SI 388
Mental Representations

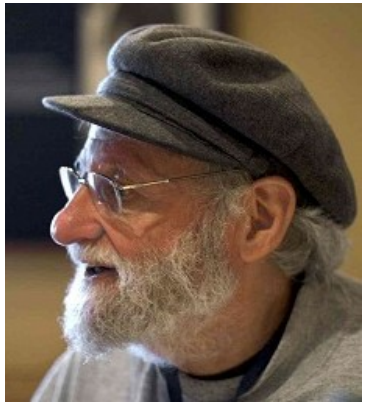
WEEK 10-1 (MON/WED 6/8 NOV)–'DESIGN OF EVERYDAY THINGS'
MARK THOMPSON-KOLAR, MSI, MA

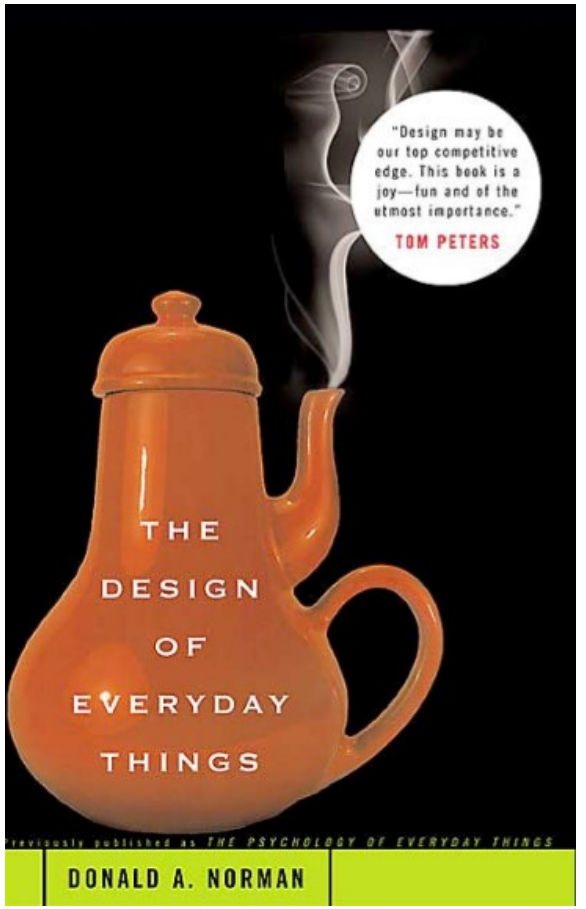
Agenda for Today

- Teach A Chapter – Groups 15 & 16 present today
  - Links to feedback forms on Canvas (as always)
- Complete Norman lecture from Monday
- Midterm exam: Today - go over answers
  - Scores posted tonight or tomorrow
  - Please email me if you have concerns

Design of Everyday Things

- Don Norman, co-founder of Nielsen Norman Group
- Effects of design on task achievement (or failure)
- Covers user-centered design, on everyday items and actions
- *Not* mainly about digital items
- Great book





Affordances

- *Perceived* properties of an item, those fundamental properties that indicate how the item could be used (Gibson, J.J. 1977)
- (Perceived) Affordances provide strong clues to operation/use of item
- Affordance is a **relationship** (not a property) jointly determined by:
  - qualities of object
  - abilities of person who might interact with it

Norman on Design (Article)

Affordances and Design article (http://www.jnd.org/dn.mss/affordances_and.html)

I assigned this article because it allows Norman to give a really clear, short vision of what's important.

- In the world of design, what matters is:
  - If the desired controls can be perceived
    - In a good design, both are readily perceived and interpreted
  - If the desired actions can be discovered
    - Whether standard conventions are obeyed

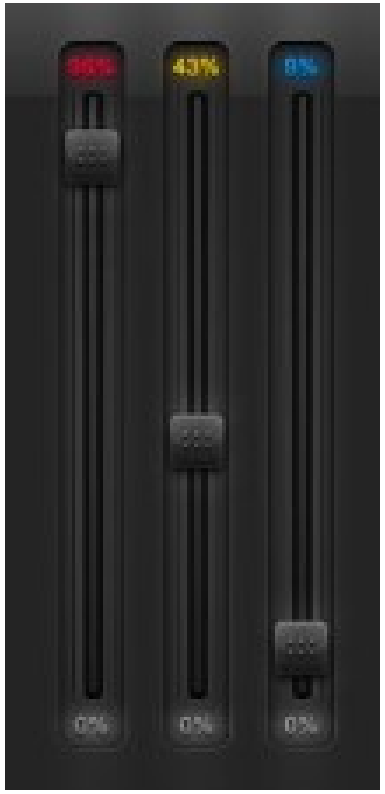
Affordances: Examples

The world is FULL of them.

- Door handles (the classic!)
  - Position to grip
  - Correct diameter for grip
  - Horizontal/vertical bar
  - Arm height
  - Juts out for pulling
- Headphones
- Mouse
- Coffee cup

Affordances: Digital

- Physical Sliders
- Physical Buttons (ex: on cell phones)
- Physical Knobs
- Physical Toggle Switches
- Digital Toggle Switches
- Digital Knobs
- Digital buttons
- Digital Sliders



Signifiers

- Any *perceivable* mark that communicates appropriate behavior to user
- Could be a mark, sign, sound, worn edges → conveys meaning
- Concept originated in science of semiology
- Examples:
  - Submit button
  - Road sign
  - Play, pause, fast forward, and rewind icons

Constraints

Elements that limit a device, item, or design.

Physical – What is even possible with the materials we have?

Legacy problem – Must work with older technologies. Crops up in unexpected places.

Constraints

Elements that limit a device, item, or design.

Semantic – What makes sense?

Mental models – (Incorrect ones)

Constraints

Elements that limit a device, item, or design.

Cultural – What is appropriate?

Norms – Unspoken, generally accepted “typical”

Constraints

Elements that limit a device, item, or design.

Legal – What is lawful?

Regulatory Compliance – Varies by industry

Signifiers

Semiotics

Signifier ⟷ **Signified**

The form of a sign

Object or concept represented

http://vanseodesign.com/web-design/icon-index-symbol/

Signifiers

Semiotics: 3 types of signs

Icon

Strongly resembles signified

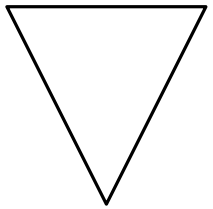
Index

Evidences signified

Symbol

No resemblance, learned

WATER
AGUA



http://vanseodesign.com/web-design/icon-index-symbol/

Mapping

- Relationship between controls and their affects
- Want the mapping to be ‘natural’ or intuitive (meets expectations)
- Taking advantage of physical analogies and cultural standards
  - Light dimmer switch
  - Mobile phone volume button
  - Touch interface drag icon, pinch/zoom

What are other examples of good mapping?

Bad mapping?

Feedback

- Communicates result of action = aka “state change”
- User’s action → should lead to feedback from interface
- Confirms **mapping**
- Examples:
  - Download an App from the Apple Store
  - Press play on a music player
  - Hit a key on a keyboard
  - Etc. *A billion examples of this!*

System Visibility

- Features must convey accurate indication of the **operations** available
  - **Perceived affordances** appropriate and explicit
  - **Signifiers** appropriate and explicit
- Intuitive **mapping** between controls ←→ operations
- Accurate, prompt, perceivable **feedback**

- When the elements work together effectively, the system = has **high visibility**

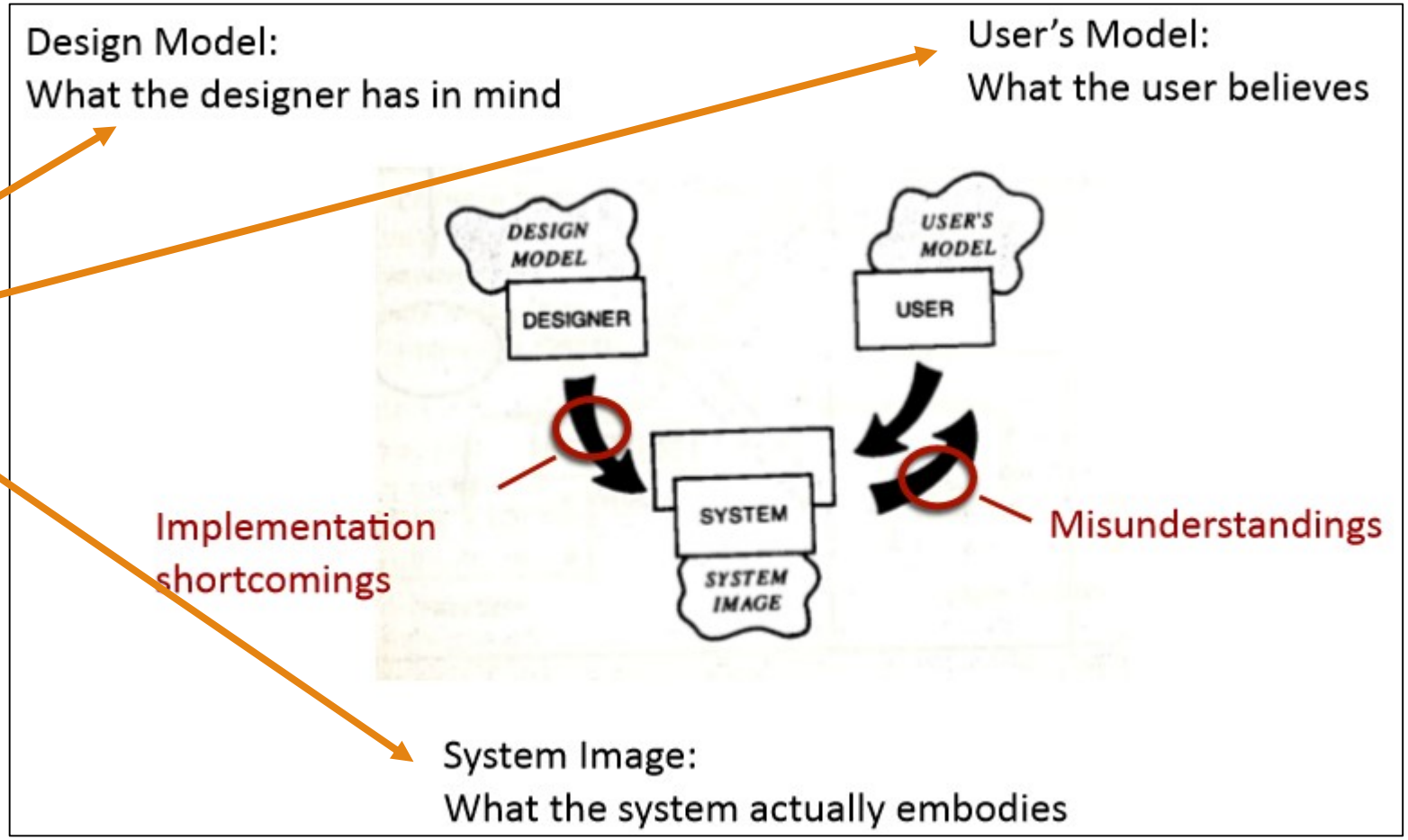
Norman's Vehicle Example

- Why is the basic vehicle easy to learn?
  - Perceived Affordances?
  - Signifiers?
  - Mappings?
  - Feedback?

Norman's Models

We talked about mental models last week:

- Design Model
- User Model
- System Image



System Image

- **System image** = visible part of a device (including the physical structure, the documentation, instructions, etc.)
  - Affordances, Signifiers, Mapping, Feedback → System Visibility!
- Designer "communicates" w/user mainly via the system image
- If system image doesn't make the design model clear, then the user will come up with ***different*** mental model.
  - User's mental model often shaped by 'fragmentary' evidence

Norman's Thermostat Example

- Will room heat faster if the thermostat is turned to maximum?
- Two 'folk' theories of thermostats
  - Timer theory = thermostat controls the relative proportion of time that the device stays on
  - Valve theory = thermostat controls how much heat comes out of the ducts

- Both are plausible! But both are wrong!
- Thermostat is an on/off toggle
  - Fully on or fully off
- Design gives no hint of the actual model
- Result → users form their own theories to cope

Yet Another (Fun) Example

How does fabric freshener work?

'Folk' theories (User's Model):

- ❑ "Captures" the stinky molecules?
- ❑ "Blocks" the foul odors?
- ❑ "Reinvigorates" your fabrics?

Actual ('system image'): Releases a stronger, more pleasant odor (or odors, created by combination of chemicals)

University of Michigan Example: Wait List

- How do you think Wait List works?
- Why does it work that way?
- History of Wait List at U-M
- Mismatch of name and 'folk theory' with reality

http://mgoblog.com/content/dear-diary-making-list

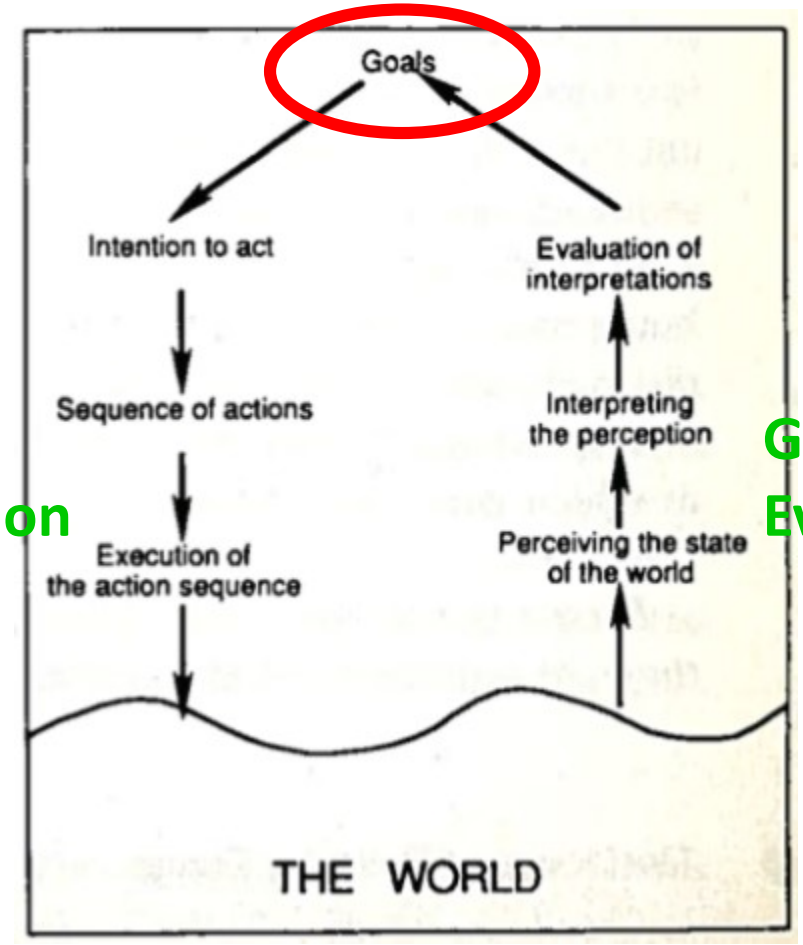
Why Interfaces can be Difficult

- Look at on campus, at home, in town ...
- http://www.baddesigns.com
- Systems that don't work the way you expect
- Different controls that are too similar
- Signifiers, feedback, mappings that:
  - Are hard to see
  - Get in your way
  - Are difficult to remember
  - Are unexpected or defy convention

www.baddesigns.com

7 Stages of Action: Overview

- Describes how we interact
  - With the world (in general)
  - With designed systems (in particular)
  - Starts with Goals …



Gulf of Execution

Gulf of Evaluation

Gulf of Execution

- How well does system allow someone to do their intended actions directly = achieve their goals?
- Do the *perceived affordances & signifiers* match user's intended action?
- **Bad if not clear what actions need to be done to accomplish the intention (operators & states!)**

(make a phone call)

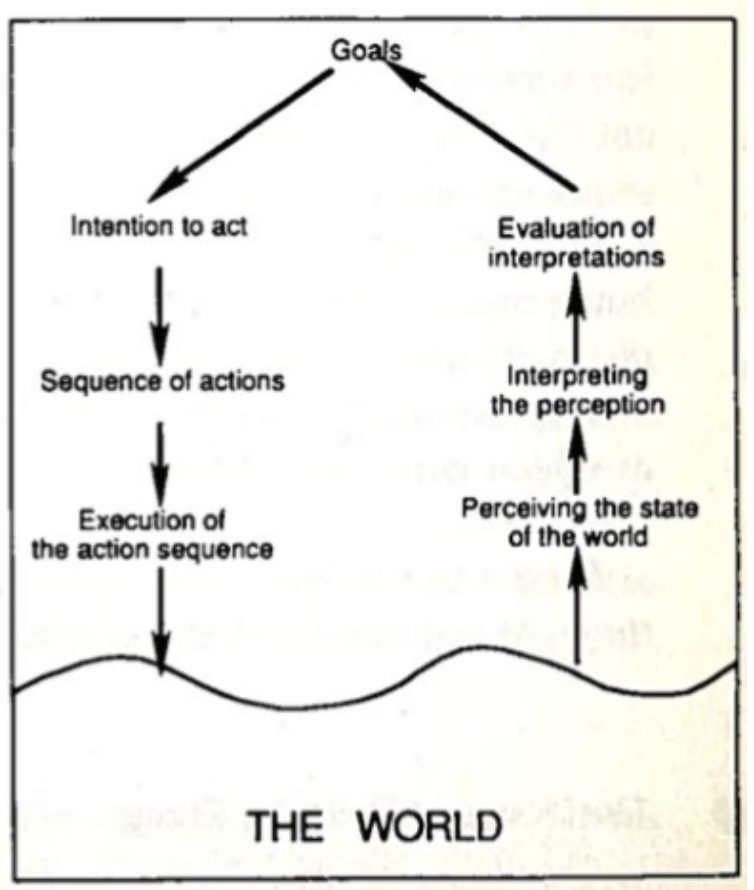
Gulf of Evaluation

- How well does the system provide a **visible state** that can be directly perceived?
- Is the **mapping** intuitive?
- Is **feedback** timely? Meaningful?
- How much **effort** must user exert **to interpret the state** of the system at any time?
- Can user know if/when **goal state** has been achieved?

The Stages as Design Guidance

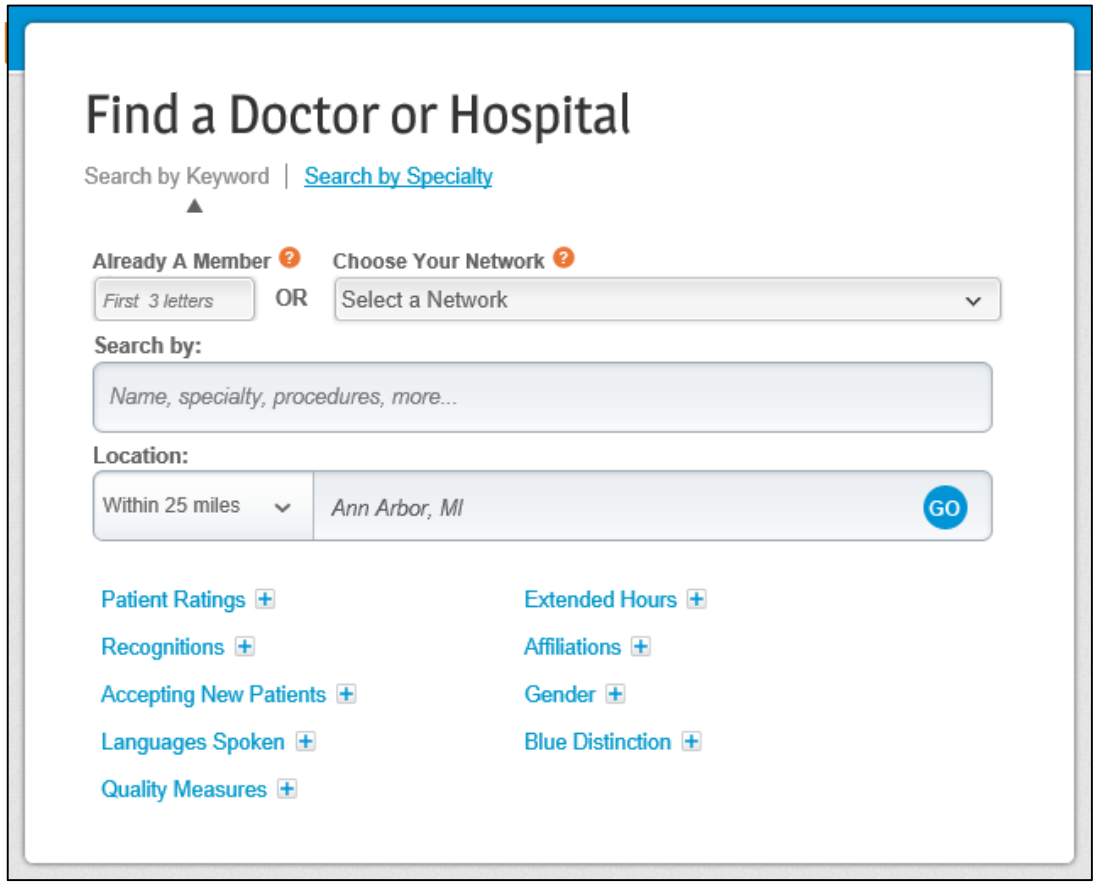
Good design accurately helps user to:

- **Determine** what **actions** are possible
- Determine **mapping** from intention to physical action
- **Perform** the action with the device
- **Evaluate** the state of the system
- Determine **mapping** from controls to state changes
- **Determine** system's current state



Think they can achieve goals.
Achieve them.
Know when they did so.

Example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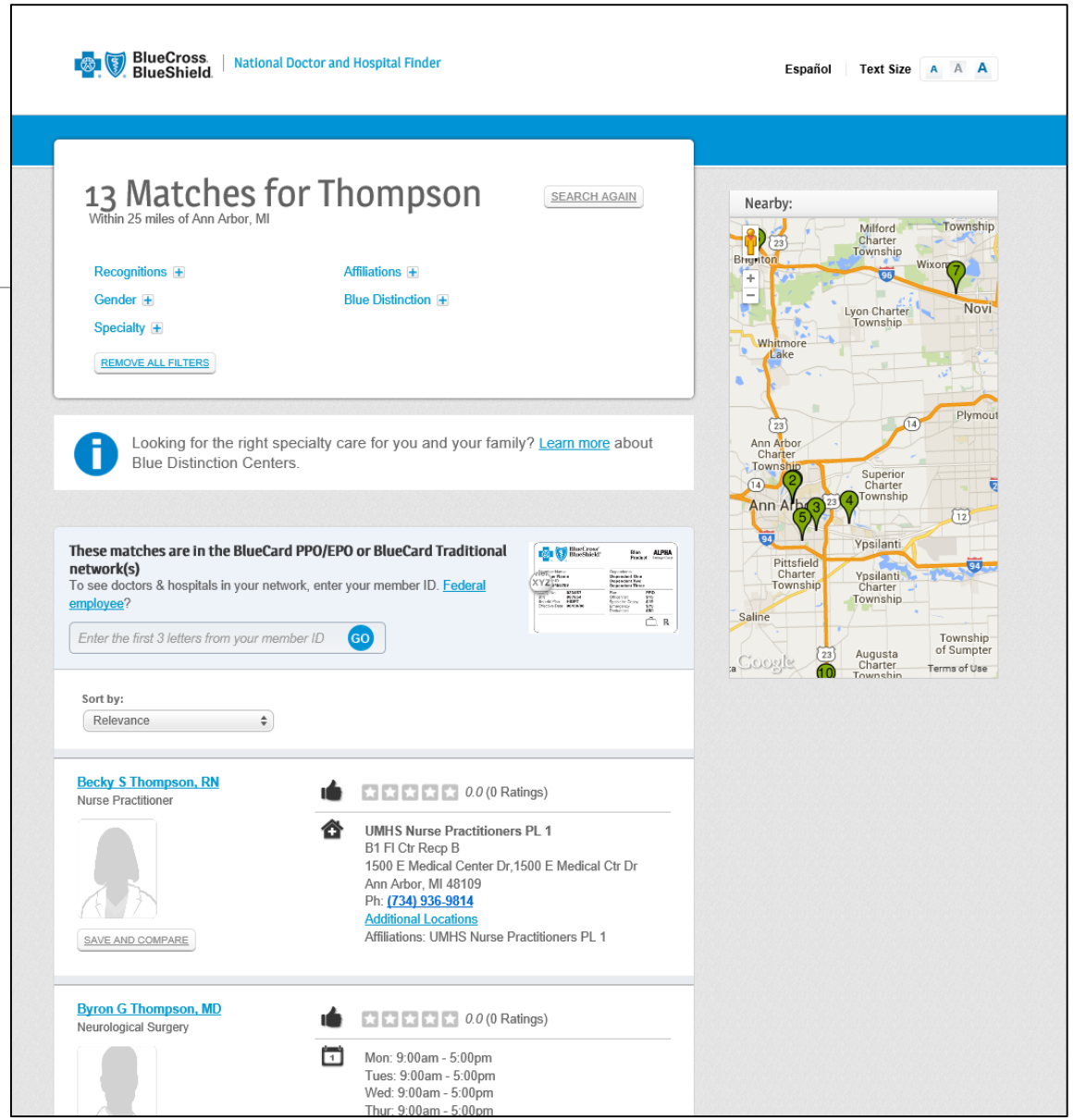
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Augusta Charter Township
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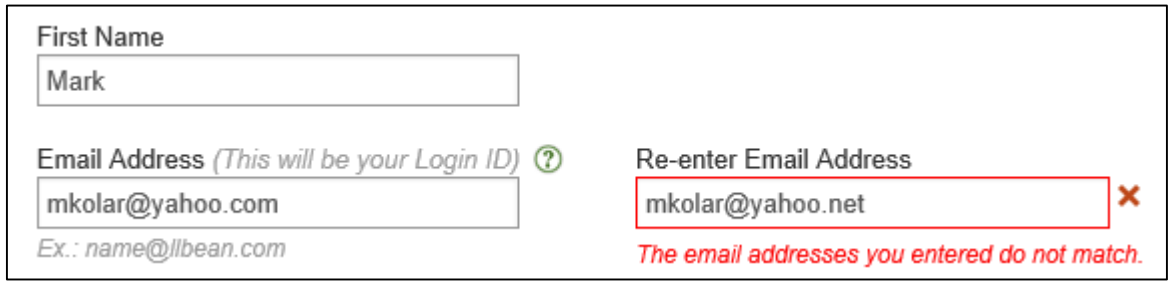
Google
Terms of Use

Implication: Design for Error

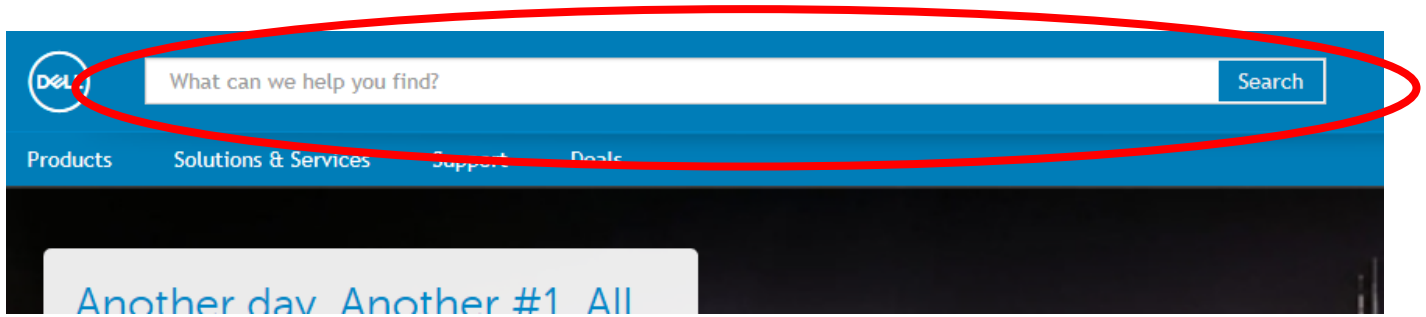
- Understand the causes of error and design to minimize those causes
  - Accept all possible phone formats.
  - Use terms users would naturally use.
- Allow undos or other easy remedies
  - Offer ability to **easily edit** shopping carts, shipping/billing data
- Make it easier for users to discover errors; aid them in correction
  - Use in-line form validation
  - Helpful error messaging
  - Search autocomplete
  - Search "did you mean" for no results

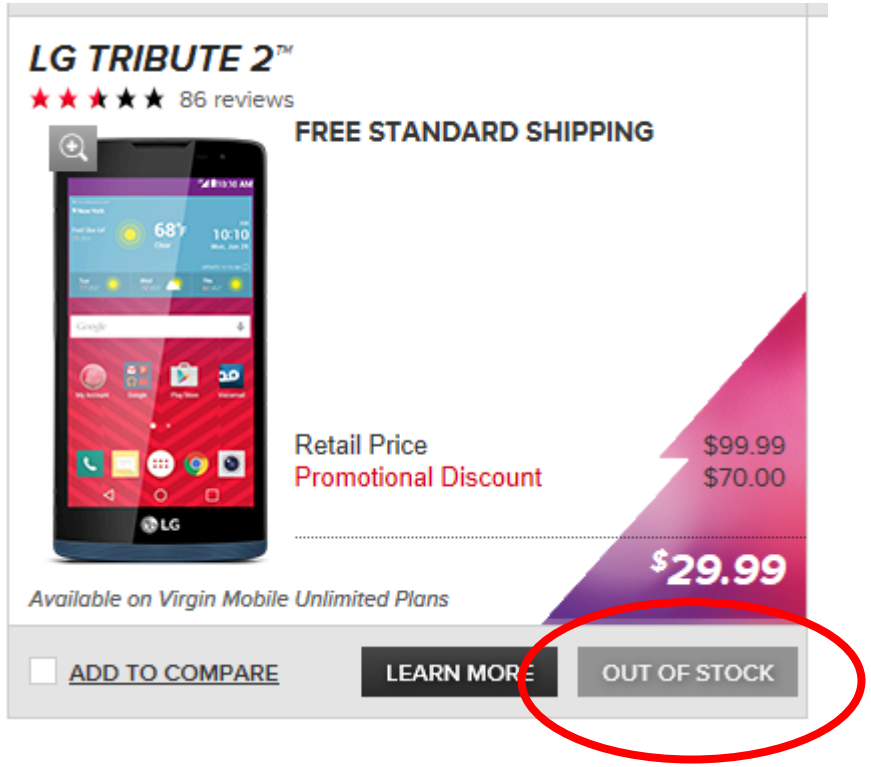


Poka-yoke Principle

"Mistake proofing"

UI does not allow users to take prohibited actions





Lesson Summary

- **Perceived affordances** = provide strong clues to the operation/use of an item
- **Signifiers** = Are marks that communicate appropriate behavior to user
- **Mappings** = indicate to users relationships between controls and their effects
- **Feedback** = User receives full and continuous feedback
- **System Visibility** = Combines A, S, M, F to help user know state of the device + options for action
- **7 Stages of Action** offer Norman's perspective on problem solving and goal accomplishment
- **Gulf of Execution =** how well a system guide someone to execute the action they intend
- **Gulf of Evaluation =** how well the system informs the user about states before / after activity

Midterm Exam

The answers

Scores to be posted today or tomorrow