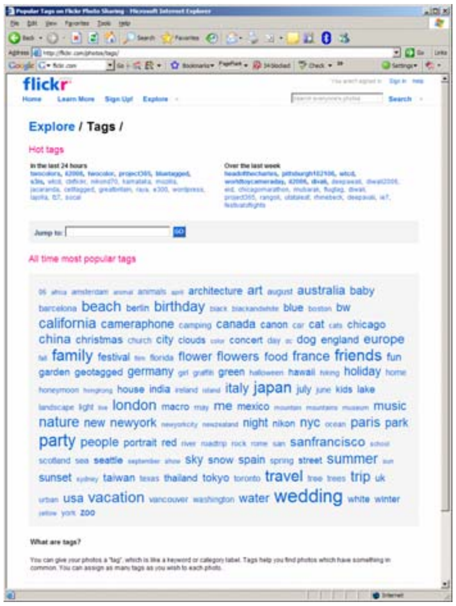
Qualitative Evaluation

CS160: User Interfaces
Maneesh Agrawala

Slides based on those of Francois Guimbretiere, James Landay and John Canny


Popular Tags on Flickr Photo Sharing - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://flickr.com/photos/tags/
Go Links
flickr
You aren't signed in Sign In Help
Home Learn More Sign Up! Explore
Search everyone's photos
Search
Internet

Explore / Tags /

Hot tags

In the last 24 hours
twocolors, 42006, twocolor, project365, bluetagged, s3is, wtcd, cbflickr, nikond70, karnataka, mozilla, jacaranda, celltagged, greatbritain, raya, e300, wordpress, lapolta, 67, socal

Over the last week
headofthecharles, pittsburgh102106, wtcd, worldtoycameraday, 42006, divali, deepavali, diwali2006, eid, chicagomarathon, mubarak, flugtag, diwali, project365, rangoli, utahbeat, rhinebeck, deepavali, ie7, festivaloflights

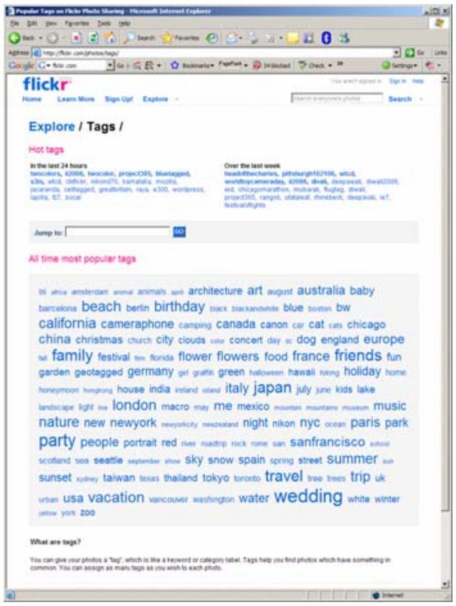
Jump to: GO

All time most popular tags

06 africa amsterdam animal animals april architecture art august australia baby barcelona beach berlin birthday black blackandwhite blue boston bw california cameraphone camping canada canon car cat cats chicago china christmas church city clouds color concert day dc dog england europe fall family festival film florida flower flowers food france friends fun garden geotagged germany girl graffiti green halloween hawaii hiking holiday home honeymoon hongkong house india ireland island italy japan july june kids lake landscape light live london macro may me mexico mountain mountains museum music nature new newyork newyorkcity newzealand night nikon nyc ocean paris park party people portrait red river roadtrip rock rome san sanfrancisco school scotland sea seattle september show sky snow spain spring street summer sun sunset sydney taiwan texas thailand tokyo toronto travel tree trees trip uk urban usa vacation vancouver washington water wedding white winter yellow york zoo

What are tags?

You can give your photos a "tag", which is like a keyword or category label. Tags help you find photos which have something in common. You can assign as many tags as you wish to each photo.


Popular Tags on Flickr Photo Sharing - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://flickr.com/photos/tags/
Go Links
Google flickr.com Bookmarks PageRank 34 blocked Check Settings
flickr
You aren't signed in Sign In Help
Home Learn More Sign Up! Explore
Search everyone's photos
Search
Jump to:
GO
Internet

Explore / Tags /

Hot tags

In the last 24 hours
twocolors, 42006, twocolor, project365, bluetagged, s3is, wtcd, cbflickr, nikond70, karnataka, mozilla, jacaranda, celltagged, greatbritain, raya, e300, wordpress, lapita, 67, socal

Over the last week
headofthecharles, pittsburgh102106, wtcd, worldtoycameraday, 42006, divali, deepavali, diwali2006, eid, chicagomarathon, mubarak, flugtag, diwali, project365, rangoli, utdatweat, rhinebeck, deepavali, ia7, festivaloflights

All time most popular tags

06 africa amsterdam animal animals april architecture art august australia baby barcelona beach berlin birthday black blackandwhite blue boston bw california cameraphone camping canada canon car cat cats chicago china christmas church city clouds color concert day dc dog england europe fall family festival film florida flower flowers food france friends fun garden geotagged germany girl graffiti green halloween hawaii hiking holiday home honeymoon hongkong house india ireland island italy japan july june kids lake landscape light live london macro may me mexico mountain mountains museum music nature new newyork newyorkcity newzealand night nikon nyc ocean paris park party people portrait red river roadtrip rock rome san sanfrancisco school scotland sea seattle september show sky snow spain spring street summer sun sunset sydney taiwan texas thailand tokyo toronto travel tree trees trip uk urban usa vacation vancouver washington water wedding white winter yellow york zoo

What are tags?

You can give your photos a "tag", which is like a keyword or category label. Tags help you find photos which have something in common. You can assign as many tags as you wish to each photo.

Pros

- See what's popular
- Context

Cons

- Tag meaning unclear
- No pictures
- Does tag ordering mean anything?

Low Fidelity Prototype

Pick up after class

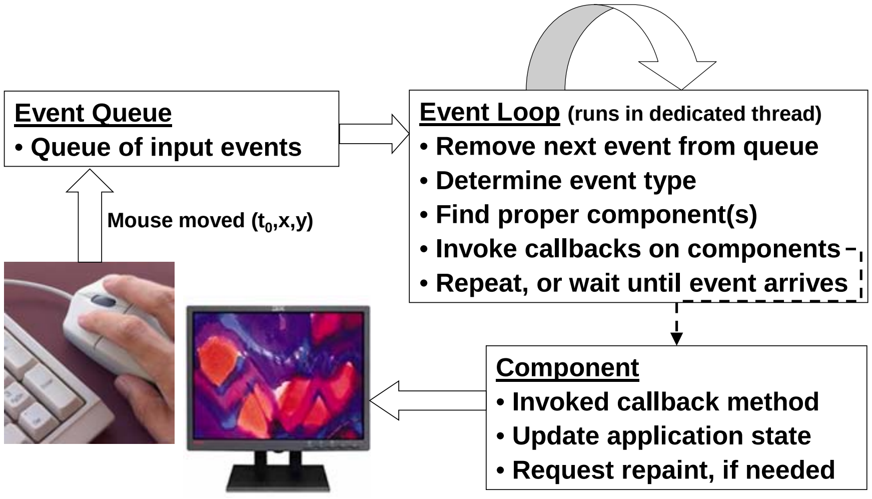
- Mean: 55.41
- Stdev: 3.02

Upcoming Schedule

Interactive Prototype (due Monday before class)

- Sign up for presentation time via email (by Thursday noon)
- Come to Soda 615 (my office for presentation)
- Make sure you have materials available for a demo
  - Talk to us if you need to demo on a lab machine
- Bring printout of report to your presentation

Review: Event-Driven UI



Event Queue
- Queue of input events

Event Loop (runs in dedicated thread)
- Remove next event from queue
- Determine event type
- Find proper component(s)
- Invoke callbacks on components
- Repeat, or wait until event arrives

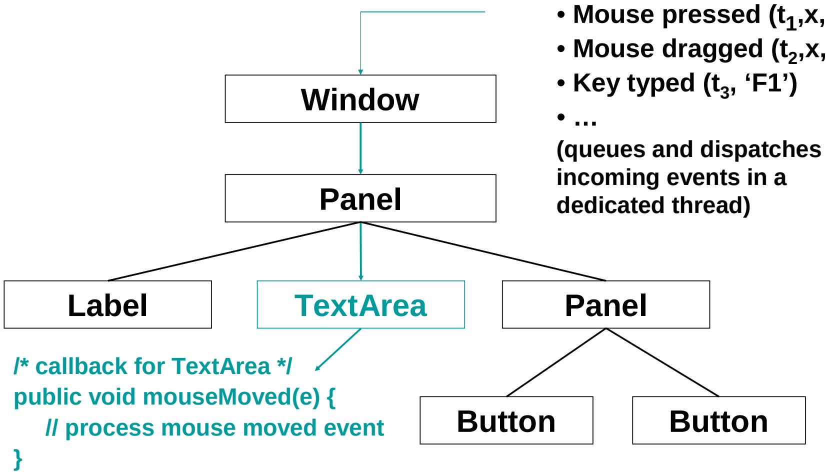
Component
- Invoked callback method
- Update application state
- Request repaint, if needed

Review: Event Driven UI

<u>Event Queue</u>

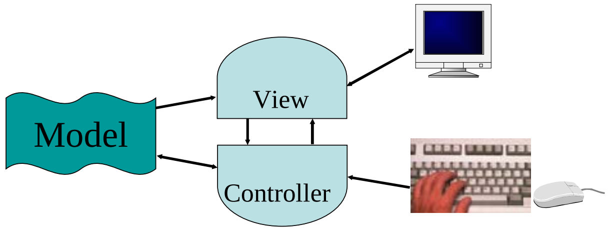
- Mouse moved (t_0,x,y)
- Mouse pressed (t_1,x,y,1)
- Mouse dragged (t_2,x,y,1)
- Key typed (t_3, ‘F1’)
- …

(queues and dispatches incoming events in a dedicated thread)

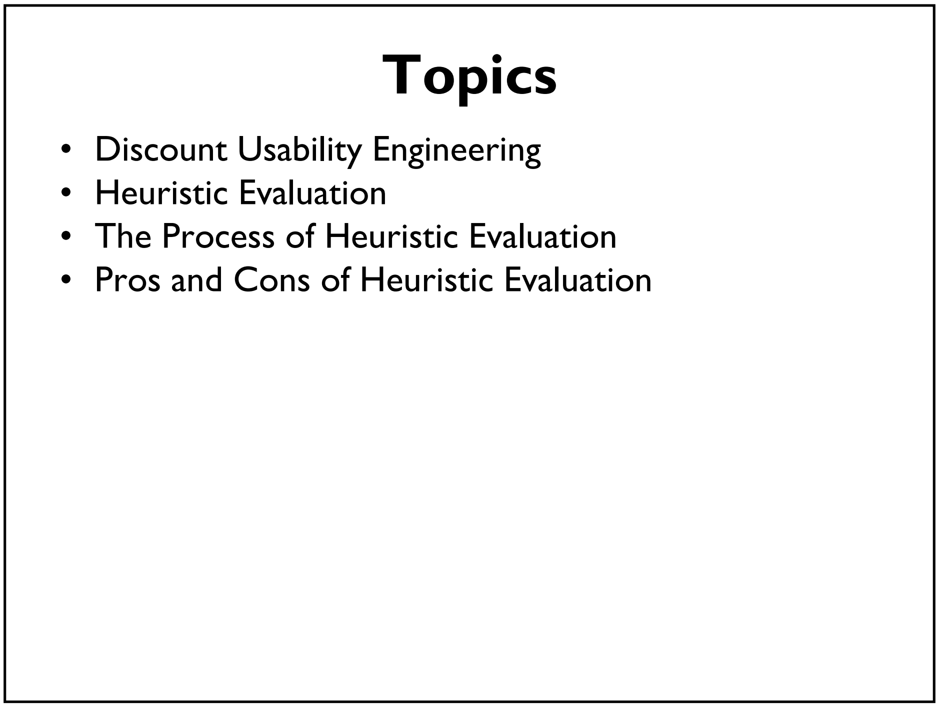


```
/* callback for TextArea */
public void mouseMoved(e) {
    // process mouse moved event
}
```

Review: Model View Controller

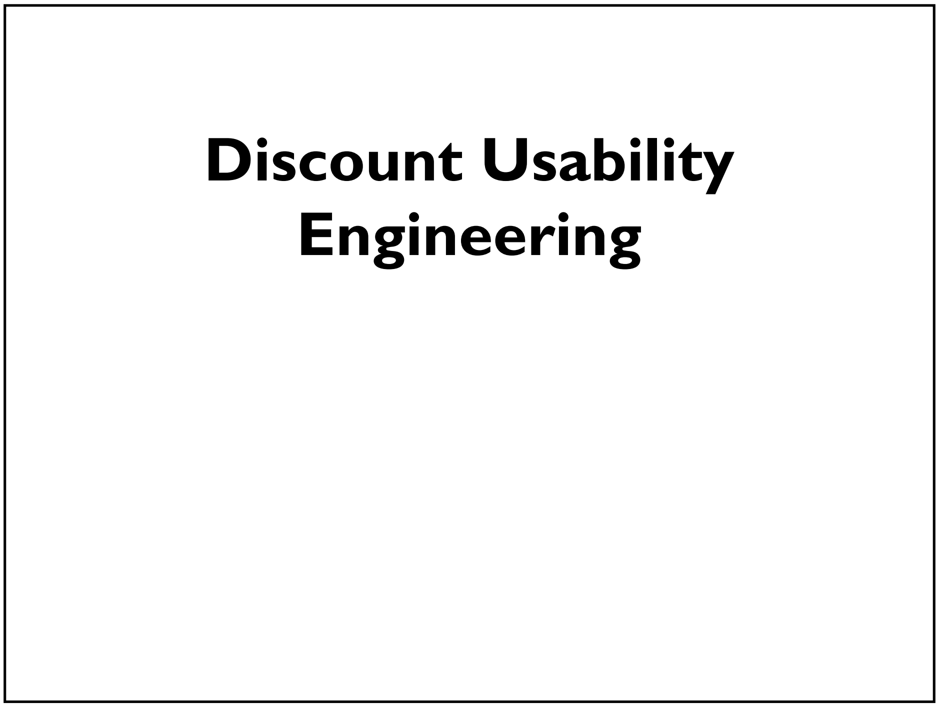


- Model – Information application manipulates
- View – Visual display of the model
- Controller – Receives and handles input from user



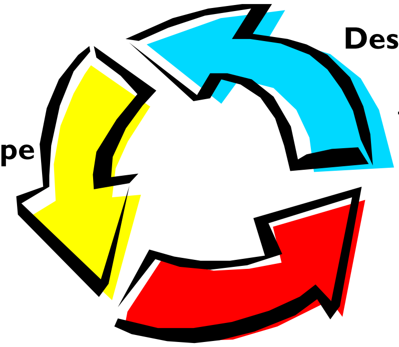
Topics

- Discount Usability Engineering
- Heuristic Evaluation
- The Process of Heuristic Evaluation
- Pros and Cons of Heuristic Evaluation



Discount Usability Engineering

Iterative Design



Design

Brainstorming
Task analysis
Contextual inquiry

Prototype

Low-fi, paper

Evaluate

Low-fi testing,
Qualitative eval
Quantitative eval

Discount Usability Engineering

Cheap

- No special labs or equipment needed
- The more careful you are, the better it gets

Fast

- On order of 1 day to apply
- Standard usability testing may take a week

Easy to use

- Can be taught in 2-4 hours

Quantitative Testing is Costly

Its very expensive – you need to schedule (and normally pay) many subjects.

It takes many hours of the evaluation team's time.

A user test can easily cost $10k's

Examples: Discount Usability Eng.

- Walkthroughs
  - Put yourself in the shoes of a user
  - Like a code walkthrough

Cognitive Walkthrough

Formalized technique for imagining user's thoughts and actions when using an interface

- Given detailed description of interface
- Select task
- Tell a story motivating user actions required to do task
- Interface should give motivations via prompts/feedback
- Breakdown in motivations imply problem with interface

Walkthroughs are difficult to do when tasks are ill defined and can be accomplished in many ways

Examples: Discount Usability Eng.

- Walkthroughs
  - Put yourself in the shoes of a user
  - Like a code walkthrough
- Action analysis
  - GOMS (add times to formal action analysis)
- ***Heuristic evaluation***

- Low-fi testing
- On-line, remote usability tests

Heuristic Evaluation

Usability Heuristics

"Rules of thumb" describing features of usable systems

- Can be used as design principles
- Can be used to evaluate a design

Example: *Minimize users' memory load*

Pros and cons

- Easy and inexpensive
  - Performed by experts
  - No users required
  - Catch many design flaws
- More difficult than it seems
  - Not a simple checklist
  - Cannot assess how well the interface will address user goals

Heuristic Evaluation

Developed by Jakob Nielsen (1994)

Can be performed on working UI or sketches

Small set (3-5) of evaluators (experts) examine UI

- Check compliance with usability heuristics
- Different evaluators will find different problems
- Evaluators only communicate afterwards to aggregate findings
- Use violations to redesign/fix problems

Original Heuristics

H1-1: Simple and natural dialog

H1-2: Speak the users' language

H1-3: Minimize users' memory load

H1-4: Consistency

H1-5: Feedback

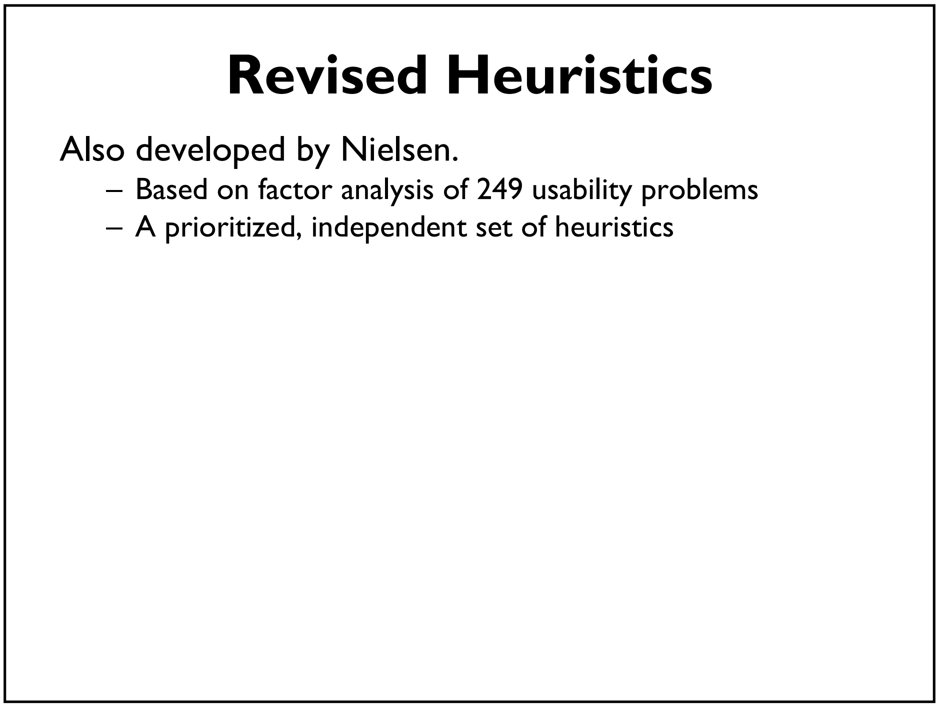
H1-6: Clearly marked exits

H1-7: Shortcuts

H1-8: Precise & constructive error messages

H1-9: Prevent errors

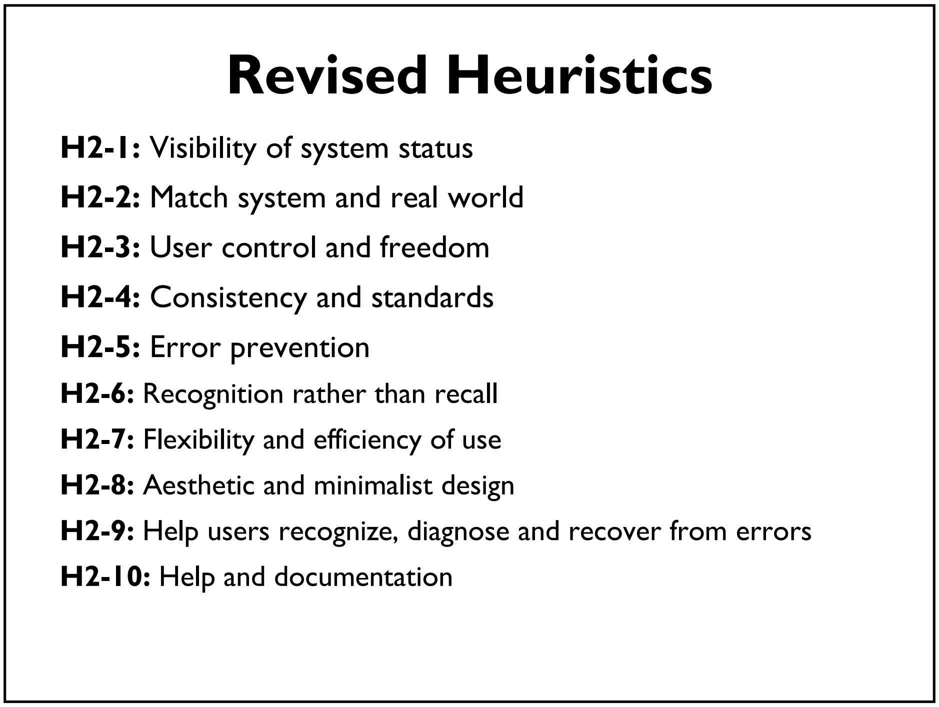
H1-10: Help and documentation



Revised Heuristics

Also developed by Nielsen.

- Based on factor analysis of 249 usability problems
- A prioritized, independent set of heuristics



Revised Heuristics

H2-1: Visibility of system status

H2-2: Match system and real world

H2-3: User control and freedom

H2-4: Consistency and standards

H2-5: Error prevention

H2-6: Recognition rather than recall

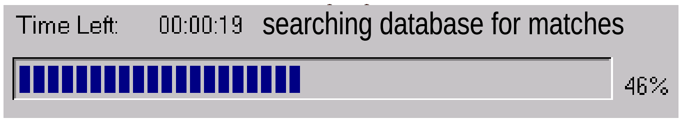
H2-7: Flexibility and efficiency of use

H2-8: Aesthetic and minimalist design

H2-9: Help users recognize, diagnose and recover from errors

H2-10: Help and documentation

Heuristic: Visibility (Feedback)



Time Left: 00:00:19 searching database for matches

46%

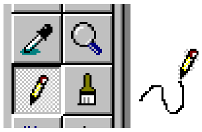
H2-1: Visibility of system status

- Keep users informed about what is going on
- Example: pay attention to response time
  - 0.1 sec: no special indicators needed
  - 1.0 sec: user tends to lose track of data
  - 10 sec: max. duration if user to stay focused on action
- Short delays: Hourglass
- Long delays: Use percent-done progress bars
  - Overestimate usually better

Heuristic: Visibility (Feedback)

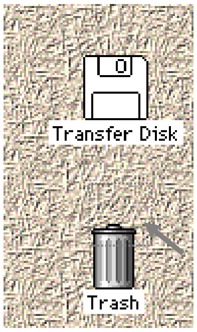
Users should always be aware of what is going on

- So that they can make informed decision
- Provide redundant information



Feedback: Toolbar, cursor, ink

Heuristics: Match System & World



H2-2: Match between system & real world

- Speak the users' language
- Follow real world conventions
- Pay attention to metaphors

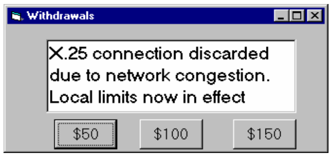
Bad example: Mac desktop

- Dragging disk to trash
- Should delete it, **not** eject it

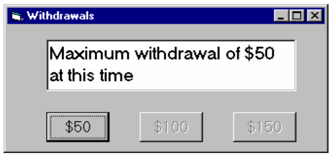
Heuristics: Match System & World

Speak the users' language (H1-2)

- Withdrawing money at ATM

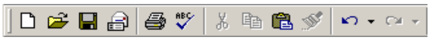


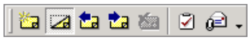
X.25 connection discarded due to network congestion. Local limits now in effect



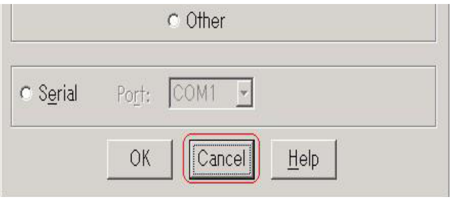
Maximum withdrawal of $50 at this time

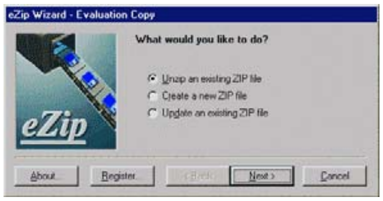
- Use meaningful mnemonics, icons and abbreviations





Heuristics: Control & Freedom




eZip Wizard - Evaluation Copy
eZip
What would you like to do?
● Unzip an existing ZIP file
○ Create a new ZIP file
○ Update an existing ZIP file
About...
Register...
< Back
Next >
Cancel

H2-3: User control & freedom

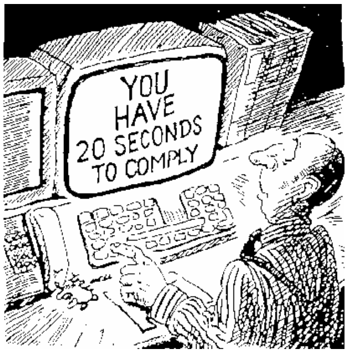
- "Exits" for mistaken choices, undo, redo
- Don't force down fixed paths like BART ticket machine…

Wizards

- Must respond to Q before going to next
- Good
  - For infrequent task (e.g. Internet Config)
  - Beginners (2 versions in WinZip)
- Not good
  - For common tasks

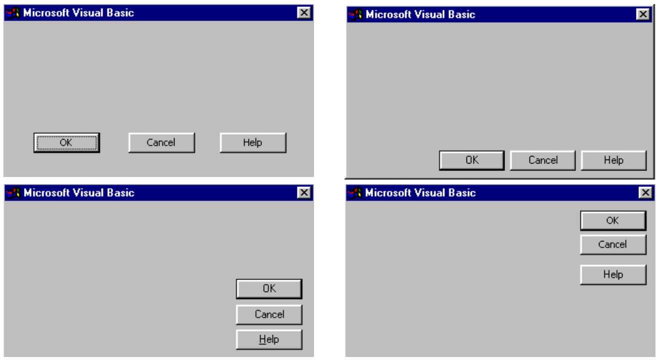
Heuristics: Control & Freedom

- Mark exits: Users don't like to be trapped!



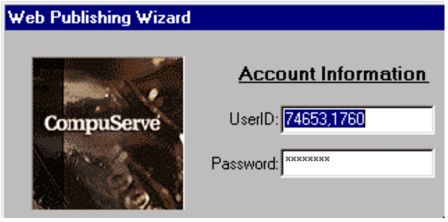
- Strategies
  - Cancel button (or Esc key) for dialog
    - Make the cancel button responsive!
  - Universal undo

Heuristics: Consistency



H2-4: Consistency and standards

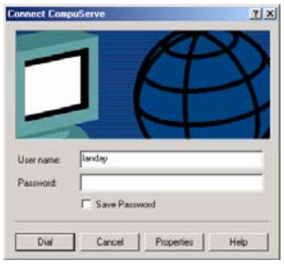
Heuristics: Errors and Memory



Account Information

UserID: 74653,1760

Password: xxxxxxxx



User name: landay

Password:

□ Save Password

H2-5: Error prevention

H2-6: Recognition rather than recall

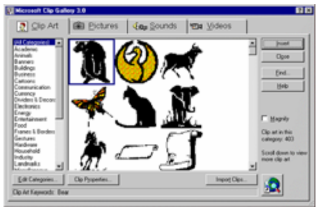
- Make objects, actions, options, & directions visible or easily retrievable

MS Web Publishing Wizard

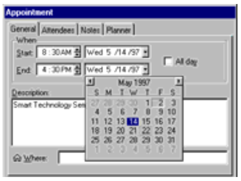
- Before dialing, asks for id & password
- When connecting, asks again for id & pw

Heuristic: Errors and Memory

- Promote recognition over recall
  - Recognition is easier than recall



- Describe expected input clearly
  - Don't allow for incorrect input



Start: 8 :30AM Wed 5 /14 /97
End: 4 :30PM Wed 5 /14 /97
Smart Technology Sem

May 1997

S	M	T	W	T	F	S
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

- Create orthogonal command systems
  - Using generic commands that can be applied to all interface objects

Preventing Errors

Error types

- Mistakes
  - Conscious decision with unforeseen consequences
- Slips
  - Automatic behaviors kicking in
    - Drive to the store, end-up in the office
    - Press enter one time too many…
  - Mode errors
    - Forget the mode the application is in
  - Loss of activation
    - Forget what your goals were

Forcing Functions

Interlock mechanisms

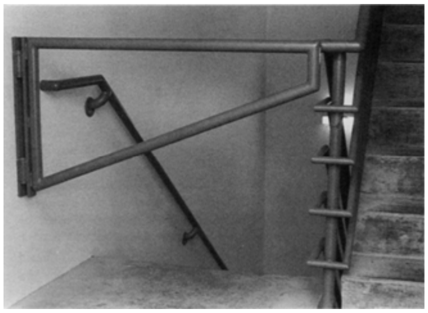
- – Switching from P to D in a car

Lockin mechanisms

- – No eject button for floppy disk on Mac

Lockout mechanisms

- – Exit stairways

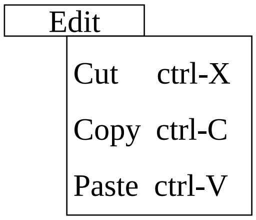


Dealing With Errors

People will make errors!

- – You can ignore them
  - Generally very confusing
- – You can correct them automatically
  - Spelling corrector
  - But will I trust the system to be right 100%
- – You can discuss about it
  - But novice/expert tradeoff
- – You can try to teach the user what to do
  - Office assistant

Heuristics: Flexibility



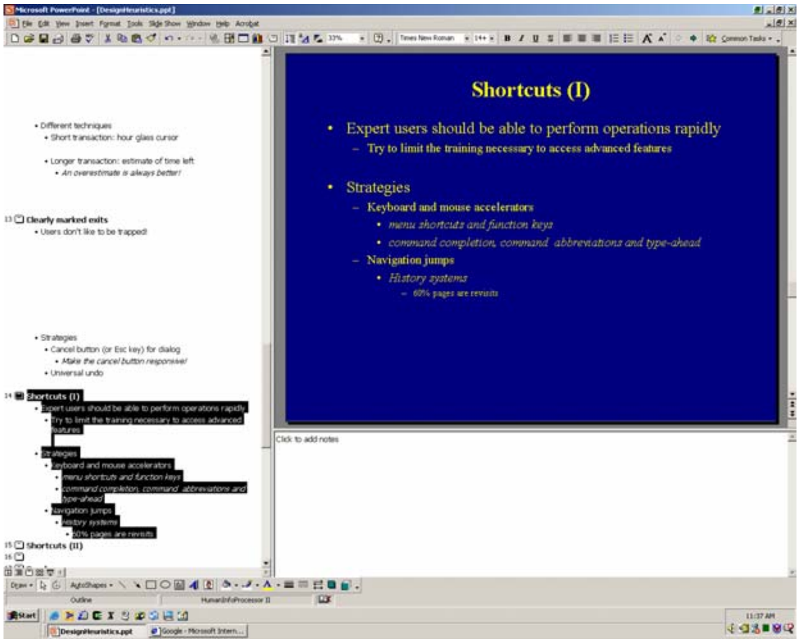
H2-7: Flexibility and efficiency of use

- – Accelerators for experts (e.g., gestures, shortcuts)
- – Allow users to tailor frequent actions (e.g., macros)

Heuristics: Flexibility

- Experts should be able to perform operations rapidly
- Limit training necessary to access advanced features

- Strategies
  - – Keyboard and mouse accelerators
    - menu shortcuts and function keys
    - command completion, command abbreviations and type-ahead
  - – Toolbars and tool palettes
    - Trade screen real estate for rapid access
  - – Navigation jumps
    - History systems
      - – 60% pages are revisits



Microsoft PowerPoint - [DesignHeuristics.ppt]

- Different techniques
  - Short transaction: hour glass cursor
  - Longer transaction: estimate of time left
    - *An overestimate is always better!*

13 Clearly marked exits
- Users don't like to be trapped!

- Strategies
  - Cancel button (or Esc key) for dialog
    - *Make the cancel button responsive!*
  - Universal undo

14 Shortcuts (I)
- Expert users should be able to perform operations rapidly
  - Try to limit the training necessary to access advanced features
- Strategies
  - Keyboard and mouse accelerators
    - *menu shortcuts and function keys*
    - *command completion, command abbreviations and type-ahead*
  - Navigation jumps
    - *History systems*
      - 60% pages are revisits

15 Shortcuts (II)
16

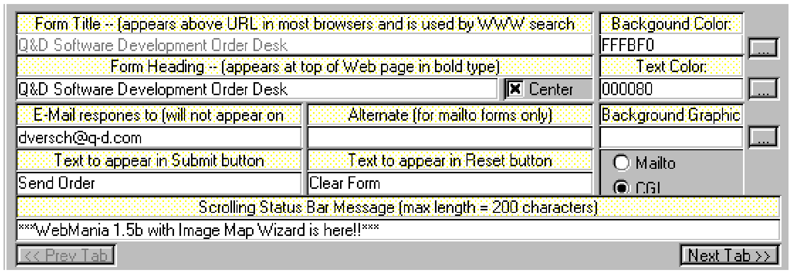
Shortcuts (I)

- Expert users should be able to perform operations rapidly
  – Try to limit the training necessary to access advanced features
- Strategies
  – Keyboard and mouse accelerators
    - *menu shortcuts and function keys*
    - *command completion, command abbreviations and type-ahead*
  – Navigation jumps
    - *History systems*
      – 60% pages are revisits

Click to add notes

Shortcuts: Keyboard accelerators, toolbars, page size scrolling, launch bar…

Heuristics: Aesthetics

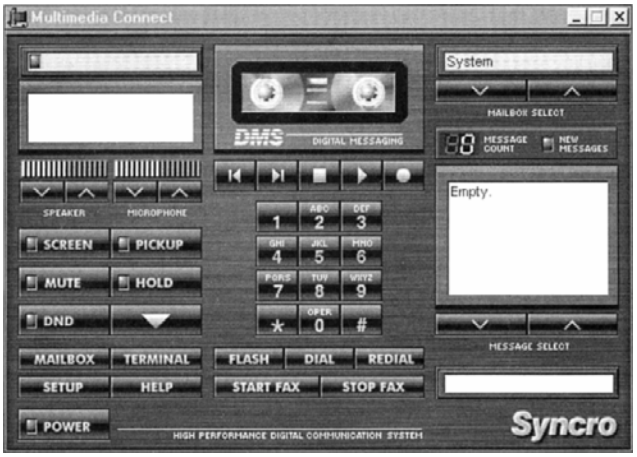


Form Title -- (appears above URL in most browsers and is used by WWW search
Q&D Software Development Order Desk
Backgound Color:
FFFBF0
Form Heading -- (appears at top of Web page in bold type)
Q&D Software Development Order Desk ☒ Center
Text Color:
000080
E-Mail respones to (will not appear on
dverssch@q-d.com
Alternate (for mailto forms only)
Background Graphic
Text to appear in Submit button
Send Order
Text to appear in Reset button
Clear Form
○ Mailto
● CGI
Scrolling Status Bar Message (max length = 200 characters)
WebMania 1.5b with Image Map Wizard is here!!

H2-8: Aesthetic and minimalist design

– No irrelevant information in dialogues

Hueristic: Aesthetics

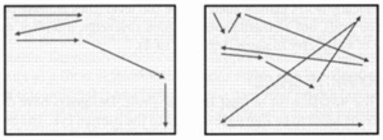


From Cooper’s “The inmates are running the asylum”

Heuristic: Aesthetics

Simple and natural dialog (H1-1)

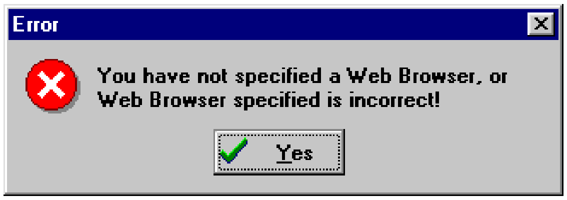
Present information in natural order



From Cooper’s “About face 2.0”

- Occam’s razor
  - Remove or hide irrelevant or rarely needed information
    - They compete with important information on screen
      - Pro: Palm Pilot
      - Against: Dynamic menus
  - Use windows frugally
    - Avoid complex window management

Heuristics: Help Users

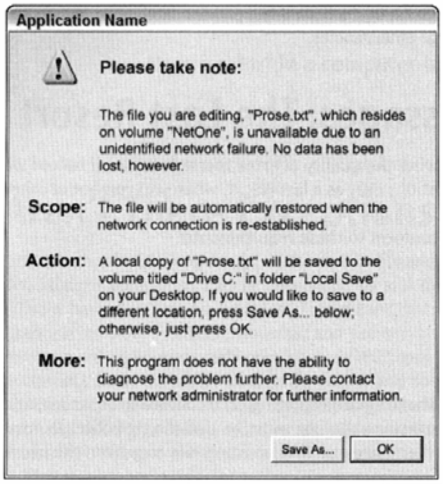


You have not specified a Web Browser, or Web Browser specified is incorrect!

H2-9: Help users recognize, diagnose, and recover from errors

- Error messages in plain language
- Precisely indicate the problem
- Constructively suggest a solution

Good Error Messages



Please take note:

The file you are editing, "Prose.txt", which resides on volume "NetOne", is unavailable due to an unidentified network failure. No data has been lost, however.

Scope: The file will be automatically restored when the network connection is re-established.

Action: A local copy of "Prose.txt" will be saved to the volume titled "Drive C:" in folder "Local Save" on your Desktop. If you would like to save to a different location, press Save As... below; otherwise, just press OK.

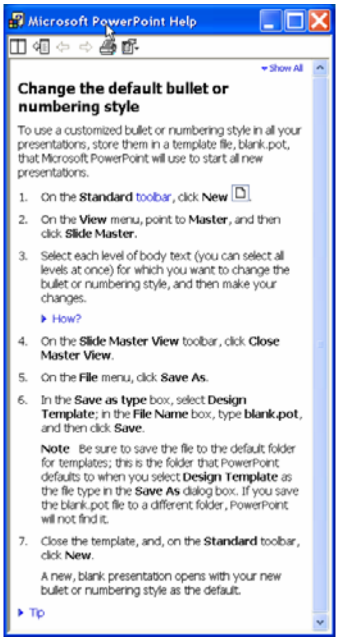
More: This program does not have the ability to diagnose the problem further. Please contact your network administrator for further information.

From Cooper's "About Face 2.0"

Heuristics: Docs

H2-10: Help and documentation

- Easy to search
- Focused on the user's task
- List concrete steps to carry out
- Not too long



Change the default bullet or numbering style

To use a customized bullet or numbering style in all your presentations, store them in a template file, blank.pot, that Microsoft PowerPoint will use to start all new presentations.

1. On the **Standard** toolbar, click **New** .
2. On the **View** menu, point to **Master**, and then click **Slide Master**.
3. Select each level of body text (you can select all levels at once) for which you want to change the bullet or numbering style, and then make your changes.

   ▸ How?
4. On the **Slide Master View** toolbar, click **Close Master View**.
5. On the **File** menu, click **Save As**.
6. In the **Save as type** box, select **Design Template**; in the **File Name** box, type **blank.pot**, and then click **Save**.

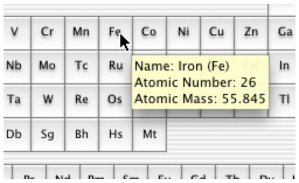
   Note Be sure to save the file to the default folder for templates; this is the folder that PowerPoint defaults to when you select **Design Template** as the file type in the **Save As** dialog box. If you save the blank.pot file to a different folder, PowerPoint will not find it.
7. Close the template, and, on the **Standard** toolbar, click **New**.

   A new, blank presentation opens with your new bullet or numbering style as the default.

▸ Tip

Types of Help

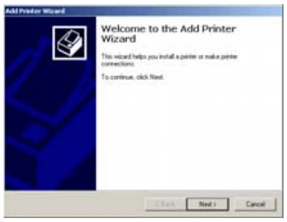
- Tutorial and/or getting started manuals
  - Presents the system conceptual model
    - Basis for successful explorations
  - Provides on-line tours and demos
    - Demonstrates basic features
- Reference manuals
  - Designed with experts in mind
- Reminders
  - Short reference cards, keyboard templates, tooltips…



Name: Iron (Fe)
Atomic Number: 26
Atomic Mass: 55.845

Types of Help

- Wizards
  - Walks user through typical tasks
    - Users feel they are losing control
    - What if I do not have the information requested?



Add Printer Wizard

Welcome to the Add Printer Wizard

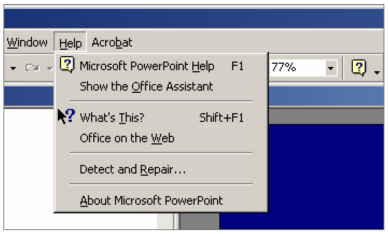
This wizard helps you install a printer or make printer connections.

To continue, click Next.

- Tips
  - Migration path to learning new features
  - Can become boring and tedious

Types of Help

- Context sensitive help



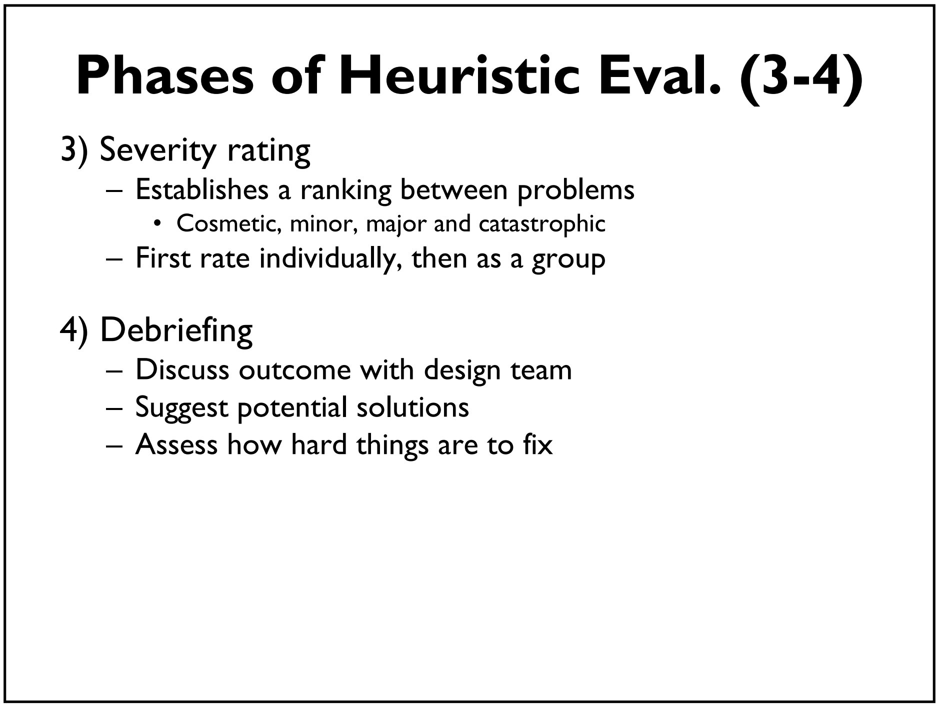
Window
Help
Acrobat
Microsoft PowerPoint Help F1
Show the Office Assistant
What's This? Shift+F1
Office on the Web
Detect and Repair...
About Microsoft PowerPoint
77%

The Process of Heuristic Evaluation

Phases of Heuristic Eval. (1-2)

1) Pre-evaluation training
- Provide the evaluator with domain knowledge if needed

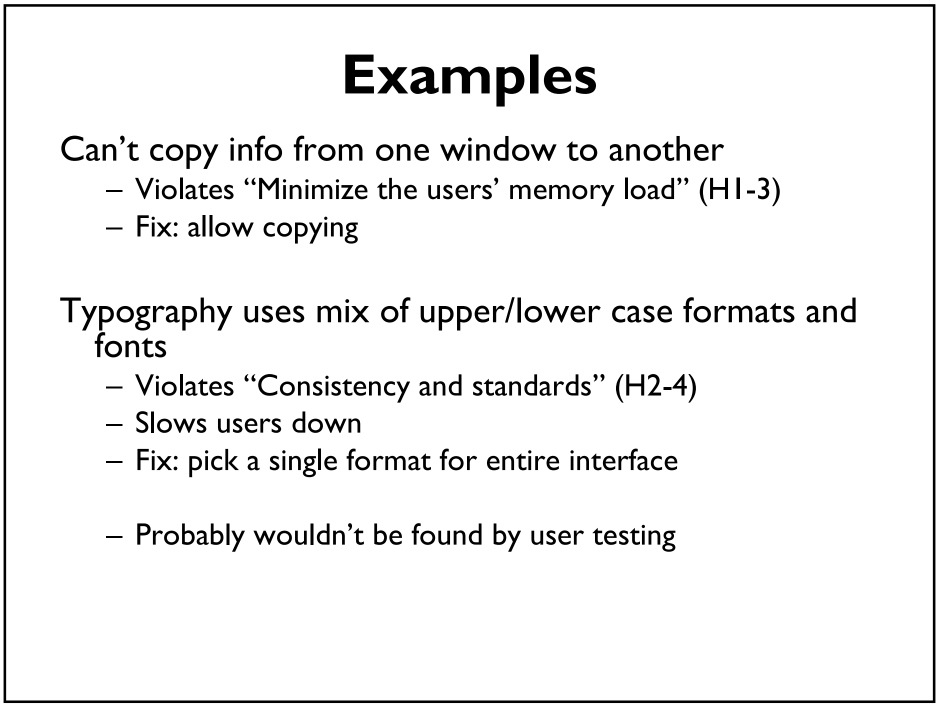
2) Evaluation
- Individuals evaluate interface then aggregate results
  - Compare interface elements with heuristics
- Work in 2 passes
  - First pass: get a feel for flow and scope
  - Second pass: focus on specific elements
- Each evaluator produces list of problems
  - Explain why with reference to heuristic or other information
  - Be specific and list each problem separately



Phases of Heuristic Eval. (3-4)

3) Severity rating
  - – Establishes a ranking between problems
    - Cosmetic, minor, major and catastrophic
  - – First rate individually, then as a group

4) Debriefing
  - – Discuss outcome with design team
  - – Suggest potential solutions
  - – Assess how hard things are to fix

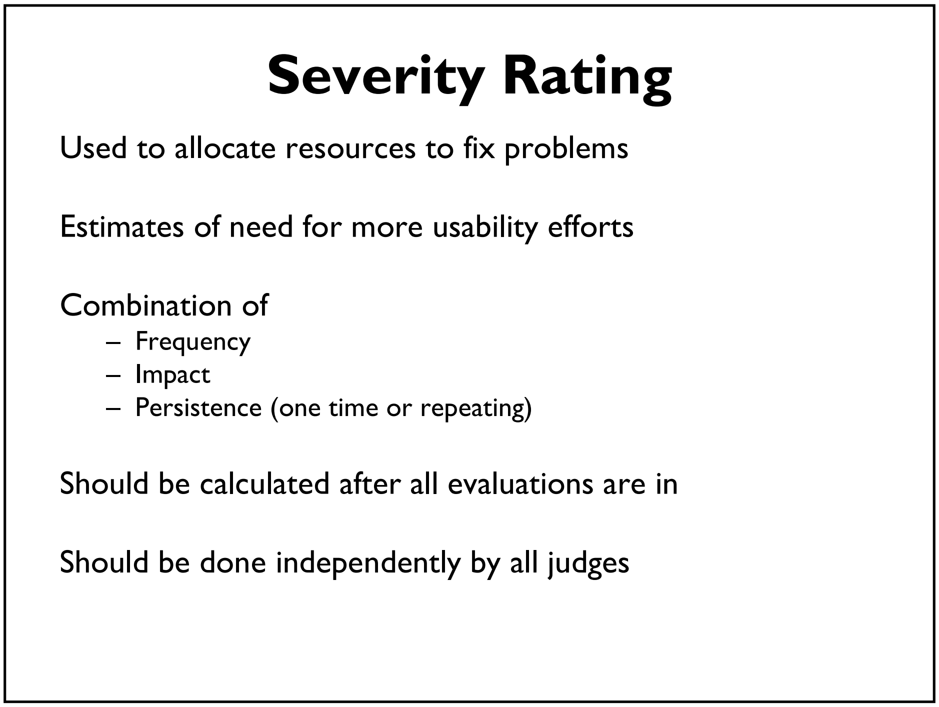


Examples

Can’t copy info from one window to another
  - – Violates “Minimize the users’ memory load” (H1-3)
  - – Fix: allow copying

Typography uses mix of upper/lower case formats and fonts
  - – Violates “Consistency and standards” (H2-4)
  - – Slows users down
  - – Fix: pick a single format for entire interface

  - – Probably wouldn’t be found by user testing



Severity Rating

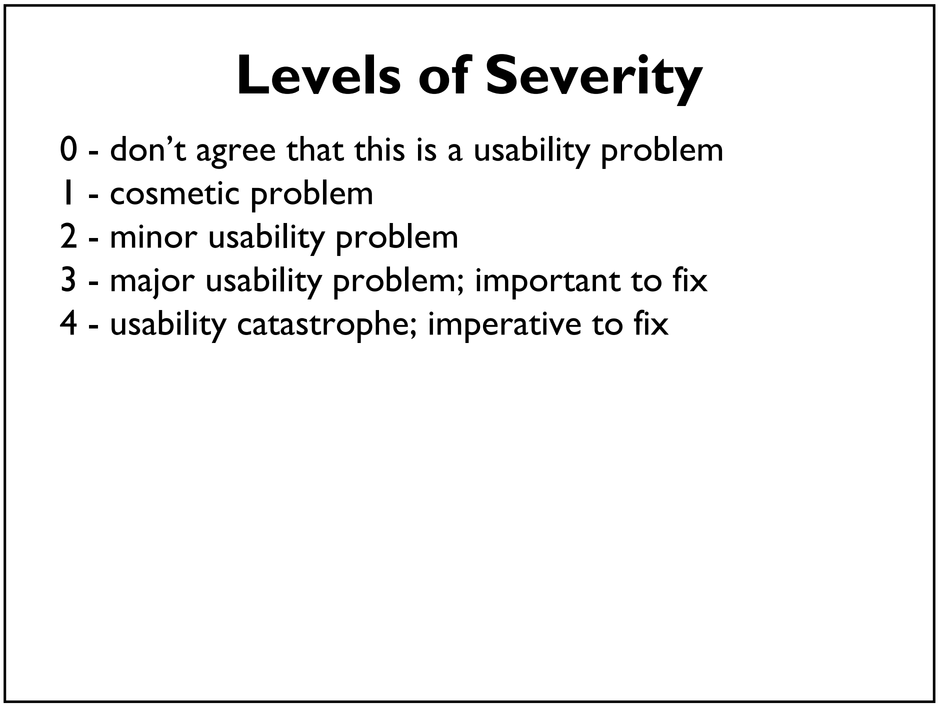
Used to allocate resources to fix problems

Estimates of need for more usability efforts

Combination of
- Frequency
- Impact
- Persistence (one time or repeating)

Should be calculated after all evaluations are in

Should be done independently by all judges



Levels of Severity

0 - don’t agree that this is a usability problem
1 - cosmetic problem
2 - minor usability problem
3 - major usability problem; important to fix
4 - usability catastrophe; imperative to fix

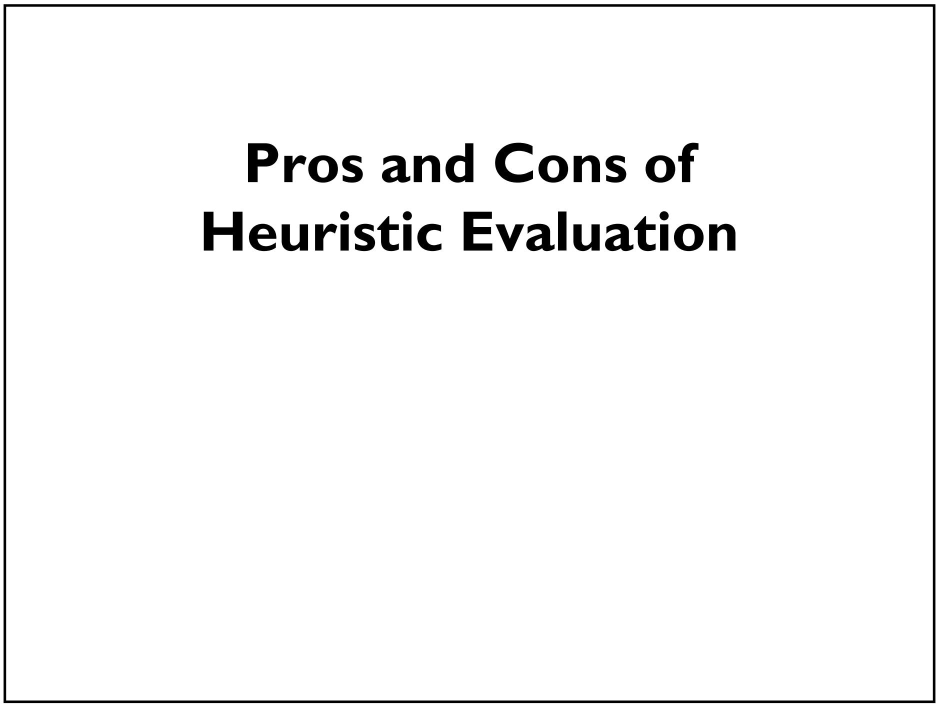
Severity Ratings Example

1. [H2-4 Consistency] [Severity 3][Fix 0]

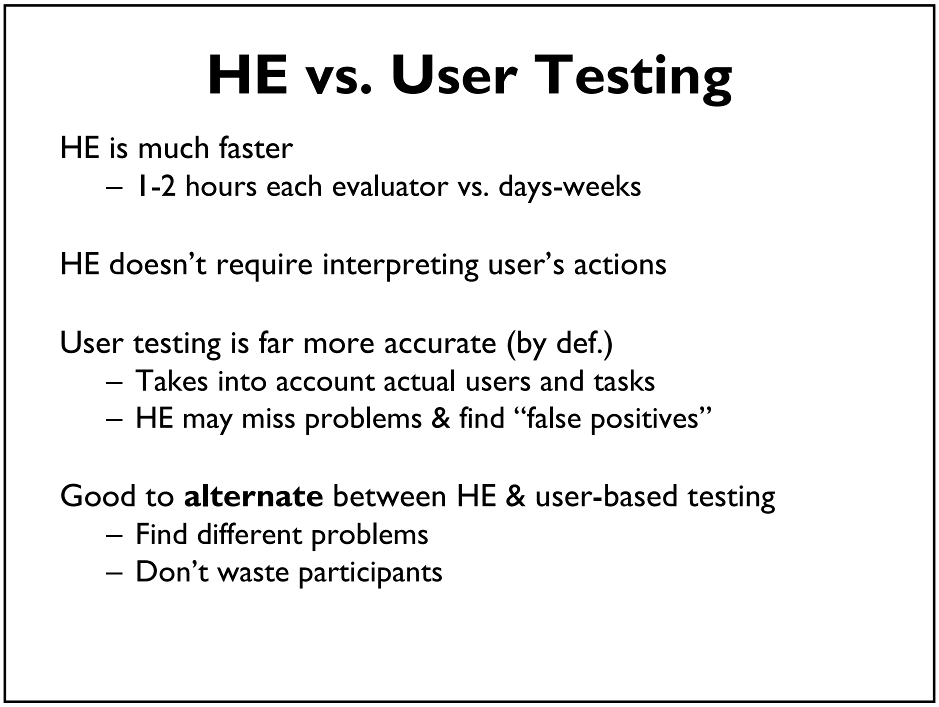
The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

Debriefing

- Conduct with evaluators, observers, and development team members
- Discuss general characteristics of UI
- Suggest improvements to address major usability problems
- Development team rates how hard things are to fix
- Make it a brainstorming session
  - Little criticism until end of session



Pros and Cons of Heuristic Evaluation



HE vs. User Testing

HE is much faster
- 1-2 hours each evaluator vs. days-weeks

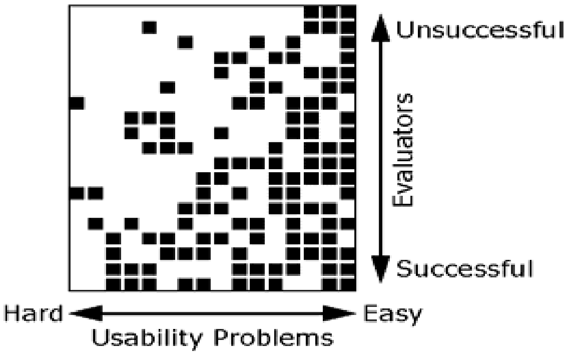
HE doesn't require interpreting user's actions

User testing is far more accurate (by def.)
- Takes into account actual users and tasks
- HE may miss problems & find "false positives"

Good to **alternate** between HE & user-based testing
- Find different problems
- Don't waste participants

Why Multiple Evaluators?

- Every evaluator doesn't find every problem
- Good evaluators find both easy & hard ones



Number of Evaluators

Single evaluator achieves poor results

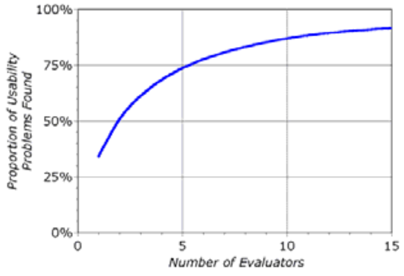
- Only finds 35% of usability problems
- 5 evaluators find ~ 75% of usability problems
- Why not more evaluators???? 10? 20?
    - Adding evaluators costs more
    - Many evaluators won't find many more problems

But always depends on market for product:

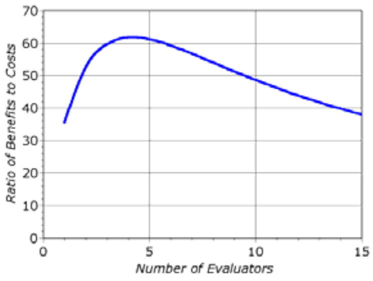
- popular products → high support cost for small bugs

Decreasing Returns

Problems Found



Benefits / Cost



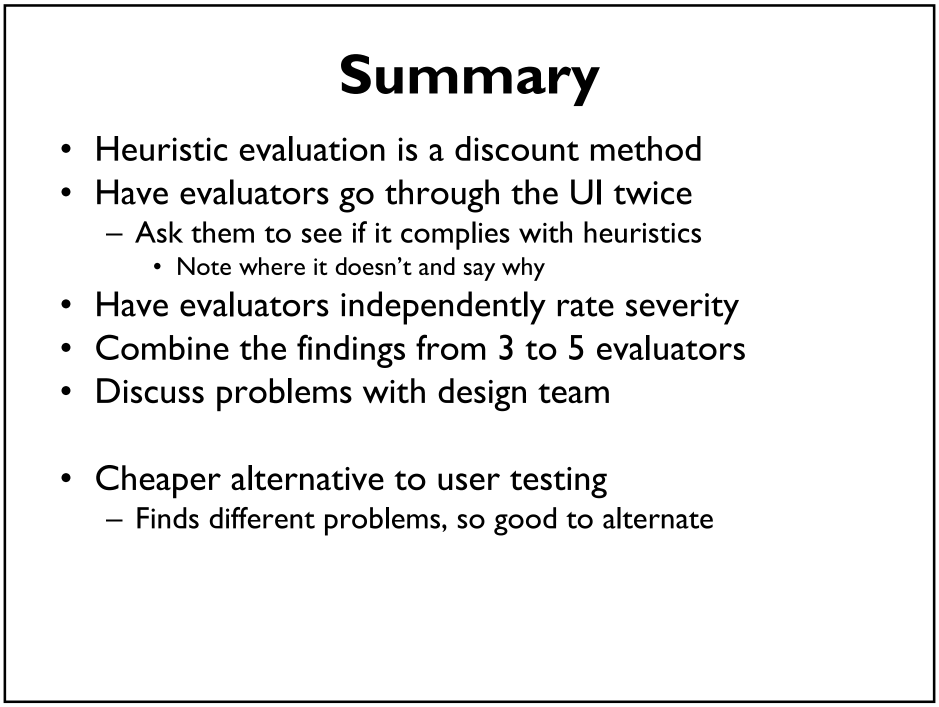
Caveat: Graphs are for a specific example

Benefits of Using HE

Discount: benefit-cost ratio of 48 [Nielsen94]

- Cost was $10,500 for benefit of $500,000
- Value of each problem ~15K (Nielsen & Landauer)
- how might we calculate this value?
  - In-house → productivity
  - Open market → sales
  - Customer calls to your customer service center

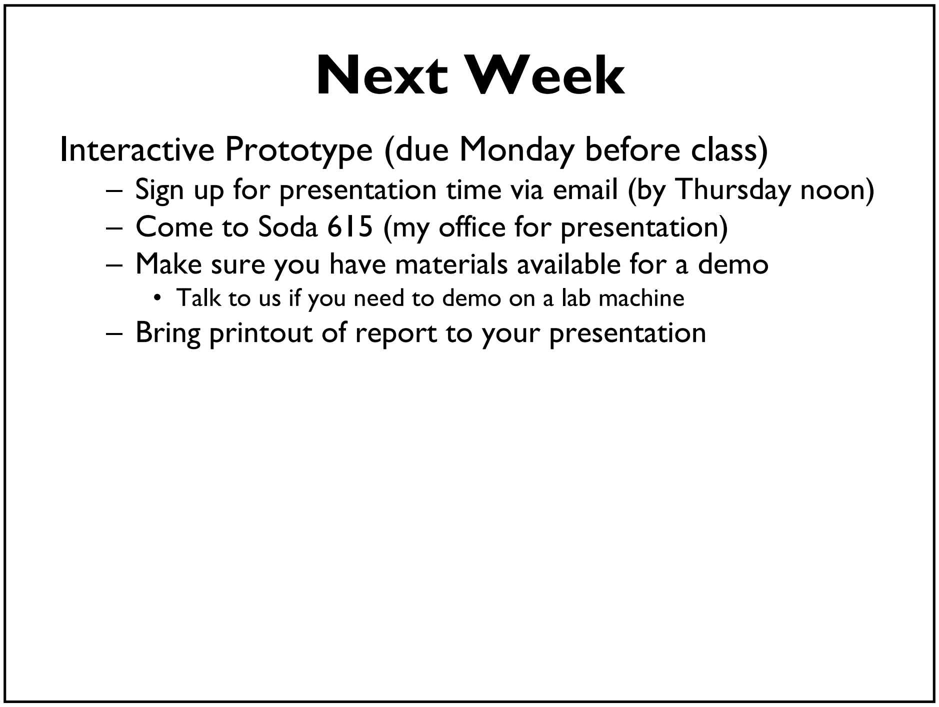
Tends to find more of the high-severity problems



Summary

- Heuristic evaluation is a discount method
- Have evaluators go through the UI twice
  - Ask them to see if it complies with heuristics
    - Note where it doesn't and say why
- Have evaluators independently rate severity
- Combine the findings from 3 to 5 evaluators
- Discuss problems with design team

- Cheaper alternative to user testing
  - Finds different problems, so good to alternate



Next Week

Interactive Prototype (due Monday before class)

- Sign up for presentation time via email (by Thursday noon)
- Come to Soda 615 (my office for presentation)
- Make sure you have materials available for a demo
  - Talk to us if you need to demo on a lab machine
- Bring printout of report to your presentation