Heuristic Evaluation

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Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2023
November 1, 2023
Hall of Fame or Shame?

Big basket
From Bharti Bhagtani
https://uxdesign.cc/heuristic-evaluation-of-bigbasket-application-4a69f43be47d

“India’s largest online supermarket”
Hall of Shame!

Big basket
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“India’s largest online supermarket”

Good
– ?

Bad
– not aesthetic & minimalist design
– popups with too much info
– cluttered
Heuristic Evaluation

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Outline

• Heuristic Evaluation Overview
• The Heuristics
• Team Break
• Exercise (graded)
Evaluation

- About figuring out how to improve design
- Issues with lo-fi tests?
Evaluation

• About figuring out how to improve design
• Issues with lo-fi tests?

Not realistic
– visuals & performance

Not on actual interface
– participant can’t test alone

Need participants
– can be hard to find repeatedly
Heuristic Evaluation

• Developed by Jakob Nielsen (now famous consulting co.)
• Helps find usability problems in a UI design
• Key idea: small set (3-5) of evaluators examine UI
  – independently check for compliance with usability principles ("heuristics")
  – evaluators only communicate afterwards
    • findings are then aggregated
    – use violations to redesign/fix problems
• Can perform on working UI or on sketches
Why Multiple Evaluators?

- Every evaluator doesn’t find every problem
- Good evaluators find both easy & hard to find problems
Heuristics

H1: Visibility of system status

H2: Match between system & real world

H3: User control & freedom
Heuristics (cont.)

H4: Consistency & standards

H5: Error prevention
H6: Recognition rather than recall
Heuristics (cont.)

H7: Flexibility and efficiency of use
Heuristics (cont.)

H8: Aesthetic & minimalist design

bad
good

https://icons8.com/articles/redesigning-boarding-pass-again/
Heuristics (cont.)

bad

H9: Help users recognize, diagnose, & recover from errors
Heuristics (cont.)

good
Good Error Messages

- Clearly indicate what has gone wrong
- Human readable
- Polite
- Describe the problem
- Explain how to fix it
- Highly noticeable
H10 – Help & Documentation

- Better if the system can be used without documentation, but it may be necessary

- How
  - easy to search
  - focused on task
  - list concrete steps

http://blog.screensteps.com/10-examples-of-great-end-user-documentation
H11* – Accessible Design

Users can interact with the system using alternative input methods. Content is legible with distinguishable contrast & text size. Key information is upfront & not nested for screen readers. Purely visual or auditory content has text-based alternatives for users with low vision & low hearing.

* New heuristic that CS147 staff has added to Nielsen’s 10.
H11* – Accessible Design

Users can interact with the system using *alternative input methods*. Content is legible with *distinguishable contrast* & *text size*. Key information is upfront & *not nested* for screen readers. Purely visual or auditory content has *text-based alternatives* for users with low vision & low hearing.

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H12* – Value Alignment & Inclusion

The design should encode values that users can understand and relate to. It should make a diverse group of users feel included and respected. The design should prevent the reproduction of preexisting inequities and not create additional burdens for disadvantaged populations.

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Welcome to CS 166 and 162!
Register for CS166 on Piazza here.
Join the waitlist here.

About CS 166
CS 166 meets TuTh 1:20 to 3:00 in CIT 348. The first class is on Thursday, January 25.

CS 166 teaches principles of computer security from an applied viewpoint and provides hands-on experience with real security threats and countermeasures. The course additionally covers principles and skills useful for making informed security decisions and for understanding how security interacts with the world around us. Many topics are covered including: cryptography, authentication, access control, operating systems security, web security, and more. Other topics include general security principles, human factors such as trust and social engineering, the security of complex systems, and the economics of security. The course aims to balance theory and practice.

About Models of Computation
This was a core undergraduate Computer Science course on the foundations of computing. The questions it aimed to answer were:

What is computation?
What is a computer? (hardware vs. software)
What are typical programming languages?

The course has been taught by Dr. Smith (Professor of Computer Science).
Neutral

CS 106A
Welcome to Programming Methods. This course is an introduction to computer programming and software development.

ASSIGNMENTS

PROJECTS
All projects are due at 11:59 pm on the specified due date.

<table>
<thead>
<tr>
<th>Name</th>
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<td>5/5</td>
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<tr>
<td>Website (INTERMEDIATE)</td>
<td>5/5</td>
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<tr>
<td>Intro/Python (INTERMEDIATE)</td>
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<td>Intro/Java/PHP (INTERMEDIATE)</td>
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Stereotypical

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## Experimental Measures

<table>
<thead>
<tr>
<th></th>
<th>Enrollment Intentions</th>
<th>Sense of Belonging</th>
<th>Anticipated Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical self-confidence</td>
<td>Future CS Intentions</td>
<td>Stereotype Anxiety</td>
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Heuristic Violation Examples

1. [H6 Recognition Rather Than Recall]
   Can’t copy info from one window to another
   – user needs to memorize the data & retype
   – fix: allow copying

2. [H4 Consistency and Standards]
   Typography uses different fonts in 3 dialog boxes
   – slows users down
   – probably wouldn’t be found by user testing
   – fix: pick a single format for entire interface
Severity Ratings

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. [H4 Consistency & Standards] [Severity 3]

The interface used the string “Save” on the first screen for saving the user’s settings, but used the string “Store” on the second screen. Users may be confused by this different terminology for the same function.

Fix: Use “Save” everywhere in the application.
Cart

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item #</th>
<th>Remove?</th>
<th>Item Description</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>#033DVM4800</td>
<td>□</td>
<td><strong>Denon DVM-4800 DVD Video Changer</strong></td>
<td>$1,199.95</td>
<td>$1,199.95</td>
</tr>
<tr>
<td>1</td>
<td>#204EL570</td>
<td>□</td>
<td><strong>Bazzoku EL570 5&quot;x7&quot; 2-way speakers</strong> Vehicle: 1989 Toyota Tercel Liftback with equalizer or radio delete option (<strong>change</strong>)</td>
<td>$79.95</td>
<td>$79.95</td>
</tr>
<tr>
<td>1</td>
<td>#158DSCP50</td>
<td>□</td>
<td><strong>Special Sony DSC-P50 Digital Still Camera, 2.1 Mega Pixel</strong> Save $100! Was $399.95, Now: $299.95</td>
<td>$299.95</td>
<td>$299.95</td>
</tr>
<tr>
<td>1</td>
<td>#123DVL9A595</td>
<td>□</td>
<td><strong>Panasonic DVD-LA95 Portable DVD-A/V Player with 9&quot; Screen</strong> -- This item is temporarily out of stock --</td>
<td>$999.95</td>
<td>$999.95</td>
</tr>
<tr>
<td>1</td>
<td>#170GXT160</td>
<td>□</td>
<td><strong>Maxell GX-Silver T 160 VHS Video Tape</strong></td>
<td>$2.49</td>
<td>$2.49</td>
</tr>
</tbody>
</table>

**Total**

Merchandise Total: $2,582.29

Standard Shipping Charge: $13.95
Alternative shipping options available before final checkout
Order Total: $2,596.24

- To change an item’s quantity, enter the correct number in the **Quantity** column, then press **Update Cart**.
- To remove an item, check the box in the **Remove?** column, then press **Update Cart**.
- To order an item that appears in your printed Crutchfield catalog, enter the item number into the Cart and click **Update Cart**.
- International visitors, please [click here](#).
Problems Found this Year

1. H4: Consistency and standards, severity 3
2. H4: - Which red refers to removing objects?
3. H5: Error prevention; the letter "H" is in Quantity, and no error is identified
4. H1: system status: "International Visits, please click here" doesn't explain why they have to click there, or where it will take them
5. H4: consistency; in the remove column, it's either a toggle or a yes and no check box
6. H4: consistency; "Total" means different things in different places
7. H4: you're allowed to order something that is out of stock? Severity: 2
8. H4, severity 2. Background color differs between blue and white
9. H4: message about one problem is at the top as opposed to under like out of stock one
10. H5 Error Prevention: Level 2 Unclear that the message under Please Note is describing an error. Maybe make the error explanation text color red to match.
11. H11 - the title is not accessible to red-green color blindness
12. H4: gives the user the ability to not remove an out-of-stock item
13. H2: uses item numbers and codes that users don’t understand [level 4]
14. H8: minimalist design not followed, lots of different colors without purpose
15. H4: inconsistent coloring of boxes in the cart
16. H6: cluttered design with lots of extraneous information
17. H4: severity 3 Remove option is one option except for item 4 which is yes or no for some reason
18. H11 - severity 3 - coloring and contrast is not accessible for color blindness, the font is also really small
19. H8 - the design is extremely cluttered with all the information being all displayed in the same size and type (only diff is color), user needs to be able to identify the most important things, remove all irrelevant information, and highlight important information
20. H9: Aesthetic and minimalist design - too many different and vibrant colors for background and text
21. H11: accessible design [3-4] legible text, high saturation title and blue text, change colors
22. H6: Unnecessary information added that clusters the page, design is not minimalist, conflicting colors
23. H5: Error Prevention the quantity is h instead of a number at row 3
24. H8: incredibly cluttered and confusing with different colors
25. H4: inconsistent coloring of boxes in the cart
26. H4: severity 3 Remove option is one option except for item 4 which is yes or no for some reason
27. H7 severity 3, instructions are at the bottom rather than the top
28. H4: Consistency and Standards Severity 3: Uses links at the top to navigate (logout, continue shopping) but buttons for navigation elsewhere (update cart, clear cart), making navigation unnecessarily difficult
29. H4: Remove checkboxes are inconsistent, one has yes no
30. H4: Wihat does red indicate? Used for discounts, stock, and item nums
31. H5: The user does not need to know the item number
32. H8: Aesthetic and Minimalist Design - Screen is cluttered and the colors aren't great - users don't care about item numbers, Price, and total seem to be the exact same thing. H6 [3] Recognition rather than recall, what does update cart mean
33. H4: checkbox for one product but not others
34. H8: users don't need to know the item number, H4 - the color red is inconsistently used, H5 - this component is not recommended, H9 - DVD out of stock but still being charged, H2 - removing an item is confusing
35. H1: the colors aren't good for contrast (red on a green background)
36. H6: add and clear cart buttons look the same
37. H4: remove boxes either have one checkbox or a yes/no checkboxes
38. H6: Aesthetic and Minimalist Design
39. H4: 2. Background color differs. H8 4 designs not minimal and have a lot of distracting info
40. H1: The error message is very hard to read
41. H5: H10 (?): issue with the second item #204... is explained in a message at the top of the screen but has to cross-check the item number with the list of items below... not immediately clear what the message is referring to and why #204... is red
42. H6: Error message, which indicates a product is not compatible with a car, is not easy to spot and requires a multiple step solution
43. H6 [Severity 4]: No error message given for the quantity of the digital still camera being "H". This is a fatal error because we have no idea how many the user actually meant to buy. Inform the user of this incorrect input or only allow them to input numerals.
44. H4: Error message doesn't contain ways to resolve the error
45. H5: the component that is not recommended is written in black font and doesn't alert the user, should stand out more to alert the user before purchasing
46. H4: Use of the color red is inconsistent, means different things in different contexts
47. H1: Green decorative background of title text can confuse users into thinking that they have already completed a process, since green is associated with completion
48. H4 [Severity 4]: I can't see a checkout button. Even if it should not be accessible until I resolve all the errors, it should be greyed out or similar so I don't feel unable to proceed.
49. H4: color red is used for a lot of different things (errors, ads, etc.)
50. H2: don't need to know the item # (could also be error prevention)
51. H3: out of stock but still being charged
52. H9: there is an H in quantity But no Indication
53. H11: too many steps to update cart
54. H4: blue text on blue background
Problems Found Last Year

- **H1: Visibility of system status**
  - Username for current shopping cart missing [1]

- **H2: Match between system & real world**
  - "price" and "total" should refer to different things [1]
  - Items referred to by their Item Number [3]

- **H3: User control & freedom**
  - Not clear where/how user can place order [1]
  - Missing a search bar [1]

- **H4: Consistency & standards**
  - Red used inconsistently - error, special, title, out of stock [4]
  - Yes/No Checkbox in “Remove?” [5]
  - Menu Bar links on different lines - logout, continue, shopping [1]
Problems Found Last Year

- **H5: Error prevention**
  - Out of Stock items allowed to be added to cart [4]
  - "h" in Quantity Field [7]
- **H6: Recognition rather than recall**
  - Item number not auto-filled, difficult for user to remember [2]
- **H7: Flexibility and efficiency of use**
  - Update Cart Button required to update cart and ambiguous use [2]
  - Quantity Field could be a selection menu [1]
- **H8: Aesthetic & minimalist design**
  - Color Combinations - red/green, black text on blue background [6]
  - Crowded Design - columns and text squished [2]
  - # Sign not necessary [1]
Problems Found Last Year

- H9: Help users recognize, diagnose, & recover from errors
  - "Please Note" error message refers to item bolded in red but multiple items bolded in red [2]
  - Last row has quantity 1 but no other info, user unsure how to fix [1]
- H10: Help & Documentation
  - Instructions for use not immediately visible [1]
  - International users not immediately redirected to other page [2]
- H11*: Accessible
  - Aesthetic choices difficult for visually impaired- blue links, small text, blue on blue color scheme [3]
  - Error message relies on ability to view red color - hard for color-blind [1]
- H12*: Fairness & inclusion
  - Requires knowledge of your car beyond just model and year [1]
Problems Found Two Years Ago

- H4 (consistency): The use of red to indicate errors, out of stock items, and sales/savings [26]
- H4 (consistency): two of the check boxes have yes/no next to them but none of the others do. Error prevention? [22]
- H9 (Aesthetic): "#" is not needed [2]
Decreasing Returns

problems found

benefits / cost

* Caveat: graphs for a specific example
Heuristic Evaluation Summary

• Have evaluators go through the UI twice
• Ask them to see if it complies with heuristics
  - note where it doesn’t & say *why*
• Have evaluators independently rate severity
• Combine the findings from 3 to 5 evaluators
  - come to agreement on problems, fixes & severity

• Alternate with user testing – you’ll find different types of problems
Speech UI Heuristics

S1: Give the agent a persona through language, sounds, and other styles.
S2: Make the system status clear.
S3: Speak the user’s language.
S4: Start and stop conversations.
S5: Pay attention to what the user said and respect the user’s context.
S6: Use spoken language characteristics.
S7: Make conversation a back-and-forth exchange.
S8: Adapt agent style to who users are, how they speak, and how they are feeling.
S9: Guide users through a conversation so they are not easily lost.
S10: Use responses to help users discover what is possible.
Speech UI Heuristics

S11: Keep feedback and prompts short.
S12: Confirm input intelligently.
S13: Use speech-recognition system confidence to drive feedback style.
S14: Use multimodal feedback when available.
S15: Avoid cascading correction errors.
S16: Use normal language in communicating errors.
S17: Allow users to exit from errors or a mistaken conversation.

The list of heuristics along with detailed descriptions and examples can be found at http://hci.stanford.edu/publications/2018/speech-he/sui-heuristics.html
Administrivia

• Individual heuristic evaluation assignment next week

• Midterm two weeks from today (in class plus at home design problem)
  – Have an OAE letter? If you haven’t gotten it to us, you must by the end of today or we will not able to accommodate
Grading on Last Assignment

Assignment #5 Low-fi Prototype & Test

A5 Group Grade:
✓ --: 3% ✓ -: 8% ✓ : 56% ✓ +: 33% ✓ ++: 0%

A5 Individual Presentation:
✓ --: 0% ✓ -: 3% ✓ : 18% ✓ +: 70% ✓ ++: 8%

A5 Group Average: 91%
A5 Individual Presentation Average: 94%
TEAM BREAK
EXERCISE

Heuristic evaluation practice
(graded – turn it in at the end of class)
[8 min]: On your own, find 8+ usability violations (type in a google doc/write on this paper & circle things on this image – write your name & SUNetID)

For each one: Which guideline was violated and why? How could it be fixed?

[5 min]: Share with your group (3-4)
What violations did you all find? Which ones did only one of you notice?

[5 min]: Share with the class
Raise your hand or post a screenshot with your description on Slack.

Find, label, & describe 8-10 Heuristic Violations
[10 min]: Share with the class
Raise your hand or post a screenshot with your description on Slack. *Turn in* with your name & SUNetID on piece of paper at end of class (by studio).

**H2, H8**
Where is the recipient?

**H6**
Why are these buttons all different? **H3**
How can I go back?

**H8** - low contrast

**H1**
Where is the message confirmation?

**H3**
Can only go one direction

Screen 1
Choose Recipient

Screen 2
Create Message

Screen 3
Inbox
No new messages!

User selects James L. and presses “NEXT”

Body
Dear Prof. Landay,
I love HCI. Please give me an A+.
Sincerely,
Student in CS147

Send Text >
Problems Found Last Year

**H2: Match between system & real world**
Showing “(null)” for empty content

**H3: User control & freedom**
No “back” button [5]

**H6: Recognition rather than recall**
No way to see who you’re sending to in the second screen
Problems Found Two Years Ago

1. H1: no feedback on whether the message is sent or not, just navigates to inbox screen
2. [H3: user control and freedom] No way to cancel message solution: add an ‘x’ or cancel button that allows them to delete the message on screen 2
3. H8. There was unnecessary users listed that were null
4. H4: so many different colors, not consistent
5. H1: No visibility of system status (can’t really tell which page I’m on - perhaps some sort of diagram at the bottom could fix this)
6. H6: James L is not displayed on create message screen
7. [H6 Recognition rather than recall] Can’t see who you’re sending the message to when you’re creating the message. Fix: include sub-header that specifies name you just clicked on
8. H4: inconsistent button design
9. H4: consistency with names on the first screen (names have or don’t have last initials) --> should just choose one format (potentially just first name if we want to avoid clutter)
10. H8 (aesthetics) - The headers have low contrast (especially the purple/pink) and should use less saturated colors for better contrast.
11. H3/H6: User can’t go back from screen 2 to 1 if they misliked on the wrong person’s profile, no recall of who you selected --> recall the recipient name on screen 2
12. H3: User control and freedom - can only send to recipients in the list, no way to add a new recipient
13. H9: “error”/null messages offer no explanation
14. H3: can only send text (no images/files which might be helpful in certain cases)
15. [H5 Error prevention] Could potentially select (null) users to write messages to. Fix: just don’t display the icons of null users at all.
16. H7: unnecessary “next” button on the first page. Might instead click on the person to transition to the next screen, and display the person’s name on screen 2 (H6) and add back button there (H3)
17. H3: How do you view old messages?
18. H10: no help or documentation included - just buttons indicating the very next step
19. H4 consistency: not sure the differences between ‘text’ ‘messages’ ‘body’
20. H3 - no ability to edit message text
21. H2: “Body” and “Null” might not make sense to user without technical background, but also why would they even see these words to begin with
22. H4: terminology of “message” vs “text”
Further Reading

Heuristic Evaluation

- Books
  - *Usability Engineering*, by Nielsen, 1994

- Web site
  - [http://www.nngroup.com/articles/](http://www.nngroup.com/articles/)

- Accessibility
  - [Accessibility - Foundations - Human Interface Guidelines - Design - Apple Developer](http://www.nngroup.com/articles/)

Exit Ticket

Next Time

- Designing the Future: Early and Future Visions of HCI
  - Read
    - *As We May Think* by Vannevar Bush
    - *Tools For Thought* (Ch 9), Engelbart Demo
  - Listen and Read: *Of Mice and Men*, 99% Invisible, Episode 149 (21 minutes)

- Studio
  - Half-way review of medium-fi with outside experts