

Interaction Design

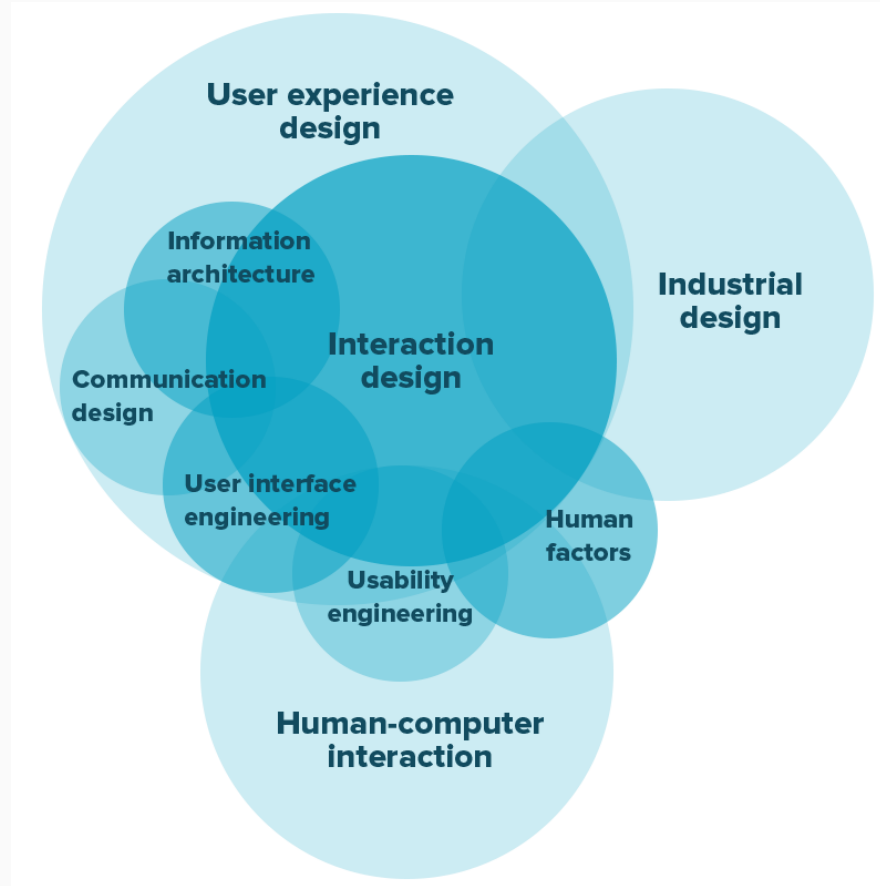
ITS290F

What is Interaction Design (IxD)?

“Interaction Design (IxD) defines the **structure and behavior** of interactive systems. Interaction Designers strive to create **meaningful relationships** between people and the products and services that they use, from computers to mobile devices to appliances and beyond.”

— IxDA (Interaction Design Association)

Relationships between different subsets of UX Design



Bad interaction...

- Creates **obstacles** / **frictions** between a user and a product
- Distract people from getting to their goal and often make them give up altogether

Examples of good interaction

- Cashing out at an ATM in less than a minute
- Apps automatically fills in the verification code send via SMS
- Use a widget on your home screen instead of opening an app
- Seeing a **green** checkmark when correctly filling in a form

Which UI design guidelines / principles have been used to create these interactions?

Laws and Principles of IxD

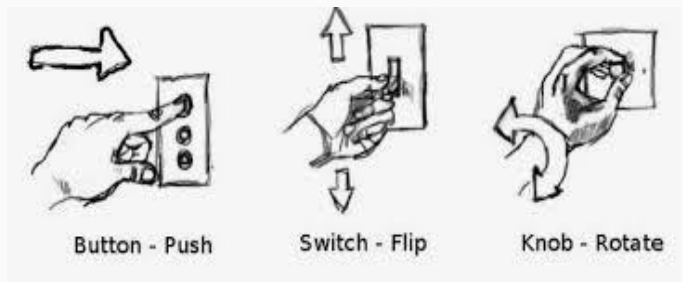
Fundamental Principles of Interaction

1. Affordances
2. Signifiers
3. Feedbacks
4. Constraints
5. Natural Mappings
6. Conceptual (mental) models

1. Affordances

Affordance (Physical)

Affordance describes all actions that are made physically possible by the properties of an object or an environment. (物體的特性決定了行為的可能性)



Bad Affordance?

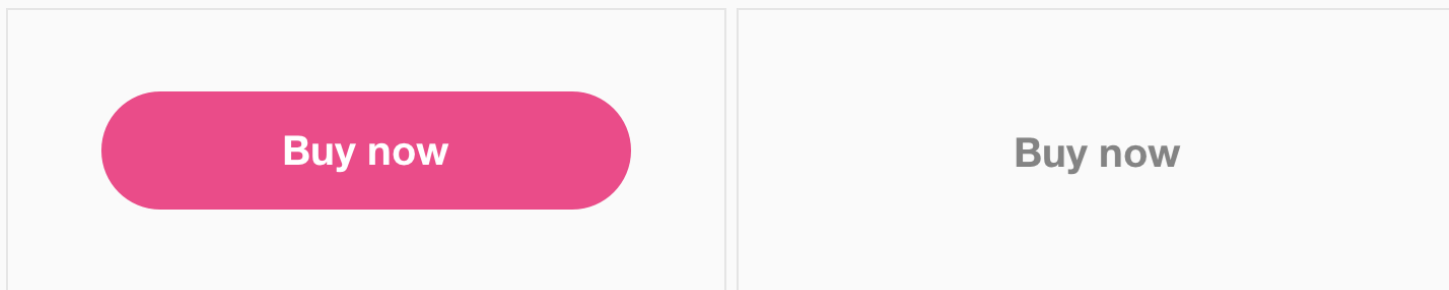


The bars on the 'push' side of the door provide a misleading affordance to pull - you need a **handle to pull**, but a **handle is useless when pushing**.

Source: <http://morgancarter.com.au/design-solutions/affordance-for-overflowing-content>

Affordance in UI Design (Digital)

A digital interface needs to rely on visual cues to make them intuitive and easy to use.



Which one of the above do you perceive to be **clickable**?

Source: <https://uxdesign.cc/affordance-in-user-interface-design-3b4b0b361143>

Affordance in UI Design

Guidelines for Visualizing Links

Textual links should be **colored** and underlined to achieve the best perceived affordance of clickability.

nnngroup.com

NN/g

Is this a
hyperlink or
underline?

Affordance in Mobile UI Design

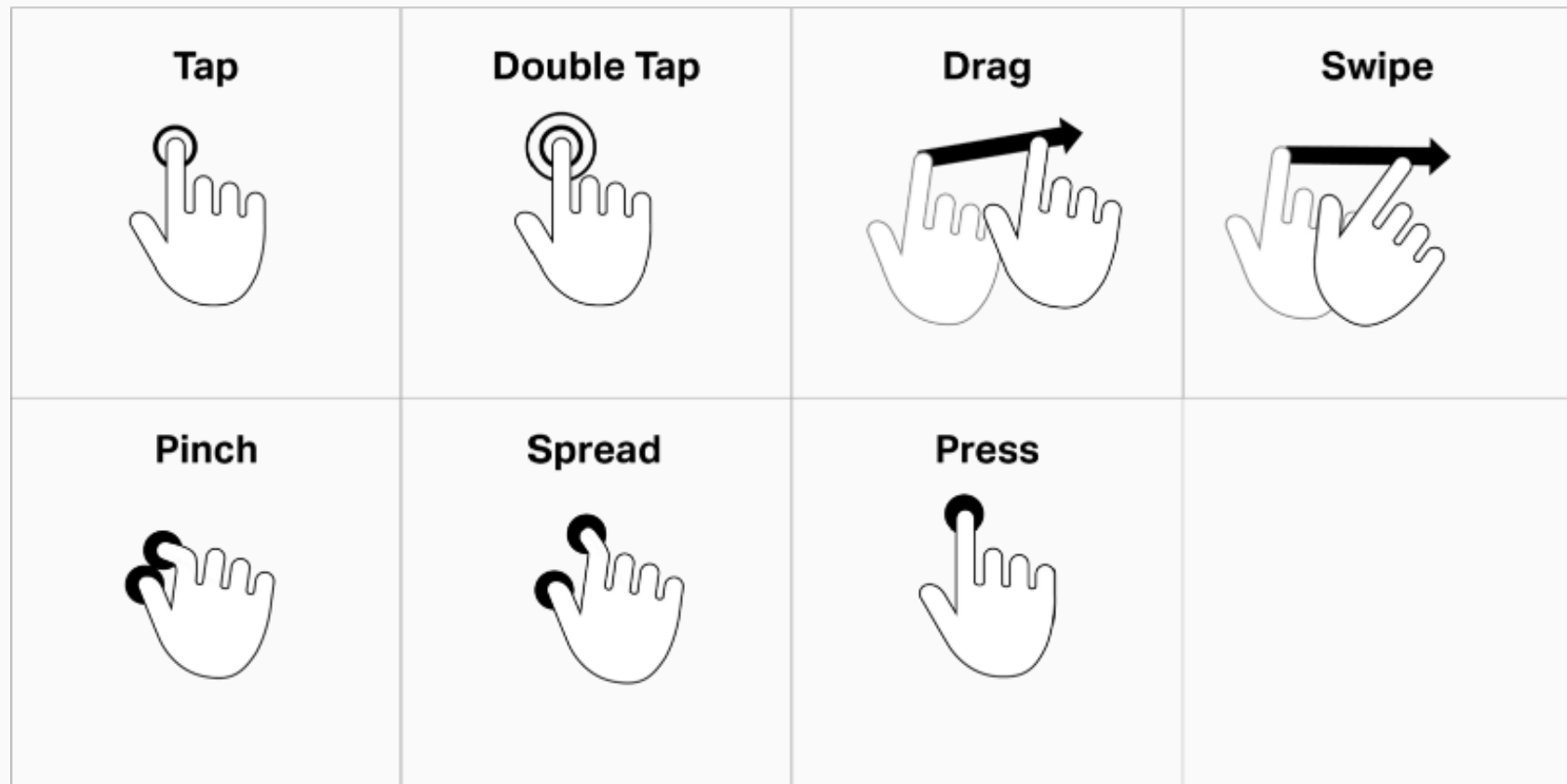
An affordance in mobile interface design isn't as obvious as a chair or a slot in a door. When we talk about affordance in the context of a mobile interface, we're referring to any **object with utility** — any **object that offers interaction affords use**.

Affordance in interface design relies heavily on **signifiers** and is often determined by **a user's previous experience and appetite for discovery**.

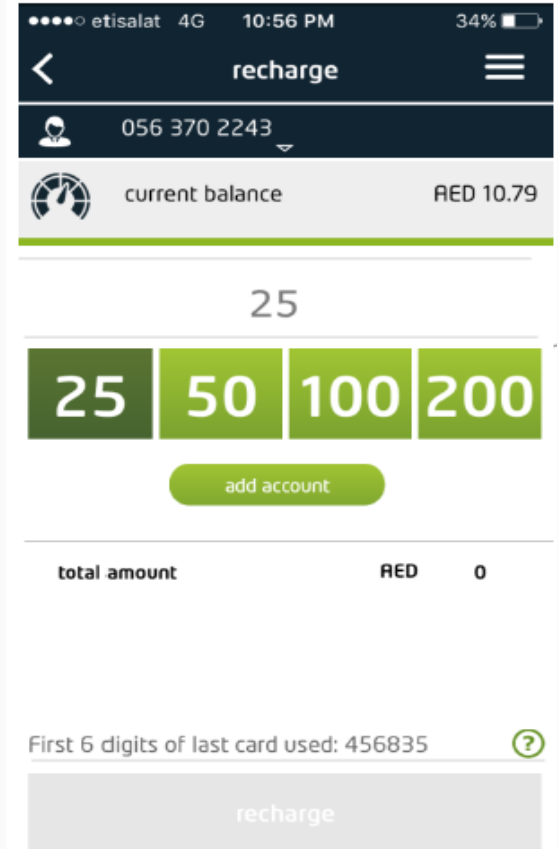
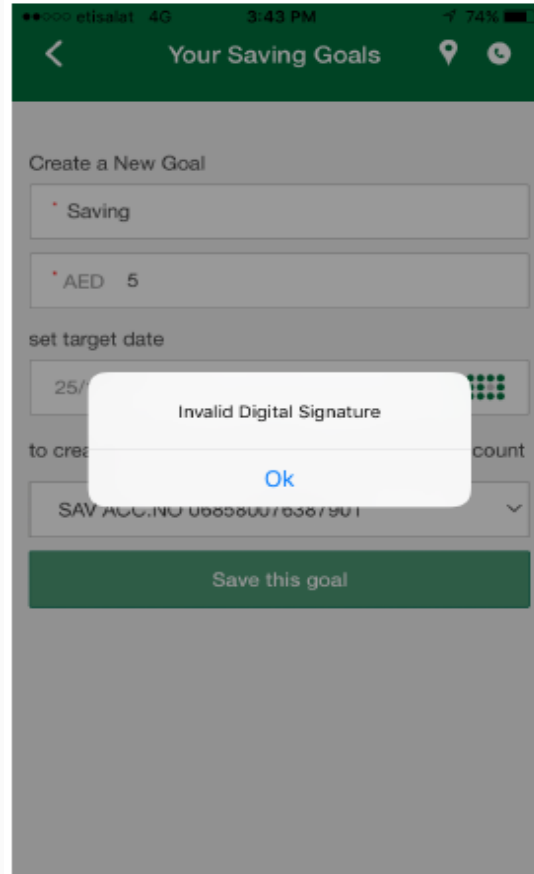
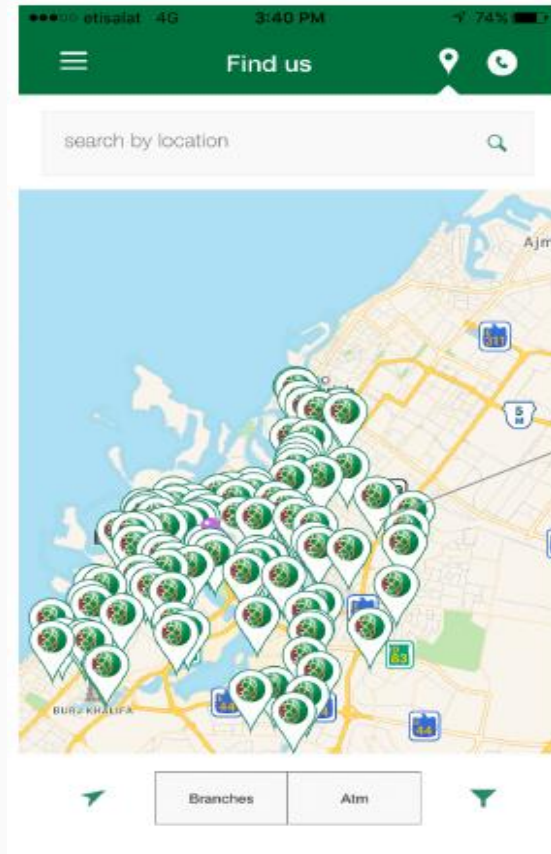
From experience with touch screen interfaces we're accustomed to certain universal affordance which are **consistent across devices and platforms**.

Remember, affordances are what an object can do based on a user interaction.

Affordance in Mobile UI Design



Where are the affordances?



2. Signifiers

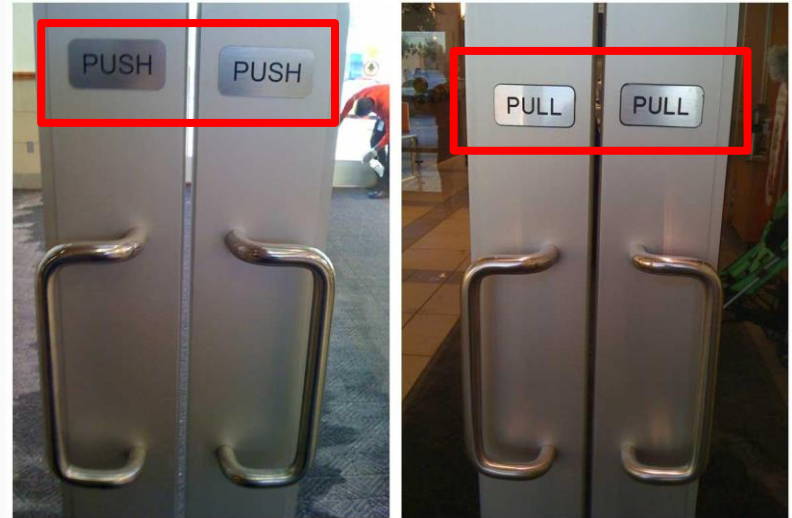
Signifier

A signifier is some sort of *indicator* (in the physical or digital world) or *signals*, that can be interpreted meaningfully.

- Examples: signs, labels and drawings placed in the world

Signifiers can be used to enhance affordance.

- Some affordances are perceivable, others are invisible.



Signifiers - Example



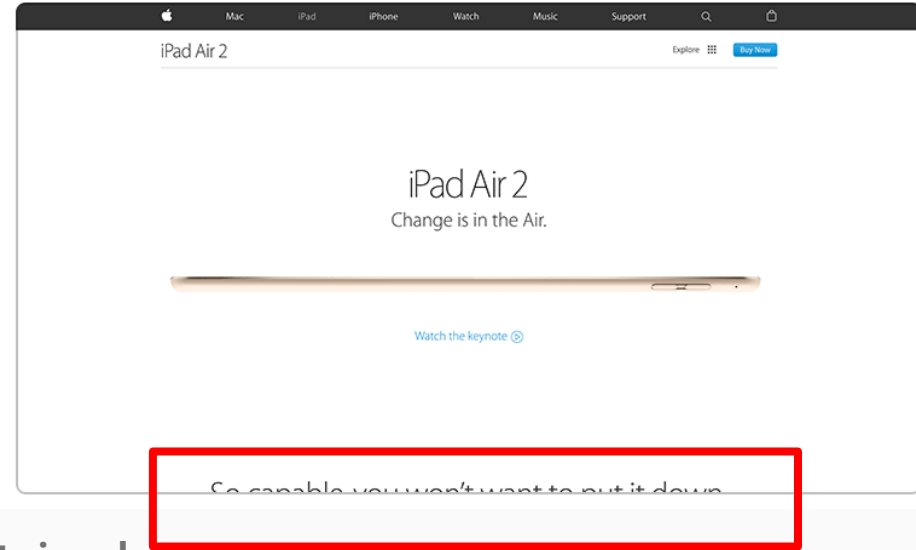
Signifiers on a touch screen

Menu selection

Scroll Left



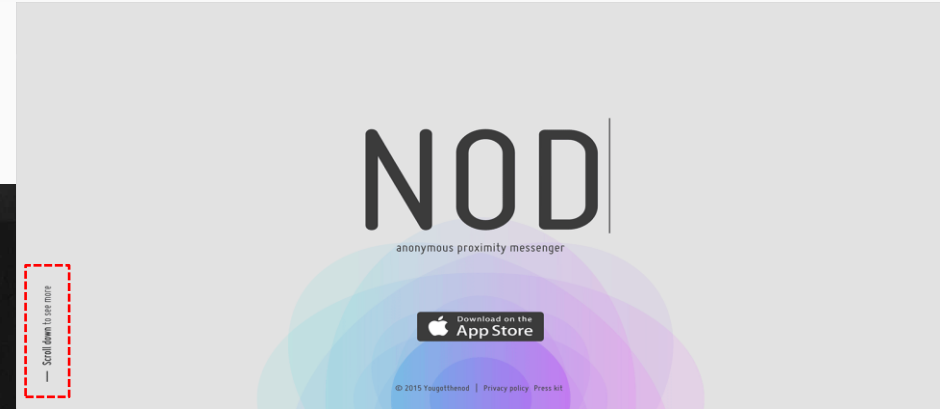
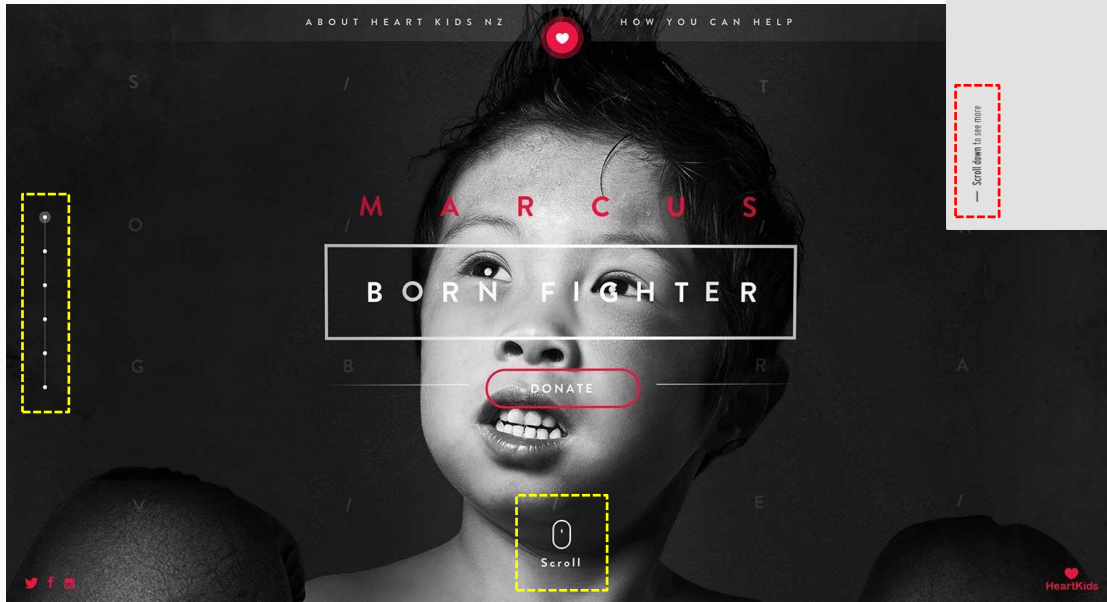
Cut-off content



The example on the left is completely contained within the screen, with nothing that encourages you to scroll. But the example on the right clearly has more content below the fold.

Source: <http://morgancarter.com.au/design-solutions/affordance-for-overflowing-content>

A 'scroll me' icon or button



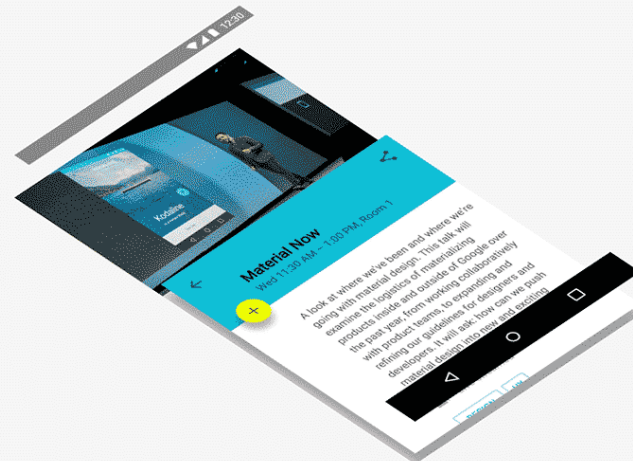
Source: <http://morgancarter.com.au/design-solutions/affordance-for-overflowing-content>

Where is the *Submit* button?

On a mobile phone, there's no space for an icon saying “scroll!”

Form Header	Form Header
Field label 1 <input type="text"/>	Field label 1 <input type="text"/>
Field label 2 <input type="text"/>	Field label 2 <input type="text"/>
Field label 3 <input type="text"/>	Field label 3 <input type="text"/>
Field label 4 <input type="text"/>	<div>Save</div>

- User could see a cut-off, which provides a clear affordance for users to scroll.
- People couldn't see the Submit button.
- User could see the Submit button.
- But it looks like the form only has 3 fields.



There are lots of implementations of this solution on the web. *For example: Google I/O App Layer Visualization*

Examples of Signifiers in UI Design



In this example, we have 4 signifiers, some more powerful than others.

The button itself. This is not a very strong signifier but someone who often uses modern websites might recognize this as a button just by looking at it. If the user recognizes it, he knows that he can click on it.

The color change. When the user hovers the button, he'll see that the color is changing. This small change in the hover state affords that you can click on it.

The cursor change. As in the previous point, when the user hovers the button, his cursor will change from an arrow to a pointing finger. This increase the affordance of the click.

The text on the button. The text written on the button itself can help the user know what to do. In this example, it's pretty obvious that you are going to login if you click it.

Affordance and Signifier Relationship - Basic



or



Two signifiers are used to identify that this object affords linking.

1 ■ Icon - an illustration of content or subject matter.

2 Label - identifies content/subject matter

Affordance and Signifier Relationship - Complex



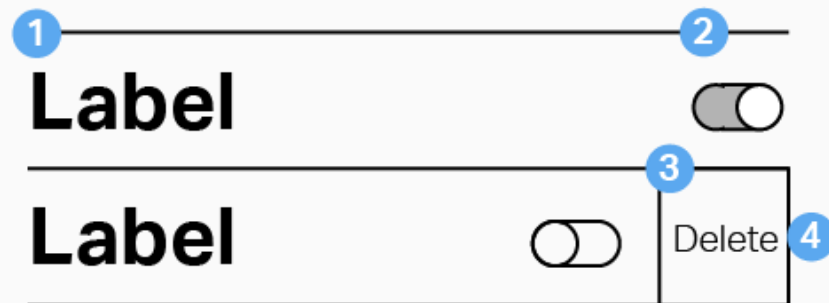
Three signifiers reveal this object's enhanced affordance



1   Remove/Add (New)

2 Label

3  Draggable

Affordance and Signifier Relationship - Hidden



- 1 Label indicates function/content
- 2   Signifies On/Off
- 3 Discoverable affordance through swipe
- 4 Label is instructional

3. Feedbacks

Feedback



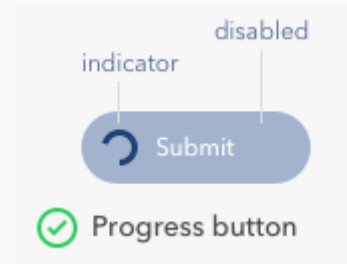
Feedback -- **communicating the results of an action** -- is a well-known concept from the science of control and information theory.

- popup message, sound, haptic, color change, and animation, etc.

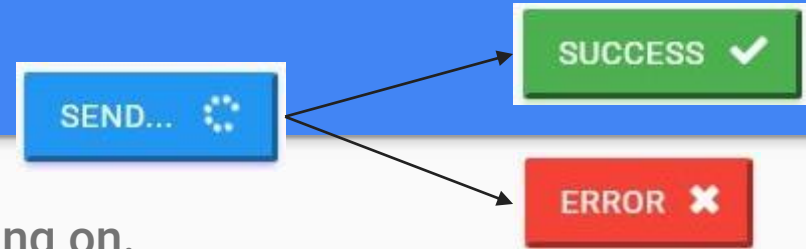
Feedback must be **immediate**

Give feedback to user nothing more than the **minimum necessary**

Too much feedback can be **annoying**



Feedback -- Constant visibility of system status



Users are kept informed about what's going on.

There is continuous information about the results of their actions and the **current state** of the product (system).

There is no confusion in the mind of a user as to the **state of the product, i.e., processing, loading, searching, uploading, etc., or some other state change.**

After an action has been executed, it's easy to determine the new state.

Feedback -- Constant visibility of system status

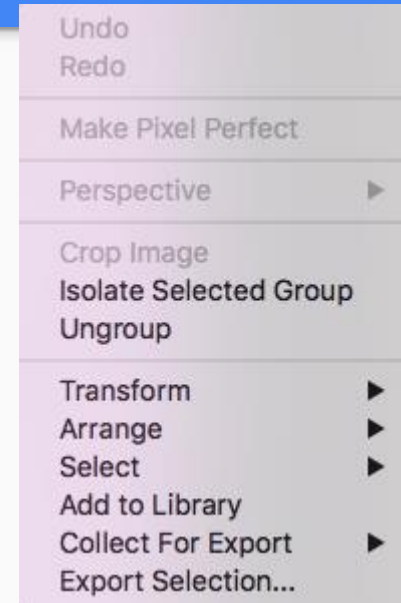


This uploading sequence demonstrates three states via continuous feedback: dragging a document onto an icon, upload progress, and completion confirmation.

4. Constraints

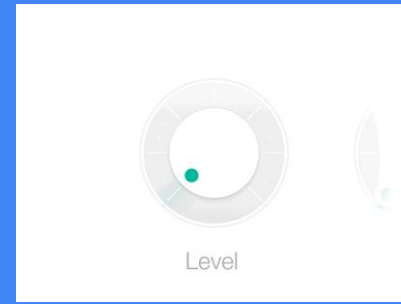
Constraints

The design concept of constraints is a way to determine how to **restrict the kind of user interaction that can take place in a given moment**. Interaction design constraints help efficient interaction by providing “guide rails” for users—almost like a guiding hand steering the interactions that **can** occur.



5. Natural Mappings

Natural Mapping

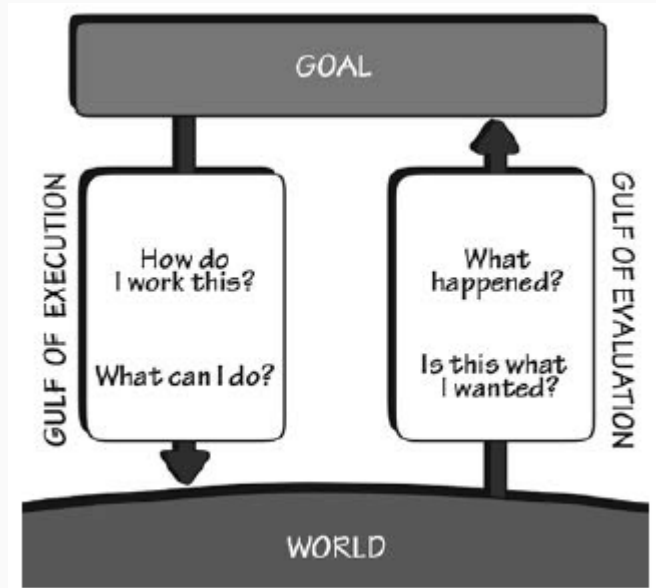


Mapping to familiar physical analogies

Natural mapping refers to a design in which the system's **controls** represent or correspond to the **desired outcome**. When controls map to the actions that will result, systems are faster to learn and easier to remember.

Natural mappings bridge the **gulf of execution**, helping users to understand how a system can be used and what actions are required to accomplish their goal.

Gulf of Execution & Evaluation



Gulf of Execution is the degree to which the **interaction possibilities** of an artifact/system (app, webpage, electrical appliances and etc.) **corresponding to the intentions** of the person and what that person perceives is possible to do)

- Takes place when people use something and try to figure out how it operates

Gulf of Evaluation is the degree to which the system/artifact **provide representations** that can be **directly perceived and interpreted** in terms of the expectations and intentions of the user.

- The difficulty of assessing the state of the system and how well the artifact supports the discovery and interpretation of that state.

Gulf of Execution & Evaluation

Stage 2. Forming the intention – what should I do to meet this goal?

Find a hotel room I like on a booking website.

Stage 3. Specifying the action sequence – how exactly do I achieve this intention?

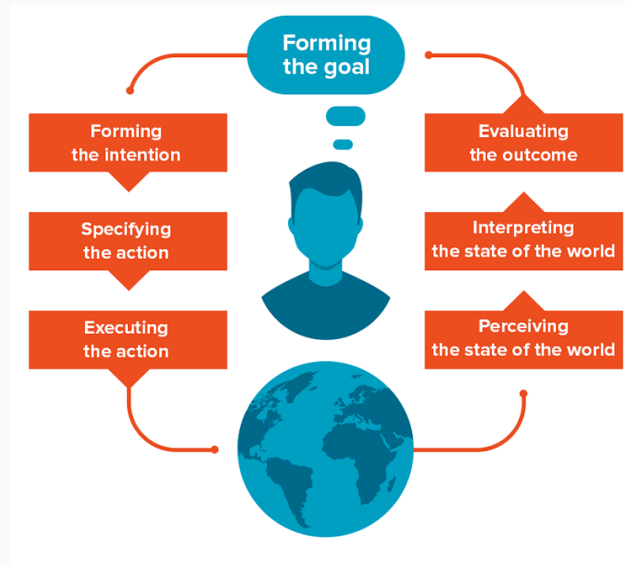
Open up a browser. Log into Booking.com. Specify my parameters (location, dates, number of guests, other filters). Scroll through the search results. Open the results I like in a new tab to save them for later. Compare the chosen results and find the best option. Click Book, etc.

Stage 4. Performing the action sequence – do the described steps.

Attempt the actions I intended.

Stage 1. Forming goals – what do I want to do?

Book a hotel room.



Stage 7. Comparing the outcome with the goal – did I achieve my goal?

Yes.

Stage 6. Interpreting the perception – figure out if anything changed.

Do I have a confirmation email in my inbox?

Stage 5. Perceiving the state of the world – use your senses to evaluate how you're feeling now.

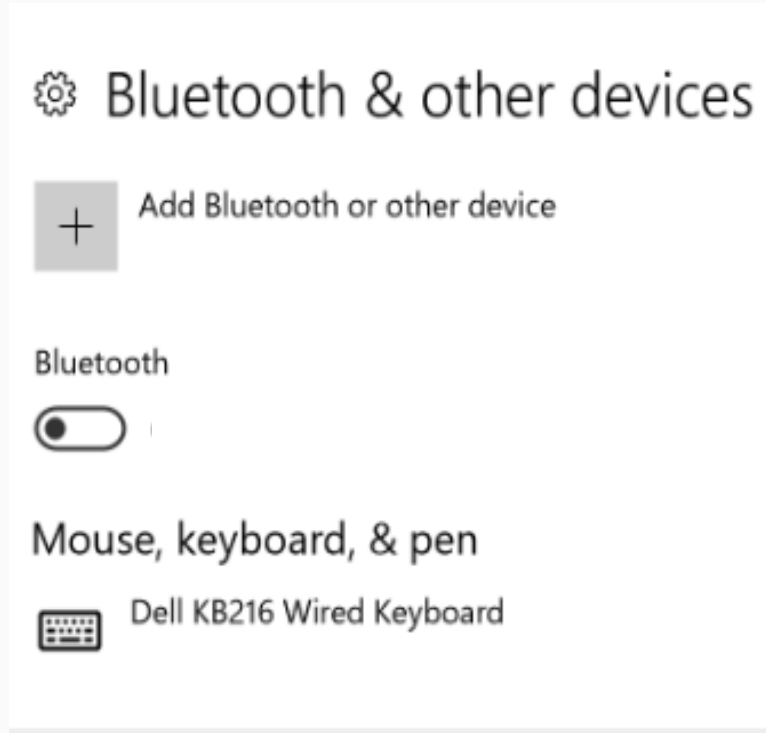
Did I finish the booking process?

Mapping - Which knob controls which burner?

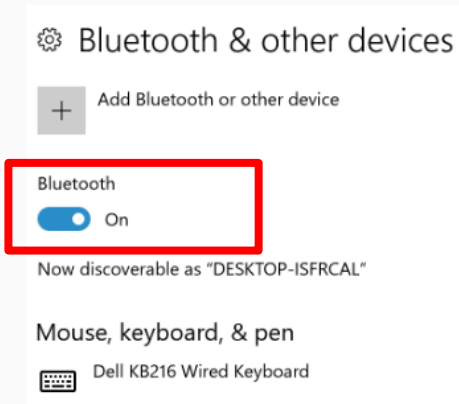
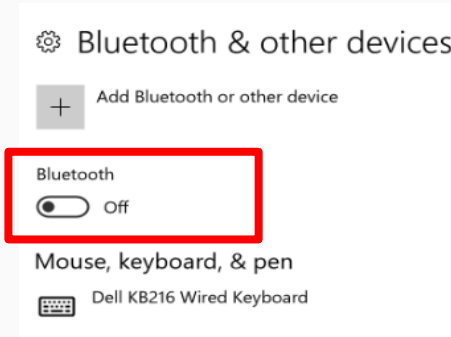


On the left, a typical stovetop arranges burners in a two-by-two grid and the controlling knobs aligned in a single row across the bottom. This design makes it difficult for users to guess which knob controls each burner (no stimulus-response compatibility). **On the right**, the arrangement of the controls mimics the arrangement of the five burners, and therefore has a higher stimulus-response compatibility.

Mapping - On or Off?



Is Bluetooth On or Off?



6. Conceptual (mental) models

Conceptual (Mental) Model

Great interaction design **presents all the information a user needs** to create a good conceptual model of the system, thereby leading to their **understanding** and a **sense of control**. A conceptual model enhances both **discoverability** and **evaluation of results** when using the system.

Mental models—or cognitive maps—are the images in a user’s mind that inform their **expectation of a certain interaction** and **how something works in the real world**. Cognitive maps are internal representations of our physical environment, particularly associated with spatial relationships. By effectively using the user’s mental model, interaction designers can create systems that “feel” intuitive.

Example



The car seat setting in a Mercedes is a great example of an interaction design that uses a mental model. A car seat shape for controls makes it intuitively easy to understand and operate.

Example: Mental Model behind Online Shopping



Online shopping users use mental model like this one to interact with e-commerce websites / apps:

1. Identify what to buy by browsing or searching the product catalogs
2. Place products into shopping cart
 - a. Products in shopping cart can be removed at any time before checkout
 - b. Must pay for everything in the shopping cart at checkout
3. Select the choice of payment method
4. Make arrangements for delivery
5. Track delivery, after-sale / customer service and etc.

What information should users require at each stage? Have they be given the information when needed?

References

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- Norman, Don. The Design of Everyday Things: Revised and Expanded Edition.

