Conceptual Models & Interface Metaphors

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Winter 2021
March 1, 2021

Hall of Shame?

- Design based on a top retailer’s site
- Color deficiency
  - can’t distinguish between red & green
- In study, user could not get by this screen!
- How to fix?
  - redundant cues

A Better Design

1. Instructions at the top for all errors
2. Redundant exclamation icons
3. Changed color on boxes around input fields with errors
4. Instructions on what to fix near each error

Hall of Fame or Shame?

- M-Pesa mobile payments
- Common in Africa

Hall of Fame or Shame?

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Hall of Fame or Shame?

- M-Pesa mobile payments
- Common in Africa
- Simple UI but brings banking services to the unbanked!

Conceptual Models & Interface Metaphors

Conceptual Models
- Mental representation of how an artifact works & how interface controls affect it
- People may have preconceived models that are hard to change
- (4 + 5) vs. (4 5 +)
- dragging to trash?
  - deletes file but ejects disk
- Interface must communicate model
  - visually, possibly physically or using sound

Design of Everyday Things
- By Don Norman
  - UCSD, Apple, HP, NN Group, NU, UCSD
- Design of everyday objects illustrates problems faced by designers of systems
- Explains conceptual models
  - doors, washing machines, digital watches, phones
- Resulting design guides
  - Highly recommended

Outline
- Design of Everyday Things
- Conceptual models
- Team break
- Design guides for conceptual models
- Interface metaphors
- UI consistency

Affordances as Perceptual Clues
- Well-designed objects have affordances
  - clues to their operation
  - often visual, but not always (e.g., speech)
Affordances as Perceptual Clues

Poorly-designed objects
- no clues or misleading clues

French artist Jacques Carelman
Crazy design for a screw punch!

Norman doors

Refrigerator

Problem: freezer too cold, but fresh food just right

Normal Settings
C and 5
Colder Fresh Food
C and 6-7
Coolest Fresh Food
B and 8-9
Coldest Freezer
D and 7-8
Warmer Fresh Food
C and 4-1
OFF (both)
0

A   B   C    D   E

What is your conceptual model?
Spend 30 sec. drawing a diagram showing your model
- where the cooling units are & how they are controlled
Share with your neighbor

A Common Conceptual Model

independent cooling units
Actual Conceptual Model

![Actual Conceptual Model Diagram]

Can you fix the problem?
Possible solutions
- make controls map to customer’s model
- make controls map to actual system

Design Model & Customer Model

![Design Model & Customer Model Diagram]

- Customers get model from prior experience & usage of new
  - through system image
- What if the two models don’t match?

Conceptual Model Mismatch

- Mismatch between designer’s & customer’s conceptual models leads to...
  - slow performance
  - errors
  - frustration
  - ...

Model Mismatch: Car Automatic Shifter

![Model Mismatch: Car Automatic Shifter Diagram]

Administtrivia

- Hi-Fi Prototype Assignment posted last week
  - mid-way milestone due on Thur/Fri Mar. 11/12 (at start of studio)
  - final prototype due Thur/Fri Mar. 18-19 (at start of studio)
  - final presentations at project fair, Fri. Mar. 19, 6:30 PM
  - (show starts at 6:30 PM)
  - final write-up due Sat. Mar. 20, 6 PM
- Midterm Monday, March 8th
  - If you sent us an OAE letter, you should get email from us about accommodations for the exam
  - If you aren’t in CS47 and want to learn React Native
    - see CS147 home page for links to CS47 assignments 1-4 and Lectures 1-10

TEAM BREAK
Talk about how to build your hi-fi prototype
Design Guides
- Provide good conceptual model
  - customer wants to understand how controls affect object
- Make things visible
  - if object has function, interface should show it
- Map interface controls to customer’s model
  - infix vs. postfix calculator – whose model is that?
- Provide feedback
  - what you see is what you get! (WYSIWYG)

Make Things Visible
- Refrigerator
  - make the 1..9 dial something about percentage of cooling between the two compartments?
- Controls available on watch w/ 4 buttons?
  - too many & they are not visible!

Make Things Visible
- Compare to controls on old & new car radios
  - \#controls = \#functions
  - controls are labeled (?) and grouped together

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Make Things Visible
- Compare to controls on old & new car radios
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  - controls are labeled (?) and grouped together
  - tradeoffs of the “glass UI” (e.g., Tesla)?
Map Interface Controls to Customer’s Model

- Which is better for car dashboard speaker front / back control?
- Control should mirror real-world

Dashboard

Map Interface Controls to Customer’s Model

- Which is better for car dashboard speaker front / back control?
- Control should mirror real-world

Mercedes Benz Seat Control maps to real world

Map Interface Controls to Customer’s Model

Problem?
Which knob controls which burner?

Map Interface Controls to Customer’s Model

Possible fixes?

Metaphor

- Definition:
  “The transference of the relation between one set of objects to another set for the purpose of brief explanation.”

- Lakoff & Johnson, Metaphors We Live By:
  “... the way we think, what we experience, and what we do everyday is very much a matter of metaphor
  in our language & thinking – “argument is sea”
  ... he attacked every weak point
  ... criticisms right on target
  ... if you use that strategy

- We use metaphor in UI design to leverage existing conceptual models

Metaphor

Desktop Metaphor

Engelbart’s windows

In today’s Emacs
Desktop Metaphor

Suggests a conceptual model
- not really an attempt to simulate a real desktop
- a way to explain why some windows overlapped
- leverages knowledge about files, folders & trash

Example Metaphors

- Global metaphors
  - personal assistant, wallet, clothing, pens, cards
- Data & function
  - to-do list, calendar, documents, find, assist
- Collections
  - drawers, files, books, newspapers, photo albums

How to Use Metaphor

- Develop interface metaphor tied to conceptual model
- Communicate that metaphor to the user
- Provide high-level task-oriented operations, not low-level implementation commands

Avoid Metaphor for Metaphor’s Sake

- Skeuomorphism
  - “making items resemble their real-world counterparts”
  - “a physical ornament or design on an object made to resemble another material or technique”
- Argument against: takes up space & leads to inconsistent look
- Argument for: helps people learn

Ways of Being Consistent

- Interfaces should be consistent in a meaningful way
  - e.g., ubiquitous use of same keys for cut/copy/paste
- Types of consistency
  - consistent internally
    - e.g., same terminology & layout throughout app
  - consistent with other apps
  - e.g., works like MS Word, uses same keyboard conventions
  - design patterns (across many apps)
  - consistent with physical world

Is Consistent Always Better?  NO

- Palm PDA example: should “new appointment” & “delete appointment” be in the same place?
- New (add) is common, but delete is not
Is Consistent Always Better? NO

Early Palm design (like desktop version)

Streamlined design

Is Consistent Always Better? NO

Firefox 3 Back/Forward Buttons

Is Consistent Always Better? NO

Most Recent Firefox Back/Forward Buttons

Is Consistent Always Better? NO

Summary

- Conceptual model:
  - mental representation of how the object works & how interface controls effect it

- Design model should equal customer’s model:
  - mismatches lead to errors
  - use customer’s likely conceptual model to design

- Design guides:
  - provide good conceptual model
  - make things visible
  - map interface controls to customer’s model
  - provide feedback

Further Reading

- Design of Everyday Things, Donald Norman
- Design as Practiced, Donald Norman
  - Talks about failure to make changes to Macintosh

- Computing the Case Against User Interface Consistency, Jonathan Grudin
  - Talks about why interfaces should not always be consistent

Next Time

- Lecture
  - Wednesday: Usability Testing & Midterm Review
  - Monday: Midterm

- Studio
  - This week: project work, feedback, Midterm Q&A
  - Next week: Hi-Fi Prototype Midway Milestone