User Centered Design And Prototyping

Rapid prototyping techniques

Why User Centered Design is important

Approaches to User Centered Design

Why Prototype?

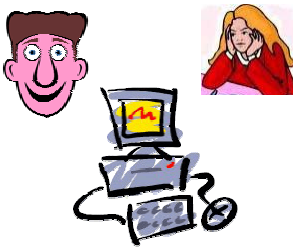
If asked cold, users may have trouble describing what they want.

- At best you may get a list of features.

A prototype is something tangible that can:

- be used to elicit feedback on what they want/don't want,
- involve the user in the design process,

..before the system is built.



How To Prototype

Generate as many ideas as possible

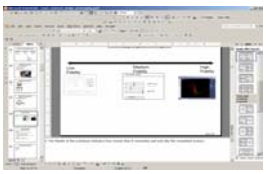
- Don't get "too attached" to a particular approach early on in the design process
- Separate the process of generating prototypes from the critiquing of designs
  - Brainstorm: generate as many ideas as possible
  - Only when you run out of new ideas should evaluation begin

Prototyping Techniques

Low Fidelity

Medium Fidelity

High Fidelity



Low Fidelity Prototypes

Paper mockups of some design ideas

- Cheap and fast to build
- Easy and quick to modify
- Allows many alternatives to be compared

Focus on:

- Brainstorming as many ideas as possible (discount usability)
- Making it clear and detailed enough to communicate the main parts of the interface be but don't focus on small details or making it 'pretty'.

May be used to elicit feedback from the user (getting the user involved during the early phases of the design process)

Types Of Low Fidelity Prototypes

- **Sketches**
- **Storyboards**
- **Pictive**
- **Tutorials and manuals**

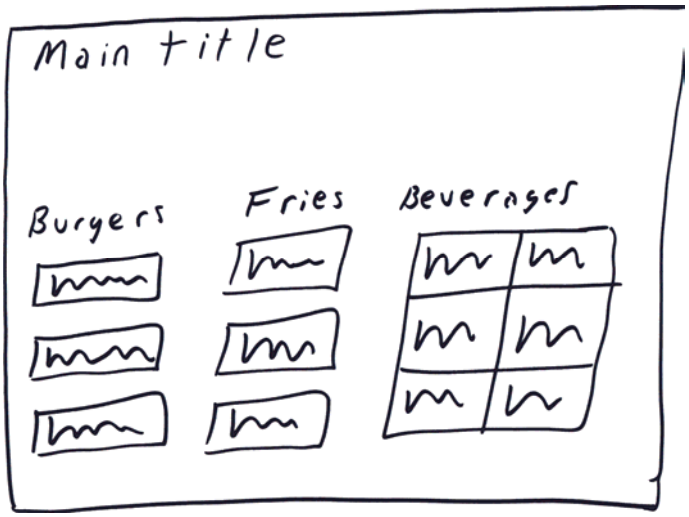
Low Fidelity Prototypes

Sketches:

- A rough drawing of the intended system
- Pro:
  - The crudity of the prototype means people concentrate on high level concepts
  - It's easy to generate many ideas and to change existing designs
- Con: It may be hard to envision the progression of a dialog

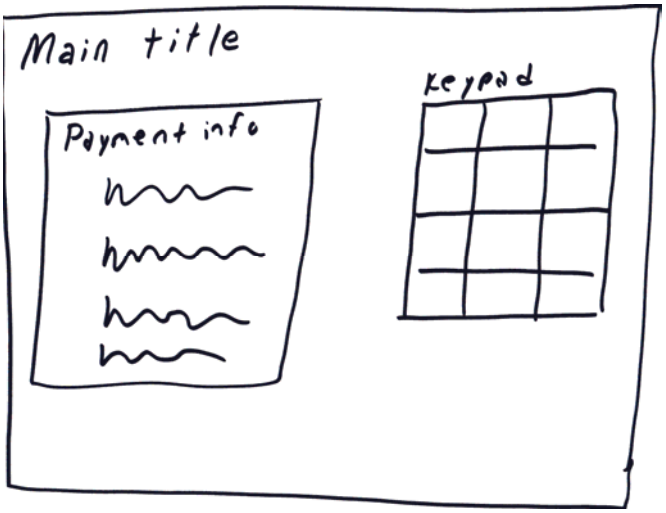
Sketches

Screen 1: Initial order screen



Sketches (2)

Screen 2: Payment screen



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Low Fidelity Prototypes

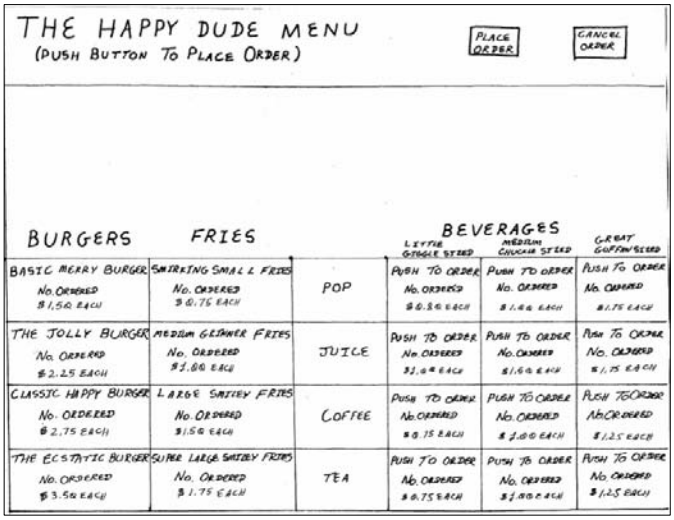
Storyboarding

- 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

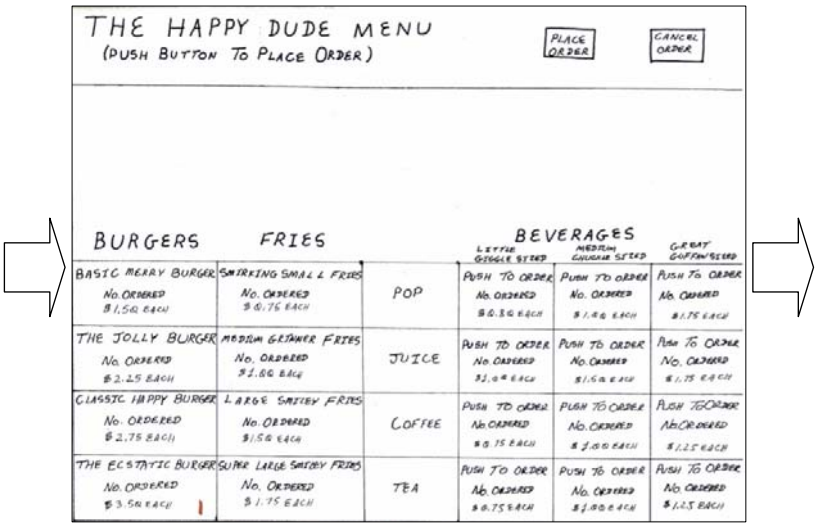
James Tam

Storyboarding



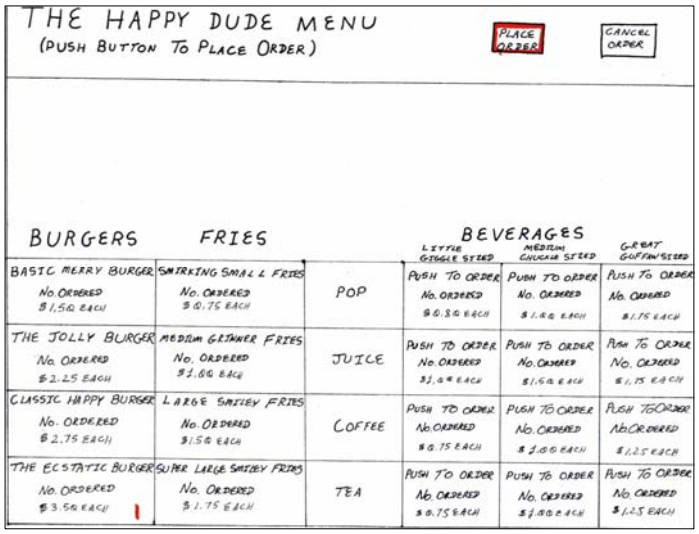
Initial order screen

Storyboarding (2)



Person orders an “Ecstatic Burger”

Storyboarding (3)



Order is placed

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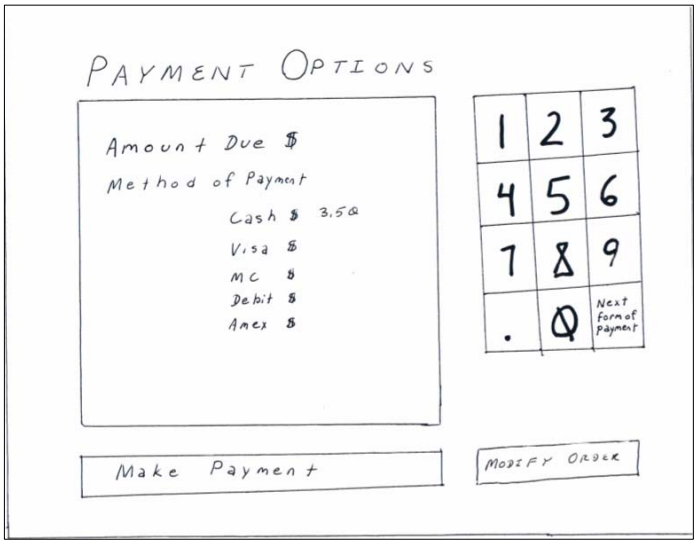
Storyboarding (4)



Payment screen comes up

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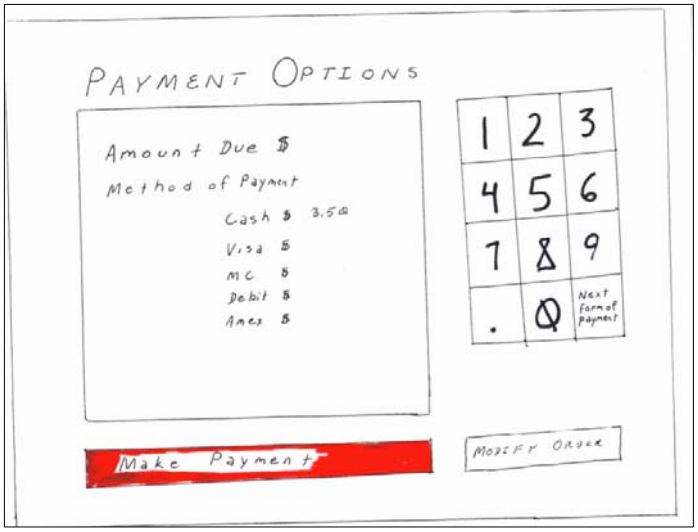
Storyboarding (5)



User pays with cash

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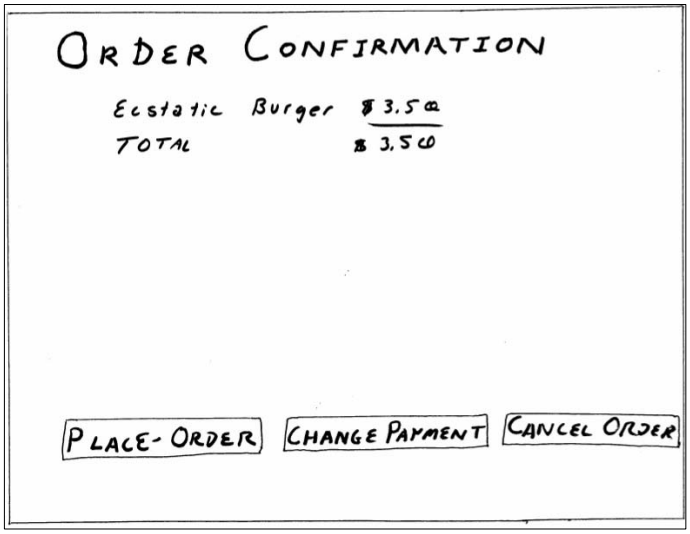
Storyboarding (6)



Order confirmation screen comes up

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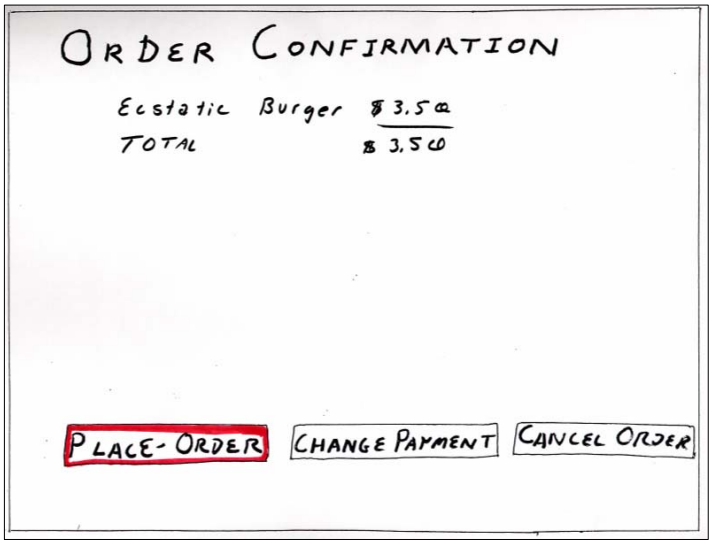
Storyboarding (7)



Order is placed

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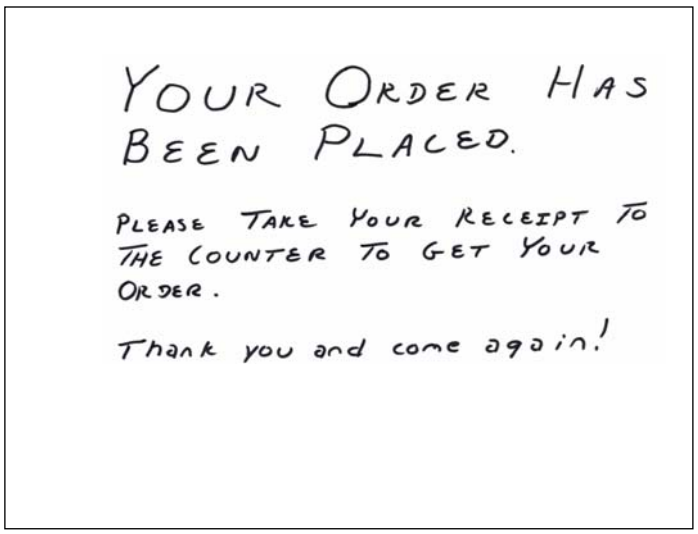
Storyboarding (8)



Order confirmation is shown

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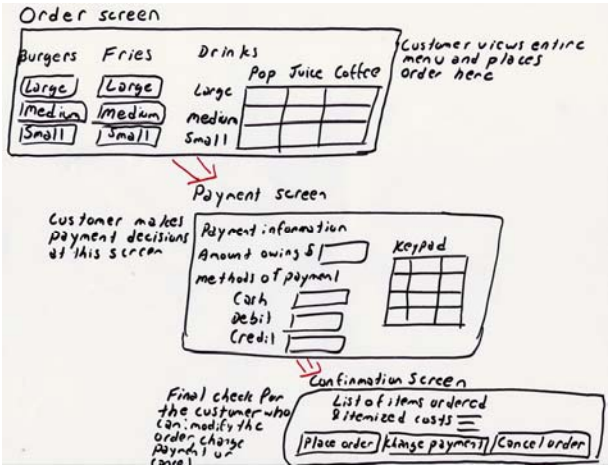
Storyboards Can Vary In Fidelity

The level of detail can vary.

- For your portfolio make sure that the prototype is detailed enough to let your marker know how the system is supposed to work



Storyboarding (9)

- **Showing key points in the interaction makes it easy to figure out how the system works.**
  - Easiest of the three low-fidelity prototyping techniques to understand if there is no one to explain how the system works (i.e., the prototype is in a written report)

- **Showing an alternative interaction requires a whole new series of panels to be made.**
  - Shortcut: Photocopy backgrounds of the prototype that are common to many interactions

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
  - Works well for 'live' presentations (when there is a person to demonstrate the prototype).
  - Very difficult to understand the system when there is no one to describe how things work (i.e., a written report for your portfolio).

- Session is videotaped for later analysis
  - Usually end up with mess of paper and plastic!
  - "How does it work again?"

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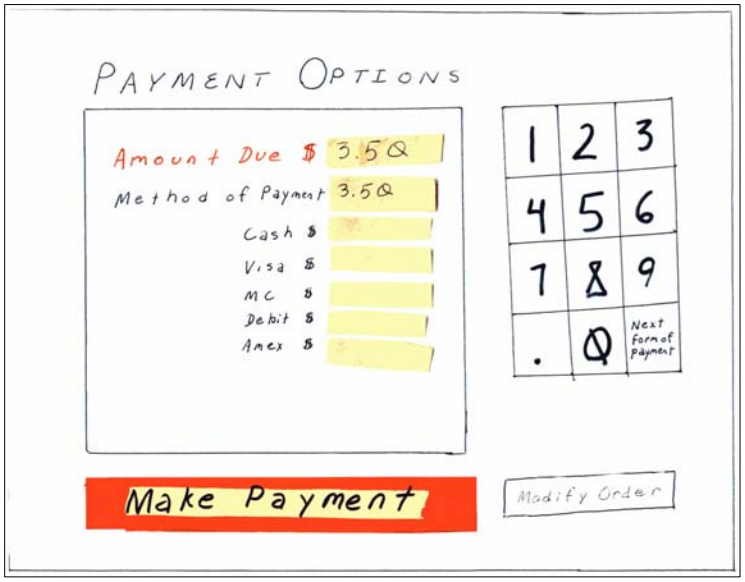
Pictive (2)



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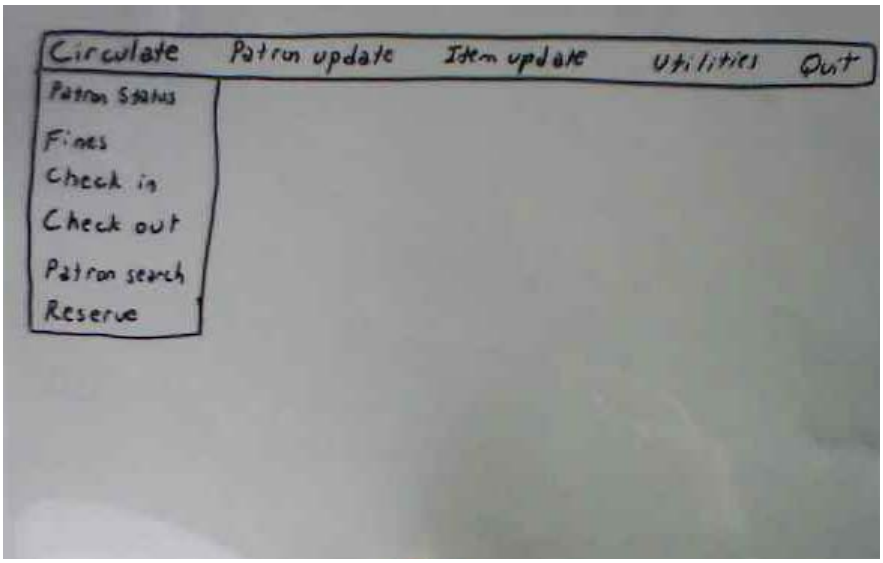
Pictive (3)



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Other Low 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

James Tam

Tutorials

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

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Tutorials

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

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Tutorials

There are three things you can do with this proposal:

1. *You can accept it by clicking the Accept button.*
2. *You can reject it by clicking the Reject button.*
3. *You can ignore it by leaving this screen.*

Your decision will be final when you end this turn. Click the Accept button and then right-click to call up the Marker window. Click the top button to return to the Main Galactic screen. Click the Turn button to send your diplomatic response to the Pakleds.

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.

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

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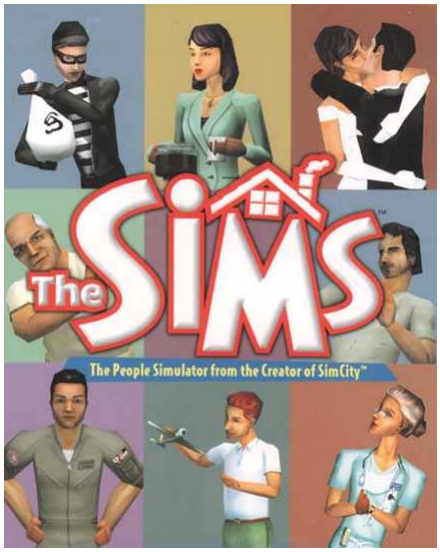
Manuals



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

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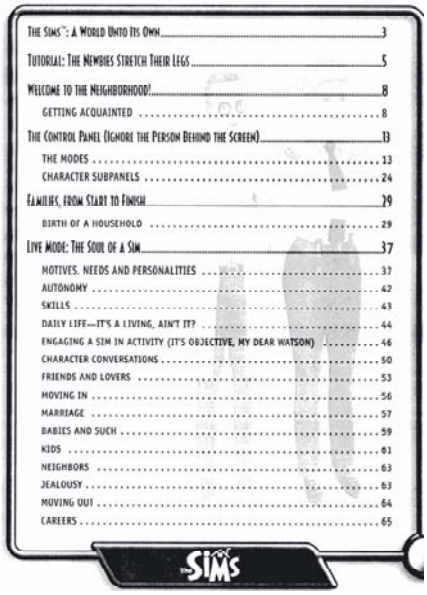

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Manuals

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 th 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. Bingo instant housemate! If the conditions aren't ripe, the visitor declines, and so do both parties' Relationship points. The person moving in doesn't require a specific amount of household Simoleons, 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/

Paper Vs. Electronic Documentation

Advantages of electronic documentation:

- Help may be more readily available (e.g., help that is integrated into the system doesn't require searching for a paper manual).
- A savings in physical space.
- Information can be updated more easily (online help).
- Searching for information may be quicker (e.g., if a keyword is known)
- Related information can be directly linked.
- Graphics, sound and animations may be used to help engage the user and to explain complex interactions.
- Blind users can use screen readers and listen to instructions.

Paper Vs. Electronic Documentation (2)

Advantages of paper-based documentation:

- When reading a long document some people find paper manuals easier to read.
- Paper displays may be able to show more information (all at once).
- People are typically more familiar with the 'user interface' of paper manuals than they are with electronic ones.
- A savings in screen space:
  - Splitting the display between work and electronic documentation reduces the space for work displays.
  - Switching the display between the two may be a large burden on short term memory.

- Note: Small screen displays (e.g., cell phones) typically do not have sufficient screen space for electronic based help and must rely on paper based help.

Medium Fidelity Prototypes

•Computer generated

- Range from a complete but a non-functional interface to simulated versions of the system.

•Types:

- Scripted simulations and slide shows
- Prototypes created using interface builders (horizontal, vertical)
- Wizard Of Oz

Medium Fidelity Prototypes

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

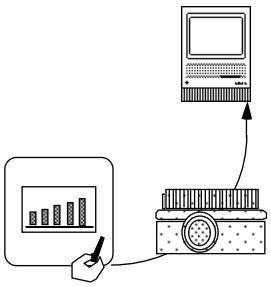
- User's reactions are usually "in the small"
  - Blinds people to major representational flaws because of a tendency to focus on more minor details
- Users reluctant to challenge/change the design itself
  - Designs are too "pretty", egos…
- Management may think its real!

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



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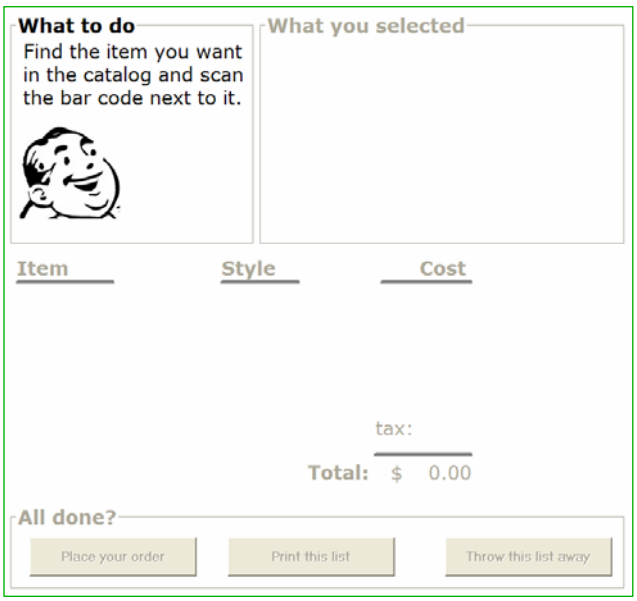
Scripted Simulations



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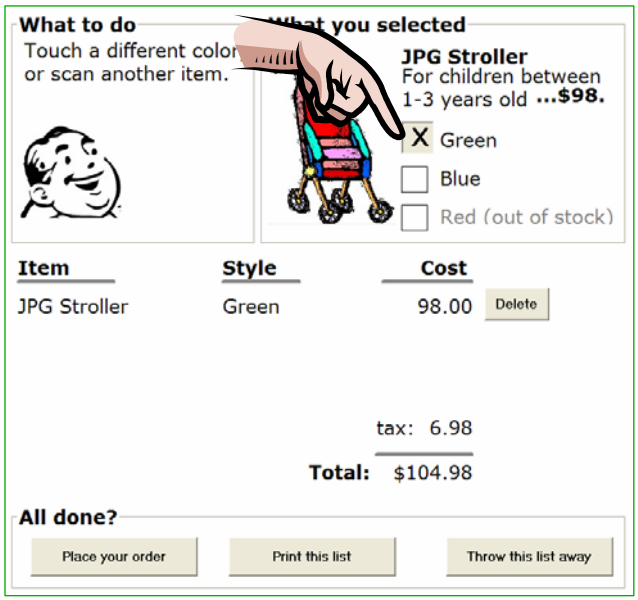

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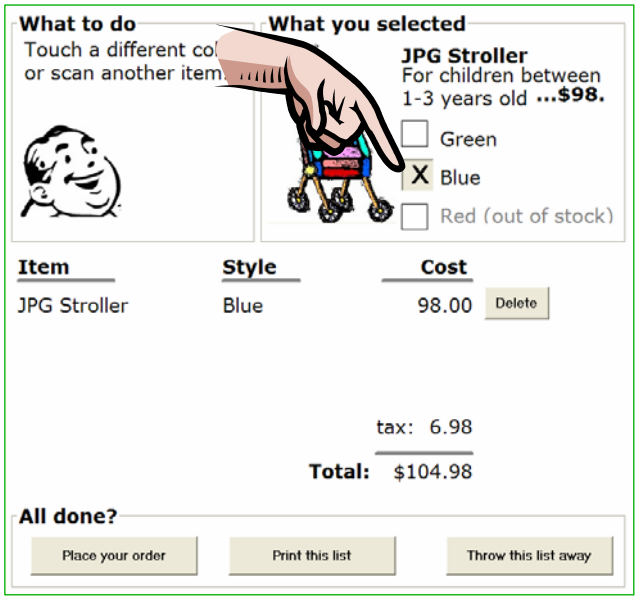

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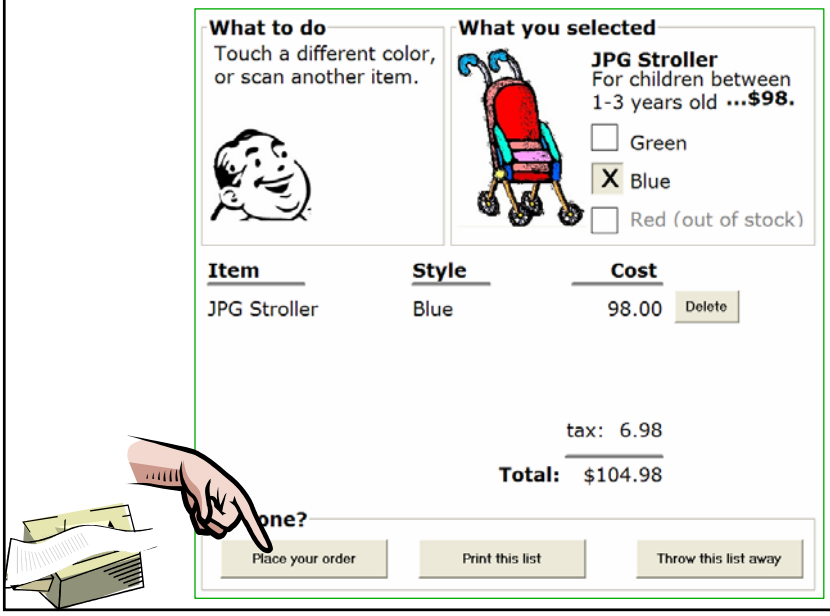

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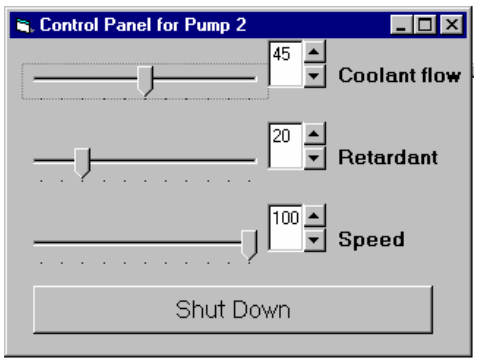
Medium Fidelity Prototypes

Interface builders

- Tools for letting a designer lay out the common widgets
- Main advantage: decouples user interface design (i.e., HCI issues) from the complexities of programming an interface (e.g., How do I get the program to execute a method when a button is pressed?).



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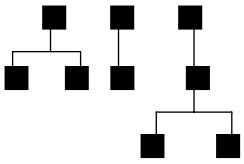
Medium Fidelity Prototypes

Approaches to limiting prototype functionality

- Horizontal prototypes
  - Build the all or most of the system using an interface builder.
  - System functionality is not implemented or implemented in a minimalist fashion (it's an "empty gui")

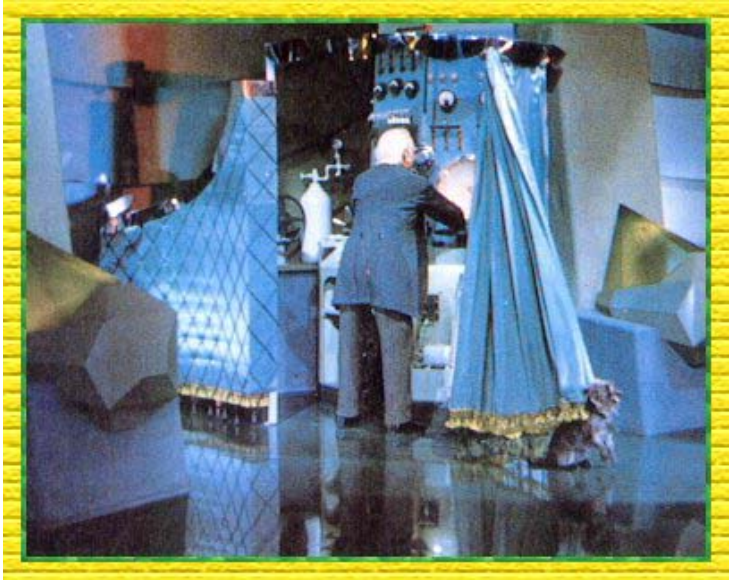
Medium Fidelity Prototypes (2)

- Vertical prototypes
  - Includes in-depth functionality for only a few selected features
  - Common design ideas can be tested in depth
  - Can involve a separate prototype or the actual system



The Wizard Of OZ: The Movie

The Wizard Of OZ: The Movie



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

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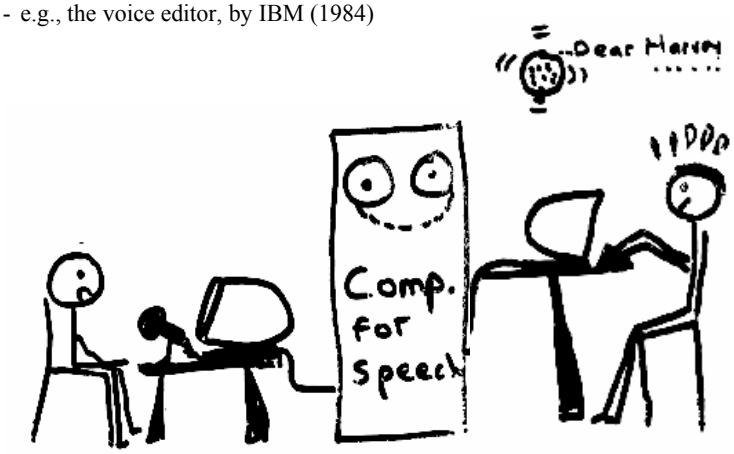
Wizard Of Oz: The Prototyping Technique

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)



What the user sees

The Wizard

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!

High-Fidelity Prototypes

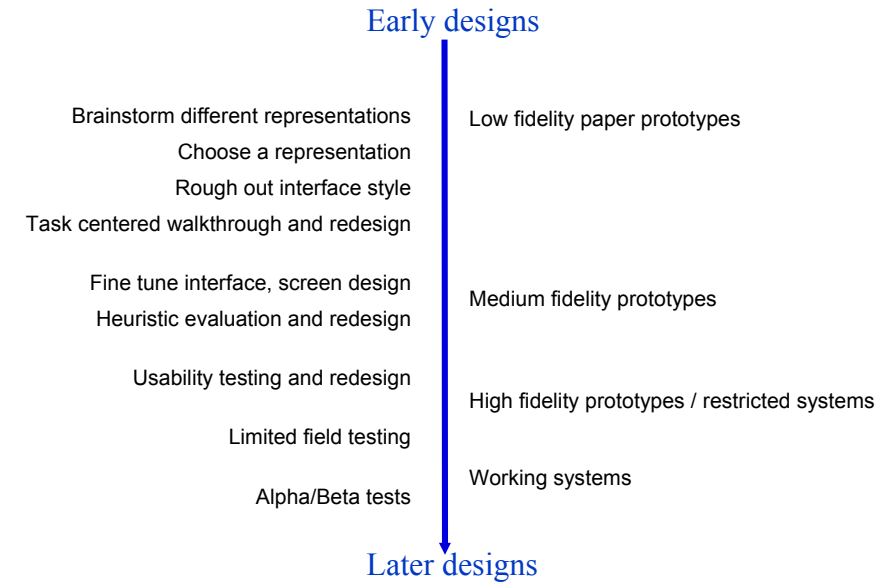
- **Are near fully implemented versions of the system**
  - Alpha/beta versions of the system
- **Pro: Allows for realistic user testing (detailed feedback)**
- **Cons: Because of the detail level involved, making changes to the system is much more time consuming than with prototypes with a lower level of fidelity.**

A Quick Comparison: High Vs. Low[1]

	Advantages	Disadvantages
Low-fidelity prototype	• Cheap and fast to build • Many alternatives can be implemented and compared • Useful for eliciting requirements • Useful for addressing major screen design issues	• Difficult to implement a system based on just the prototype • Limited usefulness for usability testing • Facilitator controlled: Navigation and flow limits
High-fidelity prototype	• Fully implemented system: can perform user testing • Shows look and feel of final system • Computer controlled: can determine and evaluate navigation and flow	• More expensive and time consuming to build • Not an efficient mechanism for eliciting requirements

1 Based on "Interaction Design" (2002): Preece, Rogers, Sharp

The Prototyping Process



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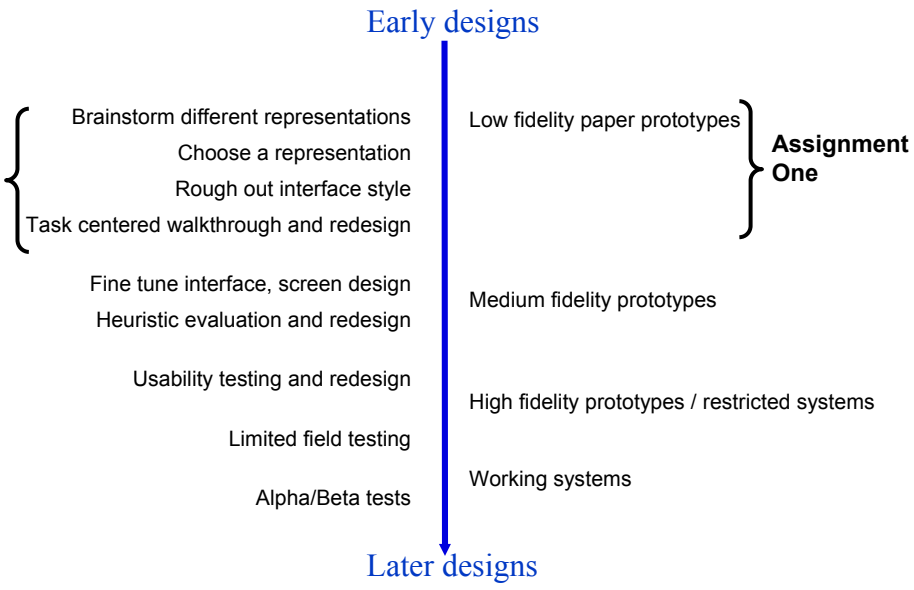
The Prototyping Process



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The Design Of Well Crafted Tools

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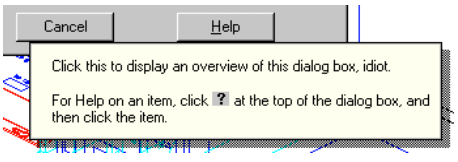
The All Too Common Approach In The Design Of Software



AutoCAD Mechanical

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System-Centered Design

- During the early decades when computer software was first produced most of the users were technical experts




- "The substantial experience and motivation of these users meant that complex interfaces were accepted and even appreciated." (from "*Designing the User Interface*")

(Specs from www.commodore.com)
- a main board with a powerful new 1Mhz MOS 6502 processor
- 4K of memory
- real storage device (cassette tape)
- several expansion ports including an RS232 (serial) port
- upper and lower case text
- :
- **Plus The Basic programming language was included with the system!**

Dilbert © United Features Syndicate

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System-Centered Design (2)

- **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?**

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Problem With System-Centered Design

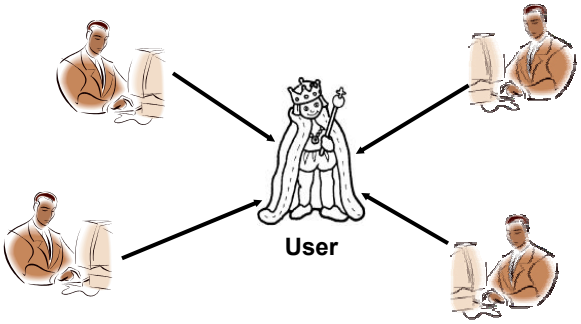
Current computers users include more than just hard-core techies and can be quite diverse in their skills and interests.

Characteristics Of A User-Centered Focus

1) **Early - and continual focus on users**
2) **Early - and continual user testing**
3) **Engaging in iterative design**

1) Early And Continual Focus On Users

- Decide who will be using the system and what they will be doing with it
- This forms the basis of your design
- Many techniques may be employed



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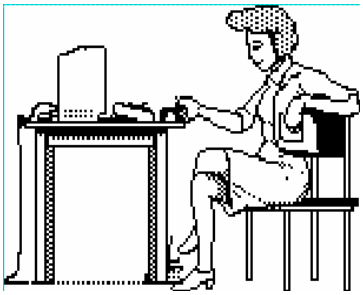
2) Early And Continual User Testing

- Not something to do just at the end!
- Instead: From the start of the development process and throughout have users do real work using different versions of your system.



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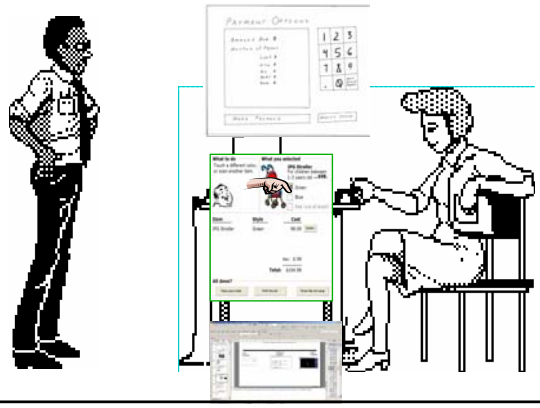
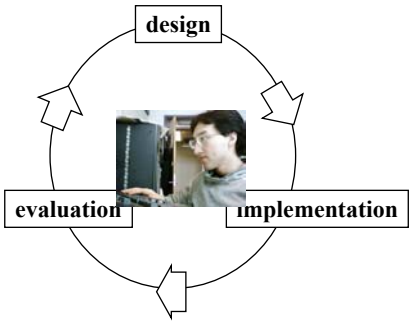


3) Engage In Iterative Design

- Identifying required changes.
- Being able to make the required changes.
- Being willing to make the required changes.



Participatory Design

Goes beyond what is employed with most user-centered approaches.

- Typical case with user-centered design: the user is consulted throughout the design process by the design team

With Participatory design the user is made a member of your design team

- Users become actual participating members in the design process
- Users considered subject matter experts
- Design must be an iterative process

James Tam

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 (there is 'buy in' because they were a part of the process).**

James Tam

Participatory Design (Down side)

- **Hard to get a good pool of end users.**
- **User's thinking may be constrained by what they know**
  - The user is not always right.
- **User's thinking may be constrained by what they don't know**
  - Users are not expert designers.

Mitigating Some Of The Pitfalls Of Participatory Design

Pitfall	Approach to mitigate the pitfall
• For long term projects (several years), having a user on the design team may eventually leave the person out of touch with the current needs of the user group. • Some users who don't get picked to be participant members may become antagonistic or resentful	• Periodically change the representative from the user group
• Users are not expert designers • Users are not always right	• Producing prototypes throughout the design process can be used to elicit meaningful feedback (and perhaps even allow for testing).

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)

James Tam

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.

James Tam

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

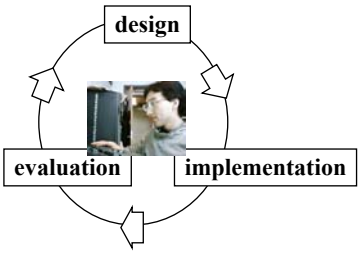
Beavis and Butthead is the intellectual property of Paramount Pictures and the MTV Television Network

Methods For Involving The User (3)

3) Create prototypes (continued)

- Get input at all design stages

  All designs subject to revision



What You Now Know

Prototyping

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

Prototyping methods

- Storyboarding
- Pictive
- Vertical and horizontal prototyping (typically created via interface builders)
- Scripted simulations
- Wizard of Oz

User centered design

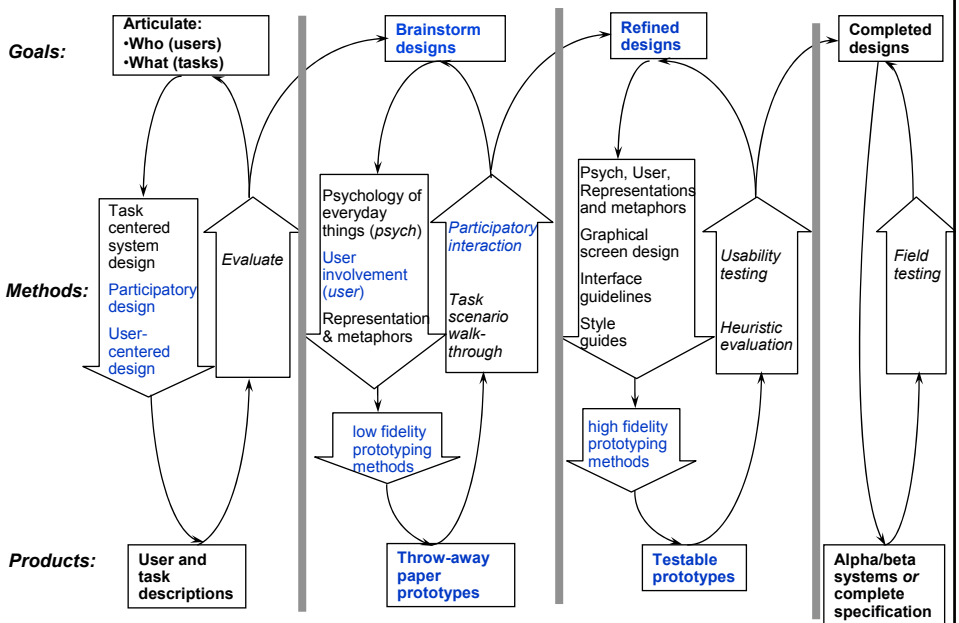
- The design is based upon a user's real needs, tasks, and work context

Participatory design

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

James Tam

Interface Design And Usability Engineering



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

James Tam