



Plan for Today's Lecture(s)

- Taskonomic Classification (runover from 10/24)
- Introduction to Interactions
- Affordances and Interactions
- Interactions in “Memory Institutions”



UNIVERSITY OF CALIFORNIA, BERKELEY
SCHOOL OF INFORMATION

INFO 202

“Information Organization & Retrieval”

Fall 2013

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24 October 2013
Lecture 17.3 – Taskonomic Classification



Taskonomy

- In contrast to "taxonomy" - an approach to organization based on similarity of content or characteristics - a "taskonomy" organizes on the basis of purpose or "activity structure"
- A COOK'S TASKONOMY (Figure 7.1 in TDO)

Prep

Poultry knife

Paring knife

Vegetable knife

Cutting board

Oven

Oven mitts

Baking sheets

Aluminum foil

Parchment paper

Roasting pan

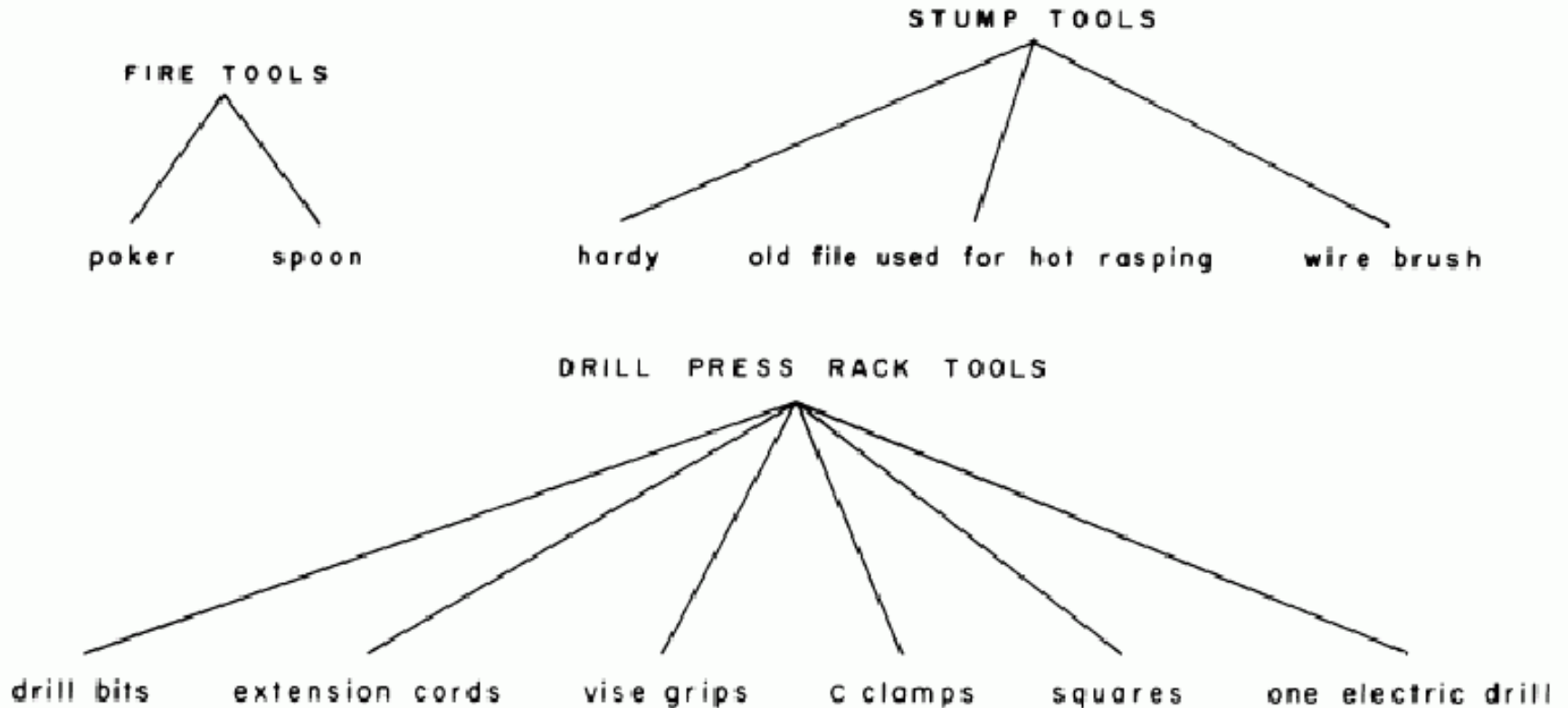
Stove

Pots and pans

Wooden spoons

Wok

The Blacksmith's Taxonomy



- Janet W. D. Dougherty and Charles M. Keller, "Taskonomy: A Practical Approach to Knowledge Structures," *American Ethnologist*, Vol. 9, No. 4, Symbolism and Cognition II (Nov., 1982), pp. 763-774



“Distributed Cognition”

- "Distributed cognition" is a "dialect" of cognitive science that views cognitive activity as not just something that takes place within the mind of a single person at some moment in time; it is:
 - Distributed across the members of a social or goal-oriented group
 - Distributed and coordinated between people and the technology and artifacts they create and use

Hollan, Hutchins, & Kirsh, "Distributed Cognition: Toward a New Foundation for Human-Computer Interaction Research," ACM TOCHI, 2000

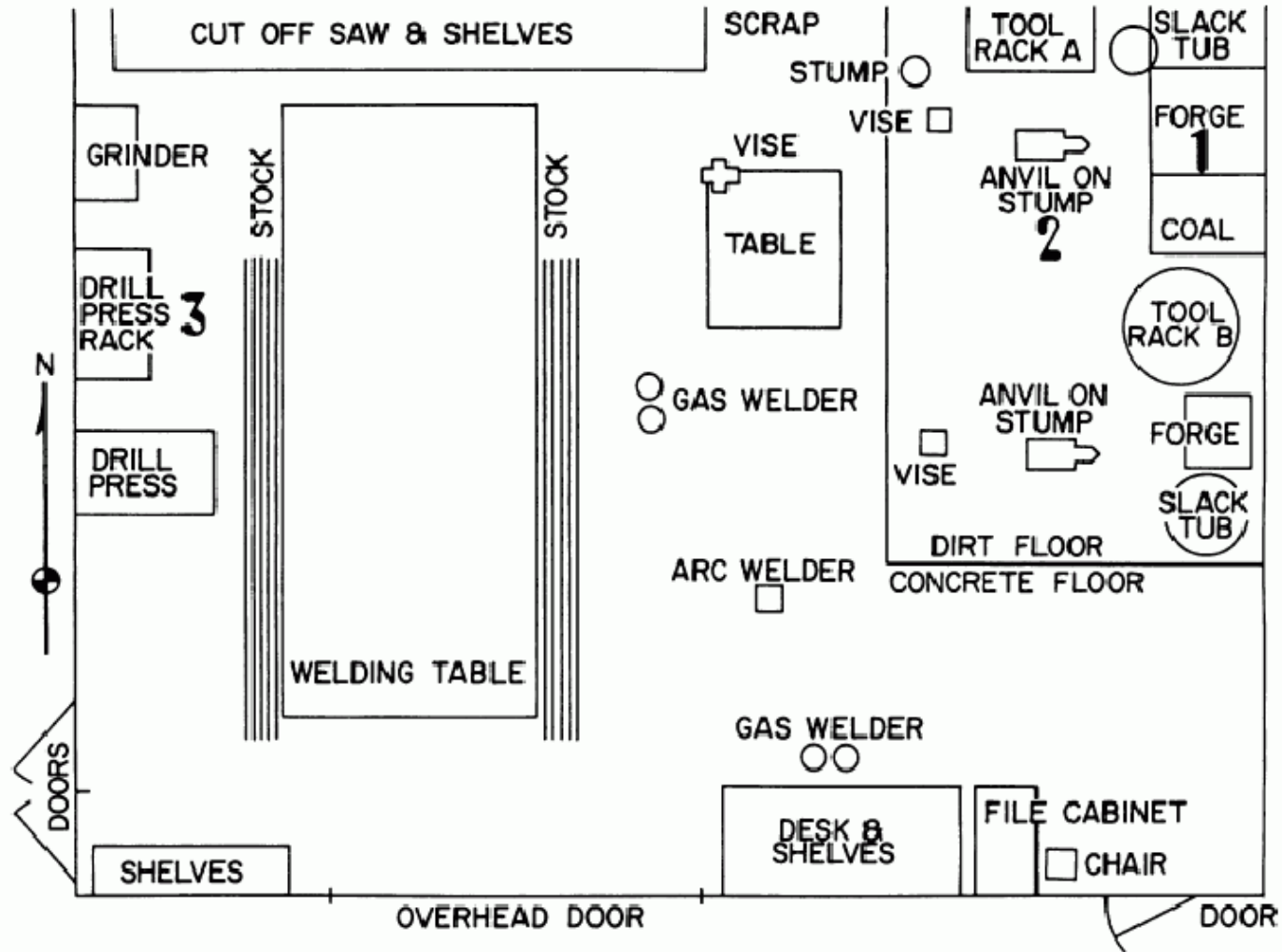


“The Intelligent Use of Space”

- "Whether we are aware of it or not, we are constantly organizing and reorganizing our workplace to enhance performance"
- "The physics of the world is such that at times the histories of use are perceptually available to us in ways that support the tasks we are doing"
- "When space is used well, it reduces the time and memory demands of our tasks... to simplify choice, to simplify perception, and simplify internal computation"

Kirsh, David. "The intelligent use of space."
Artificial intelligence 73, no. 1 (1995): 31-68.

The Blacksmith's Use of Space



Task-Based Card Sorting



“When space is used well, it reduces the time and memory demands of our tasks... to simplify choice, to simplify perception, and simplify internal computation” –

[David Kirsh on “Cognitive Overload”](#)



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29 October 2013
Lecture 18.1 – Interactions in Organizing Systems



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
- The interaction of **ACCESS** is fundamental in any collection of resources –why would you collect and organize resources you didn't expect to access in the future?



Classifying Interactions

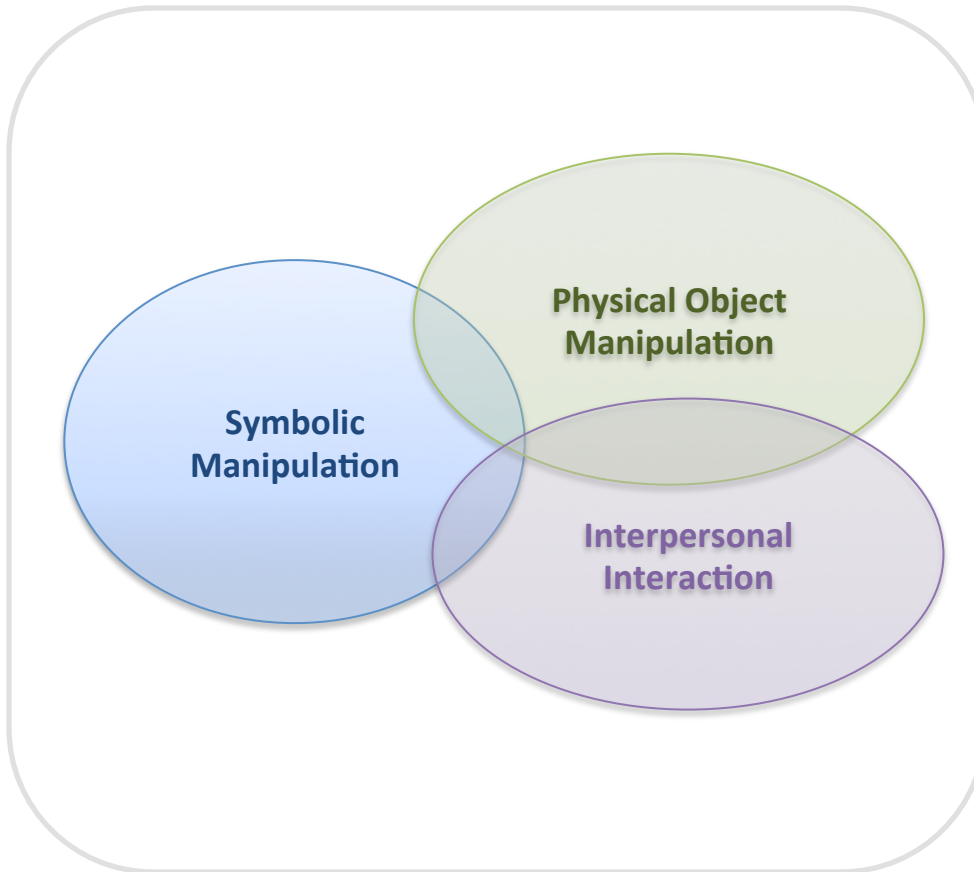
- Type of resource involved (physical or digital)
- How value is created
- Generality (generic to domain or resource-specific)
- “Property layer” involved (properties of individual resources, properties of collections)
- Extent of mediation (none, partial, complete)
- Initiative (by user, by resource, mixed initiative)



Classifying Interactions

- Implementation technology or algorithm (person to person, self-service, mechanical, IR, machine learning, NLP,...)
- Impact on the resources or collection (unchanged, translated, transformed, consumed, destroyed)? Are new resources created as a result of the interaction?

Interaction and Value Creation



Interactions differ in the absolute and relative amounts of physical manipulation, interpersonal or empathetic contact, and symbolic manipulation or information exchange involved in the interaction

Apte, U. and Mason, R. Global Disaggregation of Information-Intensive Services. *Management Science* (1995).



Value Creation with Physical Resources

- Physical manipulation is often the intrinsic type of interaction with physical resources
- The resource might have to be handled or directly perceived in order to interact with it
- Physical manipulation and interpersonal contact might be required to interact with information resources in physical form like printed books in libraries or music in CDs or albums
- Interactions involving physical resources often emphasize generic aesthetic or emotional goals

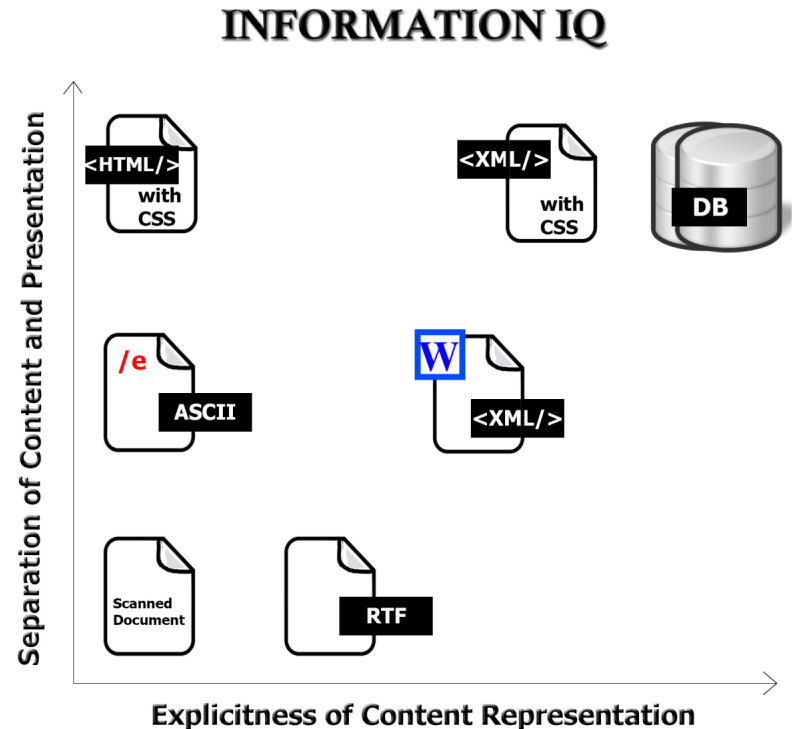


Value Creation with Digital Resources

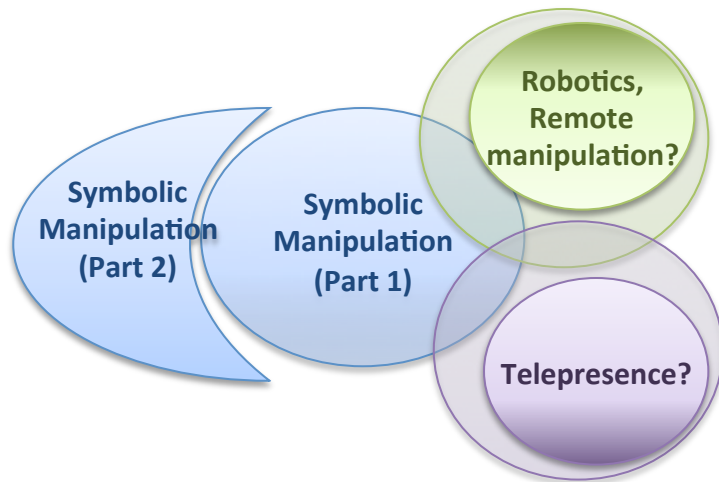
- With digital resources, neither physical manipulation nor interpersonal contact is required for interactions
- The essence of the interaction is **information exchange or symbolic manipulation of the information** contained in the resource
- By replacing interactions that involve people and physical resources with symbolic ones, organizing systems can lower their costs without reducing user satisfaction (automation, self-service, outsourcing...)

Value Creation with “Smart” Resources

The variety and functions of interactions with digital resources are determined by the amount of structure and semantics represented in their digital encoding, in the descriptions associated with the resources, or by the intelligence of the computational processes applied to them



Disaggregation of Symbolic Interaction and Other Impacts of Technology



Information can augment interpersonal and physical interactions, and can also replace them

A Continuum of Technology Support in Interactions

Person-to-person



Technology-enhanced Person-to-Person



Self-Service





Substituting Information for Interaction

- A “smart resource” or organizing system that can capture, manage, integrate and retrieve information about the customer / user and prior interactions can **substitute information for interaction**
- A hotel clerk with a CRM database doesn’t need to ask for your room preferences; Amazon doesn’t need to ask you about what type of books you like
- Design implication: hidden computational services are interchangeable with customer-facing “touch points”



Generic and Domain-Specific 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
- Different principles, or different implementations of the same organizing principles, determine the efficiency or effectiveness of the interactions



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



Direct vs Mediated Interactions

- Interactions with a resource can be direct, mediated or indirect, or limited to interactions with resource copies or descriptions
- Many of the interactions with individual physical resources seem unmediated when they take place
- This means we don't always realize the role of additional descriptions or organization in supporting or improving interactions



Patterns of “Interaction Initiation”

A) Where can I buy a notebook computer?

B) Here's my catalog of notebook computers.

A) I'd like to order this one.

B) OK.

B) And here's your invoice.

A) OK.

A) When will the computer arrive?

B) By next Tuesday.

B) Here's my complete catalog, in case you're interested in other products.



Interaction Patterns

The [ebXML standards activity](#) defined a set of “transaction patterns” for describing business processes that we use to understand interactions in organizing systems

The patterns differ in how the interaction is initiated, whether it makes any assumptions about prior interactions, and whether it creates obligations for future interactions

Interaction Patterns

A) Where can I buy a notebook computer?

B) Here's my catalog of notebook computers.

Query/response pattern – no assumption of prior interaction, no dependence on identity of requestor

A) I'd like to order this one.

B) OK.

Commercial transaction – creates an obligation to perform

Interaction Patterns

B) And here's your invoice.

Notification – initiated by the system, follows up on prior interaction and thus depends on identity of the original requestor

A) When will the computer arrive?

B) By next Tuesday.

Request/ confirm – based on a prior interaction

B) Here's my complete catalog, in case you're interested in other products

Information distribution – initiated by the system but no dependence on prior interaction



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Lecture 18.2 – Affordances and Interactions



“The Design of Everyday Things” ([new edition Nov 2013](#))

- “*intentional arrangement of resources and the interactions they support?* – that’s what design does” (Don Norman)
- Design must convey the essence of a device’s operation
 - The way it works
 - The possible actions that can be taken
 - Just what it is doing at any particular moment



Affordances (1)

- For physical resources, many potential interactions are inherent in their AFFORDANCES – perceptible and actionable properties that determine what can be done with them (given some capabilities of the entities interacting with them)
- Affordances can also be analyzed as constraints that limit what can be done with a resource
- Creating affordances is often the purpose of design



Easily Perceivable Affordances





Affordances (2)

- Many organizing systems use the readily perceived properties that create affordances as the basis for resource selection, arrangement, and interaction design
- (this is especially true with “taskonomic” classification)
- But not every affordance makes sense as an organizing principle, and not every affordance is related to a useful interaction

Not every Affordance is Related to a Useful Interaction

- In graphical, screen-based interfaces, all that the designer has available is control over perceived affordances. The computer system ... affords pointing, touching, looking, and clicking on every pixel of the display screen. Most of this affordance is of no value. Thus, if the display does not have a touch-sensitive screen, the screen still affords touching, but it has no result on the computer system.

[Norman, Donald. "Affordances and design"](#)



Design to Support Interaction (1)

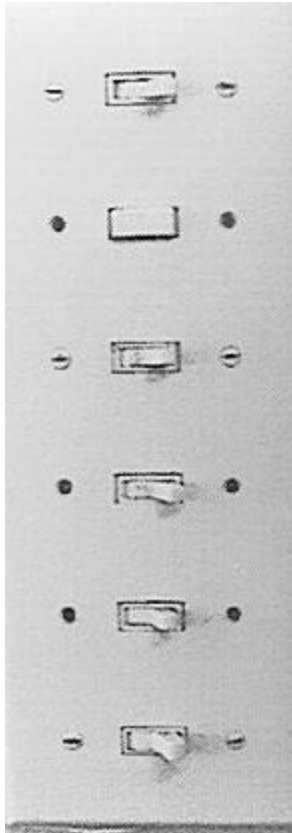
- With physical resources, good design makes it easy to distinguish between parts and properties that are functional and those that are decorative or otherwise non-functional
- With digital and computational resources, it is often impossible to discern capability in the “presentation layer”
 - So designing the interactions isn't sufficient; we must also make them discoverable and comprehensible



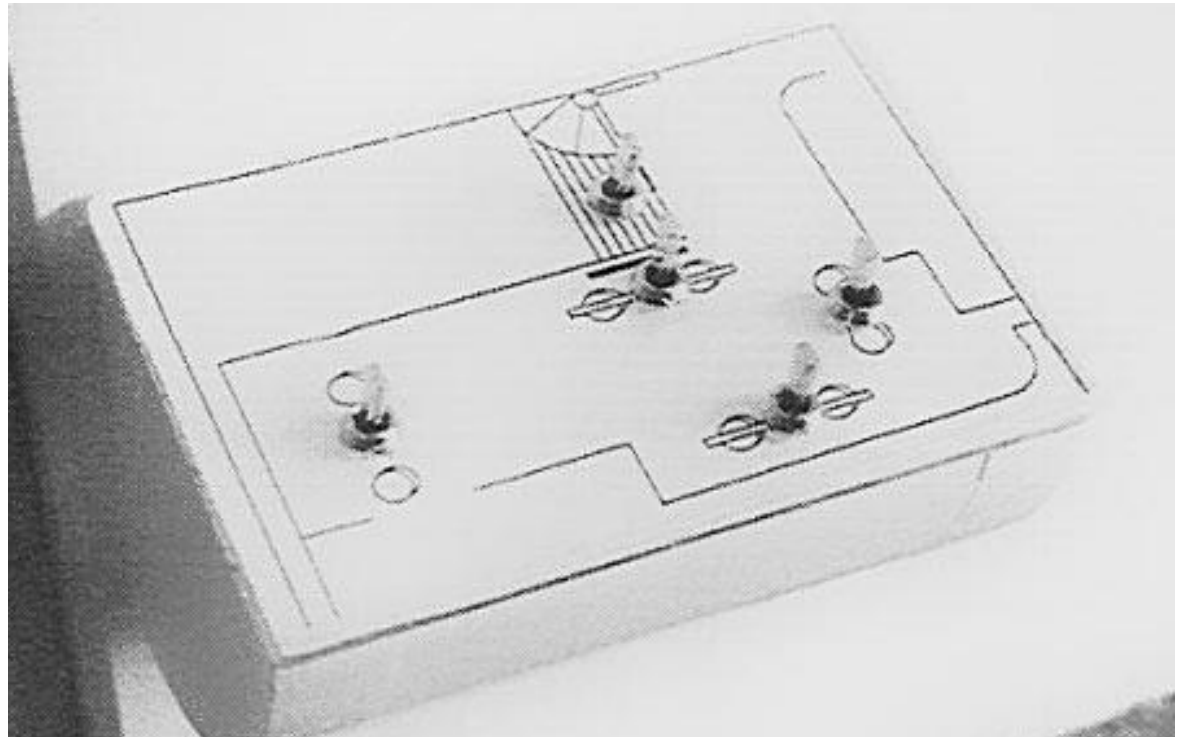
Design to Support Interaction (2)

- Many interactions with physical and digital resources are invoked and performed using controls or other “user interface elements”
- These controls and UI elements have affordances too, and good design makes it easy to see how to use them
- Does the arrangement of the controls map well to the arrangement of the resources they control?
- If the resources belong to logical groups or categories, does the arrangement of the controls reflect them?

**BEFORE: Array of 6
light switches**



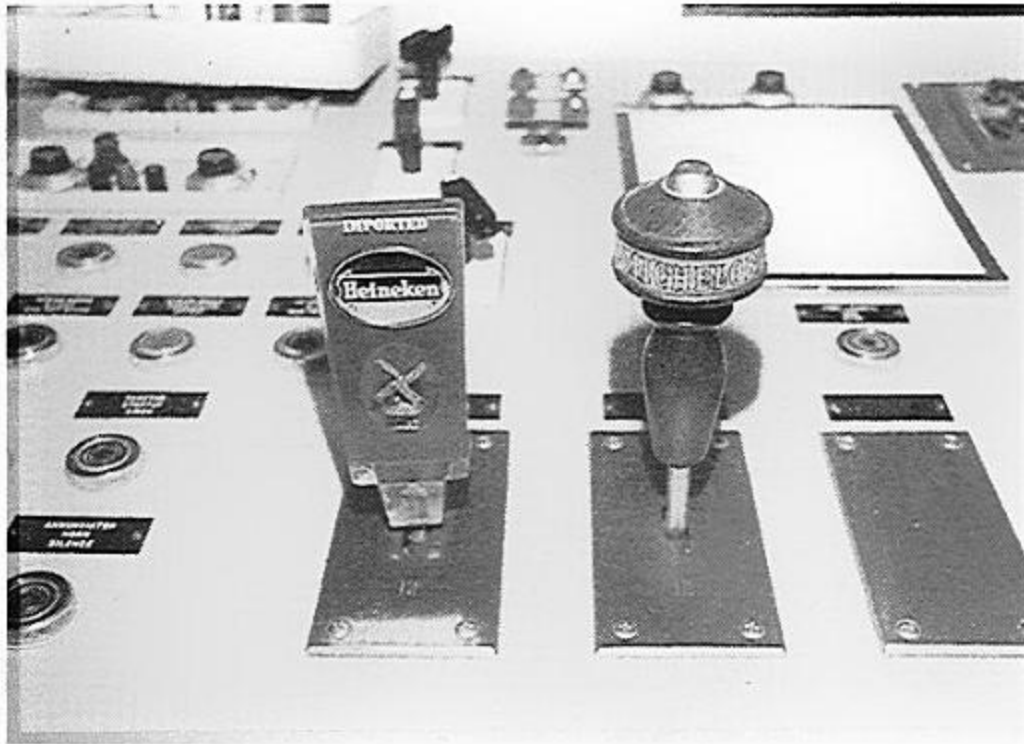
**AFTER: Switches
arranged to match
room layout**



Donald Norman, The Design of Everyday Things

Beer tap handles used to distinguish identical knobs in control room of a nuclear power plant

4.6 Make the Controls Look and Feel Different. The control-room operators in a nuclear power plant tried to overcome the problem of similar-looking knobs by placing beer-keg handles over them. This is good design, even if after the fact; the operators should be rewarded. (From Seminara, Gonzales, & Parsons, 1977. Photograph courtesy of Joseph L. Seminara.)



Donald Norman, The Design of Everyday Things



Good and Bad Mappings





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Lecture 18.3 – Designed Interactions



Designed Interactions (1)

- The interactions that are “afforded” should be distinguished from “designed interactions” that are made possible by intentional acts of description, arrangement, or technological mediation
- For example, when a book is checked out of a library it might be read, translated, summarized, criticized, or otherwise used — but none of these interactions are directly designed into the library
- A digital library, however, might design in support for translation, summarization, annotation, and other services



Designed Interactions (2)

- Different principles, or different implementations of the same organizing principles, determine the efficiency or effectiveness of designed interactions
- Choices about descriptions and organizing principles involve tradeoffs to determine which interactions are efficient, possible, difficult, or impossible

Interactions with Digital and Computerized Resources (1)

- We often can't perceive the designed interactions with digital and computerized resources, because their capabilities are internally implemented rather than inherent in perceptible surface properties or file names




[Sonicator](#)

Interactions with Digital and Computerized Resources (2)

- Even when we see some indications of potential interactions we can't directly understand or compare their capability

Google Search

I'm Feeling Lucky

 bing





Classifying Interactions by Resource Property Layers

- The resource properties that enable interactions can be distinguished in three layers:
 - Properties of individual resources
 - Properties of resource collections
 - Derived or computed properties

Properties of Individual Physical Resources



Different Properties Needed for Different Interactions



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



Organizing Books by Color

Trading
aesthetics for
scalability in
organization
and retrieval



Photo by See-ming Lee (<http://www.flickr.com/photos/seeminglee/4556156477>)

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Properties of Individual Information Resources

<Book>

<Title>Moby Dick</Title>

<Author>Melville</Author>

<PublicationYear>1851</PublicationYear>

<Category>Fiction</Category>

</Book>



Derived or Computed Properties

- For individual resources: image or audio signatures, sentiment analysis, summaries
- For collections: inter-item similarity, inter-item relationships/ links, discriminating terms (inverse document frequency), statistically improbable phrases, principle components/ factor analysis/LSI



Properties of Resource Collections

- Statistics like the average age, size, usage of the resources
- For documents with text content, statistics like term distributions



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Lecture 18.3 – Interactions in “Memory Institutions”
and their Convergence



The Baseline: Distinctiveness

- Libraries, museums, and archives have traditionally been distinguished on the basis of resource types, organizing principles, interaction repertoires, user communities, and access policies
- Furthermore, the broad categories of libraries and museums can be subdivided into scores of finer types
- Curriculum models still support traditional definitions of the roles, functions, and audiences of each type of organizing system

Libraries



Museums



Archives





Emerging Convergence

- The web has put vast amounts of resources online and changed default behaviors with respect to resource discovery and access
- Dealing with the web as a common challenge (or opportunity)
- Common need to reposition toward less formal interactions and purposes
- Effective digitization
- Common platforms, governance



Emerging Convergence

- These commonalities have not historically been dominant features in the self-characterization of libraries, museums, and archives, they are increasingly important to their sustainability
- While the traditions and historical areas of expertise in archives, libraries, and museums may differ, the new challenges facing all collecting cultural institutions are best addressed in concert, in an inter-disciplinary forum that explores multiple solutions and takes advantage of many skills



Readings for Next Lecture

- Schwarzman, A., Hur, H., Pai, S., and Glass, C. XML-centric workflow offers benefits to scholarly publishers.
people.ischool.berkeley.edu/~glushko/202/Schwarzman-XML-CentricWorkflow.pdf
- Baron, Richard J., Elizabeth L. Fabens, Melissa Schiffman, and Erica Wolf. "Electronic health records: just around the corner? Or over the cliff?." *Annals of internal medicine* 143, no. 3 (2005): 222-226.
annals.org/article.aspx?articleid=718641
- Brunnermeier, Smita B., and Sheila A. Martin. "Interoperability costs in the US automotive supply chain." *Supply Chain Management: An International Journal* 7, no. 2 (2002): 71-82.