Designing Basics
[Develop]

"Keeping the same art style and setting. Create an image set in the pacific northwest forest where some baby animals are sitting together thinking up of new design ideas." ChatGPT
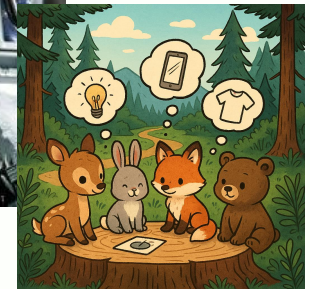
Today: Designing for HCD

- Lecture:
  - Mental models
  - Norman's Gulfs
  - Design Principles

Applications should be intuitive

Mental models

- What user believes about the system.
  - Based on prior knowledge, prior interactions, advertisement
  - Predict how a system works → how they interact

Scenario: Warm Evening

Alex returns home from their theater performance on a hot evening and finds the living room uncomfortably hot.

In an attempt to cool the room quickly, Alex sets the thermostat to 45F, even though a comfortable temperature would be around 70F.
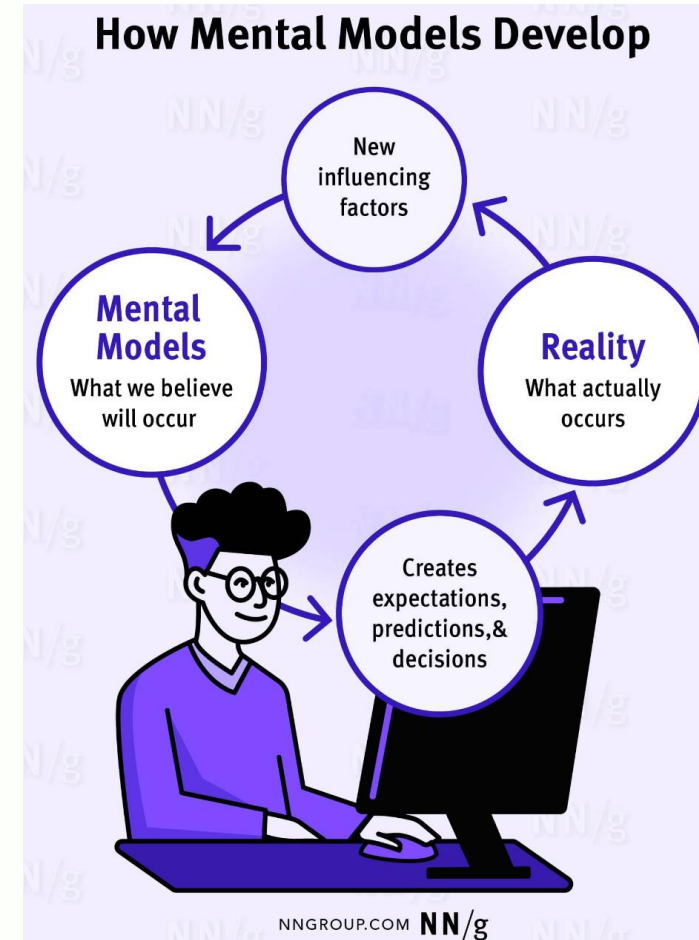
Is that the right process?

What is Alex's mental model?

Recall: Mental models

- Are based on Belief, not Facts
- Unique to each user
- Change over time
- Has inertia to change

- Does it meet expectations?
- Does it match the intended design?

How Mental Models Develop

New influencing factors

Mental Models
What we believe will occur

Reality
What actually occurs

Creates expectations, predictions, & decisions

NNGROUP.COM NN/g

Reduce Mental Model Gap

- Make the system conform
- Improve users' mental model
  - Labels
  - Instructions
  - Training (tutorial, demo, …)
  - **Metaphors**

Thermostat Mental Model

❌ **Faulty Mental Model (Faucet Metaphor):**

Its not a **water faucet**—turn it up more and *more heat flows faster*, like turning a faucet wider to get more water.

✅ **Better Metaphor: Oven Timer or Target Tracker**

The thermostat is more like **an oven timer** or **a GPS target tracker**—you set the *destination* (temperature), and the system works steadily to get there.

Turning the thermostat higher doesn't make it arrive faster

What metaphors can you spot?

2. 🏷️ "Big Spring Deal" and "List Price $99.95 → $69.95"

- **Metaphor:** In-store **sales tags/price markdowns**
- **Mental Model Support:** Maps to how we understand discounts in brick-and-mortar stores (e.g., red sale signs).
- **Goal:** Creates urgency and perceived value.

3. 📦 "FREE delivery," "In Stock," and "Ships from Amazon.com"

- **Metaphor:** Warehouse/order fulfillment model
- **Mental Model Support:** Reinforces that users are dealing with inventory like in a physical logistics system.
- **Goal:** Builds trust and expectation of prompt delivery.

4. 🔄 "Buy Again"

- **Metaphor:** Repeat purchase behavior
- **Mental Model Support:** Mimics going back to a favorite store to pick up the same item again.
- **Goal:** Makes reordering cognitively easy and fast.

5. ⭐ Star Ratings

- **Metaphor:** Hotel/movie star reviews
- **Mental Model Support:** Lets users quickly gauge product popularity/quality using a widely understood metric.
- **Goal:** Social proof to encourage buying.

6. 🔔 "Set reminder" (for price tracking)

- **Metaphor:** Alarm clock or personal assistant reminder
- **Mental Model Support:** Like setting a reminder on your phone or calendar.
- **Goal:** Helps retain customer interest even if they're not ready to buy.

These metaphors:
- Create **intuitive expectations** for interaction.
- Reduce the **gulf of execution** (users know what actions to take).
- Improve **learnability** and **efficiency** in navigation and decision-making.

What's wrong with this picture?

https://www.nngroup.com/articles/mental-models/

The 2 UX Gulfs

Challenges people need to overcome to successfully interact with the system:

- Gulf of Evaluation – Understanding the state of the system
- Gulf of Execution – Taking action to accomplish a specific goal
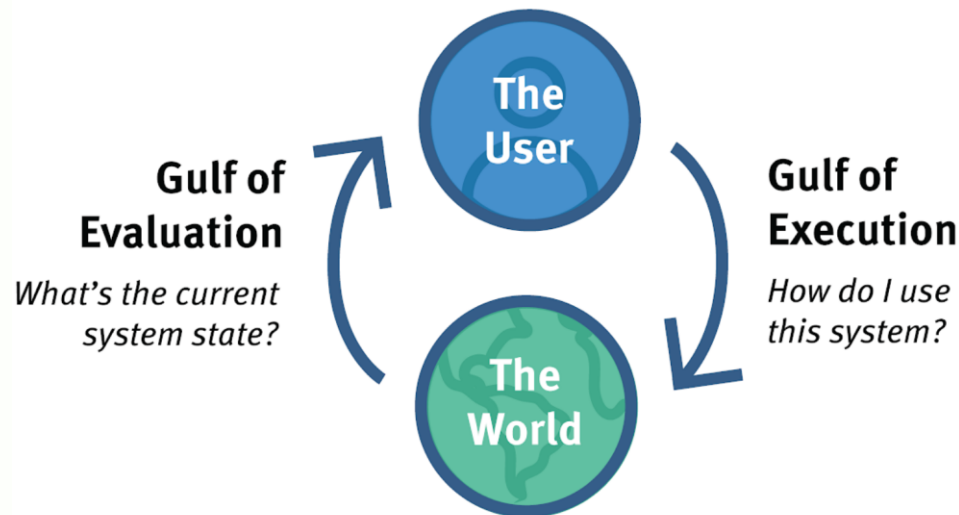
Gulfs caused by:

Breakdowns in:

Evaluation:

- Perceiving the system-status indicator
- Interpreting what it means

Execution

- Planning an action based on understanding
- Manipulating the controls

Successful execution usually depends on correct evaluation

How to bridge these gulfs- make things intuitive?

- What are the gulfs with this interface?
- How would you do it? Design your solution.

On your own [5 min]

"Google Nest Pro Thermostat E is for Everyone. It's beautifully designed to blend right into any home. The frosted display shows you the temperature when you're close, and fades into the background when you walk away."

Design Principles:

1. Visibility of user's options/actions.
2. Feedback
3. Constraints
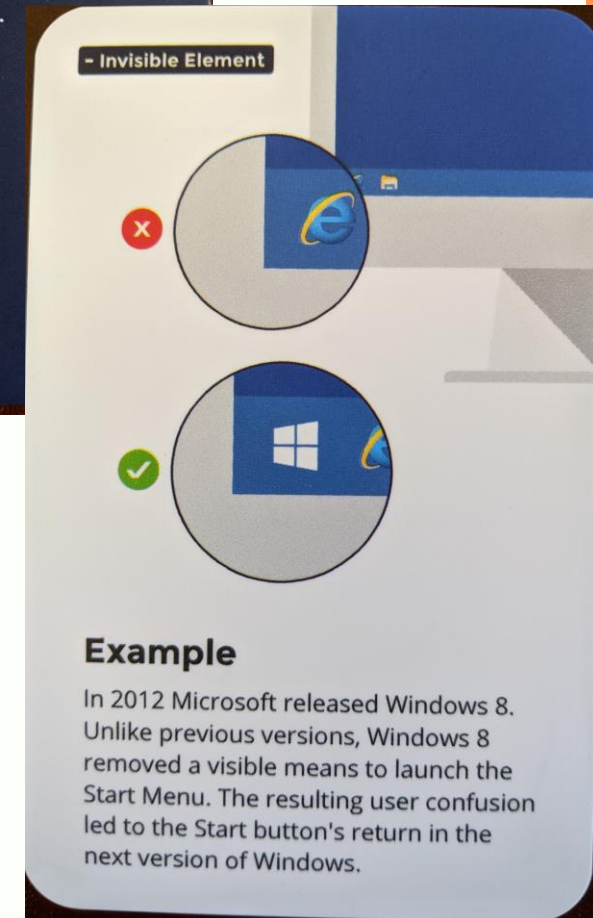4. Consistency
5. Affordance

14

Visibility

What options or actions are available

Examples:

- Good: Car controls
- Bad: Trap Card 1

Bridges gulf of ?
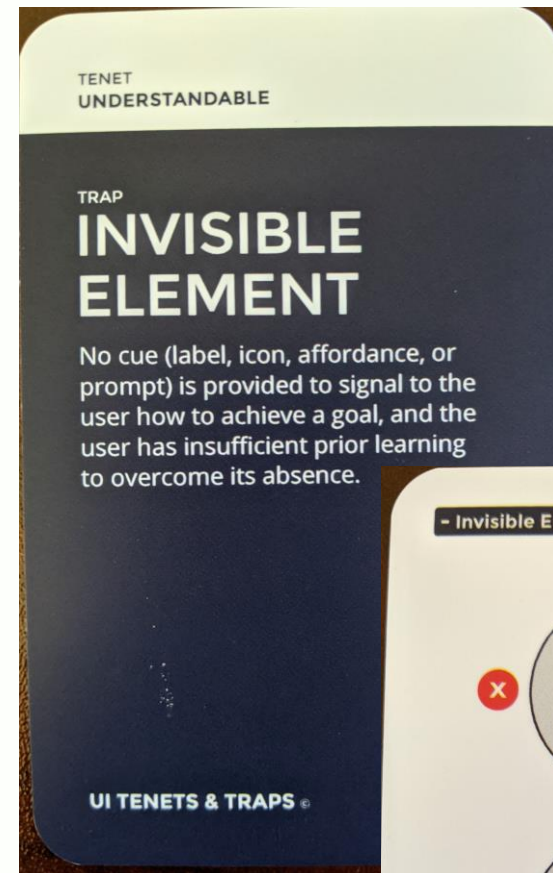
Feedback

What happens when you taken an action

Examples:

- Good: Cutting bread, writing with a pen – no lag in feedback
- Bad: Trap Card 12

Bridges gulf of ?

Costly click: Man accidentally buys 28 Tesla cars online worth 1.4 million euros

TENET
RESPONSIVE

TRAP
SLOW OR NO RESPONSE

The user is prevented from achieving a goal in a timely manner because of actual or perceived poor system performance.

UI TENETS &

» Slow or No Response

?

Example

After pressing the button to activate the Super-Bright LED Flashlight application on an Android phone, it can take up to 5 seconds for the light to actually turn on.

16
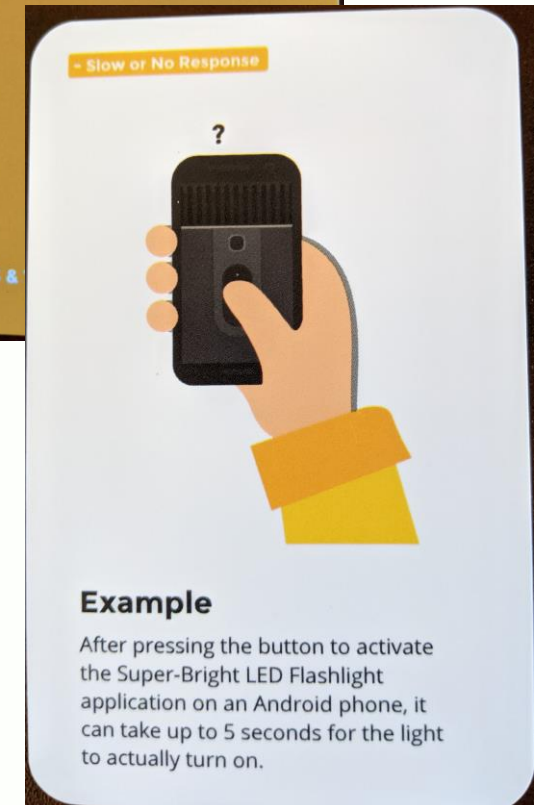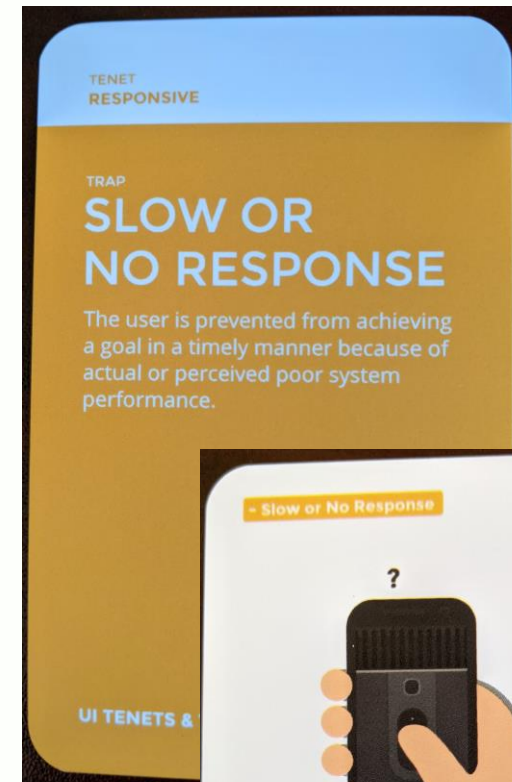
Constraints

Making some errors impossible

Examples

- Good: Greying out some options, templates for phone, menus instead of cmd to prevent syntax errors

- Bad: Trap card 11

Bridges gulf of ?

TENET
COMFORTABLE

TRAP
ACCIDENTAL ACTIVATION

The system misinterprets a user's physical actions resulting in an unintended outcome.

UI TENETS &

- Accidental Activation

Example

With gesture based systems like Kinect, it is often difficult to determine the user's intent: Is a hand gesture a navigational swipe or an effort to scratch one's ear? This makes scrolling via hand gestures prone to accidental activations.

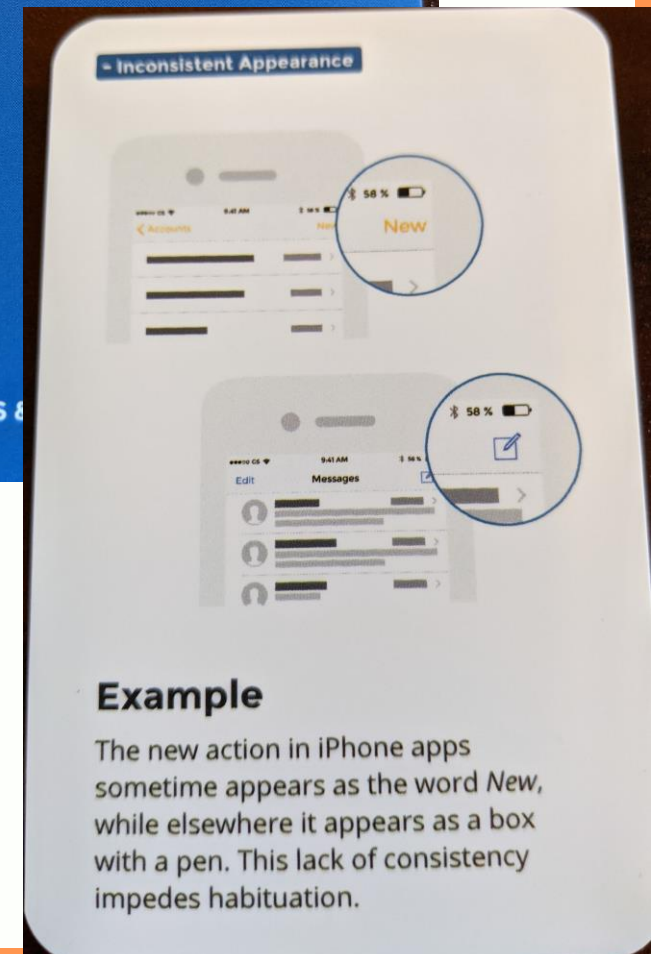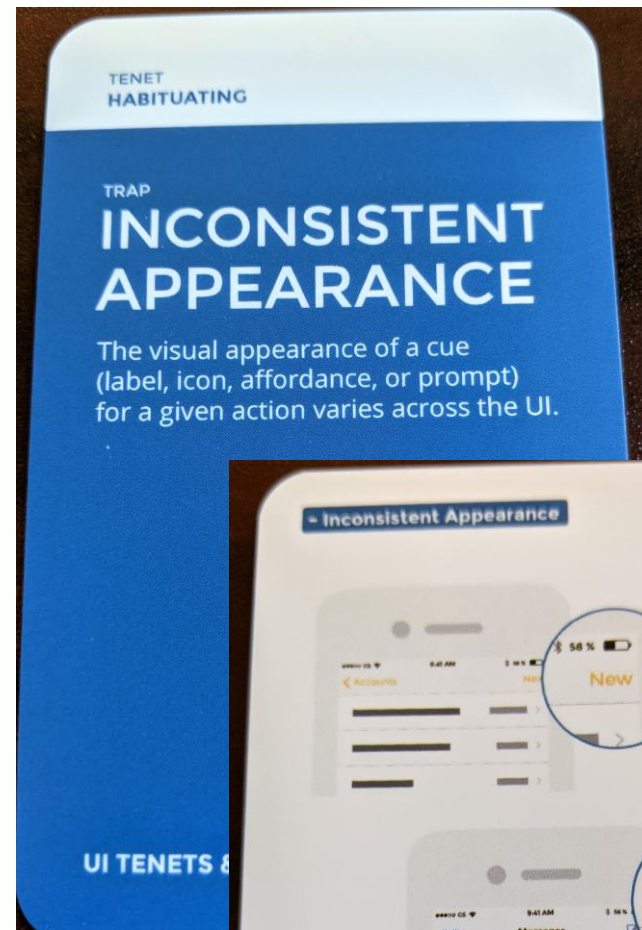## **Consistency**

- Internal: within your system
- External: with other systems and the physical world
- Examples
  - Microsoft suite: Word <-> power point, etc.
  - Bad: Trap card 24

  Bridges gulf of ?

TENET
HABITUATING

TRAP
INCONSISTENT APPEARANCE

The visual appearance of a cue (label, icon, affordance, or prompt) for a given action varies across the UI.

UI TENETS &

~ Inconsistent Appearance

New

58 %

Edit Messages

Example

The new action in iPhone apps sometime appears as the word *New*, while elsewhere it appears as a box with a pen. This lack of consistency impedes habituation.

Affordance

- Match between what an object *can do* and your *capability*
  - *Anti-affordances: DND, Apple Focus*
  - *Hidden affordances: You just don't know its possible*
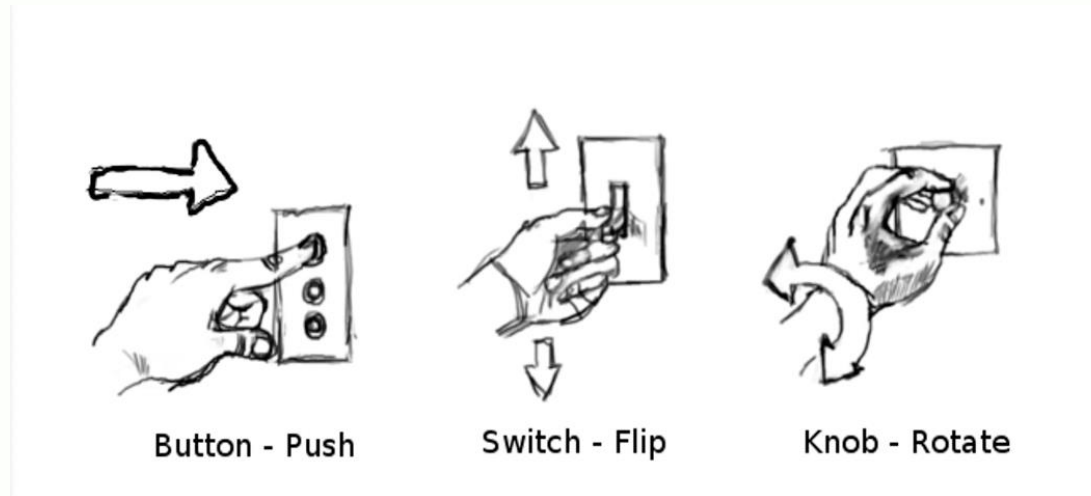
Affordances feed into system functionality: level of control on light?

Affordance (a bit more)

- Signifiers: Communication of *what actions are possible* and *how they should be done*; If signifiers are not perceived, they fail to function.

https://www.interaction-design.org/literature/topics/affordances

Design Principles

1. Visibility of user's options/actions. [Gulf. Eval]
2. Feedback [Gulf. Eval]
3. Constraints [Gulf. Exe]
4. Consistency [Gulf. Eval]
5. Affordance [Gulf. Exe]

There are trade-offs

- More constrain, less visible
- More affordance/visible, more clutter
- More consistency/ sometimes less usable

…
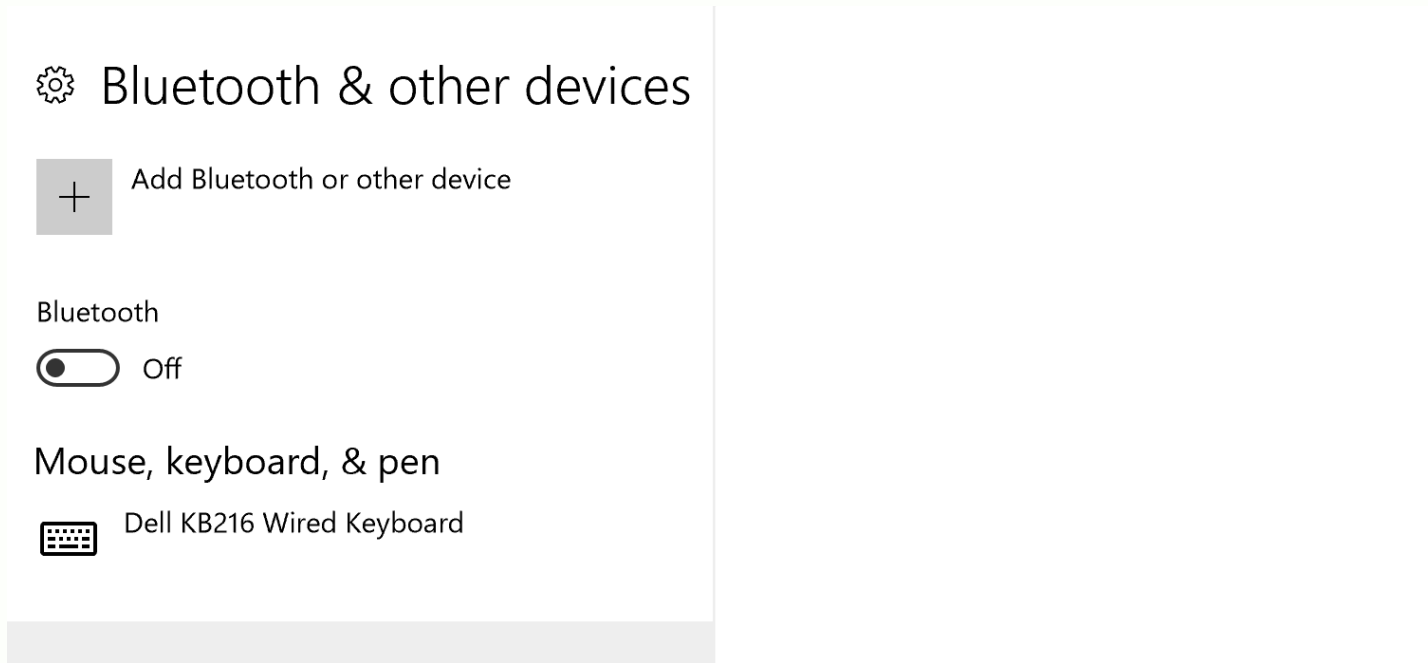
You will use Design Principles

- In class for:
  - Designing your interface and interactions
  - Evaluating teams in "design gallery", next week
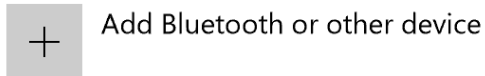 - Next: Activity

Next Class: Ideation

Connect Bluetooth [x] to computer

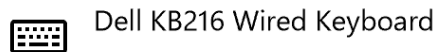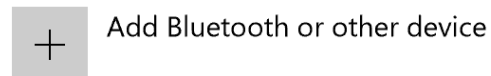Where do you think are the challenges a non-techie user may face in this example?

https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/

The two UX Gulfs

⚙ **Bluetooth & other devices**

➕ Add Bluetooth or other device

Bluetooth

[●○] Off

Mouse, keyboard, & pen

⌨ Dell KB216 Wired Keyboard

⚙ **Bluetooth & other devices**

➕ Add Bluetooth or other device

Bluetooth

[●○] On

Now discoverable as "DESKTOP-ISFRCAL"

Mouse, keyboard, & pen

⌨ Dell KB216 Wired Keyboard