

The Design of Everyday Things

Harley Eades



It's never a users fault!



<https://youtube.com/watch?v=yY96hTb8WgI>

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

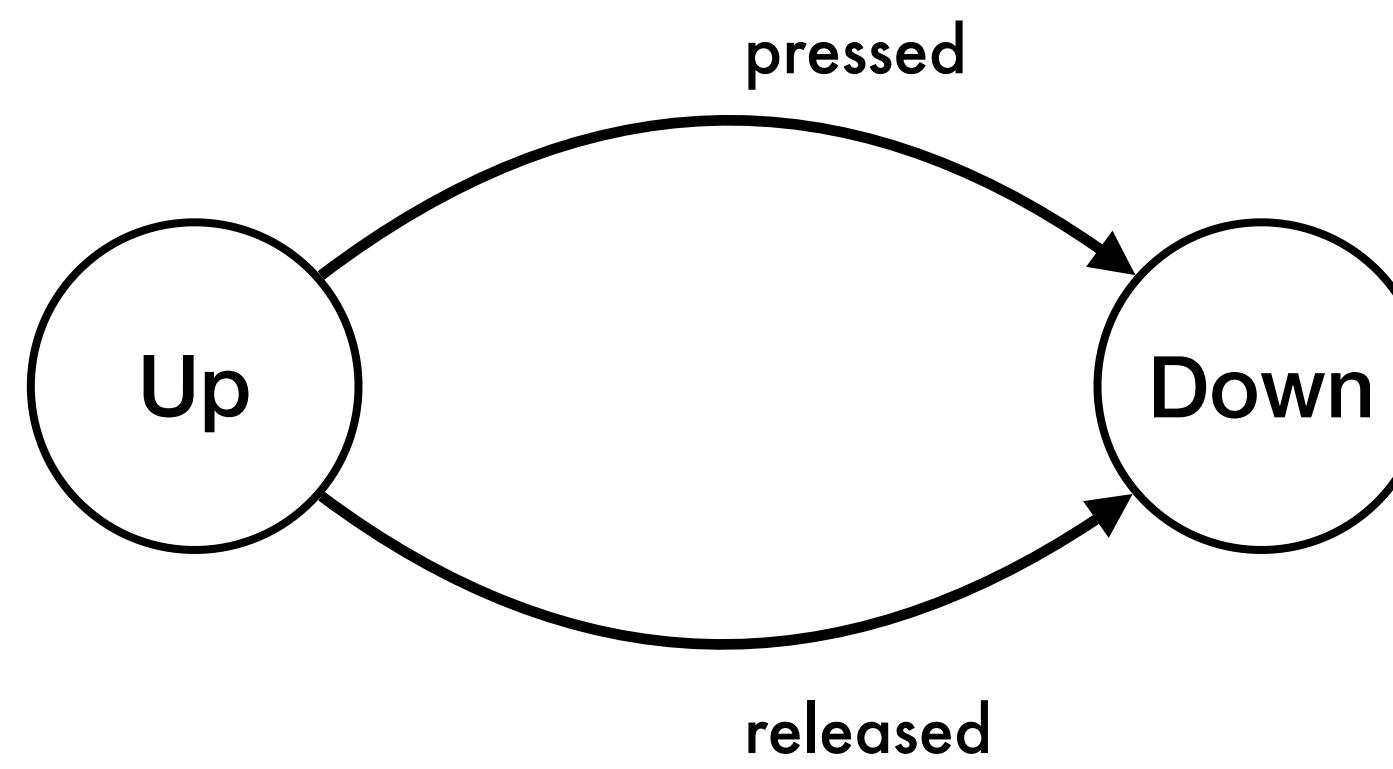
Communicative: Information is sent

Receptive: Information is received

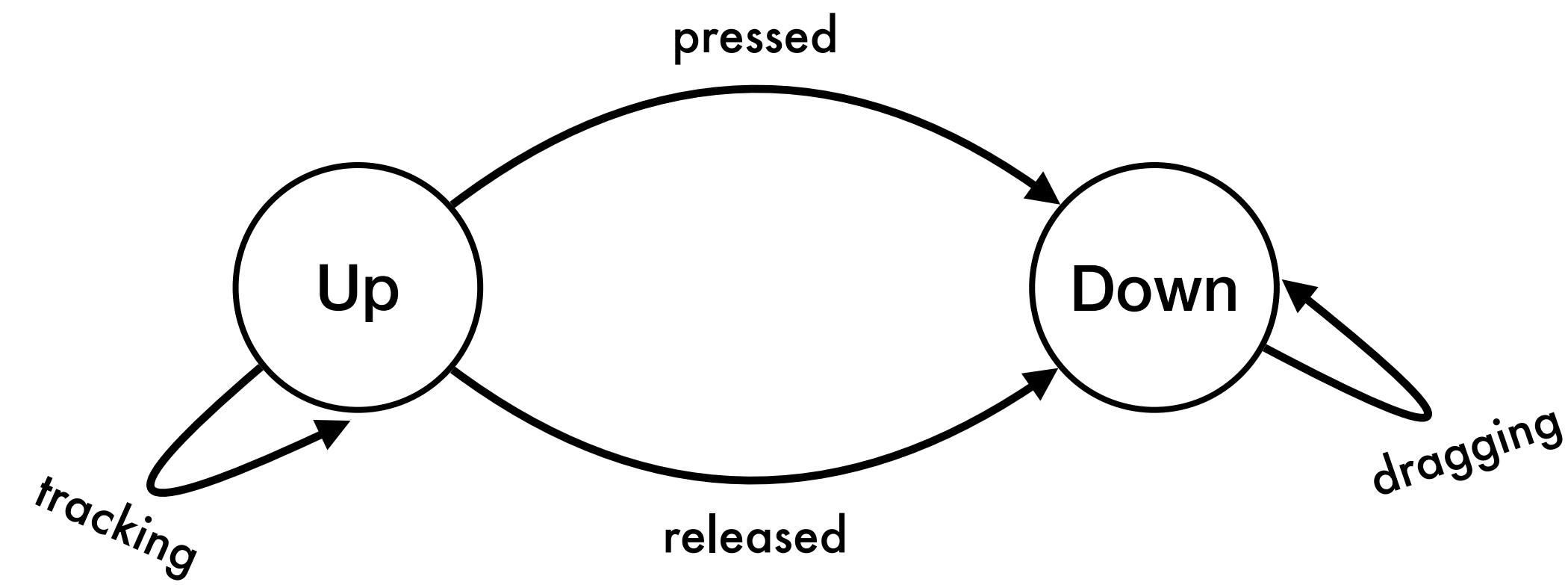
Effective: There are changes as a result



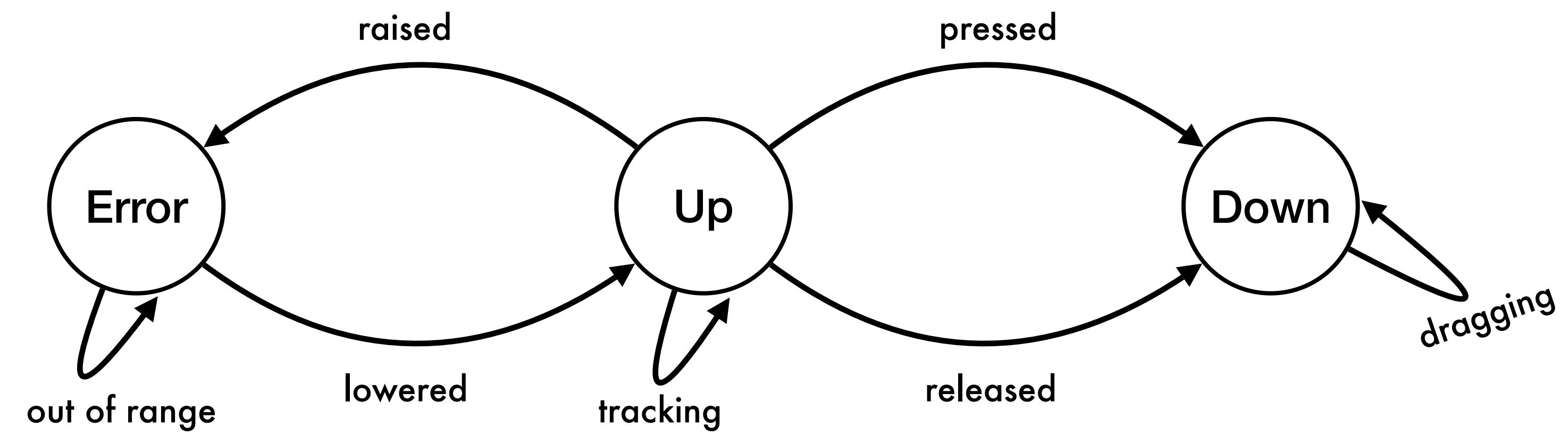
Model of a Button



Model of a 1-button mouse



Buxton's 3-State Model



Buxton's 3-State Model

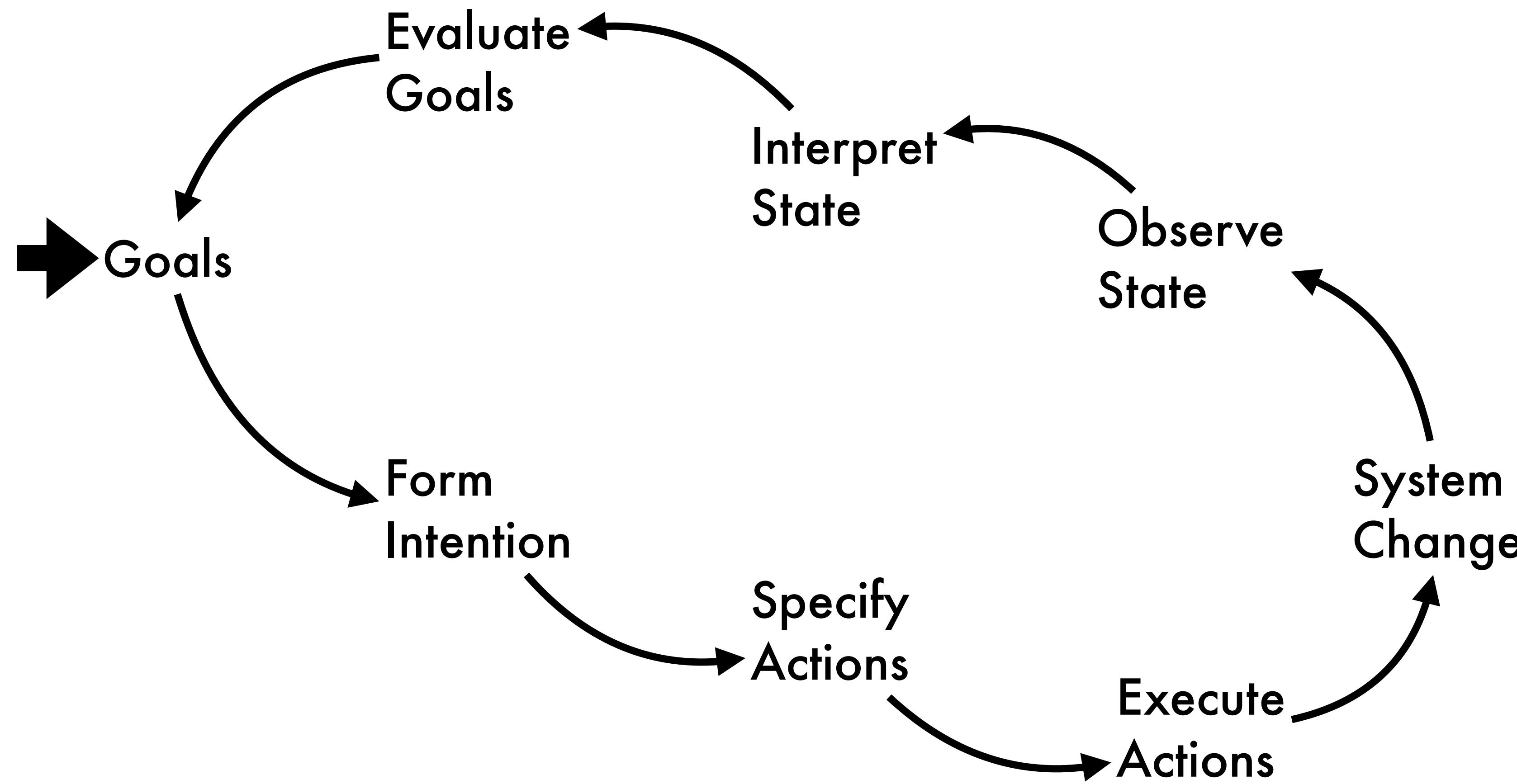
Reading assignment, due in lab next session

<https://www.dgp.toronto.edu/OTP/papers/bill.buxton/3state.html>

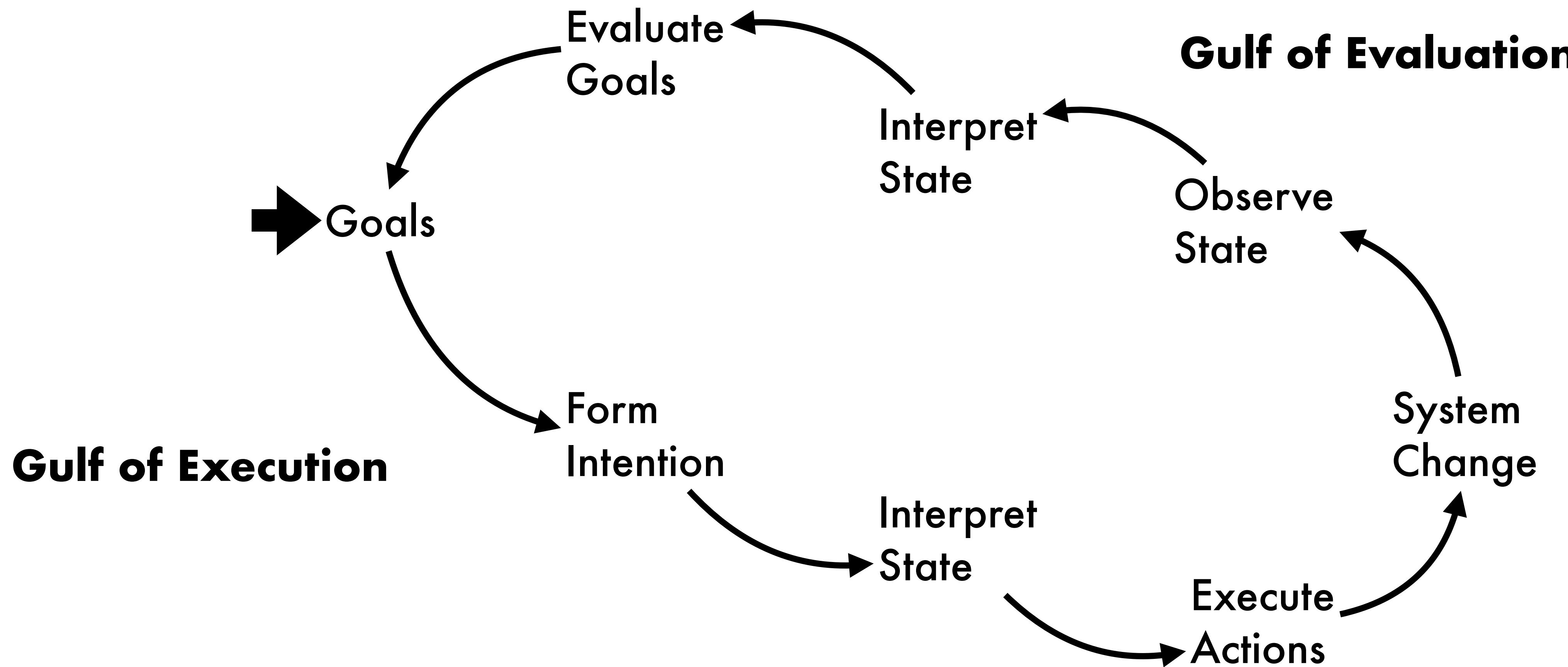
Norman's Execution-Evaluation Cycle

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 know
4. Execute the action sequence
 - [walk, reach, twist]
5. Perceive the system state
 - [head "click" sound, see light from the 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]
8. [REPEAT]

Norman's Execution-Evaluation Cycle



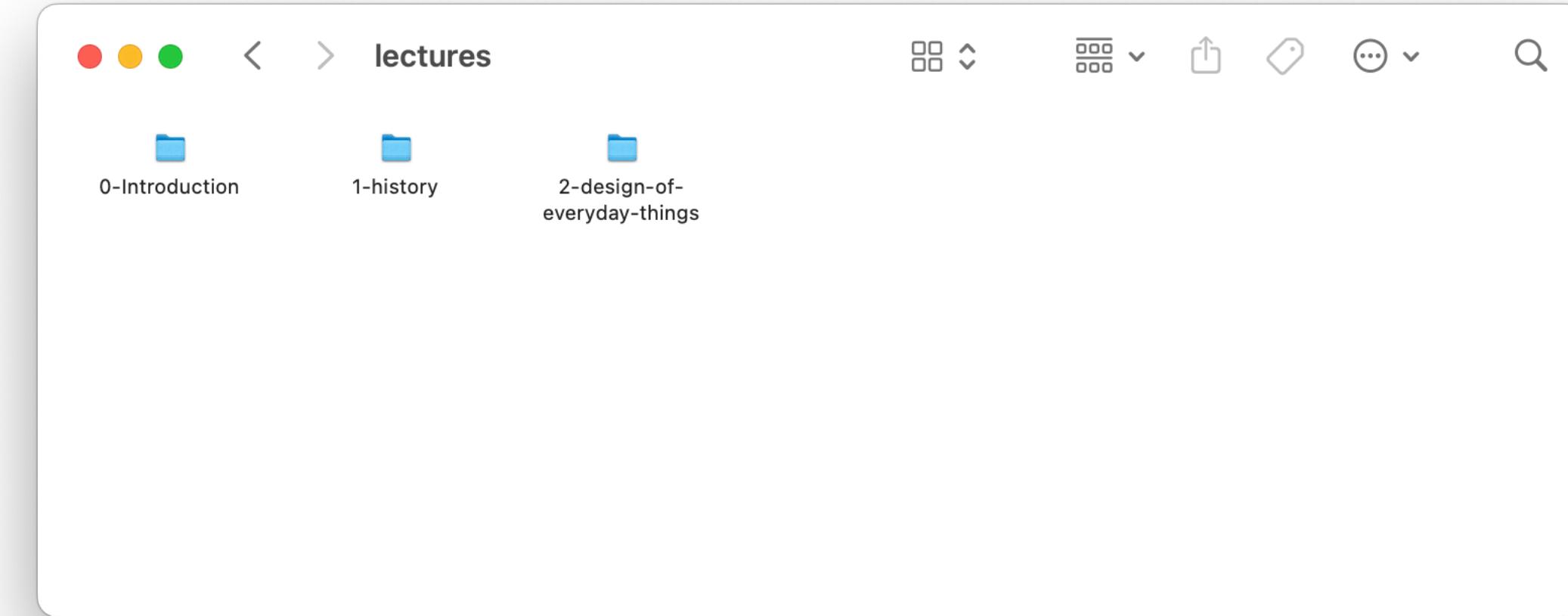
Norman's Execution-Evaluation Cycle



Gulf of execution example

1. Establish the goal
2. Form the intention
3. Specify the action sequence
4. Execute the action sequence

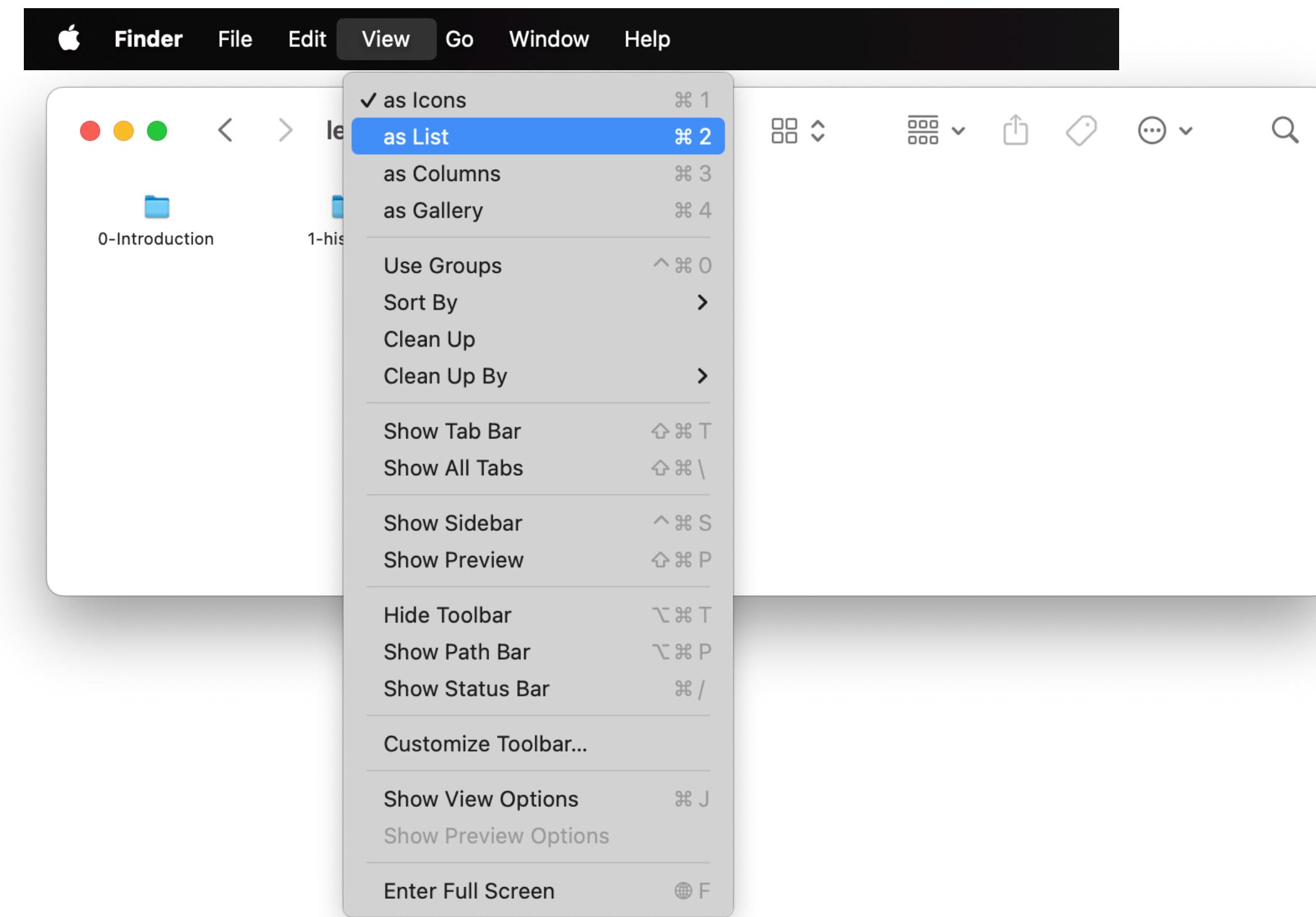
Goal: Make the folders easier to read



Gulf of execution example

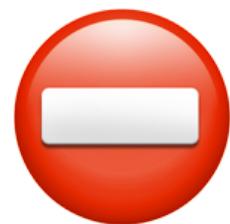
1. Establish the goal
2. Form the intention
3. Specify the action sequence
4. Execute the action sequence

Goal: Make the folders easier to read



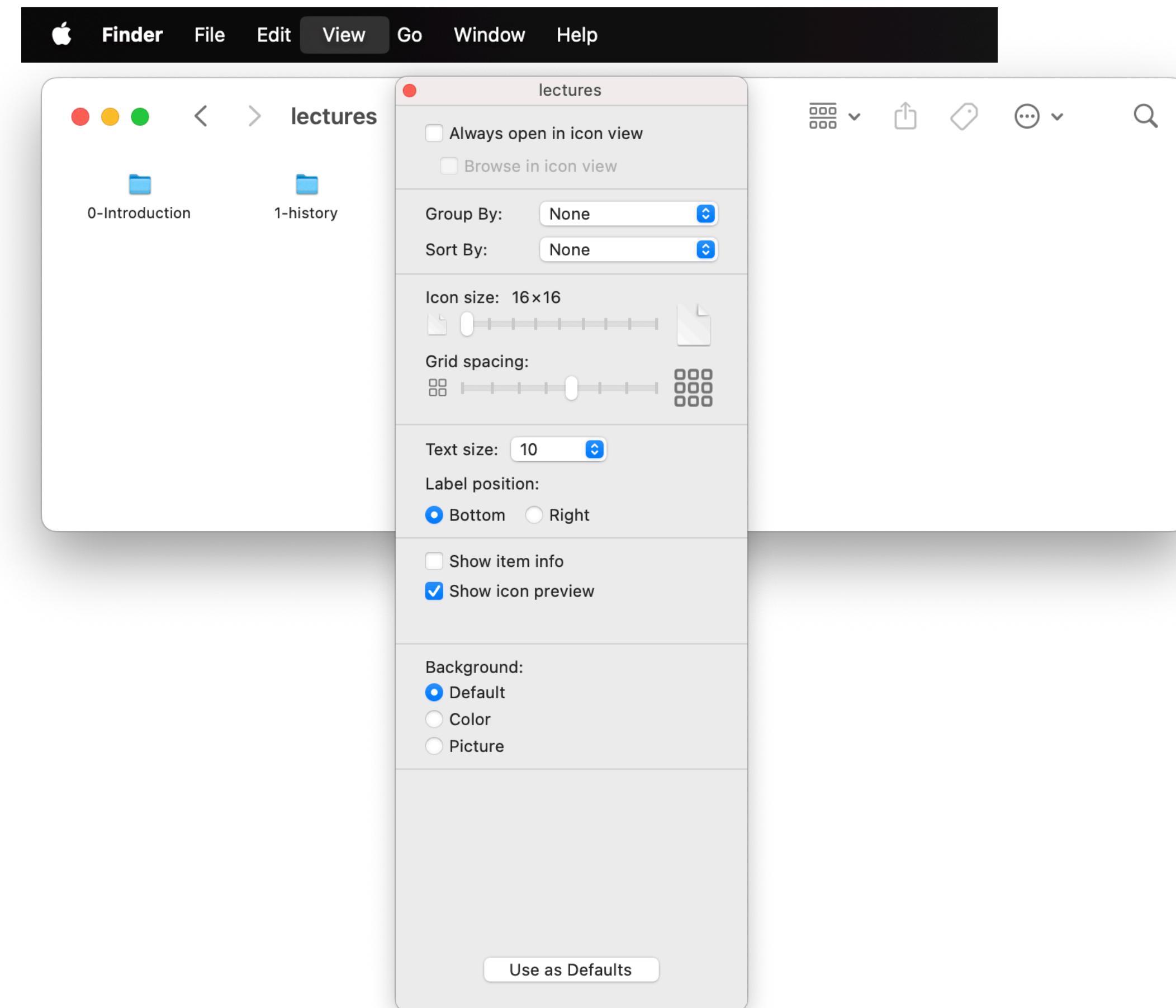
Gulf of execution example

1. Establish the goal
2. Form the intention
3. Specify the action sequence
4. Execute the action sequence



**It was hard to specify the action sequence.
This extends the gulf of execution.**

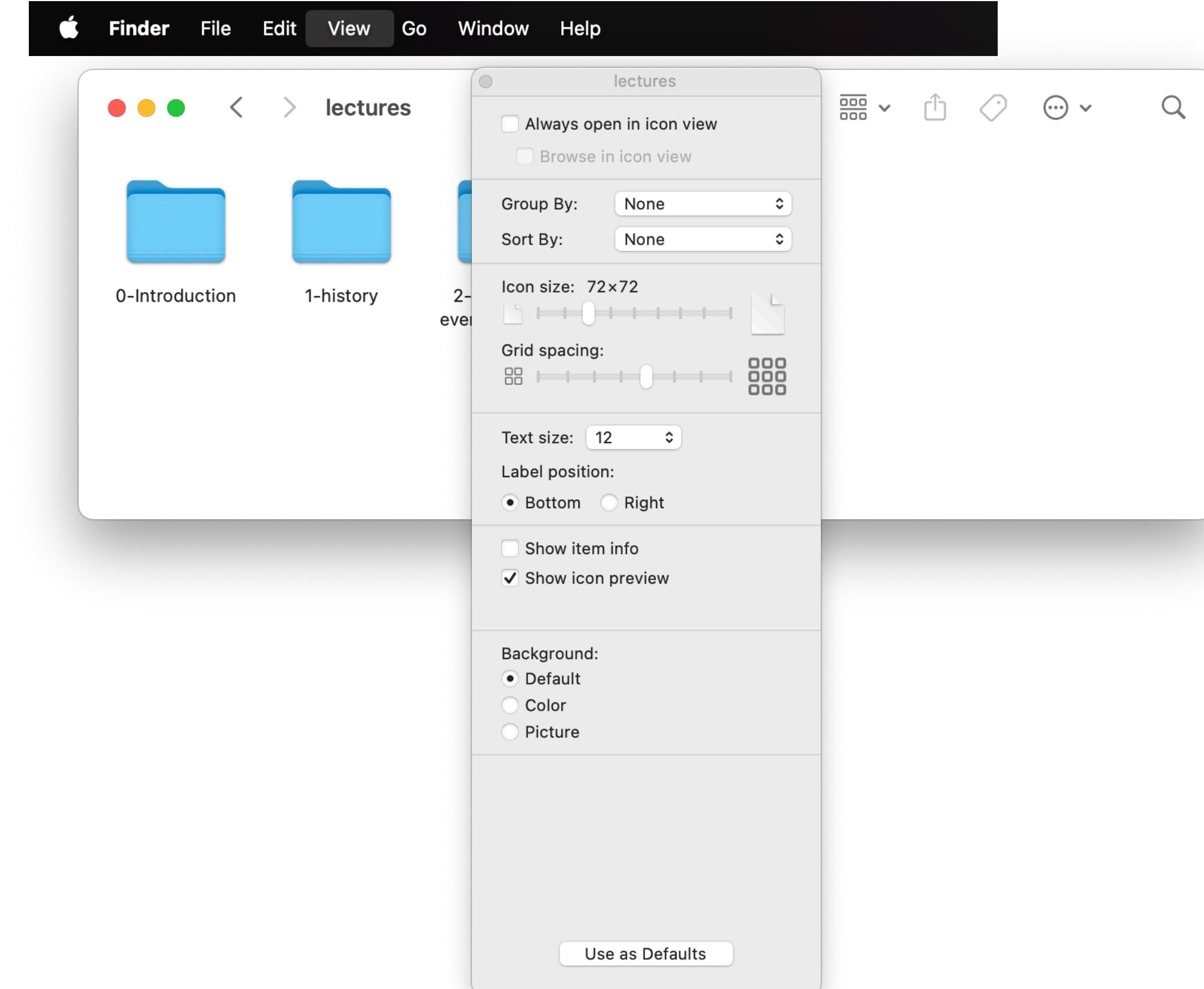
Goal: Make the folders easier to read



Gulf of evaluation example

5. Perceive the system state
6. Interpret the system state
7. Evaluate the system state with respect to the goals and intentions.

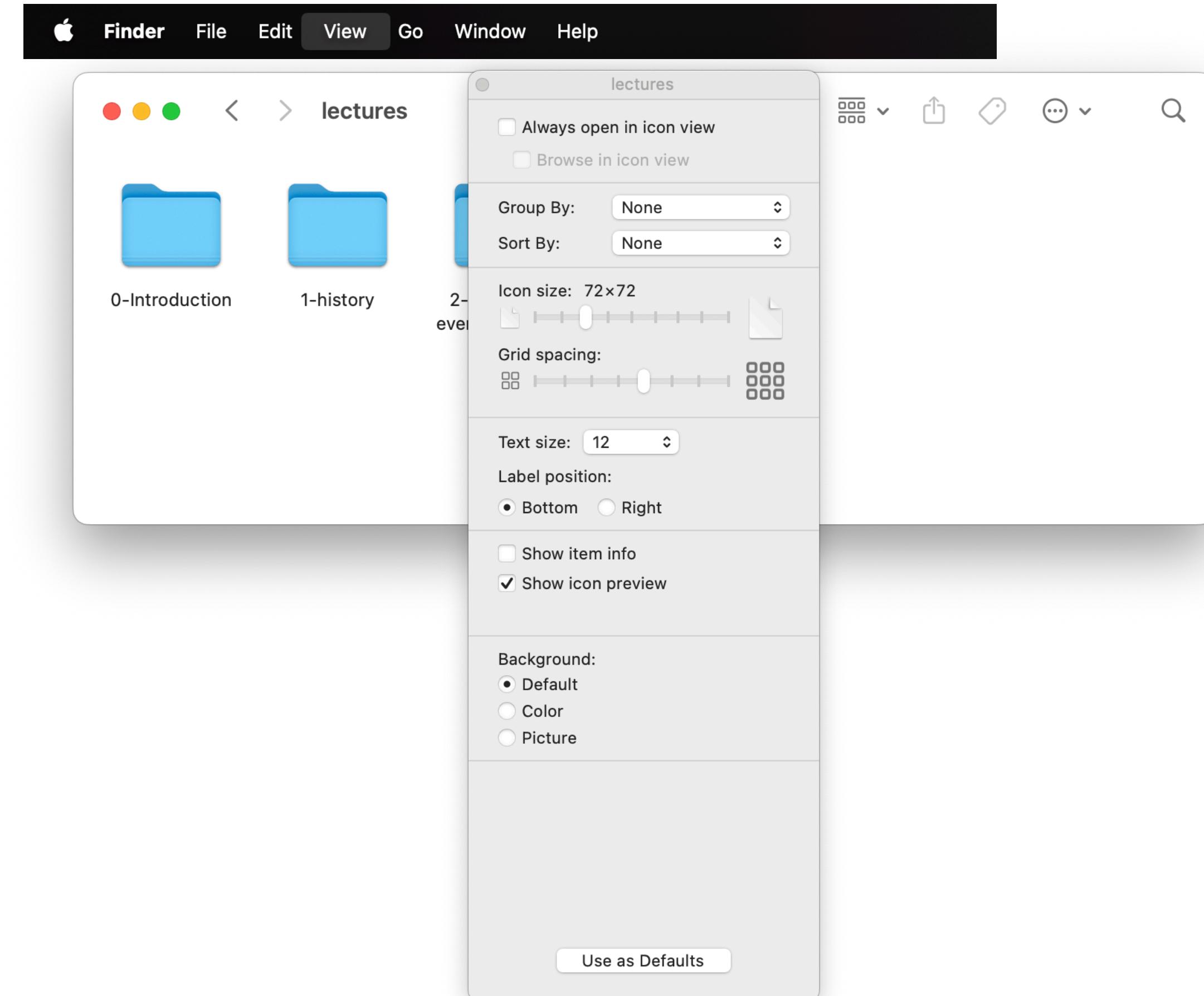
Goal: Make the folders easier to read



Gulf of evaluation example

5. Perceive the system state
6. Interpret the system state
7. Evaluate the system state with respect to the goals and intentions.

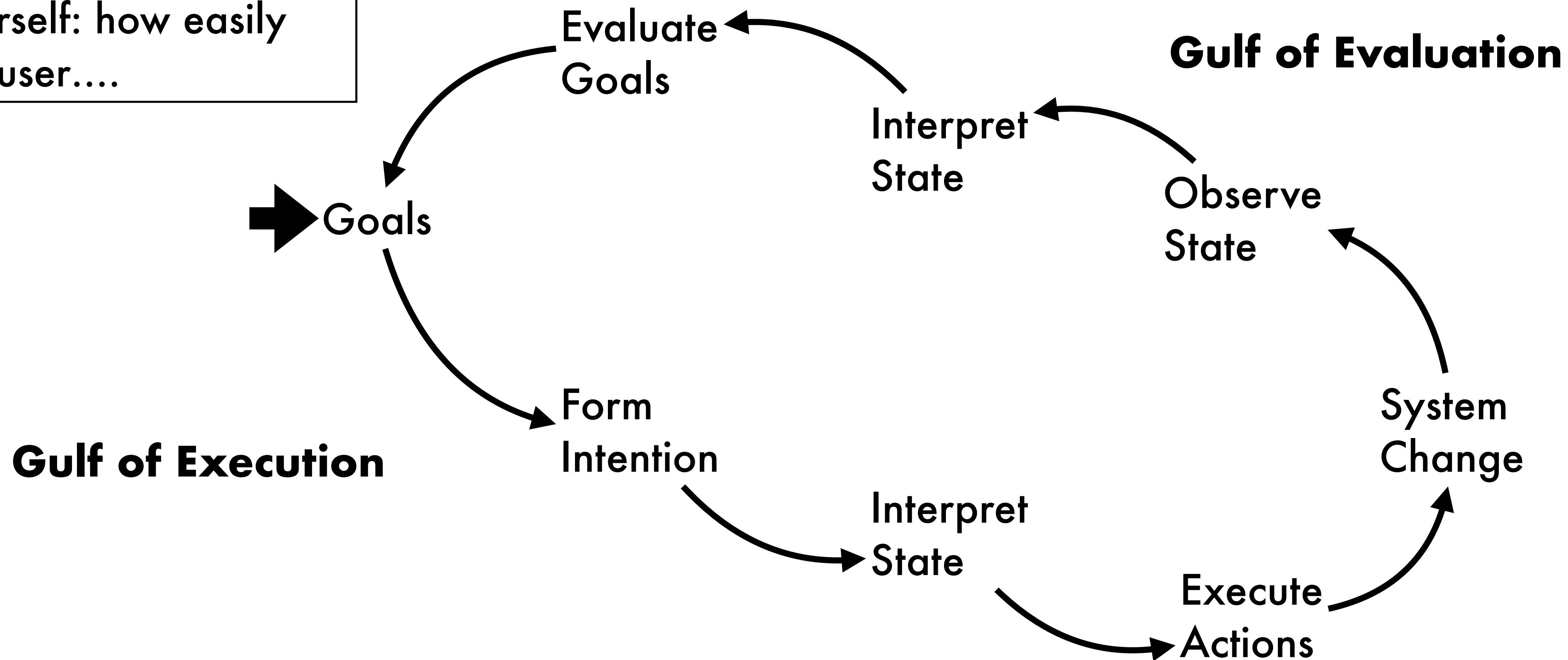
Goal: Make the folders easier to read



The system made evaluation easy.

!!

Ask yourself: how easily
can the user....



!!

Ask yourself: how easily
can the user....

Gulf of Execution

Goals

...determine what
the system is for

Form
Intention

Evaluate
Goals

Interpret
State

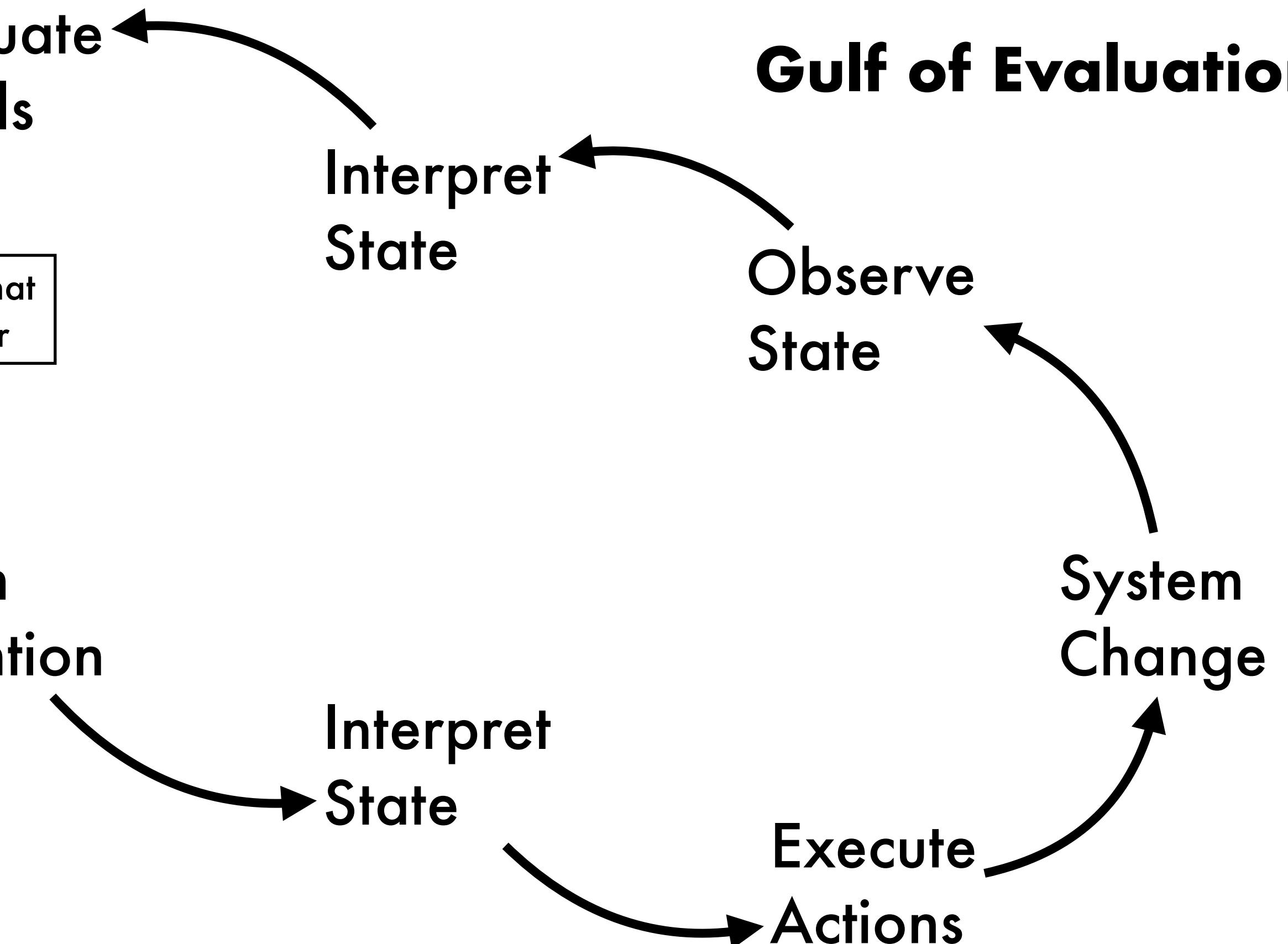
Gulf of Evaluation

Observe
State

System
Change

Interpret
State

Execute
Actions



!!

Ask yourself: how easily
can the user....

Gulf of Execution

Goals

...determine what
the system is for

Form
Intention

...tell what
actions are
possible?

Evaluate
Goals

Interpret
State

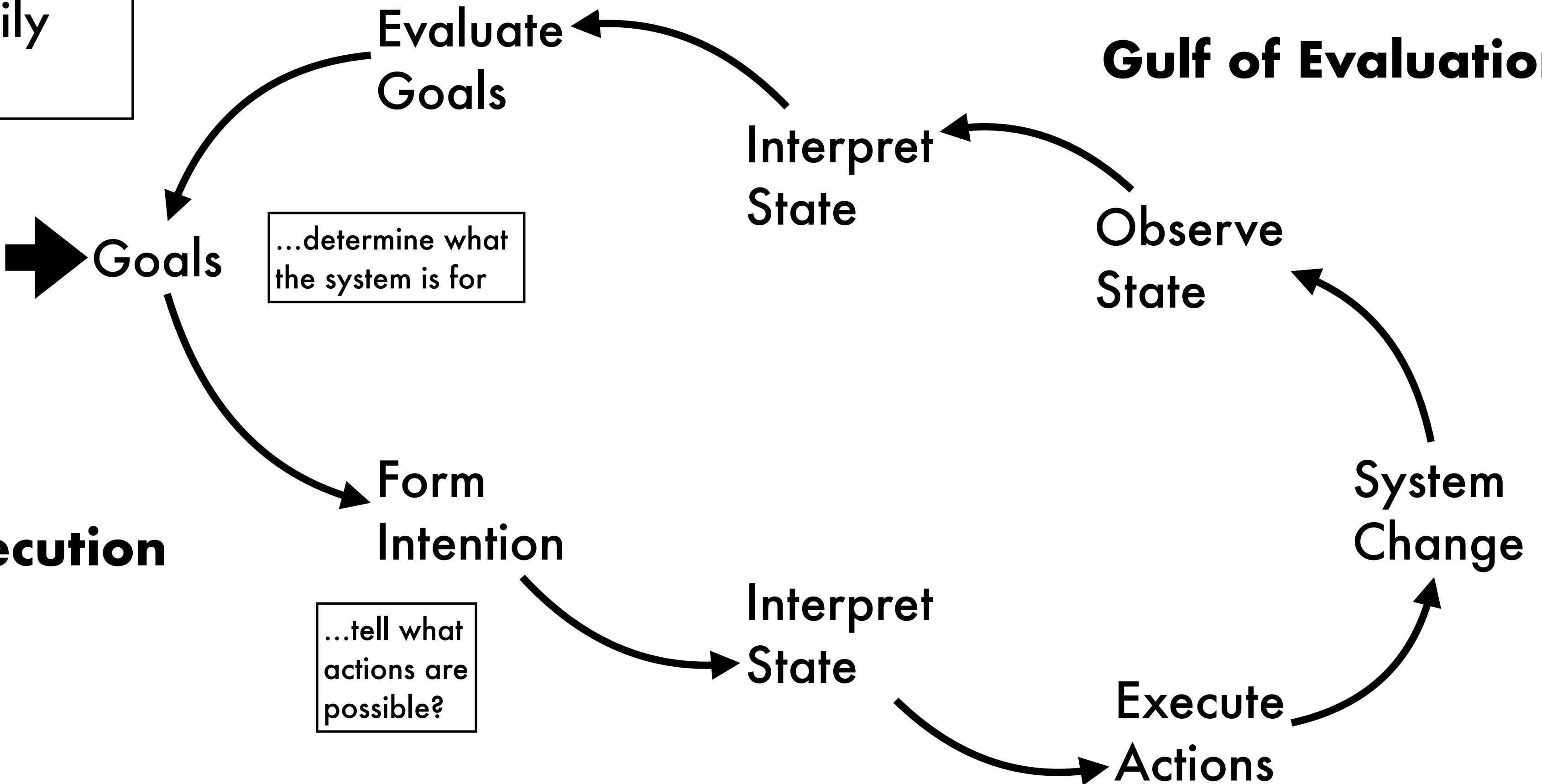
Gulf of Evaluation

Observe
State

System
Change

Interpret
State

Execute
Actions



!!

Ask yourself: how easily
can the user....

Gulf of Execution

Goals

...determine what
the system is for

Form
Intention

...tell what
actions are
possible?

Interpret
State

...identify and carry
out the appropriate
action?

Execute
Actions

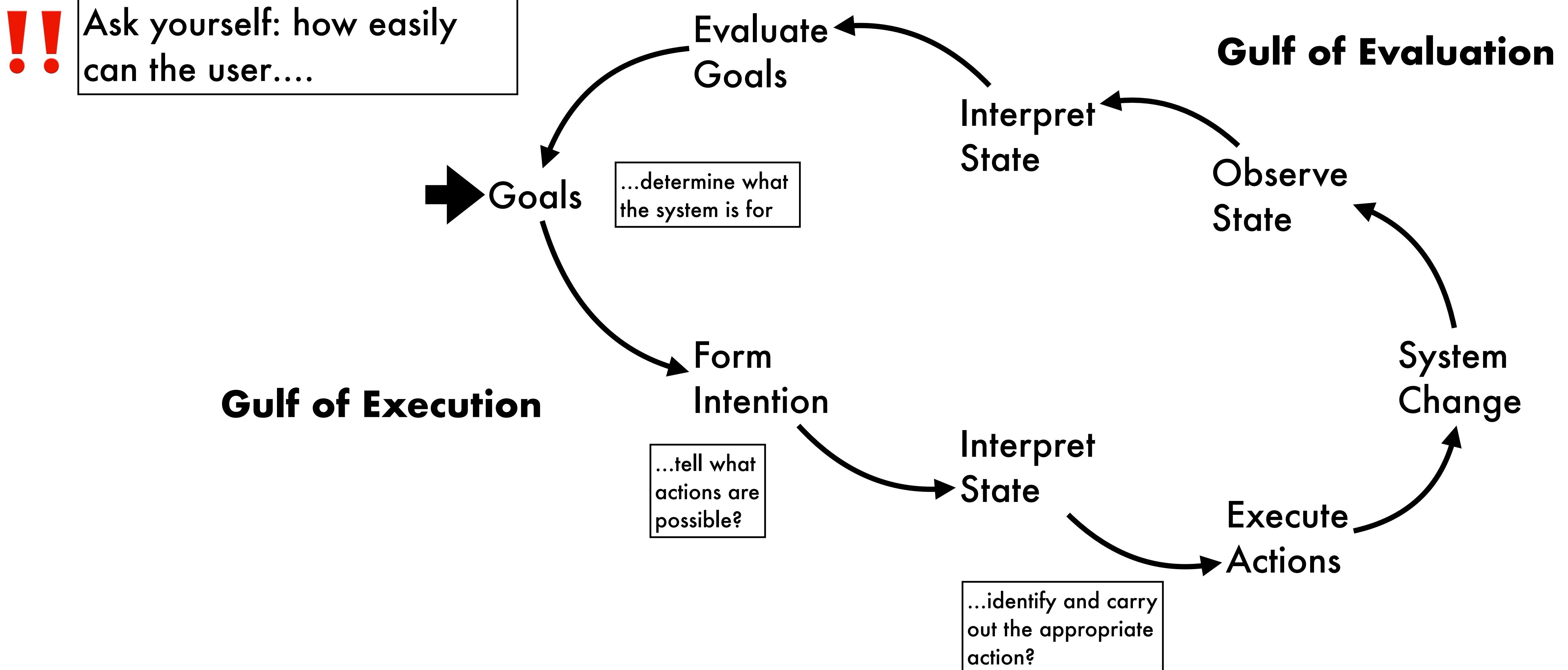
System
Change

Gulf of Evaluation

Evaluate
Goals

Interpret
State

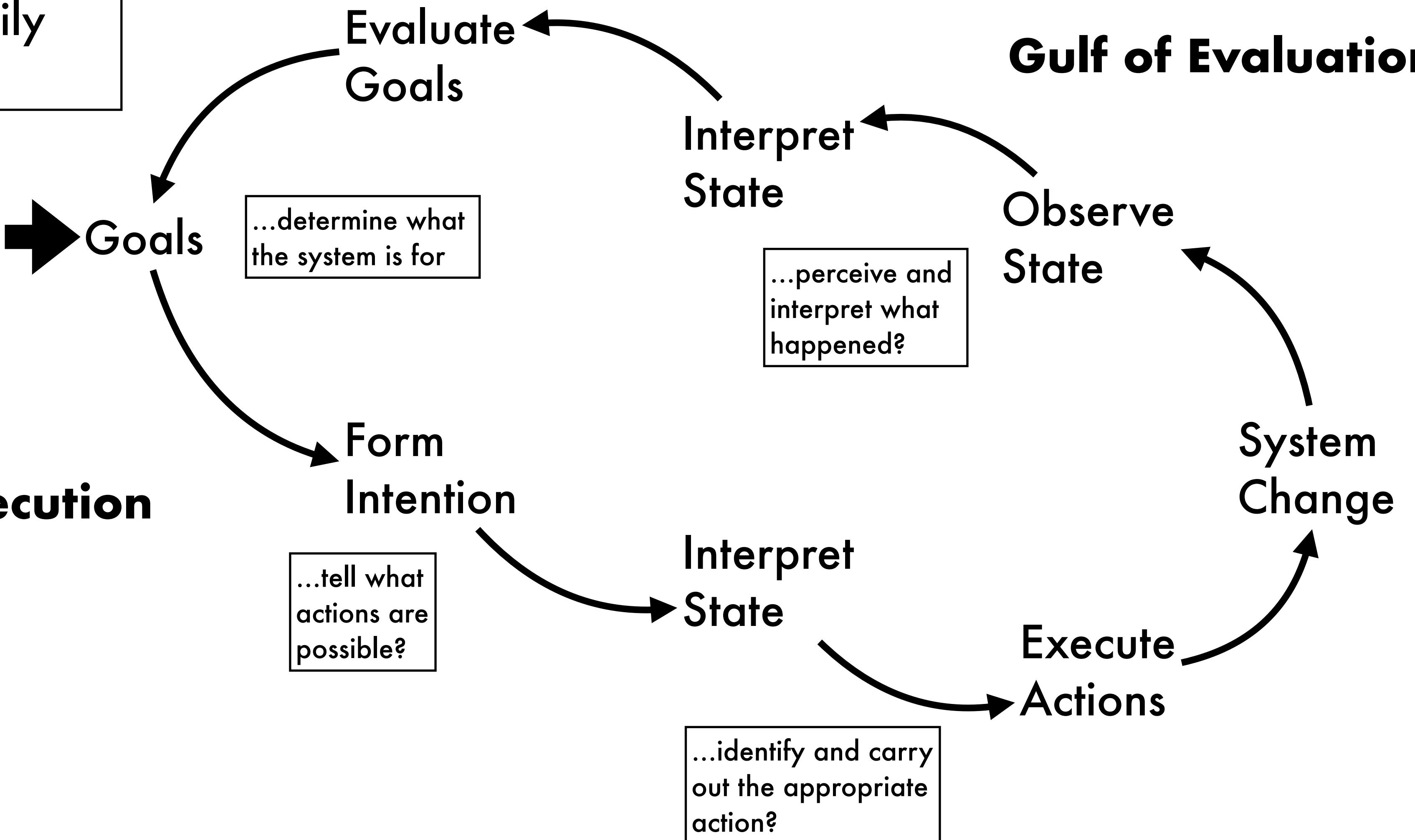
Observe
State



!!

Ask yourself: how easily
can the user....

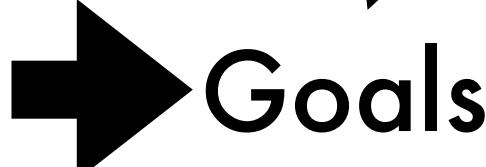
Gulf of Execution



!!

Ask yourself: how easily
can the user....

Gulf of Execution



Form
Intention

...tell what
actions are
possible?

Evaluate
Goals

...determine what
the system is for

...evaluate progress
towards the goal?

Interpret
State

...identify and carry
out the appropriate
action?

Interpret
State

...perceive and
interpret what
happened?

Gulf of Evaluation

Observe
State

System
Change

Execute
Actions

Design Principles

Affordances	Metaphors
Constraints	Mappings
Feedback	Visibility
Consistency	

They help us answer the questions the execution-evaluation cycle pose to us.

Design Principles

Affordances

Affordances

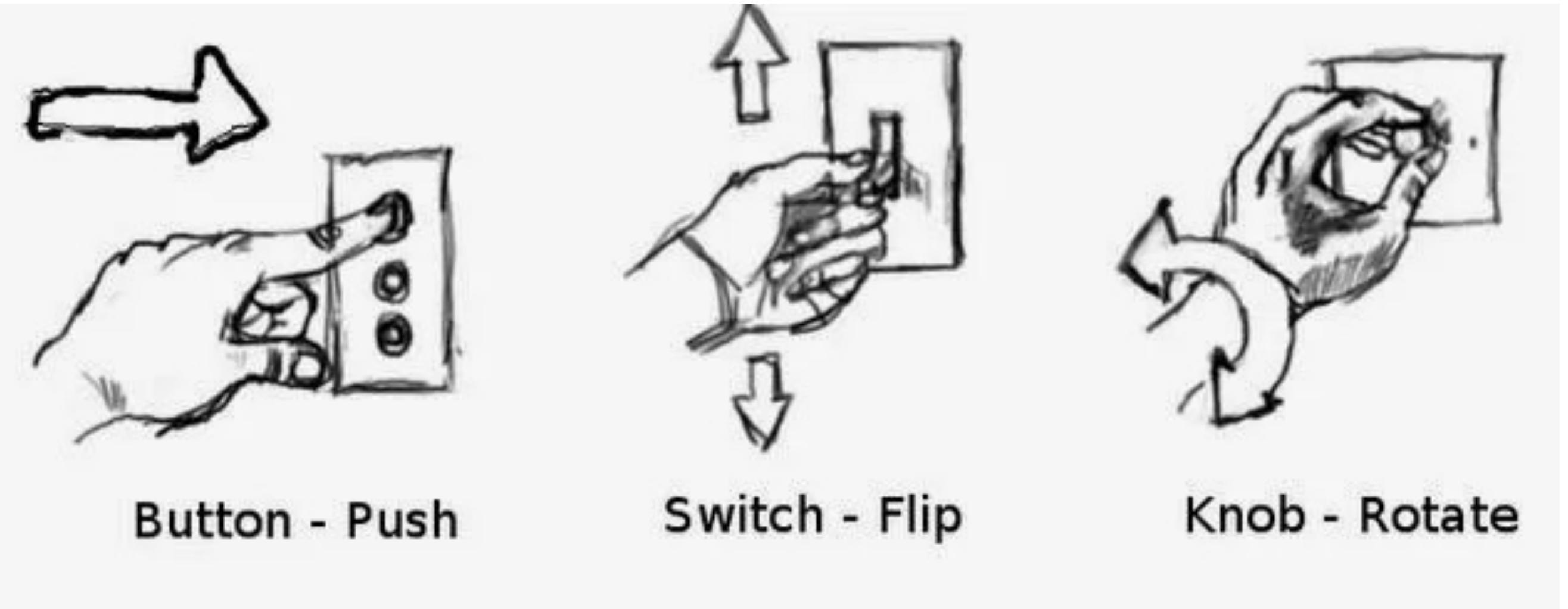
What does this chair afford?

Perceived Action Possibilities



Affordances

Perceived Action Possibilities



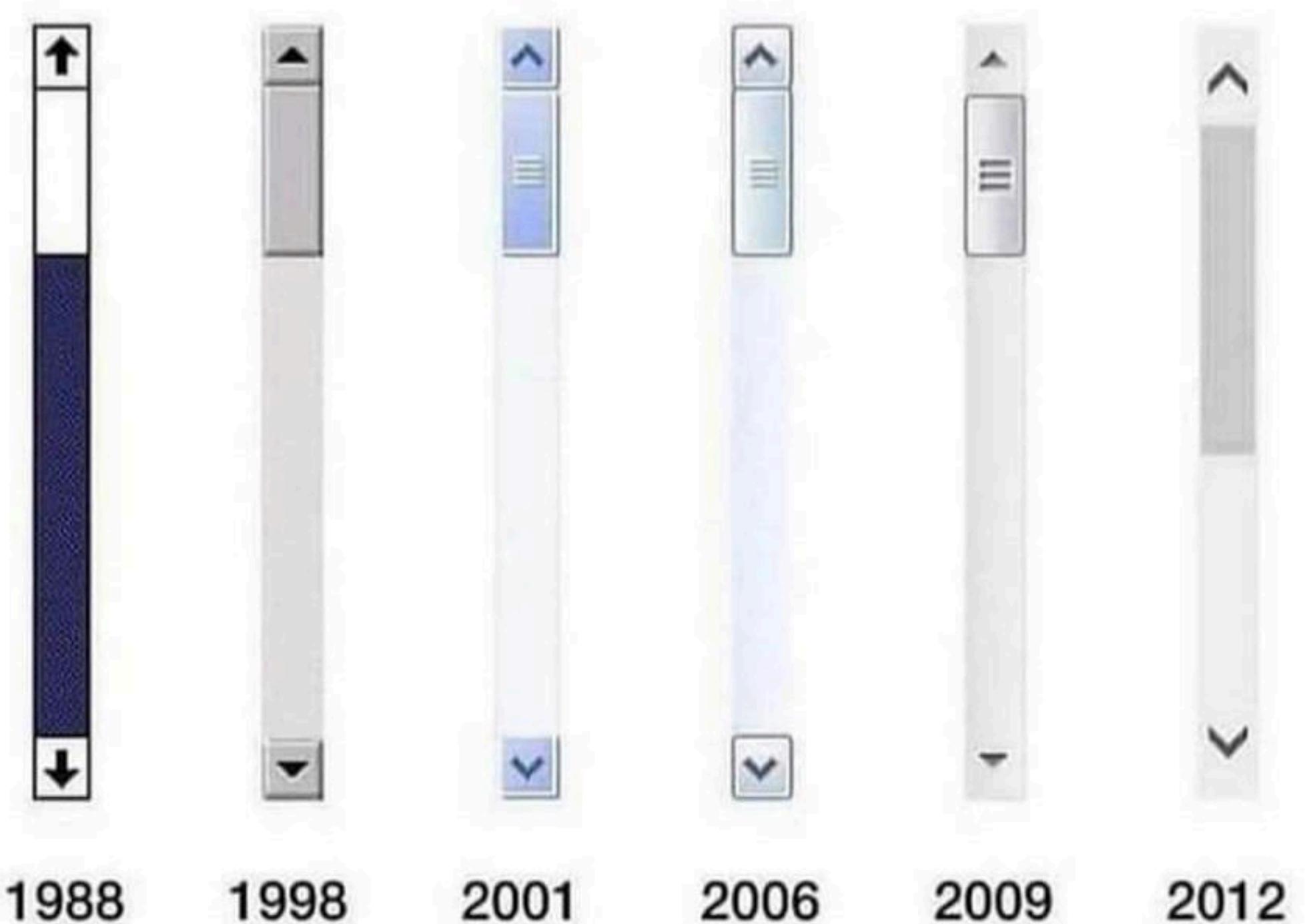
Affordances

Perceived Action Possibilities

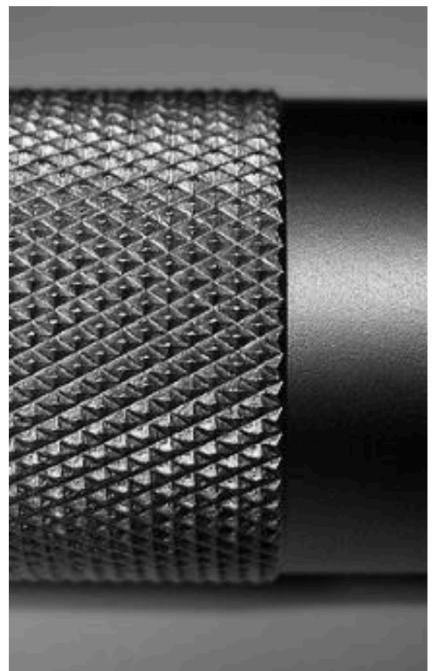


Affordances

Perceived Action Possibilities



Real-world example



Affordances

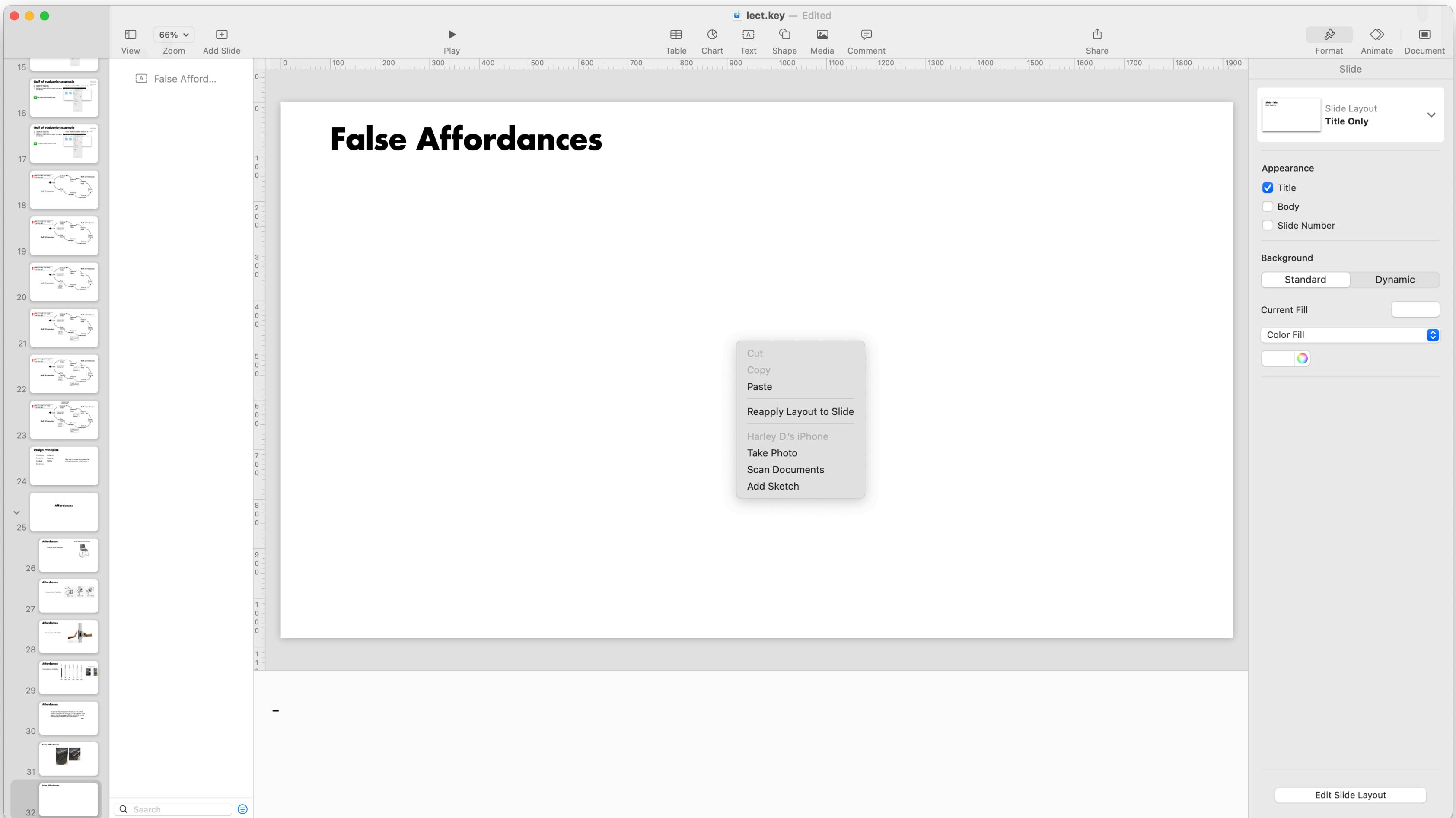
“In general, when the apparent affordances of an artifact matches its intended use, the artifact is easy to operate. When apparent affordances suggest different actions than those for which the object is designed, errors are common.”

Gaver

False Affordances

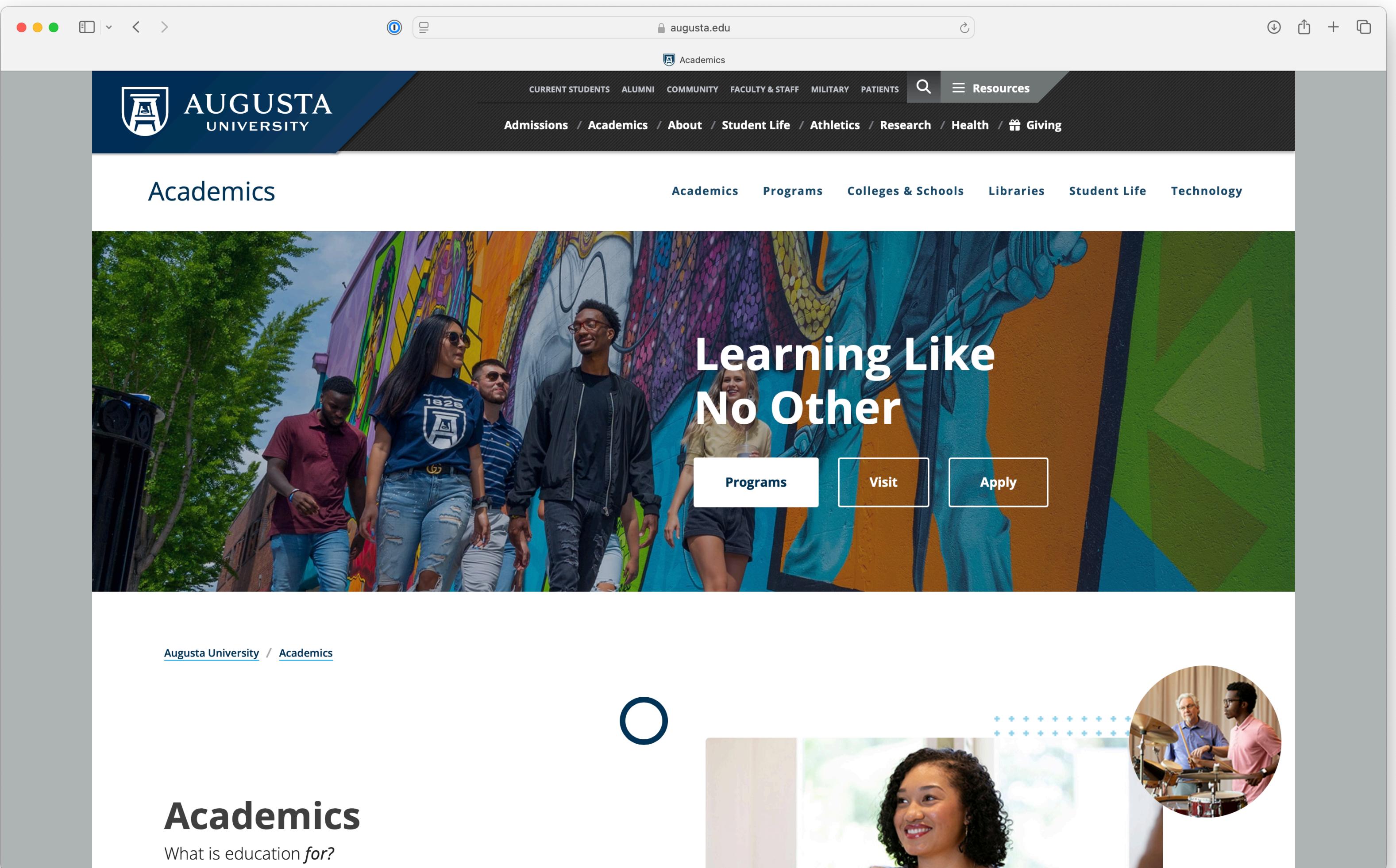


Hidden Affordances



Hidden Affordances

Clicking the logo on websites to return to the home page is a convention, but not afforded by the page.



Convention vs Affordances

“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 perceptible, else they fail to function.

Design Principles

Constraints

Constraints

Prevent some actions while allowing others.

Prevent errors before they can happen

Disruptive error messages are a last resort



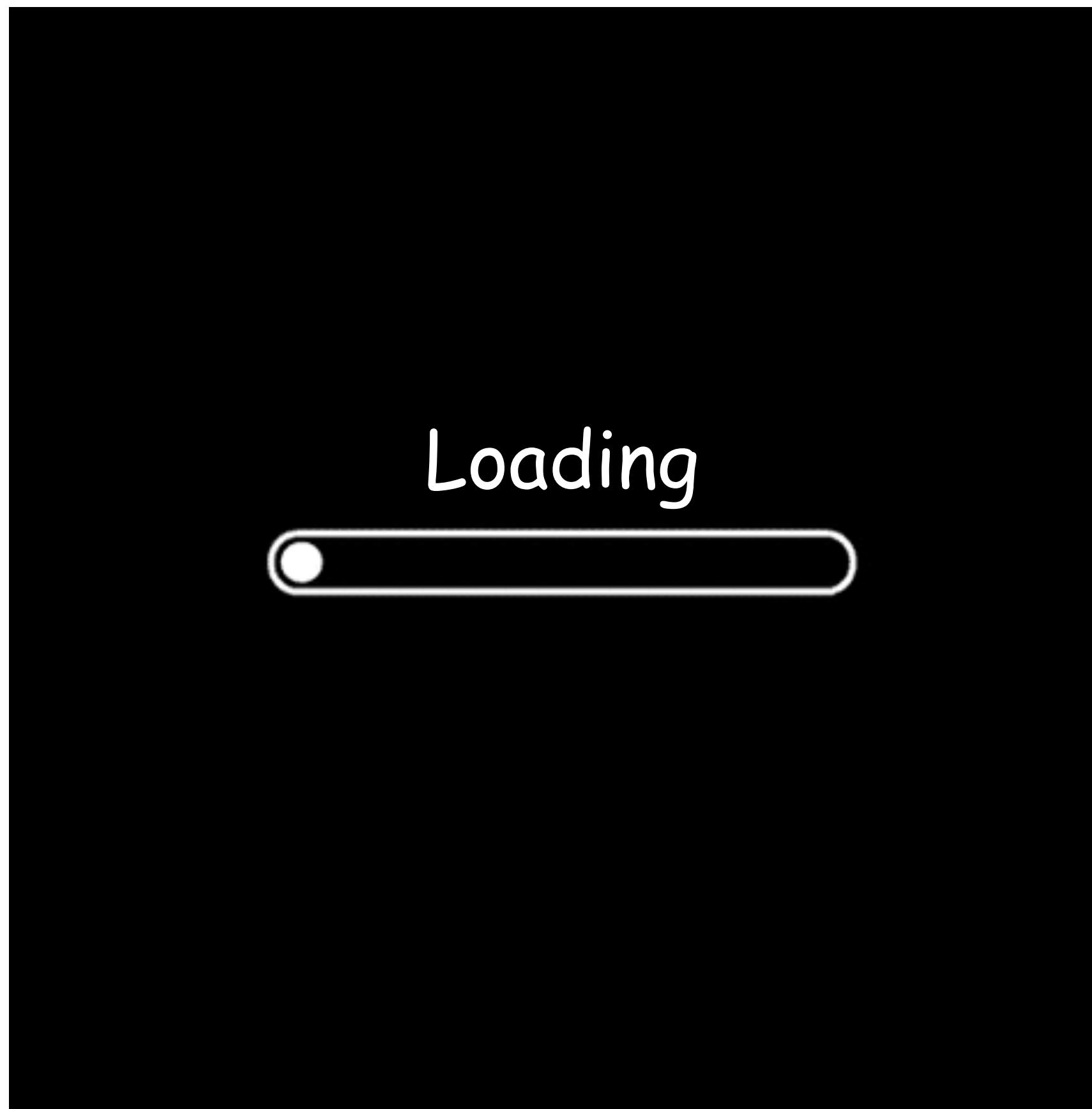
Constraints



Design Principles

Feedback

Feedback



Feedback

All actions have to be confirmed

Must be immediate

Must be informative

Preferably non-distracting and unobtrusive

Design Principles

Consistency

Consistency

Interfaces should be consistent in meaningful ways

Ex: Ubiquitous use of the same keys for cut/copy/paste

Types of consistency

- Internal (i.e., within itself)
 - Ex: The same terminology and layout throughout
- External (i.e., with other applications)
 - Ex: common widget appearance
 - Ex: design patterns common across applications

Consistency

Is consistency always better?

50%

Card title

Supporting text

50%

Card title

50%

50%

Card title

Supporting text

Original design

Consistent design

Design Principles

Metaphors

Metaphors

Examples

Suggest an existing mental model

Desktop metaphor

- Simulate a real desktop
- files, folders, trash
- Hidden windows

Wireless

- Invisibility
- distance

Metaphors

Ex: Email!

The screenshot shows a Gmail inbox interface. On the left, a sidebar lists 'Mail' categories: 'Inbox' (1 message), 'Starred', 'Snoozed', 'Important', 'Sent', 'Drafts' (5 messages), and 'More'. The 'Inbox' tab is highlighted with a pink bar. On the right, the main area shows the 'Primary' tab selected. A red horizontal bar highlights the first email in the list, which is from 'Joe Carlson' with the subject 'Fwd: Quote Estimate - Hi Mil...'. Below it, other emails are listed: 'julie' (from 'julie@ink-42.com'), 'Julie Wen', 'julie', 'SF Office', and 'Project Primavera'. The interface includes a search bar at the top and various toolbar icons like reply, forward, and delete.

From	Subject
Joe Carlson	Fwd: Quote Estimate - Hi Mil...
julie	julie@ink-42.com has shared
Julie Wen	Fun Book Club - Hey Justin
julie	Ink-42 Form - I've invited you
SF Office	Group SF Office created and
Project Primavera	Group Project Primavera cre...

Metaphors

Ex: icon for zooming



Broken Metaphors

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



New Briefcase

Dead Metaphors

Lost the original imagery of their meaning

Ex: Radio buttons!

Appearance hide

Text

- Small
- Standard
- Large

Width

- Standard
- Wide

Color (beta)

- Automatic
- Light
- Dark



Design Principles

Mappings

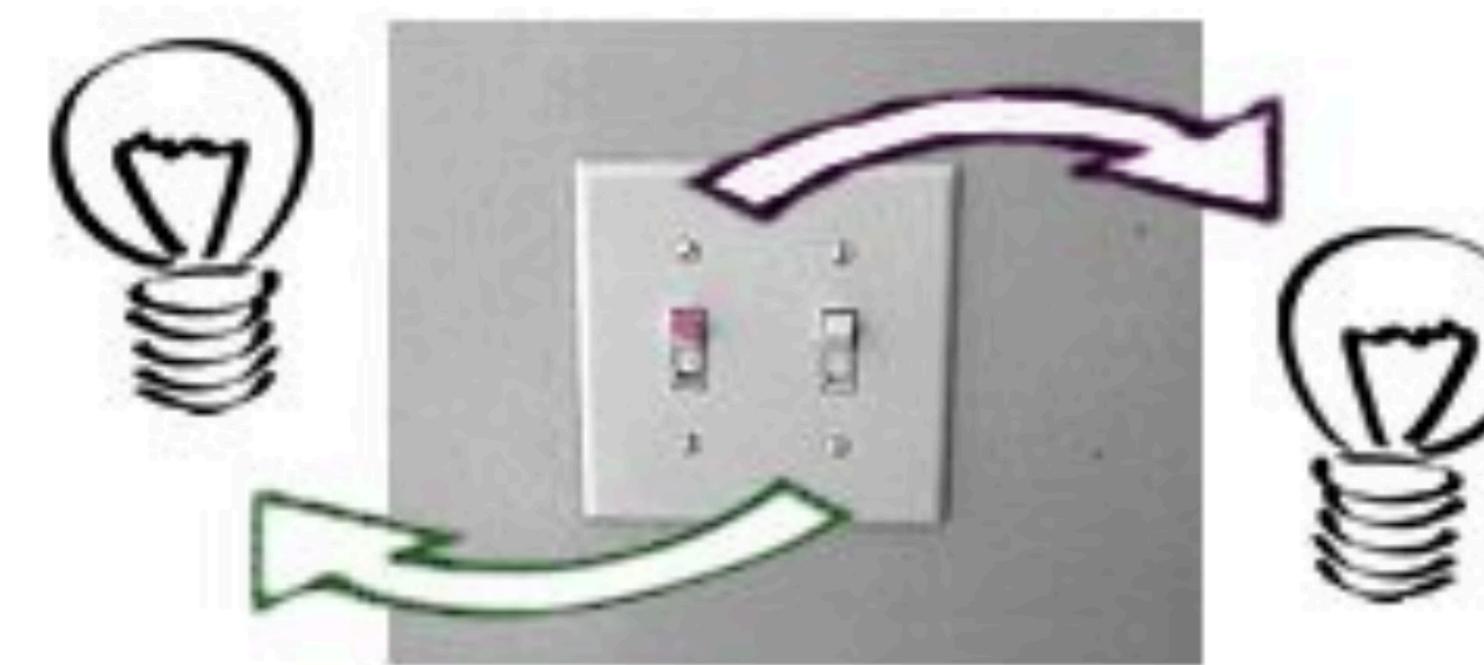
Mappings

Correspondence between an interface and the corresponding action in the world.

Minimizes cognitive steps to:

- transform action into effect
- perception into comprehension

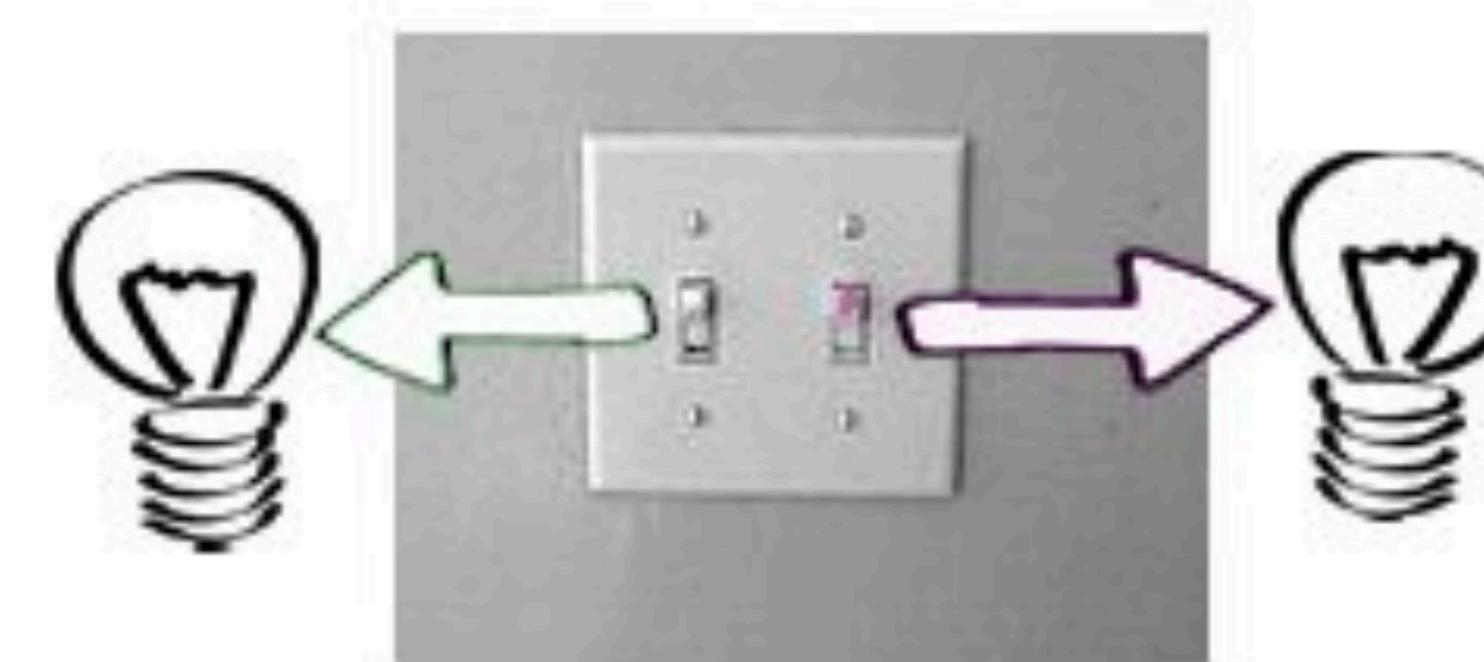
Mappings



Ex: Light switches



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



From <http://fivesketches.com/2009/11/natural-mapping-of-switches/>

Mappings

Ex: Stovetop



Mappings

Ex: Stovetop



Mappings

Ex: Stovetop



Mappings

Ex: Stovetop



Mappings

Ex: Euros



Mappings

Ex: Euros



Design Principles

Visibility

Visibility

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

Differentiate opposing functionality

- Sound can, sometimes, 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 visibility

Visibility

Ex: Cockpits



Visibility

Ex: Elevator with security panel



Features of Good Design

- **Affordances:** make each operation visible
- **Mappings:** makes the relationship between the actual action of the device and the action of the user obvious
- **Feedback:** make the result the users action obvious
- **Mental model:** make the underlying behavior of the device easy to understand and remember
- **Constraints:** make errors less possible by forcing the only action to work to be the right action