TODAY
1. Hall of Fame/Shame
2. Logistics / Discussion
3. Principles of Interaction II
4. In-Class Activity
Hall of Fame

Hall of Shame
DESIGN OF AN ICE CREAM VENDING MACHINE
DESIGN OF AN ICE CREAM VENDING MACHINE

No undo
Limited locus of control
Low visibility
Issues of trust
R08 Principles of Interaction

Posted: Tuesday, October 7
Due: Tuesday, October 14, 7AM
Point Total: Reading responses are worth 5% of your total grade.

Reading


2. Required: Section 1.6 in Rogers, Sharp, & Preece, What is Interaction Design, Chapter 1, Interaction Design: Beyond Human-Computer interaction, 2011. [source link](#).

R08 questions/provocations:

1. What does Norman say are two of the most important characteristics of good design? Explain each.

2. According to Norman, what are the six fundamental principles of interaction? Provide a one sentence definition of each.

3. According to Norman, what is the difference between a signifier and an affordance? Give a design example from your own experience.

4. According to Rogers, Sharp, & Preece, what is the difference between usability goals and user experience goals?

5. Rogers, Sharp, & Preece describe six usability goals from efficiency to safety to memorability. What is "utility" and how would you measure this for your team project application?
Sketches, Storyboards, and Critique

Posted: Wednesday, October 1
Draft Deadline: Thursday, October 9 (before class time)
Final Deadline: Tuesday, October 14 (before class time)
Point Total: This assignment is worth approximately 11% of your project grade (4.5% overall).

Assignment Overview
Your assignment is to sketch interface designs for your project, identify three scenarios of use, and create storyboards depicting those uses. Your focus here is on visuals and visual storytelling rather than prose (whew, after TA02, right?). To help you with the assignment, please look at the Sketching and Storyboarding readings.

A Brief Timeline
On Thursday, October 9th, you must come to class with draft interface sketches (focus is on interface) and a draft storyboard sketch (focus is on narrative of use). The operative word is sketch. The artifacts need to be refined enough to elicit helpful feedback from your peers. We will use class time to “speed date” from team-to-team and collectively provide feedback on these artifacts.

On Tuesday, October 14, you must submit a PDF of your report to Canvas (before class time).

What to Do

1. To start, read the Sketching and Storyboarding readings (I've marked the readings that are required--feel free to dig deeper with the optional readings if you’re so inclined). Sketching is critical to interface design—it serves a communicative function to articulate thoughts/ideas visually with your team and clients. It's a form of critical thinking, and sketching allows you to visualize your ideas while working on your project. As Suva and Tversky (2002) note, “Designers do not sketch to externally represent ideas that are already consolidated in their minds. Rather they draw sketches to try out ideas, usually vague and uncertain ones. By examining the externalizations, designers can spot problems they may not have anticipated.”

2. Generate a list of tasks that users should be able to accomplish with your application. This is a brainstorm activity—so ballooning elaboration is essential (the full list of tasks should go in your report Appendix). Then, pare this list down to three primary (representative) tasks. Justify why these three tasks were selected in your report.

3. Create a storyboard for a user (or users) using your application and accomplishing the three primary tasks you identified above. You can think of this storyboard much like the opening skits in some of the presentations. They are quick, highly engaging and expressive ways of articulating the goals and reasons for your application. If your tasks are very disparate and non-intersecting, feel free to create a storyboard to help describe each task. It’s up to you. Be creative. Again, this storyboard must be sketched on paper and scanned in. All storyboards should have accompanying text (at least some of the storyboard panses (just like comics or movie storyboards).

4. Think about the interfaces and interactions necessary to accomplish these tasks: what does the “main” screen look like? What are the primary interface elements and why? For the primary interface screen, I want you to create six completely different design sketches (with annotations). Then want you to choose two secondary interface screens and generate three different design sketches for each (again, by different, I literally mean three completely different ways of rendering your interface—not simply moving a button from one corner to another). These sketches must be done on paper and scanned in (a high quality cell phone picture is fine too); each sketch must be properly labeled,
μTRACKY*

Your life is fast paced. Your phone should be too.

*Formally the “Environment Aware Application Launcher”
6:00 AM
Some coffee would be nice right now.
User wants coffee nearby

I'll use my free coffee finding app
User loads "one-touch coffee" app

Just one button to press
User presses button to find a shop

One touch coffee app finds a coffee shop nearby that fits user's preferences

Looks good!

User accepts this shop, and app routes the user

I'll be there in only 2 minutes!
App guides user to the shop.

One-Touch Coffee
ONE-TOUCH COFFEE

Coffee how you want it, when you want it.

The 'One-touch button' primary interface encompasses what is found in other one-touch button apps such as Shazam. Additionally, the interface includes a one time tutorial indicating to users the functionality of the single button and the settings button.

The 'One-screen wonder' melds the settings screen with the one-touch button, so that users can modify their preferences easily.

'Always searching for coffee' runs in the background of the user’s phone and refreshes the user’s nearest coffee shop in time intervals, such as every five or ten minutes. It also displays a map of where the coffee shop is in relation to the user, and an option for the user to find the next coffee shop match.
IN-CLASS DESIGN CRITIQUES

What did you think? Useful? How could we do it better next time?
R09 Cog Sci & Design

Posted: Monday, October 13
Due: Tuesday, October 21, 7AM

Cognitive Aspects in Interaction Design Readings

1. Required: Faaborg, A. Cognitive Science and Design, video from Google I/O 2013 [official link](#). Alex is a staff designer on Google Android.


No Reading Response
There is no reading response for this assignment, however, content from the video will be on the midterm. In addition, the video should help you design the user interfaces for your course project.
Cognitive Science & Design

- Gestalt laws
- Peripheral perception
- Geons and object recognition
- Facial recognition
- Perceived affordances
- Color
- Selective visual variables
- Interruptions & flow
- Memory & chunking
- Learning
- Perception of time
Paper Prototypes & User Testing

Posted: Friday, October 10
Deadline: Tuesday, October 28 (before class time)
Point Total: This assignment is worth approximately 11% of your project grade (4.5% overall).

Assignment Overview
Your assignment is to convert a subset of your more promising sketches from the last assignment into paper prototypes and to test them with four users. You will create and test two different versions of your prototypes. As I've noted before in class, comparing two designs is far easier/better than evaluating one single design in isolation. For example, it's easier for a user to express preference between one design over another rather than articulating, exactly, why they don't like a single design.

Following from the IRB protocols we discussed in class, your participants must sign an informed consent document before taking part in your test. With the participant's permission, you should video record all sessions. This can be done with any type of recording device from a DSLR to a mobile phone camera.

Your report should include figures of your paper prototypes, a description of your study method, and a breakdown of your primary findings from the user testing. The video recordings will be used later in the semester for TA10 (so do not lose them).

What to Do

1. To start, watch the Nielsen Norman Paper Prototyping: A How-To Video. This will help prepare you for this project assignment and the next one as well. In addition, prototyping—and, specifically, rapid prototyping—is perhaps one of the most valuable techniques in HCI/design. So, it's worth spending some time on the readings and, of course, applying the prototyping concepts in your projects.

2. Iterate and refine the three primary tasks that users should be able to accomplish with your application (based on learnings/insights from the last assignment).

3. Then, transition to the first core part of the assignment: riff, iterate, and create two different paper prototypes for the three primary tasks. That is, you must create “Paper Prototype #1” that allows your users to accomplish the three tasks one way and “Paper Prototype #2” that allows your users to accomplish the three primary tasks another way. The paper prototypes should be functionally different so that your users can compare and contrast their experiences with both of them. So, for example, the two prototypes should represent the tasks in fundamentally different ways. Remember, the focus here is not on aesthetics/beauty but rather on understandability, usability, approachability, and, to some degree, layout, widget type, etc.

4. Once you've created the two paper prototype designs, beta test them with members of your team and make requisite changes. This “eating your own dog food” is a good way to catch errors before investing time in testing with actual users.

5. Now you're ready for real user testing (the second core part of the assignment). Recruit four independent users to test out your paper prototypes. These users cannot be members of the class; however, they can be members of Dr. Vihla Väännönen's section. Each user testing session must be done in isolation (that is, you cannot have more than one user testing at a time) with at least two experimenters present. For the testing session, you should follow this protocol:

   1. First, download and modify this IRB “informed consent” template to fit your project [link]. At the beginning of the user testing session, read the “Purpose of this Study” section of the consent form aloud to your participants. This should be done consistently for each participant. Then, give your participants a chance to read the entire consent form, ask questions, and, if they agree to participate, have them sign the form. If they do not agree to participate, simply wish them a nice day and recruit another participant (it can be slightly awkward but this happens). If they do agree to participate, provide a copy of the form and take the signed copy for yourself (please ask).
WARNING

QUIZ ON THURSDAY 10/16
Covering Lectures 6 – 13 and Readings R05, R07, and R08

MIDTERM ON EITHER TUES 10/28 OR THURS 10/30
WARNING

Quiz on Thursday 10/16
Covering Lectures 6 – 13 and Readings R05, R07, and R08

Midterm on Either Tues 10/28 or Thurs 10/30

In class we decided on Thurs, 10/30
Great designers produce **pleasurable experiences**. *Experience*: note the word.

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**Don Norman**  
Highly regarded designer/author  
Quote from the Design of Everyday Things, *p. 10*
Great designers produce **pleasurable experiences**. *Experience:* note the word. Engineers tend not to like it; it is too subjective.

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**Don Norman**
Highly regarded designer/author
Quote from the Design of Everyday Things, *p. 10*
Great designers produce **pleasurable experiences**. *Experience*: note the word. Engineers tend not to like it; it is too subjective. But when I ask them about their favorite automobile or test equipment, they will **smile delightedly** as they discuss the fit and finish, the **sensation** of power during acceleration, their **ease of control** while shifting or steering, or the **wonderful feel** of the knobs and switches on the instrument. These are experiences.

Don Norman

Highly regarded designer/author
Quote from the Design of Everyday Things, *p. 10*
**DISCOVERABILITY**

When we interact with a product, we need to figure out how to work it.

- Affordances
- Signifiers
- Mappings
- Feedback
- Conceptual Model

---

Conceptual Model

The design model is the designer’s conceptual model.

The user’s model is the mental model developed through interaction with the system (and past experiences).

The system image results from the physical structure that has been built (including documentation, instructions, and labels).

The designer expects the user’s model to be identical to the design model. It rarely is!

The designer communicates to the user through the design.

If the system image does not make the design model clear and consistent, the user will end up with the wrong mental model!

**Discoverability**

When we interact with a product, we need to figure out how to work it.

**Affordances**
- Signifiers
- Mappings
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---

CONCEPT OF AFFORDANCES

Direct perception of possibilities for action.

Victor Kaptelinin
HCI Professor
Chapter 44, Affordances and Design, Interaction Design

Source: https://www.interaction-design.org/encyclopedia/affordances_and_design.html
Affordance

An **affordance** is a relationship between the **properties of an object** and the **capabilities of the agent** that determines just how the object could possibly be used...

Don Norman
Highly regarded designer/author
Design of Everyday Things, Revised 2013, p. 10-14
An affordance is a relationship between the **properties of an object** and the **capabilities of the agent** that determines just how the object could possibly be used.
An affordance is a relationship between the properties of an object and the capabilities of the agent that determines just how the object could possible be used...

Don Norman
Highly regarded designer/author
Design of Everyday Things, Revised 2013, p. 10-14
An affordance is a relationship between the properties of an object and the capabilities of the agent that determines just how the object could possibly be used... Visible affordances provide strong clues to the operation of things. A flat plate mounted on a door affords pushing. Knobs afford turning, pushing, and pulling. Slots are for inserting things. Balls are for throwing or bouncing.

Don Norman
Highly regarded designer/author
http://www.jnd.org/dn.mss/affordances_and.html
An **affordance** is a relationship between the **properties of an object** and the **capabilities of the agent** that determines just how the object could possibly be used... Visible affordances provide strong clues to the operation of things. A flat plate mounted on a door affords pushing. Knobs afford turning, pushing, and pulling. Slots are for inserting things. Balls are for throwing or bouncing. **Perceived affordances help people figure out what actions are possible** without the need for labels or instructions. I call the signaling component of affordances signifiers.

**Affordance**

Don Norman
Highly regarded designer/author
Design of Everyday Things, Revised 2013, p. 10-14
AFFORDANCE CONTROVERSY

I introduced the term affordance to design in my book, "The Psychology of Everyday Things." The concept has caught on, but not always with true understanding. Part of the blame lies with me: I should have used the term "perceived affordance," for in design, we care much more about what the user perceives than what is actually true. What the designer cares about is whether the user perceives that some action is possible (or in the case of perceived non-affordances, not possible).

Don Norman
Highly regarded designer/author
http://www.jnd.org/dn.mss/affordances_and.html
**Discoverability**

When we interact with a product, we need to figure out how to work it.

- Affordances
- Signifiers
- Mappings
- Feedback
- Conceptual Model

Knobs Afford Turning, Pushing, Pulling
Which door do I push?
Which door do I pull?
Which door do I **push**?
Which door do I **pull**?
Which door do I **push**?
Which door do I **pull**?
Which door do I **push**?
Which door do I **pull**?

The vertical handle affords grasping and pulling.

The flat, ribbed horizontal bar has the obvious perceived affordance of pushing.
“**Affordances** determine what actions are possible. **Signifiers** communicate where the action should take place.” p. 14

The vertical handle affords grasping and pulling.

The flat, ribbed horizontal bar has the obvious perceived affordance of pushing.
WHICH SIDE DO I PUSH?
A signifier is necessary to signal where to push.
Which door do I push, Which door do I pull?
Norman door!
When external signifiers—signs—have to be added to something as simple as a door, it indicates bad design.

Norman door!
**Affordance** refers to the perceived & actual properties of a thing that determine just how that thing could possibly be used.
FAIL #3

PUSH

You can HAVE IT YOUR WAY® and pull if you want, but this hinge is pretty stubborn.
FAIL #3

PUSH

You can HAVE IT YOUR WAY® and pull if you want, but this hinge is pretty stubborn.

AMERICAN EXPRESS

Pull

FAIL #4
Not a "Norman Door" but no wonder (even gifted) people get confused!
1.5 Affordances of Doors. Door hardware can signal whether to push or pull without signs. The flat horizontal bar of A (above left) affords no operations except pushing; it is excellent hardware for a door that must be pushed to be opened. The door in B (above right) has a different kind of bar on each side, one relatively small and vertical to signify a pull, the other relatively large and horizontal to signify a push. Both bars support the affordance of grasping: size and position specify whether the grasp is used to push or pull—though ambiguously.
1.5 Affordances of Doors. Door hardware can signal whether to push or pull without signs. The flat horizontal bar of A (above left) affords no operations except pushing; it is excellent hardware for a door that must be pushed to be opened. The door in B (above right) has a different kind of bar on each side, one relatively small and vertical to signify a pull, the other relatively large and horizontal to signify a push. Both bars support the affordance of grasping; size and position specify whether the grasp is used to push or pull—though ambiguously.
There is no obvious perceptual affordance for indicating where and how to resize a window, so a **signifier** is used.
There is no obvious perceptual affordance for indicating where and how to resize a window, so a **signifier** is used.

It’s not always used
This “3-line” tab signifies slide out interaction.
1.5 Affordances of Doors. Door hardware can signal whether to push or pull without signs. The flat horizontal bar of A (above left) affords no operations except pushing; it is excellent hardware for a door that must be pushed to be opened. The door in B (above right) has a different kind of bar on each side, one relatively small and vertical to signify a pull, the other relatively large and horizontal to signify a push. Both bars support the affordance of grasping: size and position specify whether the grasp is used to push or pull—though ambiguously.

FIGURE 1.2. Problem Doors: Signifiers Are Needed. Door hardware can signal whether to push or pull without signs, but the hardware of the two doors in the upper photo, A, are identical even though one should be pushed, the other pulled. The flat, ribbed horizontal bar has the obvious perceived affordance of pushing, but as the signs indicate, the door on the left is to be pulled, the one on the right is to be pushed. In the bottom pair of photos, B and C, there are no visible signifiers or affordances. How does one know which side to push? Trial and error. When external signifiers—signs—have to be added to something as simple as a door, it indicates bad design. (Photographs by the author.)
“Affordances determine what actions are possible. Signifiers communicate where the action should take place.” p. 14
44. Affordances and Design

by Victor Kaptelinin. How to cite in your report.

44. Abstract

The concept of affordances originates from ecological psychology; it was proposed by James Gibson (1977, 1979) to denote action possibilities provided to the actor by the environment. In the late 1980s Norman (1988) suggested that affordances be taken advantage of in design. The suggestion strongly resonated with designers’ concern about making possible uses of their products immediately obvious, and soon the concept came to play a central role in interaction design and Human-Computer Interaction (HCI). This chapter discusses the origins, history, and current interpretations of affordances in HCI research, and reflects on the future of affordances as an HCI concept.

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   44.3.1 Gibson’s ecological approach to visual perception

Affordances: Clarifying and Evolving a Concept

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Abstract

The concept of affordance is popular in the HCI community but not well understood. Donald Norman appropriated the concept of affordances from James J. Gibson for the design of common objects and both implicitly and explicitly adjusted the meaning given by Gibson. There was, however, ambiguity in Norman’s original definition and use of affordances which he has subsequently made efforts to clarify. His definition germinated quickly and through a review of the HCI literature we show that this ambiguity has lead to widely varying uses of the concept. Norman has recently acknowledged the ambiguity, however, important clarifications remain. Using affordances as a basis, we elucidate the role of the designer and the distinction between usefulness and usability. We expand Gibson’s definition into a framework for design.

Keywords: Affordance, usefulness, usability, design.

1 Introduction

The affordance concept was popularized in the HCI community through Donald Norman’s book The Psychology of Everyday Things (POET) [14]. The word affordance was new to the HCI vocabulary and the concept seemed somewhat novel: an affordance is the design aspect of an object which suggests how the object should be used [14]. It is not widely known that the word affordance was first coined by the perceptual psychologist James J. Gibson in his seminal book The Ecological Approach to Visual Perception [5]. Gibson and Norman appear at first glance to have similar ideas, however, a comparison of their respective definitions reveals important differences between the two uses are identified followed by a brief survey of the use of the concept in the HCI literature. We clarify a number of ambiguities that remain today including the meaning of affordances in application software. Lastly we provide a design framework that extends Gibson’s definition of affordances.

2 Gibson’s Affordances

Gibson’s academic career centered on the field of visual perception [5]. He deviated from the classical theories of perception that were based on physics and physical optics because he felt that physics provided an inappropriate frame of reference for visual perception. Gibson made it his life’s work to describe an appropriate ecological frame of reference. He believed that studying the animal’s visual perception in isolation from the environment that is perceived resulted in false understandings. Gibson claimed that we perceive at the level of mediums, surfaces, and substances rather than at the level of particles and atoms and, in particular, we tend to perceive what the combination of mediums, surfaces, and substances offer us. Thus “...the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. [5, p.127]”

There are three fundamental properties of an affordance:

1. An affordance exists relative to the action capabilities of a particular actor.
2. The existence of an affordance is independent of the actor’s ability to perceive it.
Discoverability

When we interact with a product, we need to figure out how to work it.

Mapping is a technical term, borrowed from mathematics, meaning the relationship between the elements of two sets of things... The relationship between a control and its results is easiest to learn wherever there is an understandable mapping between the controls, the actions, and the intended result.

Don Norman
Highly regarded designer/author
Design of Everyday Things, Revised 2013, p. 22-23
**Mapping Example**

- **Poor mapping:** arbitrary arrangement of stove controls

- **Good mapping:** controls spatially map to their burners

GOOD MAPPING

FIGURE 1.7. Good Mapping: Automobile Seat Adjustment Control. This is an excellent example of natural mapping. The control is in the shape of the seat itself: the mapping is straightforward. To move the front edge of the seat higher, lift up on the front part of the button. To make the seat back recline, move the button back. The same principle could be applied to much more common objects. This particular control is from Mercedes-Benz, but this form of mapping is now used by many automobile companies. (Photograph by the author.)
POOR MAPPING: MY LIGHT SWITCHES
APPLE TOUCHPAD MAPPING

“Natural mapping”

Original mapping

Which is better? Why?
DISCOVERABILITY

When we interact with a product, we need to figure out how to work it.

Affordances
Signifiers
Mappings
Feedback
Conceptual Model

Feedback—communicating the results of an action—is a well known concept from the science of control and information theory... Feedback [for user interaction] must be immediate: even a delay of a 10th of a second can be disconcerting.

Don Norman
Highly regarded designer/author
Design of Everyday Things, Revised 2013, p. 23-25
FEEDBACK IMPROVE PERFORMANCE

low-level

high-level

Becker, J. of Applied Psychology 1978
Feedback can change behavior.
vehicle activated speed signs
speed cameras
vehicle activated speed signs
vas signs

Days in Hospital Bed: 46

Speed Limit: 25

Slower is better

ELM GROVE POLICE
vas signs
Find Examples
Of mapping, constraints, affordances, signifiers, and feedback in UI
Backup Slides
Affordances, Constraints, Mappings

[Example from The Design of Everyday Things by Don Norman]
Affordances, Constraints, Mappings

Size of holes *constrain* size and number of fingers.

Holes afford putting something through them. Obvious something=fingers!

Mapping between finger, holes, and blade is constrained by design.

[Example from The Design of Everyday Things by Don Norman]
How do you set the time?

It’s difficult to tell. There is **no evident relationship** between the operating controls and the functions, no constraints, no apparent mappings.

[Example from The Design of Everyday Things by Don Norman]
Norman’s Refrigerator

Your task: Suppose the freezer is too cold and the fresh food section just right. How would you adjust the controls so as to make the freezer warmer and keep the fresh food the same?

[Example from The Design of Everyday Things by Don Norman]
Conceptual Models

Conceptual Model One: Derived from the controls and our own understanding of refrigerators

Conceptual Model Two: Actual conceptual model based on physical design

[Example from The Design of Everyday Things by Don Norman]
Affordances affect our perception of use

Can affordances change our behavior?
From my *Moving Beyond Line Graphs* BECC2010 talk, see http://bit.ly/jonuw, then navigate to “talks”
In-N-Out Burger!
Battle of the Cans
Environmental protection

Recyclable

Other waste

Love our homeland
Battle of the Cans
Winner!
34% increase in recycling

Duffy, Environment and Behavior, 2010
Holes constrain behavior and also remind what is recyclable.
Dark Palette
Light Palette
Smartsheet Gantt Palette
Light Palette