focus - problems in software development
uses scenario-based development to motivate activities/topics

defs
MUDs - multi-user domain
MOOs - MUDs object-oriented
MOosburg - community oriented MOO
• combines sync & async communication mechanisms
• models geography of Blacksburg, Virginia
• post/review community info
• shared interactive tools (chat, whiteboard, notebook, calendar, ...)

VSF - virtual science fair
scenario used throughout book as part of MOosburg

stakeholder - many different groups of people who will be impacted by development of system (we called them users)

claims analysis - analytic evaluation method involving id. of scenario features that have significant consequences for people in situation

actors - humans interacting w/computer or other selling elements.

artifact - designed object or tool used in support of an activity
Activity design - phase in which problems/opp. of current practice are transformed into new ways of behaving

- what info does it contain?
- what operations on info?
- what are results of operations?

User interface is physical representation of system for viewing & interacting with system.

Fig 3.1 - L.L. bean website

System functionality?

Info
  - products to offer
  - info about products (img, description, sizes, colors, ...)
  - customer data base

Ops
  - searching
  - adding items to cart
  - looking up orders

Results
  - receipt
  - list
  - email confirmation
System functionality

⇒ what's possible

user interface

⇒ how to experience these possibilities?

Focus
design of system functionality (conceptual design / task-level design)
what system will do

3.1 Designing Effective Activities

effectiveness = efficiency

⇒ cost of achieving something w.r.t time/space/...

⇒ degree that it satisfies need

efficiency can be a component of effectiveness

In previous stages we analyzed users / current tasks / desired task.

- one option is make minor changes to existing system functionality.
  - easier for users to understand/appreciate
  - easier to implement

- technological determinism
  - technology is most important factor in success
  - tracking & applying leading edge computer technology driving goal

tradeoff: technological innovation can transform tasks in exciting & satisfying ways, but incremental changes to existing practice are easier to understand and adopt
Distributed cognition - how task-relevant information is distributed throughout a situation in many different forms:
- Knowledge & skills of people involved
- State of tools/artifacts in use
- Recent or long-term memories of specific events.

Helps to reason about which aspects of activity are best supported by computer software.

Develop scenarios (& activities) to try out ideas about technology. Try out balance between general purpose solutions vs. specialized functionality.

3.2 Designing Comprehensible Activities

User must also understand what goals are possible & if they are making progress.

Interface mainly contributes to this but designer's model has direct impact and guides design of artifact.

Fig 3.2 - Designer think of system in different model than a user might.

We may think in terms of task analysis, list, classes, etc., whereas user think in terms of their knowledge of related systems & activities.
mental model - user's understanding of system concepts, procedures to select relevant goals, choose & execute appropriate actions, understanding of results

model always incomplete & keeps updating through usage

want to understand users' mental model but difficult
no directly observable & can only guess based on user behavior/comments

models have many factors based on individual user

metaphor - express the unfamiliar in terms of the familiar

useful for users to understand new ideas when they are similar to familiar concept

be careful - they can have narrowing influence on mental model & limit activities expected by users.

(Word processor as typewriter metaphor -> "insert" idea)

use of different metaphors can help brainstorm to see if system can share same functionality, generate new ideas

computer support in library:

- warehouse vs. meeting place
  - books stored vs. conversation
  - staff focus on avail stock, purchase of goods, delivery, tracking stock vs. talk among staff, patrons, curf libraries
  - database application good fit vs. event/meet calendar, online reviews
3.3 Designing Satisfying Activities

entertainment → must be satisfying
required → still requires others factors such as morale / efficiency...

tradeoff - automation tedious and error prone steps improves job satisfaction but automation of some activities may undermine motivation and self-esteem.

tradeoff - people who use systems are motivated by personal goals & needs but SW must also be designed to support collaborators' goals and needs.

3.4 Science Fair Case Study: Activity Design

Fig 3.3 move from problem based scenario to activity design
- introduce new functionality
- users needs / how to meet them.

1) explore design space.
- find metaphors - come from technology of MOOSburg (Table 3.2),
  come from other ideas (Table 3.1)

2) activity design scenarios of claims
- integrate changes into activity to see how it would transpire, how actors would react, what they do next, ... (what are side effects?)
Fig 3.4 problem scenario to activity design scenario.

Sally exhibit planning scenario uses new feature of virtual / online exhibit

pros/cons (claims analysis) shown in Table 3.3

more pros so its integrated into design.

3) Refining Activity Design.

Iterative process of refinement tasks to help refine

- computational perspective on a scenario
- engaging stakeholders in participatory design & discussion

* instead of focus on people & activity take point of view (POV) of object in terms of computation (remember book focus is SW design)

step through scenario and imagine how it translates into request produced.

* as scenarios presented gather reactions / suggestions for change / claims analysis / pov technique

ex. asked to come up with system tools

object name / responsibility card in Fig 3.4.
Coherence & completeness.

Lots of scenarios w/ indiv solutions
but as whole contains contradictions or inconsistencies.

How to help?
- Some designers work on all scenarios
- Reuse actors / task info
- Reuse design features in diff scenarios

How to ensure completeness?
- Can't analyze all scenarios
- Generalize scenarios instead

Participatory design again helps.
Images for Lecture 2 (Background Material)
Rosson, Ch1/2

** Images from Usability Engineering: Scenario-Based Development of Human-Computer Interaction, Mary Beth Rosson and John M. Carroll, Morgan Kaufmann Publishers, ISBN 1-55860-712-9 unless noted
MOOsburg Interface

- History museum in MOOsburg

MOOsburg Interface

- Virtual Science Fair

Photograph of a receptionist’s desk

- The desk and surroundings hold a huge set of artifacts used in the employee's day-to-day activities
- Artifact – a designed object or tool used in support of an activity
  - Furniture, writing instruments and supplies, forms and lists, shelves and cabinets, computers and associated software packages
Artifacts from Science Fair

• Photo from a visit to a science fair
Artifacts from Science Fair

• Poster advertising science fair
Artifacts from Science Fair

- Rating form provided to judge exhibits at a science fair

MCPS SCIENCE FAIR 2001
Judges' Rating Form
Division I (Grades 6–8)

For each exhibit, begin with a brief overview, then study the project in detail. Interview the student to assess his/her understanding of the problem domain, methods used, interpretations provided, etc., before assessing points in the categories below. Plan to spend about 15 minutes at each station; this should allow you to judge the full set of exhibits you have been assigned. Submit your completed forms to Ms. Czerny.

____ Problem Significance (10)

Quality of Project Content:

____ Soundness of methods used (15)
____ Originality of scientific approach (10)
____ Overall logic and coherence (15)
____ Use of outside resources (10)

Quality of Project Presentation:

____ Visual or physical model details (15)
____ Captions and explanatory text (10)
____ Overall layout (15)

____ Total (100)

Comments:
Lecture 2 Images
Activity Design – Rosson, Ch3

** Images from Usability Engineering: Scenario-Based Development of Human-Computer Interaction, Mary Beth Rosson and John M. Carroll, Morgan Kaufmann Publishers, ISBN 1-55860-712-9 unless noted
Fig 3.2

Designer's model is systematic, logical, and comprehensive.

User's mental model is ad hoc, informal, and incomplete.
Fig 3.3

Problem claims: look for design ideas that address negatives, but keep positives.

Problem scenarios: work from current practice to build new ideas.

Activity design scenarios: transform current activities to use new design ideas.

Claims analysis: identify, illustrate, and document design features with key implications.

Activity design space: brainstorm implications of metaphors and technology.

HCI knowledge about activity design.
<table>
<thead>
<tr>
<th>VSF Activity</th>
<th>Real-World Metaphor</th>
<th>Implications for VSF Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructing an exhibit is like writing a . . .</td>
<td>Lab journal, Documentary</td>
<td>Informal and personal notes, raw data, work in progress, Carefully constructed “story” of how the project happened</td>
</tr>
<tr>
<td>Coaching a student is like being a . . .</td>
<td>Peer (colleague), Director</td>
<td>Social support, reactions to ideas, suggestions, Specific directions about exhibit content or layout</td>
</tr>
<tr>
<td>Visiting the fair is like going to a . . .</td>
<td>Study room, Public lecture, Cocktail party</td>
<td>Quiet and focused attention to pieces of information, Receiving preorganized information as part of a group, Informal discussions, moving from one group to another</td>
</tr>
<tr>
<td>Judging exhibits is like making a . . .</td>
<td>Balance sheet, Discussion</td>
<td>Mathematical model of data, equations, results, Extended conversations about reactions, values, criteria</td>
</tr>
<tr>
<td>Summarizing the fair is like creating a . . .</td>
<td>Report card, Guided tour, Thank-you note</td>
<td>Assessment on well-established categories of achievement, Interactive visit of best sites with helpful commentary, Personal recognition of participants, mentors, judges, etc.</td>
</tr>
<tr>
<td>VSF Activity</td>
<td>MOOsburg Technology</td>
<td>Implications for VSF Activities</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Constructing an exhibit is like using a</td>
<td>Multimedia notebook</td>
<td>Project reports may have graphics, sounds, etc.</td>
</tr>
<tr>
<td></td>
<td>Electronic whiteboard</td>
<td>Informal drawings and annotations will be simple to add</td>
</tr>
<tr>
<td></td>
<td>Web pages</td>
<td>The exhibit may have hyperlinks (internal or external)</td>
</tr>
<tr>
<td>Coaching a student is like using a</td>
<td>Email</td>
<td>Familiar, asynchronous communication with attachments</td>
</tr>
<tr>
<td></td>
<td>Threaded discussion</td>
<td>Comments and replies organized by topic</td>
</tr>
<tr>
<td></td>
<td>Chat</td>
<td>Real-time conversation among co-present people.</td>
</tr>
<tr>
<td>Visiting the fair is like using a</td>
<td>Room panorama</td>
<td>Exhibits, tables, etc., are distributed around the space</td>
</tr>
<tr>
<td></td>
<td>Slide show</td>
<td>Exhibitors present while visitors make notes, ask questions</td>
</tr>
<tr>
<td>Judging exhibits is like using a</td>
<td>Voting booth</td>
<td>Input from multiple judges on a set of questions</td>
</tr>
<tr>
<td></td>
<td>Threaded discussion</td>
<td>All judges contribute to a single structured evaluation</td>
</tr>
<tr>
<td>Summarizing the fair is like using a</td>
<td>Charting package</td>
<td>Numerical coding and summaries of outcomes</td>
</tr>
<tr>
<td></td>
<td>Multimedia notebook</td>
<td>Diverse exhibit elements collected in sequential order</td>
</tr>
<tr>
<td></td>
<td>Interactive map</td>
<td>Predefined path through interesting exhibits</td>
</tr>
</tbody>
</table>
Figure 3.4 – Example Problem Scenario

1) Sally plans her exhibit on black holes.

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.

As she studies her simulation, Sally thinks of a way to turn the lack of computer support into a “feature”: She will create a sequence of visualizations that can be flipped like a deck of cards to show the animation. In fact, as she works, she gets into it and decides to create several variations, so that visitors can guess which one matches her project data and conclusions. She will then chart people’s guesses as a dynamic element in her exhibit. She knows from experience that this is just the sort of thing judges will notice and award points for. Now she just has to figure out how to fit everything into the space she will have.
1) *Sally plans her exhibit on black holes.*

Background on Sally, her motivations, ... 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.

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, she can see that there is also still a lot of flexibility—for example, she can add a new component to hold her simulation. But she is not yet sure how she can share her physical star models.

Sally knows that judges and visitors really like interactive components, so instead of just presenting her simulation in “demo” mode, she decides to build in some interactive parameters, so that people can see her conclusions but also experiment with their own ideas. This makes her realize she will need some way to collect and share these experiments.
## Table 3.3 – Claims Analysis

<table>
<thead>
<tr>
<th>Proposed Activity</th>
<th>Hypothesized Pros (+) or Cons (−) of the Feature</th>
</tr>
</thead>
</table>
| Putting exhibits online                                     | + remove many constraints regarding space and diversity in layout  
+ facilitates an iterative process of design, construction, and editing  
+ simplifies access to the exhibits by people separated in space and time  
− but may lead to a decreased emphasis or interest in physical components  
− but exhibitors may try to include too much, making exhibits complex |
| An exhibit template with traditional science project components | + simplifies and guides the exhibit planning process  
+ builds on prior exhibiting experience of fair participants  
+ enhances consistency and comparability of exhibits for viewers and judges  
− but may discourage more inventive and creative exhibit structures |
| Integrating the products of common tools into the online exhibits | + builds on exhibitors’ existing skills and preferences  
+ extends the apparent diversity of the fair and its services  
− but visitors may be confused about what is and is not “part” of the fair  
− but students may wish that flashy new tools had been provided |