Human-Computer Interaction IS4300

Projects
Due today P2

- User analysis.
  - Identify stakeholders (primary, secondary, tertiary, facilitating)
- Task analysis
  - 3+ representative tasks
  - For each
    - Hierarchical Task Analysis
- Problem scenarios
- Usability criteria

I4 – Swing Assignment

- Restaurant ordering application
- Issues?

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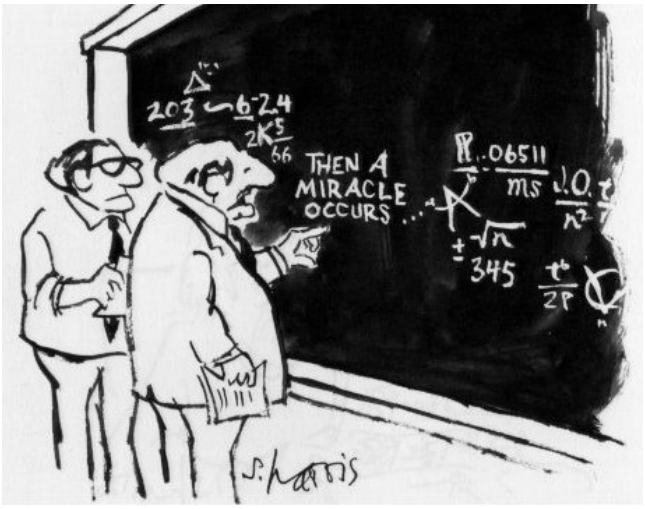
Design

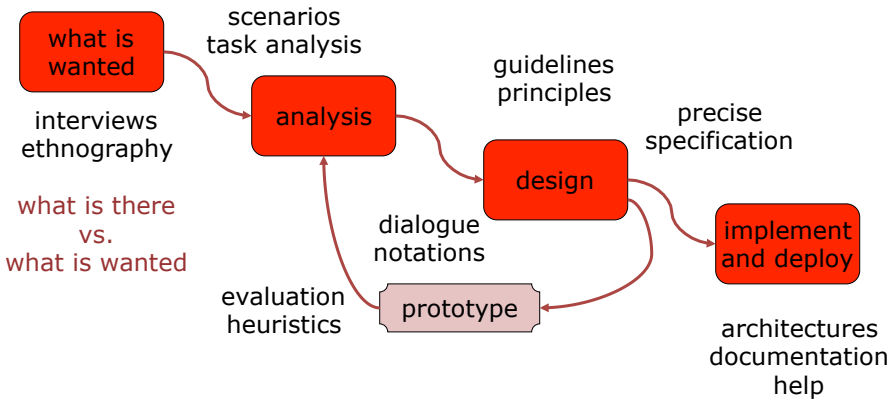


what is design?

achieving goals within constraints

- goals - purpose
  - who is it for, why do they want it
- constraints
  - materials, platforms
- trade-offs

The process of design



Design: The Plan

- Today
  - Interface Metaphors
  - Activity Scenarios
- Wednesday
  - Information Scenarios
  - Interaction Scenarios
  - Design Methodology Research
  - (Swing Events)
- Next Monday
  - UI Design & Design Guidelines

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Benyon Ch 5: "Experience Design"

- What's the point?
  - Don' t focus just on utilitarian aspects of design
  - Engagement
  - Gamification
  - Pleasure
  - Aesthetics
  - Service Design

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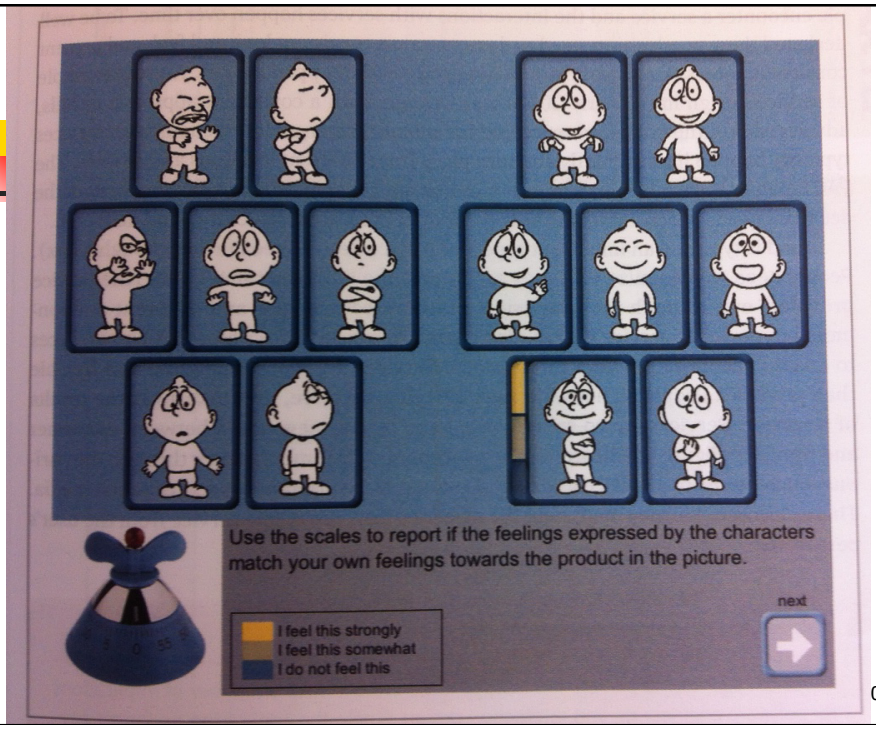

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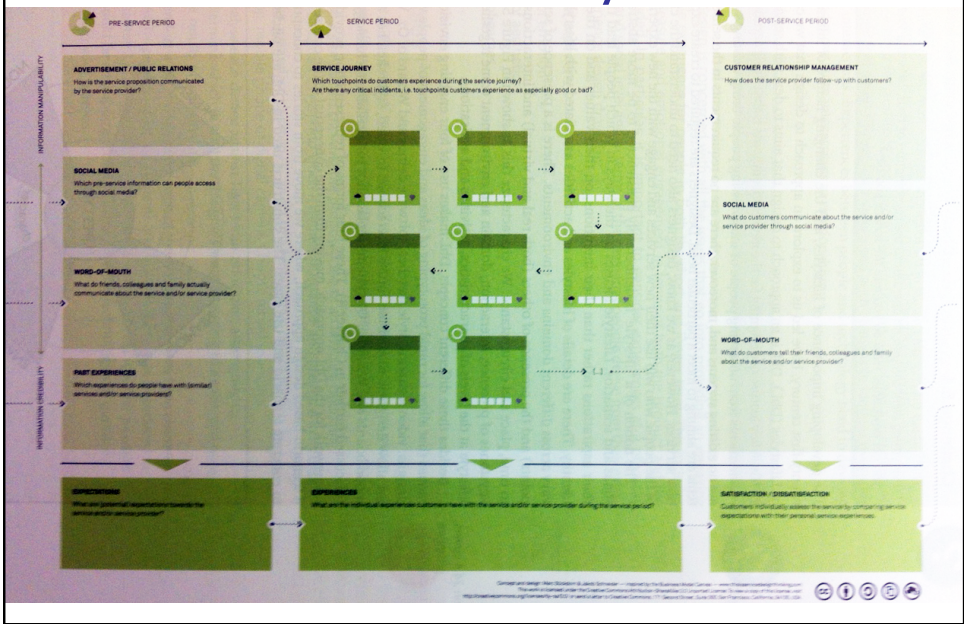
"Customer Journey"



Research: Notions of Engagement

- First contact
  - Attraction
  - Persuasion
- Cognitive engagement
  - Flow
  - Entrainment
  - Rapport
  - Presence
- Short time scale
  - Stickiness (per session)
- Long time scale
  - Stickiness (aggregate over sessions)
  - Relationship Marketing
  - Adherence / Retention
- Dark side
  - Addiction

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Why is this important?

- Dot coms care about retaining users.
- Businesses care about repeat customers.
- Game designers care about repeat users and word of mouth advertising.
- Educators care about keeping attention.
- HCI researchers care about loss of productivity due to interruptions while users are deeply engaged.
- Health providers care about changing and maintaining health behavior
  - Usually takes weeks, months, years or a lifetime!
  - Assumed 'dose-response' relationship.
  - Retention is a pre-requisite to change.

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Personal Relationship Psychology

- Psychological models of human personal relationships
  - Dimensional
  - Stage
  - Provisions
  - Economic

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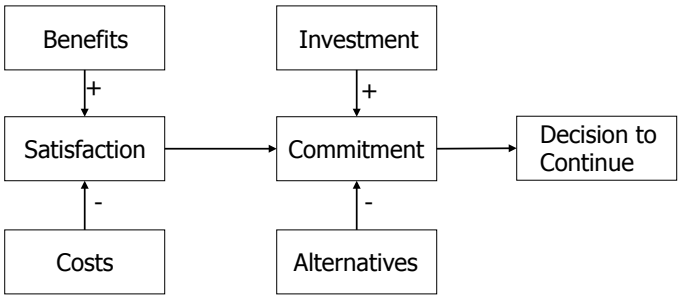
Example Economic Model

- Investment model of relational commitment



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Human Relational Behavior

- **Social Psychology**
  - Social penetration theory / self-disclosure
  - Meta-relational communication
  - Continuity behaviors
- **Helping & Psychotherapy**
  - Unconditional positive regard
  - Empathic listening

- **Sociolinguistics**
  - Politeness theory
- **Linguistics / Conversation Analysis**
  - Structure & function of social dialogue
- **Communication**
  - Comforting behavior
  - Nonverbal immediacy behavior
- **Change Over Time**
  - Increasing common ground
  - Increasing intimacy
  - Decreasing politeness

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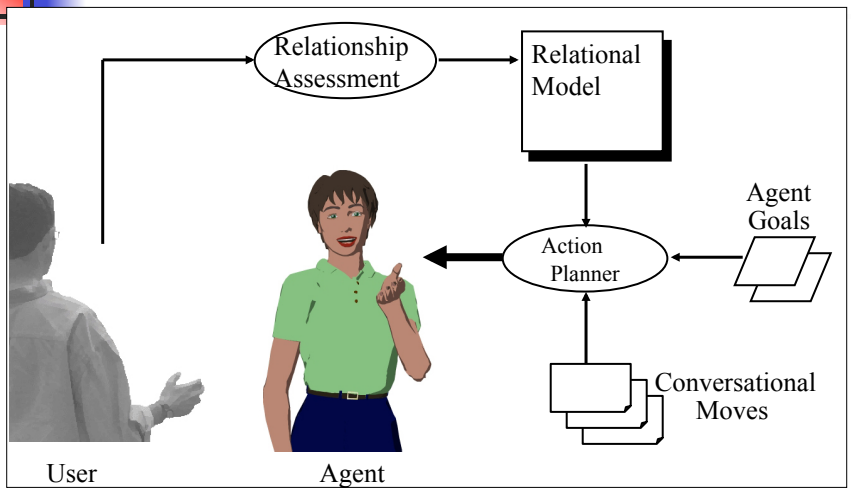
Relational Agents



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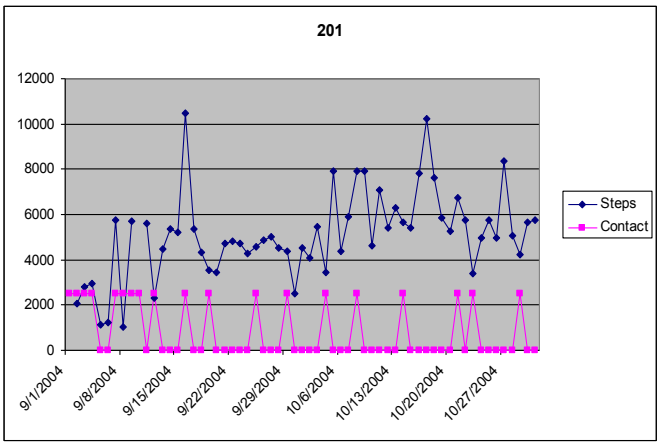
Engagement is critical in longitudinal health interventions.



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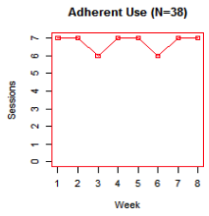
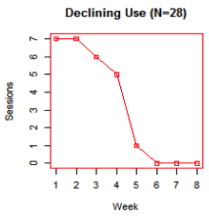
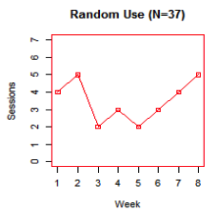
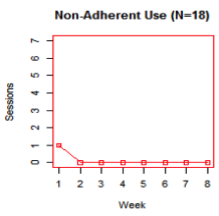
Are there characteristic patterns of engagement?

Adherent Use	Declining Use	Random Use	Non-Adherent Use
			
Change in Daily Step Counts Over Two Months			
+894.7	-1047.2	-335.4	+582.1

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Engagement Experiment 1: Variability

"It would be great if Laura could just change her clothes sometimes."

"In the beginning I was extremely motivated to do whatever Laura asked of me, because I thought that every response was a new response."

Study Research Questions

- Does the removal of dialogue variability increase perceived repetitiveness and decrease engagement?
- Does the removal of dialogue variability have a negative effect on outcomes?

Experiment Design

- Physical activity intervention to promote daily walking.
- Between-subjects, 2 conditions.

1. **NONVARIABLE**: agent uses exactly the same dialogue structure and language in every situation.
2. **VARIABLE**: dialogue structure, surface form, and background image are randomly varied.

Variability: Surface Form

"Looks like you met your exercise goal of 5,000 steps. Great job!"

"Looks like you got your walking in and met your goal of 5,000 steps!"

Variability: Dialogue Structure

1. Greeting
2. Weather talk
3. Past event talk
4. Read pedometer
5. Follow up on behavior
6. Ask enjoyment
7. Get commitment
8. Upcoming event talk
9. Farewell

1. Greeting
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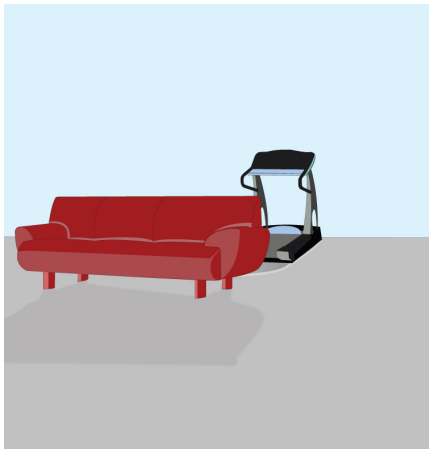
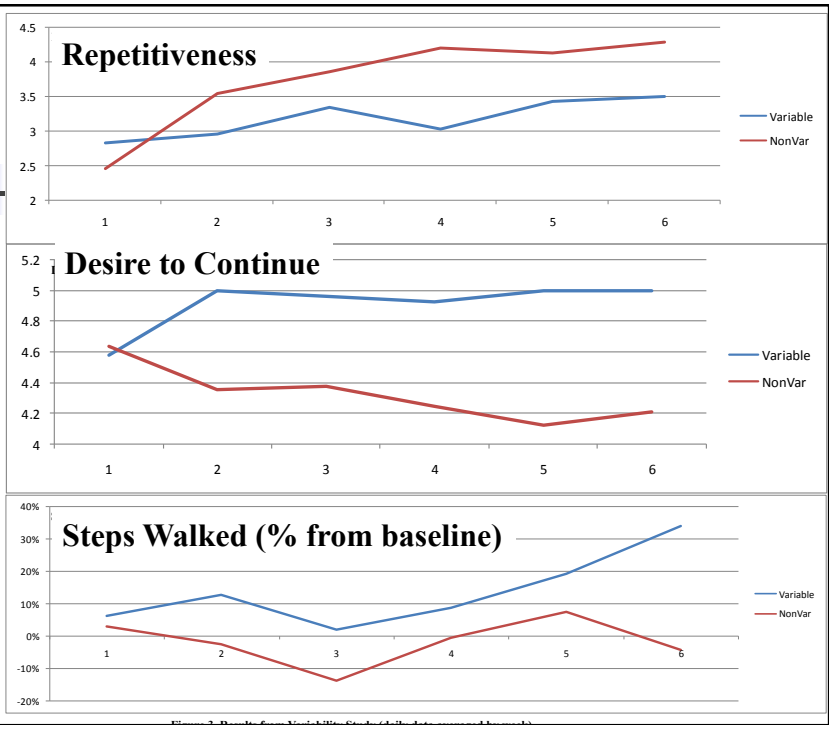
9. Farewell

Variability: Background



NSF "Virtual Lab" Study



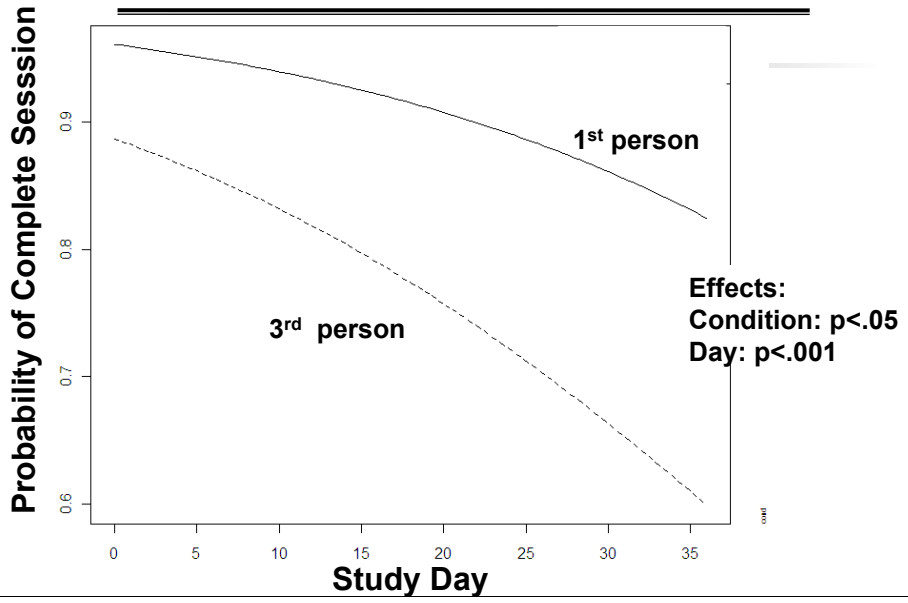
Engagement Experiment 2: Backstory

1ST-PERSON	3RD-PERSON
I'd like to tell you some stories about myself.	I'd like to tell you some stories about a friend of mine. She's an exercise counselor too.
I'm not quite sure if I told you about this before.	I'm not quite sure if I told you about this before.
When my family was living in Falmouth, my parents always had us doing outdoor stuff.	When her family was living in Falmouth, her parents always had them doing outdoor stuff.
So especially when it was nice out I would go biking or hiking or we would just go for a walk and have a picnic, things like that.	So especially when it was nice out she would go biking or hiking or they would just go for a walk and have a picnic, things like that.

Results: Engagement
N=26, avg 29 days

- **Enjoyment**
  - "I enjoy the stories that the counselor tells."
  - 1ST-PERSON reported significantly greater enjoyment of the stories compared to those in the 3RD-PERSON group (p<.001).
  - Significant decrease in enjoyment over time for all participants (p<.001)
- **Dishonesty**
  - "I feel that the counselor is dishonest".
  - No significant differences by condition or study day.
    - 1ST-PERSON: mean 1.8
    - 3RD-PERSON: mean 2.1

Results: Engagement



Ch 5 – Takeaway?

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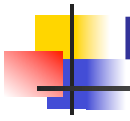

Benyon Ch 9

- Conceptual Design
  - Metaphors ("blends")
  - Activity Scenarios
  - Diagrammatic Techniques
    - HTA diagrams

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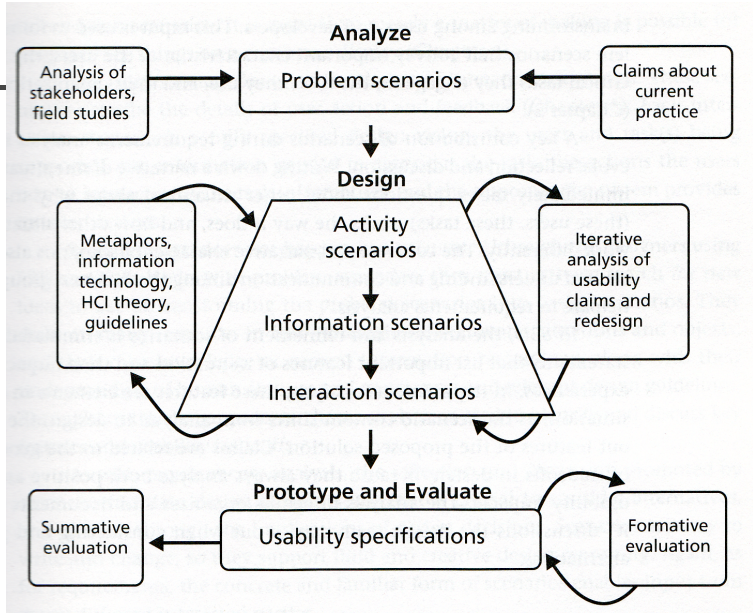
Scenario-Based Design



Activity Design

Rosson & Carrol Ch 3

- aka "conceptual design"
- First phase of design reasoning

- Current practice is transformed into new ways of behavior
- Focus on *what* the system will do, without the complexity of UI concerns
- Goal: specify system functionality

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Activity Design

- How do we design activities that users can readily understand?
  - Maximize visibility, affordances
  - Allow easy construction of valid conceptual models
  - Interaction Metaphors!

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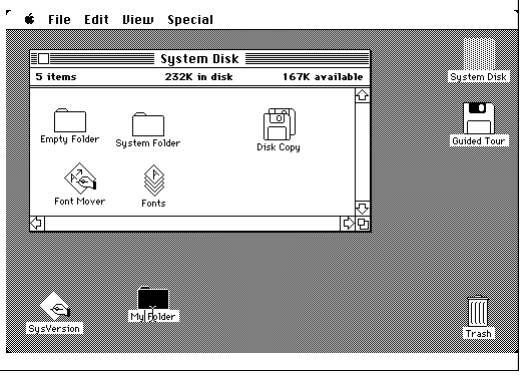
Interaction metaphors

- Making the interaction seem like something the user is already familiar with
  - Desktop, Trash can, etc.
  - Shopping Mall



Interaction metaphors

- Interface metaphors evoke an *initial* mental model in users of the system's structure and operation.
- Metaphors should relate to users' past experiences and should be consistent.
- Q: What dimension of usability do metaphors most help with?

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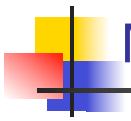
VSF Activity	Real-World Metaphor	Implications for VSF Activities
Constructing an exhibit is like writing a . . .	Lab journal	Informal and personal notes, raw data, work in progress
	Documentary	Carefully constructed "story" of how the project happened
Coaching a student is like being a . . .	Peer (colleague)	Social support, reactions to ideas, suggestions
	Director	Specific directions about exhibit content or layout
Visiting the fair is like going to a . . .	Study room	Quiet and focused attention to pieces of information
	Public lecture	Receiving preorganized information as part of a group
	Cocktail party	Informal discussions, moving from one group to another
Judging exhibits is like making a . . .	Balance sheet	Mathematical model of data, equations, results
	Discussion	Extended conversations about reactions, values, criteria
Summarizing the fair is like creating a . . .	Report card	Assessment on well-established categories of achievement
	Guided tour	Interactive visit of best sites with helpful commentary
	Thank-you note	Personal recognition of participants, mentors, judges, etc.



Metaphors

- Multiple metaphors can be mixed (e.g., windows and desktops)
- One metaphor is better than another if it leads to more correct predictions about a system's behavior.
- Users will always use *some* metaphor in the interaction.

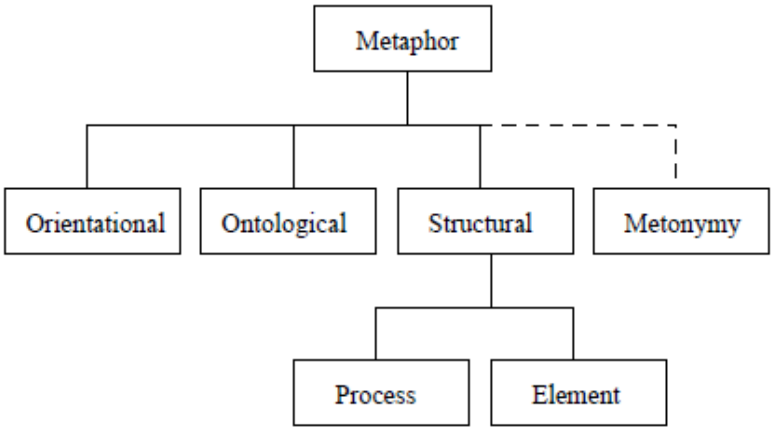
Choosing the right metaphor

- Understand how the system works / is supposed to work.
- Figure out what kinds of problems users have.
  (watch them use similar systems)
  (create prototypes and watch users)
- Generate metaphors and examine their properties.
- Key question: will users "get it"? How do you tell?

Problems with metaphors?

- Sometimes they break conventional and cultural rules
  - e.g. recycle bin placed on desktop
- Can overly constrain designers in the way they conceptualize a problem space
- Forces users to understand the system in terms of the metaphor
- Use of metaphor – as with any aspect of design – should be tentative and subject to change if it tests poorly.

A Taxonomy of User-Interface Metaphors, Barr et al, '02, '05



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Orientational Metaphor

- Gives a concept a spatial orientation
  - E.g., "Happiness is Up", "Up is More", "Progress is to the Right"

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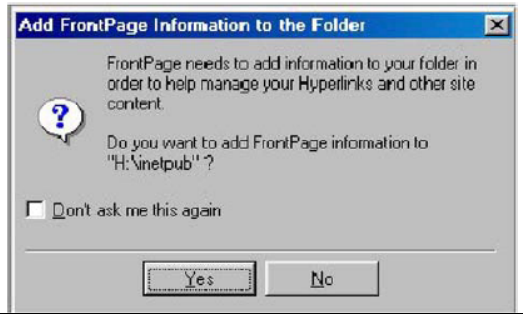
Ontological Metaphor

- Identifies a system concept with a basic category of existence in the physical world, such as substance, object, container or entity.
- E.g., "The Frontpage Application is an Entity"



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Structural Metaphor

- Identifies an abstract system concept with a detailed real world concept or object.
- E.g., "File deletion is using a trashcan."

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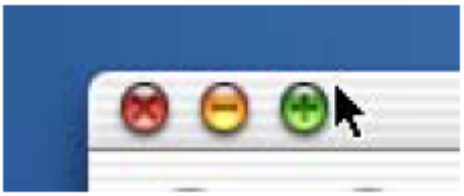
Conventional vs. New Metaphor

- New: Not yet familiar to most users
- E.g., Mac OS: "The Windows Controls are a Traffic Light"



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Metaphorical Entailments
some useful, some not

- **the interface is a wizard**,
  - "the interface knows more than I do"
  - "the interface uses a wand."
- **the data is a document**
  - The data is made of paper with ink on it.
  - The data can be crumpled into a ball and thrown into the trash.
  - The data consists of words, figures, and images.
  - The data contains information.
  - The data can be torn, or have coffee spilled on it.
  - The data has a title.
  - The data can have footnotes, a bibliography, etc

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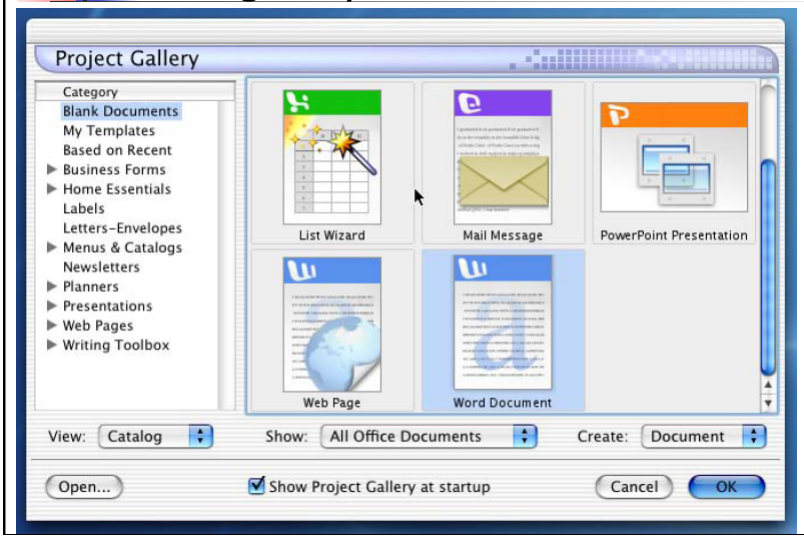
Case Study: MS Office Project Gallery

- the collection of templates and wizards is a gallery



What cues the user?

What kind of metaphor?

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Metaphors used within MS Office Project Gallery

Metaphor
THE COLLECTION OF TEMPLATES AND WIZARDS IS A GALLERY
THE VIEW OF THE COLLECTION OF PROJECTS IS A CATALOG
THE COLLECTION OF TEMPLATES IS A TOOLBOX
THE TEMPLATE IS A TOOL
THE PRE-FORMATTED DOCUMENT IS A TEMPLATE
THE INTERACTION PROCESS IS A DIALOG
THE DELIMITED AREA ON THE SCREEN IS A BOX
THE COLLECTION OF DATA IS A DOCUMENT
THE DIALOG BOX(ES) IS A WIZARD
THE COLLECTION OF SOFTWARE IS AN OFFICE
THE INTERNET IS A WEB
THE COLLECTION OF DATA IS A PAGE
THE RECTANGULAR AREA ON THE SCREEN IS A WINDOW
THE SUBSECTION OF THE WINDOW IS A PANE
THE INFORMATION TRANSFER IS MAIL
THE SOFTWARE IS AN ENTOURAGE
THE AREA OF THE WINDOW IS A SCROLL

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Using Metaphors to Create a Natural User Interface for Microsoft Surface

Hofmeester, et al, 2010

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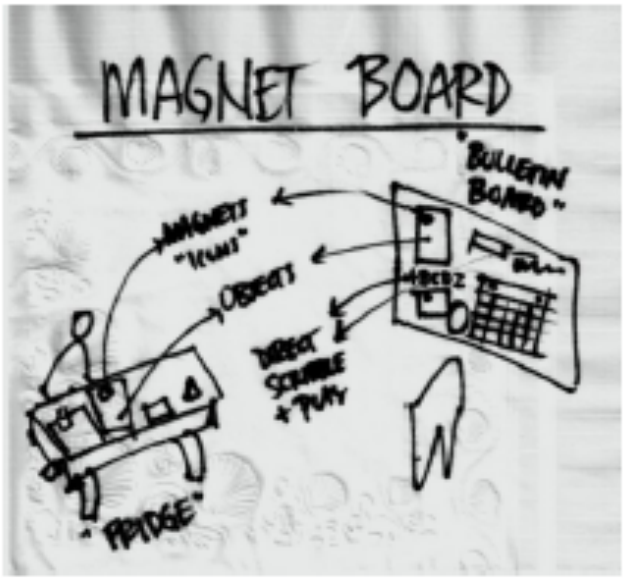

Fig. 1 Magnet board metaphor

Generated
~100 ideas

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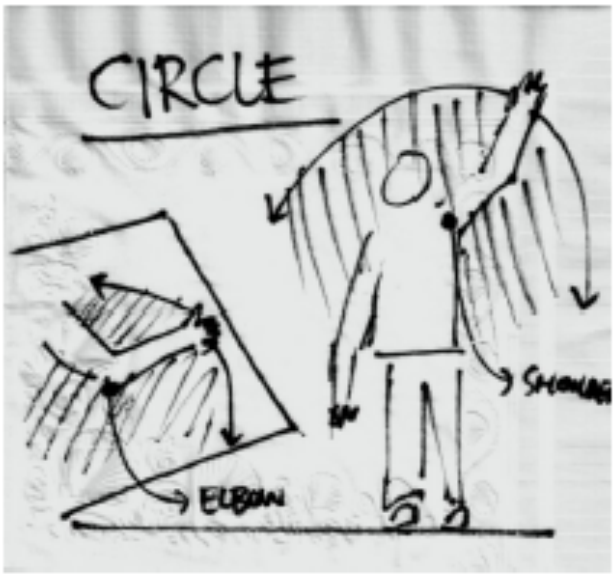

Fig. 2 Circle, personal space metaphor

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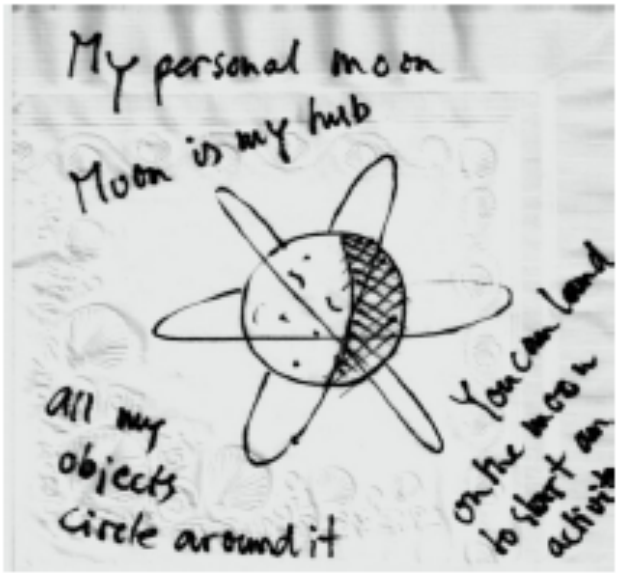

Fig. 3 My personal moon, solar system metaphor

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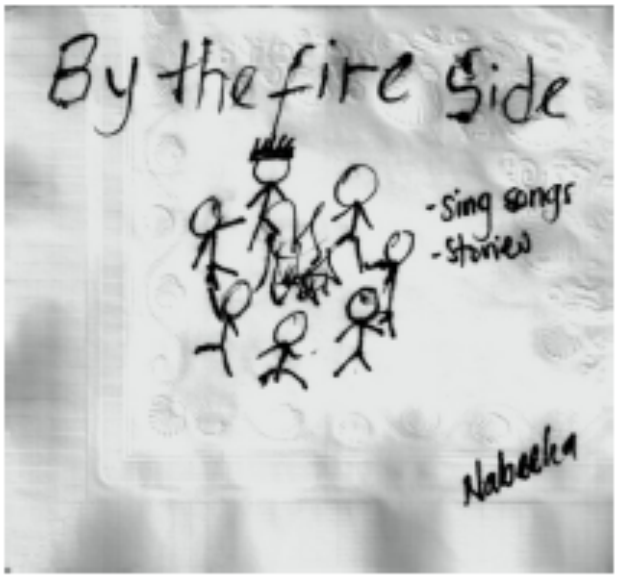

Fig. 4 By the fireside, campfire metaphor

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Additional Ideas

- Canvas, based on the blank canvas, drawing, and creating things together
- Garden, a metaphor of seeding, growing, tending, and community gardens
- Magazine, a book metaphor of beautiful typographic design, page-based content, and bookshelves
- Memory chest, a magic place of memories and discoveries
- Sphere, based around the idea of personal space
- Unfold, a paper and packaging metaphor of unfolding content
- Water, focused on the surface of the water, what is above and below, and the concept of sedimentation.

- Grouped concepts -> developed most promising

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Magnet board design

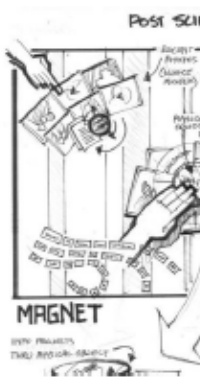

Fig. 5 Magnet interaction **Fig. 8** Magnet prototype screenshot

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Exercise

- List some metaphors for the optometrist web site.
- Representative Tasks:
  - T1. Find the cost of these:
  - T2. Find the standard warranty on Ray Ban frames.
  - T3. Order 3 red, 3 green of these: given the following payment info …

Group Exercise

- Project groups
- Pick one of your tasks
- Identify 3 metaphors you could use
  - Pros & Cons of each
  - In what ways do they lack metaphoric consistency (when do they break)?

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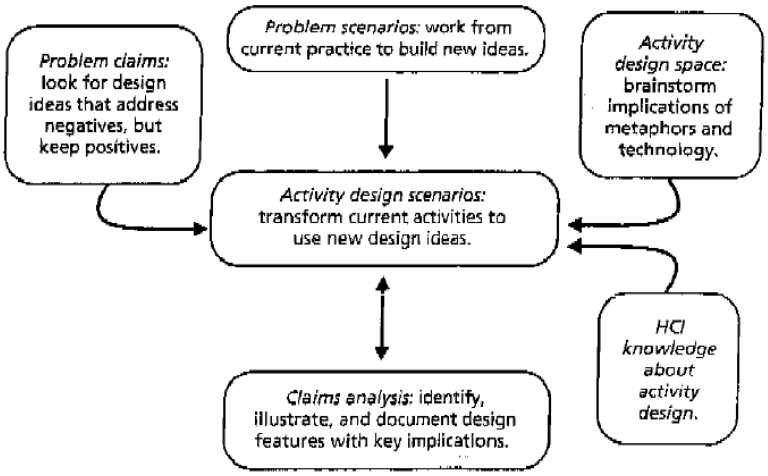
Activity Design
Problem Scenarios -> Activity Scenarios



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Activity Scenarios

- For each Problem Scenario
  - Think how your interaction metaphors & technology can be introduced to address the problem
  - Think through how the user will use them
  - Document the new story as an Activity Scenario
- Don't discuss interface design yet!

Example Problem Scenario	Transformed into Activity Design Scenario
1) Sally plans her exhibit on black holes.	*1) Sally plans her exhibit on black holes.*
Background on Sally, her motivations, . . .	Background on Sally, her motivations, . . .
Sally is a bit worried about the space and materials that are provided to everyone—a standard 4′×6′ posterboard, with a two-foot shelf underneath for supporting physical materials or models. This year she has explored some new methods, for example, an Authorware simulation that illustrates her theory of black hole formation. But she knows from past years that there are few electrical outlets in the gym, and she doesn't have a laptop to use in the exhibit anyway. She checks with the organizer, Rachel Berris, just in case, but Rachel confirms that the school district has no money for special resources such as laptops, and that she will be able to use only battery-powered equipment.	Sally is curious about how creating a virtual exhibit will be different from the ones she has created in the past. She hopes that she will have more flexibility in presenting her ideas, and thinks she might be able to come up with some interactive elements that she knows the judges will like. In fact, she has already developed an Authorware simulation that illustrates her theory of black hole formation, and she wants to include this in her virtual exhibit.
As she studies her simulation, Sally thinks of	When Sally goes to the exhibit construction area, she finds a template with a suggested layout—title page, abstract, slide show, detailed results, project report, and bibliography. At first she is worried that this will not fit the materials she has already created. But when she starts adding material,

Update Task Hierarchies

- As you design your interaction you may need to change the Task Hierarchies from Requirements Analysis to reflect a new way of doing things.
- Consider alternate representations if you feel these are important:
  - E-R diagrams
  - Dataflow diagrams
  - State diagrams
  - Network diagrams

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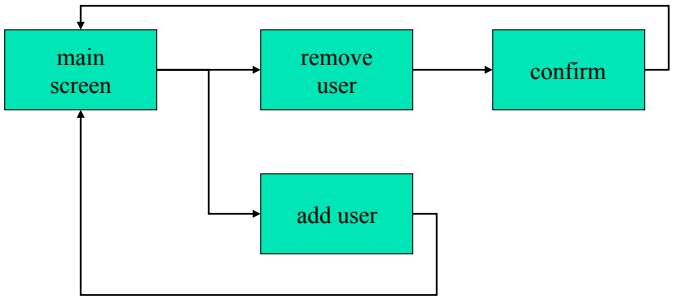
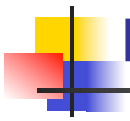
network diagrams



- show different paths through system

Physical design: play acting

- role play
- mock up device
- pretend you are doing it



Exercise

- Same groups and task
- Pick your favorite overall metaphor and convert your problem scenario into an activity scenario
- Sketch a Task Hierarchy or Network Diagram – if changed from your requirements analysis

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P3 – Conceptual Design (1 wk)

- Convert task scenarios and hierarchical task analyses into a conceptual design.
- Metaphors.
  - Make a list of possible interaction metaphors for your interface (per the examples in class). For each of your task scenarios list at least two options for interaction metaphors and some of the implications of your choice.
- Activity Design Scenarios
  - Transform each of your problem scenarios into an activity design scenario, following the examples in Rosson & Carroll Ch 3, Figures 3.4 and 3.5.

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P3 – Conceptual Design (1 wk)

- At this stage you should still be focused on the abstract steps of each task, including user input and system output actions, and should not be thinking about the details of your interface's appearance yet.
- What to Post. Your report should include three detailed activity scenarios and at least six metaphors. At this stage you should still be focused on the abstract steps of each task, including user input and system output actions, but should not be thinking about the details of your interface's appearance yet. If you have updated your task models during this exercise please provide them as well.

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To Do

- Read
  - 3 CHI papers + 1 HCIR paper
  - Rosson Ch 4
  - Swing events, read all except
    - *Implementing Listeners for Commonly Handled Events*
      - Only need to read *How to Write an Action Listener*
- Homework
  - I4 – Swing restaurant UI applet – DUE NEXT CLASS
- Project
  - P3 – Conceptual design – due in 1 week

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