Human Capability Part II

Generate an image: A cute, cartoon-style beaver wearing Oregon State University gear (orange hoodie with "OSU" on it), sitting on a log and thinking deeply. Above the beaver's head is a blown-out diagram of a brain, with colorful thought bubbles and arrows pointing to various icons representing human abilities: an eye (perception), a bell (attention), a filing cabinet (memory), a red/green color wheel (color perception), and a multitasking icon (divided attention). The style should be playful and slightly exaggerated for humor, like a smart animal having an "aha!" moment.

Upcoming Deadlines

Today

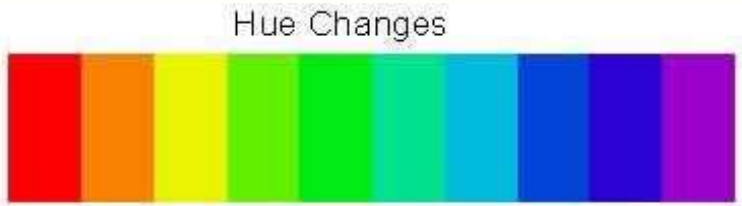
- **Visual Perception – color**
- Attention
- Memory

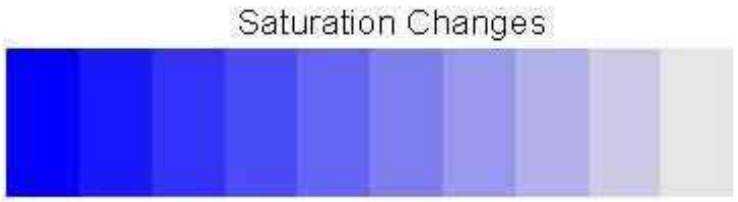
Visual Perception - Colors

5 Design principles for colors

Principle 1: Distinguish colors by Hue, saturation and brightness

1. Hue (“color”)
2. Saturation, “how much paint you added”
3. Brightness, “how much light it reflects” (regardless of hue)





Contrast

- Vision is optimized for contrast, not brightness

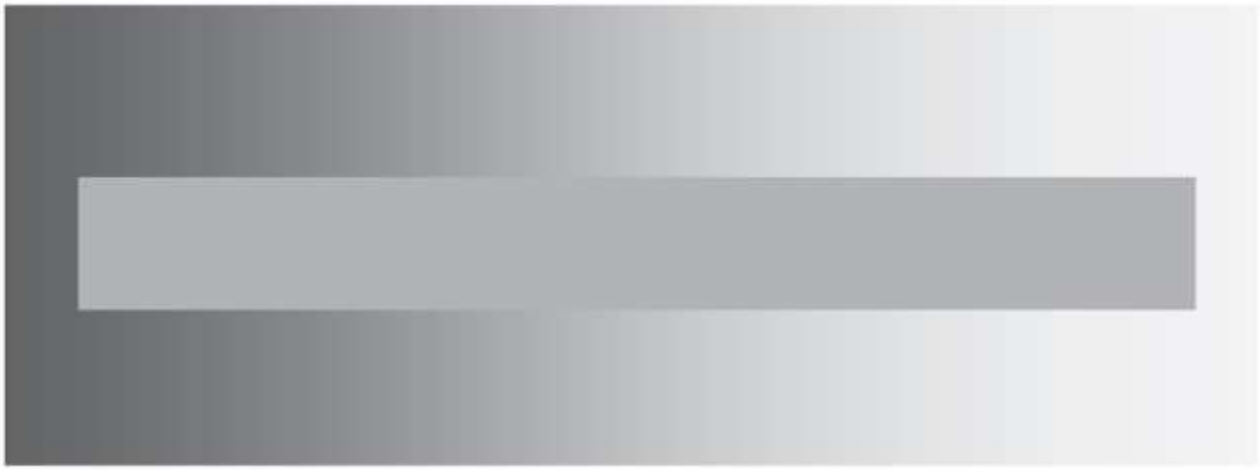


FIGURE 4.2

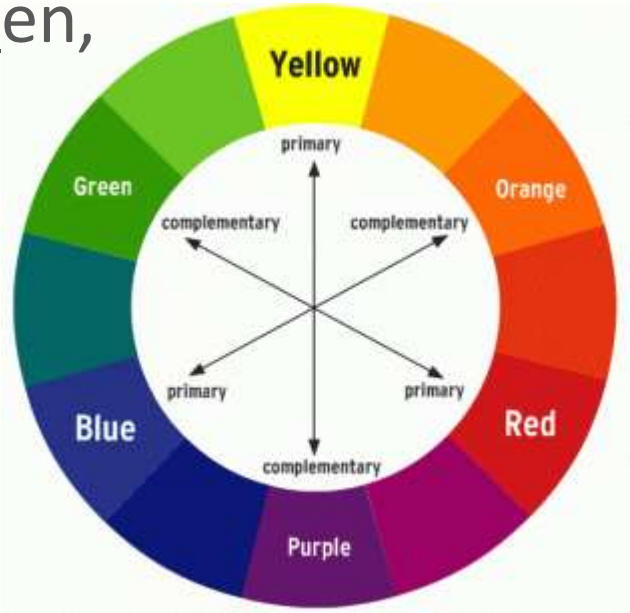
The inner gray bar looks darker on the right, but in fact is all one shade of gray.

Contrast – How to:

Principle 2: Use distinctive colors

- Choose 1 hue, from light hues, lighten, desaturate

- Choose 2nd hue from dark hues, darken, saturate.

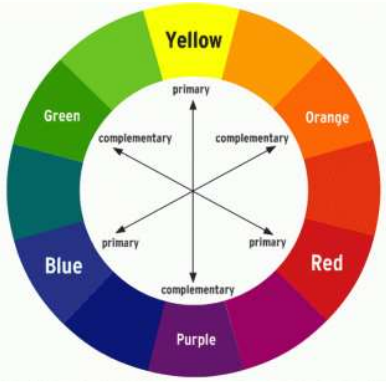


Avoid adjacent colors – they are hard to distinguish

Contrast – How to:

Principle 3: Separate strong opponent colors

AVOID THIS!



Contrast how to:

Principle 4: Avoid color pairs that hard to distinguish by color blind people

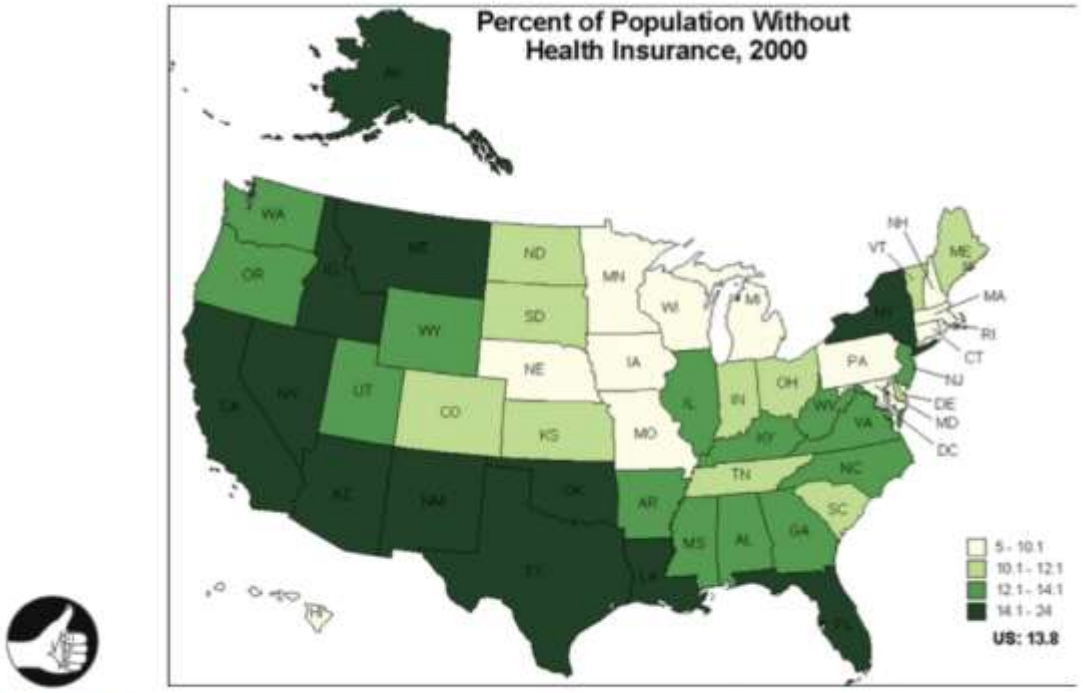


FIGURE 4.17

MinneapolisFed.org's graph uses shade differences visible to all sighted people on any display.

- Color-blindness
  - Red/green color blindness most common: 7-8% of males can't differentiate red from green, 0.4% of women.

Principle 5: Use redundancy. Don't rely on color alone

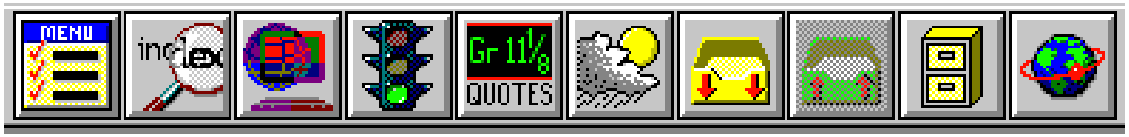
FIGURE 4.18

(A) Poor design; (B) improved, more accessible design: the current step is highlighted redundantly using boldness and a more saturated color.

Colors – Clean design

- Excessive/gratuitous colorings
  - distracting
  - unprofessional
  - **impart meaning** where none/different intended

Card #26: unattractive appearance



Interface Hall of shame: Compuserve's *WinCim 2.0* application

Our Attention is Limited; Our Memory is Imperfect

FIGURE 7.2

Modern view of memory: a dark warehouse full of stuff (long-term memory) with searchlights focused on a few items (short-term memory).

Let’s watch a video

https://www.youtube.com/watch?v=vJG698U2Mvo

Attention - selective

Selecting what (stimuli) to focus on, at a point in time, from the range of possibilities

- Cognitive attention
  - We focus on what we think is relevant to our task

Types of Attention

- Types of attention
  - Focused attention: stay focused on a task despite distractions
  - Sustained attention: stay focused for a sustained period of time
  - Divided attention: higher-level skill where one has to perform two (or more) tasks at the same time

Attention is limited

Walking and talking? Balancing while doing math? On the phone while driving? Emails while in class/ talks/meetings ?

- Mostly attend to one (cognitive) thing at a time
- Like in operating systems: Interrupt system, context switch
  - Cost of context switch: Cognitive load, Missed triggers
  - Thus, UIs should encourage this with care.

Attention is task oriented -1

- The task, not the tool
  - Ex1: The story in the book, not the physical book (or page number)
  - Ex2: The words you're writing, not the pencil

- If get interrupted/attend to tool, might forget ...
  - Ex1: Doorbell rings, put down book; where was I?
    - ➔
  - Ex2: Pencil gets too dull, attend to pencil (sharpen).
    - ➔

  - How to use External cognition?

Attention is task oriented -1

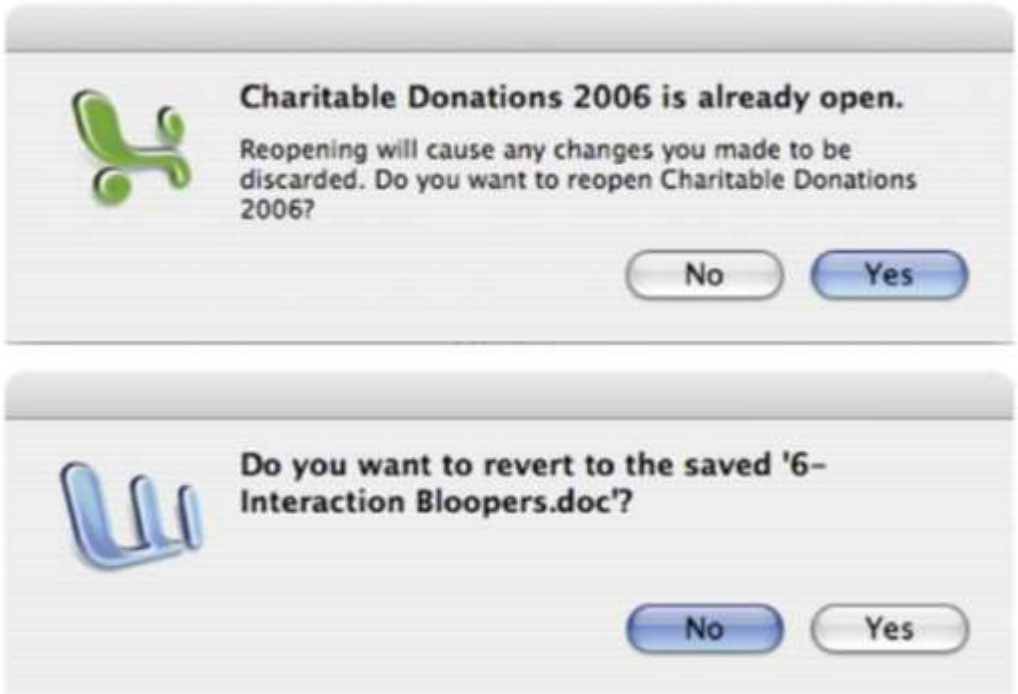
- The task, not the tool
  - Ex1: The story in the book, not the physical book (or page number)
  - Ex2: The words you're writing, not the pencil

- If get interrupted/attend to tool, might forget ...
  - Ex1: Doorbell rings, put down book; where was I?
    - ➔ Let user mark where you left off. (eg, bookmark).
  - Ex2: Pencil gets too dull, attend to pencil (sharpen).
    - ➔ Have system (last few words you wrote) show where you left off.

  - External cognition saves the day!

Attention is task oriented - 2

- Focus on completing the goal
- Example: You opened an already open file (which is



Which is better?

Attention is task oriented -3

Follow scent of information towards goal:

Goal: Pay your dentist by fund transfer

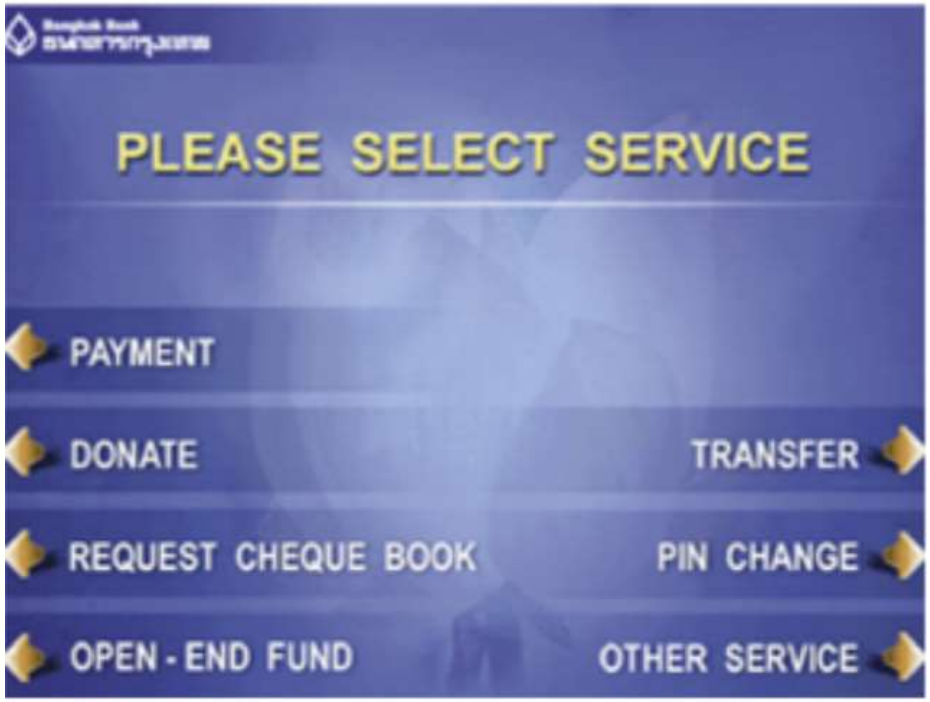


FIGURE 8.4

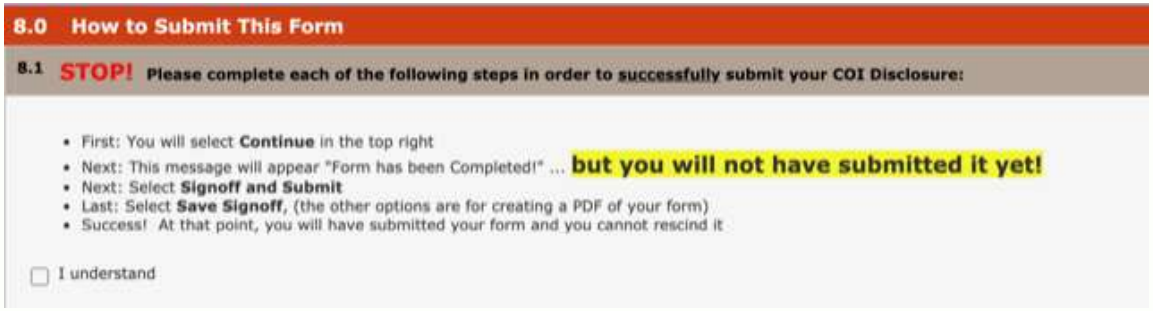
ATM screen—our attention is drawn initially toward items that match our goal literally.

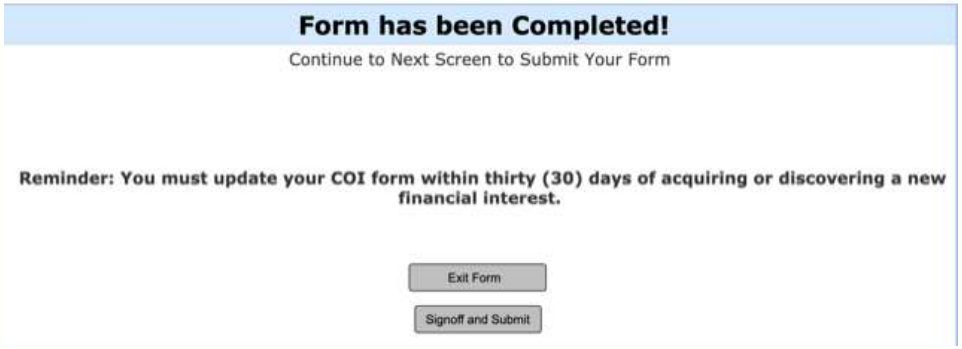
Attention is task oriented -4

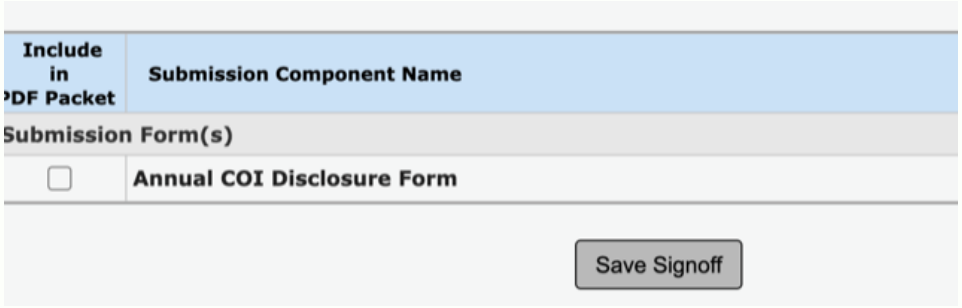
Once task is done (attention) moves on

- ATMs were redesigned to have users remove card before dispensing cash
- Users felt task was done and forgot their cards behind

Attention is task oriented (iRIS system)







Types of notifications – Signal Strength

A Guide to Notification Design | UX Collective (uxdesign.cc)

Designing Notifications

- What would trigger the notification?
- What type of feedback is being communicated?
- Which notification would require an immediate interaction?
- Where would the notification appear and how?
- Is the notification persistent or non-persistent?

Types of notifications

- **High-attention**
  - Alerts & errors (immediate attention required)
  - Exceptions (system anomalies, something didn't work)
  - Confirmations (potentially destructive actions that need user confirmation to proceed)

- **Medium-attention**
  - Warnings or success messages (no immediate action required)
  - Acknowledgments (feedback on user actions)

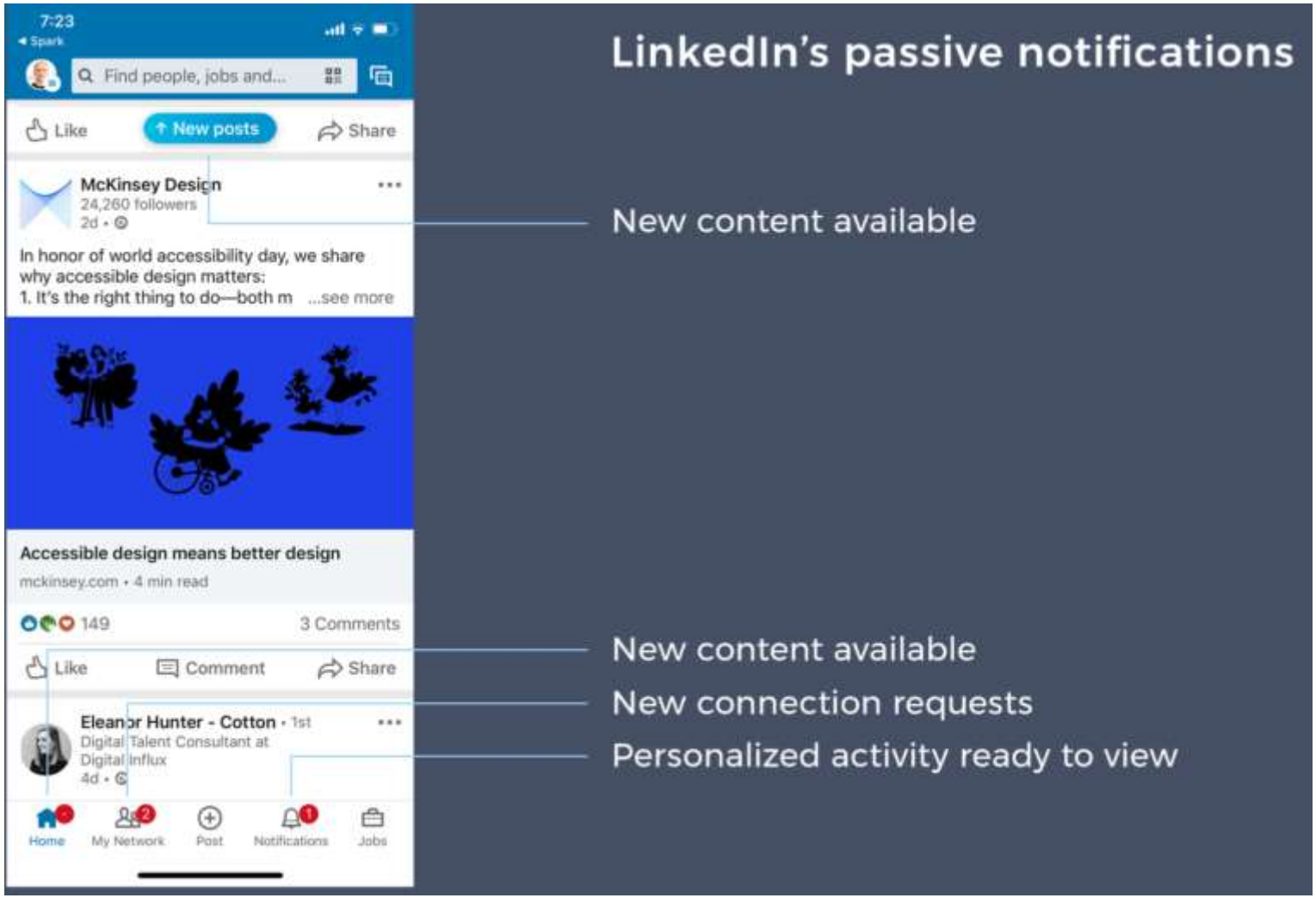
- **Low-attention**
  - Informational messages (aka passive notifications, something is ready to view)
  - Badges (typically on icons, signifying something new since last interaction)
  - Status indicators (system feedback)

A Guide to Notification Design | UX Collective (uxdesign.cc)

Demanding Cognitive Attention: Designing notifications

A comprehensive guide to notification design

Midos Philips Jun 22, 2020 · 10 min read


LinkedIn's passive notifications
7:23
Spark
Find people, jobs and...
Like
New posts
Share
McKinsey Design
24,260 followers
2d
In honor of world accessibility day, we share why accessible design matters:
1. It's the right thing to do—both m
...see more
Accessible design means better design
mckinsey.com • 4 min read
149
3 Comments
Like
Comment
Share
Eleanor Hunter - Cotton • 1st
Digital Talent Consultant at Digital Influx
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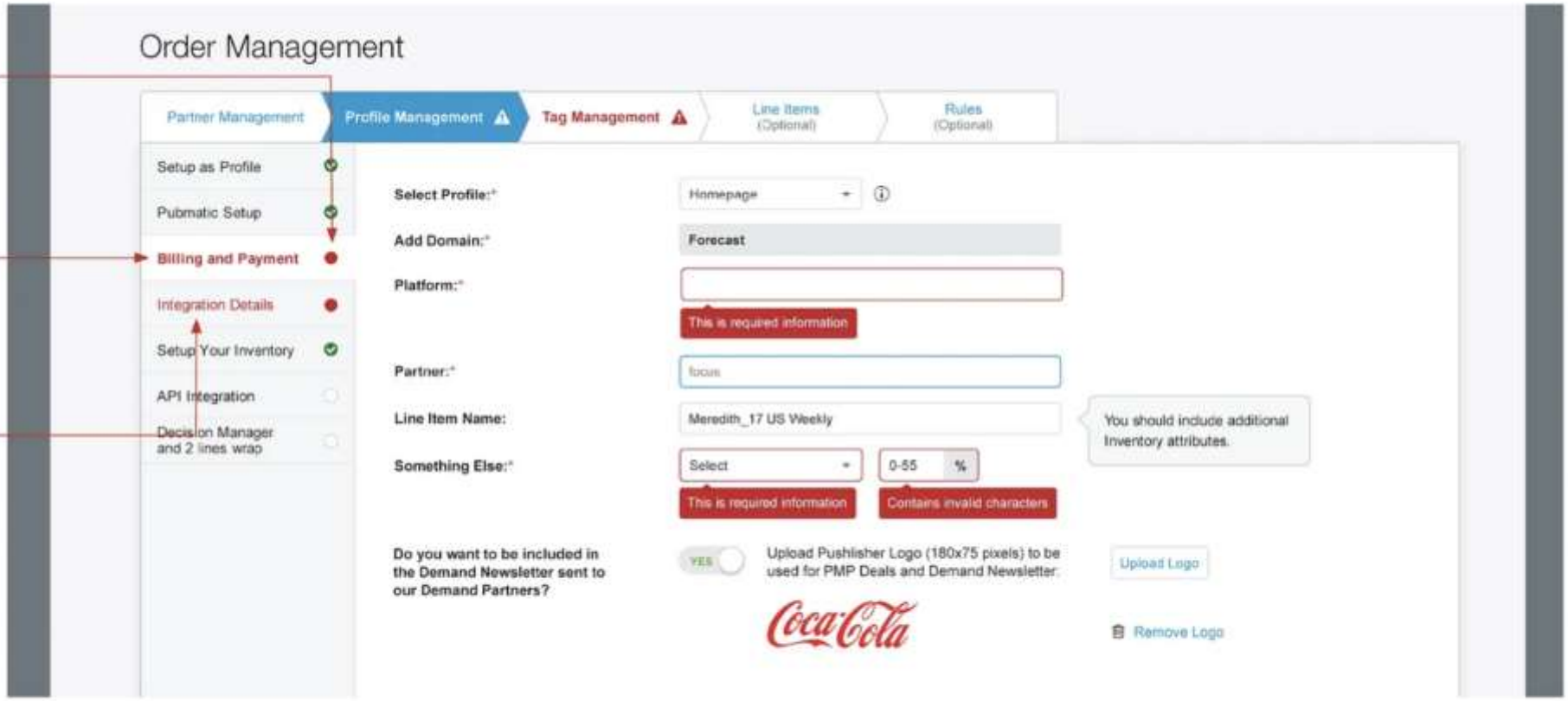
My Network
Post
Notifications
Jobs
New content available
New content available
New connection requests
Personalized activity ready to view



Inline validation on forms, aka live error checking and clear messages, enhance the UX.

Our Attention is Limited; Our Memory is Imperfect

FIGURE 7.2

Modern view of memory: a dark warehouse full of stuff (long-term memory) with searchlights focused on a few items (short-term memory).

Memory

- Memory formation
  - Changes in the neurons involved in a neural activity pattern
  - Temporary: Some changes last until chemicals dissipate (based on stimulation)
  - Permanent: neurons grow/branch forming connections

- Activating memory
  - Reactivating the same pattern of neural activity of that when memory was formed
  - More often memory pattern reactivated – the stronger the pattern – easier to reactivate

Structure of Memory

Three stages

1. Sensory buffer in the senses (perception). Stores info. ~1 sec

2. Long term memory (LTM)
   - Situations where information retained over long periods (hours…lifetimes)

3. Short term memory (STM)
   - Retained over fraction of a second to a few minutes

3a) **Working memory (short-term memory + attention)**
   - STM is passive; WM is active
   - STM remember a number, WM doing Math with that number

Working Memory

Working Memory = STM + attention

- Tiny subset of information from senses + LTM that we are aware of *right now*
- Combination of several foci of attention (searchlights)

- Not really a "Place" – more like "pointers"

- In book's warehouse analogy, it's a small number of searchlights into LTM

- Volatile and small

FIGURE 7.2

Modern view of memory: a dark warehouse full of stuff (long-term memory) with searchlights focused on a few items (short-term memory).

Implications of memory limitations

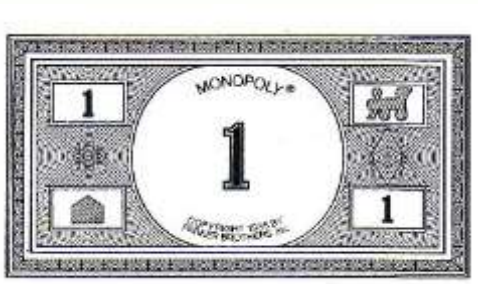
1. Recognition over recall

Recall vs. Recognition

Recall: Reactivating the same patterns of neural activity that occurred when the memory was formed

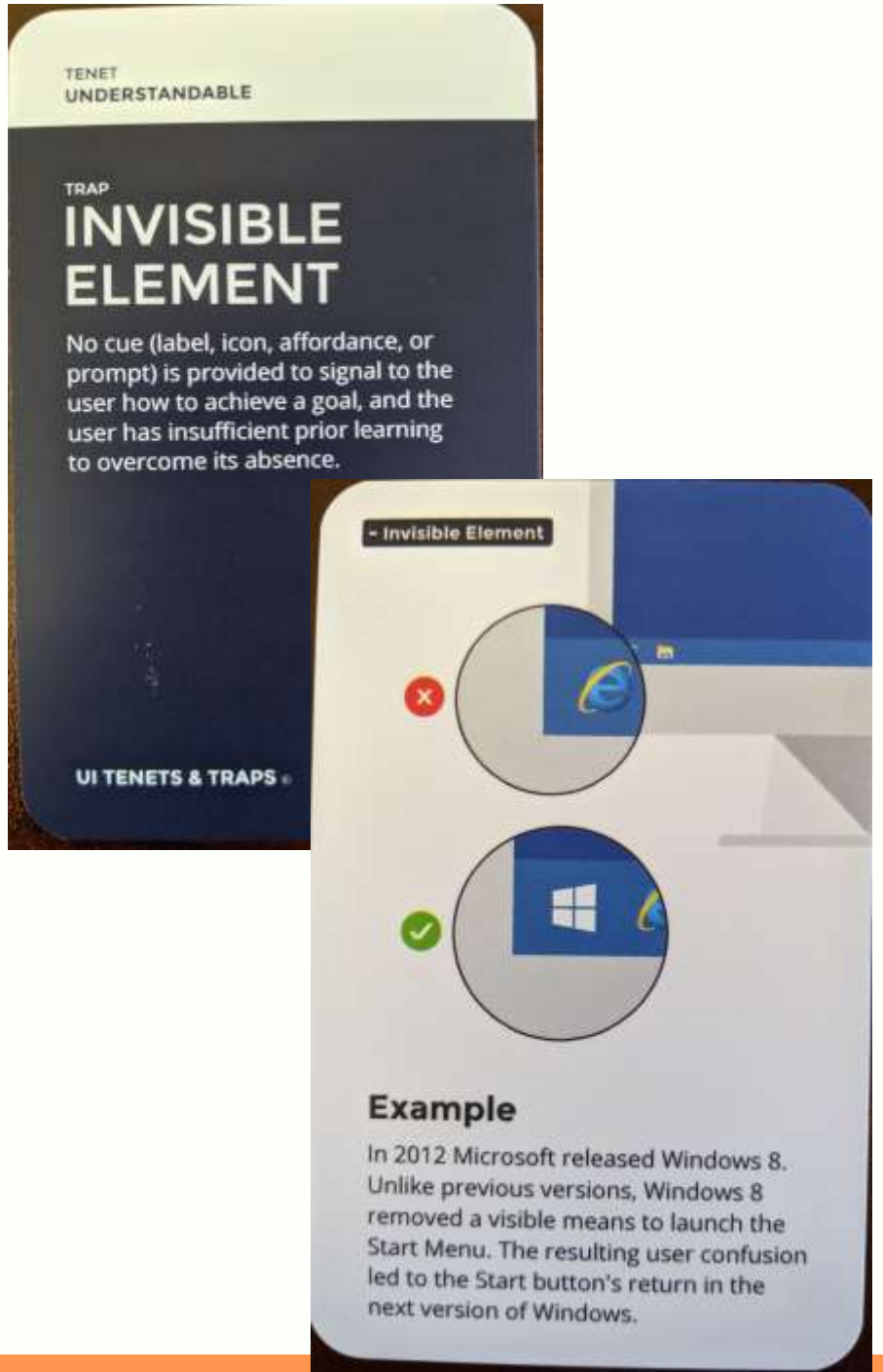
Draw a dollar bill

Recognition: New perceptions like the original ones reactivate the same patterns of neurons



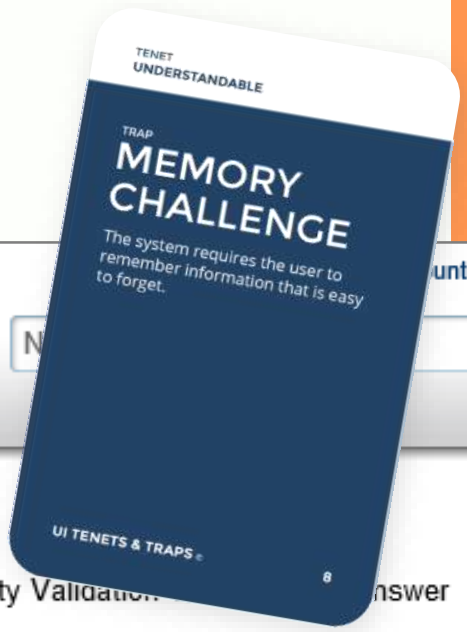
UI: promote recognition over recall

T&T #1: Invisible element



T&T #8: Memory Challenge

What was the question?



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MY ACCOUNT | CARDS | TRAVEL | REWARDS | BUSINESS

Forgot Your Password? Change it Now

Please validate your identity.

You can change your Password online instantly by first validating your identity. Enter the User ID and Security Validation... nswer you chose when you created your User ID.

If you cannot remember the User ID and/or the Security Validation Question, please call American Express @ Work® HelpDesk at 1-800-238-8087 from 8:00 am to 7:00 pm Eastern Time.

User ID

Security Validation Question

Choose one

Security Validation Answer

<< Back | Continue >>

- Select the same Question and Answer you chose when you created your User ID and Password.
- 2 to 32 characters
- No special characters (e.g., &, >, *, $, @)

NEED HELP

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Say what?!

1. Make sure you have calibrated Kinect. Start audio calibration from "Settings" → "Kinect" → "Kinect doesn't hear me".
2. Pause for a second before saying each command so that Kinect knows you're not mentioning Xbox as part of a side conversation.
3. Say Kinect voice commands using your normal speaking voice and speech pattern, don't raise your voice.
4. Once you've learned a voice shortcut you can say it all at once. For example, say "Xbox go Home" without extended pauses.
5. You can always say "Xbox select" to see the commands available on the screen.

Voice Shortcuts

Xbox on	Wakes up Xbox One, turns on television and cable/satellite set-top box
Xbox turn off	Puts Xbox One to sleep/off, can turn off television and cable/satellite set-top box
Xbox	Shows menu of global voice shortcuts and then say "more shortcuts" to see the full list
Xbox select	Shows voice commands on the screen Everything in green text can be spoken
Stop listening	Dismisses voice commands on the screen in that moment.
Xbox help	Shows help for the current app
Xbox use a code	Triggers Kinect code scanning for QR codes
Xbox show notification	Opens the notification center and shows the most recent notification

Identity

Xbox sign in/out Xbox sign in as [person]	Signs in/out an Xbox Live member

Gaming

Xbox record that	Records the previous 30 seconds of gameplay
Xbox invite	Launches the Party app in Snap mode

Volume

Xbox volume up/down Xbox mute/unmute	Controls volume of TV set

Navigation and Multitasking

Xbox go Home Xbox show my stuff	Returns to Home
Xbox go to [game or app]	Launches an installed game or application
Xbox show menu	Opens the game's or app's menu, just like pressing the Menu button on the controller
Xbox go back	Returns to previous screen
Xbox Snap [app]	Launches app in Snap mode
Xbox unsnap	Unsnaps app from Snap mode
Xbox switch	Switches focus between the two apps on the screen
Xbox Bing	Launches Bing and searches for games, music, movies, and TV shows

Communication

Xbox Skype [person]	Shows details for a contact in your Skype favorites list on your Xbox One
Xbox call [person]	Starts a video call, must be a person from your Skype favorites list
Xbox answer/answer without video	Answers incoming Skype call
Xbox hang up	Ends Skype call
Xbox send a message	Sends message to your Xbox Live friends

TV

Xbox watch TV	Launches cable or satellite TV from set-top box
Xbox watch [channel]	Changes cable or satellite TV to a recently watched or favorite channel
Xbox show guide Xbox OneGuide	Launches the OneGuide

Transport Controls

Xbox play/stop/pause/fast forward/rewind/faster/slower/skip forward/skip backward/next song/previous song	Transport controls for media playback, play and pause also work for gameplay
Xbox play music	Resumes playing most recent song in Xbox Music

KINECT VOICE COMMANDS

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Implications of memory limitations

1. Recognition over recall
2. Modes in UI
   - Different actions based on mode: car accelerator + R/D
3. Search results
   - Search keywords + results page
4. Length of instructions
5. Navigation depth

Encoding from STM/WM to LTM

Types of knowledge

- Declarative knowledge: storage of facts, and events
  - NYC is north of Miami
  - To get key out of ignition, car must be in “park”
  - Easy to teach

- Procedural knowledge (rich info)
  - How to spin a basketball on 1 finger
  - How to boot a smart phone into recovery mode
  - Best taught by demo, learned by practice

Encoding and (lack of) precision

- How we encode affects:
  - what we retrieve (recall or recognize) and
  - how we retrieve


IN GOD WE TRUST
1984

A


1984

B


IN GOD WE TRUST
1984

C


IN GOD WE TRUST
1984

D


IN GOD WE TRUST

E


IN GOD WE TRUST
1984

F


UNITED STATES of AMERICA
1984

G


IN GOD WE TRUST
1984


IN GOD WE TRUST
1984
ONE CENT


IN GOD WE TRUST
1984


LIBERTY
1984

K


IN GOD WE TRUST
1984

L


IN GOD WE TRUST
LIBERTY
2005
D


UNITED STATES OF AMERICA
E PLURIBUS UNUM
ONE CENT

5 seconds – look at these letters

Write down as many letters as you remember

…some letters were repeated

Ways to encode – chunking

C F K N E H Z Y X M B I C B A T A C

After chunking: 6 groups, or even 3 categories

C A T A B C I B M X Y Z H E N K F C

Ways to encode – meaningful relations

- Different amount of encoding needed for:
  - Remembering a bunch of arbitrary things.
  - Remembering things with meaningful relationships.
    - Hotel is on north side of town.
  - "Remembering" things that can be derived.
    - Tied to "mental" models (stay tuned).

town river corn string car shovel

what is the meaning of life

Ways to encode – Visual and Audio

- Visual encoding: encoding of images
  - Encode: car, level, dog, truth, book, value
    - Easier to recall items that have visual representation
    - Orators: Greek method of loci (walk through different parts of the building)

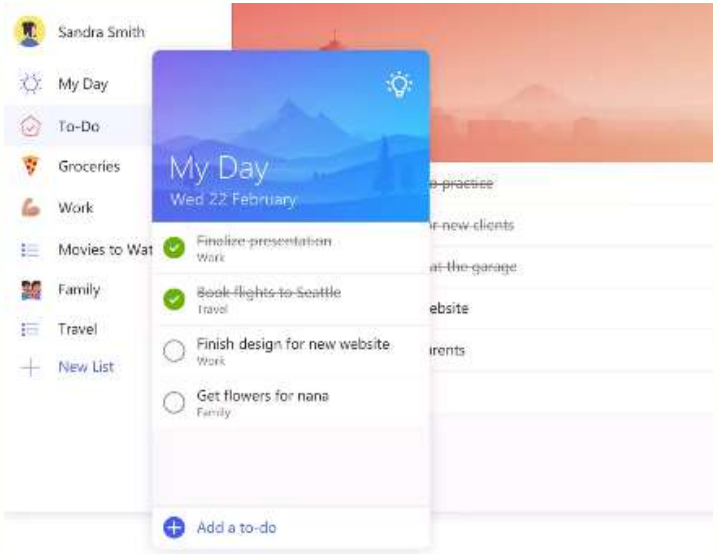
- Audio encoding: Encoding of sounds (sound, rhythm, rhyme)
  - Encode: songs through rhythm, rhyme,
    - You can recall words of a song not heard for even a decade
    - Orators: epics (Mahabharata); through Rhythms (that make sense)

Long term memory

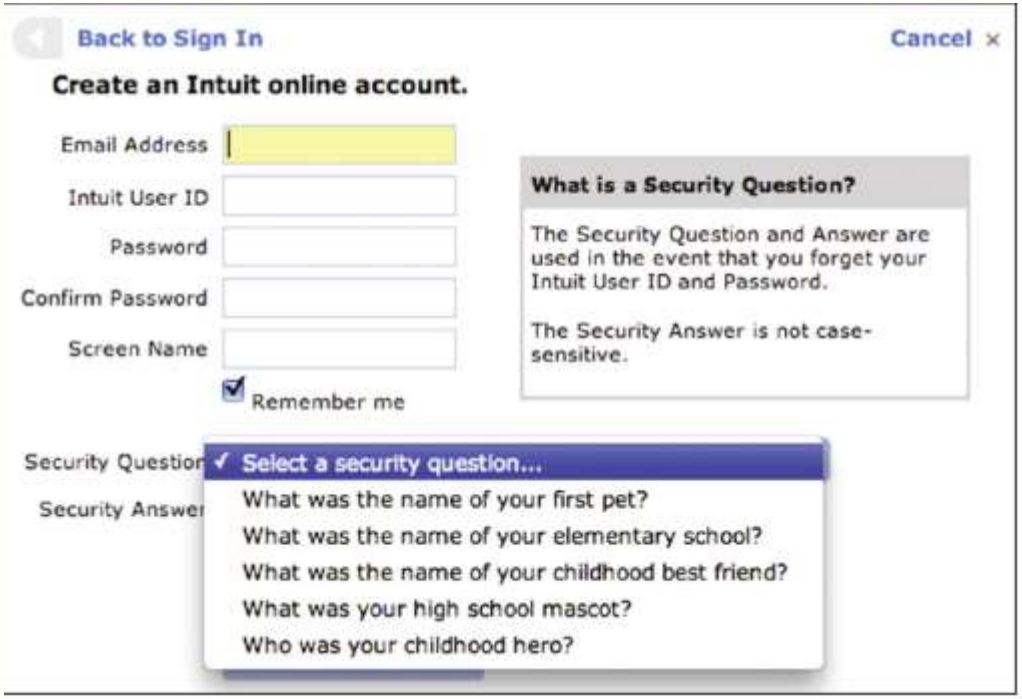
- Is actual memory store
- But
  - Error prone
  - Weighted by emotions
  - Retroactively alterable

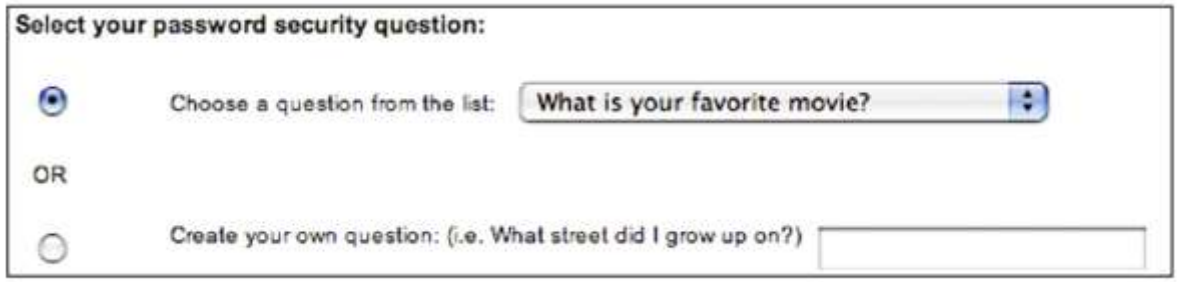
Implications

- So, reduce and/or facilitate encoding:
  - Recognition over recall
  - Support external cognition to remove need to encode
    - eg: todo checklists
  - Provide users a variety of ways to encode
    - color, flagging, position
    - E.g., forgot (todo) task, but …its under “red flag”



Implications for design: Security questions





Summary

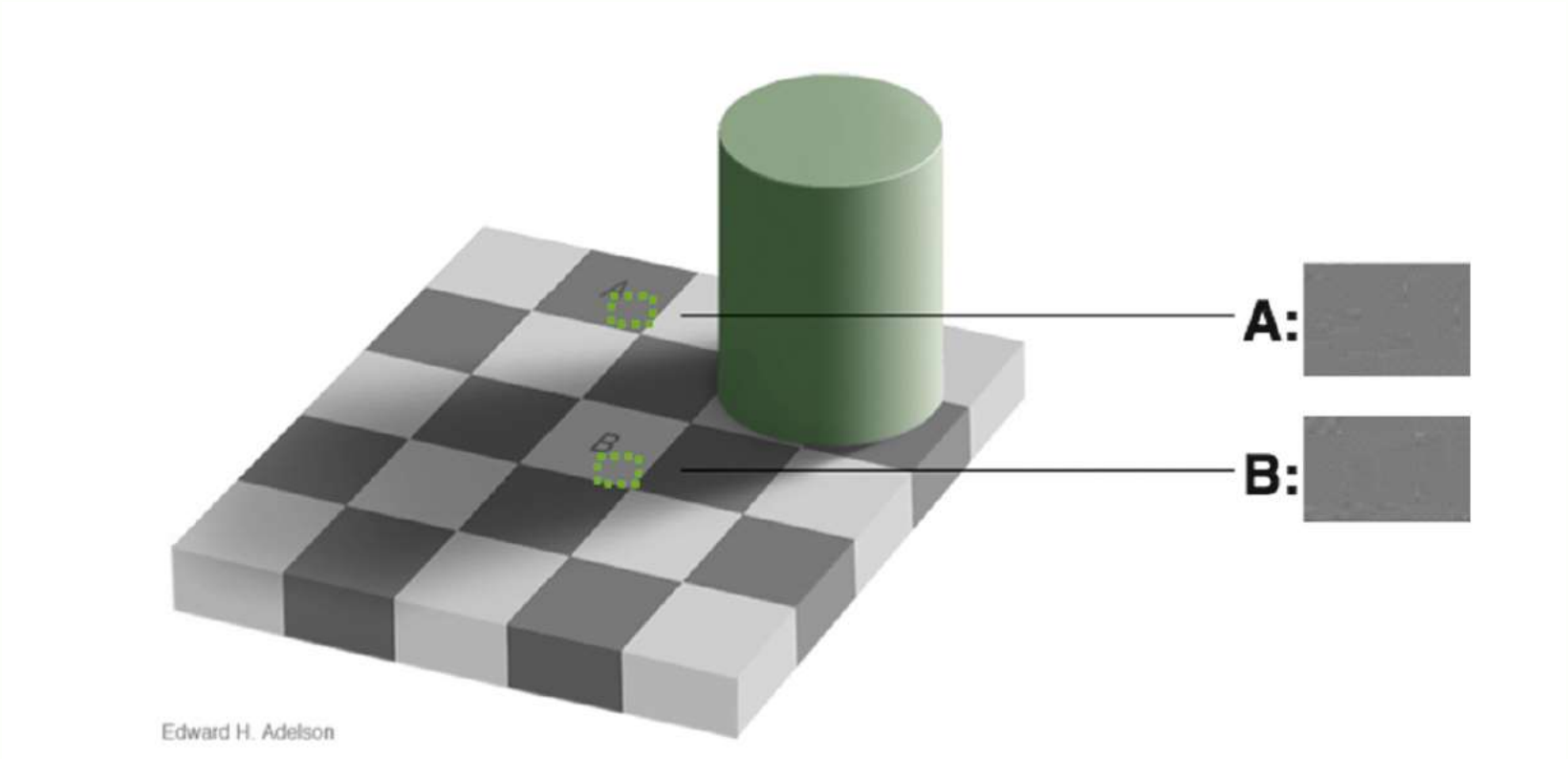
- 5 design principles of using colors
- Attention
  - Is limited (one thing at a time)
  - Task oriented
  - Design notifications
- Memory
  - Long Term vs. Short Term/Working Memory
  - Types of knowledge
  - Encoding is lossy and how we encode

Thank you!!

Next Class

Contrast

- Vision is optimized for contrast, not brightness

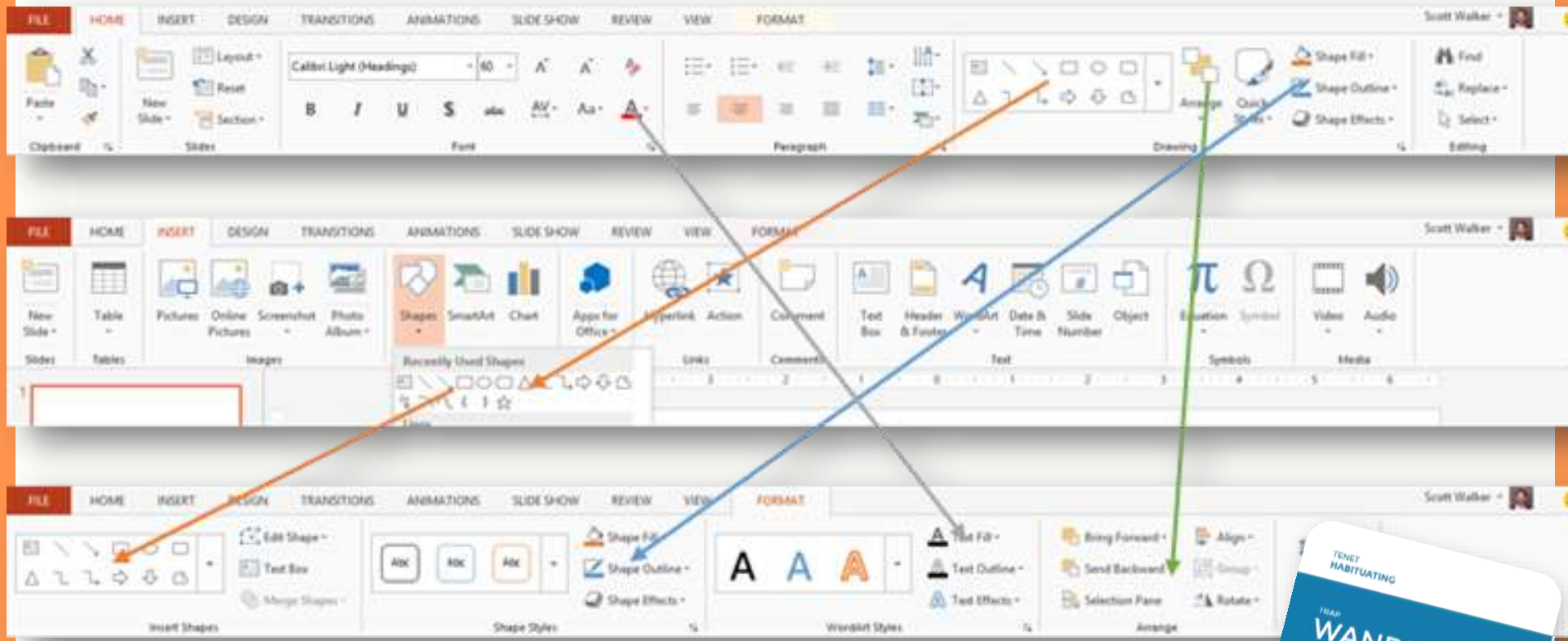


Case study

- The Microsoft Office (past) rearranging of menus due to recency.
  - Think about chunking/grouping
  - Think about imprecision of encoding.
  - What will I do if don't see what I want?
  - What about external consistency?
- Does this mean "most recent" is always a bad idea in a UI?

T&T #23: Wandering Element

Where's that control now?



Same control, different location.

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