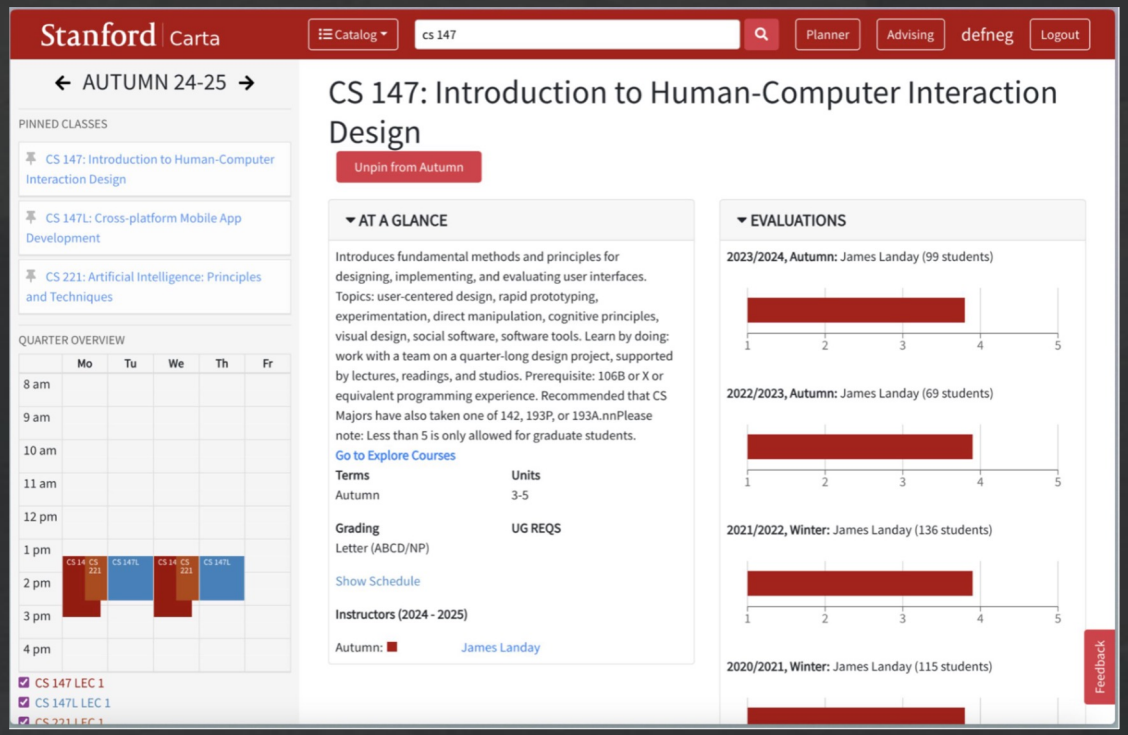
# Heuristic Evaluation

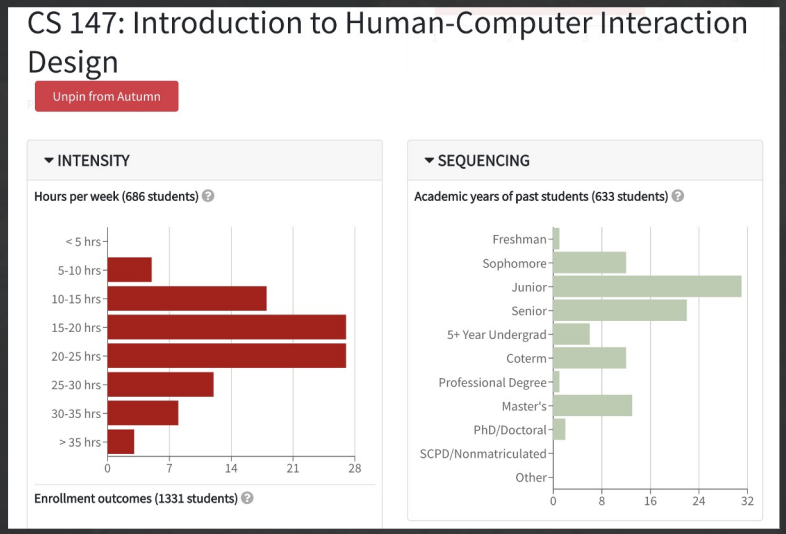
刘哲明
Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2026
November 2, 2026

Music: https://soundcloud.com/dansuneroquette

# Hall of Fame or Shame?

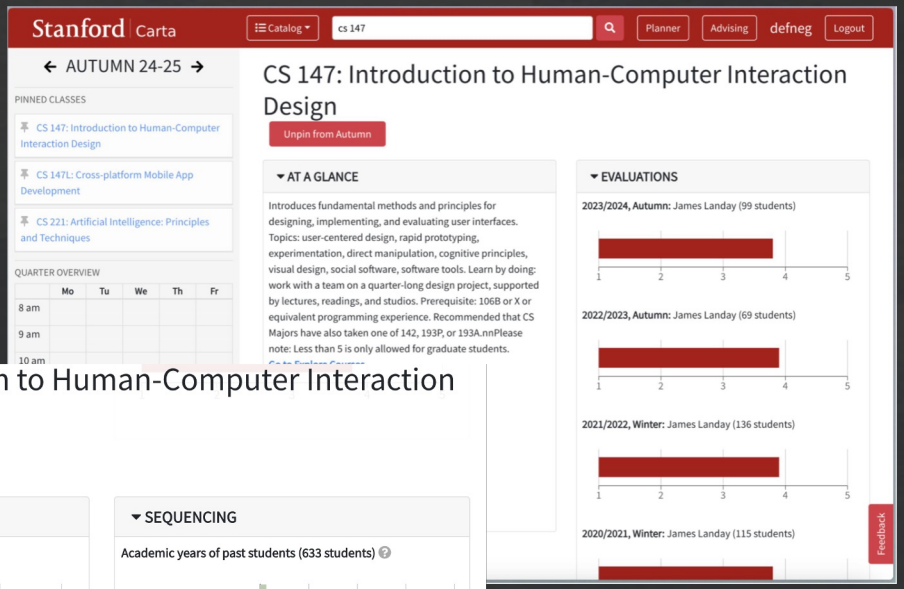


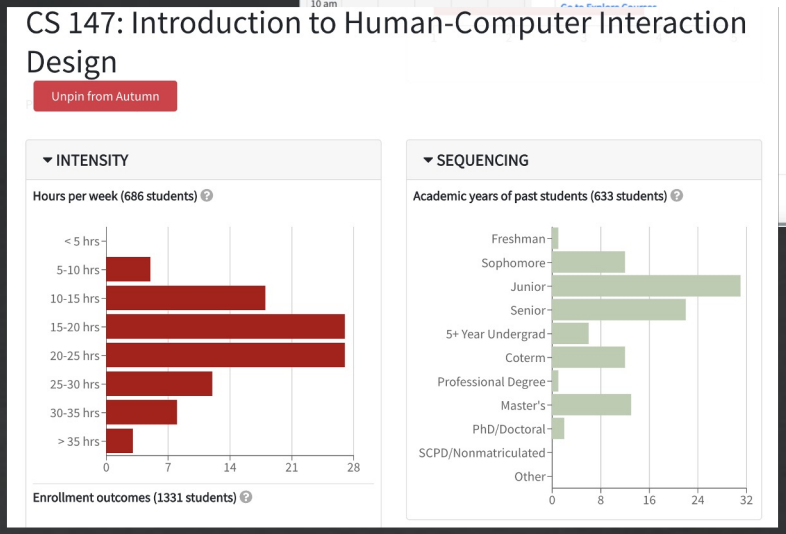




Carta

# Hall of Shame!






**Color deficiency**: Red and green used without redundant cues

**Inconsistent whitespace**: No space between course title and “Unpin”

# Heuristic Evaluation

刘哲明
Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2026
November 2, 2026

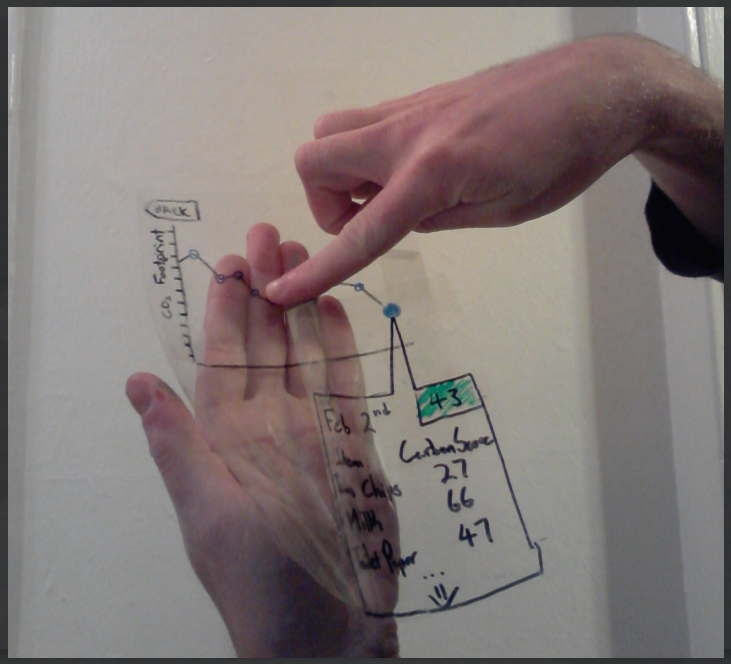
Music: https://soundcloud.com/dansuneroquette

# Outline

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

# Evaluation

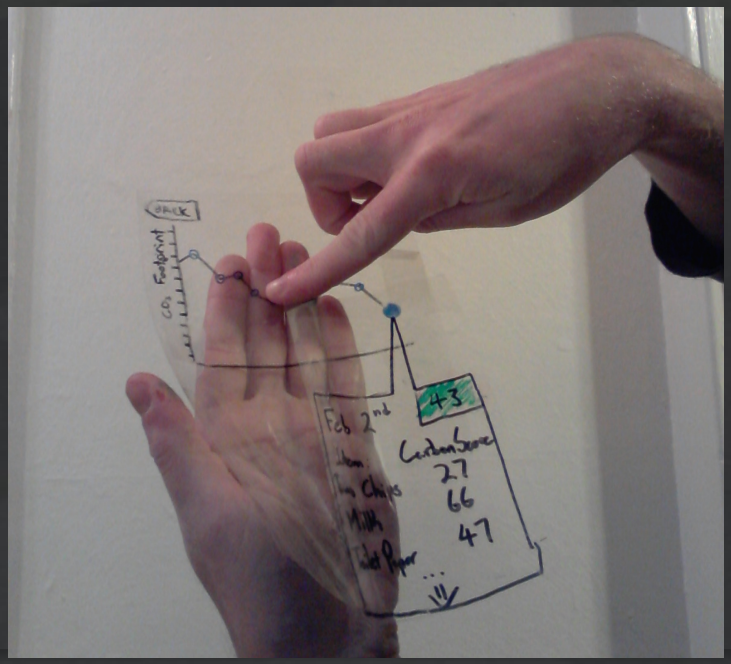
- About figuring out how to improve design
- Issues with lo-fi tests?






# Evaluation

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




Not realistic
– visuals & performance

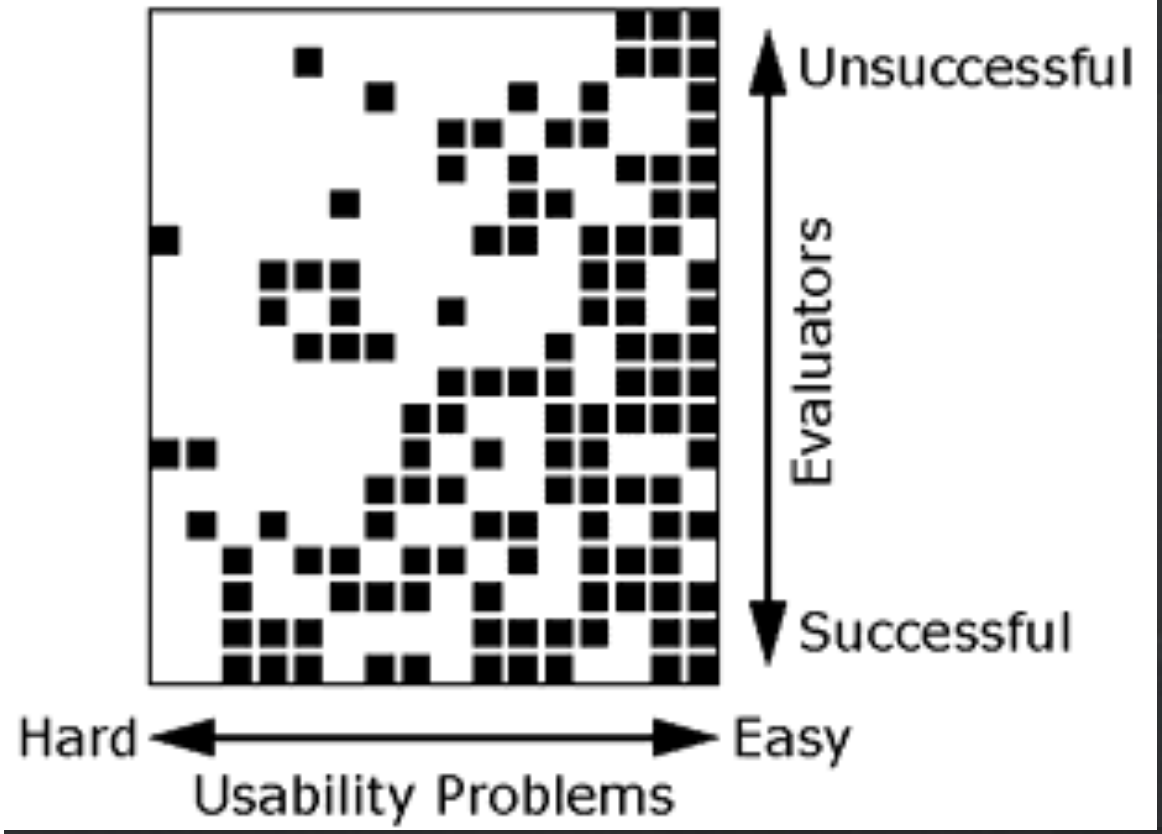
Not on actual interface
– participant can't test alone

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

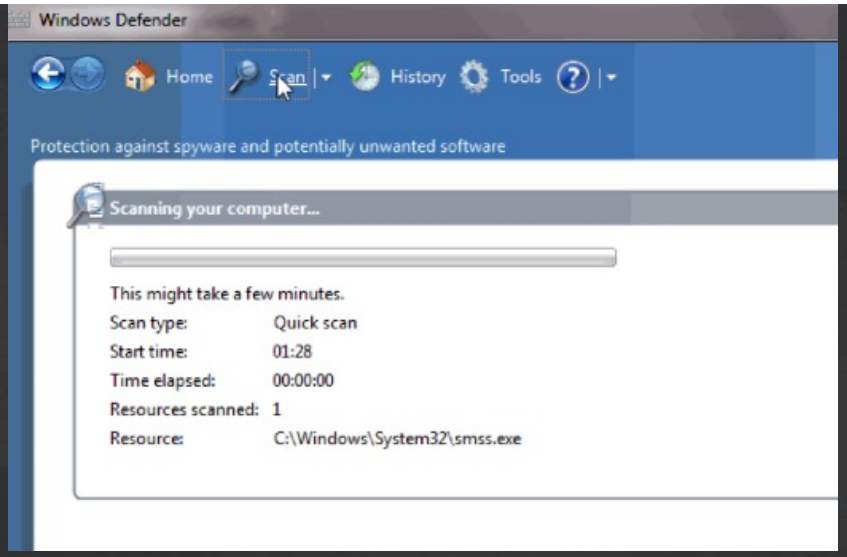
# Why Multiple Evaluators?

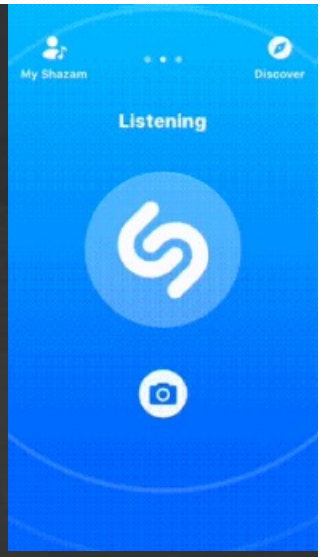



- Every evaluator doesn't find every problem
- Good evaluators find both easy & hard to find problems

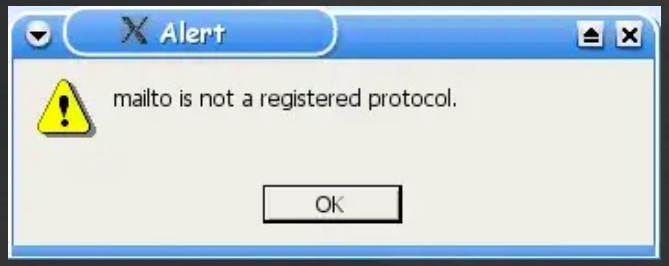
# Heuristics

## H1: Visibility of system status

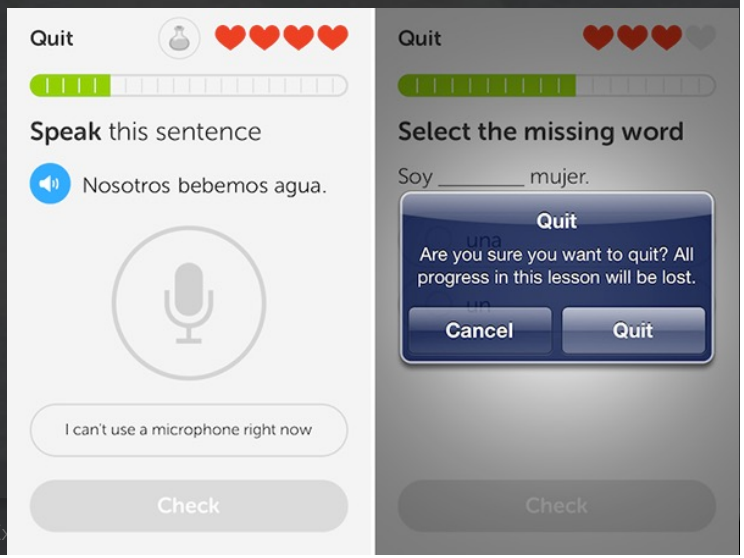



## H2: Match between system & real world

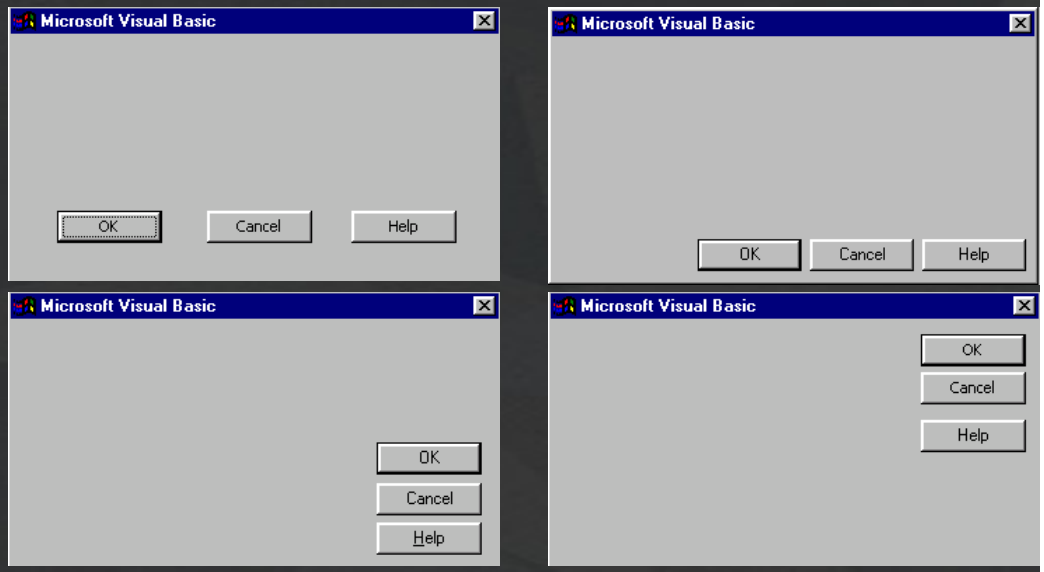



## H3: User control & freedom



# Heuristics (cont.)

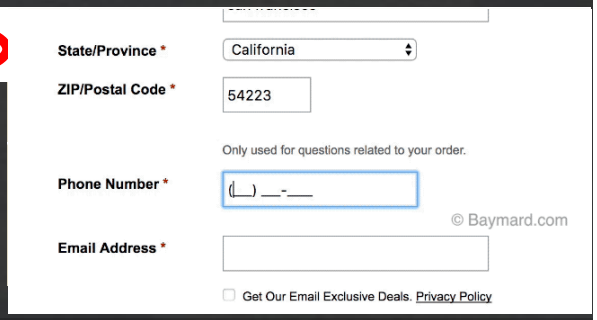
H4: Consistency & standards




H5: Error prevention

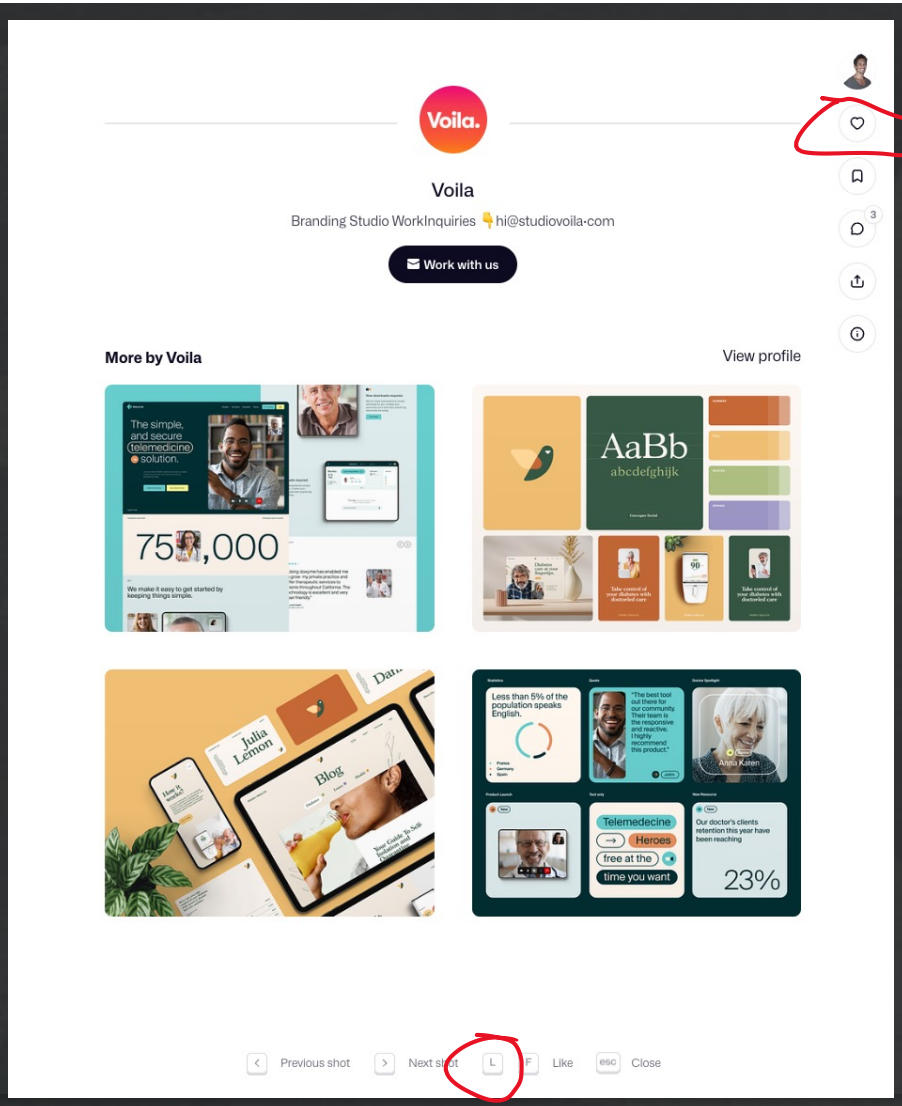
H6: Recognition rather than recall



# Heuristics (cont.)

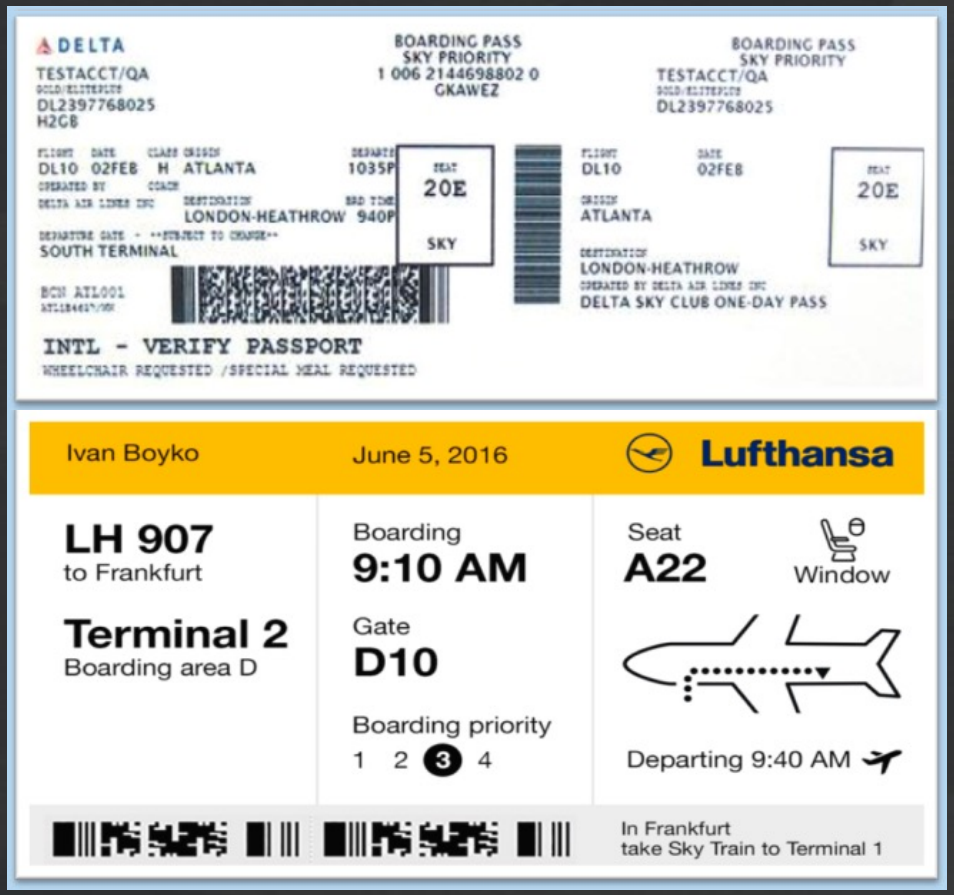
H7: Flexibility and efficiency of use



# Heuristics (cont.)

bad

good

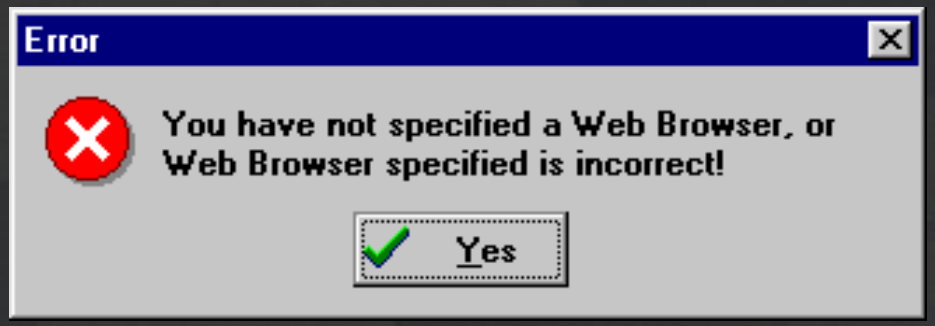


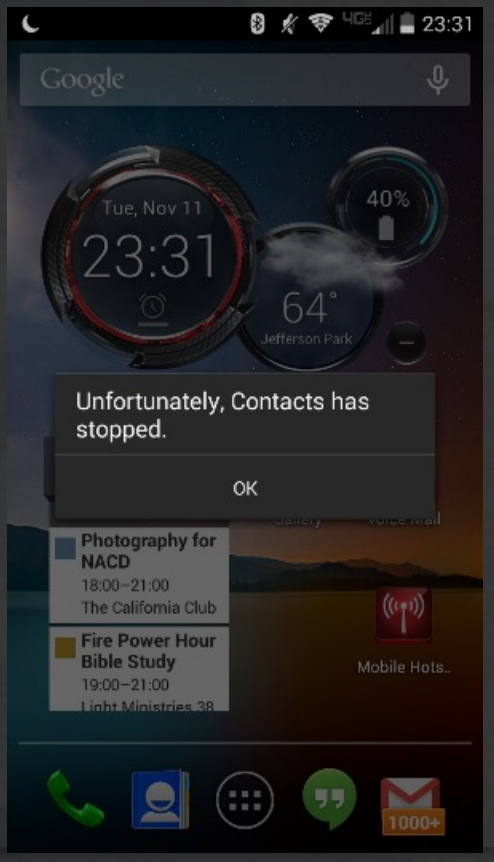

https://icons8.com/articles/redesigning-boarding-pass-again/

H8: Aesthetic & minimalist design

# Heuristics (cont.)

bad

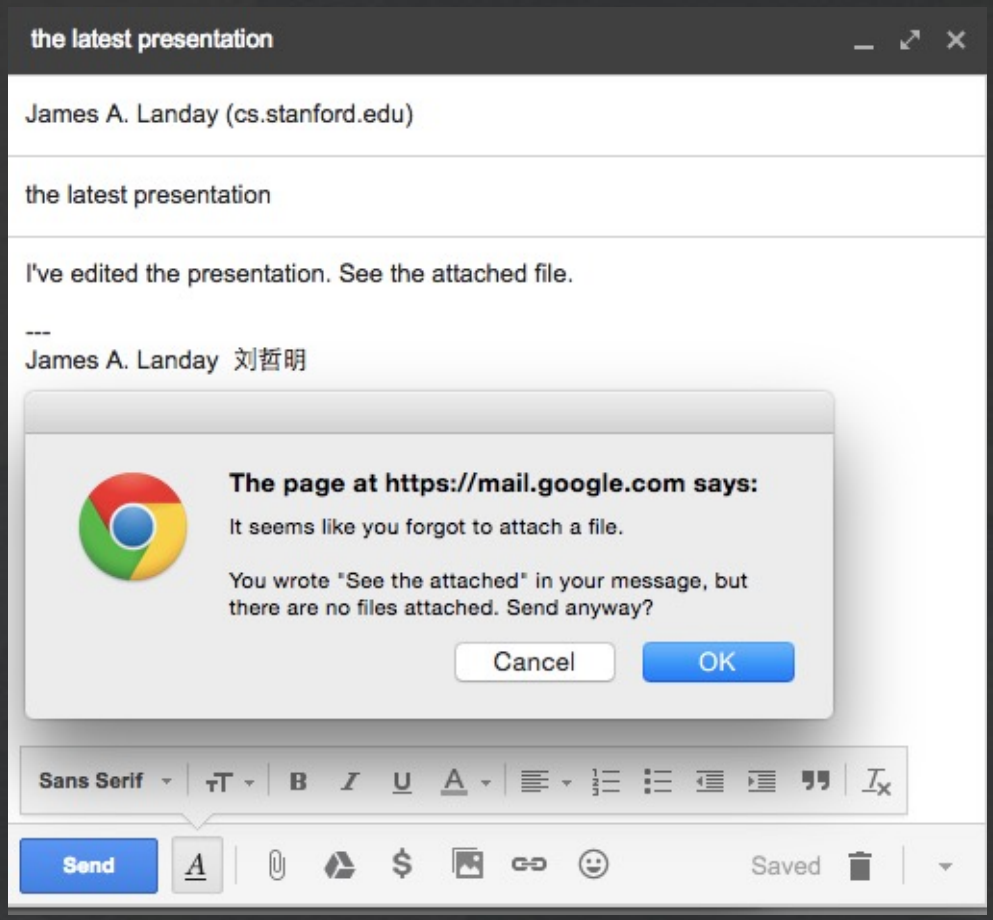



H9: Help users recognize, diagnose, & recover from errors

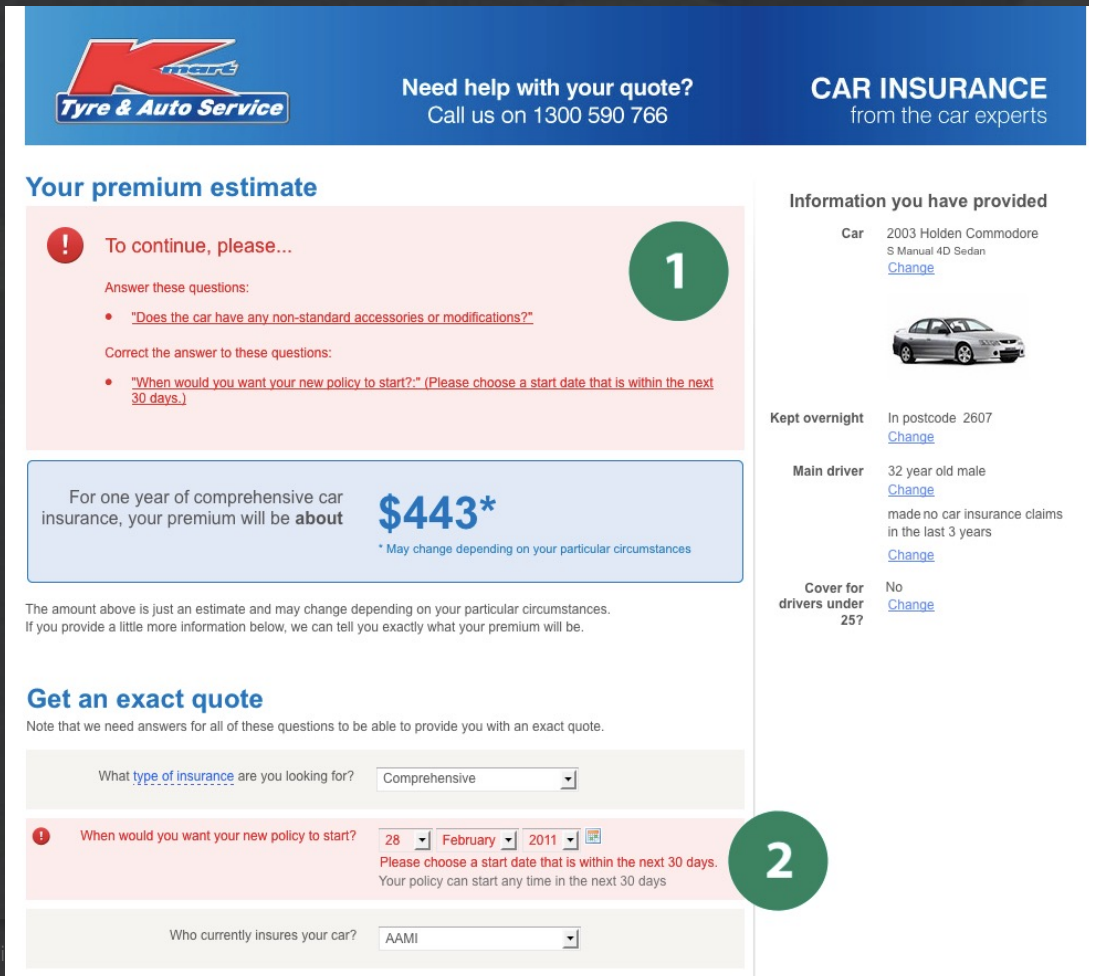
# Heuristics (cont.)

good



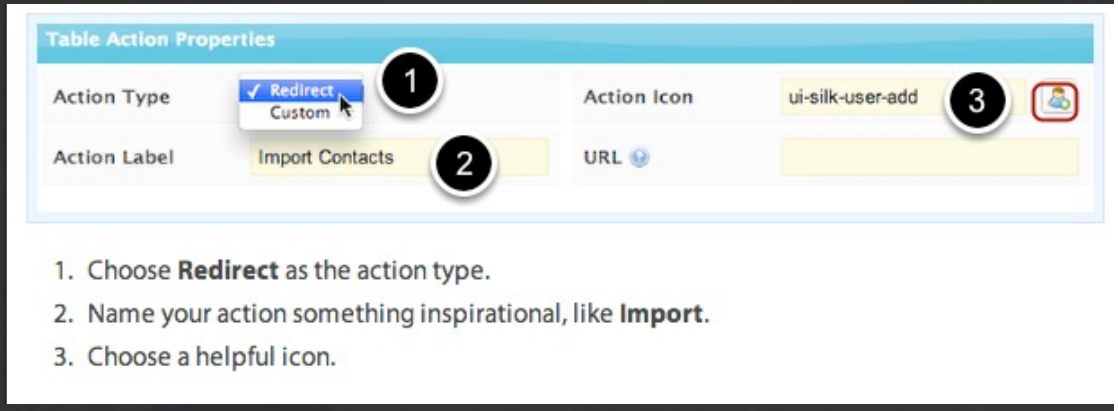
# Good Error Messages

- 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
- Make documentation
  - easy to search
  - focused on task
  - list concrete steps




http://blog.screensteps.com/10-examples-of-great-end-user-documentation

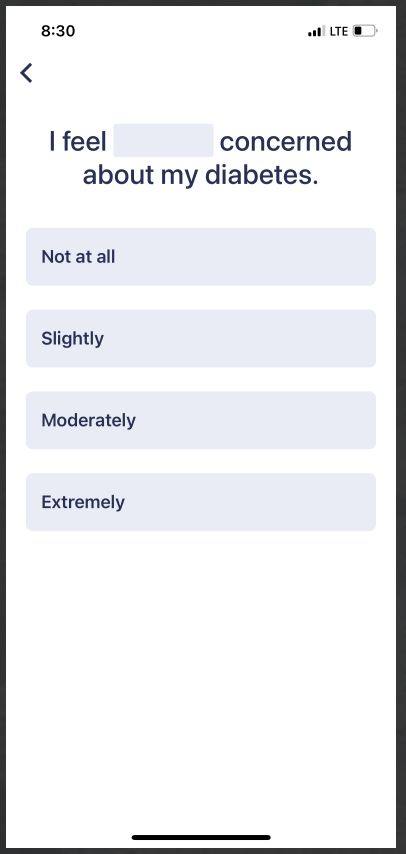
# H11* – Accessible Design

Users can interact with the system using *alternative input methods*.

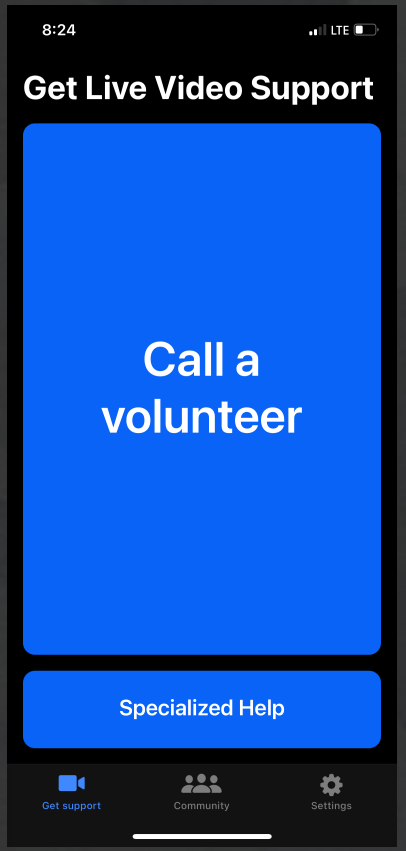
Content is legible with *distinguishable contrast* & *text size*.

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.




Glucose Buddy




Be My Eyes

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

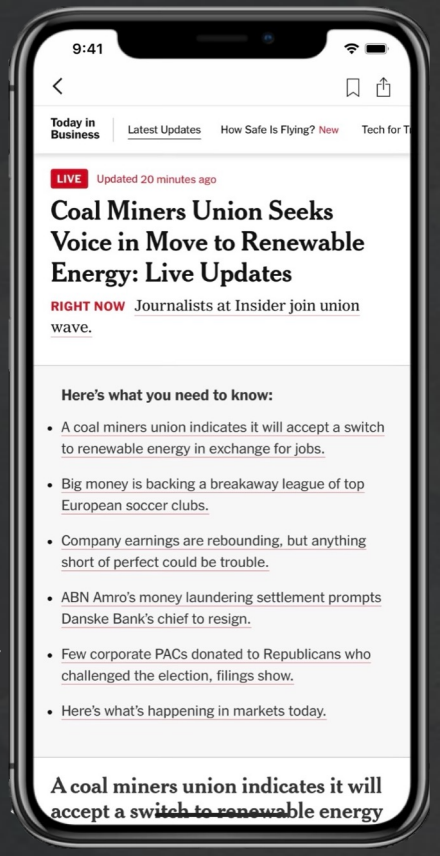
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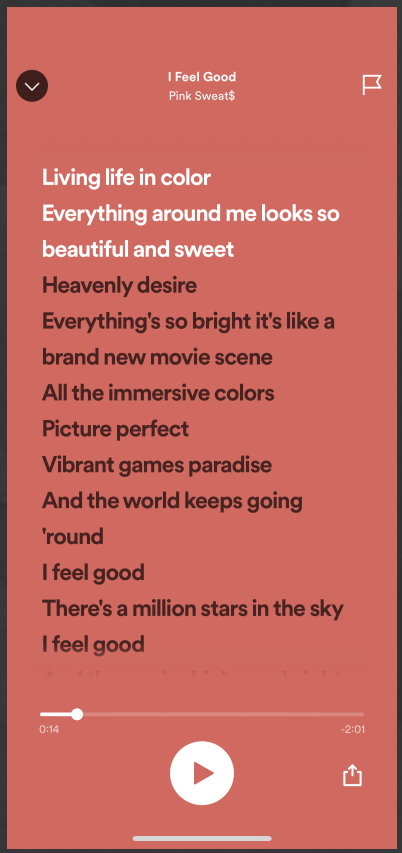
Content is legible with *distinguishable contrast* & *text size*.

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.




NY Times




Spotify (lyrics mode)

* 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.

Do the values encoded in design match the designers' target values?

How do the values encoded in respond to users' circumstances?

Do users encounter conflicting collateral values when interacting with it?

Is there a use context in which users' & designers' values diverge?

Does the design deepen or enhance the user's appreciation/understanding of the encoded values encoded?

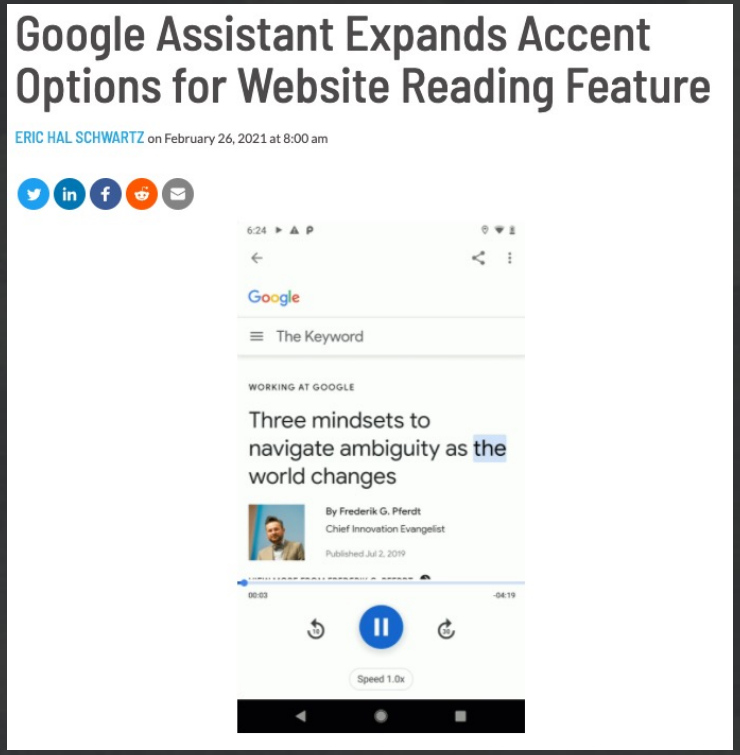
Does the design encourage behavior consistent with the target values?

# H12* – Value Alignment & Inclusion

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The design should *prevent the reproduction of preexisting inequities* and *not create additional burdens for disadvantaged populations*.




Google adds accented reading but leaves out marginalized groups.

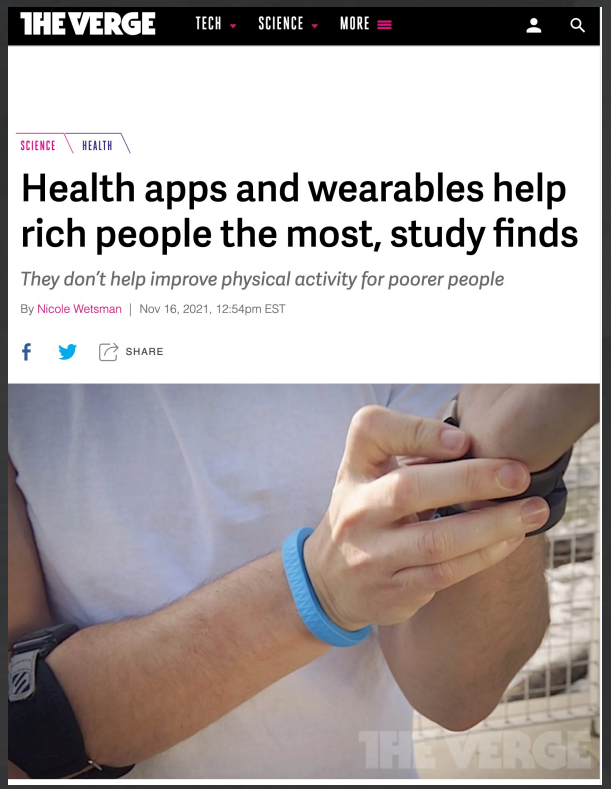
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https://www.theverge.com/2021/11/16/22785163/digital-health-physical-activity-inequity

Western, M.J., Armstrong, M.E.G., Islam, I. *et al.* The effectiveness of digital interventions for increasing physical activity in individuals of low socioeconomic status: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act* **18,** 148 (2021). https://doi.org/10.1186/s12966-021-01218-4

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Questions to ask:

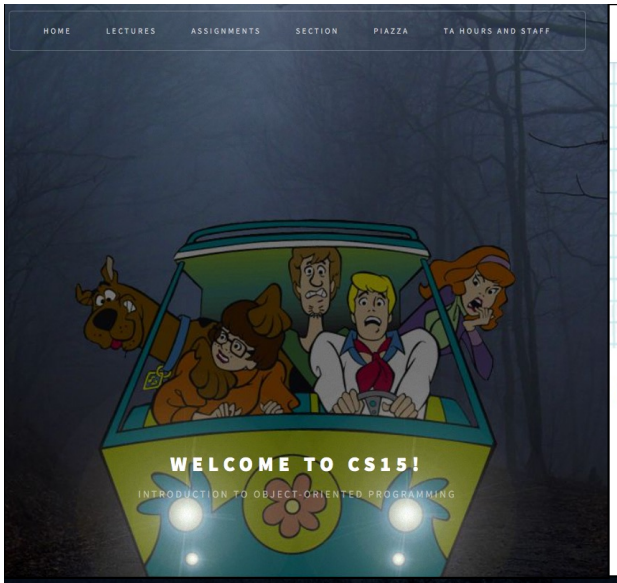
Does the design make strong default assumptions about its standard user?

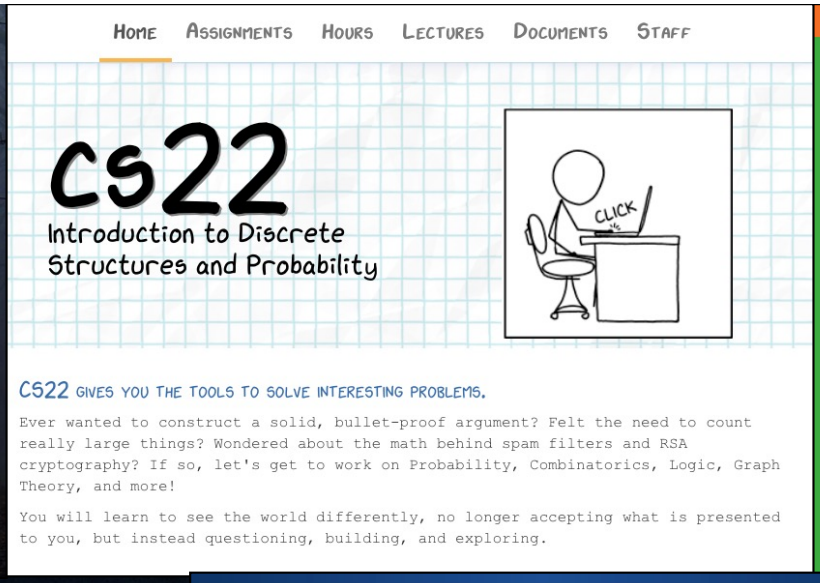
Is it substantially more burdensome for some population(s) to use?

Which users face greater difficulties when using it?

Do these assumptions reproduce existing biases in society?

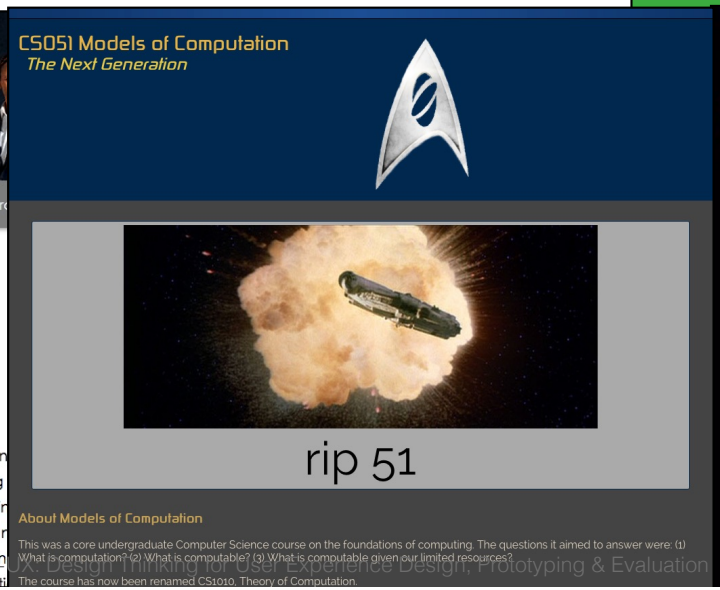
* New heuristic that CS147 staff has added to Nielson's 10.

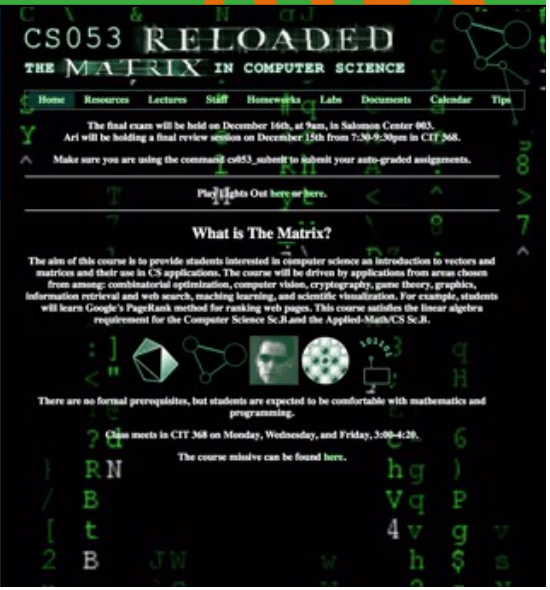

HOME
LECTURES
ASSIGNMENTS
SECTION
PIAZZA
TA HOURS AND STAFF
WELCOME TO CS15!
INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING


Home
Assignments
Hours
Lectures
Documents
Staff
CS22
Introduction to Discrete Structures and Probability
CLICK
CS22 GIVES YOU THE TOOLS TO SOLVE INTERESTING PROBLEMS.
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.


CS8: A First Byte
News
Schedule
Assignments
Labs
TA Hours
Course Info
FAQ
Staff
CS8:
A FIRST BYTE OF COMPUTER SCIENCE


CS166 / CS162
Computer Systems Security
Home
Assignments
Lectures
Calendar
Demos
Staff
Welcome to CS 166 and 162!
Register for CS166 on Piazza 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.
CS166 teaches principles of computer security from an applied viewpoint and provides hands-on experien
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 it. The mair
covered are cryptography, authentication, access control, operating systems security, web security, and r
security. Other topics include general security principles, human factors such as trust and social engineerin
security of complex systems, and the economics of security. The course aims to balance theory and practi


CS051 Models of Computation
The Next Generation
rip 51
About Models of Computation
This was a core undergraduate Computer Science course on the foundations of computing. The questions it aimed to answer were: (1) What is computation? (2) What is computable? (3) What is computable given our limited resources?
The course has now been renamed CS1010, Theory of Computation.


CS053 RELOADED
THE MATRIX IN COMPUTER SCIENCE
Home
Resources
Lectures
Staff
Homeworks
Labs
Documents
Calendar
Tips
The final exam will be held on December 16th, at 9am, in Salomon Center 003.
Ari will be holding a final review session on December 15th from 7:30-9:30pm in CIT 368.
Make sure you are using the command cs053_submit to submit your auto-graded assignments.
Pac Lights Out here or here.
What is The Matrix?
The aim of this course is to provide students interested in computer science an introduction to vectors and matrices and their use in CS applications. The course will be driven by applications from areas chosen from among: combinatorial optimization, computer vision, cryptography, game theory, graphics, information retrieval and web search, machine learning, and scientific visualization. For example, students will learn Google's PageRank method for ranking web pages. This course satisfies the linear algebra requirement for the Computer Science Sc.B and the Applied-Math/CS Sc.B.
There are no formal prerequisites, but students are expected to be comfortable with mathematics and programming.
Class meets in CIT 368 on Monday, Wednesday, and Friday, 3:00-4:20.
The course missive can be found here.

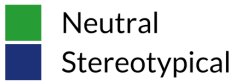
Neutral




Stereotypical



# Experimental Measures




Enrollment intentions

Sense of belonging

Anticipated Success

Danaë Metaxa-Kakavouli, Kelly Wang, James A. Landay, and Jeff Hancock. 2018. Gender-Inclusive Design: Sense of Belonging and Bias in Web Interfaces. In Proceedings of CHI '18, 1–6. https://doi.org/10.1145/3173574.3174188

# Heuristic Violation Examples

Heuristic

Number

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

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

Severity rating

1. [H4 Consistency & Standards] [Severity 3]
Different labels for “saving” content.

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.

**Carl's Car Audio and Electronics -- Shopping Bag**

what fits my car? logout continue shopping

Your vehicle: 1989 Tercel
To select a different vehicle, click 'What Fits My Car' above

**PLEASE NOTE**

| Item # | Message |
|---|---|
| **204EL570** | 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**

| Quantity | Item # | Remove? | Item Description | Price | Total |
|---|---|---|---|---|---|
| 3 | #033DVM4800 | ☐ | Denon DVM-4800 DVD Video Changer | $1,199.95 | $1,199.95 |
| 1 | #204EL570 | ☐ | Bazooka EL570 5"x7" 2-way speakers<br>Vehicle: 1989 Toyota Tercel Liftback with equalizer or radio delete option (change) | $79.95 | $79.95 |
| h | #158DSCP50 | ☐ | **Special**<br>Sony DSC-P50 Digital Still Camera, 2.1 Mega Pixel<br>Save $100! Was $399.95, Now: $299.95 | $299.95 | $299.95 |
| 1 | #133DVDLA95 | yes ☐ no ☐ | Panasonic DVD-LA95 Portable DVD-A/V Player with 9" Screen<br>-- This item is temporarily out of stock -- | $999.95 | $999.95 |
| 1 | #170GXT160 | ☐ | Maxell GX-Silver T-160 VHS Video Tape | $2.49 | $2.49 |
| 1 | | | | | |

**Total**

| | |
|---|---|
| Merchandise Total: | **$2,582.29** |
| Standard Shipping Shipping Charge:<br>Alternative shipping options available before final checkout | **$13.95** |
| Order Total: | **$2,596.24** |

Update Cart Clear Cart

- 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.

# Problems Found Last 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 Visitors, 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 a no check box
6. H4: consistency; "Total" means different things in different places
7. H5: 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. H9: 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. h8: 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. H8: Aesthetic and minimalist design - too many different and vibrant colors for background and text
21. H11: accessible design [3-4] Illegible text, high saturation title and blue text, change colors
22. H8: Unnecessary information added that clusters the page, design is not minimalistic, 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: Waht does red indicate? Used for discounts, stock, and item nums
31. H2: 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. H11: the colors aren't good for contrast (red text on a green background)
36. H5- add and clear cart buttons look the same
37. H4: remove boxes either have one checkbox or a yes/no checkboxes
38. H8 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. H9: Error message, which indicates a product is not compatible with a car, is not easy to spot and requires a multiple step solution
43. H5 [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. H9: 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. H3 [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. H9: out of stock but still being charged
52. H9: there is an h in quantity but no indication
53. H7/10: too many steps to update cart
54. H8: blue text on blue background

# Problems Found Two Years Ago

- 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 Two Years Ago

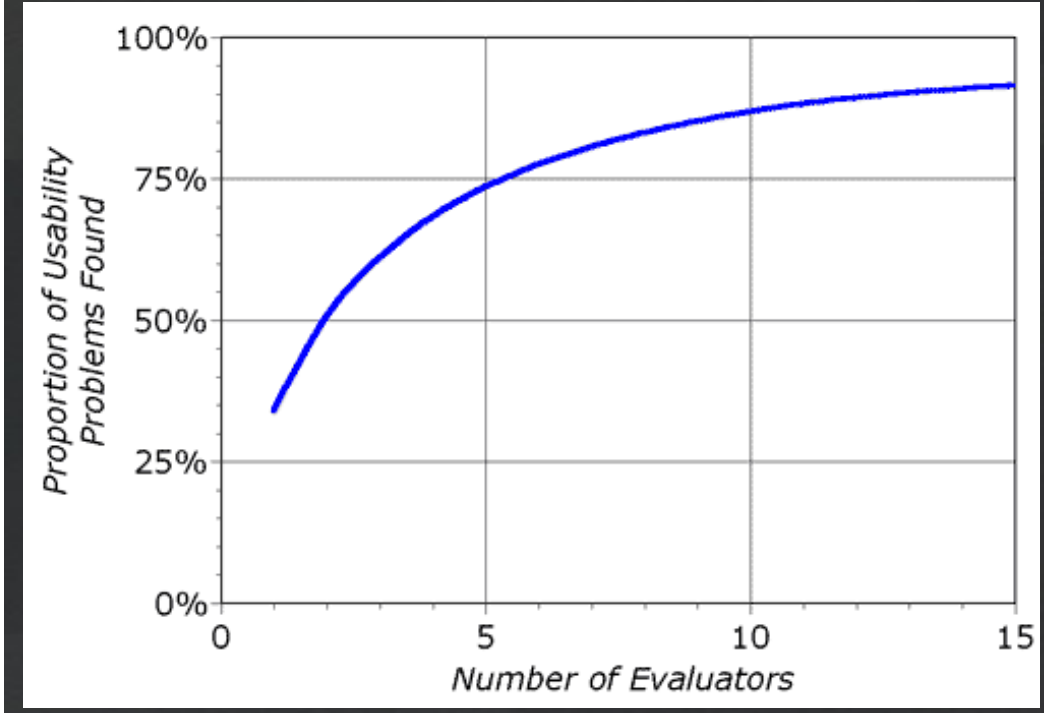
- H5: Error prevention
  - Out of Stock items allowed to be added to cart [4]
  - ”h” in Quantity Field [7]
- H6: Recognition rather than recall
  - Item number not auto-filled, difficult for user to remember [2]
- H7: Flexibility and efficiency of use
  - Update Cart Button required to update cart and 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 Two Years Ago

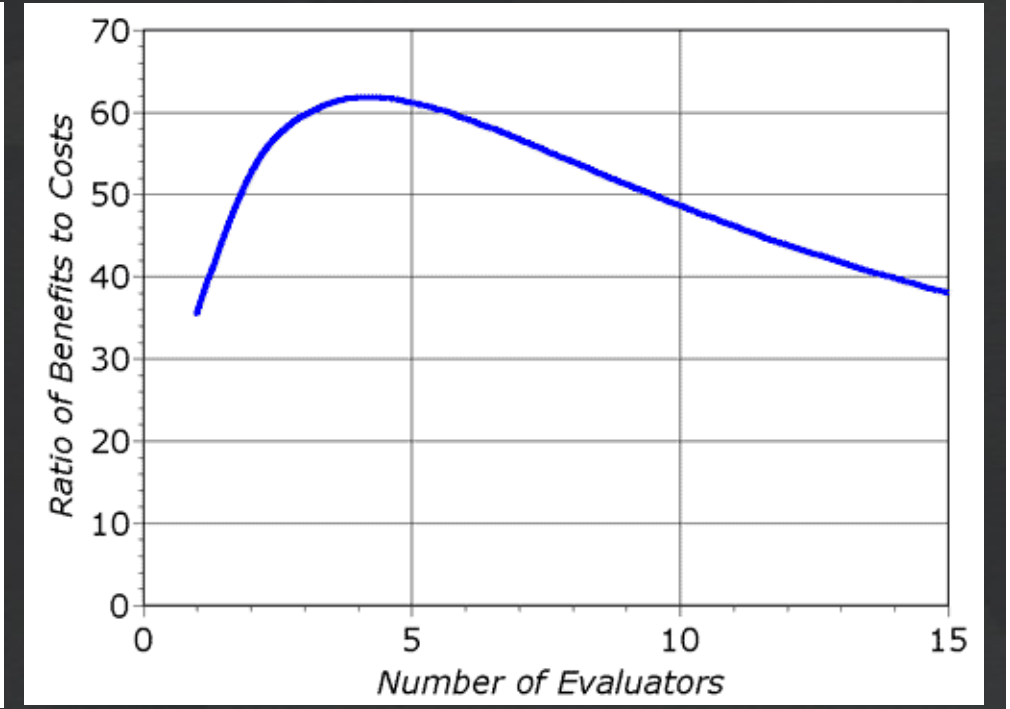
- H9: Help users recognize, diagnose, & recover from errors
  - “Please Note” error message refers to item bolded in red but multiple items bolded in red [2]
  - Last row has quantity 1 but no other info, user unsure how to fix [1]
- H10: Help & Documentation
  - Instructions for use not immediately 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]

# 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
- How about asking AI to perform HE? Tradeoffs.

# 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.

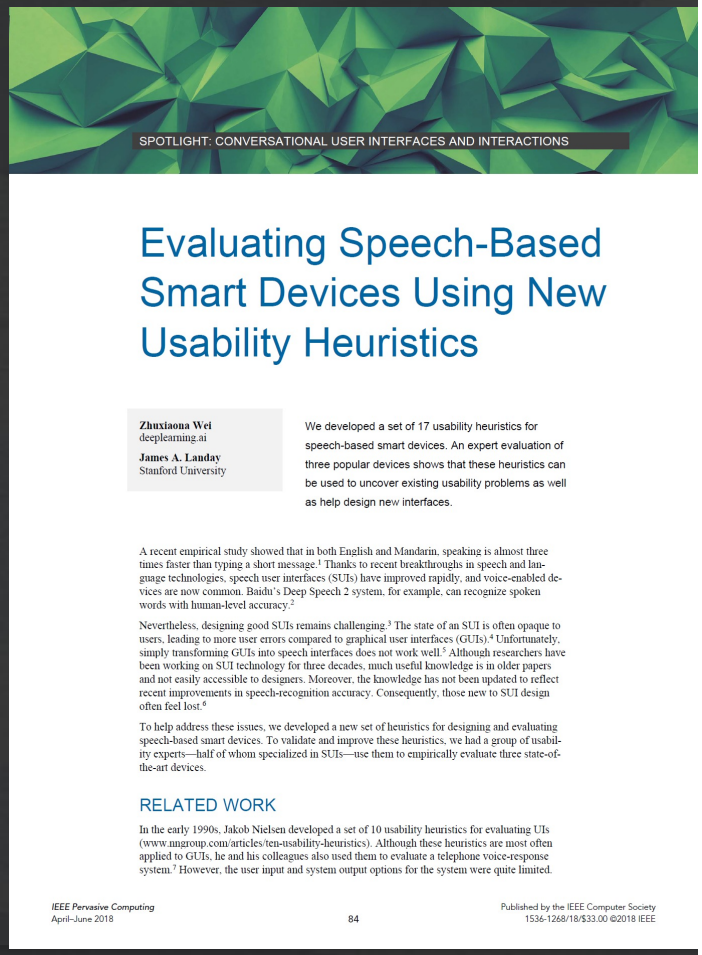
S6: Use spoken language characteristics.

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.



SPOTLIGHT: CONVERSATIONAL USER INTERFACES AND INTERACTIONS

## Evaluating Speech-Based Smart Devices Using New Usability Heuristics

**Zhuxiaona Wei**
deeplearning.ai

**James A. Landay**
Stanford University

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

A recent empirical study showed that in both English and Mandarin, speaking is almost three times faster than typing a short message.[1] Thanks to recent breakthroughs in speech and language technologies, speech user interfaces (SUIs) have improved rapidly, and voice-enabled devices are now common. Baidu's Deep Speech 2 system, for example, can recognize spoken words with human-level accuracy.[2]

Nevertheless, designing good SUIs remains challenging.[3] The state of an SUI is often opaque to users, leading to more user errors compared to graphical user interfaces (GUIs).[4] Unfortunately, simply transforming GUIs into speech interfaces does not work well.[5] Although researchers have been working on SUI technology for three decades, much useful knowledge is in older papers and not easily accessible to designers. Moreover, the knowledge has not been updated to reflect recent improvements in speech-recognition accuracy. Consequently, those new to SUI design often feel lost.[6]

To help address these issues, we developed a new set of heuristics for designing and evaluating speech-based smart devices. To validate and improve these heuristics, we had a group of usability experts—half of whom specialized in SUIs—use them to empirically evaluate three 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/ten-usability-heuristics). Although these heuristics are most often applied to GUIs, he and his colleagues also used them to evaluate a telephone voice-response system.[7] However, the user input and system output options for the system were quite limited.

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April–June 2018



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# Speech UI Heuristics

S11: Keep feedback and prompts short.

S12: Confirm input intelligently.

S13: Use speech-recognition system confidence to drive feedback style.

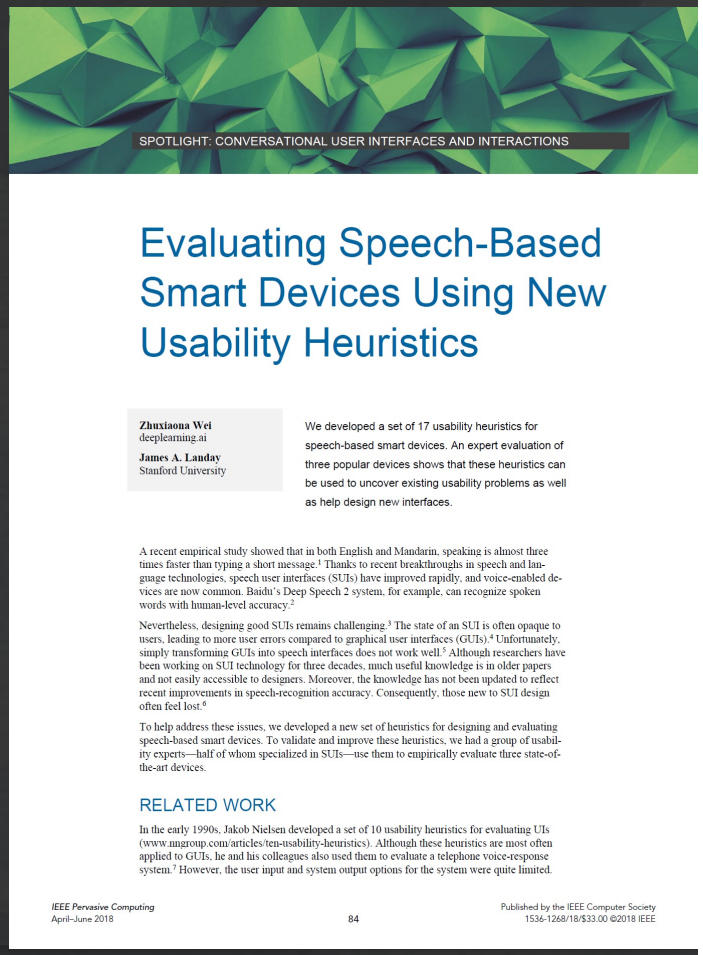
S14: Use multimodal feedback when available.

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



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# Administrivia

- Individual heuristic evaluation assignment this week
- Midterm 1 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

# TEAM BREAK

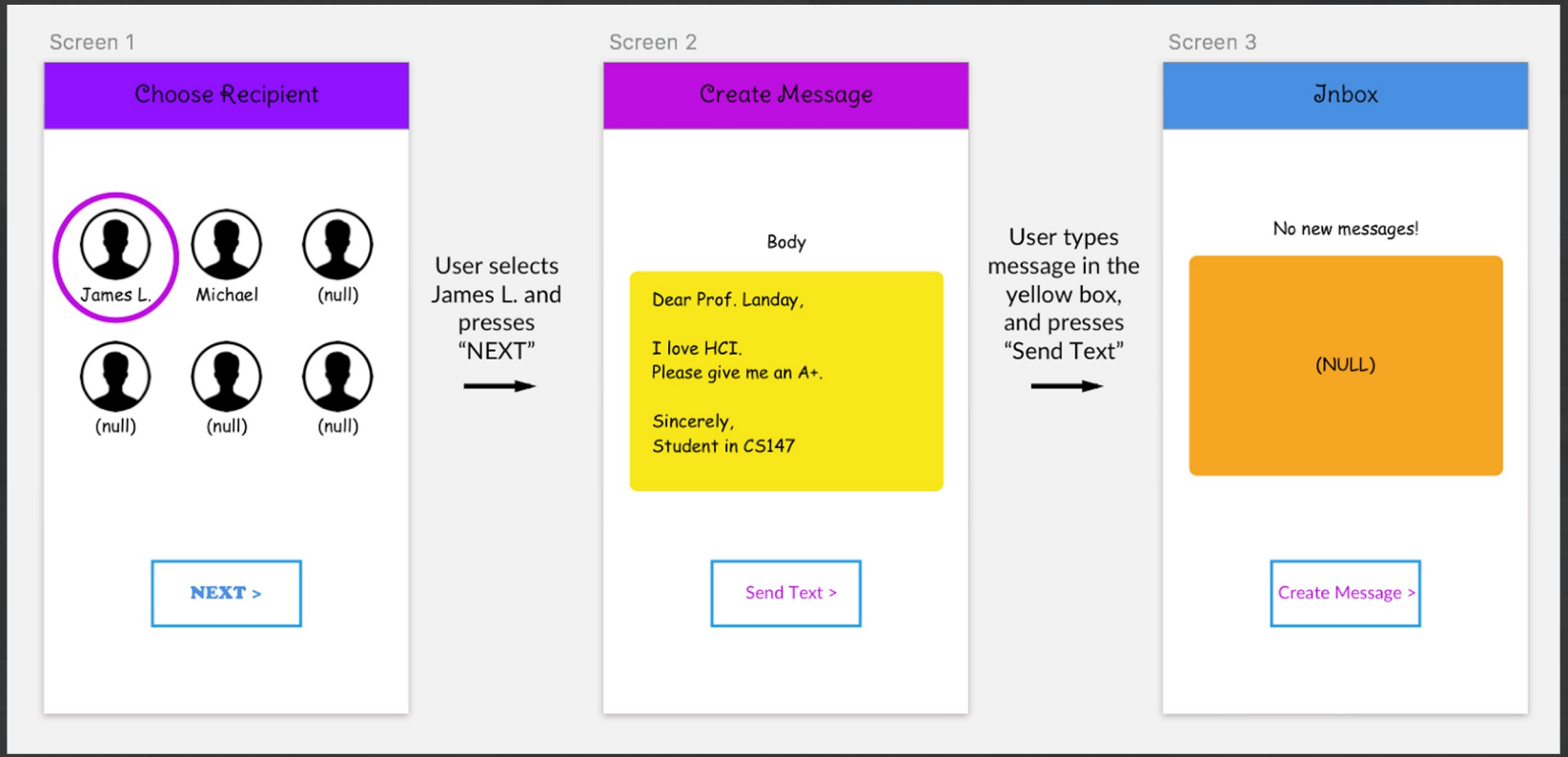
# EXERCISE

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)**

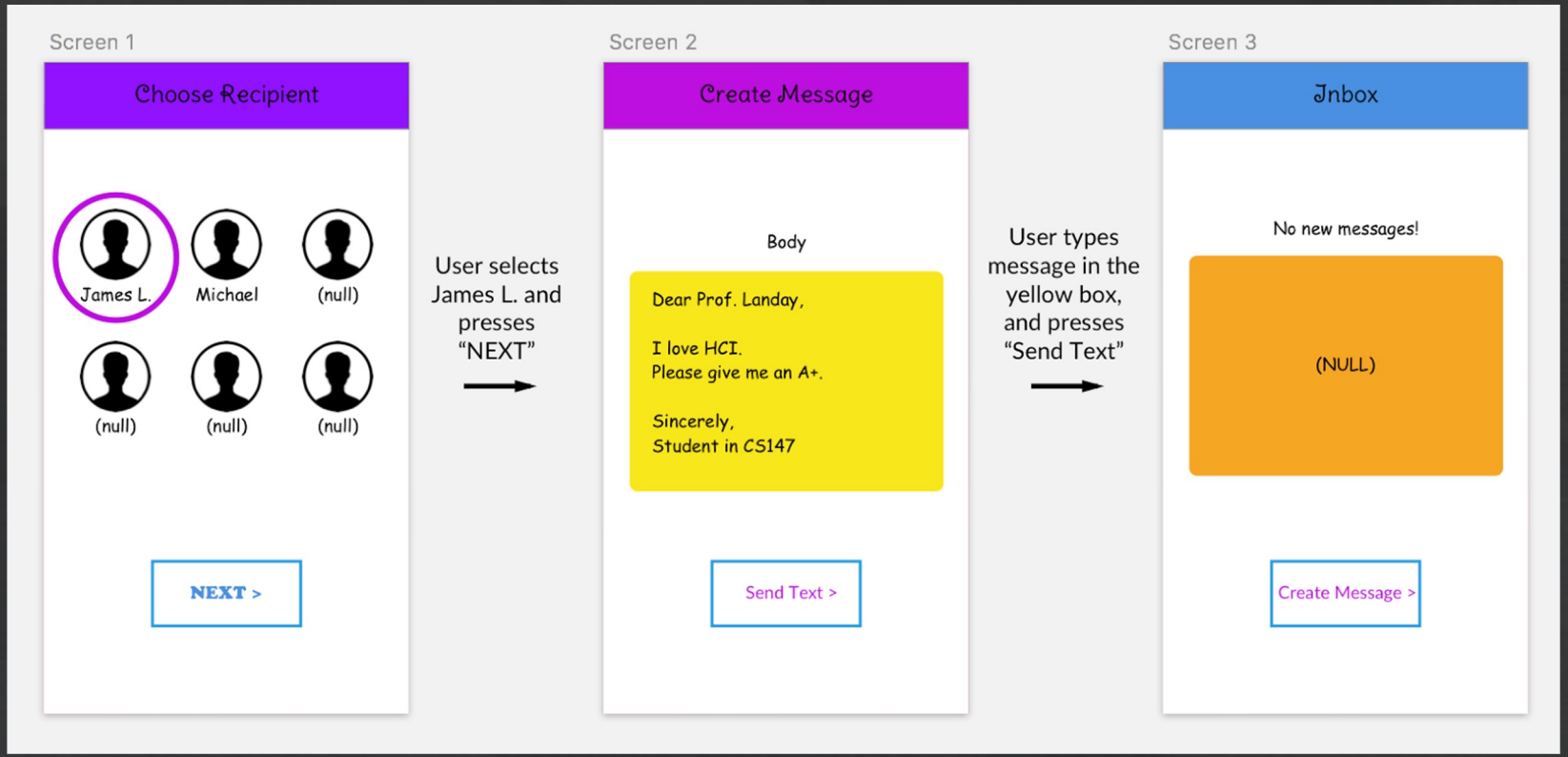
For each one: Which guideline was violated and why? How could it be fixed?




hci.st/cs147-26au-he

## [5 min]: Share with your group (3-4)

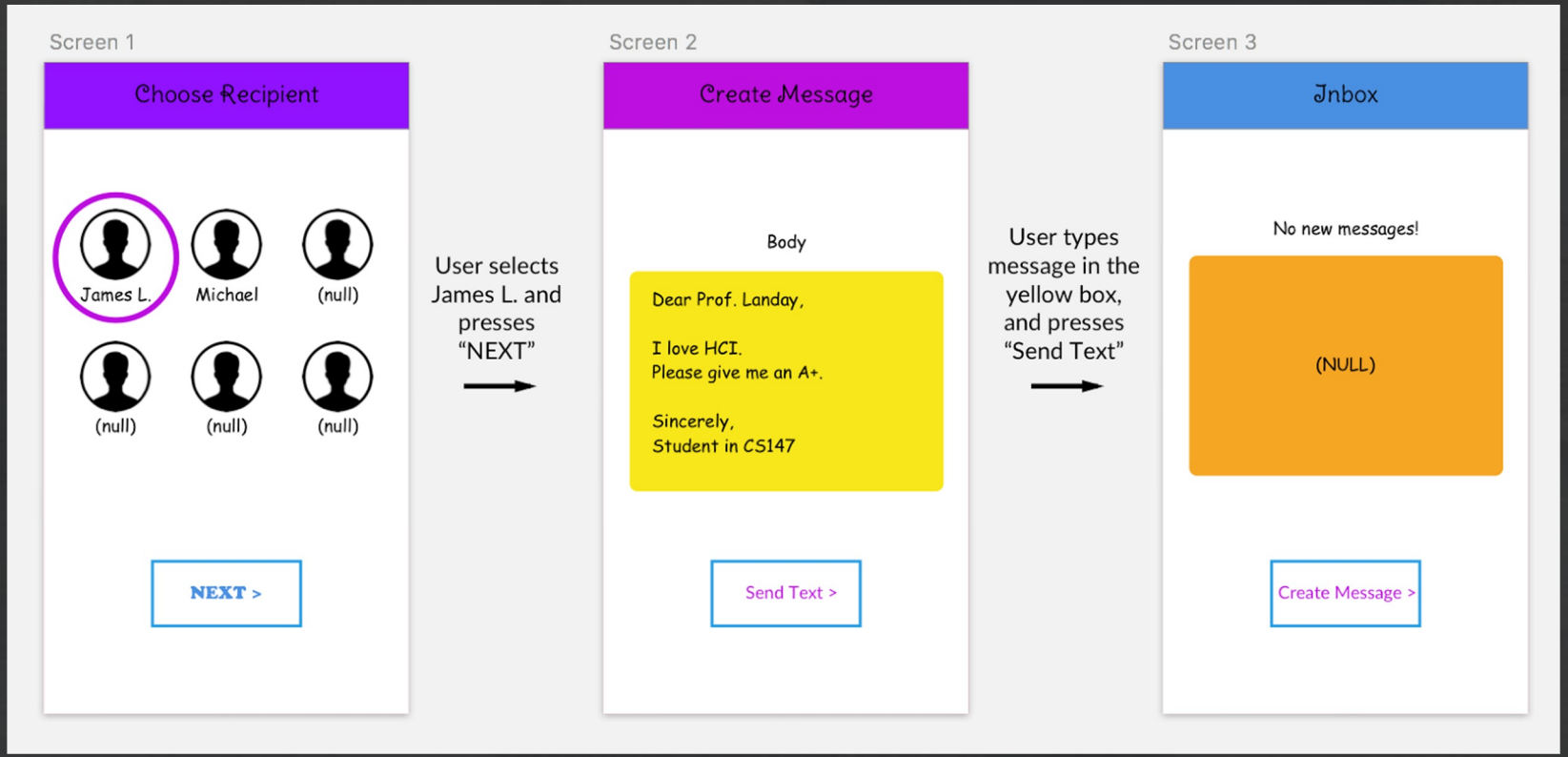
What violations did you all find? Which ones did only one of you notice?




hci.st/cs147-26au-he

## [5 min]: Share with the class

Raise your hand or post a screenshot with your description on Slack.



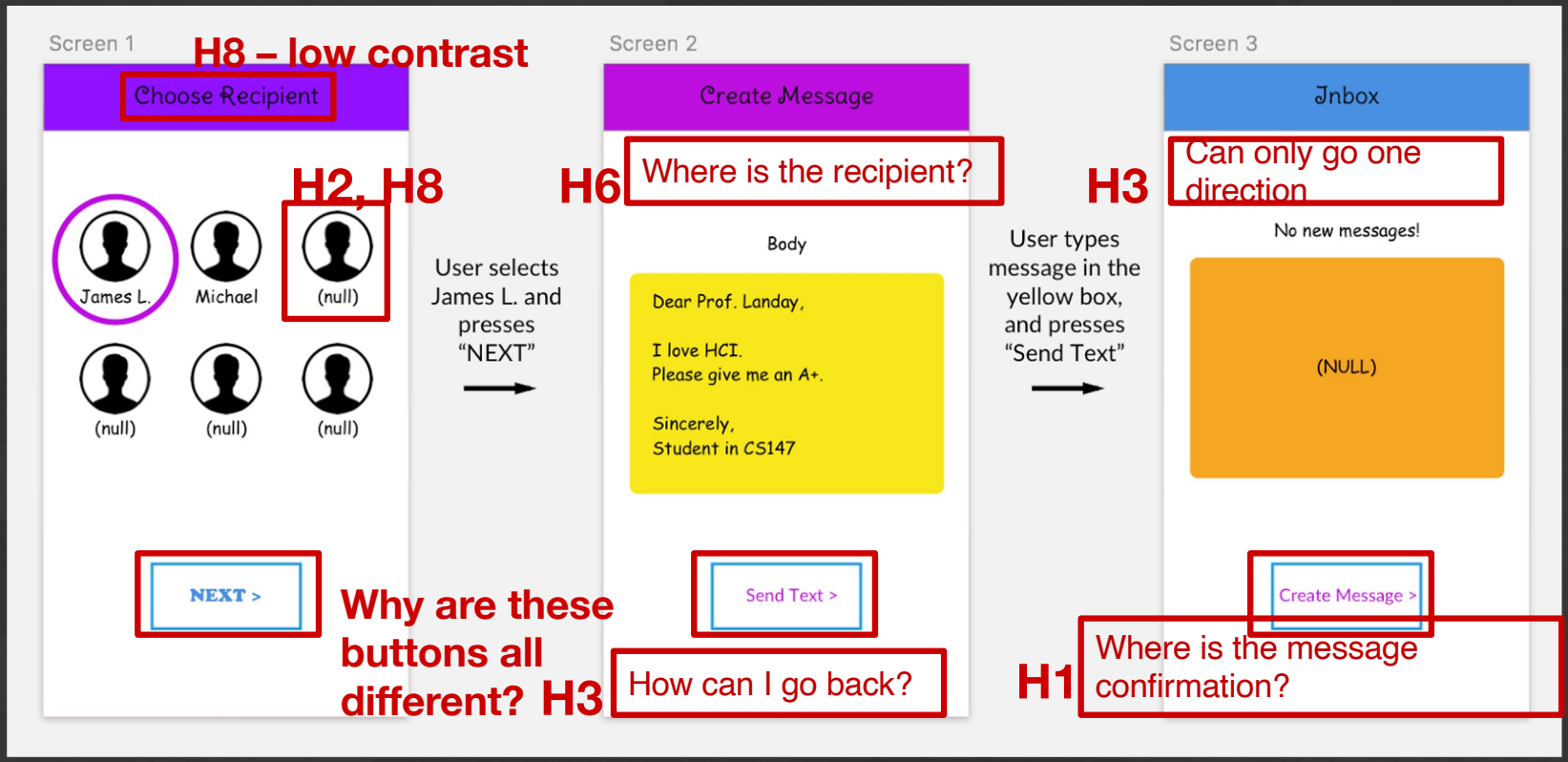

hci.st/cs147-26au-he




# Find, label, & describe 8-10 Heuristic Violations

## [5 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).



# Problems Found This Year

*H?*

# Problems Found Last Year

*H2: Match between system & real world*

?

*H3: User control & freedom*

?

*H6: Recognition rather than recall*

?

# 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 3 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 miscliked 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
  - Apple Developer->Design->Foundations->Accessibility
  - short read and to the point!

# Next Time

- Wed.
  - 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 (Thur/Fri)
  - Heuristic Evaluation Merge (must be present for A8 credit!)