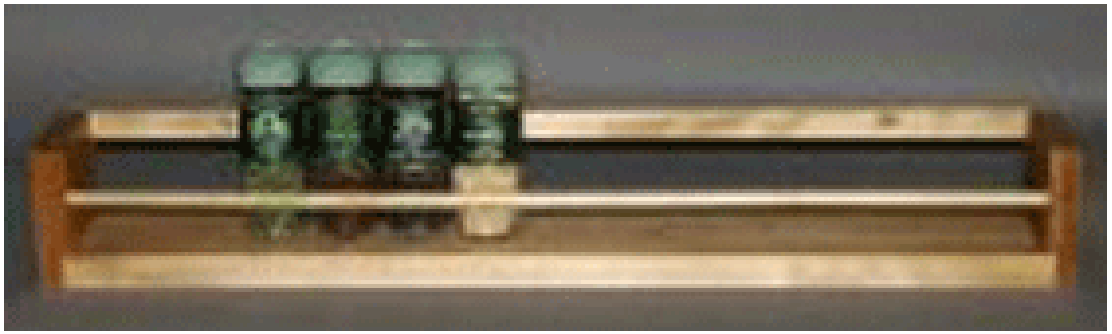
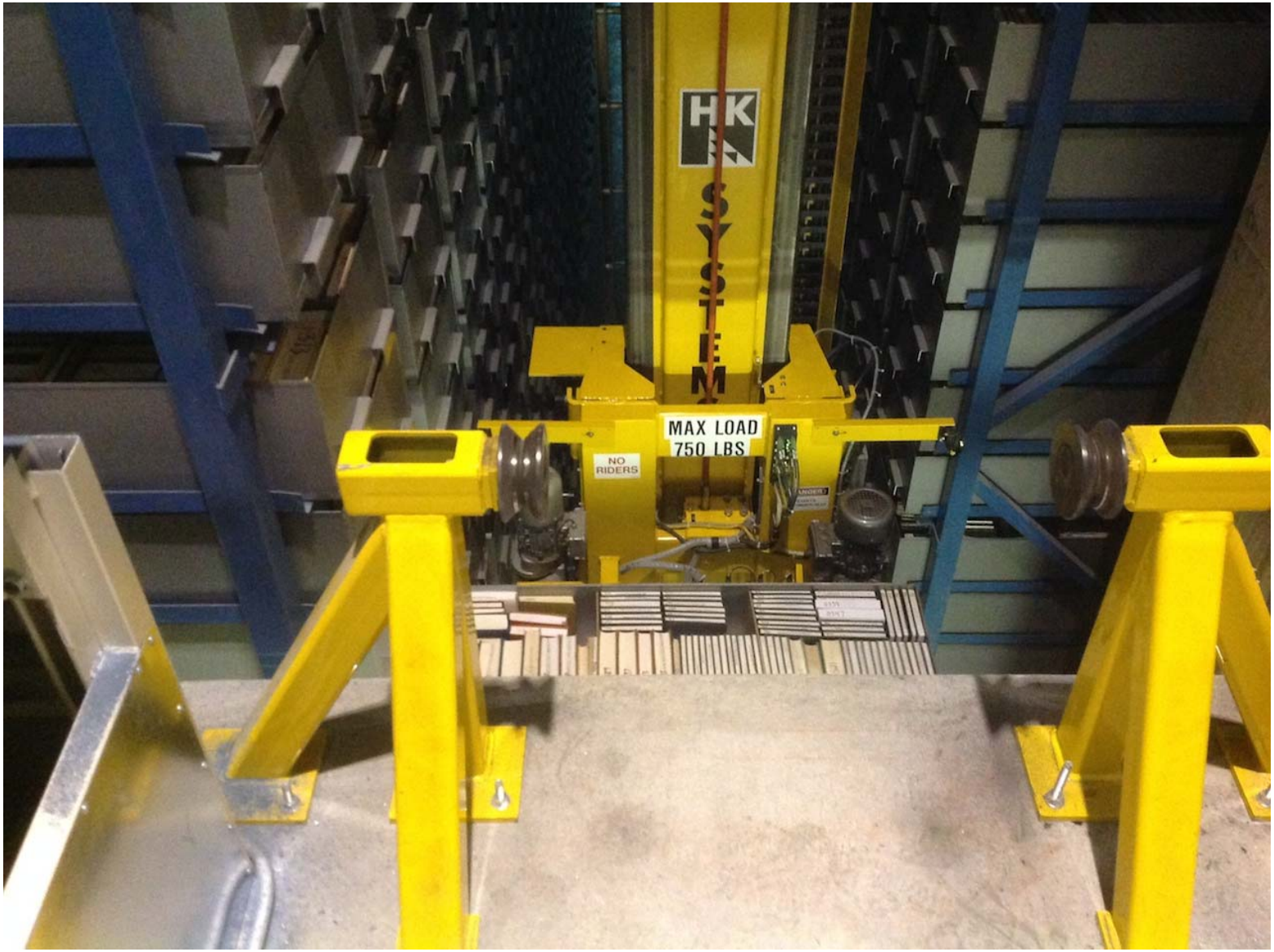


Photo by Matt Earp aka Kid kameleon

The Best Principles don't Specify Implementation: "Organize Spices Alphabetically"



A “Library Robot” Changes Only the Storage Tier



The Activities in Organizing Systems

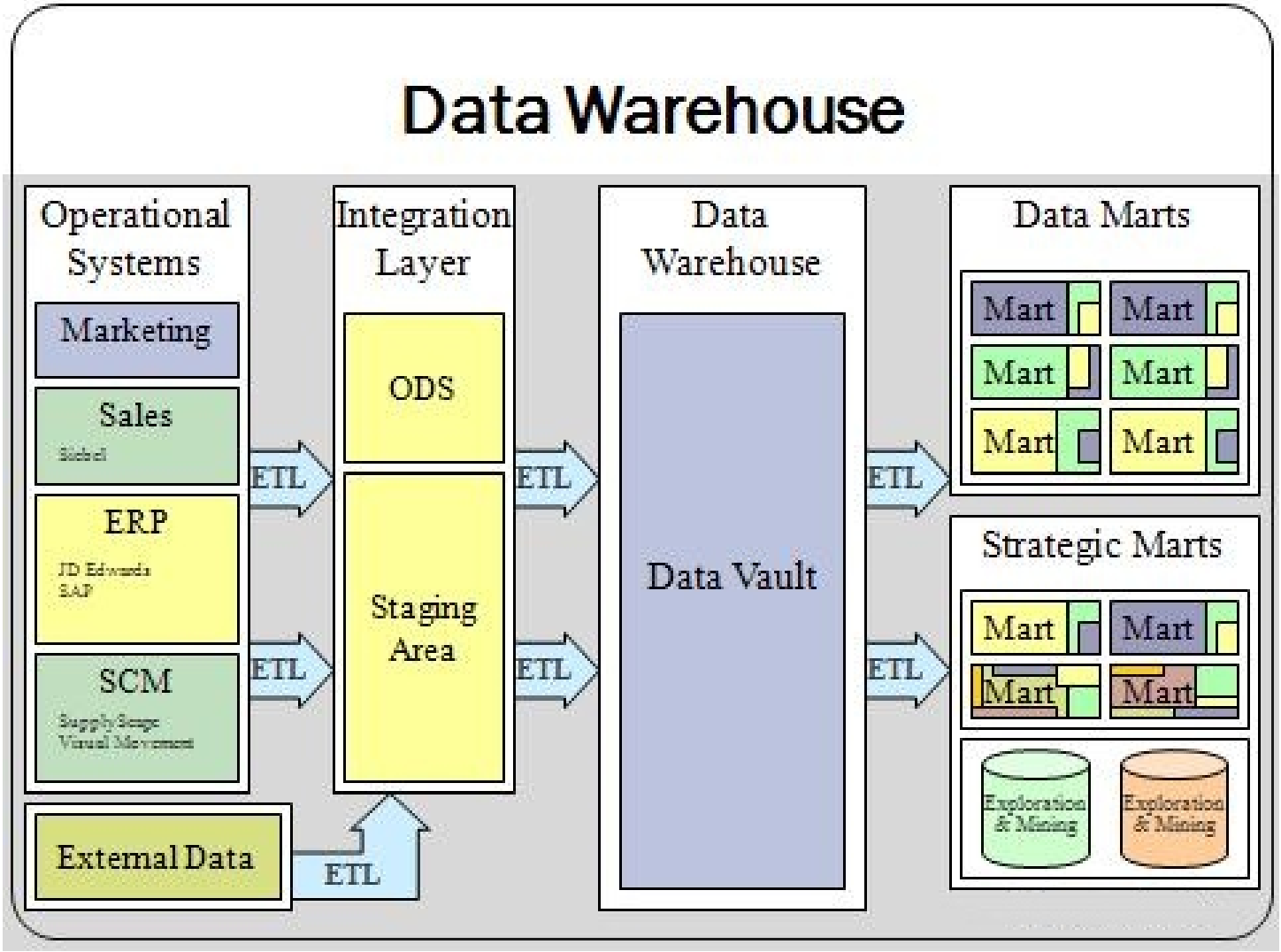
- We can identify four activities in the lifecycle of every organizing system:
  - Selecting resources
  - Organizing resources
  - Supporting resource-based interactions and services
  - Maintaining resources

An Organized Closet

Activities in a Closet Organizing System…

- **Selecting**: *Should I hang up my sweaters in the closet or put them in a drawer?*
- **Organizing**: *Should I sort my shirts by color, sleeve type, or season?*
- **Supporting Interactions**: *Do I need separate places for laundry or dry cleaning?*
- **Maintaining:** *When do I get rid of something?*

An Organized Data Warehouse



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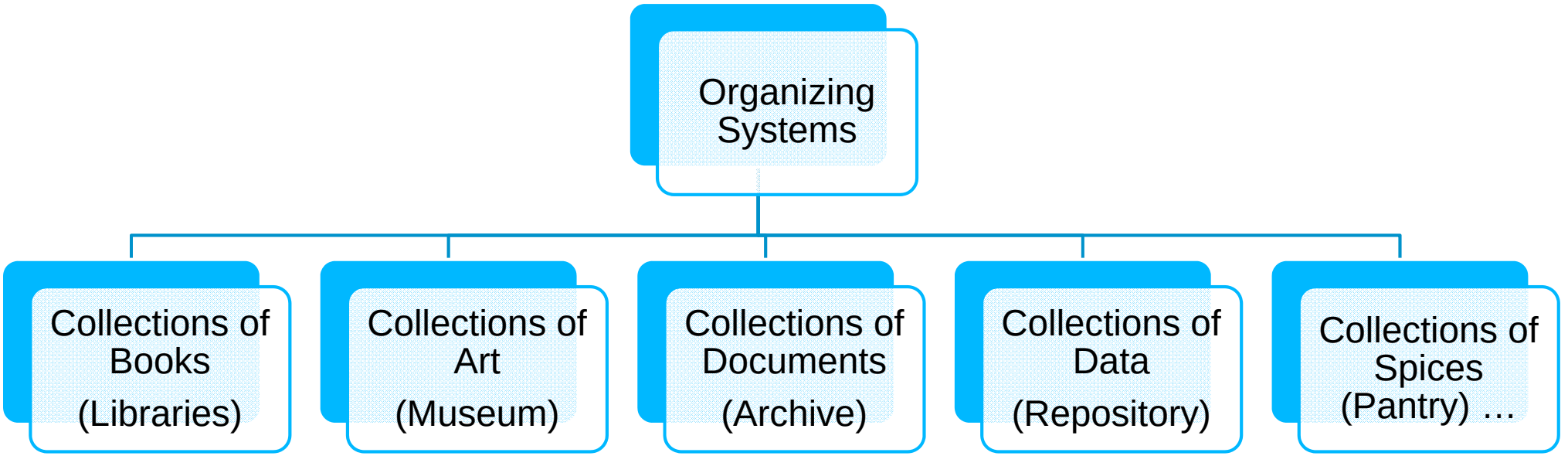
Activities in a Data Warehouse Organizing System…

- **Selecting**: *which data sources should be included? How is their quality assessed?*
- **Organizing**: *which data formats and schemas will enable effective processing? Are needed transformations made at load time or query time?*
- **Supporting Interactions**: *what are the most important and frequent queries that need to be pre-configured?*
- **Maintaining:** *data governance… retention, compliance, privacy issues*

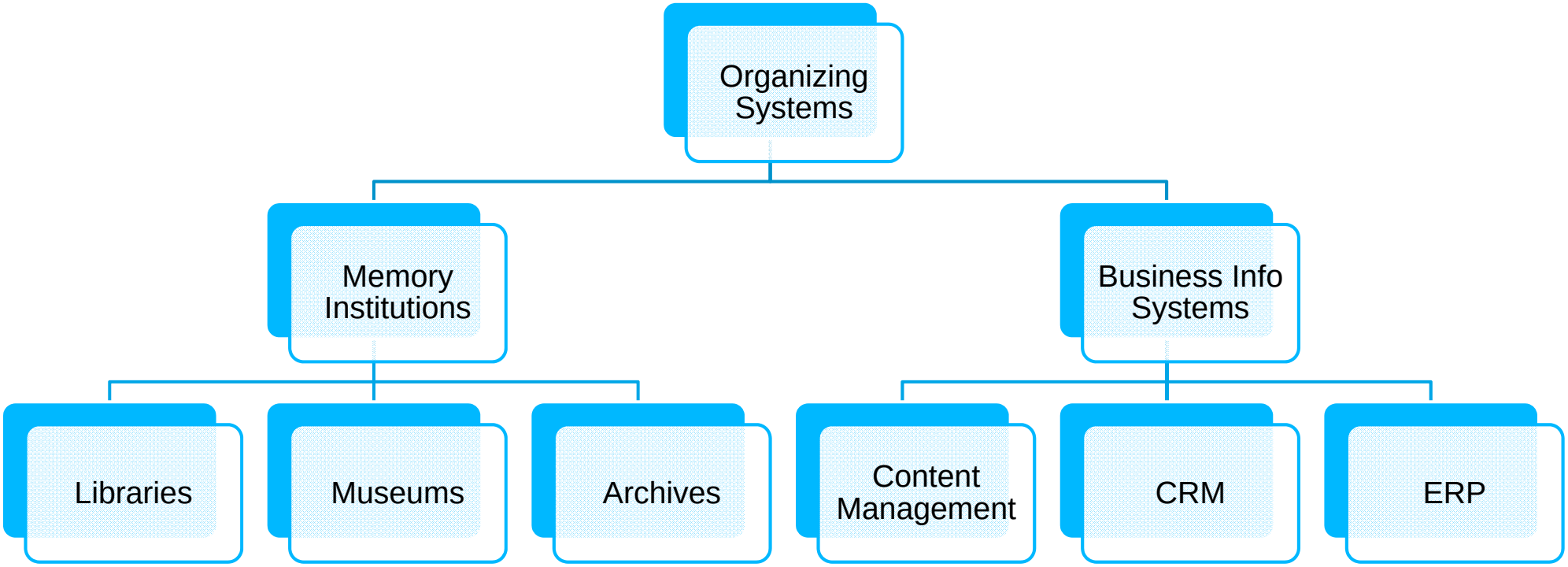
Organizing Organizing Systems

- We can classify organizing systems by:
  - resource type
  - dominant purpose
  - creator
  - size of intended user community
  - or many other ways

Categorizing by Resource Type



Categorizing by Purpose: Resource Preservation as Means vs.. End



What is a Library?

- A collection of resources
  - Organized to enable “access” and “reuse”
  - Curated for “public good” and “community creation”
  - Conventional interaction is “circulation” – borrowing and return of resources…

A Library

A Library?

Tool Lending Library

Home

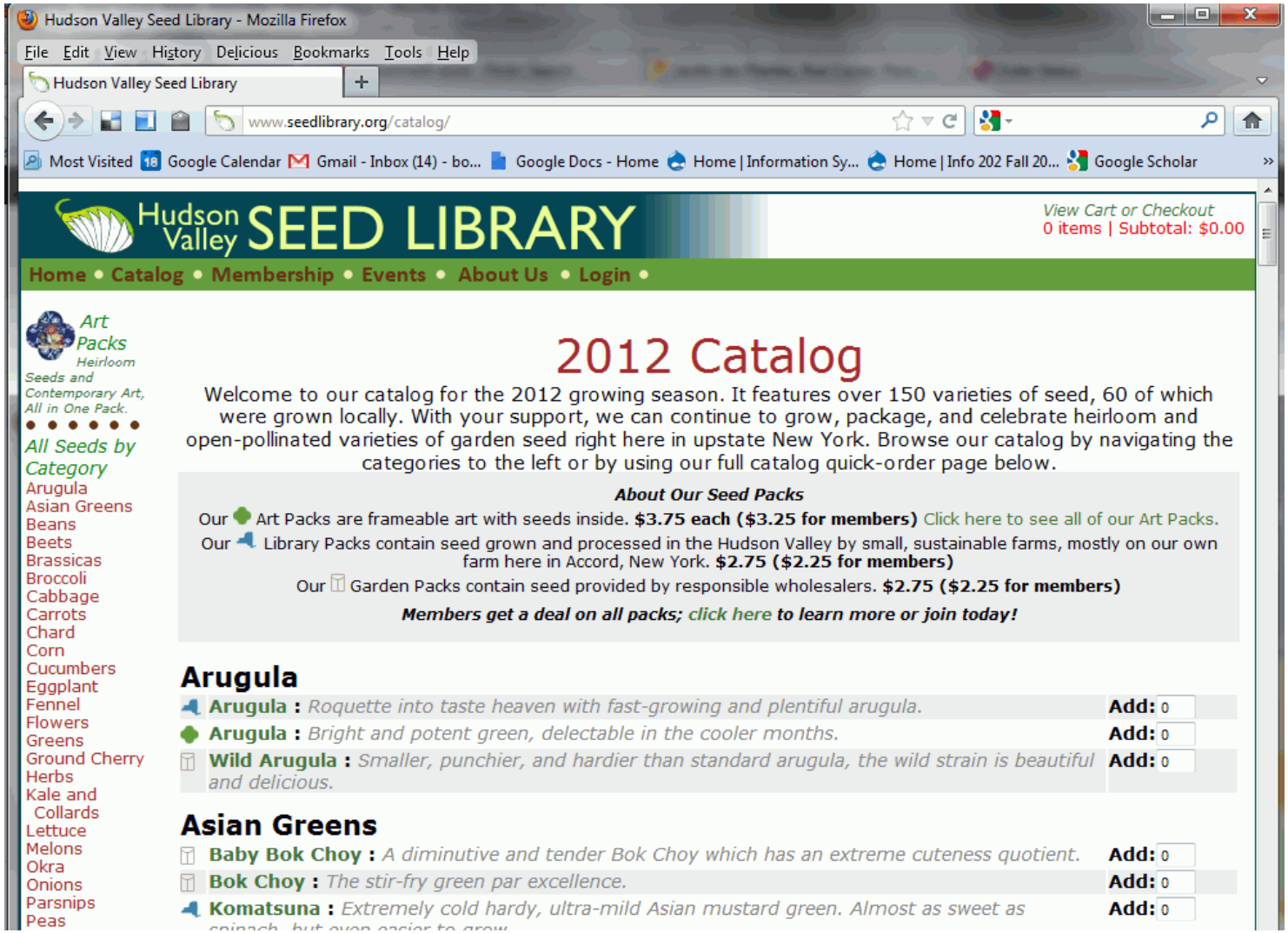
Branch Address

5205 Telegraph Avenue
Oakland, CA 94609
(510) 597-5089

Branch Hours

Monday: Closed
Tuesday: 12:30pm - 8:00pm
Wednesday: 10:00am - 5:30pm
Thursday: 10:00am - 5:30pm
Friday: 12:00pm - 5:30pm
Saturday: 10:00am - 5:30pm
Sunday: Closed

A Library?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Flowers
Greens
Ground Cherry
Herbs
Kale and Collards
Lettuce
Melons
Okra
Onions
Parsnips
Peas
2012 Catalog
Welcome to our catalog for the 2012 growing season. It features over 150 varieties of seed, 60 of which were grown locally. With your support, we can continue to grow, package, and celebrate heirloom and open-pollinated varieties of garden seed right here in upstate New York. Browse our catalog by navigating the categories to the left or by using our full catalog quick-order page below.
About Our Seed Packs
Our Art Packs are frameable art with seeds inside. $3.75 each ($3.25 for members) Click here to see all of our Art Packs.
Our Library Packs contain seed grown and processed in the Hudson Valley by small, sustainable farms, mostly on our own farm here in Accord, New York. $2.75 ($2.25 for members)
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Members get a deal on all packs; click here to learn more or join today!
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Arugula : Roquette into taste heaven with fast-growing and plentiful arugula. Add: 0
Arugula : Bright and potent green, delectable in the cooler months. Add: 0
Wild Arugula : Smaller, punchier, and hardier than standard arugula, the wild strain is beautiful and delicious. Add: 0
Asian Greens
Baby Bok Choy : A diminutive and tender Bok Choy which has an extreme cuteness quotient. Add: 0
Bok Choy : The stir-fry green par excellence. Add: 0
Komatsuna : Extremely cold hardy, ultra-mild Asian mustard green. Almost as sweet as

A Library?

WIKIPEDIA

English
The Free Encyclopedia
3 861 000+ articles

日本語
フリー百科事典
790 000+ 記事

Deutsch
Die freie Enzyklopädie
1 355 000+ Artikel

Español
La enciclopedia libre
864 000+ artículos

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Свободная энциклопедия
817 000+ статей

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L'encyclopédie libre
1 208 000+ articles

Italiano
L'enciclopedia libera
886 000+ voci

Polski
Wolna encyklopedia
874 000+ haseł

Português
A enciclopédia livre
712 000+ artigos

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自由的百科全書
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Consequences of Category Thinking

- Many types of resource collections have conventional characteristics that are deeply embedded in cultural and linguistic categories
- Using an established category to describe an organizing system reinforces these characteristics, even if we add qualifiers
- … and marginalizes any atypical characteristics of the organizing system being categorized

A “Design Space” or “Dimensional” Perspective

- In addition to using categories like Library, Museum, or Business Information System, consider an organizing system as a point in a multidimensional design space and these categories as regions in that space
- This treats the familiar categories as “design patterns” that embody typical configurations of design choices

The 6 Dimensions of an Organizing System

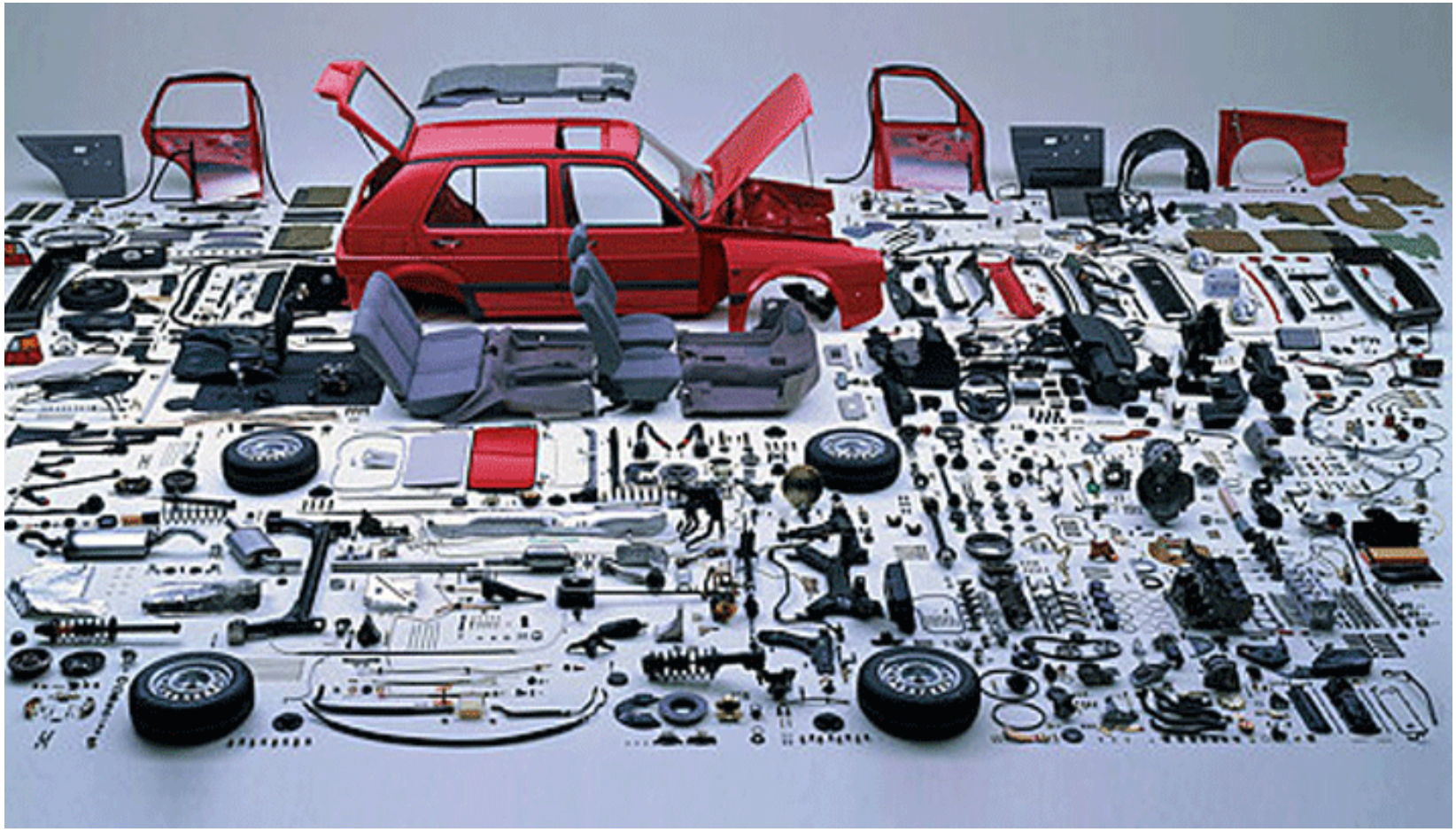
1. What Is Being Organized?
2. Why Is It Being Organized?
3. How Much Is It Being Organized?
4. When Is It Being Organized?
5. Who (or What) is Organizing It?
6. Where is it Organized?

1. What Is Being Organized?

- Identifying the unit of analysis is a central problem in every intellectual or scientific discipline - and in every organizing system

- Resources that are aggregates or composites of other resources, or that have internal structure, or that can have many attributes, pose questions about the granularity of their "thingness”

How Many Things is a Car?

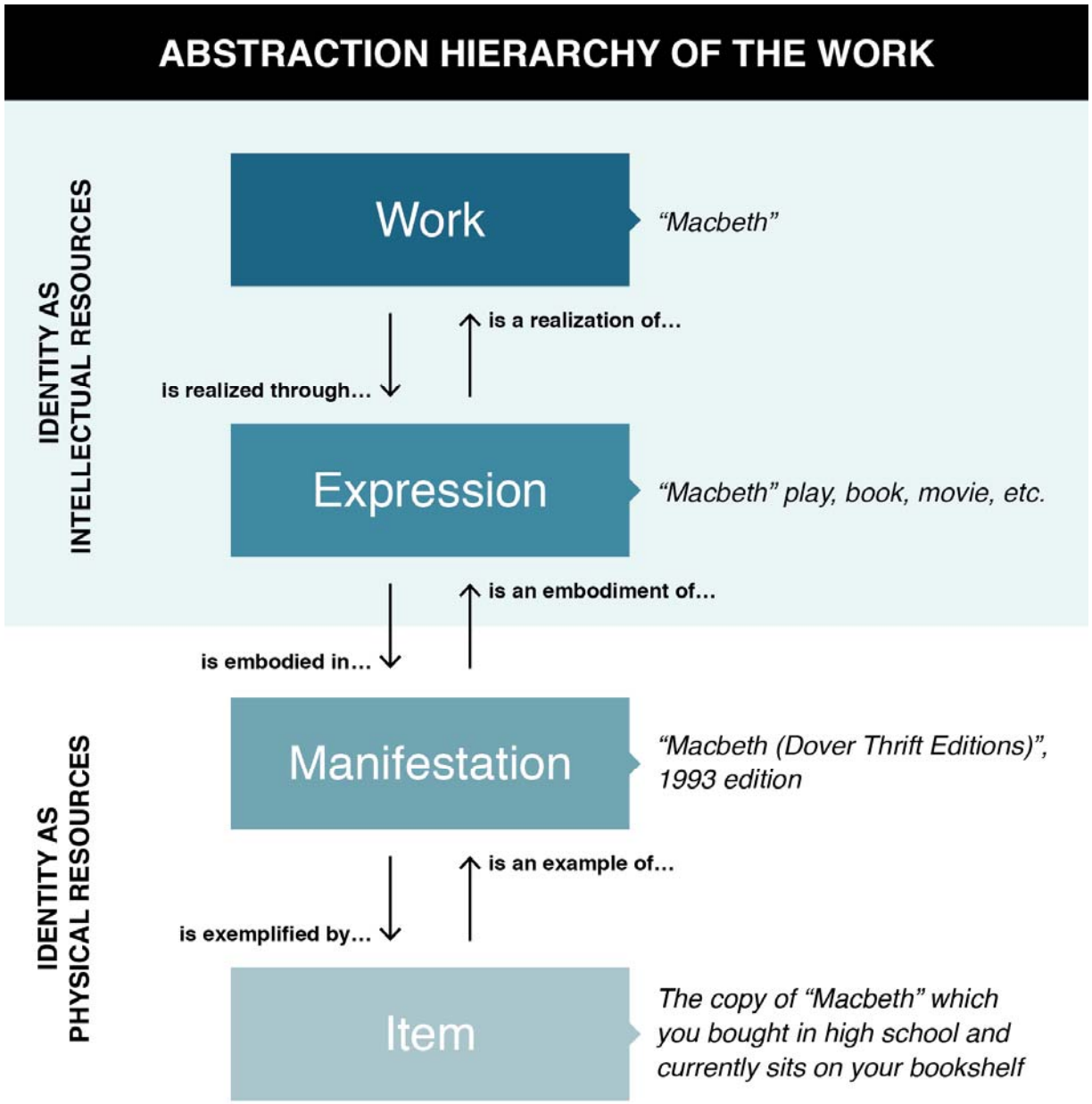


When you build it? When you sell it?
When you repair it?

“Thing” vs. “Type of Thing”

- It is easy to blur the distinction between individual things or instances of things and classes of things
- We often say that that two objects are the "same thing" when we mean they are the same "type of thing"
- Identifying a resource as an instance is not the same as identifying the category or "equivalence class" to which it belongs

What is Macbeth?

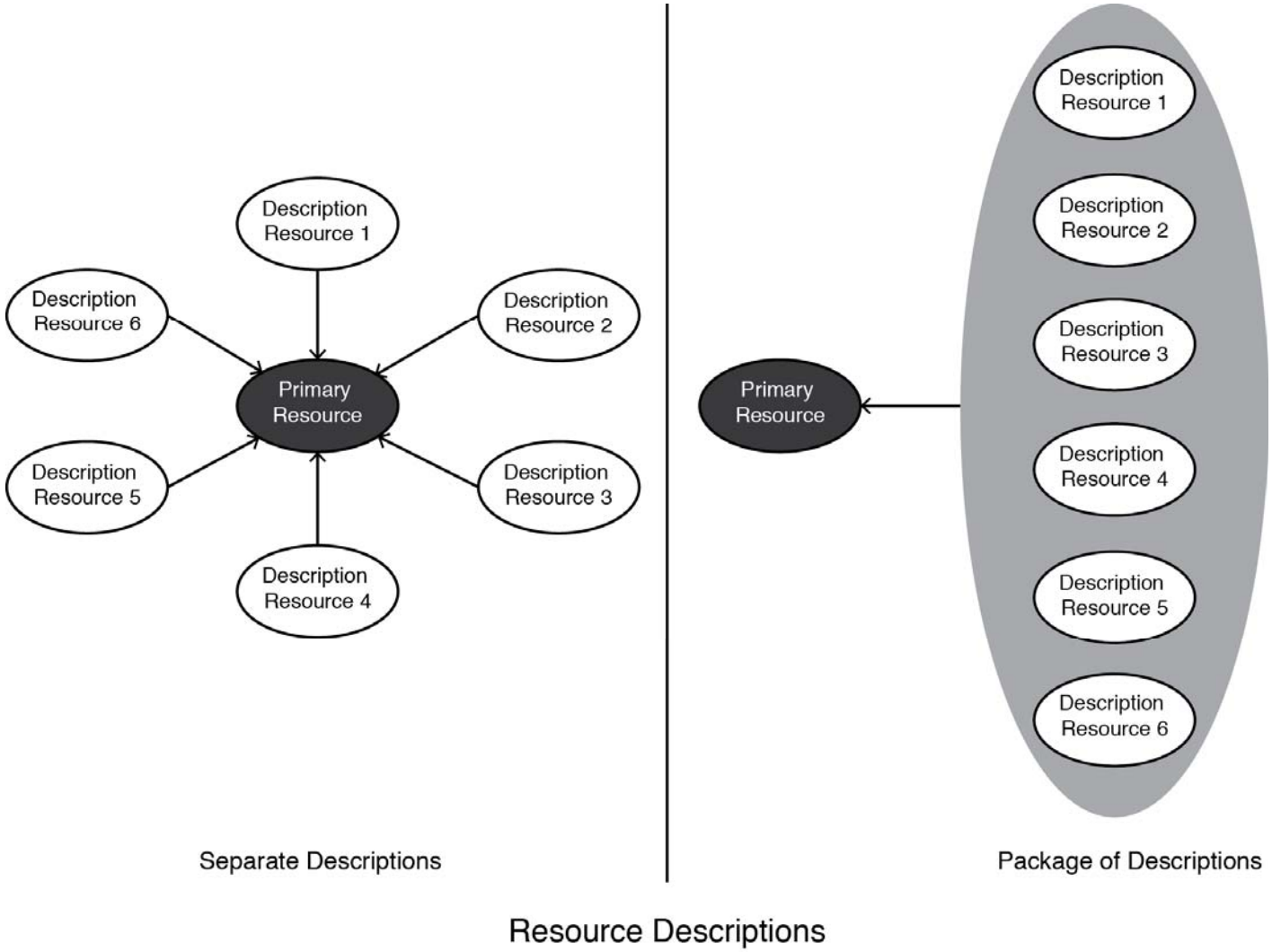


“Shamu” -- Instance or Type?

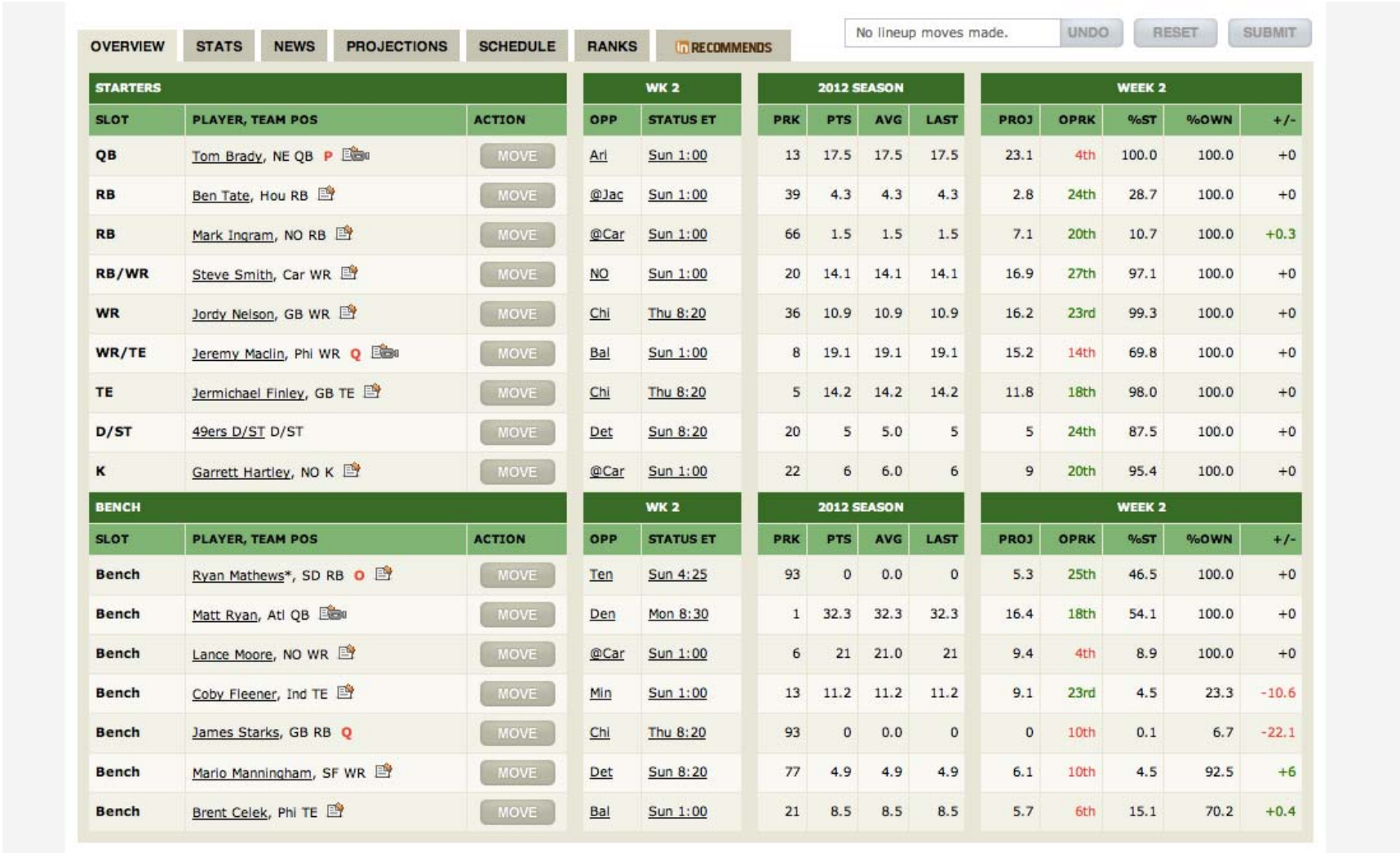
Resource Focus

- We often designate some resource as primary because it is the focus of our attention
- We often create other resources that are descriptions of or otherwise associated with the primary resource
- We call these “Description resources” (a more general term than “metadata”)

Description Resources expressed as single statements or packaged as a set



Fantasy Football: One Person's Description is another Person's Resource



OVERVIEW | STATS | NEWS | PROJECTIONS | SCHEDULE | RANKS | RECOMMENDS

No lineup moves made. UNDO RESET SUBMIT

STARTERS			WK 2		2012 SEASON				WEEK 2				
SLOT	PLAYER, TEAM POS	ACTION	OPP	STATUS ET	PRK	PTS	AVG	LAST	PROJ	OPRK	%ST	%OWN	+/-
QB	Tom Brady, NE QB P	MOVE	Ari	Sun 1:00	13	17.5	17.5	17.5	23.1	4th	100.0	100.0	+0
RB	Ben Tate, Hou RB	MOVE	@Jac	Sun 1:00	39	4.3	4.3	4.3	2.8	24th	28.7	100.0	+0
RB	Mark Ingram, NO RB	MOVE	@Car	Sun 1:00	66	1.5	1.5	1.5	7.1	20th	10.7	100.0	+0.3
RB/WR	Steve Smith, Car WR	MOVE	NO	Sun 1:00	20	14.1	14.1	14.1	16.9	27th	97.1	100.0	+0
WR	Jordy Nelson, GB WR	MOVE	Chi	Thu 8:20	36	10.9	10.9	10.9	16.2	23rd	99.3	100.0	+0
WR/TE	Jeremy Maclin, Phi WR Q	MOVE	Bal	Sun 1:00	8	19.1	19.1	19.1	15.2	14th	69.8	100.0	+0
TE	Jermichael Finley, GB TE	MOVE	Chi	Thu 8:20	5	14.2	14.2	14.2	11.8	18th	98.0	100.0	+0
D/ST	49ers D/ST D/ST	MOVE	Det	Sun 8:20	20	5	5.0	5	5	24th	87.5	100.0	+0
K	Garrett Hartley, NO K	MOVE	@Car	Sun 1:00	22	6	6.0	6	9	20th	95.4	100.0	+0

BENCH			WK 2		2012 SEASON				WEEK 2				
SLOT	PLAYER, TEAM POS	ACTION	OPP	STATUS ET	PRK	PTS	AVG	LAST	PROJ	OPRK	%ST	%OWN	+/-
Bench	Ryan Mathews*, SD RB O	MOVE	Ten	Sun 4:25	93	0	0.0	0	5.3	25th	46.5	100.0	+0
Bench	Matt Ryan, Atl QB	MOVE	Den	Mon 8:30	1	32.3	32.3	32.3	16.4	18th	54.1	100.0	+0
Bench	Lance Moore, NO WR	MOVE	@Car	Sun 1:00	6	21	21.0	21	9.4	4th	8.9	100.0	+0
Bench	Coby Fleener, Ind TE	MOVE	Min	Sun 1:00	13	11.2	11.2	11.2	9.1	23rd	4.5	23.3	-10.6
Bench	James Starks, GB RB Q	MOVE	Chi	Thu 8:20	93	0	0.0	0	0	10th	0.1	6.7	-22.1
Bench	Mario Manningham, SF WR	MOVE	Det	Sun 8:20	77	4.9	4.9	4.9	6.1	10th	4.5	92.5	+6
Bench	Brent Celek, Phi TE	MOVE	Bal	Sun 1:00	21	8.5	8.5	8.5	5.7	6th	15.1	70.2	+0.4

A Ticket is a Resource and a Resource Description at the Same Time

2. Why Is It Being Organized?

- The essential purpose of every Organizing System is to "bring like things together and differentiating among them" – enabling generic requirements of resource discovery, identification, access…

- But there are always more precise requirements and constraints to satisfy and more specific kinds of interactions to support

- Different stakeholders might not agree on these requirements, making it necessary to use multiple and possibly incompatible resource descriptions and organizing principles

Interactions –The Why of Organizing Systems

- INTERACTIONS include any activity, function, or service supported by or enabled with respect to the resources in a collection or with respect the collection as a whole
- Interactions can include access, reuse, copying, transforming, translating, comparing, combining, visualizing, recommending… anything that a person or process can do with the resources…

The Most Generic Interactions

- Finding a resource that you know exists
- Identifying a resource to make sure you have the one you were looking for
- Selecting a resource from a set of candidates in a collection
- Obtaining the resource if what you have at this point is just a resource description

Interactions

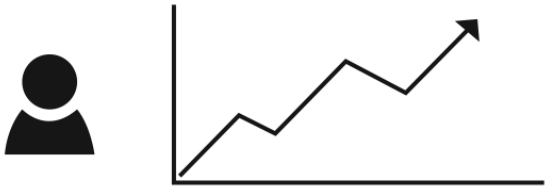
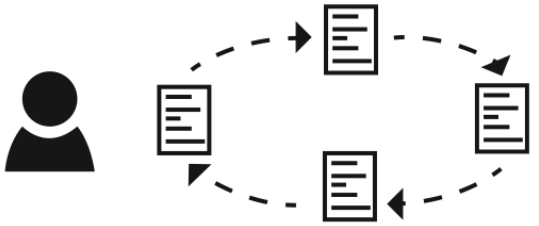
- Some interactions can be enabled with any type of resource, while others are tied to resource types
- The supported interactions depend on the nature and extent of the resource descriptions and arrangement
- Finding the optimal descriptions is an important goal but not always possible

But Description is Challenging!

- People use different words for the same things, and the same words for different things - what would a "good" description be like, and how can it be created or discovered?
- Describing and organizing always (explicitly or implicitly) takes place in some context
- The context shapes which resource properties are important and the organizing principles that use those properties, introducing bias

Classifying Resource Properties

Property Essence

Property Persistence	Intrinsic	Extrinsic
Static	**Intrinsic Static** **Definition**: Directly experienced, subject matter, implicit, inherent properties. **Examples**: Size, color, shape, author, date of creation. 	**Extrinsic Static** **Definition**: Assigned to resource, name, identifier. **Examples**: Dewey decimal 704.00 →
Dynamic	**Intrinsic Dynamic** **Definition**: Inherent properties; change over time. **Examples**: Skills, experience 	**Extrinsic Dynamic** **Definition**: Behavioral and contextual properties **Examples**: Current owner, location, best seller lists. 

Organizing System: Home Kitchen

Photo by Emilie Hardman (http://www.flickr.com/photos/quintanaroo/2741672230/) Used by permission

Resource Properties for Kitchen Organization

- **Intrinsic static properties:** Store pots, pans, and dishes in different cabinets and nest by size

- **Extrinsic static properties:** A spice rack with the spices arranged in alphabetical order

- **Intrinsic dynamic properties:** Arrange perishable goods by expiration date, a “useful life remaining” property that decreases to zero over time

- **Extrinsic dynamic properties:** Put the most frequently used condiments or spices in the front

Resource Properties for Document Organization

- **Intrinsic static properties:** Author, date published, words in the text

- **Extrinsic static properties:** ISBN, LOC Classifications

- **Intrinsic dynamic properties** Effectivity (e.g., laws and regulations)

- **Extrinsic dynamic properties** Links/citations to and from other documents

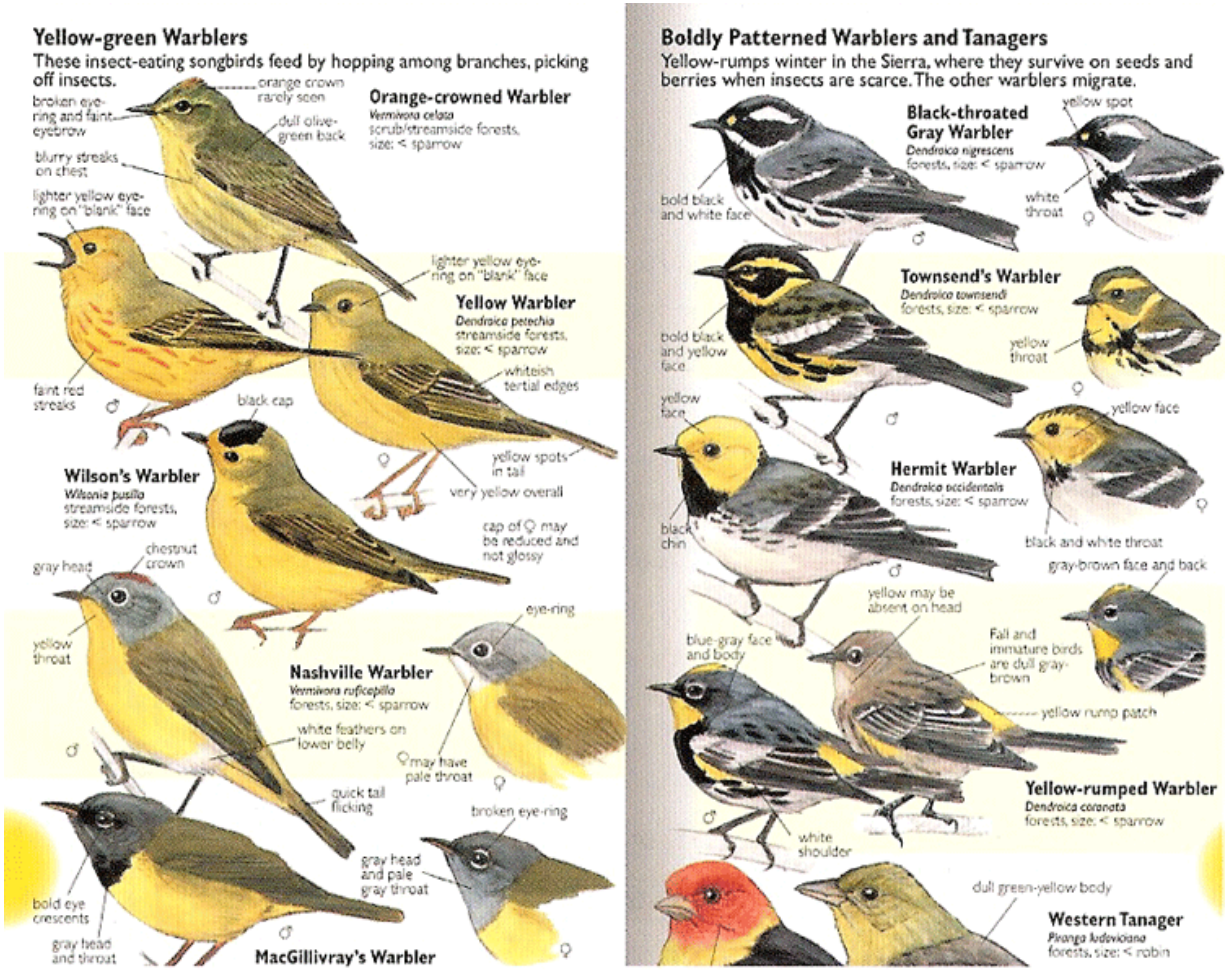
3. How Much Is It Being Organized?

- Not everything is equally organizable, because not everything is equally describable
- A controlled vocabulary can yield more consistent organization
- The scope and size of a collection shapes how much it needs to be organized
- Making resources “smart” increases how much they can be organized
- How precisely a collection of resources can be described and organized depends on well user types and requirements are known

Organizing Birds for Scientists

Order Name	Family Name Scientific	Family Name Common	Subfamily Name Scientific	Subfamily Name Common
Anseriformes	Anatidae	Waterfowl	Dendrocygninae Anatinae Cygninae Anserinae Aythyinae Oxyurinae Merginae	Whistling Ducks Geese Swans Marsh Ducks Diving Ducks Stifftails Mergansers
Falconiformes	Cathartidae Pandionidae Accipitridae Falconidae	Vultures Ospreys Hawks Falcons	 Elaninae & Milvinae Accipitrinae Buteoninae Circinae Caracarinae Falconinae	 Kites Accipiters Buteos/Eagles Harriers Caracaras Falcons
Galliformes	Cracidae Phasianidae Odontophoridae	Curassow Pheasants Quail	N/A	
Gruiformes	Rallidae Aramidae Gruidae	Rails Limpkins Cranes	N/A	
Charadriiformes	Charadriidae Haematopodidae Recurvirostridae Scolopacidae Laridae	Plovers Oystercatchers Stilts/Avocets Sandpipers/Phalaropes Gulls/Terns	 Stercorariinae	 Jaegers/Skuas

Organizing Birds for Birdwatchers



The Laws Field Guide to the Sierra Nevada is available at www.johnmuirlaws.com and many independent booksellers.

4. When Is It Being Organized?

- When the resource is created
- When it is added to some collection
- Just in time
- Never
- All the time - continuous or incremental

“Just in Case” Organization

Postponing Organization

Organizing “On the Way Out”

- If a collection of resources isn’t organized to support our desired interactions, computational techniques can re-organize them (if they are digital) or their digital resource descriptions
- … by indexing, searching, sorting, transforming, translating, labeling, categorizing, combining, summarizing… (IR, ML, NLP)
- This doesn’t always mean that the collection was organized poorly; it might just be organized for different interactions than the ones we want
- TDO calls this “organizing on the way out”

5. Who or What Is Organizing?

- Authors or creators
- Professional organizers
- Users “in the wild”
- Users "in institutional contexts“
- Automated or computerized processes

6. Where is it Organized?

- Physical location is often a constraint or convenience; use of fixed locations for personal organization

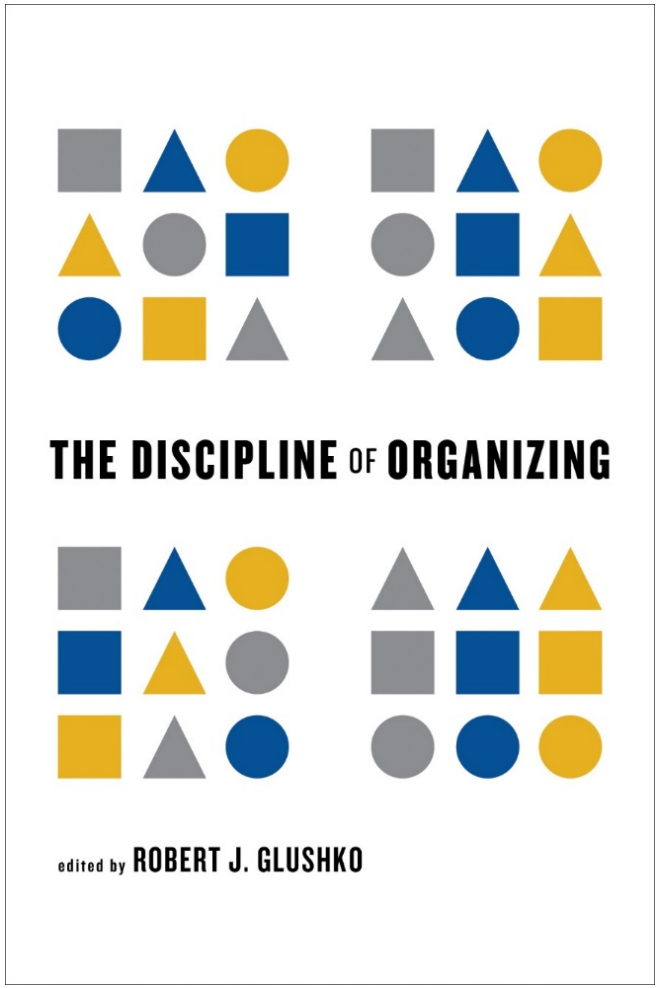
- Digital resources often have location-independent or irrelevance except…

- Built environments / city plans are places, but are usually organizing people and their interactions rather than “the land”

The Discipline of Organizing: Summary

- The concept of Organizing System unifies a vast multidisciplinary body of design and analysis practice
- A higher-level framework for resource properties and organizing principles enable conversations between people who lacked common language
- It is a generative, forward-looking approach that encourages and accommodates innovation in organizing while preserving conventional theory and practice as design patterns

The Discipline of Organizing: The Book



Published by MIT Press (2013) as a printed book and in ebook formats

“Enhanced ebook” editions published by O’Reilly Media in 2014 and 2015

In use in > 75 courses in > 20 countries as of July 2016

Named an “Information Science Book of the Year” in 2014

To Learn More

- The Discipline of Organizing book has a web site:

  http://disciplineoforganizing.org/

- Glushko, Robert J. "Collaborative Authoring, Evolution, and Personalization for a 'Transdisciplinary' Textbook", *Open Sym '15,* 19-21 August 2015 (PDF)

- Maloney, M., Glushko, Robert J., & R. A. Milowski. "Using DocBook to Produce a Polyvalent Academic Work", *XML Prague,* 14-15 February 2015. (PDF)

To Think About…

- What are the benefits of “dimensional” thinking about organizing compared with “category” thinking?
- Why should we say “resource description” instead of “metadata”… put another way, how many ways is it wrong to define metadata as “data about data”?
- When you analyze transactional or navigation or other behavioral data about people, are you organizing the data or are you organizing the people? Does it matter which way you think about this?