

BHCI Pro Seminar  
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# Sensemaking

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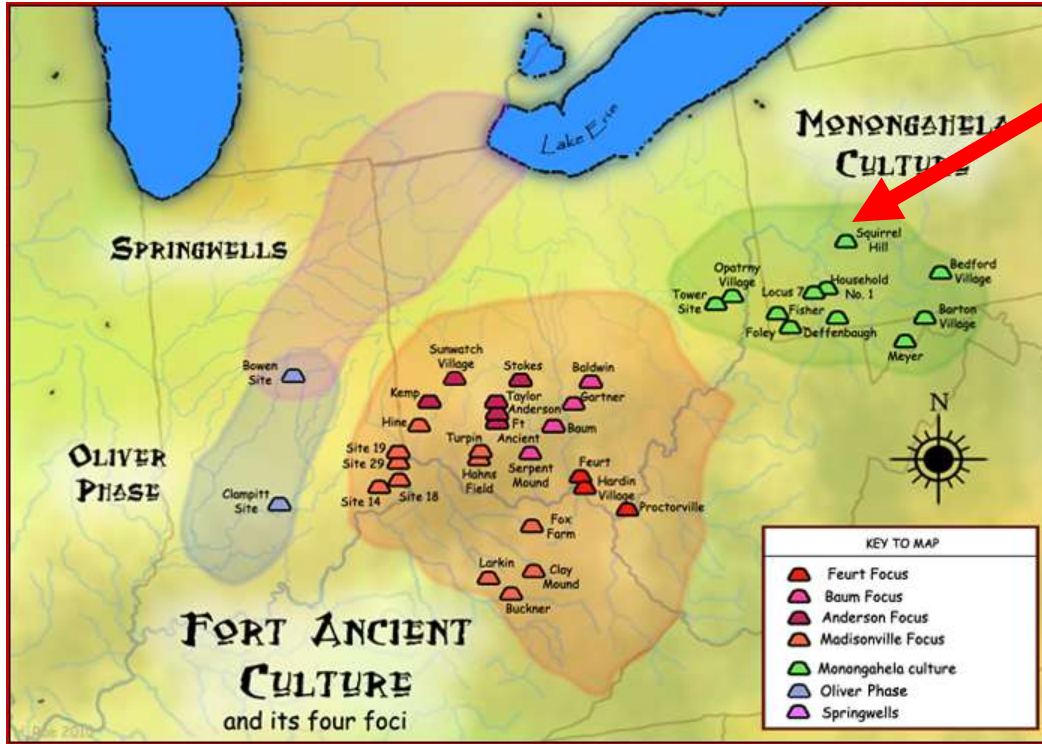
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DM21-1059

# Acknowledgement: The Land I Speak On



Land of Monongahela, Adena and Hopewell Nations;

Seneca, Lenape and Shawnee lands;

Osage, Delaware and Iroquois lands.

Now known as Pittsburgh, PA, USA.

Map by Herb Roe via Wikipedia [https://en.wikipedia.org/wiki/Monongahela\\_culture](https://en.wikipedia.org/wiki/Monongahela_culture)

# CMU Software Engineering Institute DoD Federally Funded Research and Development Center



Established in 1984

Charged to improve the state of the practice of software engineering, cybersecurity and AI Engineering

Collaborate with CMU professors and students and broadly across academia, government, and industry

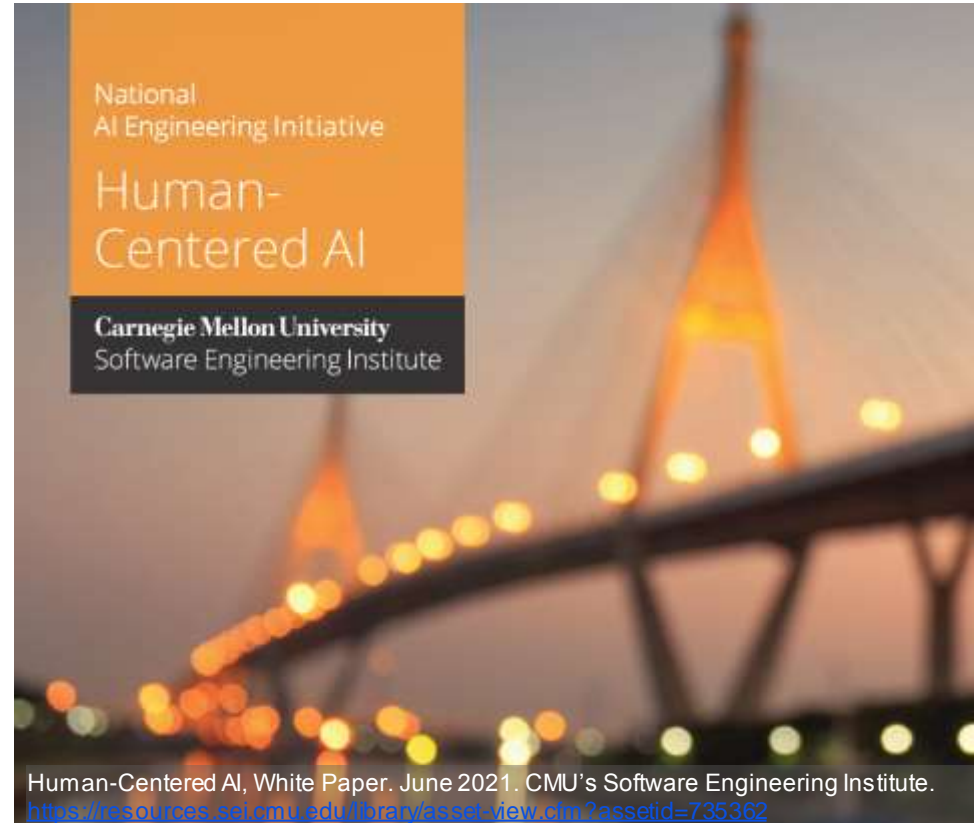
Primary offices in Pittsburgh and DC

# Human-Centered AI: Design to work with, and for, people

Effective implementations

Minimize unintended consequences

1. Understand complexity of context
2. Design for human-machine teaming
3. Engage in critical oversight



# Responsible AI Guidelines

Operationalizing DoD's Ethical Principles for AI

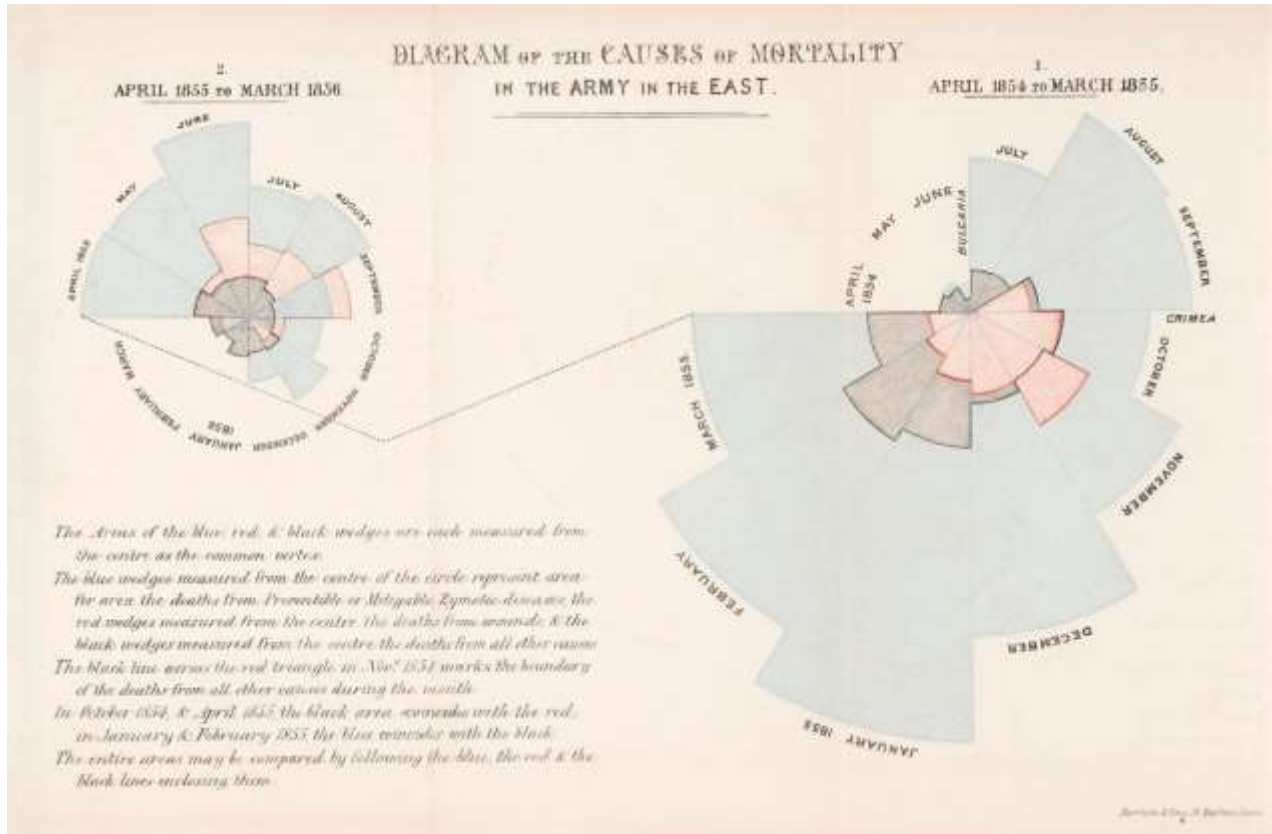
Download DIU's Responsible AI Guidelines report and learn how to implement ethical AI principles.

**Responsible AI Guidelines**

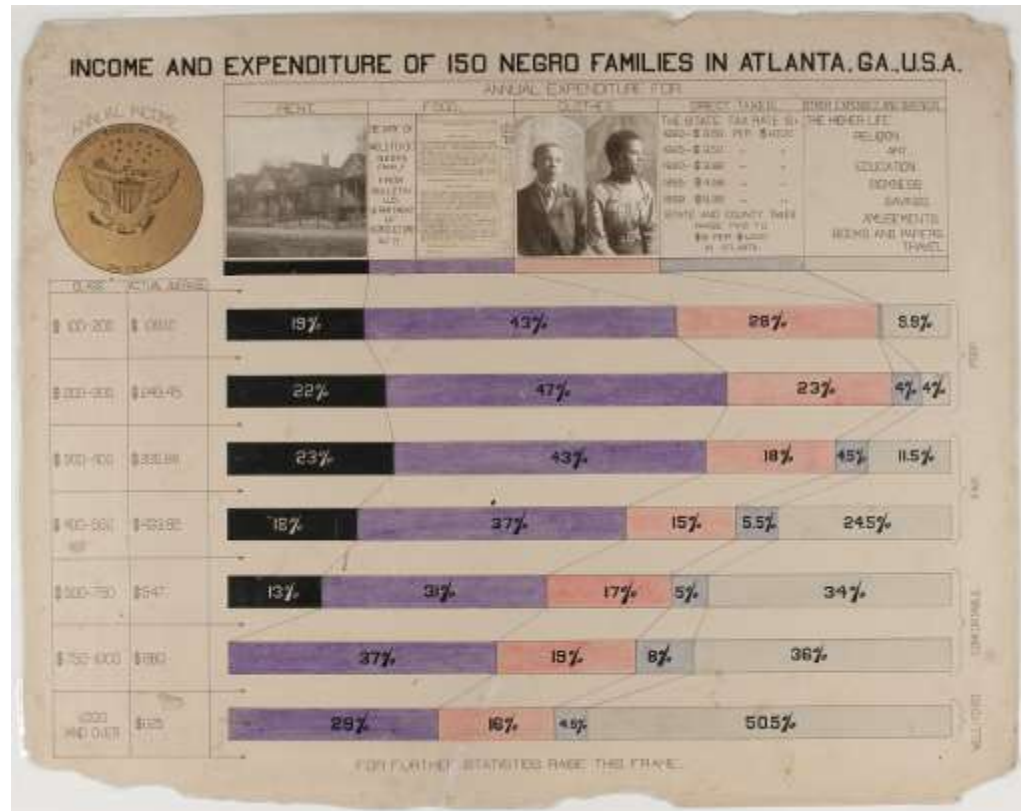
# Sensemaking



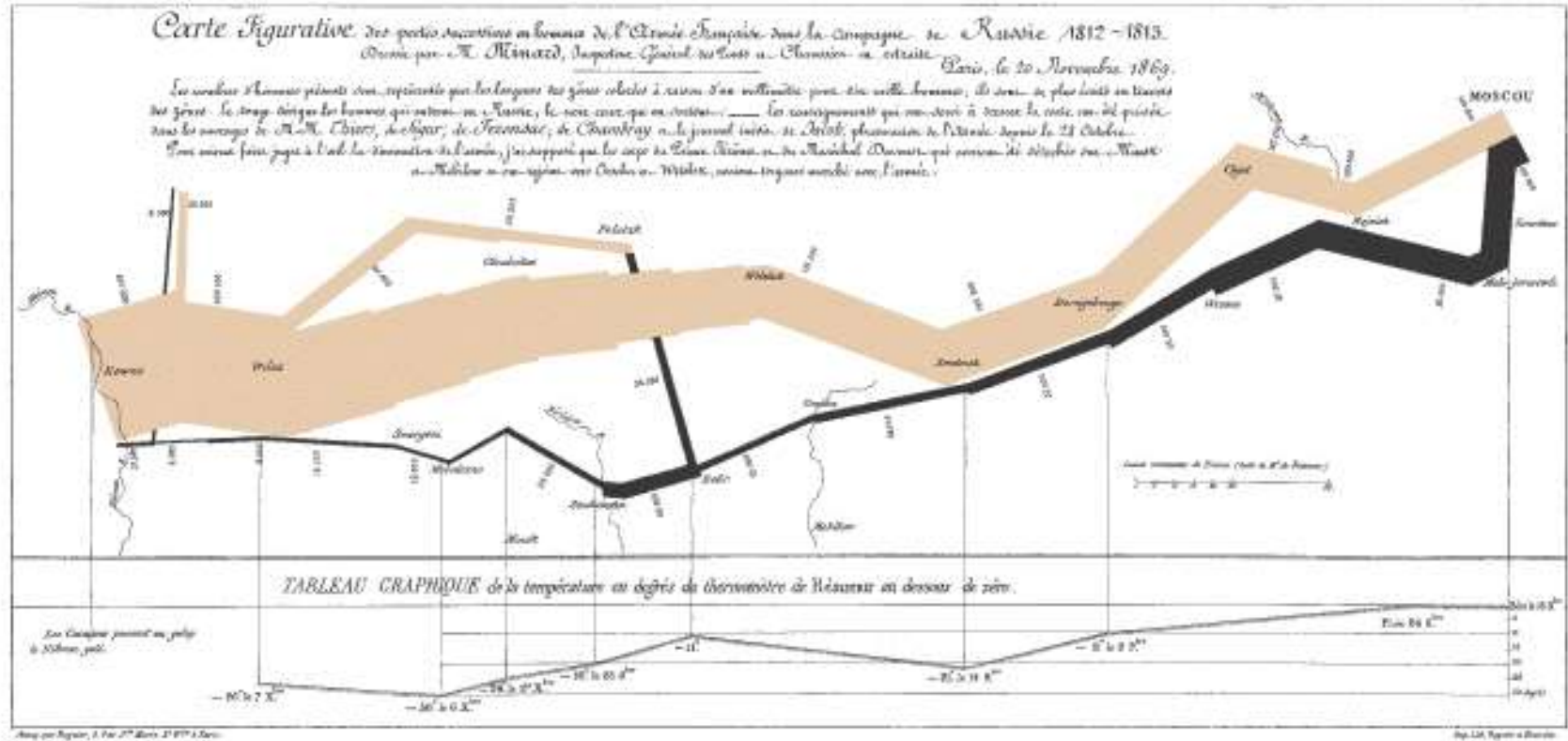
# Causes of mortality in the Army - Florence Nightingale (1856)



# Data Portraits - W.E.B. Du Bois (~1900)



# Losses of French Army in 1812 Russia Campaign - Charles Joseph Minard (1869)







# BISG

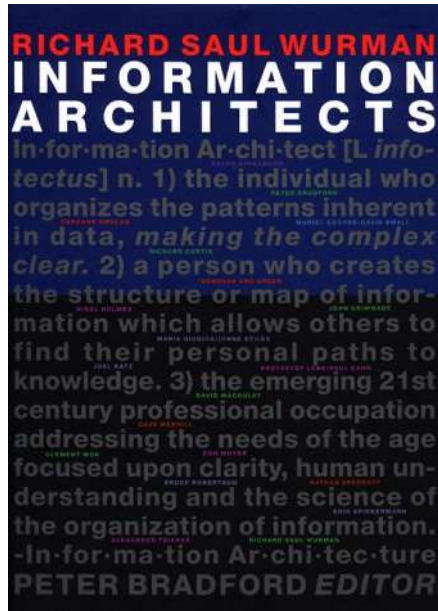
## BOOK INDUSTRY STUDY GROUP

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- BIBLES
- BIOGRAPHY & AUTOBIOGRAPHY
- BODY, MIND & SPIRIT
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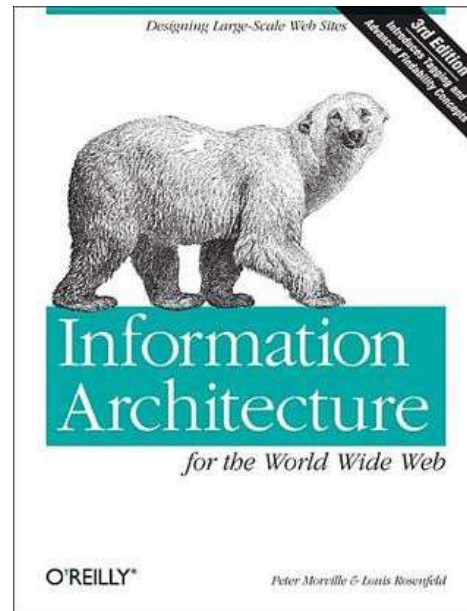
## COMPUTERS

- COM000000 **COMPUTERS** / General
- COM004000 **COMPUTERS** / Artificial Intelligence / General
- COM016000 **COMPUTERS** / Artificial Intelligence / Computer Vision & Pattern Recognition
- COM025000 **COMPUTERS** / Artificial Intelligence / Expert Systems
- COM042000 **COMPUTERS** / Artificial Intelligence / Natural Language Processing
- COM093000 **COMPUTERS** / Blockchain

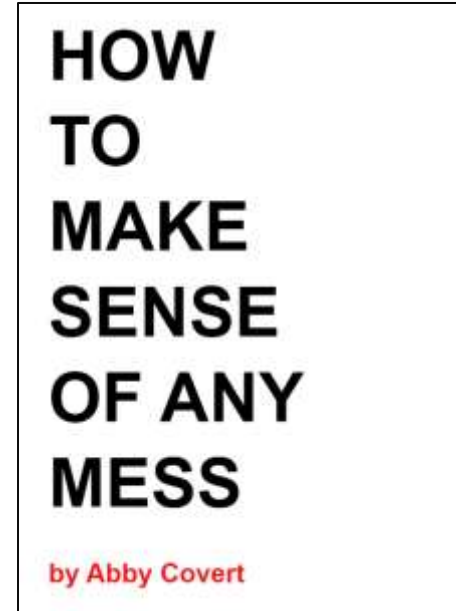
# Information Architecture



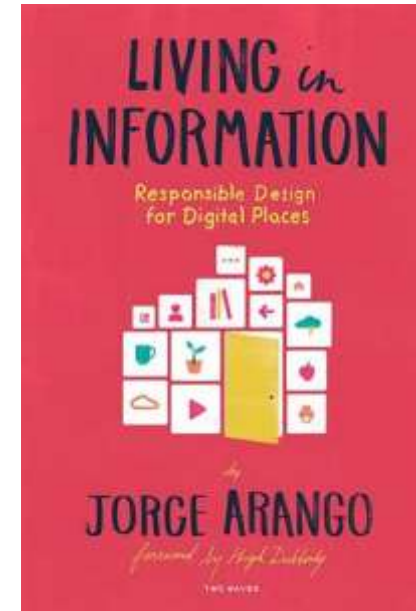
1996



1998



2014



2018

# Understand Information - Deeply

## Particularly larger data sets

- Provenance and creator's motivation
- Collection process?
- What data included? Why?
- What not included? Why?
- Recommended uses, etc.?

1. T. Gebru, J. Morgenstern, B. Vecchione, J. W. Vaughan, H. Wallach, H. Daumé III, and K. Crawford. Datasheets for Datasets. The latest version of this paper can be found online at <https://arxiv.org/abs/1803.09010>

2. M. Mitchell et al., "Model Cards for Model Reporting," Proc. Conf. Fairness Account. Transpar., pp. 220–229, Jan. 2019, doi: 10.1145/3287560.3287596

# Identify the Mess

Identify **edges** and **depths** - complexity of information and people

- Who are users? Stakeholders?
- Information - too much, not enough?

Architect the information to serve different needs

- users
- stakeholders

# Complexity

Desired outcome

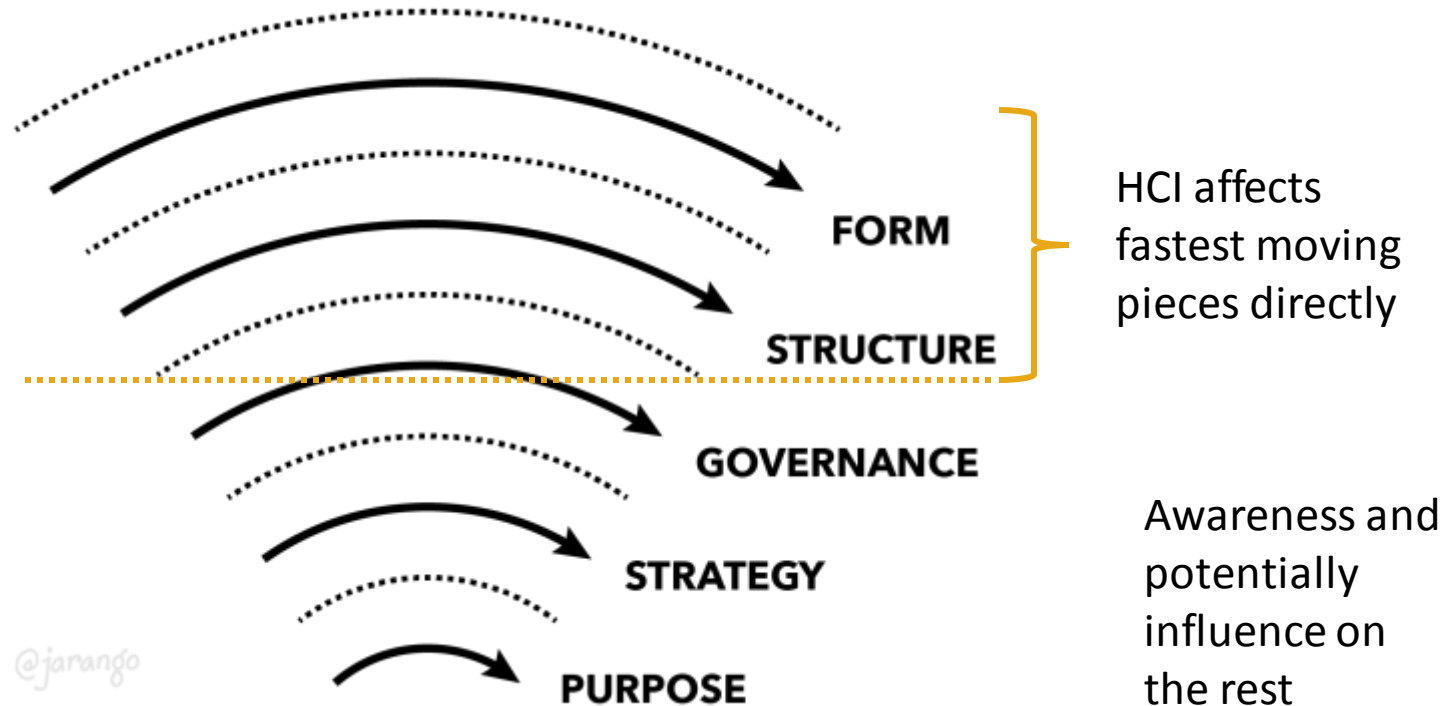
Human needs and context

Environmental context

Information



# Pace-layer model by Jorge Arango



# Architecture before Design

What is your goal

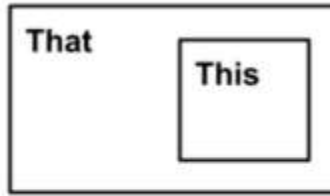
– what are you making?

Moving from why to what?

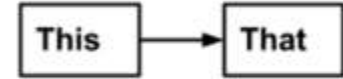
Choose a direction

How are we shifting power?\*

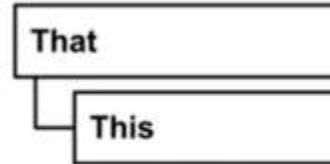
Time, scope, and scale



**This is part of that.**



**This leads to that.**



**This is a type of that.**



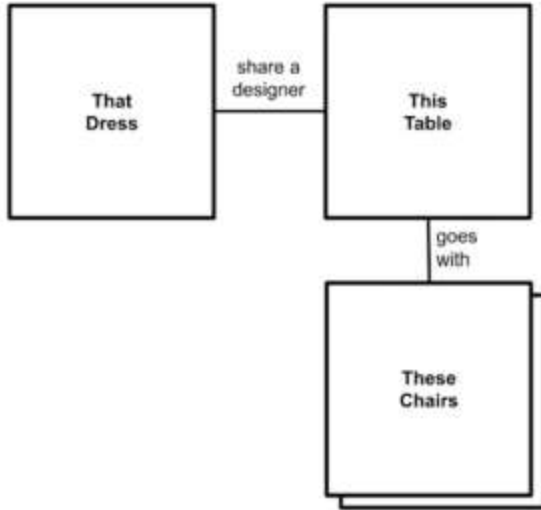
**This relates to that.**

\*"Don't ask if artificial intelligence is good or fair, ask how it shifts power." Pratyusha Kalluri.

<https://www.nature.com/articles/d41586-020-02003-2>

Abby Covert

# Diagram for Clarity - Design with, not for.



## *Common Styles for Diagrammatic Relationships*

<b>Non-Directional Lines</b>	for Associations
<b>One-way lines</b>	for Sequences
<b>Two-way lines</b>	for Reciprocation
<b>Brackets</b>	for Hierarchy
<b>Quadrants</b>	for Comparison

Abby Covert

# Control Vocabulary - Language matters

What words are in vocabulary, and which are not?

Ontologies – specific meaning in specific context

History of word usage?

# Bias in Information (data)

Unintended and purposeful bias

Misuse and abuse of the system

Understand inherent bias and amount of variance:

- Motivation
- Composition
- Collection process
- Recommended uses, etc.

Goal: Transparency and accountability.

# Joy Buolamwini, Algorithmic Justice League

“Data is a function of our history...  
The past dwells within our algorithms...  
Showing us the inequalities that have  
always been there.”

## Coded Gaze

Photo: Joy Buolamwini on The Open Mind: Algorithmic Justice.  
Jan 12, 2019. <https://www.youtube.com/watch?v=hwHnXdoSSFY>

THE  
OPEN MIND



What is a tomato?

Fruit?

Vegetable?

# Arrange information

## Taxonomy

Combine taxonomies to create unique forms

Hierarchical or heterarchical

Can be sequential

Most things need a mix of taxonomic approaches

## COMPUTERS

COM000000	<b>COMPUTERS</b> / General
COM004000	<b>COMPUTERS</b> / Artificial Intelligence / General
COM016000	<b>COMPUTERS</b> / Artificial Intelligence / Computer Vision & Pattern Recognition
COM025000	<b>COMPUTERS</b> / Artificial Intelligence / Expert Systems
COM042000	<b>COMPUTERS</b> / Artificial Intelligence / Natural Language Processing
COM093000	<b>COMPUTERS</b> / Blockchain

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# Sorting

Sorting is easier than deciding how to sort.

Classification can be exact or ambiguous.

Ambiguity costs clarity;  
exactitude costs flexibility.

Ambiguity hides in simplicity.

Result is not always aligned with organization's hierarchy or internal information structure



# Card Sorting - Design with, not for.



# Card Sorting Overview

Technique to explore how primary users group items.

Many variations – basics:

- Names of items printed on individual cards (digital or physical cards)
- Participants asked to group items in the way that makes sense to them
- Naming resulting groups
  - Open card sort - participants name them
  - Closed card sort – participants sort into pre-existing groups
- Participants can be given blanks to make own categories

# Card Sorting Participants

Representative of users of site

More participants = more data to analyze

~30 minutes to sort 50 items (no more than 100)

Confirm correct audience

# Analysis

Patterns across participants

Qualitative information (comments)

Quantitative information:

- Cards together most often (agreement)
- Cards appeared in specific categories

Considerations for items without consensus

Final category names (harmonize across participants)

Card Title	Card Number	Category 1	Category 2	Category 3	Category 4	Category 1	Category 2	Category 3	Category 4
card title	162				80%				
card title	163				29%				
card title	164						50%		
card title	165	95%							
card title	166	95%							
card title	167	57%							
card title	168								
card title	169					71%			
card title	170								14%
card title	171								63%
card title	172				80%				
card title	173				80%				
card title	174						29%		
card title	175								
card title	176		25%						
card title	177				80%				
<b># Different Cards</b>									
		11	35	8	19	24	24	8	9
<b># High Agreement Cards</b>									
		6	0	0	10	6	0	2	0
<b># Medium Agreement Cards</b>									
		2	5	5	0	3	9	4	8
<b># Low Agreement Cards</b>									
		3	30	4	9	15	15	2	1
<b>Average Card Agreement</b>									
		61%	22%	37%	54%	40%	31%	51%	50%
<b>Legend</b>									
= conflict, card appears in 6 or > categories									
= potential agreement, appears 50%+ in any cat or in 2 categories									
= agreement, appears 60% or + in a category									
= low agreement, appears 33% or < in category									
= top five result for this metric									

# Lenses for Information Architecture

How to...

- Classify
- Flex
- Engage
- Explain
- Guide
- Include
- Present
- Manage



# Iteration - Expect Dynamic Change

- Time cycles
- Length varies
  - Very short and hectic
  - Longer and iterative
  - Affects interactions

Clear communication, negotiation,  
and coordination required



How IAs can shape  
the future of  
human/AI  
collaboration

IA CONFERENCE 2021

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**Duane Degler**  
@ddegler  
Design for Context

# Sensemaking is Meaning Making

# Create Generative Environments

- Help people make decisions  
–further our best interests  
as individuals, organizations  
and as societies.
- Respect and value people’s attention
- Create more value than is captured
- Create resilient environments
- Don’t compromise the viability of  
society as a whole



Via intentional design, architecture, and stewardship

# Complex, deep work

Framing information gives it meaning.

Changes the context.

Words are powerful, wield them carefully.

Photo by Pam Sharpe [https://unsplash.com/@msgrace?utm\\_source=unsplash&utm\\_medium=referral&utm\\_content=creditCopyText](https://unsplash.com/@msgrace?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText) On Unsplash - [https://unsplash.com/s/photos/business-woman-smiling?utm\\_source=unsplash&utm\\_medium=referral&utm\\_content=creditCopyText](https://unsplash.com/s/photos/business-woman-smiling?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText)





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# When you have privilege



Take  
responsibility



Bring others in



Lengthen  
the table



Enlarge  
the tent