User Centered Design And Prototyping

Why User Centered Design is important

Approaches to User Centered Design

Rapid prototype techniques

The Design Of Well Crafted Tools
The All Too Common Approach In The Design Of Software

System Centered Design

• What can be built easily on this platform?
  
• What can I create from the available tools?

• What do I as a programmer find interesting to work on?
User Centered System Design

Design is based upon a user’s:
- abilities and real needs,
- context,
- work,
- tasks,
…know the person you are designing for.

User Centered System Design

Three assumptions¹
- A good design will satisfy the needs of the user group
- Collaborative
- Constant communication

¹ From Denning and Daenen, p111 in Winograd, Ed., Bringing Design to Software, Addison Wesley
Participatory Design

Problem
• Intuitions wrong
• Traditional methods (e.g., interviews) suffers from a number of weaknesses
• Designer cannot know the user sufficiently well to answer all issues that come up during the design

The user is just like me

Solution
• Designers should have access to a pool of representative users
  - ACTUAL end users, not their managers or union reps!

Participatory Design

Make the user a member of your design team
• Users become actual participating members in the design process
• Users considered subject matter experts
• Design becomes an iterative process
### Participatory Design (Up Side)

- Users are excellent at reacting to actual designs (prototypes).
- Users can bring in important “folk knowledge” of their work context.
- Often results in greater acceptance of the final system

### Participatory Design (Down side)

- Hard to get a good pool of end users.
- Users are not expert designers.
- The user is not always right.
Contrasting The Approaches Towards Design

System centered design
- Design is focused around the system and the developer

User centered design
- Design is focused on the user

Participatory design
- The user becomes a member of the design team

Task centered design
- Design is focused on the user and their tasks (user may not be as accessible)

Methods For Involving The User

1) At the very least, talk to users
   - It’s surprising how many designers don’t!

2) Contextual Inquiries
   - Key characteristics:
     - Interview users in their usage place (e.g., office), as they are going about their normal routine (e.g., using your system while working)
   - Purpose:
     - Used to discover the user’s culture, requirements, expectations, etc.
Methods For Involving The User (2)

3) Create prototypes
   • It’s hard to comment on something that doesn’t yet exist
   • Users are good at giving feedback for something that is even partially built

Methods For Involving The User (3)

3) Create prototypes (continued)
   • Get input at all design stages
     All designs subject to revision

User-Centered Design and prototyping
Prototyping Techniques

Low Fidelity

Medium Fidelity

High Fidelity

Low Fidelity Prototypes

Hand drawn mockups of some design ideas

Focus on:
• Brainstorming as many ideas as possible (discount usability)
• Making it clear enough to be understandable

But don’t focus on making it “pretty”
• They are not computer generated images (*don’t use drawing programs to generate them*)

May be used to elicit feedback from the user
Types Of Low Fidelity Prototypes

• Consist of hand drawn prototypes:
  • Sketches
  • Storyboards
  • Pictive

Low Fidelity Prototypes

Sketches:
  • A drawing of the high-level appearance of the intended system
  • The crudity of the prototype means people concentrate on high level concepts
  • It may be hard to envision the progression of a dialog
Sketches

Screen 1: Initial order screen

Sketches (2)

Screen 2: Payment screen
Low Fidelity Prototypes

Storyboarding
• It’s a series of key frames
  - Originally from film; used to get the idea of a scene
  - Snapshots of the interface at particular points in the interaction

• For interfaces it allows users to quickly evaluate the direction of the design

THE HAPPY DUDE MENU
(PUSH BUTTON TO PLACE ORDER)

Burgers Fries Beverages

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Beef Burger</td>
<td>$5.00</td>
</tr>
<tr>
<td>Jolly Burger</td>
<td>$3.50</td>
</tr>
<tr>
<td>Classic Happy Burger</td>
<td>$6.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Fries</td>
<td>$2.00</td>
</tr>
<tr>
<td>Large Fries</td>
<td>$3.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop</td>
<td>$1.00</td>
</tr>
<tr>
<td>Juice</td>
<td>$1.50</td>
</tr>
<tr>
<td>Coffee</td>
<td>$3.00</td>
</tr>
<tr>
<td>Tea</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

Initial order screen
Storyboarding (2)

Person orders an “Ecstatic Burger”

Storyboarding (3)

Order is placed
Storyboarding (4)

Payment screen comes up

Storyboarding (5)

User pays with cash
Order confirmation screen comes up

Order is placed
Storyboarding (8)

Order confirmation is shown

YOUR ORDER HAS BEEN PLACED.

PLEASE TAKE YOUR RECEIPT TO THE COUNTER TO GET YOUR ORDER.

Thank you and come again!

Storyboarding (9)

• Showing key points in the interaction makes it easy to figure out how the system works.

• Showing an alternative interaction requires a whole new series of panels to be made.
**Low Fidelity Prototypes**

**Pictive**

- “Plastic interface for collaborative technology initiatives through video exploration”
- Key points:
  - Design consists of multiple layers of sticky notes and transparent plastic overlays
  - Interaction is demonstrated by manipulating the notes or transparencies
- Session is videotaped for later analysis
  - Usually end up with mess of paper and plastic!
  - “How does it work again?”

![Pictive Diagram](image-url)
### Medium Fidelity Prototypes

**Many different types**
- Range from simple computer drawn images to partially working systems

**They may take longer to generate and change than simple low fidelity representations**

**Benefits**
- It seems more like the completed system so it provides a clearer idea of how it works
- May be used to elicit feedback from the user when low-fidelity approaches cannot be used
- Depending upon the type of medium fidelity prototype it may allow for some user testing.

**Pitfalls**
- User’s reactions are usually “in the small”
  - Blinds people to major representational flaws because of a tendency to focus on more minor details
- Users reluctant to challenge/change the design itself
  - Designs are too “pretty”, egos…
- Management may think its real!

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**Pictive**

Circulate  Patron update  Item update  Utilities  Quit

Patron status
Fines
Check in
Check out
Patron search
Reserve
Medium Fidelity Prototypes

Tutorials and manuals

• Write them in advance of the system
• What are they?
  - **Tutorial** for step by step description of an interaction
    an interface “walk-through” with directions
  - **Manual** for reference of key concepts
    in-depth technical description of the different parts of the system
    (a list of features)

• If highly visual, then a storyboard is set within textual explanations

• Does this work?
  - People often read manuals of competing products to check:
    interface,
    functionality,
    and match to task.
  - Acts as a design tool

Tutorials

Star Trek: The Birth of the Federation is the property of Atari: http://www.atari.com/
**Tutorials**

**Diplomacy**

The Pakleds have offered you a Friendship treaty. To read and respond to their proposal, right-click to call up the Marker window. Click the bottom left button to bring up the Diplomacy screen.

Since you just received this proposal, you are automatically in Event mode. This mode is used to view diplomatic messages you have received. The buttons at the left side of the screen are used to change modes. Active lists active treaties involving your empire. Propose is used to propose new treaties, and Race Info is used to view reference material on races you have encountered. For now, stay in Event mode.

The proposed Friendship treaty is of indefinite length and will allow you to establish trade with the Pakleds.

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**The Summary Window**

Since you accepted the Pakled proposal and clicked the Turn button, the Summary window will appear which tells you what happened during your turn. This window will appear whenever anything happens to a race you have encountered. Click the Summary button in the top left corner of the screen to bring up the Summary window at any time.

The Summary window has three modes: Events (provides up-to-date information on events), Relationships (shows current treaties) and Systems (shows vital statistics of systems you control). When you're finished, click the Close button to close the Summary window.

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*Star Trek: The Birth of the Federation is the property of Atari: http://www.atari.com/*
Manuals

“The Sims” is the property of Maxis: http://thesims.ea.com/

James Tam
Manuals

MOVING IN

Getting other folks to move in might seem like an invitation to more lost socks in the laundry, but it really can enhance your household and move your game forward. The Moving In proposition is very similar to the marriage proposal, except that the preconditions are less restrictive, and it’s available only for same-sex friends. Opposite-sex friends never have Move In available as a pie menu choice. Characters who move in to another household lose their last name and take on the names of the new household.

Here are the basics for mixing the Neighborhood nuts—we mean Sims—together. First of all, and pretty obviously, a neighbor has to be in a Sim’s house for it all to happen. Both Sims must be the same sex, and they’ve both got to be in pretty good moods. Once that’s cooking, the household Sim finds “Move In” is a pie menu choice when the visiting Sim is clicked on. So if you’ve got a situation where a couple of opposite-sex Sims are living together and you’re looking for a neighbor to move in, you need to have the Sim that’s in same sex as the neighbor be the one that extends the invitation.

The plot thickens: If the two Sims’ relationship is good enough, the visitor accepts. Bling! instant household! If the conditions aren’t right, the visitor declines, and so do both parties’ Relationship points. The person moving in doesn’t require a specific amount of household Simexes, so watch out for moochers.

If the Sim refuses the invitation, they tell you why: “Your place isn’t big enough,” or “We don’t know each other well enough,” or “I’m in a bad mood today.”

“The Sims” is the property of Maxis: http://thesims.ea.com/

Medium Fidelity Prototypes

Approaches to limiting prototype functionality

- Vertical prototypes
  - Includes in-depth functionality for only a few selected features
  - Common design ideas can be tested in depth

- Horizontal prototypes
  - Surface layers includes the entire user interface with no underlying functionality
  - A simulation: no real work can be performed

- Scenario
  - Scripts of particular fixed uses of the system; no deviation allowed

Source: James Tam
Medium Fidelity Prototypes

Approaches to integrating prototypes and the final product:
- Throw-away
- Incremental
- Evolutionary

Throw-Away Approach To Prototyping

- The prototype only is used to get feedback
- The prototype is built, tested and then discarded
**Incremental Approach To Prototyping**

- Build the system as separate modules (component)
- Each module is designed, prototyped and completed separately before being added to the final system

**Evolutionary Approach To Prototyping**

- Change the entire prototype itself in order to incorporate changes
- Eventually the reworked prototype becomes the final system
Medium Fidelity Prototypes

Painting/drawing packages
• Draw each storyboard scene on computer
  - Neater/easier (?) to change on the fly than paper
• A very thin horizontal prototype
• Does not capture the interaction “feel”
• NOT the approach to take for the first assignment

Control panel for pump 2

Control panel for pump 2

DANGER!

Medium Fidelity Prototypes

Scripted simulations and slide shows
• Encode the storyboard on the computer
  - Created with media tools
  - Scene transition activated by simple user inputs
  - A simple medium fidelity prototype

• User given a very tight script/task to follow
  - Appears to behave as a real system
  - Deviations from the script blows the simulation
Scripted Simulations

What to do
Find the item you want in the catalog and scan the bar code next to it.

What you selected

<table>
<thead>
<tr>
<th>Item</th>
<th>Style</th>
<th>Cost</th>
</tr>
</thead>
</table>

tax:

Total: $ 0.00

All done?

Place your order  Print this list  Throw this list away

Scripted Simulations

What to do
Touch a different color or scan another item.

What you selected

<table>
<thead>
<tr>
<th>Item</th>
<th>Style</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPG Stroller</td>
<td>Green</td>
<td>98.00</td>
</tr>
</tbody>
</table>

tax: 6.98

Total: $104.98

All done?

Place your order  Print this list  Throw this list away
Scripted Simulations

What to do: Touch a different color, or scan another item.

What you selected:
JPG Stroller
For children between 1-3 years old ...$98.
- Green
- Blue [X]
- Red (out of stock)

Item: JPG Stroller
Style: Blue
Cost: 98.00

Tax: 6.98
Total: $104.98

All done?
- Place your order
- Print this list
- Throw this list away

James Tam
Medium Fidelity Prototypes

Interface builders
• Tools for letting a designer lay out the common widgets

• Construct mode
  - Change attributes of objects

• Test mode:
  - Objects behave as they would under real situations

• Excellent for showing look and feel
  - A broader horizontal prototype
  - But constrained to widget library

• Vertical functionality added selectively
  - Through programming

The Wizard Of OZ: The Movie

The movie “The Wizard of OZ” is the property of Time-Warner: www.warnervideo.com
The Wizard Of OZ: The Movie

A method of testing a system that does not exist
• Human simulates the system’s intelligence and interacts with user
  - e.g., the voice editor, by IBM (1984)
**Wizard Of Oz: Examples**

IBM: an imperfect listening typewriter using continuous speech recognition
- Secretary trained to:
  - Understand key words as “commands”
  - Types responses on screen as the system would
  - Manipulating graphic images through gesture and speech

Intelligent Agents / Programming by demonstration
- Person trained to mimic “learning agent”
  - User provides examples of task they are trying to do
  - Computer learns from them
- Shows how people specify their tasks

In both cases, system very hard to implement!

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**The Prototyping Process**

**Early designs**
- Brainstorm different representations
- Choose a representation
- Rough out interface style
- Task centered walkthrough and redesign
- Fine tune interface, screen design
- Heuristic evaluation and redesign
- Usability testing and redesign
- Limited field testing
- Alpha/Beta tests

**Later designs**
- Low fidelity paper prototypes
- Medium fidelity prototypes
- High fidelity prototypes / restricted systems
- Working systems
The Prototyping Process

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Later designs

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Assignment

One

What You Now Know

User centered design
- The design is based upon a user’s real needs, tasks, and work context

Participatory design
- Make the end-user a member of the design team

Prototyping
- Allows users to react to the design and suggest changes
- Low-fidelity prototypes best for brainstorming and choosing representations
- Medium-fidelity prototypes best for fine-tuning the design

Prototyping methods
- Storyboarding
- Pictive
- Vertical, horizontal and scenario prototyping
- Scripted simulations
- Wizard of Oz
Interface Design And Usability Engineering

Goals:
- Articulate: Who (users) - What (tasks)

Methods:
- Task centered system design
- Participatory design
- User-centered design

Evaluate
- Psychology of everyday things (psych)
- User involvement (user)
- Representation & metaphors

Brainstorm designs
- Participatory interaction
- Task scenario walk-through

Psych, User, Representations and metaphors
- Graphical screen design
- Interface guidelines
- Style guides

Refined designs
- Usability testing
- Heuristic evaluation

Low fidelity prototyping methods
- Testable prototypes
- Completed designs

Products:
- User and task descriptions
- Throw-away paper prototypes

High fidelity prototyping methods
- Alpha/beta systems or complete specification

Field testing

This diagram is a variation of the one presented by Saul Greenberg