CSE440: Introduction to HCI
Methods for Design, Prototyping and Evaluating User Interaction

Lecture 04: Design of Everyday Things
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What we will do today

It is never a user’s fault!
99% Invisible Post. (Just read and listen everything there!) =)
snatch

coming soon
What is Interaction?

Two-Way
One-way is reaction

Communicative
Information is sent

Receptive
Information is received

Effective
There are changes as a result
What is Interaction?

Two-Way
   One-way is reaction

Communicative
   Information is sent

Receptive
   Information is received

Effective
   There are changes as a result
Buxton’s 3-State Model
Buxton’s 3-State Model

State 1

Button up

State 2

Button Down

Tracking

Dragging
Buxton’s 3-State Model
Norman’s Execution-Evaluation Cycle

1. Establish the goal
   Increase light in the room

2. Form the intention
   To turn on the lamp

3. Specify the action sequence
   Walk to the lamp, reach for the knob, twist the knob

4. Execute the action sequence
   [walk, reach, twist]

5. Perceive the system state
   [hear “click” sound, see light from lamp]

6. Interpret the system state
   The knob rotated. The lamp is emitting light. The lamp seems to work

7. Evaluate the system state with respect to the goals and intentions
   The lamp did indeed increase the light in the room [goal satisfied]

   [REPEAT!]
Norman’s Execution-Evaluation Cycle

- Goals
- Evaluate Goals
- Interpret State
- Observe State
- System Change
- Execute Actions
- Develop Action Plan
- Form Intention
- Evaluate Goals
Norman’s Execution-Evaluation Cycle

Gulf of Execution

Goals

Form Intention

Develop Action Plan

Execute Actions

Observe State

Interpret State

Evaluate Goals

Gulf of Evaluation

System Change
What factors can extend the Gulfs in the example of increasing light in the room?
Gulf of Execution: An Example

Gulf of Evaluation: An Example
Gulf of Evaluation: An Example
Bridging the Gulfs

Ask yourself: How easily can the user...

Goals

Evaluate Goals

Form Intention

Develop Action Plan

Observe State

Interpret State

System Change

Execute Actions
Bridging the Gulfs

Ask yourself: How easily can the user...

- Goals
- Form Intention
- Develop Action Plan
- Execute Actions
- Observe State
- System Change
- Interpret State
- Evaluate Goals

...determine what the system is for?
Bridging the Gulfs

Ask yourself: How easily can the user...

- Evaluate Goals
  - Determine what the system is for?
- Interpret State
- Observe State
- System Change
- Execute Actions
- Develop Action Plan
  - Tell what actions are possible?
- Form Intention
Bridging the Gulfs

Ask yourself: How easily can the user…

Evaluate Goals
...determine what the system is for?

Interpret State

Observe State

System Change

Develop Action Plan
...identify and carry out the appropriate action?

Execute Actions

Form Intention
...tell what actions are possible?

Goals
Bridging the Gulfs

Ask yourself: How easily can the user...

- **Evaluate Goals**: ...determine what the system is for?
- **Form Intention**: ...tell what actions are possible?
- **Develop Action Plan**: ...identify and carry out the appropriate action?
- **Interpret State**: ...perceive and interpret what happened?
- **Observe State**: System Change
- **Execute Actions**:
Let's Bridge the Gulfs...

... of finding the right Screenshot in my computer!

1. **Goals**
   - Form Intention
     - ...tell what actions are possible?
   - Develop Action Plan
     - ...identify and carry out the appropriate action?

2. **Interpret State**
   - Observe State
     - ...perceive and interpret what happened?
   - Evaluate Goals
     - ...determine what the system is for?

3. **System Change**
   - Execute Actions
     - ...evaluate progress towards the goal?
How did you bridge the gap?
Design principles help us answer these questions

- Affordances
- Constraints
- Feedback
- Consistency
- Metaphors
- Mappings
- Visibility
Design principles help us answer these questions

**Affordances**
Constraints
Feedback
Consistency
Metaphors
Mappings
Visibility
Affordances

Perceived Action Possibilities

What does this chair afford?
Affordances
Affordances
Affordances

Technology affordances are often based in affordances from the physical world
Affordances
Affordances

“Real-world” example: Knurling
Affordances

“In general, when the apparent affordances of an artifact matches its intended use, the artifact is easy to operate. When apparent affordances suggest different actions than those for which the object is designed, errors are common.”

Gaver
False affordances
False affordances
Hidden affordances

When there is no perceptual information suggesting an actual intended use
Hidden affordances

Logos linking to home is a convention, but not afforded by the page
“Designers sometimes will say that when they put an icon, cursor, or other target on the screen, they have added an ‘affordance’ to the system. This is a misuse of the concept. … It is wrong to claim that the design of a graphical object on the screen ‘affords clicking.’ … Yes, the object provides a target and it helps the user know where to click and maybe even what to expect in return, but those aren’t affordances, those are conventions, and feedback, and the like. … Don’t confuse affordances with conventions.” Norman
Affordances vs Signifiers

Affordances are the possible interactions between people and the environment. (It is not a property of the "thing"!)

Perceived affordances often act as signifiers, but they can be ambiguous.

Signifiers signal things, in particular what actions are possible and how they should be done. Signifiers must be perceivable, else they fail to function.

Norman
Design principles

Affordances

**Constraints**
Feedback
Consistency
Metaphors
Mappings
Visibility
Constraints

Prevent some actions while allowing others

Prevent errors before they can happen

Disruptive error messages are a last resort
Constraints
Design principles

Affordances
Constraints
**Feedback**
Consistency
Metaphors
Mappings
Visibility
Feedback

https://www.videoblocks.com/video/loading-bar-scribble-animation-doodle-cartoon-4k-b03byrauliz20iitl
Feedback

All actions have to be confirmed

Must be immediate

Must be informative

Preferably non-distracting and unobtrusive
Design principles

Affordances
Constraints
Feedback
**Consistency**
Metaphors
Mappings
Visibility
Consistency

Interfaces should be consistent in meaningful ways
   Ubiquitous use of same keys for cut/copy/paste

Types of consistency
   Internal (i.e., within itself)
      e.g., same terminology and layout throughout
   External (i.e., with other applications)
      e.g., common widget appearance
      e.g., design patterns common across applications
Is consistency always better?
Design principles

Affordances
Constraints
Feedback
Consistency
**Metaphors**
Mappings
Visibility
Metaphors

Suggest an existing mental model
  “horseless carriages”, “wireless”

Desktop metaphor
  Not an attempt to simulate a real desktop
  Leverages knowledge of files, folders, trash
  Explains why some windows seem hidden
Example: Mail Metaphor
Example: Health Metaphor
Broken Metaphors

Are not consistent, do not operate in every circumstance, or do not uphold things consistent with what the metaphor would suggest
Dead Metaphors

Lost the original imagery of their meaning
Design principles

Affordances
Constraints
Feedback
Consistency
Metaphors
Mappings
Visibility
Mappings

Correspondence between an interface and the corresponding action in ‘the world’

Minimize cognitive steps to transform action into effect, or perception into comprehension (i.e., execution and evaluation)
Mappings

Removing the cover plate, then removing and swapping the switches.

Mappings
Mappings
Mappings
Design principles

Affordances
Constraints
Feedback
Consistency
Metaphors
Mappings
Visibility
Visibility
Visibility
Visibility

Differentiate opposing functionality

Use visual function to confirm the user's mental model of operation

Sometimes sound can be used to make things ‘visible’ (e.g. vacuum cleaner clogging up)

Just the right things have to be visible: excess is as bad as lack of visible clues
Summary
Summary: Features of Good Design

Has affordances (makes each operation visible)

Offers obvious mappings (makes the relationship between the actual action of the device and the action of the user obvious)

Provides feedback on the user’s action

Provides a good mental model of the underlying behavior of the device

Provides constraints (to prevent errors)
Bad Design Hunt

Can you discover instances of bad design on campus?

False affordances? A lack of consistency, visibility, or mappings?

“Thanks to you, I now constantly notice how badly things are designed.” — anonymous student from the Spring 2017 offering
Ask me something!