Paper Prototyping

The Fast and Easy Way to Design and Refine User Interfaces

Chapters 1,2, 4, 7

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Morgan Kaufmann, 2003

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Introduction

- What is paper prototyping?
  - Method for designing, testing, and refining user interfaces

- Book definition
  - Variation of usability testing where representative users perform realistic tasks by interacting with a paper version of the interface that is manipulate by a person “playing computer,” who doesn’t explain how the interface is intended to work

Introduction - How does it work?

- Product team
  - Choose user who represents audience
  - Determine typical tasks
  - Make screen shots and /or hand-sketches of items needed to perform tasks
    - windows, menus, dialog boxes, pages, data, pop-up messages

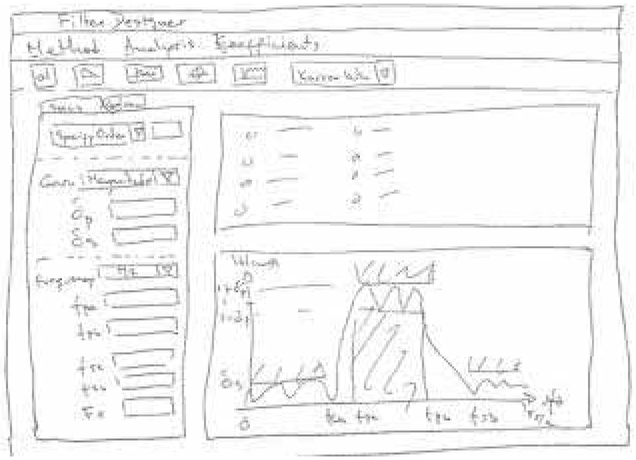


Figure 1.1 A hand-drawn paper prototype of a screen from an application used to design filters for scientific data

Figure 1.2 Paper prototyping is a team effort. After creating the usability tasks, the product team works together to generate a mock-up of the interface.

Introduction - How does it work?

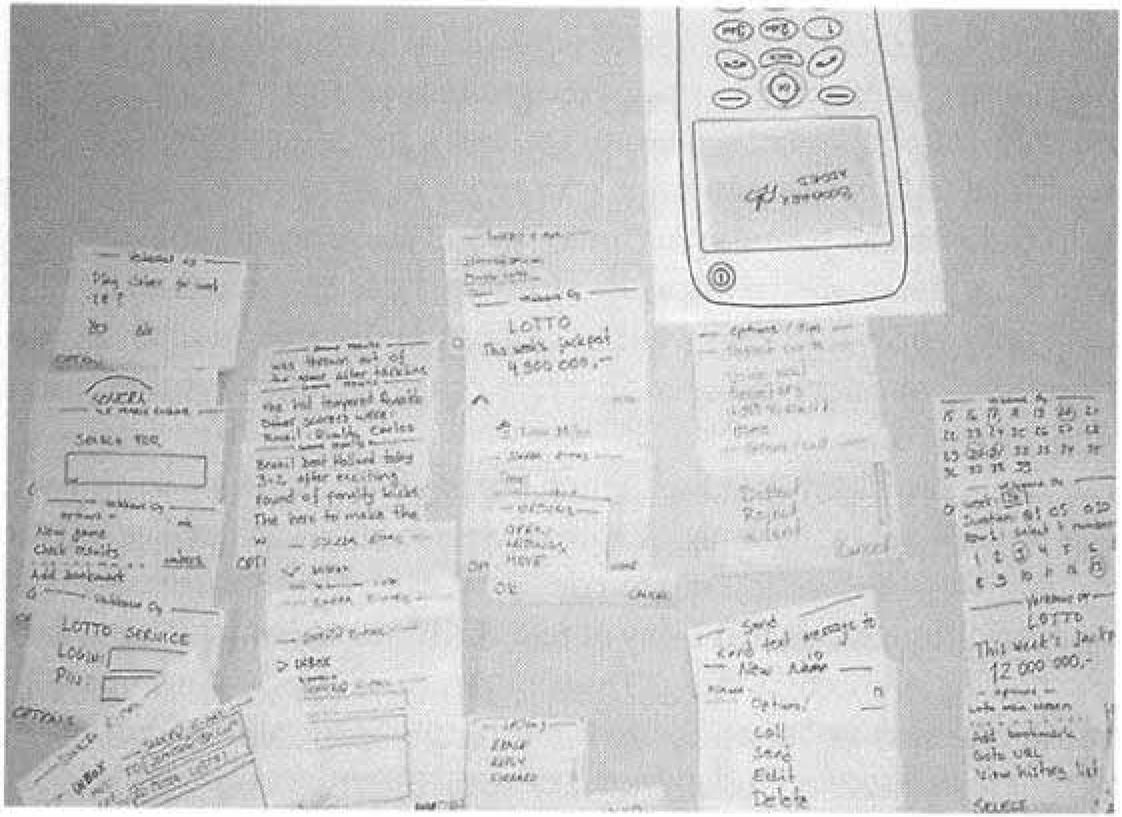


Figure 1.3 Individual pieces contain content that is relevant to the usability tasks – in this case, using a wireless phone to check lottery results and sports scores

Introduction - How does it work?

- Conduct usability test
  - Have a user attempt tasks outlined by interacting directly with the prototype

- Roles
  - **User** : person representative of your audience
  - **“Computer”** : person who manipulates the pieces of paper to simulate how the interface behaves
    - does not explain how it works
  - **Facilitator** : some typically trained in usability to conduct session
  - **Observers** : note-takers that watch session but are not directly involved

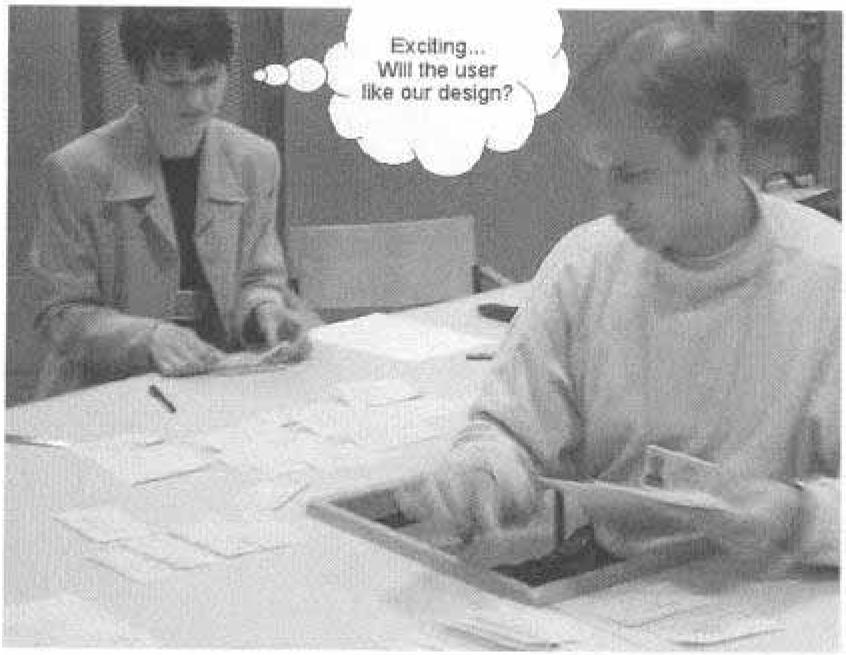


Figure 1.4 The Computer practices the tasks before the first user ever arrives. Another team member reviews her list of issues that she hopes the usability tests will cover.

Introduction - How does it work?

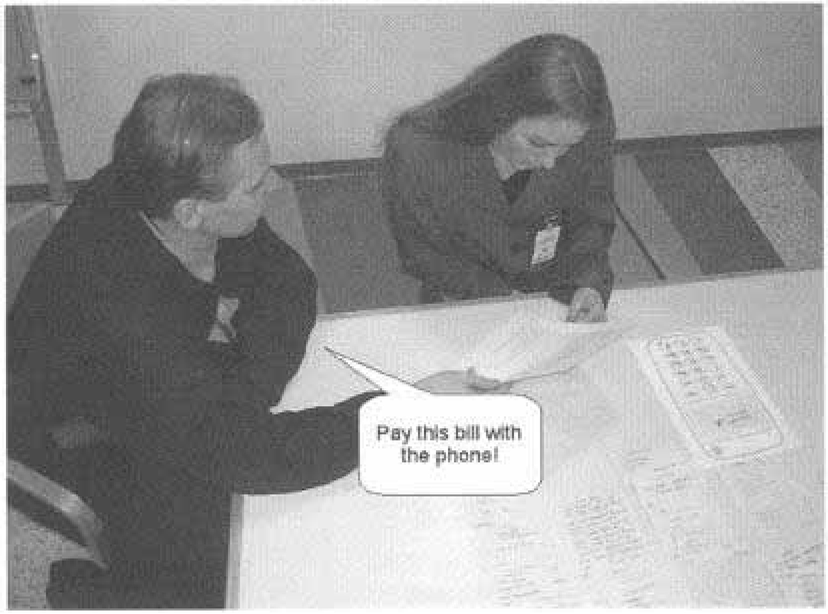


Figure 1.5 The facilitator explains the purpose of the session and how to interact with the prototype. The facilitator sits next to the user, giving each task and interacting with her as needed.

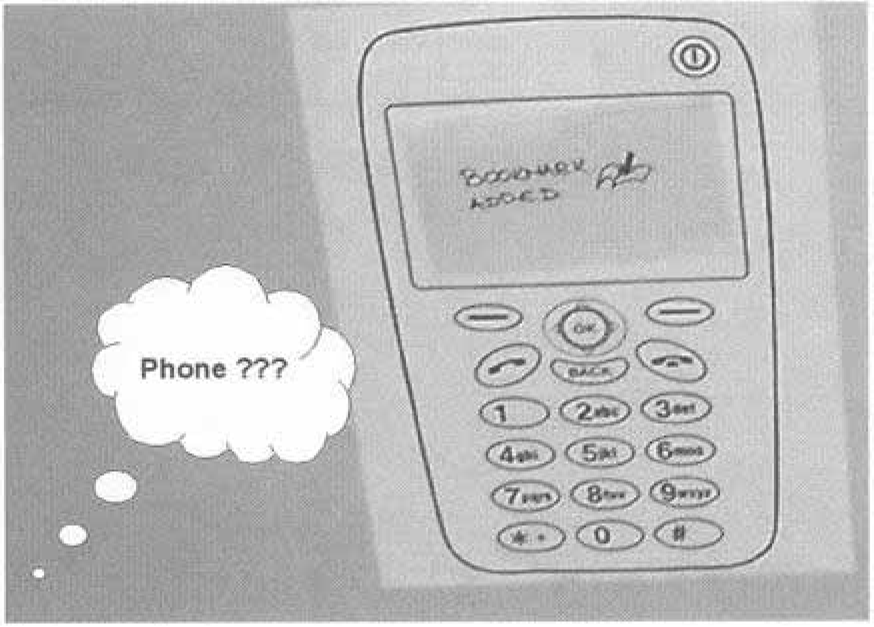


Figure 1.6 The user might find paper prototyping odd at first but quickly gets into the spirit.

Introduction - How does it work?

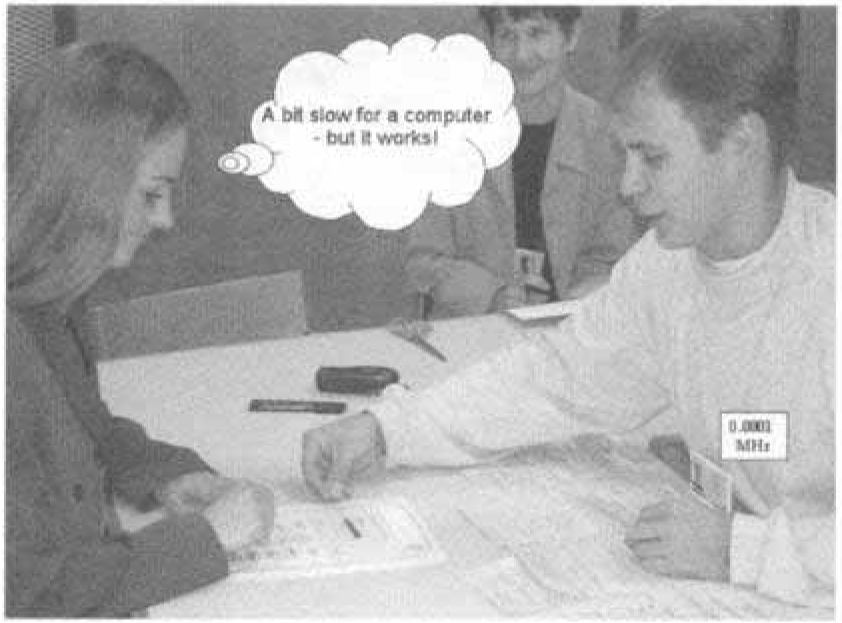


Figure 1.7 The Computer highlights the item the user has just “clicked” on. Other team members observe quietly and take notes. The facilitator (not visible) is still sitting next to the user.

Figure 1.8 Paper prototyping is a creative activity and is often quite fun.

What Paper Prototyping Isn’t

- Other techniques commonly confused with paper prototyping

- Comps *(compositions)*
  - Visual representations that show look of interface, colors, fonts, layout, etc.
  - May have several variations for consumer to choose from and spur discussion
  - **Can’t interact with them**

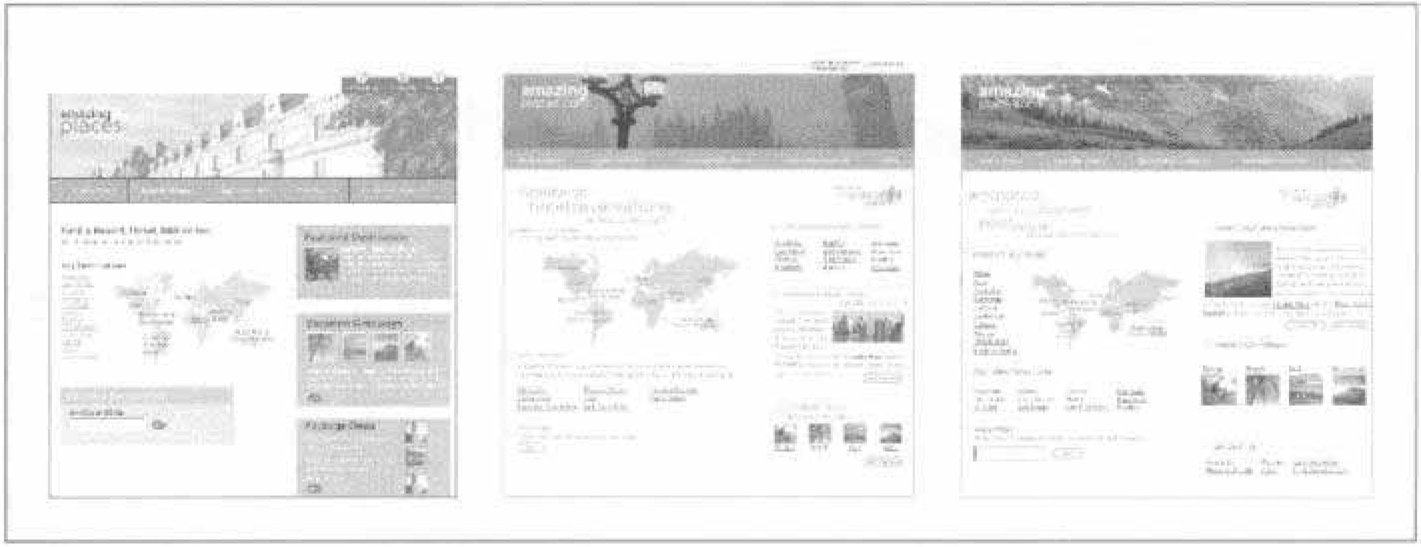
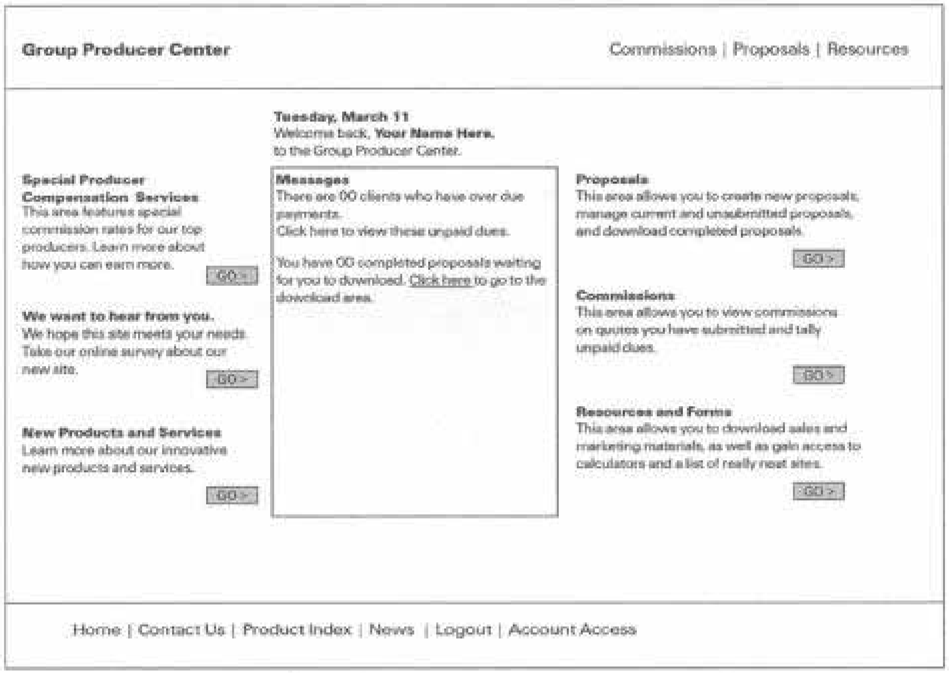


Figure 1.9 A set of comps for the home page of PlacesToStay.com. Comps are used to explore different layouts, graphics, and visual emphasis. Unlike this example, some comps use nonsense words for text and links.

What Paper Prototyping Isn't

- Wireframes
  - Defines layout for a website, showing where content goes
  - Early planning states for layout and navigation
  - **Lacking realistic content to determine user's understanding**
    - Major areas designated but don't contain any content


Group Producer Center
Commissions | Proposals | Resources
GO >
GO >
GO >
GO >
GO >
GO >
Home | Contact Us | Product Index | News | Logout | Account Access

Tuesday, March 11
Welcome back, **Your Name Here.**
to the Group Producer Center.

Special Producer Compensation Services
This area features special commission rates for our top producers. Learn more about how you can earn more.

We want to hear from you.
We hope this site meets your needs. Take our online survey about our new site.

New Products and Services
Learn more about our innovative new products and services.

Messages
There are 00 clients who have over due payments.
Click here to view these unpaid dues.

You have 00 completed proposals waiting for you to download. Click here to go to the download area.

Proposals
This area allows you to create new proposals, manage current and unsubmitted proposals, and download completed proposals.

Commissions
This area allows you to view commissions on quotes you have submitted and tally unpaid dues.

Resources and Forms
This area allows you to download sales and marketing materials, as well as gain access to calculators and a list of really neat sites.

Figure 1.10 A wireframe shows the layout of a Web page, but often the content is represented by nonsense words.

What Paper Prototyping Isn’t

- Storyboards
  - Series of drawings or images that represent how an interface is used to accomplish a particular task
  - More high-level and conceptual and used to understand work flow and interface support
  - **Users can’t interact**

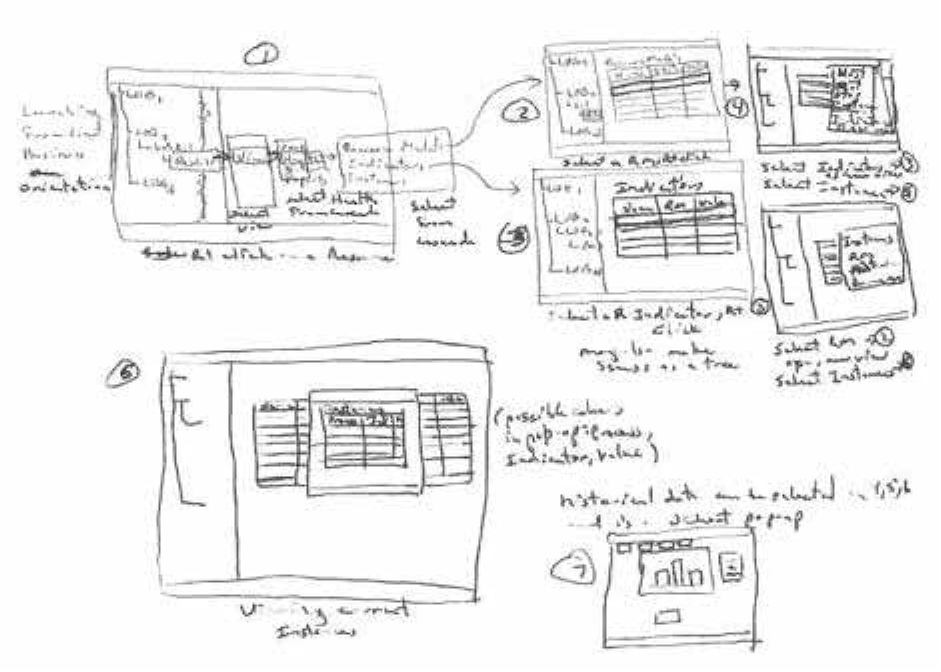


Figure 1.11 A hand-sketched storyboard used by developers to work out a sequence of screens. The annotations explain choices the user makes or processing done by the system.

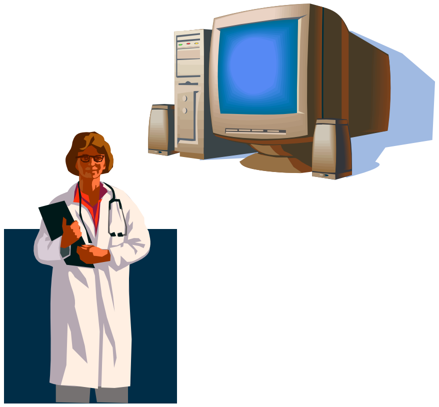
Pros and Cons

- There are many advantages to paper prototyping
  - Fast way to mock up an interface — no coding required
  - Finds a wide variety of problems in an interface, including many of the serious ones
  - Allows an interface to be refined based on user feedback before implementation begins
  - A multidisciplinary team can participate
  - Encourages creativity from the product team and users alike

- On the other hand, paper prototyping
  - Doesn't produce any code
  - Does not find all classes of problems with an interface
  - Can affect the way users interact with the interface
  - Makes some development teams nervous because they fear users will think it unprofessional
  - Has stronger benefits in some situations than in others

Terminology

- Computer, computer
  - In paper prototyping, a human being simulates the behavior of a computer. To differentiate the silicon-based entities from the carbon-based ones, computer is the machine where Computer refers to the person simulating a computer



- Product, interface
  - Can be used interchangeably, intended as a term to encompass screens, help pages, manuals, training, hardware, packaging, etc.
- Product team, development team
  - Product team is anyone who works on the product and includes tech writers, marketing, training, and customer support. Anyone who has direct or indirect effect on the end user’s experience
  - Development team is someone who is making/testing/supporting something a user will come into contact with

Terminology

- Release
  - Moment when real users obtain the official version of the interface and start using it, could also be a launch, deployment, or rollout
- Screen
  - Generic term to mean any piece of the user interface (web page, LCD, dialog box, form, etc.)
- Test versus Study
  - Test refers to one session with a user
  - Study is a series of usability tests conducted over one to several days

Findings From Paper Prototype Usability Tests

- Usability issues
  - All the things you typically find in usability testing - confusing concepts, poor terminology, layout problems, lack of feedback, etc.
- Missing (or misspecificed) functional requirements
  - Users often have needs that the development team isn't aware of, or the team may have a mistaken assumption about what functionality will satisfy a user requirement.
- Preference for one design alternative
  - Sometimes there are multiple ways to provide a function and they're equally easy to implement.
  - Users may have a clear preference for one way over another.

Findings From Paper Prototype Usability Tests

- Priorities
  - No company has unlimited resources — paper prototyping can separate the gotta-haves from the nice-to-haves.
- Issues outside the user interface
  - A product is more than just a user interface.
  - The brand and the company's reputation are important, as is the context in which the product will be used.
  - Paper prototypes are often sufficiently realistic that they encourage test participants to extrapolate to real-world situations of use.
  - Thus, they can uncover issues beyond the user interface.

Paper Prototyping Case Studies

- 1990s Walker Digital preparing to launch new online service
  - Trying to figure out how unique method of selling airline tickets would work

- Wanted to find out if average people
  - Understood the service
  - Willing to use it

- Without consumer acceptance, business model won't succeed
  - Focus only on technical challenges won't work

Paper Prototyping Case Studies

- Usability testing
  - Created paper prototype of site
  - 2 team member played “Computer”
  - 2 days of testing
  - 7 users who fit client profile
  - Performed various ticket-purchasing scenarios

Important Usability Issues Found (three show stoppers)

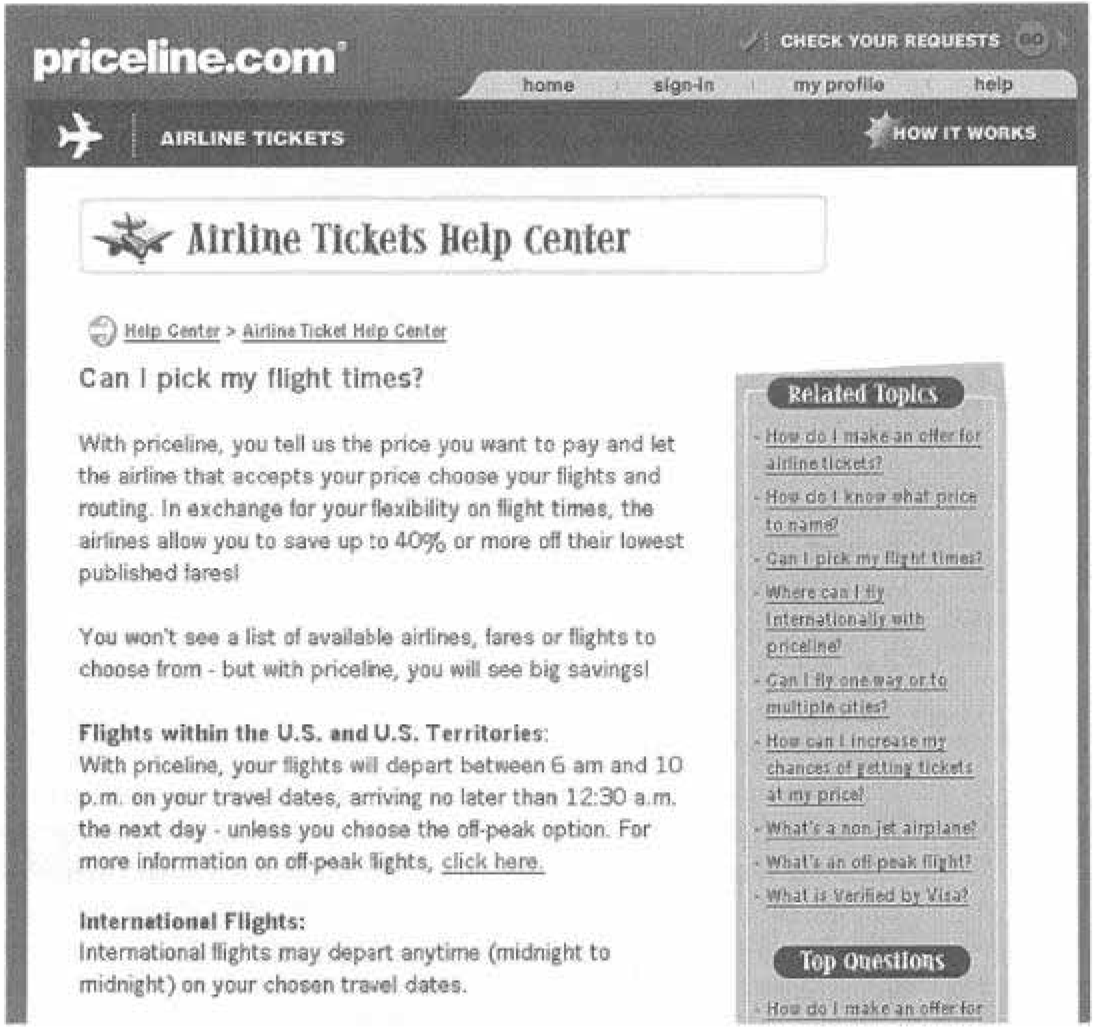
- Asking for email to enter the site met with complete resistance
- The site had to establish credibility before people were willing to transact
- Three days was too long to wait for an answer

Unimportant Usability Issues

- People didn’t need to see the probabilities of getting a ticket; they were going to do their homework
- People understood the concept of submitting a binding offer. They had some questions but understood what the site was offering them and how it might benefit them.

Paper Prototyping Case Studies

- 2002 Screen shot



Can I pick my flight times?

With priceline, you tell us the price you want to pay and let the airline that accepts your price choose your flights and routing. In exchange for your flexibility on flight times, the airlines allow you to save up to 40% or more off their lowest published fares!

You won't see a list of available airlines, fares or flights to choose from - but with priceline, you will see big savings!

Flights within the U.S. and U.S. Territories:
With priceline, your flights will depart between 6 am and 10 p.m. on your travel dates, arriving no later than 12:30 a.m. the next day - unless you choose the off-peak option. For more information on off-peak flights, click here.

International Flights:
International flights may depart anytime (midnight to midnight) on your chosen travel dates.

Related Topics

- How do I make an offer for airline tickets?
- How do I know what price to name?
- Can I pick my flight times?
- Where can I fly internationally with priceline?
- Can I fly one way or to multiple cities?
- How can I increase my chances of getting tickets at my price?
- What's a non jet airplane?
- What's an off peak flight?
- What is Verified by Visa?

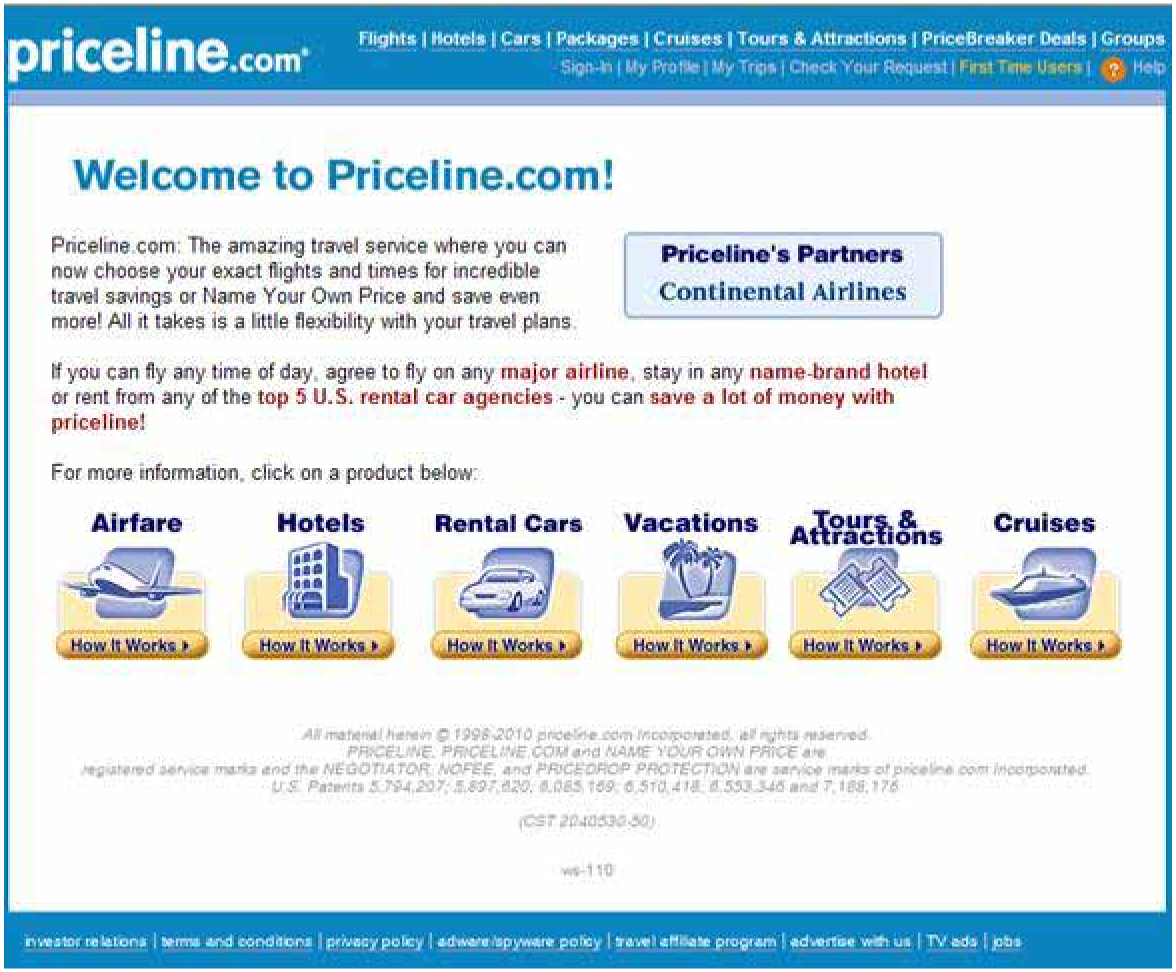
Top Questions

- How do I make an offer for

Figure 2.5 This page from Pricelie.com, April 2002, explains the trade-off between flexibility and ticket cost – a question that came up in paper prototyping testing 5 years earlier, before the site had even launched. Also note, the explicit mention that Priceline doesn't show flights, which at least prevents users from continuing to search for this information.

Paper Prototyping Case Studies

- 2010 Screen shot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Paper Prototyping Case Studies

- Not a new concept, idea around for decades
  - What did we do before GUIs?

- 1971, NCR: Postal Mail Sorting Machine
  - Mail sorting done by hand, NCR wanted to partially automate process
  - Postal worker read zip code and key it in so machine route properly
  - Should envelope appear vertical or horizontal?
    - Is it faster to move eyes left to the next envelope or up to the next envelope?
    - Hypothesis – horizontal is faster, it's like reading
  - Prototype using foam board and stiff paper
    - Envelopes shifted manually, user pressed buttons to indicate which way to go
    - Result – vertical is faster, addressed are compressed more vertically

Paper Prototyping Case Studies

- 1974, Xerox: Stenographic Translator
  - Color-screen editing station for computer-translated court reporter notes
  - Users would have to navigate between multiple screens which change while the user edited text
- Prototyping
  - 250 pages of screen drawings
  - Stenographer instructed on how device would work and asked to perform several tasks
    - Bringing up notes, editing them, adjusting the steno's "profile", printing
  - Experimenter flipped between pages
- Results
  - Complete user interface designed, tested, refined in 4 weeks
  - Stenographers using 12 beta machines able to quickly learn and use them for creating transcripts

Making a Paper Prototyping

Chapter 4

Creating a Background

- Helpful to create background that goes underneath prototype
  - Help orient users that they are looking at a computer screen or electronic display
  - Controls appear on every screen – no need to redraw, quick to change
  - Help define visible region (when parts are all over)
  - Screen real estate
  - Help with video taping (where to setup camera)

- If you have screen shots then you don't need a background

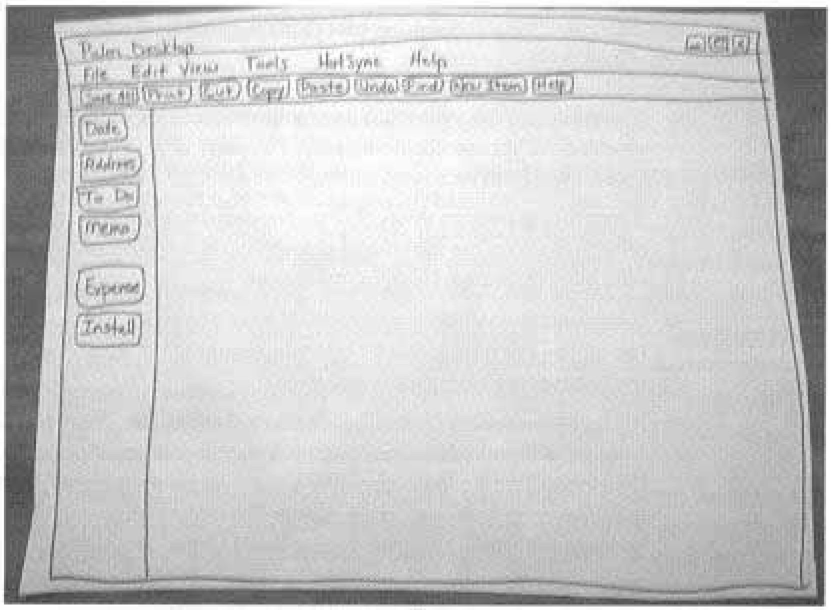


Figure 4.4 A background for a Windows application (the Palm Desktop) drawn on a large piece of paper. The menu bar, tool bar, and left-hand buttons appear on every screen. All other prototype pieces are placed on top of this background. Note that the toolbar icons have been replaced by their corresponding words.

Creating a Background

- Software Application Background
  - Use main window if interested in one application
  - Start with OS if interested in multiple apps, or test launching the app
    - Draw only enough of the familiar OS elements to orient users

- Browser Background
  - Version or brand isn't important
  - Use only most common buttons
  - You can start by telling users "You've opened your favorite web browser and typed in www.whatever.com"
  - Distinguish between multiple windows or one window with several boxes

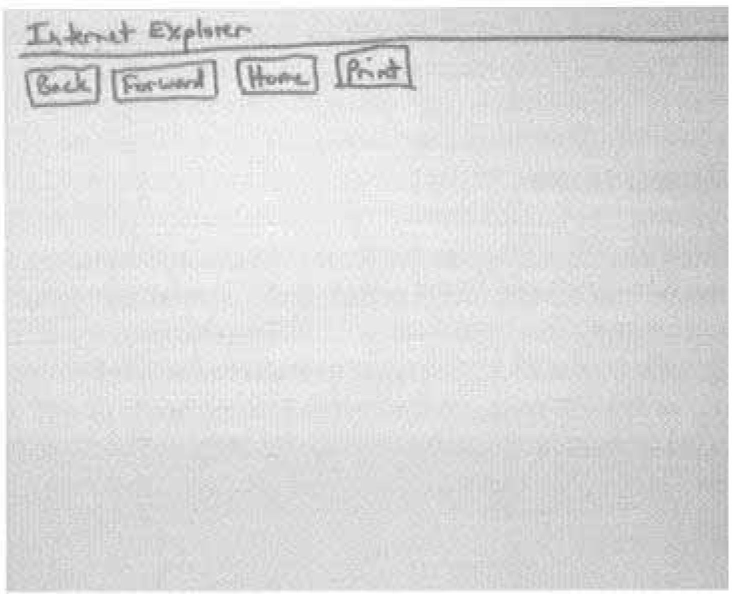


Figure 4.5 A background for testing a Web site can consist of just the most common browser buttons. The browser brand or version isn't important – this background says "internet Explorer" simply to inform users they're looking at a Web browser.

Creating a Background

- Small Screen Interfaces
  - When to incorporate display constraints?
    - Depends on what you are testing – functionality or layout
  - Many graphical packages available to create each screen, then print for testing
  - Blinder approach
    - Card with a drawing of device with a cutout where display is
    - Use grid or graph paper to accurately represent character/icon sizes

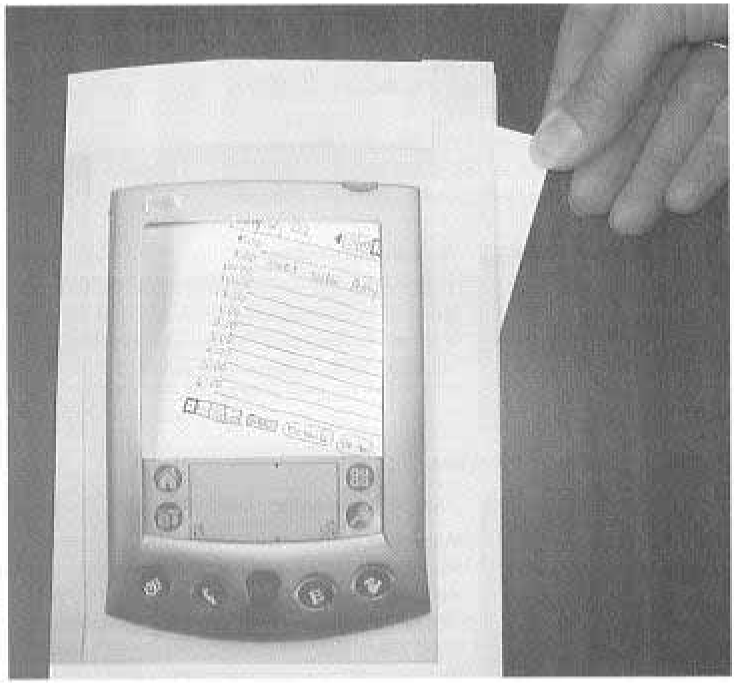


Figure 4.6 For a small-screen device where size constraints are important, you can make a blinder using a photograph of the device, somewhat larger than life. Use hand-drawn content on an appropriately sized grid for the display.

How to Prototype Widgets

- Need to create screens placed on top of the background

- Buttons and checkboxes
  - Removable tape
  - As user touches desired option, Computer moves or adds tape
  - Some users will do this themselves

- Tabbed dialog boxes
  - Metaphor for stacked of index cards
  - Prototype with a stack of index cards, using removable tape to make tabs
  - When user click on tab, move card to top of stack

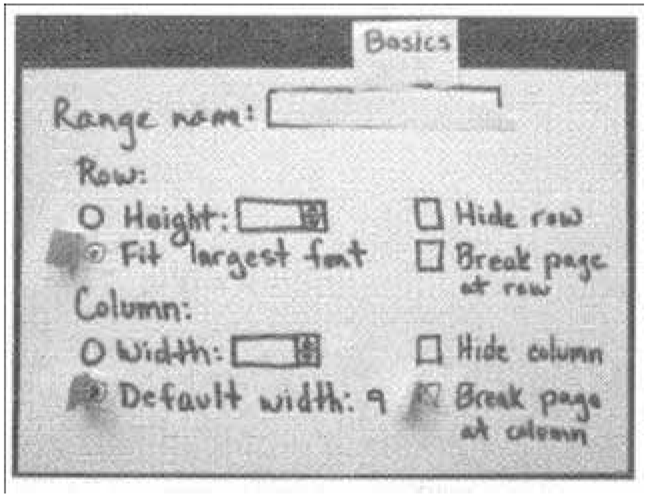


Figure 4.7 Radio buttons/checkboxes

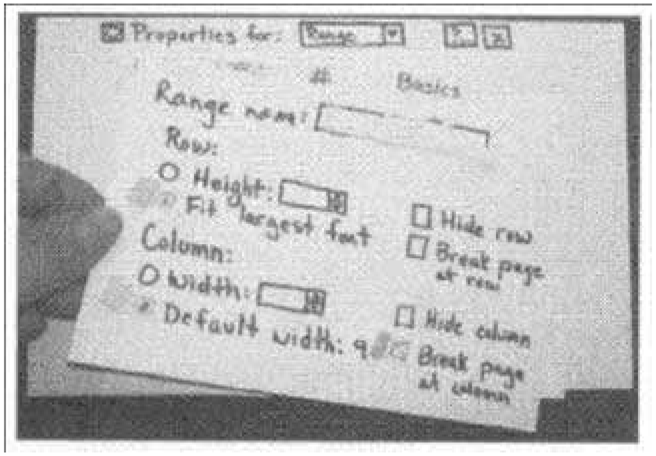


Figure 4.8 Tabbed dialog boxes

How to Prototype Widgets

- Text fields
  - User can write on removable tape
  - Computer can reuse later in interface
  - Transparency may be easier for larger forms
- Drop-down lists
  - Write default selection on prototype
  - Put rest of list on another paper
  - When user makes selection, Computer writes to a piece of removable tape and puts on top of default

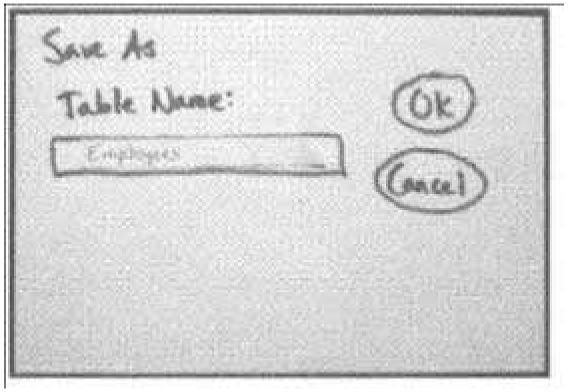


Figure 4.9 Text fields.

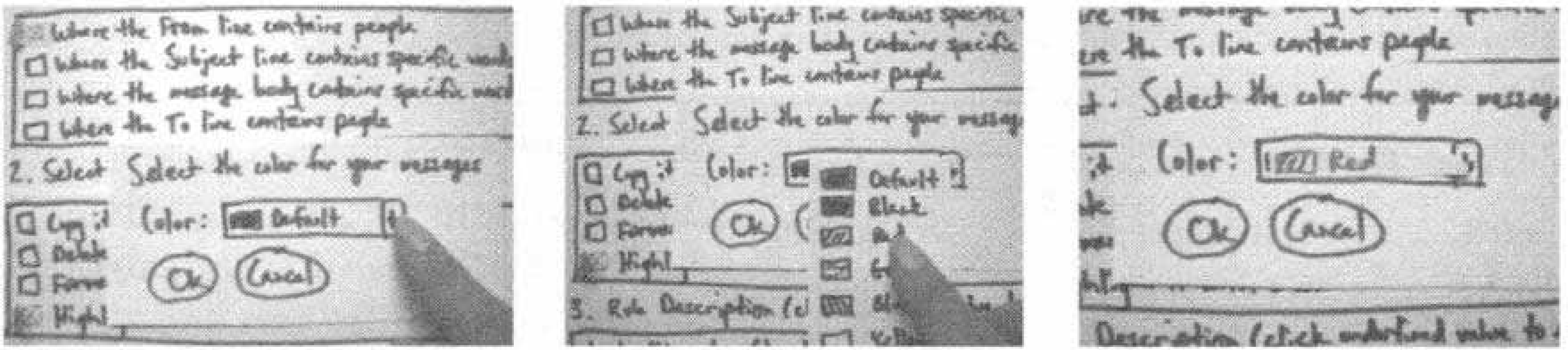

Where the From line contains people
Where the Subject line contains specific words
Where the message body contains specific words
Where the To line contains people
2. Select
Select the color for your messages
Color:
Default
Black
Red
Ok
Cancel
Copy
Delete
Forward
Highlight
3. Rule Description (click underlined value to

Figure 4.10 Drop-down lists.

How to Prototype Widgets

- Selection bar/highlight
  - Show which element is highlighted
  - Make a highlighted piece from transparency that's colored

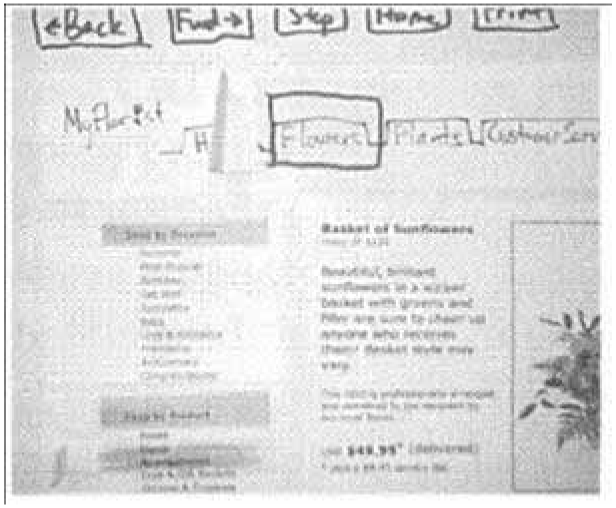


Figure 4.11 Selection bar/highlight.

- Expandable dialog boxes
  - Cover the expanded part with a blank paper or fold screen so additional options are not visible
  - When user clicks the button, remove paper or unfold screen
  - Change the button ("Less")

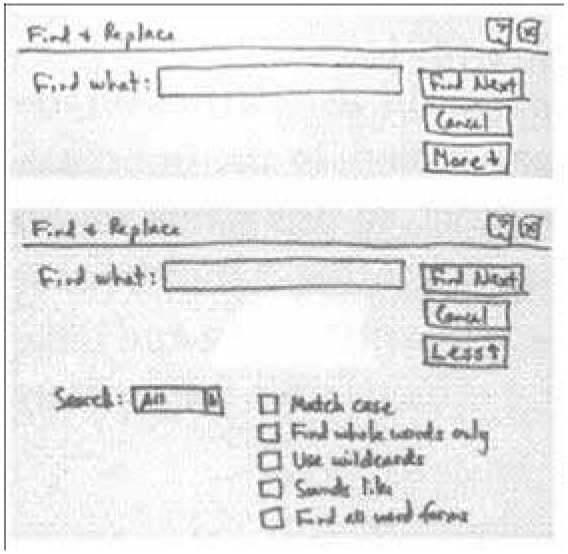


Figure 4.12 Expandable dialog boxes.

How to Prototype Widgets

- Expandable lists
  - Cut list into pieces and use tape so you can separate parts of list and add expanded portion
  - You don’t have to support all lists, your task definitions should indicate which options users want to expand

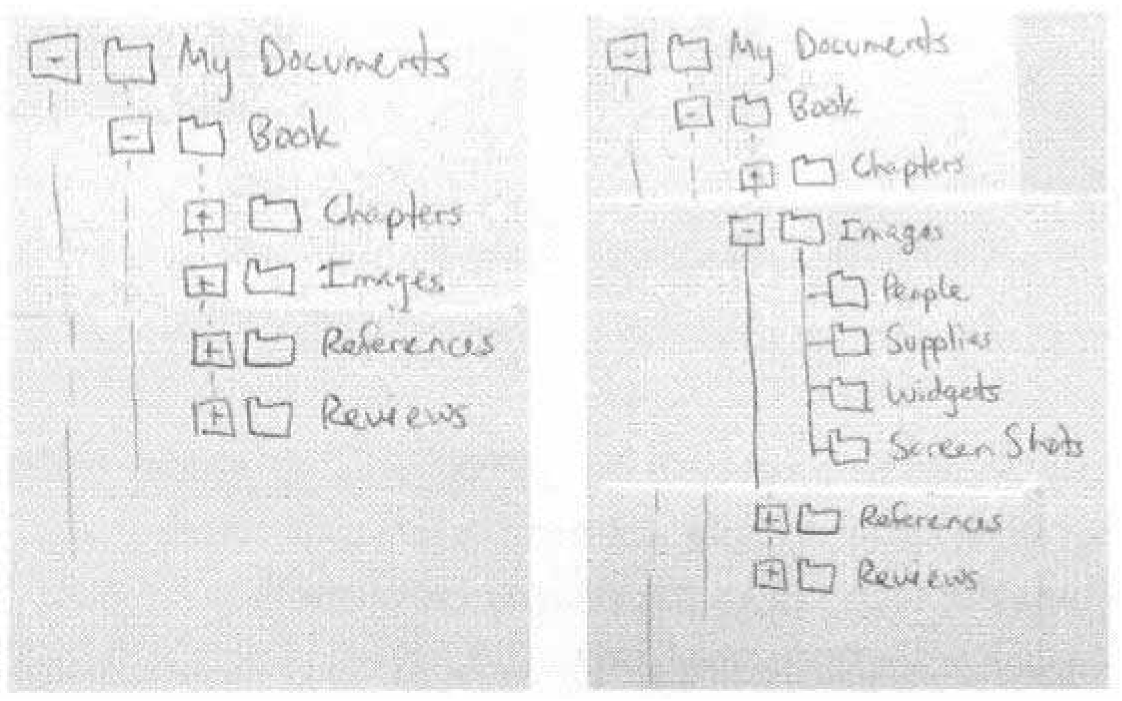


Figure 4.13 Expandable lists.

How to Prototype Widgets

- Disabled controls
  - Use a version with gray marker on removable tape and place it on the black text
  - Remove gray label when option is enabled

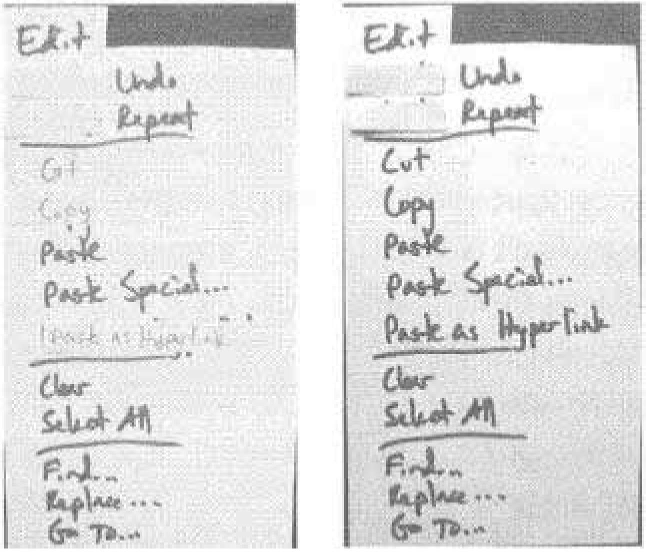


Figure 4.14 Disabled ("grayed-out") controls.

- Cursors
  - Arrows and I-beams not necessary
  - What if cursor convey information
    - Draw then on small paper and put on interface as cue to user

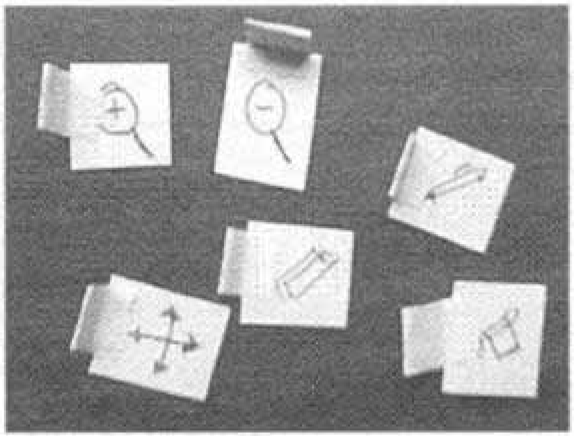
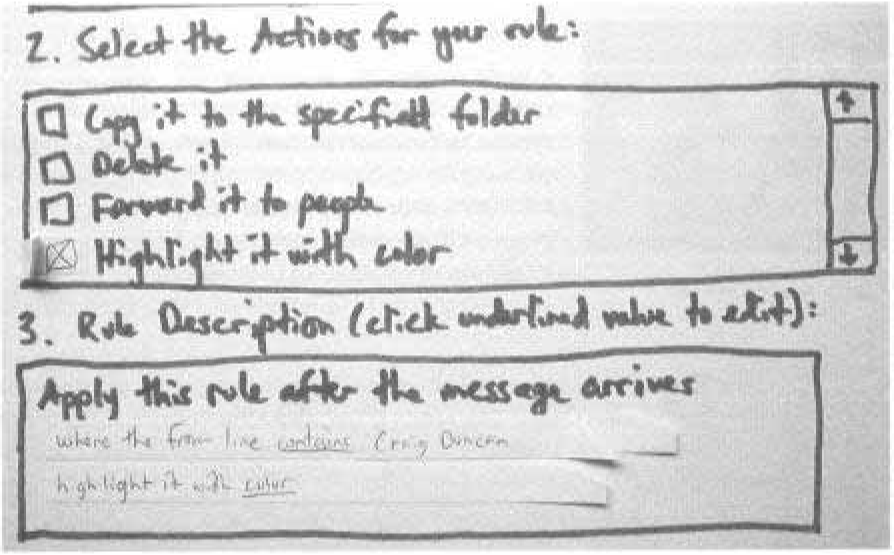


Figure 4.15 Cursors.

Representing the User’s Choice

- Is it important to accurately track the user’s choices?
  - Cognitive effort high if user/Computer/observers has to remember
  - Makes task harder
- Mail filtering example
  - Start with “where the from line <u>contains people</u>”
  - Click on link, select name from address book
  - Computer replaces with user selection, now entry says “where the from line <u>contains </u>Craig Duncan”



2. Select the Actions for your rule:

□ Copy it to the specified folder
□ Delete it
□ Forward it to people
☒ Highlight it with color

3. Rule Description (click underlined value to edit):

Apply this rule after the message arrives
where the from line contains Craig Duncan
highlight it with color

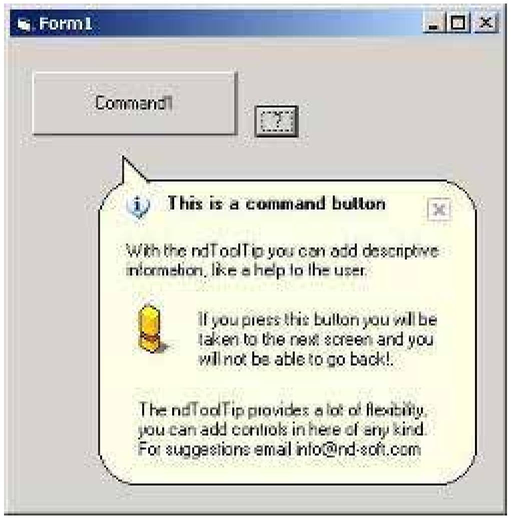
Figure 4.16 As the user specifies each component of the mail filtering rule, the Computer writes it on pieces of removable tape so that all the user’s actions, in the sequence they happened, are shown in the interface

Simulating Interaction

- Many aspects of HCI can be simulated by human to get feedback
  - Complex or subtle interaction can’t be simulated perfectly and may be a drawback of paper prototyping

- Tooltips/mouseovers
  - Tell user final version will support tooltips
  - If user wants to see tool tip, point and ask “What is this” and them what it would say

- Rollover/pop-up menus
  - Harder to simulate, most users will click on menu drop down and click to make selection
  - May still have problems with rollover menus



This is a command button

With the ndToolTip you can add descriptive information, like a help to the user.

If you press this button you will be taken to the next screen and you will not be able to go back!.

The ndToolTip provides a lot of flexibility, you can add controls in here of any kind. For suggestions email info@nd-soft.com

Simulating Interaction

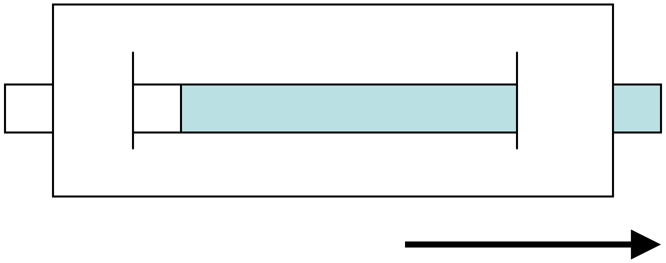
- Beeps
  - Say “beep”

- Drag & Drop
  - Most user don’t try in unfamiliar interface
  - Ask users to specify what they are dragging and where they are dropping
  - Computer can talk through the visual change that takes place

- Right mouse menus
  - Tell users at start that right mouse menus exists
  - If they want to see one they should tell you

Simulating Interaction

- Sliders, progress indicators
  - Can be done verbally
  - Cut two slits in piece of paper and use a strip for the slider



- Animation and video
  - Simulating rapidly changing images not feasible
  - Use video player to show video
- Web site links
  - Tell users if they are not sure if something is a link, point and ask
- Scrolling
  - Fold paper so users don't see what's below, unfold when user scrolls
  - Cutout in large cardboard, slide page up/down as user "scrolls"

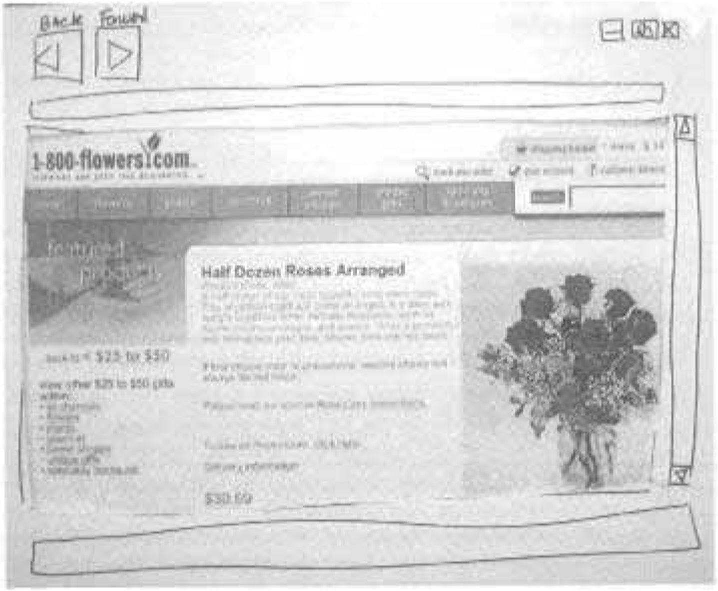


Figure 4.17 It's usually not necessary to get fancy about simulating scrolling, but if you need to do it you can use a cutout and move the scrolled piece behind it.

Beyond Computer Screens – Incorporating Other Elements

- Interface not limited to screen, it's everything user interacts with during process of accomplishing goal
  - Printed manuals, online help, hardware devices, human beings, knobs, buttons

- Hardware Props
  - Tape backup system
    - Provide blank tape
    - Make "Whirr!" noise when drive making funny noises
  - Portable MP3 Player
    - Know when connected to computer to complete functions or on device itself

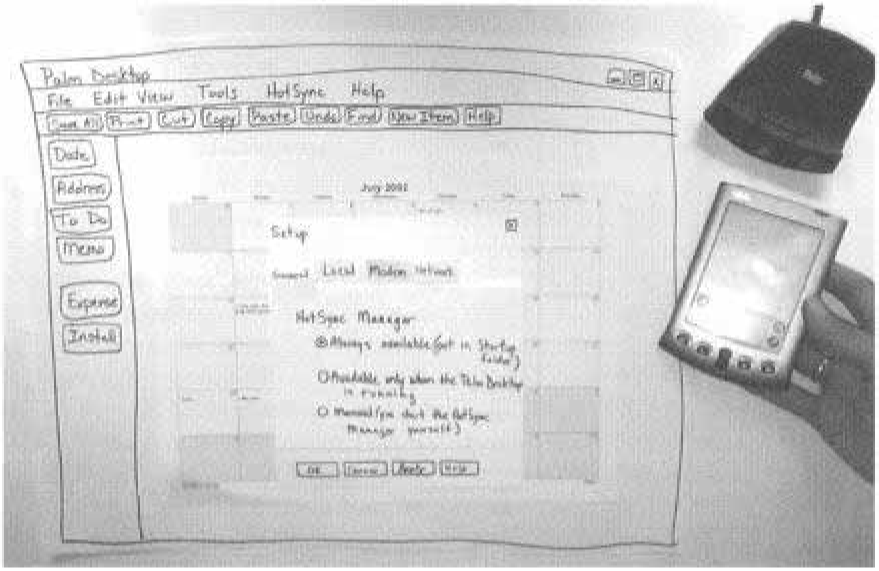

Palm Desktop
File Edit View Tools HotSync Help
Save All Print Cut Copy Paste Undo Find New Item Help
Date
Address
To Do
Memo
Expense
Install
July 2001
Setup
Local Modem
HotSync Manager
Always available
Available only when the Palm Desktop is running
Manual
OK

Figure 4.18 If a software interface works in conjunction with a hardware device, you can set it on the table and have users interact with it as part of the prototype.

Beyond Computer Screens – Incorporating Other Elements

- Hardware Devices
  - Interaction can be with a piece of equipment
  - Instrument panels, medical equipment, consumer appliances

  - “Paper” prototype includes cardboard, Fome-Cor, or other materials to create 3D prototype

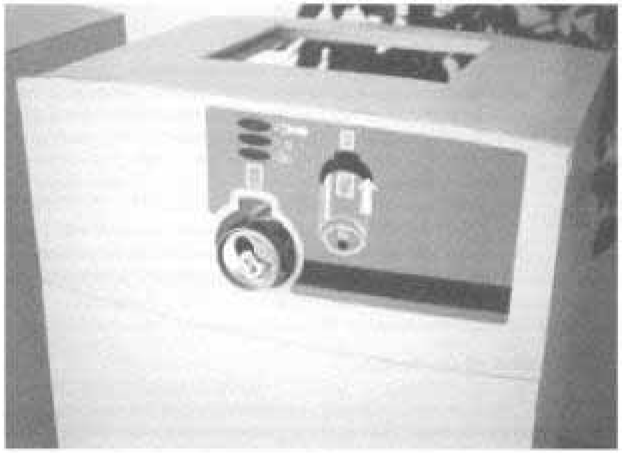
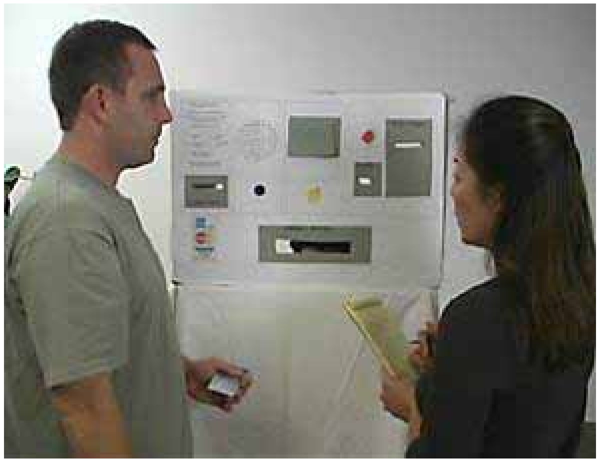
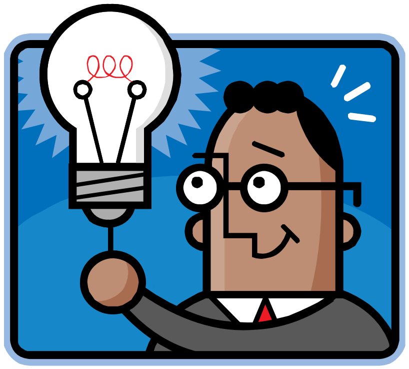


Figure 4.19 The mock-up of the manual version of the can recycling machine. In testing, a visible researcher stood behind the machine to accept or reject each can while another used color pieces of paper to simulate the indicator lights.



Beyond Computer Screens – Incorporating Other Elements

- “Incredible Intelligent Help”
  - Used before online help or print documentation developed
  - Help refine help manuals as well as interaction
  - How to implement
    - Facilitator prompts user to ask question when they are confused
    - “Help System” gives terse answer to see if it solves the problem
    - If user still confused, ask another question and get more details
  - Outcome
    - What was missing piece of information
    - Incorporate in interface and/or documentation



Beyond Computer Screens – Incorporating Other Elements

- Human Actors
  - Human may be part of interaction, talk to service rep
  - Designate a person on team to play role, but they can't look at the interface in testing (as in real life)

Preparing the Paper Prototype

Chapter 7

Introduction

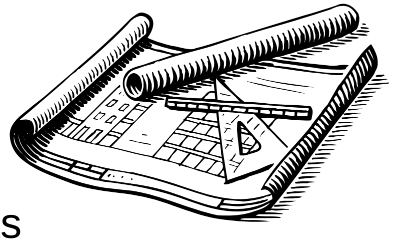
- Create the paper prototype and now prepare for usability testing by doing walkthroughs

- List piece needed for task
  - Which screens are needed to support tasks?
  - Example – browser window, homepage, login, create new accounts
  - Person making corresponding screen responsible for details like drop down menus, options, etc.

- Data
  - Users care about content, interface is a means to an end
  - Data should be realistic enough that users can interact with it in a meaningful way (especially with SMEs)

Hand-drawn versus Screen-shots

- How much do you expect it to change?
  - If no changes, why redraw
  - If many of the screens change, you don’t want hand drawn ones to stick out



- Which method is faster?

- Where is the data coming from?
  - If you have access to database, printing screen shots would be faster
  - If you have to make up data, it may be faster to draw

- Will the printouts be readable?

Tips for Hand-Drawn Prototypes

- Neatness doesn't count (much)
  - Be neat enough to read, but no neater
  - You'll probably have to change it, don't refine design until you test it

- Monochrome is okay
  - Color can't save an inherently flawed design
  - Add color and other visual refinement later

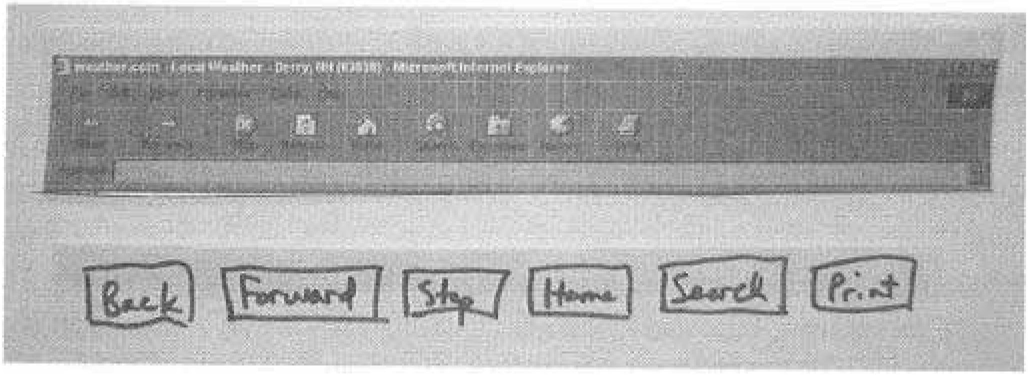


Figure 7.1 Two versions of browser buttons – one drawn by hand, and the other printed out. Notice that the hand-drawn buttons are easier to read.

Tips for Hand-Drawn Prototypes

- Size (usually) doesn't matter
  - If users write on prototype, field need to be large enough to accommodate
  - Larger prototype helps observers

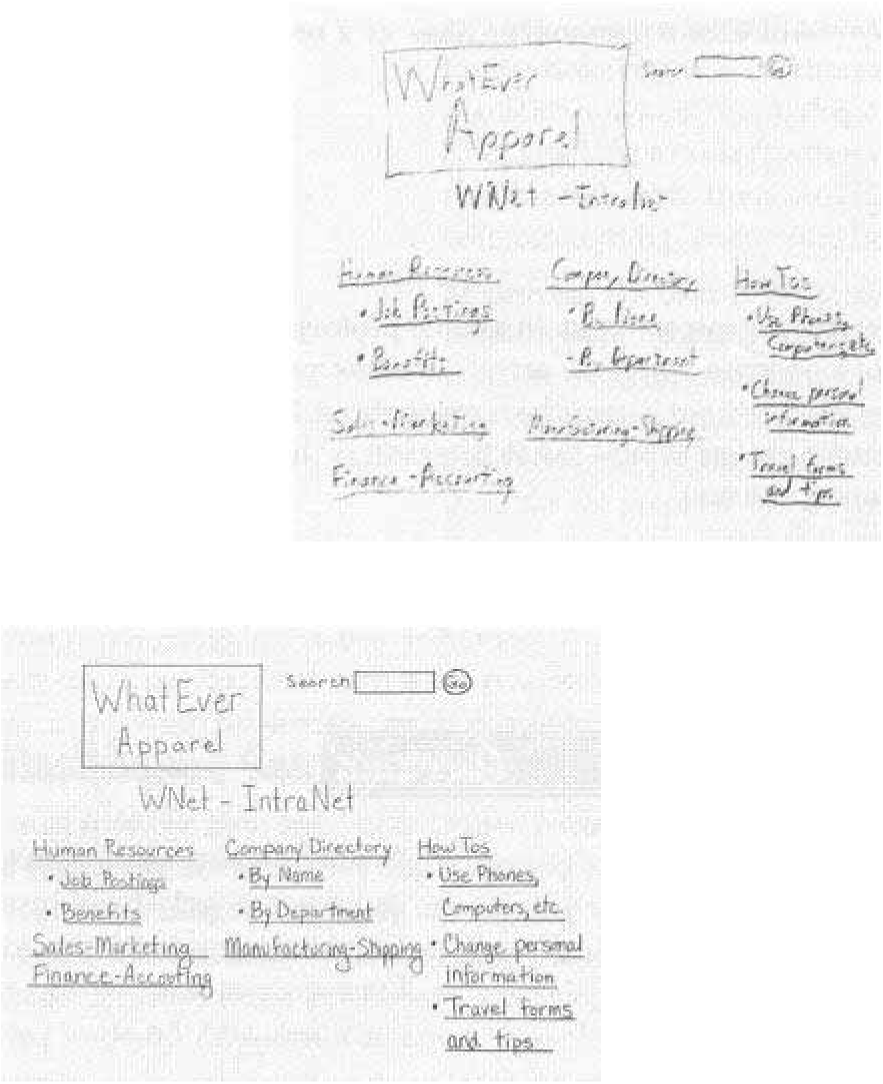


Figure 7.2 Although messy, the version on the top is legible enough to get user feedback. The extra time needed to create the neater version does not provide sufficient benefit to justify the effort.

Greeking and Simplification

- Greeking means to use nonsense words to represent text

- Why use greeking?
  - You haven’t finished designing the interface
  - Simplify parts of the interface you have no control over
  - Prevent users form getting drawn into the content

- Don’t overuse!
  - Greeking all menu items expect one you are testing – artificially makes task easy

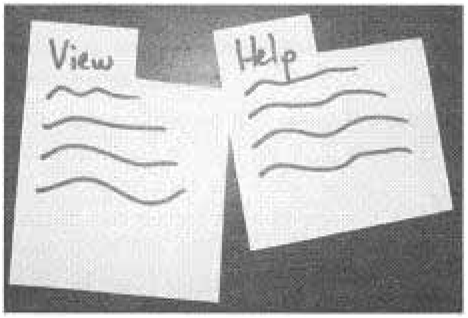


Figure 7.3 You can use greeking for parts of the interface that aren’t directly related to your tasks.

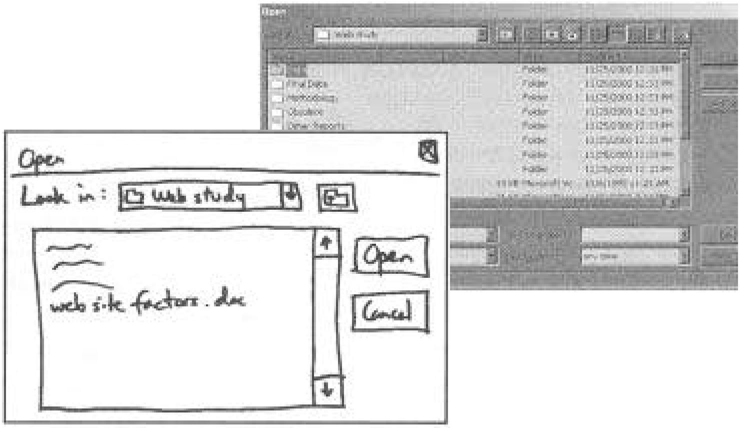


Figure 7.4 I usually used a simplified version of the File Open dialog box and greek the other files because we’re not testing the operating system or the file structure.

Using Screen Shots and Separating Elements

- Maybe you want to use screen shots
  - Enlarge so observers can see
  - Remove defaults
  - Clear link history (no clues!)

- Separate persistent elements
  - Tempted to print out screen shots, one for each permutation
  - If element changes, must change printouts
  - Cut up screens

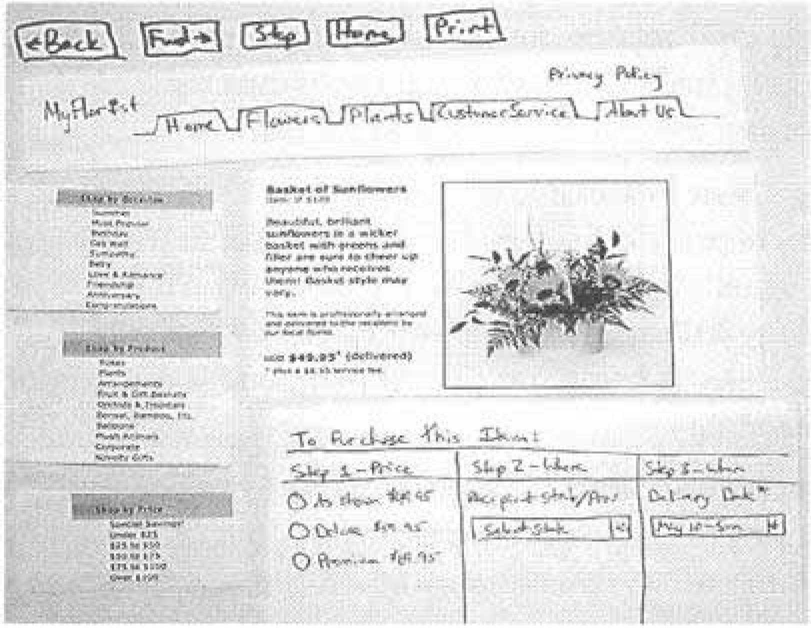
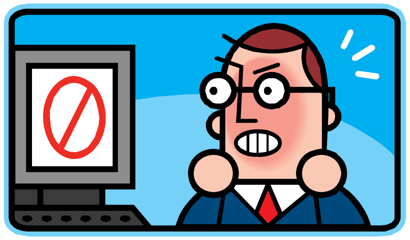


Figure 7.6 The Web page started out as a screen shot but was cut into pieces to facilitate site-wide changes. The revised tabs and ordering information (which were redrawn by hand in this example) can easily be used on every product page.

How Much to Prototype – Anticipating Paths and Errors



- Several ways to complete task, infinite number of ways to go wrong
- Prepare enough for reasonable action sequences
  - No necessary (not possible) to anticipate everything
- Prepare to handle likely errors
  - Possible to jot down error message during testing or just verbally say it
- Rule of thumb
  - 50% ready before first internal walkthrough
  - 80 to 90% ready before first usability test

Organizing the Prototype

- Messy business, need to organize pieces so Computer can quickly find next piece
  - Ordering ... not!
  - Table or three ring binder
  - Organization by task versus function
  - Use of envelopes
  - A “Gallery of Annoying Pieces”

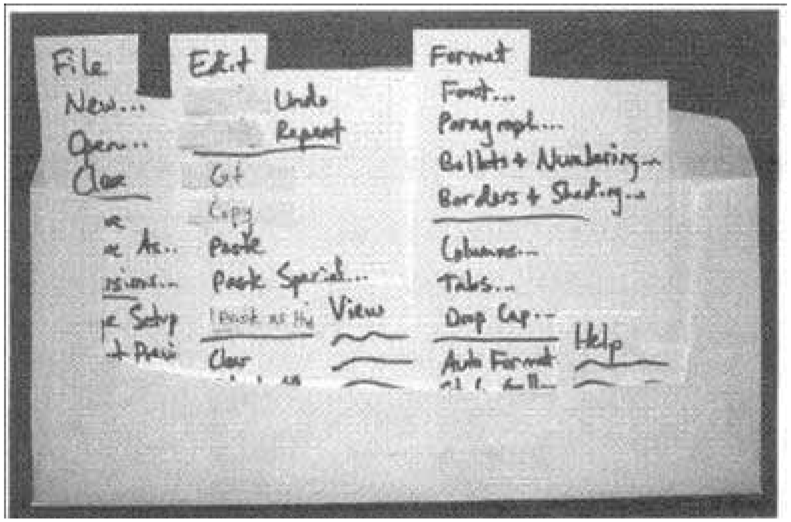


Figure 7.7 An envelope is a handy way to organize drop-down menus.

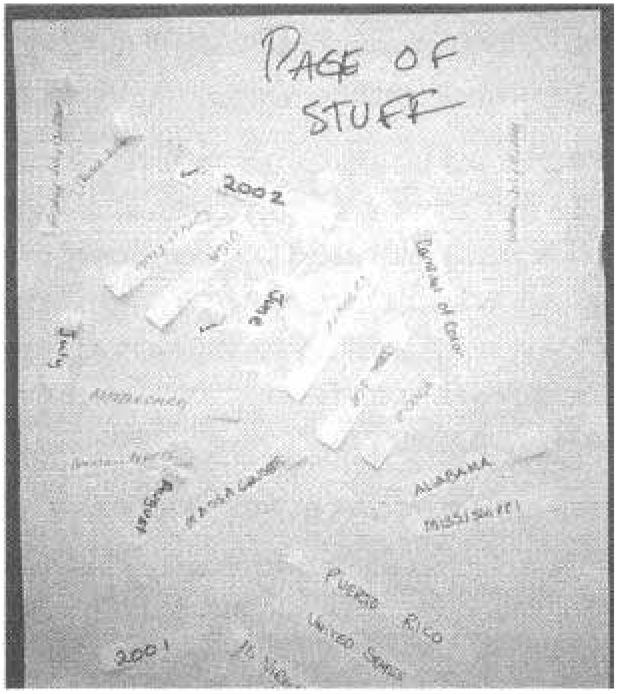


Figure 7.8 Give all those little sticky pieces a home so that they don’t end up stuck to your elbows during a usability test. I call this the “gallery of annoying pieces,” but this team their titled their version “Page of Stuff.”

Internal Walkthroughs

- Help product team prepare to conduct usability tests with the paper prototype

- Similar to usability test
  - You have prototype and tasks
  - BUT, no outside users. Team member act as expert user

- What should it do?
  - Identify parts of the prototype that still need to be created
  - Prepare for different paths user may reasonably take
  - See how interface is intended to work
  - Give the Computer time to practice manipulating those pieces of paper
  - Identify technical feasibility issues

Internal Walkthroughs

- How to do an internal walkthrough?
  - Computer
    - Person who organizes and manipulates the paper
    - May be more than one person
  - Expert User
    - Team member performing task
    - Do not make bizarre mistakes or other radical departures
  - Scribe
    - Writes down all of the missing pieces, issues, questions
    - Don’t stop to talk during walk through, discuss after
  - Facilitator
    - Not necessary, but it doesn’t hurt
    - Allow person to become familiar with function and behavior of interface – practice!

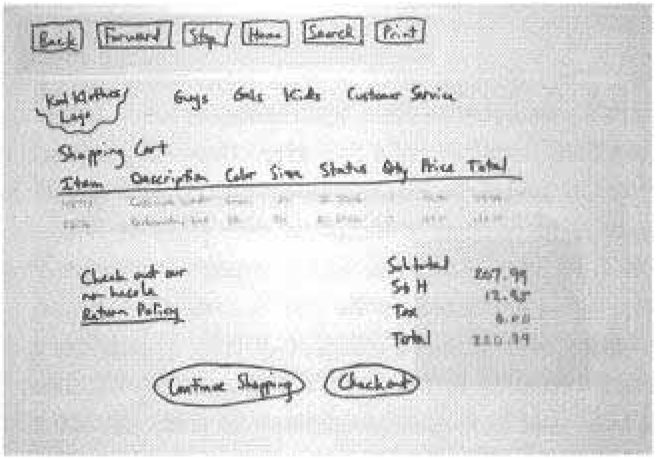


Figure 7.9 The Co-processor can help out by doing things such as writing the line items for the shopping cart based on what the user selects and recalculating the total.

The Final Walkthrough – the Usability Test Rehearsal

- Basically another internal walkthrough, with a few extra elements
  - Takes place the day before first usability test
  - Includes more people than just those who worked on the prototype
- Make sure everyone and the prototype are ready for usability testing
- Facilitator runs test as in usability test, but
  - Familiarize observers with the prototype
  - Collect people’s questions
  - Estimate task timing
  - Decide when you’ll intervene
  - Create a “game plan”

Pilot Tests

- Cross between a internal walkthrough and a usability test

- Purpose
  - Refine tasks and methodology used in the main tests
  - Usability test is to refine the interface

- Differences
  - Unlike walkthrough, bring in a representative user
  - Unlike usability test, as user to give feedback on tasks and instructions (no just do them)
  - Able to interrupt user and have discussion with teammates

Usability Tests

- Next time …
    - Now that we are prepared what do we do with all of our users?