# SI 388 Responsiveness Thresholds

WEEK 5-2 (WED 4 & MON 9 OCT)

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# Agenda

- Short lesson on Timing, aka Responsiveness Thresholds
- I'll talk for a few minutes Wednesday about the midterm
- In-class Assignment 3 today – the prompt is on Canvas

# Learning Objectives

After today's unit, students should be able to:

- ❑ Identify important UX-related "thresholds of responsiveness"
- ❑ Explain at a high level the concept of Flow State
- ❑ Relate them to design approaches that leverage them

# Responsiveness and Perception/Attention

- We are wired to expect interactive systems to respond within certain time limits
- Objective time (what a clock measures)
- Subjective time (what we perceive)
- *Perceived* responsiveness >> actual speed of system
- Responsiveness = Keeping users informed when delays occur
- **Most important factor of user satisfaction**
  - Multiple studies confirm (See Johnson, Ch. 14).

# Human Perception of Time

- Just Noticeable Difference threshold for time is 20% (Steve Seow/Microsoft)
- If an app is slow, it needs to speed up by at least 20% for users to notice it

- Active phase = high level of mental activity. Feels faster, even if it's not!
- Passive phase = waiting around, possibly bored. Feels 36% slower than if Active!
  - People overestimate passive phase time by 36% (Richard Larson, MIT)

Courtesy Eli Fitch, 2017

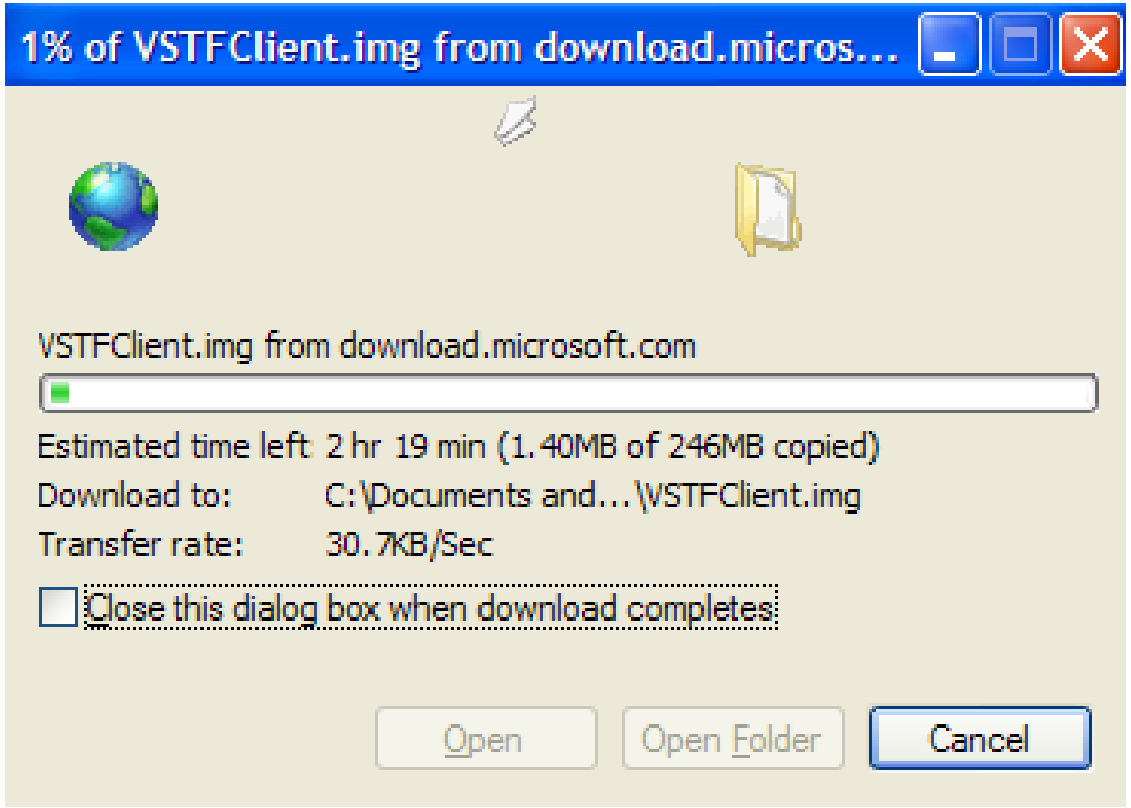
# Optimizing for Subjective Time

- Make passive phase less painful
- Make active phase a greater proportion of total time in app/site

*Examples on upcoming slides*

# Design Implications for Time

- Show immediately that an input/command was received
- Tell how long operations will take →
- Perform low-priority tasks in the background, without interrupting
- Anticipate most common requests

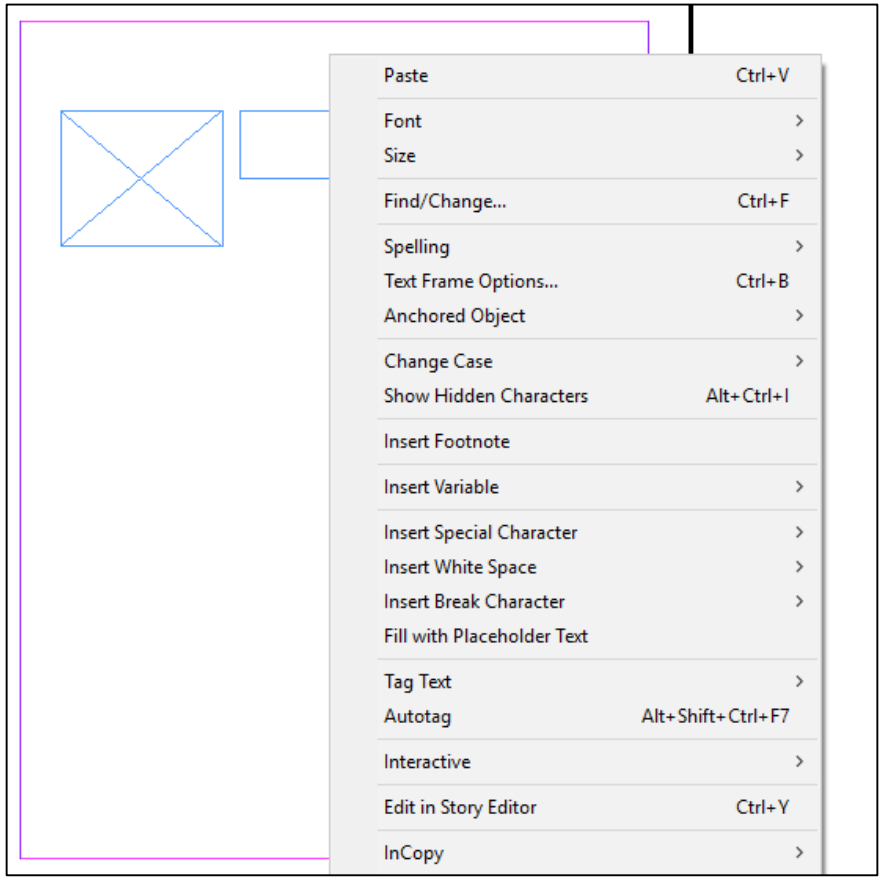


# Design Implications for Time

Another good example:

- Anticipates users' needs, provides options for next steps.
- Right-clicking the mouse is now a convention to reveal commonly used commands, based on context.

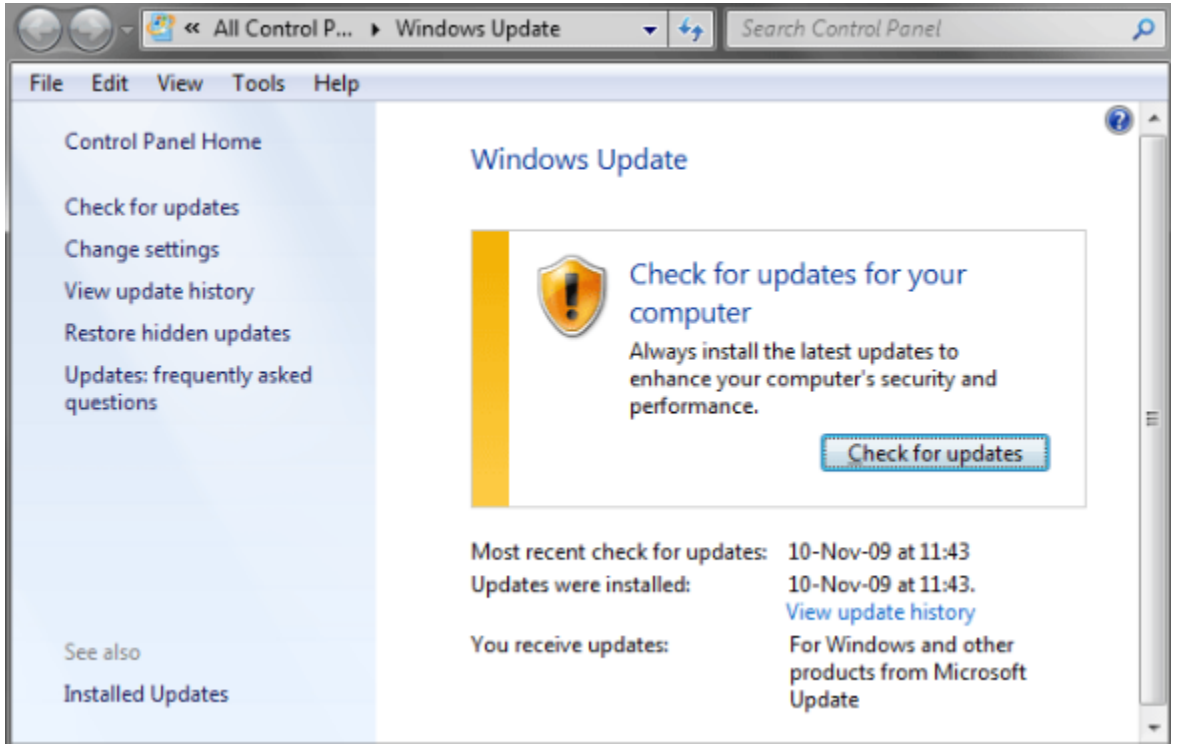
*Adobe InDesign* →



# Antipattern – Reducing Control

Antipattern example:

- Windows 7 critical updates took control away from users to install updates.




Today, it is ***expected*** that systems be responsive. Was not always the case.

# Imperceptible Passage of Time

**Flow State**

- Psychologist Mihaly Csikszentmihalyi
- *"A state of effortless concentration so deep that they lose their sense of time, of themselves and their problems. An optimal experience."*
- Concentration on the task + deliberate control of attention
- Maintaining focused attention on absorbing activities requires no exertion of self control, freeing resources to be directed to the task at hand.

[in Canvas/Files, from Week 13. Csikszentmihalyi, M. (1996). Ch. 5: The Flow of Creativity. In Creativity: Flow and the psychology of discovery and invention. New York: Harper/Collins (pp. 107-126). [in Files]

[in Canvas/Files, from Week 8. Kahneman, D. (2013). Ch. 3—In Thinking Fast and Slow. Farrar, Straus and Giroux. [in Files]

# Time Constraints of Human Perception

Some meaningful thresholds for interface responsiveness, with design implications.

- **Limit for perceived audiovisual "locking" of visual events and sounds** 0.1 sec
  (max. gap btw seeing action and hearing the sound related to it)
- **Maximum gap between events to be considered causal** 0.1 sec

Why these are important:

- *Users can sense they're directly manipulating elements in the UI. "I am sorting the data, vs. ordering the computer to sort the data."*
- *If interface delays > 0.1 sec, cause-and-effect are broken, such as button clicks and expected program response.*

# Time Constraints of Human Perception

- **Attentional "blink" of inattentiveness after other input** 0 to 0.5 sec.
  - *If UI alters display of elements nearly simultaneously, user will miss second event.*

- **Time required to correct motor-movement mistake** 0.5 sec.
  - *Include ½ second of time before hovered elements open or close when users exit them.*
  - *Menus*
  - *Gives higher degree of control to users → better user experience*

# Time Constraints of Human Perception

- **Maximum gap expected in human conversation** 1 sec.
- **Maximum limit for user's flow of thought to stay uninterrupted** 1 sec.
- **Maximum limit for users to feel in *direct* control of the interface** 1 sec.
  - Issuing commands that system completes promptly

Why important:

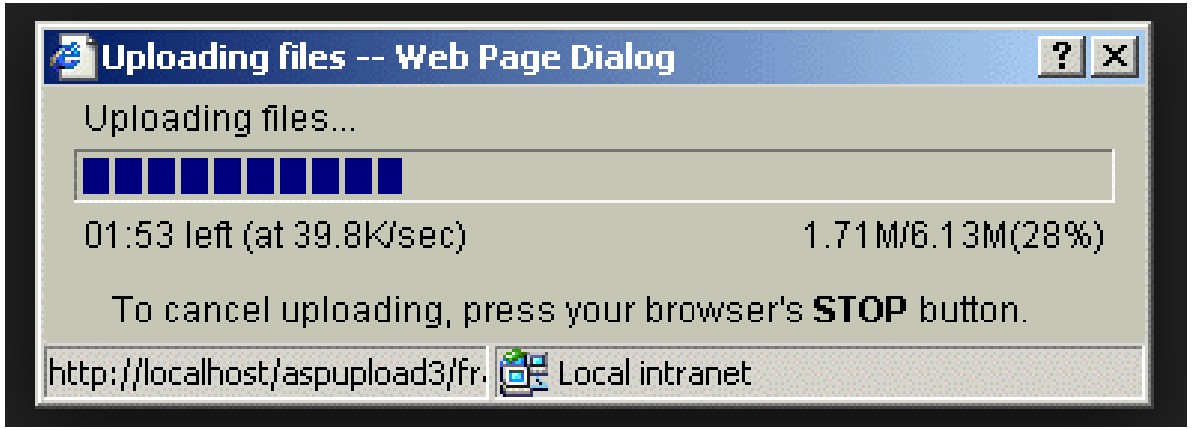
- *If lag is >1 second, human users will detect a pause, which interrupts attention.*
- *No need to show a progress indicator if <1 second.*
- *Do show simple progress bar/busy indicator if 1-6 seconds.*
- *For ex: Web or app pages should load within a second, or users will experience slowness (and comment on it!).*

# Time Constraints of Human Perception

- **Maximum unbroken attention to a single, discrete task ("unit task")** 6-10 sec.

Why important:

- *Any single task should be do-able within 6-10 seconds. If not, break it down better.*
- *If interface lag is >6 seconds, and definitely >10 seconds, users become impatient and usually assume a technical problem.*
  - *Search results >6 seconds to return*
  - *Download >6 seconds*
- *Use **explanatory** progress indicators if >6 seconds delay. An explanation plays on users' reasonableness and are polite.*
  - *It should appear within 1 second!*



# Progress Indicators

**Best practices for progress indicators** (McInerney and Li, 2002)

- Don’t mislead; keep the info shown **accurate**
- Show time remaining, **not** time completed (e.g. 32 seconds remaining)
- Show work related in context (e.g. 33K copied out of 350K)
- Use human time (e.g. 1:34 remaining, not 194 seconds)

# Display Important Information First

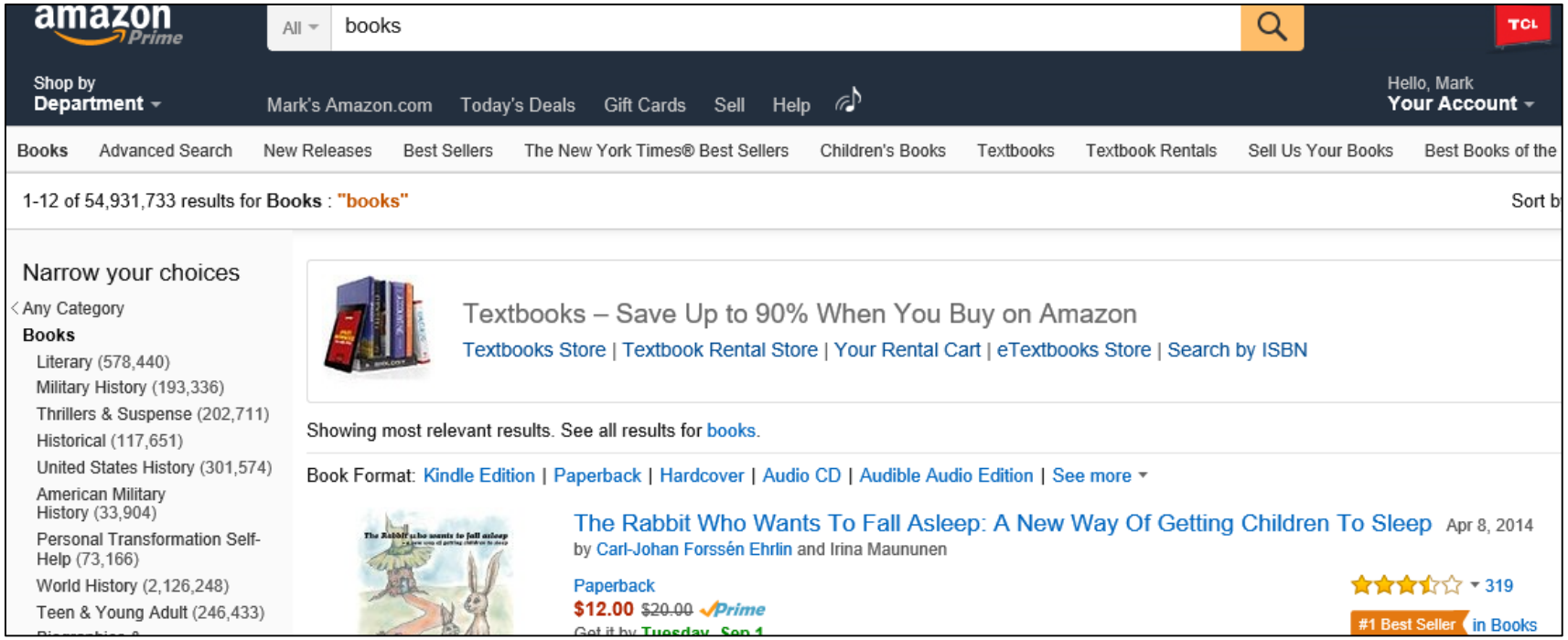
**Load and show important information first**

This allows users to start working right away.

*Ex:*

*Default search results to most relevant →*

*Another example (not shown): Lazy load site images if back end is slow*



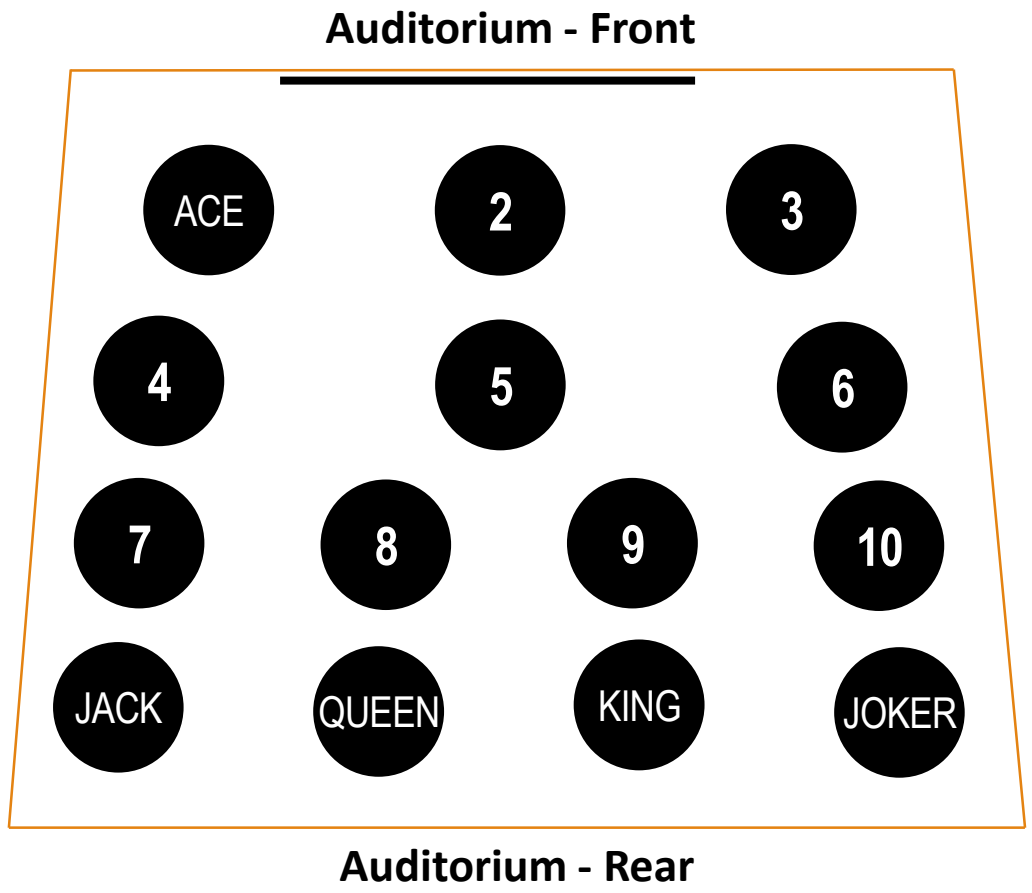
# Summary

- Human JND for time is +/- 20%.  Gains/reductions within that are not noticeable.
- Subjective time is how we perceive time; objective is what the clock shows
- Humans have key thresholds at:
  - .1 second
  - .5 second
  - 1 second
  - 6-10 seconds
- Check out Johnson, p. 198-199 for comprehensive list of time thresholds
- Progress/busy indicators help when times exceed the 1 and 6-10 second thresholds
- Activities occur in Passive and Active time. We over-estimate the passage of Passive time by 36%
- Flow State is an interesting phenomenon we'll touch again later

# Assignment: In-class group exercise - setup

1. You will be in groups of 5-6 students
   - Take a playing card, pass deck along
   - Gather with your same-numbers/symbol (7's, Jacks, etc.) as on the diagram (next screen)
2. Put all group members' names on a blank title sheet only
3. Put the group's playing card symbol on the **title sheet** and **deliverable**
4. *1 hour (until 11:30):* Do the exercise on paper—sketching and hand-printed
5. Make sure all names are on the title sheet
6. Instructor collects title sheets
7. *30 minutes:* Group evaluate a different group's deliverable
8. **Teams swap deliverables (see next slide)**
9. Instructor collects evaluated deliverables

# Group Locations and Deliverable Swaps




**Teams trade w/each other**

Aces ←→ Sevens

Jacks ←→ Fours

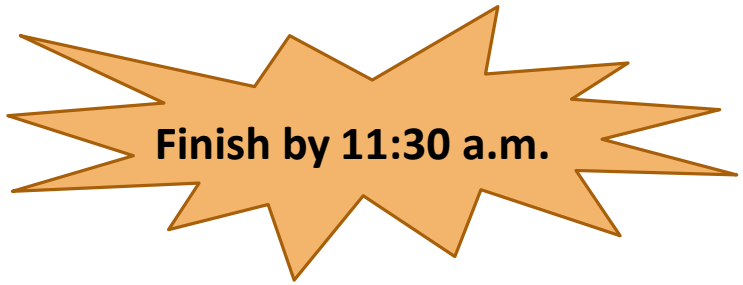
Twos ←→ Nines

Fives ← → Queens

Eights ← → Tens

Jokers ← → Sixes

Kings ← → Threes




# Assignment: In-class Exercise 3

1. Design one of the following interfaces for a tablet device or laptop:
   - A railroad control interface that monitors U.S. passenger trains.
   - An air traffic control interface that monitors airlines.
   - A package delivery monitoring interface for Fedex.

The interface's purpose is to tell the managers where trains are, number of passengers they carry, how fast they are going, and their start and destination points. (Apply these concepts to the other interfaces as makes sense.

2. Be sure to:
   - Describe the main features of your interface
   - Describe how its design helps the human controllers quickly perceive the various kinds of information
   - Utilize several visual perception and attention concepts.
   - Explicitly identify several concepts from recent lectures that are relevant to your design. This is the most important part of the assignment.

You will hand in your title sheet and deliverable to Mark at **11:30 a.m.**

**Some potentially relevant concepts**

*(The Assignment in Canvas contains a list)*

# Evaluation Rubric

____ Design fully meets all the stated requirements (3).

- *Comments where it falls short.*

____ *Several* concepts from lesson (and/or readings) are used (3).

- *Comments where it falls short or does great.*

____ Concepts are explicitly related to design elements (3).

- *Comments where falls short or does great.*

____ Entire submission is clear, easy for grader to understand (1)

- *Comments where falls short.*

____ Total out of 10

# Notes for in-class exercise 3

When you're done…

- ❑ Hand in your evaluation paper
- ❑ Hand in the deliverable
- ❑ Feel free to depart ☺