Prototypes: Design and Evaluation

Some content from: Camburn, Bradley, et al. "Design Prototyping Methods: State of the Art in Strategies, Techniques, and Guidelines." Design Science, vol. 3, 2017, https://doi.org/10.1017/dsj.2017.10.

Announcements

- TA meetings: you need to schedule these TODAY
  - (they start next week)
- Ask if you cannot find a slot.

Each Prototype Focuses on a Question

- "Acquire sufficient information to move forward in product development with minimal expenditure of time and cost. Therefore, every prototype test should answer a specific question (Otto & Wood 2001)."
- Web app or native app?
- Accounts, or anonymous access?
- Free-form text, or fields?
- How "live" does interaction need to be?

General Findings on Prototyping

Variable	Design Heuristic
Testing	Construct a clear testing objective
Timing	Early prototyping is the most critical
Ideation	Prototypes lead to functional ideas
Fixation	Fast prototyping reduces fixation
Feedback	Feedback may induce corrections but also increase fixation
Usability	End-user testing may enhance performance assessment accuracy
Fidelity	Higher fidelity representations lead to accurate interpretation of the design

Timing

- Earlier is better (first 30% of project by time)
- Late prototyping is correlated with unsuccessful efforts
  - "late adoption of prototyping was an especially clear hallmark of unsuccessful design teams." (Jang and Shunn)

Ideation

- Frequent early prototyping leads to new design ideas
- In chess, it's hard to think many moves ahead
  - Instead, actually play the game, starting several different ways

Fixation

- We tend to get "stuck" (fixate) on designs that seem compelling
- But are those designs really the best?
- "a slow fabrication process may induce fixation, but a rapid one will not, as compared to sketching only (Viswanathan & Linsey 2013)."
- Implementing your idea is usually slow

Feedback

- Reluctant to show managers? Show peers.
- Managers often expect high-fidelity prototypes
  - Show peers your low-fidelity prototypes
- Receiving feedback on a design may increase fixation
  - To mitigate, present *multiple* designs

Usability

- Interactivity level is a key fidelity parameter
- High interactivity levels can enable usability testing

Fidelity

- Higher-fidelity representations lead to more accurate interpretations by reviewers
- But more rapid prototyping reduces fixation
- Select fidelity level wisely

Prototyping Techniques

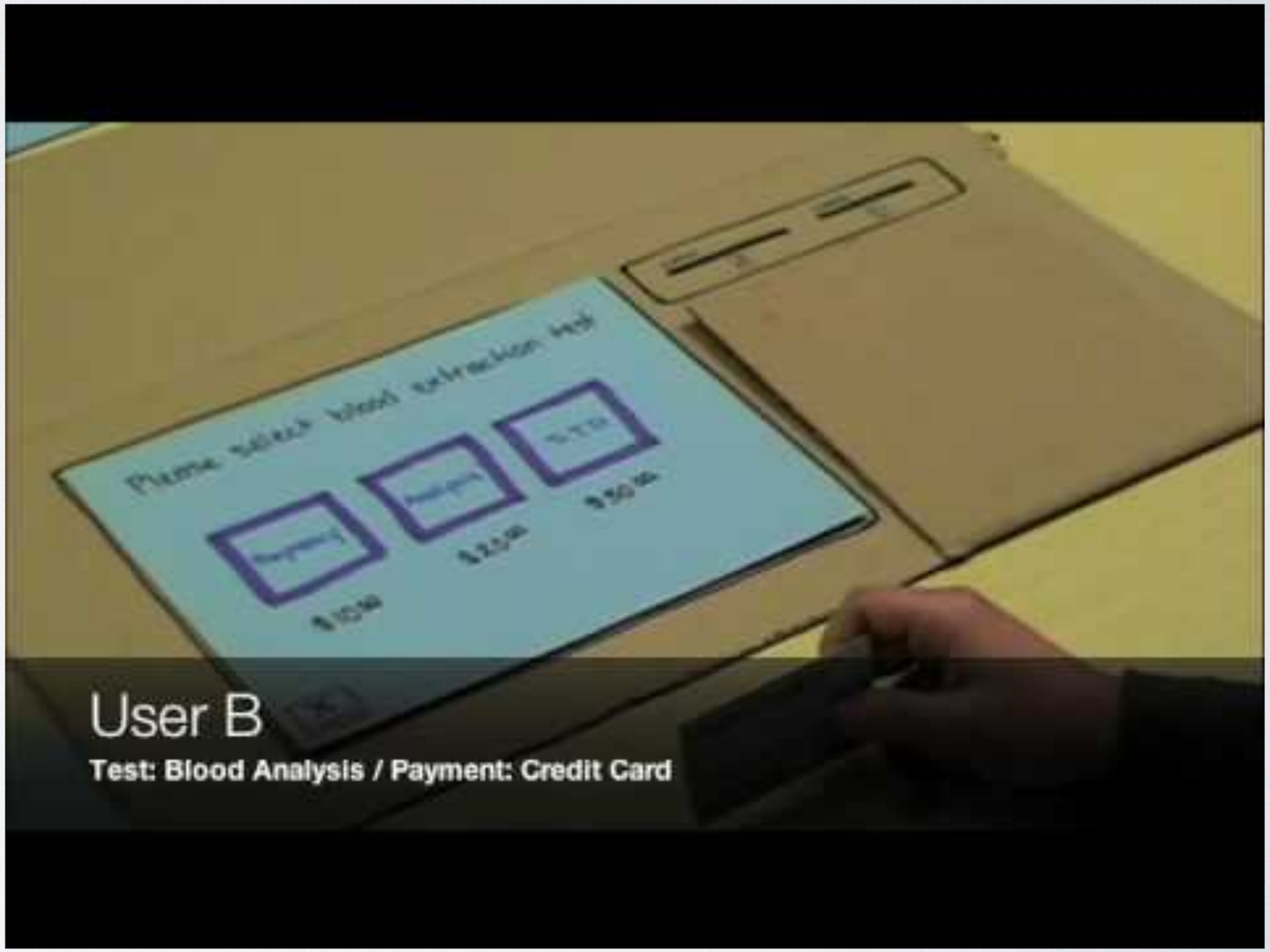
- Sketches
- Paper or LEGO prototypes
- Wireframes
- Wizard of Oz
- Full-Resolution Mockups, Storyboards

Sketches

- Very informal, whiteboard-style diagrams

Paper Prototypes

- Neater drawings of various interfaces
- Enable showing the interface to potential users
- Ask users to tell you what they would do



Wireframes

- Balsamiq (https://balsamiq.com/)

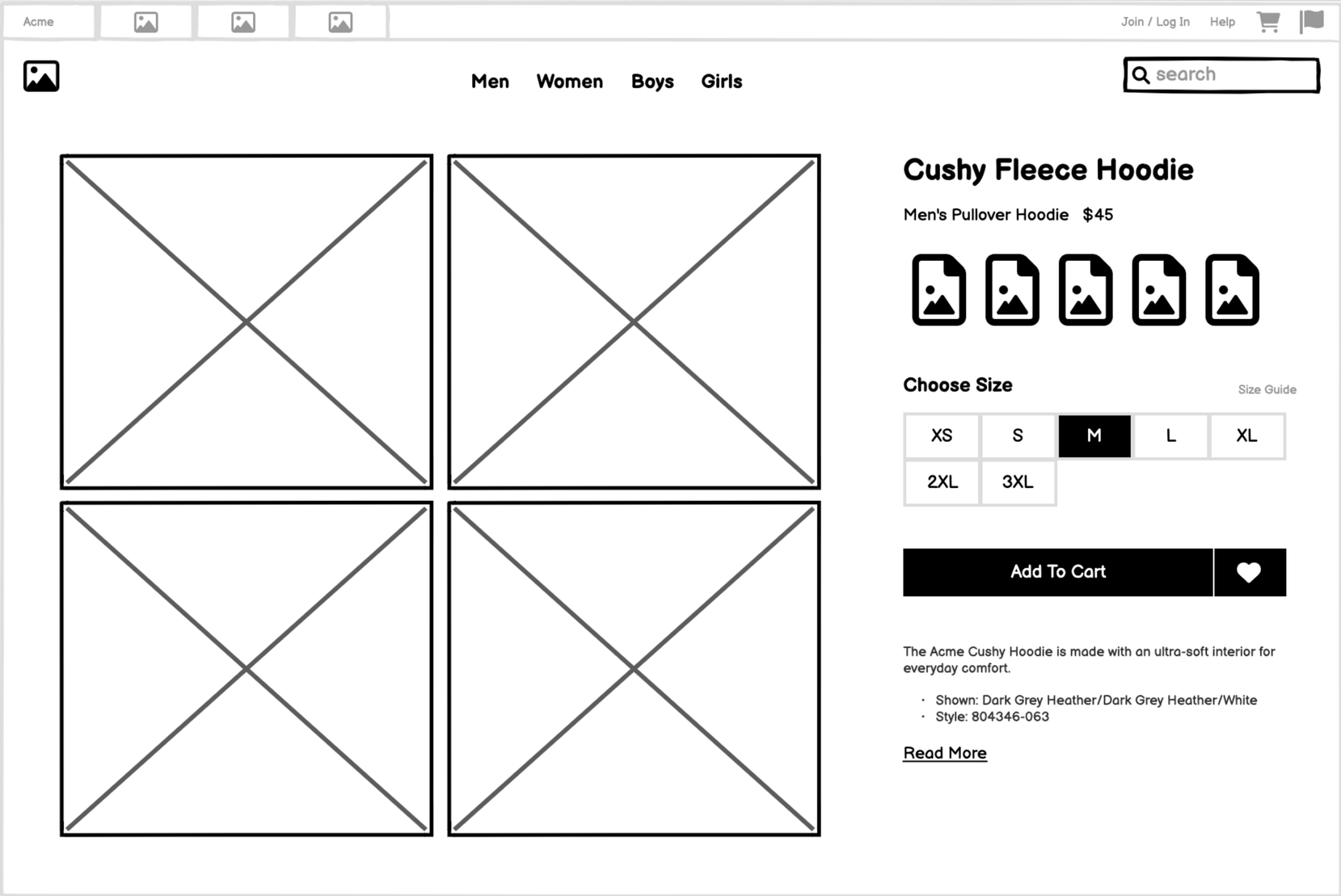


Image: https://balsamiq.com/learn/articles/what-are-wireframes/

Wizard of Oz

- Goal: evaluate usability of a very sophisticated system
- Problem: implementing it is expensive
- Solution: Someone remote-controls a dumb prototype

Full-Resolution Mockups

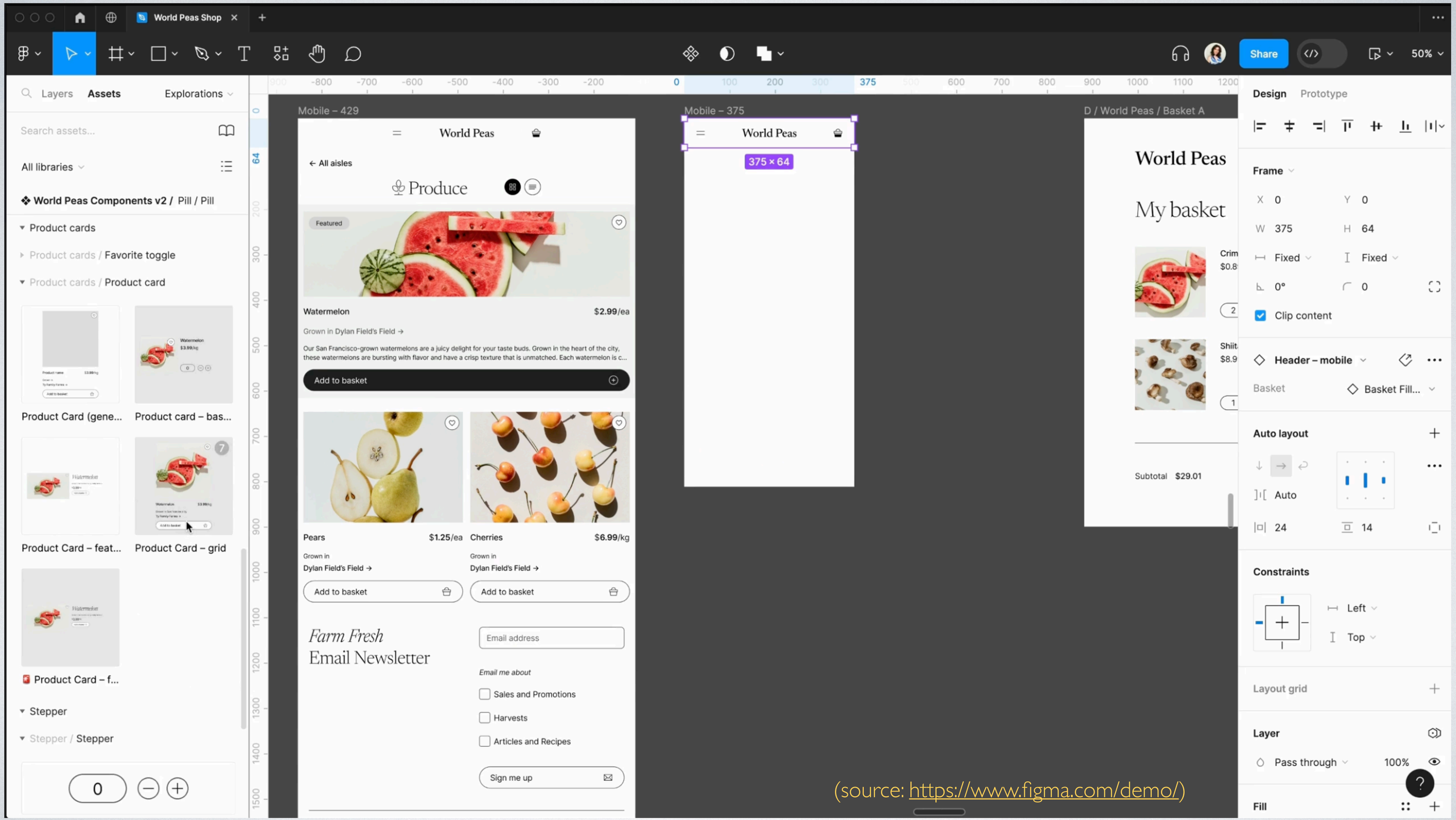
- Sometimes expensive to create
- But these avoid people getting distracted by nonessential aspects of prototypes

Activity

- Sketch the home page of a canoe rental website. It should allow users to select a date and time to rent a canoe, and it should look enticing so that users will feel excited to go canoeing. You can do this on paper or in a drawing app.
- Upload a photo or screenshot of your design to Gradescope.

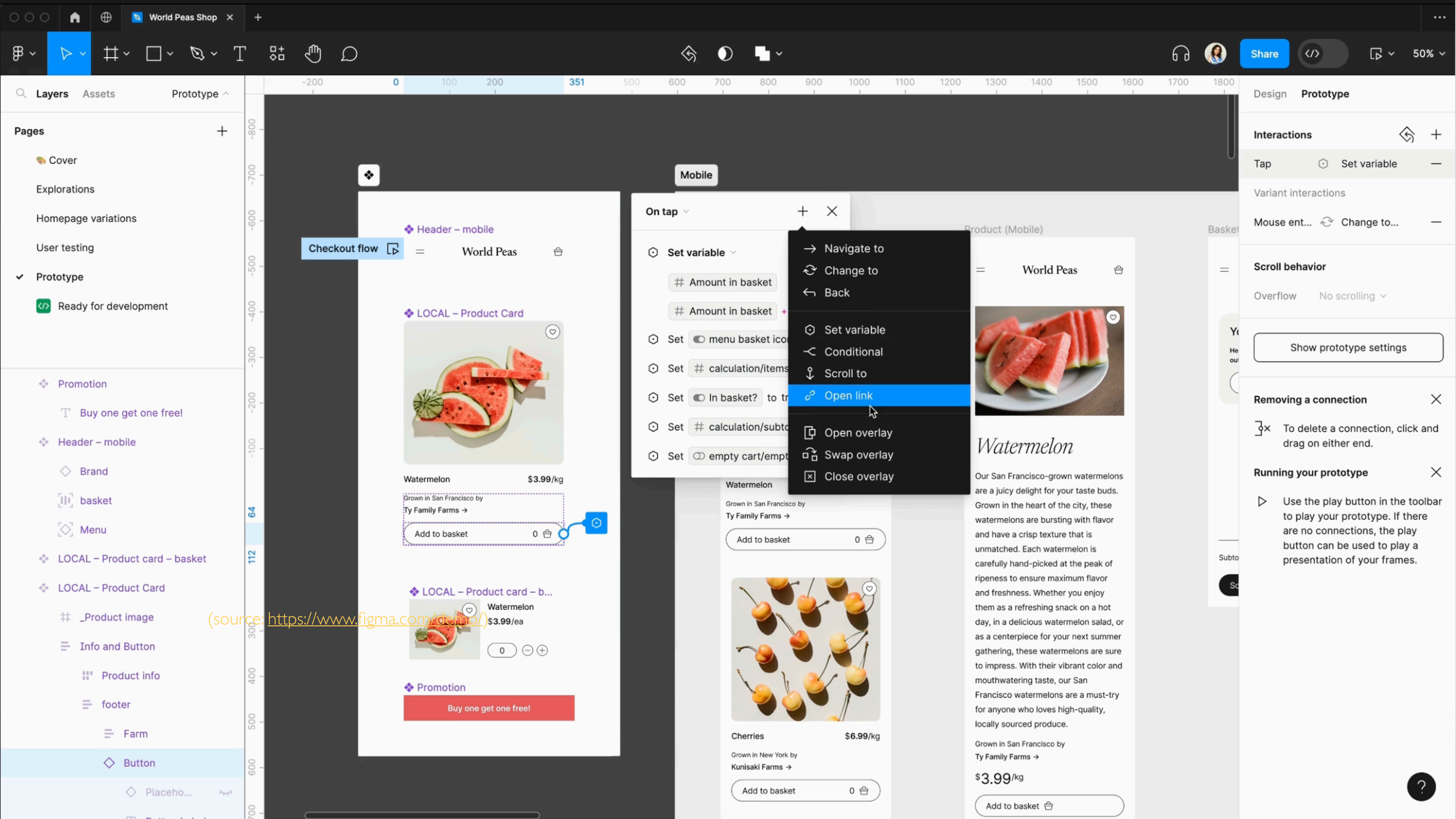
Tools

- Of course depend on fidelity
- Figma is handy
- First, prototype individual fields



(source: https://www.figma.com/demo/)

Then, Show What Controls Do…



(source: https://www.figma.com/demo/)

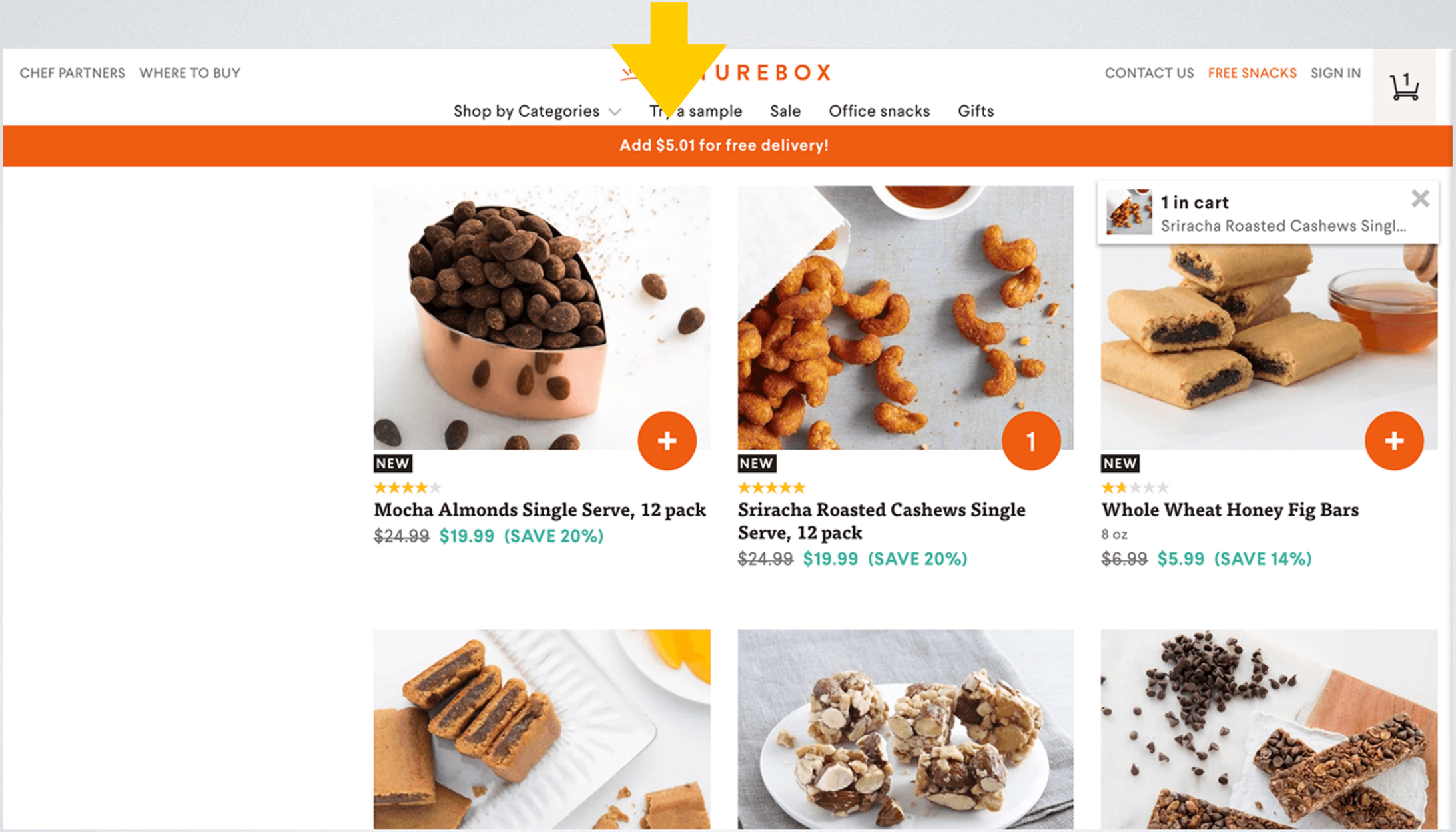
Some Heuristics Might Help

- Nielsen's 10 Usability Heuristics
- Date from 1994, but still very useful today
  - Timeless? I'm teaching a well-tested approach, anyway
- Goal: identify usability problems without recruiting participants

#1: Visibility of System Status

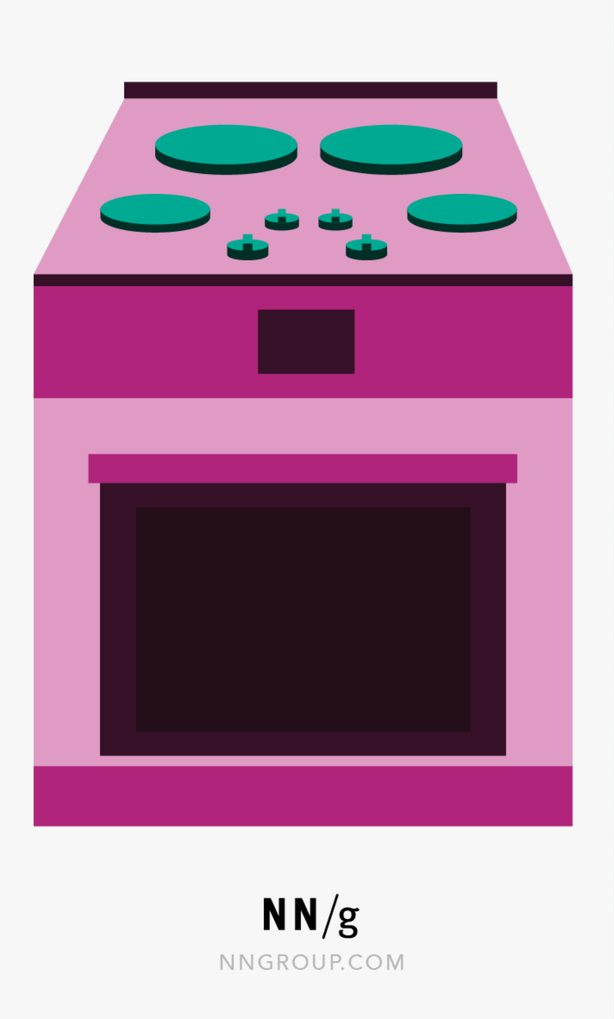
- Examples:
  - *you are here* on mall maps
  - Progress indicators (is the system processing?)

Banner at top shows how much more to spend for free delivery

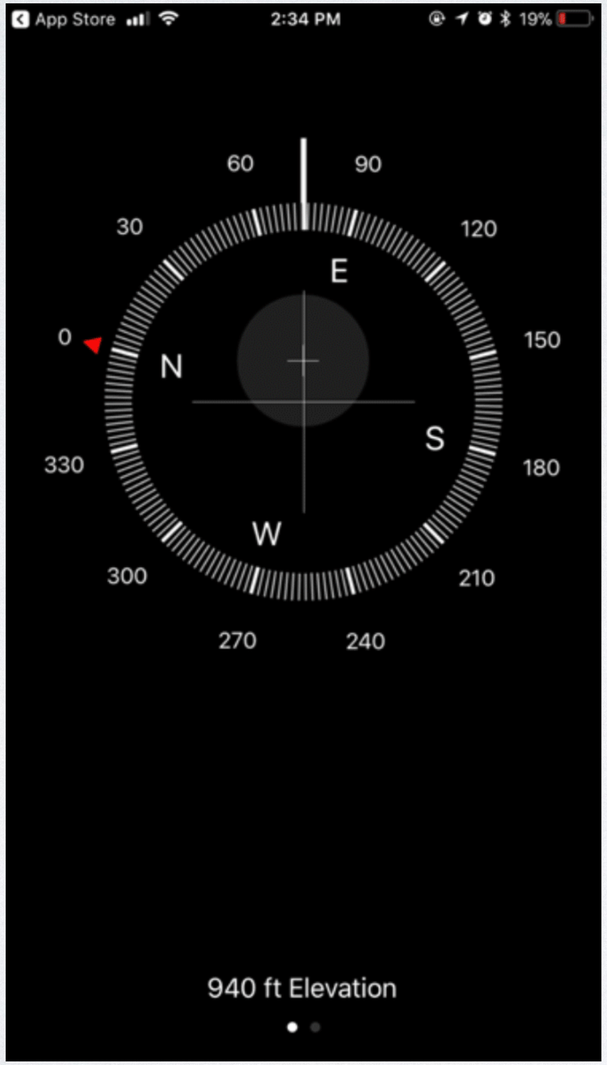


#2: Match Between System and the Real World

- The design should speak the users' language. Use words, phrases, and concepts familiar to the user, rather than internal jargon. Follow real-world conventions, making information appear in a natural and logical order.



The Compass Looks Like a Compass



How is the user supposed to know this means "back"?

suspension doesn't isolate bumpy roads well, and at lower speeds it feels a touch busy on *all* roads," said Mays.

Research the 2018 Volkswagen Tiguan | Search Inventory | Car Seat Check | Photo Gallery

How the Competitors Fared in Each Category

INTERIOR QUALITY	JUDGES' AVERAGE SCORE
2017 Mazda CX-5	**9.7**
2017 Honda CR-V	7.7
2017 Ford Escape	6.3
2018 Volkswagen Tiguan	6.3
2017.5 Nissan Rogue	6
2017 Jeep Compass	5.3
2018 Chevrolet Equinox	4.7

Cars.com graphics by Paul Dolan

How We Tested

Our weeklong test took place in the Chicago suburbs where judges drove each car on the same loop for back-to-back impressions. Other areas scored included awarding points for as-equipped crash avoidance technologies including forward collision warning with automatic emergency braking, blind spot warning, lane departure warning, lane departure steering and lane-centering steering. Plus, we evaluated and scored how well child-safety seats fit in each SUV.

Feedback

What Does This Button Do in Word?

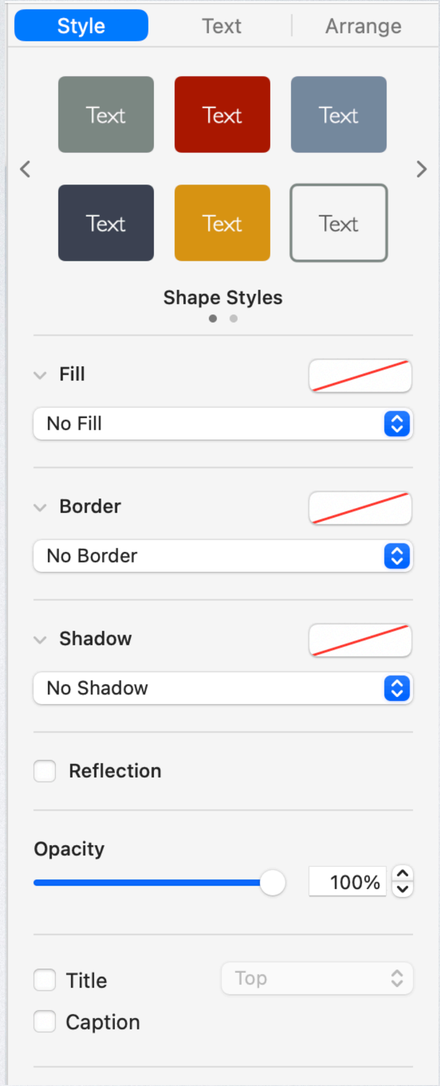
- Floppy drives were obsolete in 2001
- This is Word 365, ©2024

#3: User Control and Freedom

- Users often perform actions by mistake. They need a clearly marked "emergency exit" to leave the unwanted action without having to go through an extended process.
- Support Undo and Redo.
- Show a clear way to exit the current interaction, like a Cancel button.
- Make sure the exit is clearly labeled and discoverable.

Let Users Pick the Order

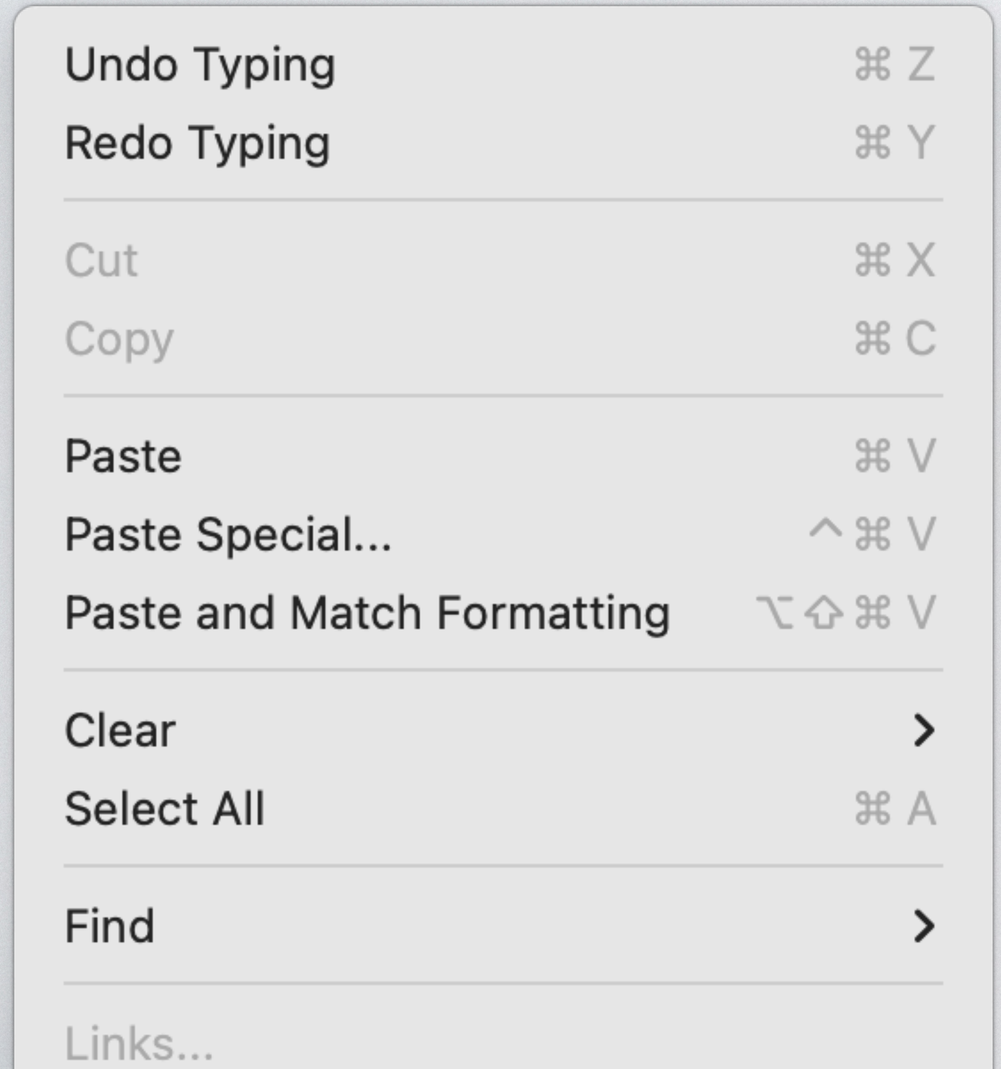
- "Wizards" force users to make choices in an order the developer chose
- Inspectors let users choose in any order



#4: Consistency and Standards

- People spend more time using *other products* than *your* product
- Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform and industry conventions.
- Your "clever" solution can cause confusion

I'm Looking at YOU, Microsoft

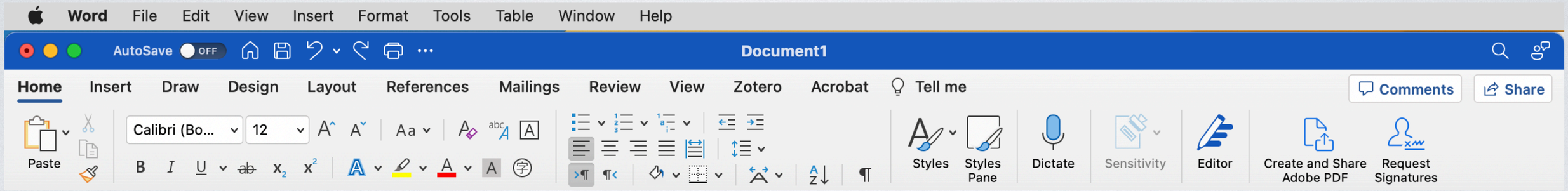


Mac standard for Redo is ⇧⌘Z

I'm STILL Looking at You, Microsoft

- ^A should move cursor to beginning of line (broken in Microsoft apps)
- Likewise ^E (end of line)

Not Just Shortcuts



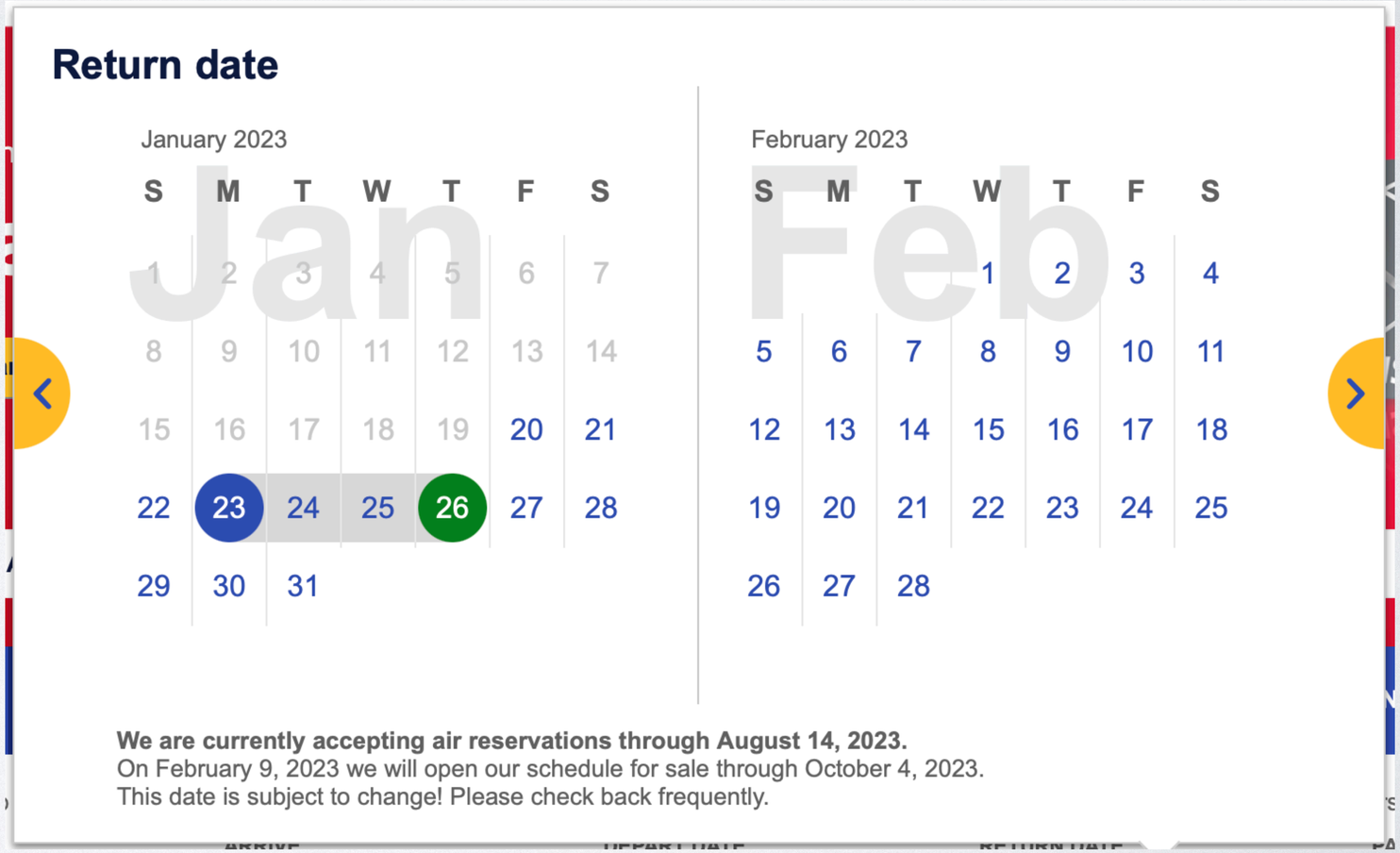
- Two (!??) menu bars, THREE different sections of buttons

Error Prevention

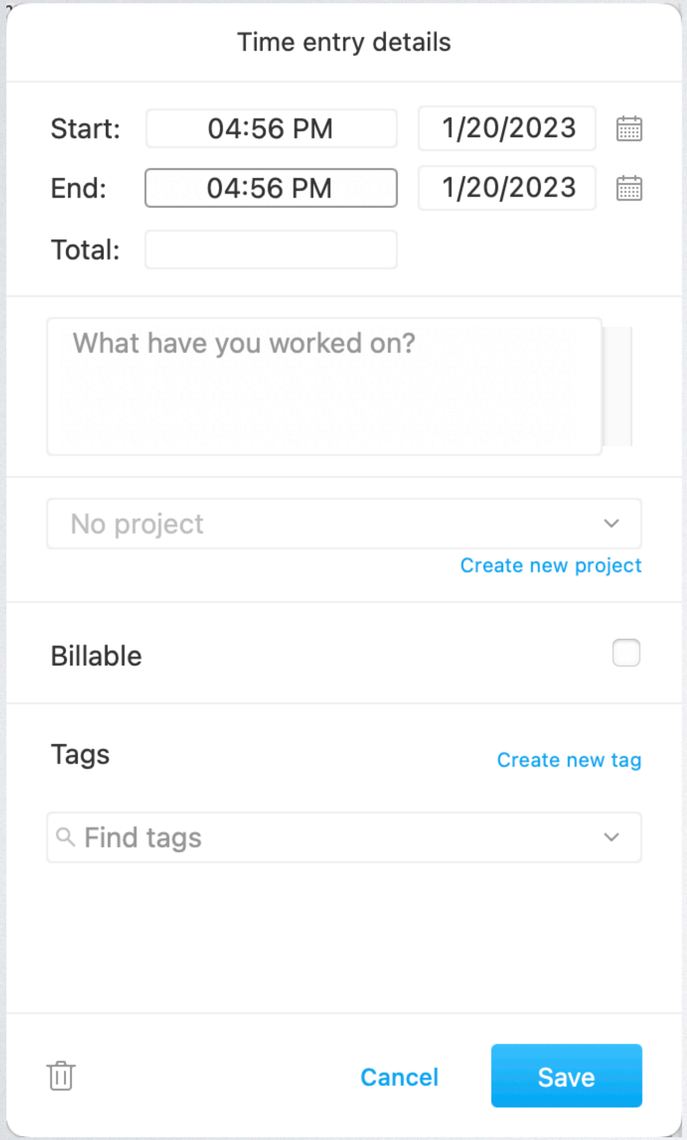
- Good error messages are important, but the best designs carefully prevent problems from occurring in the first place. Either eliminate error-prone conditions, or check for them and present users with a confirmation option before they commit to the action.

Southwest

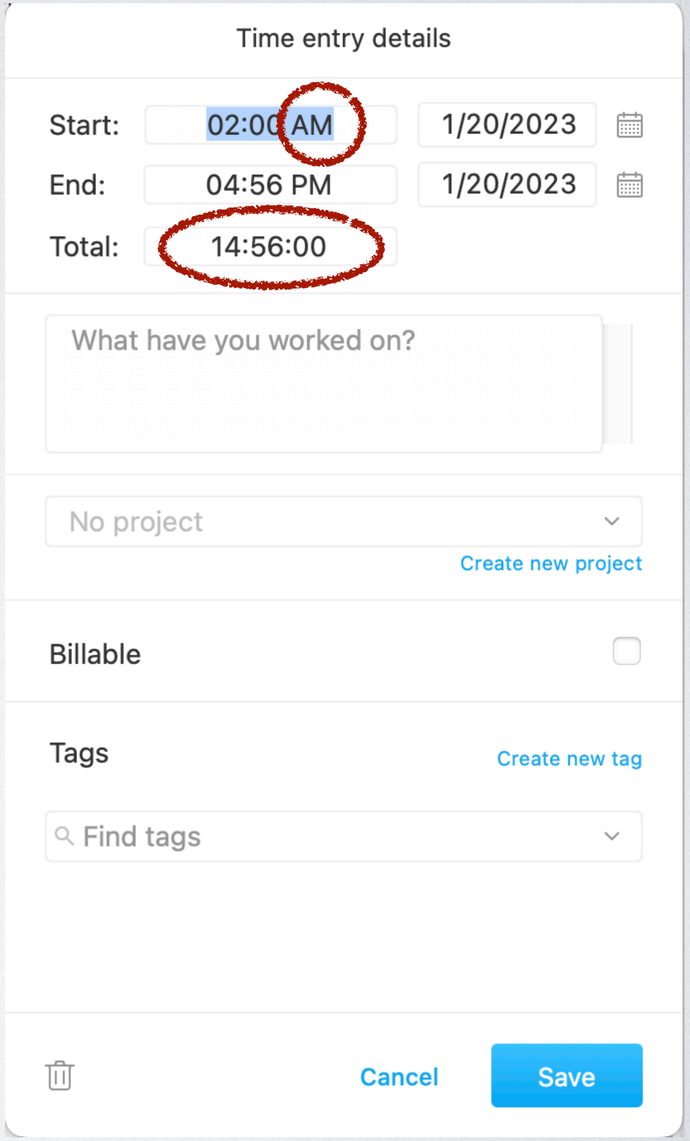
- Can't set return date before departure date



Clockify Desktop



Change start time: "2:00"



#6: Recognition Rather Than Recall

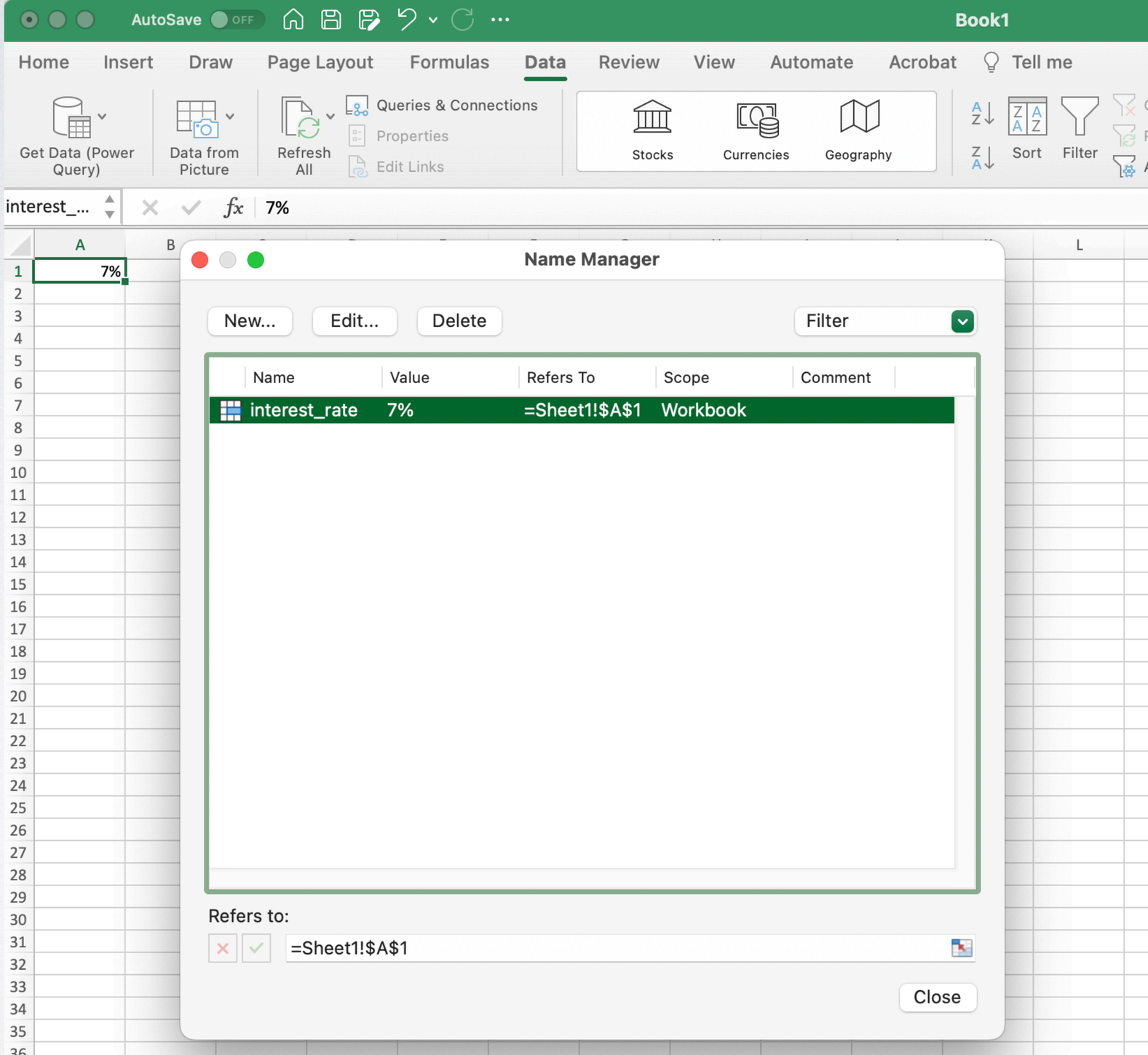
- Minimize the user's memory load by making elements, actions, and options visible. The user should not have to remember information from one part of the interface to another. Information required to use the design (e.g. field labels or menu items) should be visible or easily retrievable when needed.

Command Line vs. GUI

- Command line requires you to remember command names
- GUI gives you lists of possible commands in menus

Capitals

- What's the capital of Portugal?
- Is Lisbon the capital of Portugal?

Excel Name Manager

- Can't see the list of named ranges in the formula editor or in the table
- Instead, use the "Name Manager": a modal dialog box!
- Close the box. What were the names, again?