RAPID PROTOTYPING

Another piece of the puzzle...

• Revisiting the star life cycle

Interaction Development Life Cycle
RAPID PROTOTYPING

ASK: Do you do RP? If so, how?

Alfred Hitchcock story
Artists, sculptors, architects, aircraft designers all prototype, but only recently software developers

• Star life cycle is evaluation-centered

• Dilemma: Can't evaluate an interface until it is built, but after building, changes are difficult

• Solution: Rapid prototyping — producing interactive versions of an evolving interaction design

Don’t wait until first release or field test

* Main technique supporting iterative refinement

• Prototype is conversational "prop" to support communication of concepts not easily conveyed verbally  [R. Bellamy, Apple Corp.]
RAPID PROTOTYPING

• Advantages

  * Concrete baseline for communication between users and developers
  * Allows user to "take it for a spin"
  * Encourages early user participation and involvement
  * Allows early observation of user performance
  * Low fidelity prototype is obviously not finished, so users have impression it is easy to change
  * Allows immediate observation of consequences of design decisions
  * Can help with user "buy in"
  * Can help sell management an idea for a new product
  * Can help effect a paradigm shift from existing system to new system

New in-house product, to get users excited
RAPID PROTOTYPING

• Dangers

* Technical difficulties

* Needs cooperation of management, developers, and users

* Managers may view prototyping as wasteful

* Managers and/or customers and/or marketing may view prototype as final product

* Programmers may lose discipline

* Prototype can be overworked

* Prototyping tool may influence design

> * Developers must not let tool drive design prototype; tool must support what is desired in final interface

* Possibility of overpromising with prototype

> * E.g., don’t have mouse in prototype if delivery platform will not allow use of mouse

* Fidelity of prototype to final product

> * Mention Virzi, CHI ’96 paper (lo fi found as many problems)
LOW-FIDELITY PROTOTYPING

• Low-fidelity paper prototypes are bona fide technique on their own
  
  * Not just a stop-gap technique

  * Not just a low-tech substitute for computer-based prototype
  
  * Very large corporations with extensive resources use paper prototype routinely for early interaction development

  * Computer-based prototype can distract from usability focus early on

  * Paper prototype is better support for participatory design
  
  * Can evolve very quickly
  
  **E.g., Post-Its, etc. as users are doing tasks**

  * People do take paper prototype seriously; it does find many usability problems
HIGH- AND LOW-FIDELITY PROTOTYPING

- Interaction design has two parts
  - * Look and feel: objects
  - * Sequencing: behavior

*Sequencing includes changing object behavior*

<table>
<thead>
<tr>
<th>Type of prototype</th>
<th>&quot;Strength&quot;</th>
<th>When in life cycle to apply &quot;strength&quot;</th>
<th>Cost to fix look and feel</th>
<th>Cost to fix sequencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper (lo-fi)</td>
<td>Flexibility; easy to change sequencing, overall behavior</td>
<td>Early</td>
<td>Almost none</td>
<td>Low</td>
</tr>
<tr>
<td>Computer (hi-fi)</td>
<td>Fidelity of look and feel</td>
<td>Later</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
## PROTOTYPE EVOLUTION WITHIN PROJECT

<table>
<thead>
<tr>
<th>&quot;Product&quot; type</th>
<th>Purpose (in development)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenarios and screen sketches</td>
<td>Requirements gathering, client/user walk-throughs</td>
</tr>
<tr>
<td>Hand-drawn paper prototype</td>
<td>Evaluate conceptual model, early design ideas</td>
</tr>
<tr>
<td>Computer-printed paper prototype (e.g., with VB, Visio)</td>
<td>Mid-range formative evaluation</td>
</tr>
<tr>
<td>Computer-based prototype with some working functionality (e.g., database functions)</td>
<td>Main-line formative usability evaluation</td>
</tr>
<tr>
<td>Product release</td>
<td>Field support, customer help line, post-deployment usability evaluation</td>
</tr>
</tbody>
</table>
PROTOTYPE EVOLUTION WITHIN PROJECT

• In real-world project, would make and evaluate all of these

• Which to use for your project?

  * Do computer-based prototype, but with only enough apparent functionality to support usability evaluation

  What does "apparent functionality" mean?

  * Do not focus time and effort on functionality!
RAPID PROTOTYPING

Elaborate here, not too fast...

• What to put in early prototypes — to evaluate usability of overall interaction design metaphor/paradigm
  Follow-on to conceptual design

  * Start with representative sample screen or two
  * Mock-up a representative task
  * Follow a representative task thread
  Learn a great deal from incomplete design, and from a single brand new user

• What to put in later prototypes — to evaluate usability of details
  * More detailed, refined screens
  * More complete tasks
  * Move from low- to high fidelity
RAPID PROTOTYPING

• Same process to prototype Web applications as for GUIs
  
  Web can make prototype more accessible for different users, conditions

• Invest *just enough* effort in a rapid prototype
  
  * To achieve formative evaluation goal, but no more

• Typical transition to real product
  
  * Keep details (code) of user interaction design objects, look and feel
    
    In formative evaluation, you evolve these exactly as they are.
  
  * Discard any functional or other code holding prototype together
    
    E.g., sequencing code; was probably never meant to be product code
TEAM EXERCISE: RAPID PROTOTYPING

ALMOST ALL YOU EVER WANTED TO KNOW ABOUT RP YOU LEARNED IN KINDERGARTEN!!!

• Goal:

  * To obtain experience with rapid construction of a low fidelity prototype for early stages of user interaction design

• Activities:

  * Draw Web pages in more detail than in your scenarios

  * Make prototype "executable," at least for benchmark tasks

• General – What we are going to do:

  * Draw interaction objects on paper, cut them out, and tape in aligned position, relative to other objects, on separate blank plastic transparencies.

  * Use "easel" to register each sheet of plastic with other sheets.
* During "execution" most dynamics will be created by adding and removing various registered plastic sheets to/from the easel.

* You will need to prototype at least the benchmark tasks from your usability specifications, since the prototype will be used in the formative evaluation exercise. Prototype will be "executed" on the easel, usually taped to tabletop for stability. 

  *not shown on overhead projector.*

* IMPORTANT: Get everyone on your team involved in drawing, cutting, taping, etc. — not just one or two people. You'll be done much faster if everyone pitches in. However, this is not art class, so don't worry too much about straight lines, exact details, etc.

* Details – How to make a paper prototype: 

  *Demonstrate as you go, with own samples*

* Start with simplest possible background for each Web page in pencil or pen on full size paper, as base for all moving parts
  - Include only parts that never change (e.g. for CMS: monthly "grid", no month name)
  - Shouldn’t have to use copy machine -- whatever you plan to copy, use that as Web page base
sheet and share with all overlays for that page
* Everything else is **drawn in pencil or pen on paper**, cut out, and taped (in proper location) on separate plastic sheet

  *Important: this is the paradigm – paper cutouts on plastic*

* Don’t draw *anything* twice; make it modular to reuse
  
  - The less you put on each layer, the more modular
  
  - Shouldn’t have a sheet with a lot on it; means repeating something on another sheet

* Whatever changes when user gives input should go on **separate** paper-on-plastic sheet

* If user will **type in values** (e.g., item number) use clear sheet on top and marking pen

* Don’t forget to make a **highlight** for major selectable objects
  
  - Use square or rectangle with "handle"; color with marking pen
* Fasten some objects (e.g., pull-down lists) to top or side of easel with tape "hinges", so they "flap down" to overlay the screen

* Use any creative techniques to demonstrate motion, dynamics, feedback
  - E.g., scrolling can be done with paper through slits cut in larger paper (all taped to plastic sheet)

* Make a "not yet implemented" message!

* Pilot testing: Be sure that your prototype will support your benchmark tasks by having one member of your team "run" the prototype while another member plays "user" and tries out the benchmark tasks.

• Deliverables:

∫ An "executable" version of your prototype, constructed of paper taped in registration to plastic sheets.

∫ Pilot test completed

• Completed by: 2 hours max.