Heuristic Evaluation

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Autumn 2022
November 7, 2022
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
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
  – can’t test alone

Need participants
  – can be hard to find repeatedly
Heuristic Evaluation

- Developed by Jakob Nielsen
- Helps find usability problems in a UI design
- 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 ones
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
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 Nielson’s 10. Glucose Buddy Be My Eyes
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.
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.

* New heuristic that CS147 staff has added to Nielson’s 10.
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*.

* New heuristic that CS147 staff has added to Nielson’s 10.
Welcome to CS 166 and 162!
Register for CS166 on Plurk [here](#).
Join the waitlist [here](#).

About CS 166
CS 166 meets TuTh 1-2:20 in CIT 368. 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 the practical aspects of security threats and countermeasures. The course additionally covers principles and skills for making informed security decisions and for understanding how security interacts with the world around it. The main topics covered are cryptography, authentication, access control, operating systems security, web security, and network security. Other topics include general security principles, human factors such as trust and social engineering, and the economics of security. The course also delves into theory and engineering aspects of computer security, with an emphasis on hands-on experience.

About Models of Computation
This is a core undergraduate Computer Science course on the foundations of computing. The goal of this course is to teach students who are interested in computer science about the foundations of computing. Students will learn about the mathematical language used to describe computer programs, and the abstract models that underlie computation. The course covers such topics as finite automata, regular languages, context-free grammars, and Turing machines.

CS22: Introduction to Discrete Structures and Probability
Ever wanted to construct a solid, bullet-proof argument? Felt the need to count really large things? Wondered about the math behind spam filters and RSA cryptography? If so, let's get to work on Probability, Combinatorics, Logic, Graph Theory, and more!

You will learn to see the world differently, no longer accepting what is presented to you, but instead questioning, building, and exploring.
Experimental Measures

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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.
**PLEASE NOTE**

This component is NOT recommended for your vehicle. We suggest removing this item (bolded in red below) from your cart. Please call us toll-free at 1-888-955-6000 and we'll be glad to provide further assistance.

### Cart

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item #</th>
<th>Item Description</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>#033DVM4800</td>
<td>Denon DVM-4800 DVD Video Changer</td>
<td>$1,199.95</td>
<td>$1,199.95</td>
</tr>
<tr>
<td>1</td>
<td>#204EL570</td>
<td>Bazooka EL570 5&quot;x7&quot; 2-way speakers Vehicle: 1989 Toyota Tercel Liftback</td>
<td>$79.95</td>
<td>$79.95</td>
</tr>
<tr>
<td></td>
<td>#158DSCP50</td>
<td>Special Sony DSC-P50 Digital Still Camera, 2.1 Mega Pixel</td>
<td>$299.95</td>
<td>$299.95</td>
</tr>
<tr>
<td></td>
<td>#123DVDLA95</td>
<td>Panasonic DVD-LA95 Portable DVD-A/V Player with 9&quot; Screen -- 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>Maxell GX-Silver T-160 VHS Video Tape</td>
<td>$2.49</td>
<td>$2.49</td>
</tr>
</tbody>
</table>

**Total**

Merchandise Total: **$2,582.29**

**Standard Shipping** 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

- Foo
Problems Found this Year

- Bar
Problems Found this Year

- Baz
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
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.

Evaluating Speech-Based Smart Devices Using New Usability Heuristics

Zhimiona Wei
Applicant from Stanford University

We developed a set of 17 usability heuristics for speech-based smart devices. An expert evaluation of these popular devices shows that the heuristics can be used to uncover existing usability problems as well as help design new interfaces.

A recent empirical study showed that both English and Spanish speakers are shown these heuristics. Each has a set of sub-heuristics. Although these heuristics are new, they can be used to improve systems.

Nonetheless, designing good UIs remains challenging. “The state of an UI is often a process of user testing over time and comparison of graphical user interfaces (GUIs).” Unfortunately, simple transformation of GUIs into speech interfaces does not work well. Although novices have been shown to benefit from designing communication interfaces, the lack of accessibility and usability has been an issue.

To help address these issues, we developed a set of heuristics for designing and evaluating speech-based smart devices. To validate and improve these heuristics, we built a group of usability experts—each of whom specialized in UIs—to empirically evaluate their state-of-the-art devices.

RELATED WORK

In the early 1990s, Jakob Nielsen developed a set of 10 usability heuristics for evaluating UIs (www.nngroup.com/articles/usability-heuristics). Although these heuristics are most often applied to GUIs, his colleagues also showed that they were effective in assessing voice-user interfaces. However, the user interface and system output options for the system were quite limited.
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

- Questions on individual heuristic evaluation assignment?

- Midterm a week from this Wed (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 Presentation: ✓ --: 4% ✓ -: 8% ✓ : 76% ✓ +: 12% +: 0%
A5 Individual Presentation: ✓ --: 0% ✓ -: 0% ✓ : 52% ✓ +: 44% +: 4%

A5 Group Presentation Average: 90%
A5 Individual Presentation Average: 93%
TEAM BREAK
EXERCISE
Heuristic evaluation practice
[8 min]: On your own, find 8+ usability violations
For each one: Which guideline was violated and why? How could it be fixed?

[5 min]: Share with your group
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* on slack #lecture channel or name on piece of paper at end of class.

**Screen 1**
- **H8 – low contrast**
- Choose Recipient
- User selects James L. and presses “NEXT”
- Why are these buttons all different? **H3**
- Next

**Screen 2**
- Create Message
- Body
  - Dear Prof. Landay,
  - I love HCI.
  - Please give me an A+.
  - Sincerely,
  - Student in CS147
- How can I go back? **H3**
- Send Text

**Screen 3**
- Inbox
- No new messages!
- Can only go one direction
- Where is the message confirmation?
- Create Message
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 misclicked 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/

• Accessibility
  – Accessibility - Foundations - Human Interface Guidelines - Design - Apple Developer
Next Time

• Conceptual Models & Interface Metaphors
  – Read “The Psychology of Everyday Things” (Ch. 1), from *The Design of Everyday Things* by Donald Norman

• Midterm Review
  – In 2nd half of lecture next Monday – bring questions!

• Studio
  – Ad-hoc group heuristic evaluation
  – Must be present to get credit on group assignment