SWE 632 - Design & Development of User Interfaces

George Mason University

Instructor:
Dr. Kevin Moran

Teaching Assistant:
David Gonzalez Samudio

Class will start in:

20:00

SWE 632 - Design & Development of User Interfaces

George Mason University

Instructor:
Dr. Kevin Moran

Teaching Assistant:
David Gonzalez Samudio

Class will start in:

20:00

SWE 632 - Design & Development of User Interfaces

Fall 2020

George Mason University

Dr. Kevin Moran

Week 12:

Visual Design

SWE 632 - Design & Development of User Interfaces

Fall 2020

George Mason University

Dr. Kevin Moran

Week 12:

Visual Design

With at least 30 new things you won't believe!

SWE 632 - Design & Development of User Interfaces

Fall 2020

George Mason University

Week 12:

Visual Design

With at least 30 new things you won't believe!

#10 will shock you!

Administrivia

- Project Checkpoint 6 out now, ***Due Nov 17th*** (next week)

- No Discussion Question this Week!

Class Overview

1. *Overview of Visual Design:* What it is and Why it Matters
2. *Guidelines for Visual Design:* Simplicity and Regularization
3. *Scale, Contrast, & Proportion:* Formatting Matters
4. *Organization & Structure:* Information Conveyance
5. *Images & Icons:* Getting the Right Picture Across
6. *Design Languages:* Unifying your Design
7. *7 Minute Break*
8. *Group Activity:* Creating a Design Language
9. *jQuery:* Jacob & Sam
10. *GraphQL:* Kanav, Vy, & David

Today

- Importance of visual design: solving communication problems
- Some guidelines
- A lot of example and anti-examples

Overview of Visual Design

Elements of Visual Design

label label

Visual Design

- *Solving **communications problems** in ways that are both functionally effective and aesthetically pleasing.*

- Creating a visual language containing a vocabulary of design elements characterized by

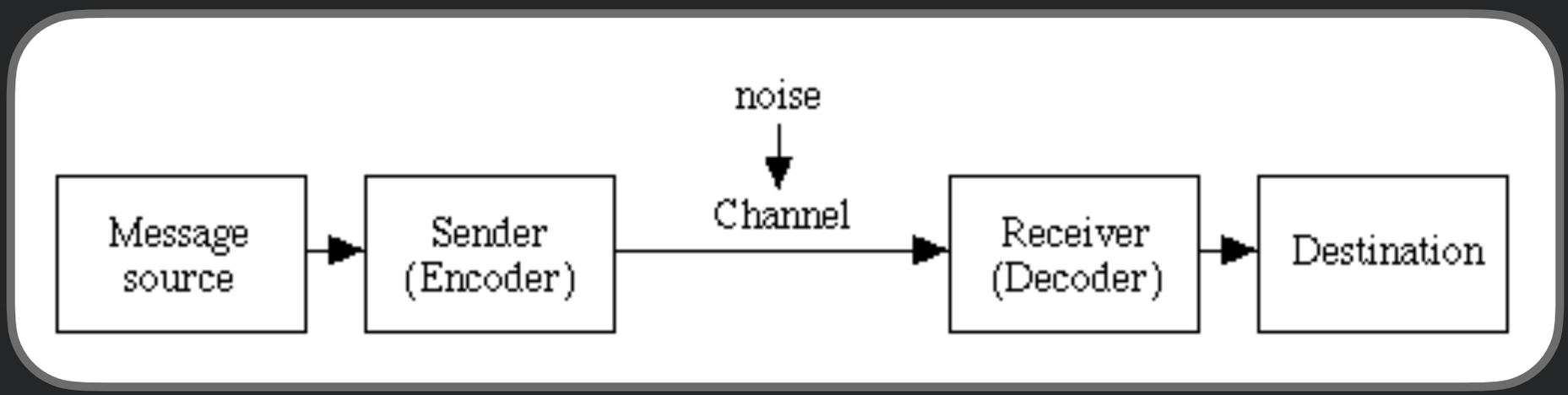
  - Visual variables—shape, size, position, orientation, color, texture, …

  - Organizational relations between elements—balance, structure, proportion, …

  - Visual syntax—rules for assembling elements w/in design language

Visual Design as Communication

- Goal: ***efficiently*** & ***accurately*** transmit information from system to user
- Visual variables & organization encode information



Goals for Visual Design

- Successfully ***transmit*** information
- Present coherent & consistent design that reduces ambiguity and potential confusion
- Reduce visual ***search*** time through layout & organization
- Create desired ***emotional*** reactions through aesthetic choices

Guidelines for Visual Design

Elegance & simplicity

- ***Elegance*** — derives from Latin eligere, to “select carefully”
- ***Judicious*** selection of elements and economy of expression revealing an intimate understanding of problem
- Removing & combining superfluous elements until only the necessary remains

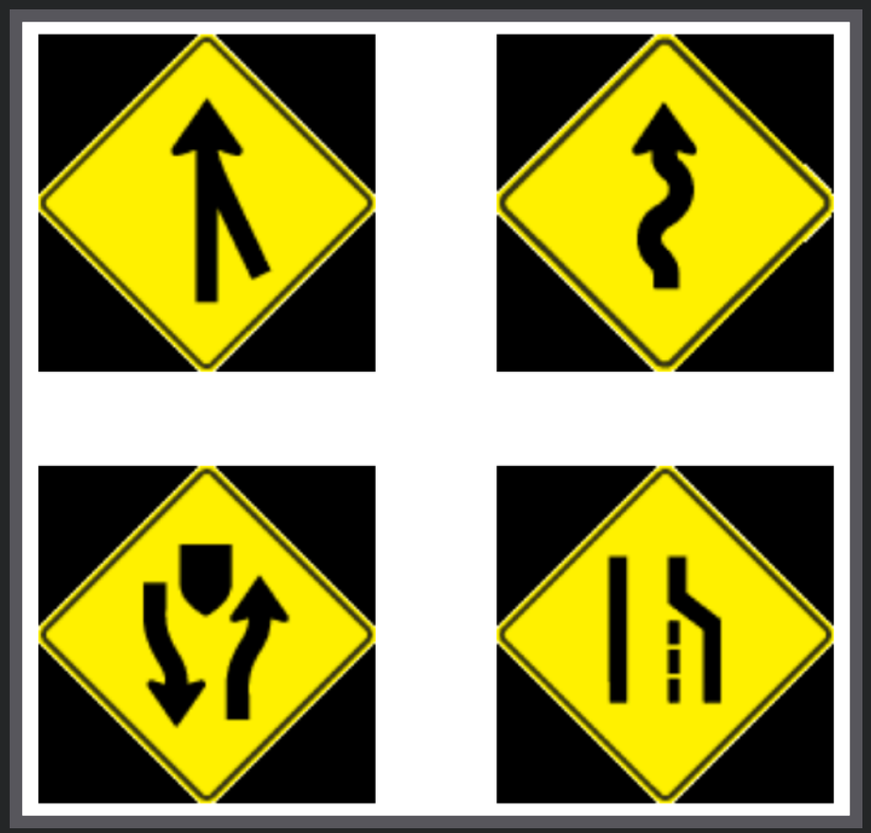
Benefits of Simplicity

- ***Approachability*** - rapidly understood affordances, allowing glanceable understanding of possible interactions

- ***Immediacy*** - greater emotional impact because interactions can be quickly understood

Marc Berthier. Tykho Radio. 1997. Synthetic rubber and other materials, 5 1/2 x 5 1/2 x 1 5/8″ (14 x 14 x 4.1 cm). Manufactured by Lexon, France. The Museum of Modern Art, New York. Gift of the manufacturer.

Reducing a Design to its Essence



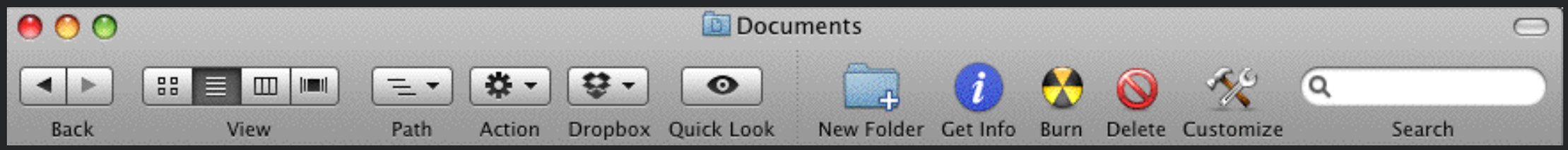
- Make design simple, bold, and direct by removing inessential details & elements
  - Even essential elements may be suggested

1. *Determine essential qualities & information to be conveyed*

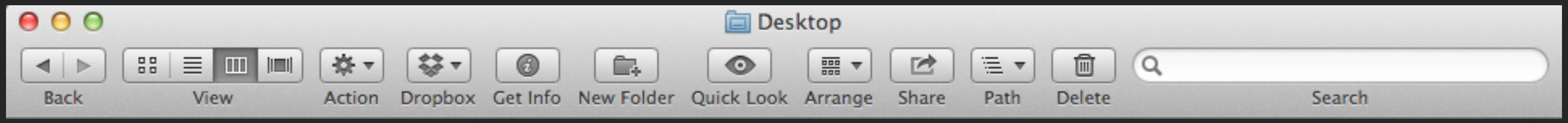
2. *Critically examine each element & ask how design would suffer without it.*

3. *Try removing elements. What happens?*

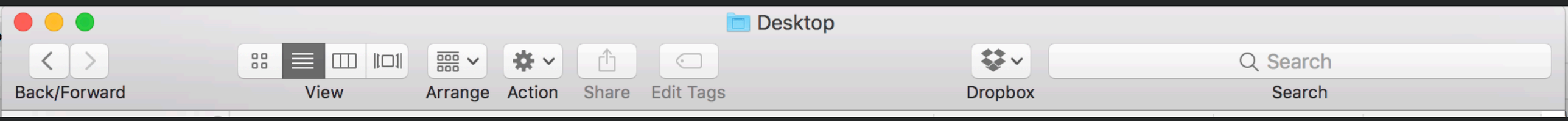
Trade-offs in Simplicity



OSX c.2010

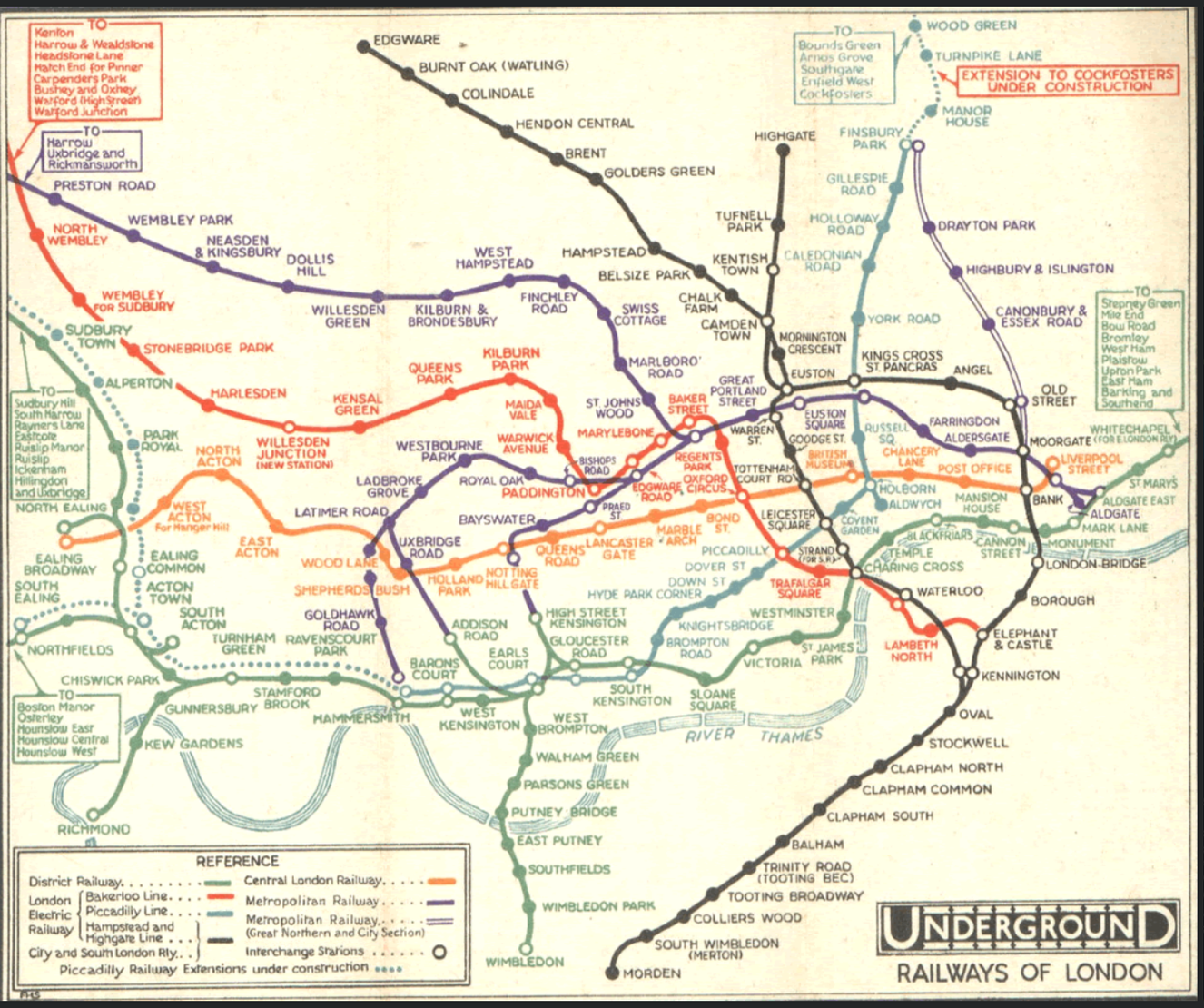


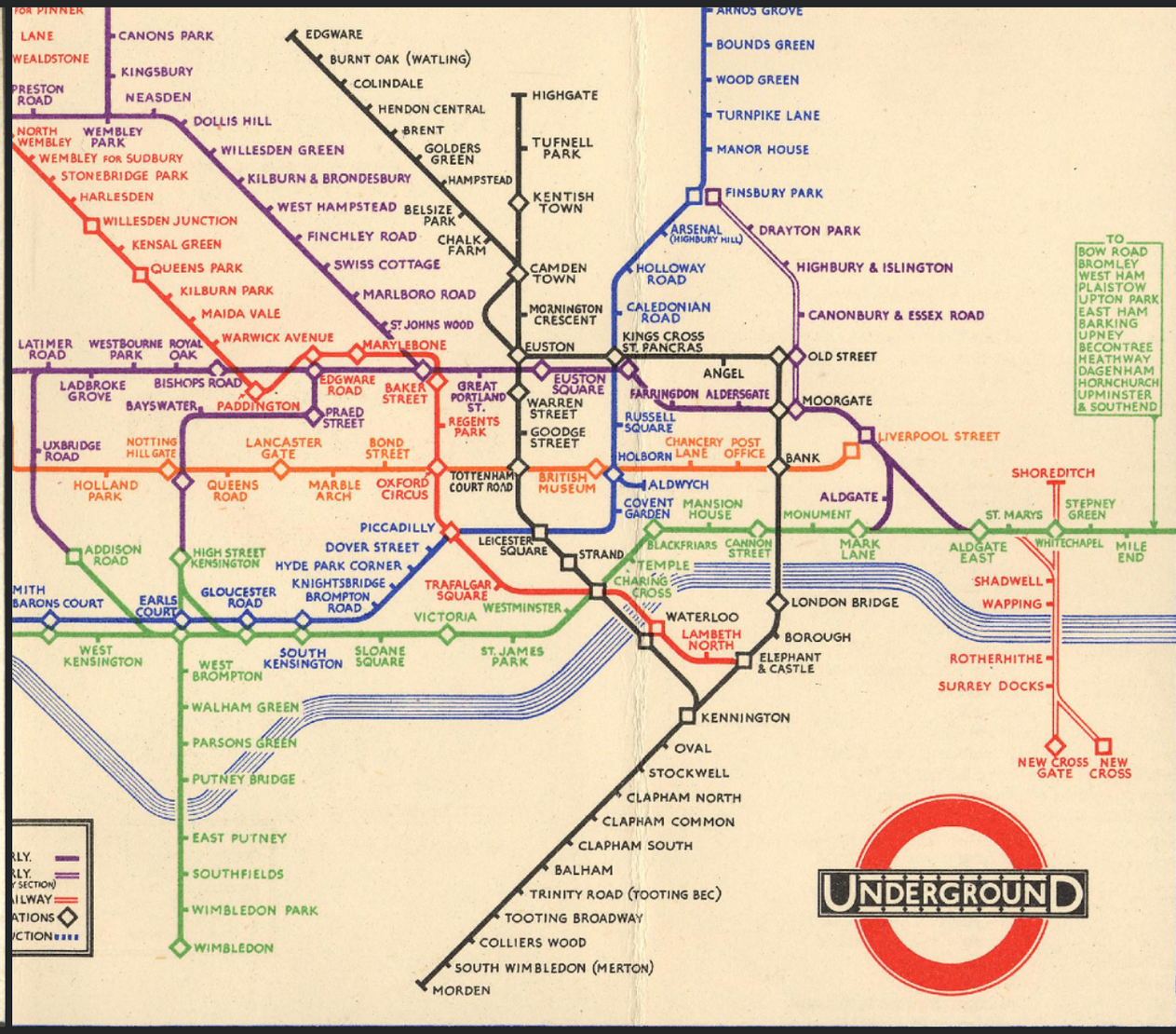
OSX c.2011



OSX c.2016

Guidelines for Visual Design





Reduction in new map: relative distances don’t matter

Regularizing the Elements of a Design

- Reduce information by repeating elements according to a rule, principle or rhythm
- Enable user to scan ahead
- Use irregularity where needed to clarify that something is irregular!

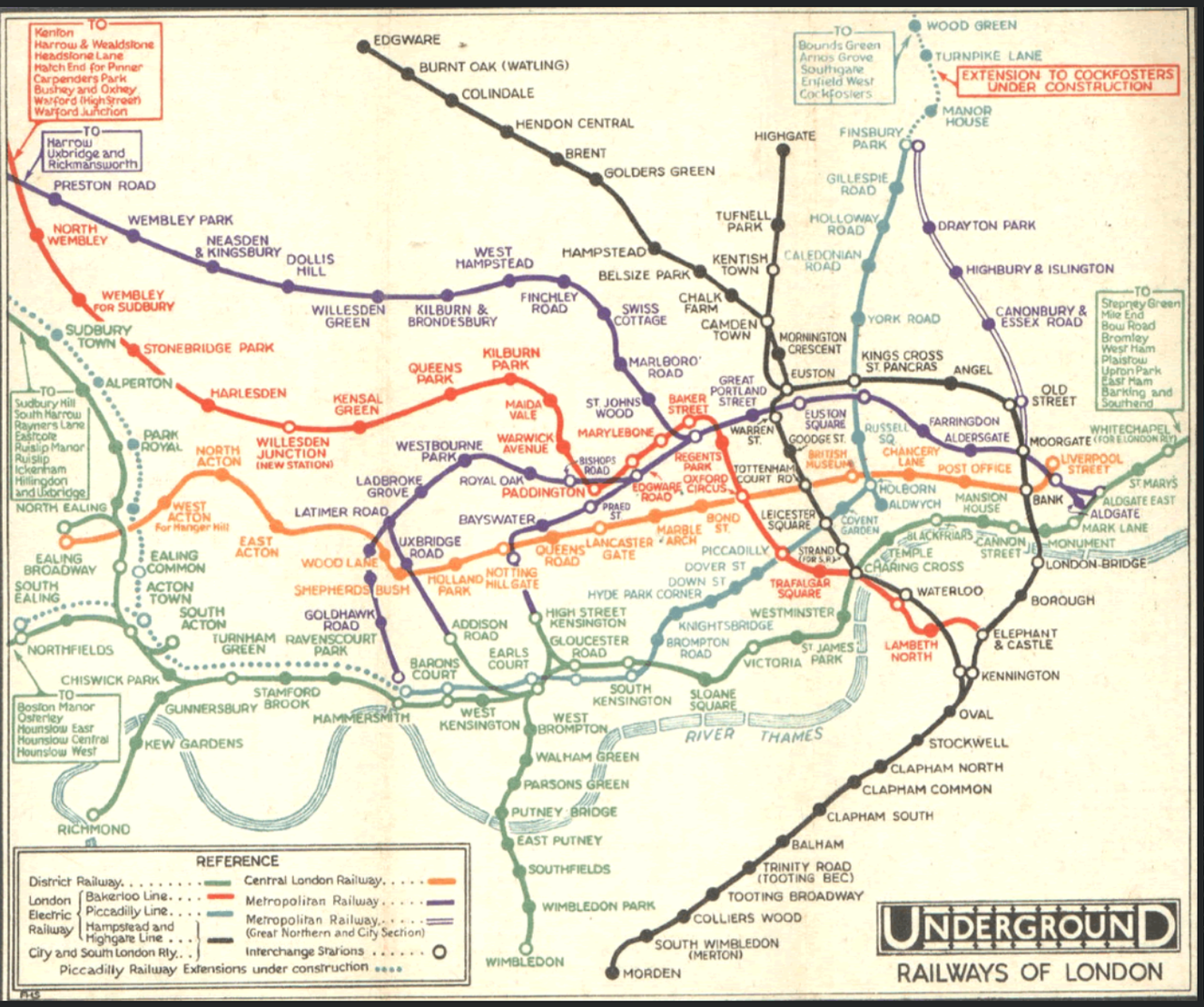
1. Use ***regular*** geometric forms, simplified controls, muted colors where possible

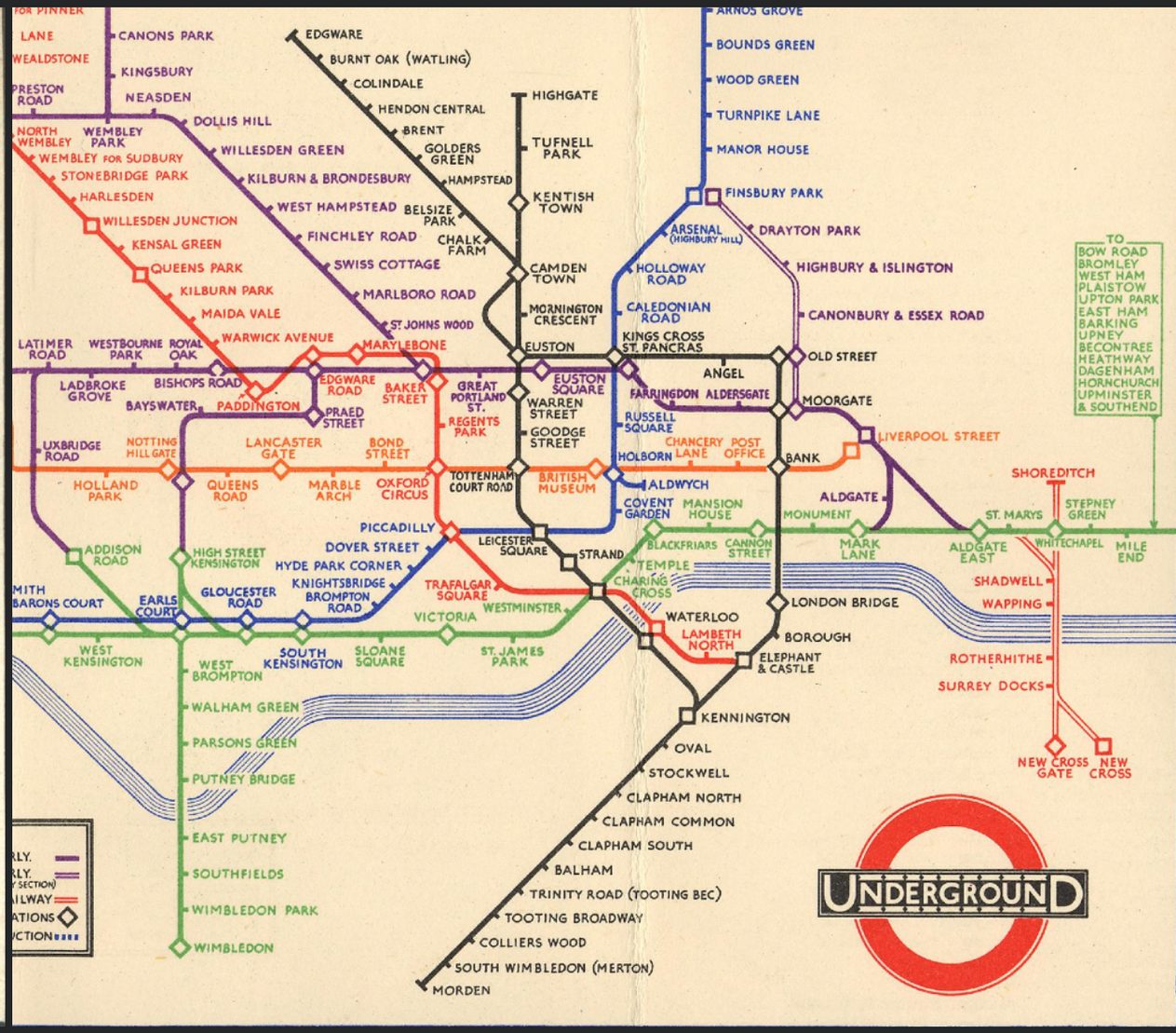
2. If multiple similar forms required, make them ***identical*** as much as possible in size, shape, color, texture, spacing, alignment

3. ***Limit variation*** in typography to a few sizes

4. Make sure critical elements intended to stand out are ***not*** regularized

Guidelines for Visual Design

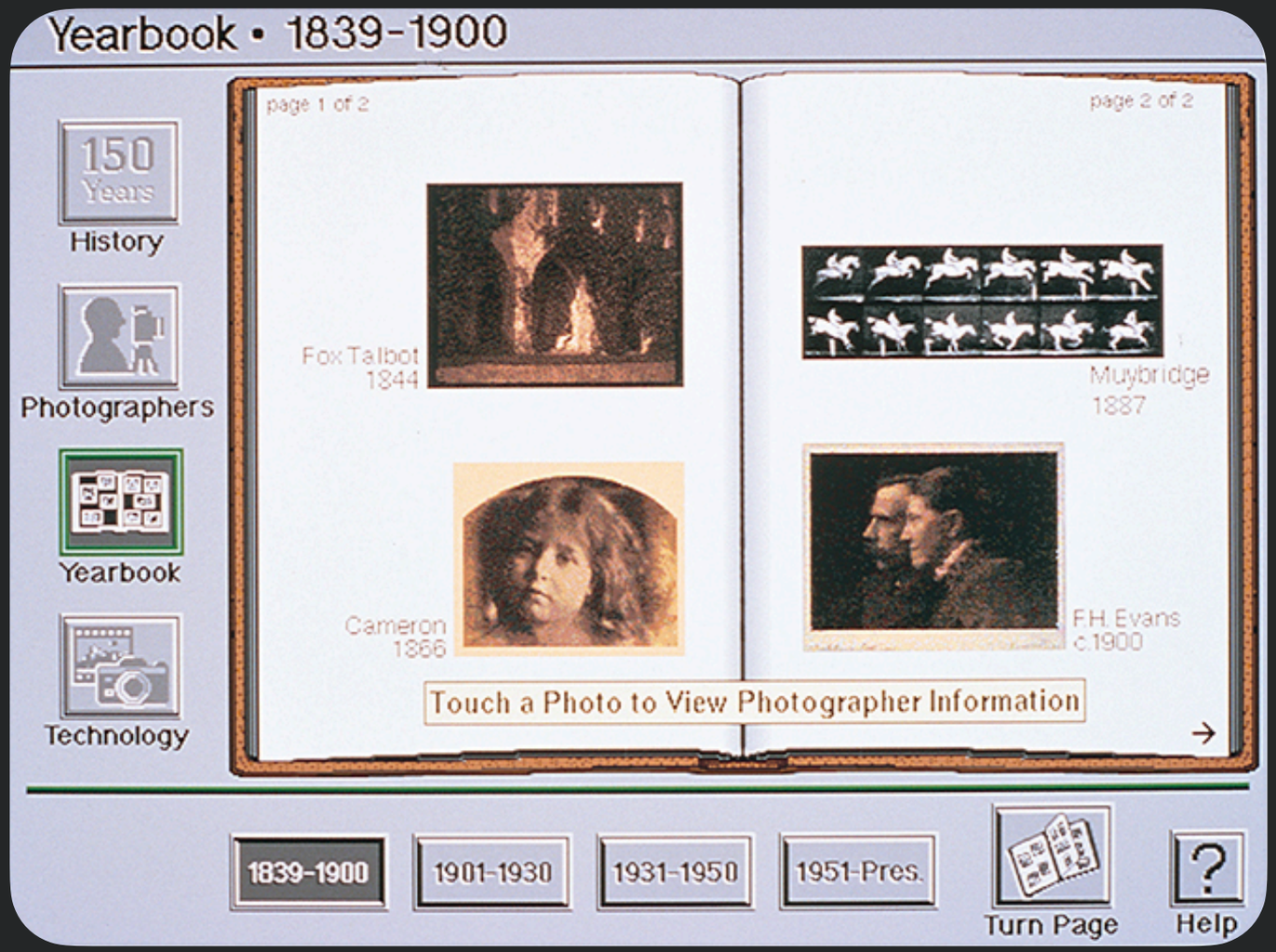




Regularization in new map: Straight lines result in station names laid out in a line, rather than bouncing around

Error - Excessive Skeuomorphism

- Skeuomorphism - making visual design resemble reality (like metaphors)
- Excessive skeuomorphism is distracting and wastes potential visual bandwidth that could encode meaningful information
- Trend towards "flat" interfaces



July 2013

Wednesday July 3

Ted Faszer's Birthday all-day

Mike Yutzy's Birthday all-day

Thursday July 4

Cherie Yvette's Birthday all-day

Monday July 15

Allie Johnson's Birthday all-day

Dr Stoll 8:45 AM to 9:45 AM

Thursday July 18

Richard Gintowt's Birthday all-day

Jacks birthday 11 AM to Noon

Monday July 22

Alisha Campbell's Birthday all-day

Saturday July 27

Ted Faszer's Birthday

Details

Wednesday, July 3, 2013

all-day events

Mike Yutzy's Birthday

Ted Faszer's Birthday

2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM

November 2016

Day | Week | Month | Year

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		• SWE 432 Noon				
20	21 • SWE meeting 11 AM	22 • Office Hours 10:30 AM • SWE 432 Noon	23	24 • SWE 432 Noon	25	26
27	28	29 • Office Hours 10:30 AM • SWE 432 Noon	30			
				Dec 1 • SWE 432 Noon	2	3
4	5	6 • Office Hours 10:30 AM • SWE 432 Noon	7	8 • SWE 432 Noon	9	10
11	12	13 • Office Hours 10:30 AM	14	15	16	17

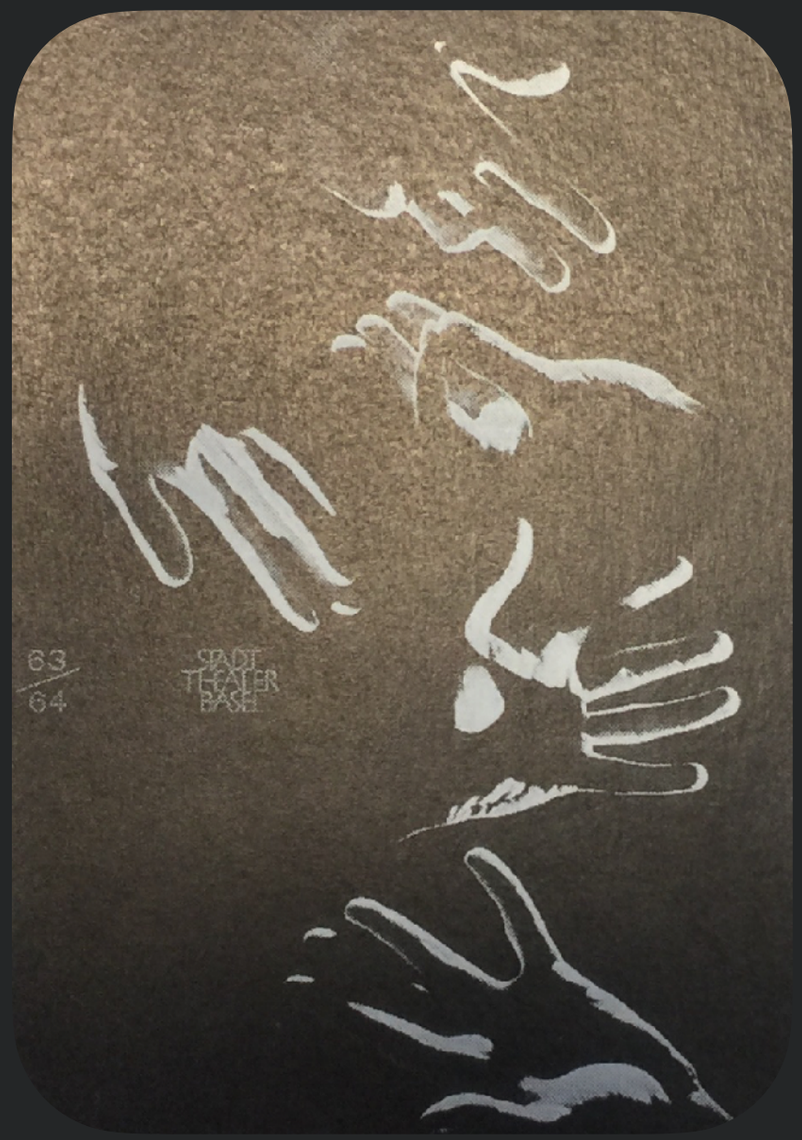
Scale, Contrast, & Proportion

Scale, Contrast, & Proportion

Information consists of differences that make a difference.
(Edward Tufte, Envisioning Information)

Individual visual variables of design that encode information

Terminology



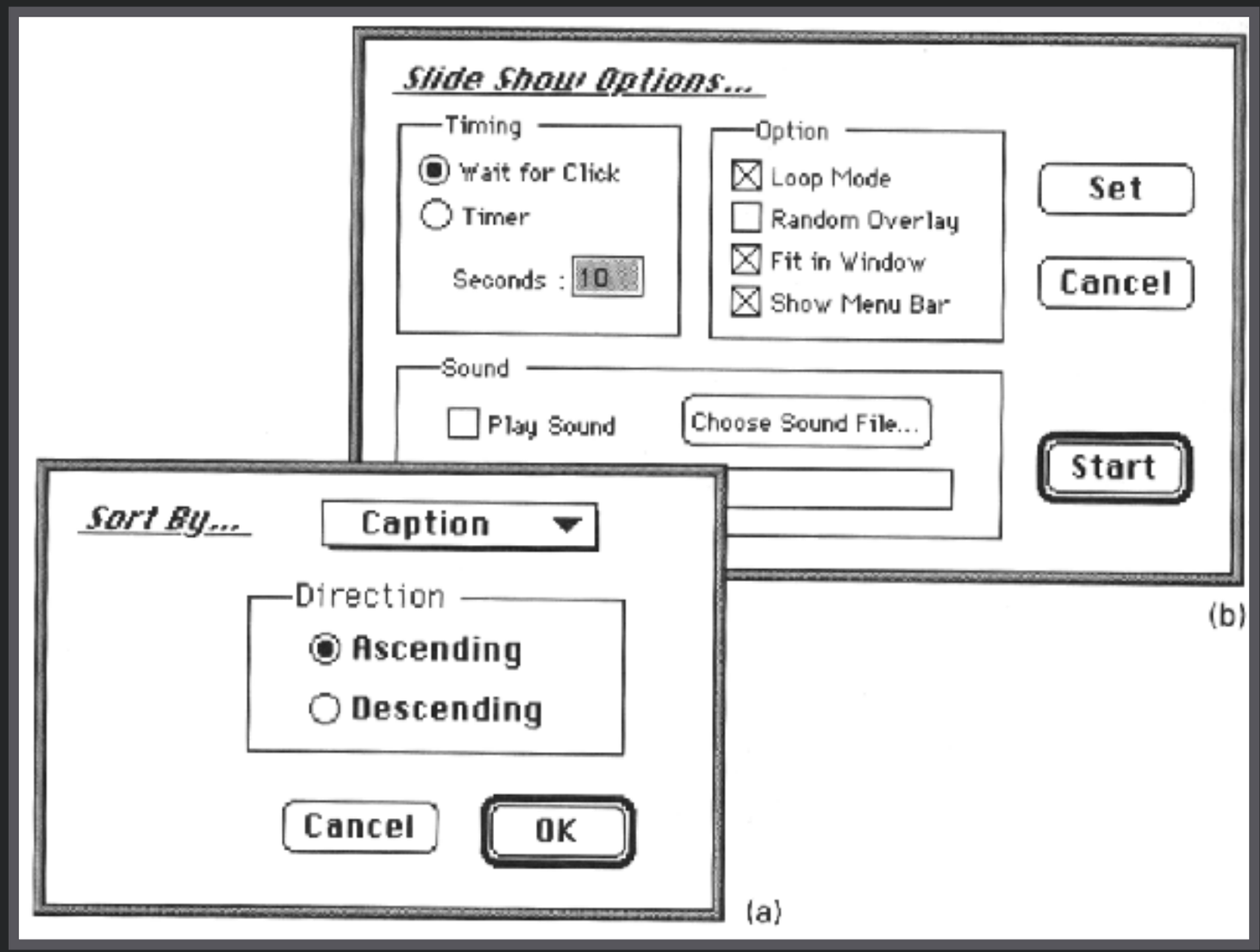
- Scale - ***relative*** size or magnitude of element in comparison to related elements
- Contrast - visually noticeable ***distinctions*** along a common visual dimension
- Proportion - ratio and ***balance*** between elements
- Emphasis - contrasts can emphasize important elements or areas & add visual ***interest*** by creating tension & drama

Principles

- ***Clarity*** - contrasts should be clear and easily differentiated, not slight and subtle
- ***Harmony*** - proportions and ratios should be harmonious
- ***Activity*** - use contrasts to maintain orientation & context within design
- ***Restraint*** - contrasts should be conscious, strong, few in number, and never overwhelming

Error - Excessive Typographic Contrasts

5 different types sizes in 3 different fonts (!!)



Layers

- Contrasting color, value, texture can segregate information into separate layers

- Supports ***overlapping*** information in displays, allowing selective processing of specific sets of elements

- Allows different layers to be read and interpreted ***separately***

Creating Layers

1. Group items into categories based on intended use

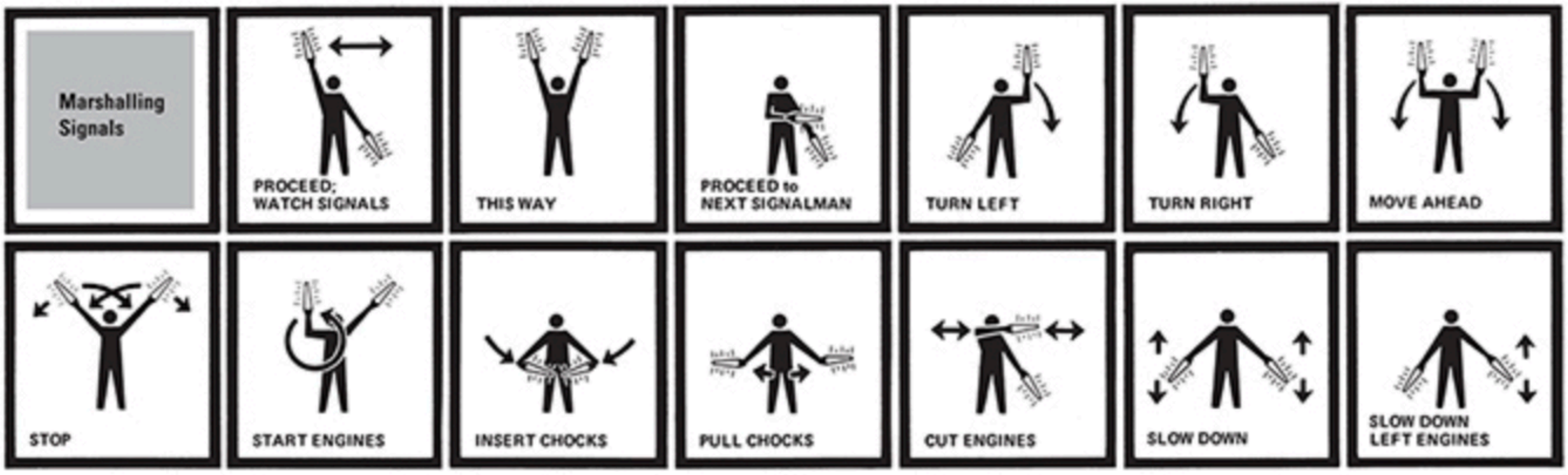
2. Determine rank & importance of groups

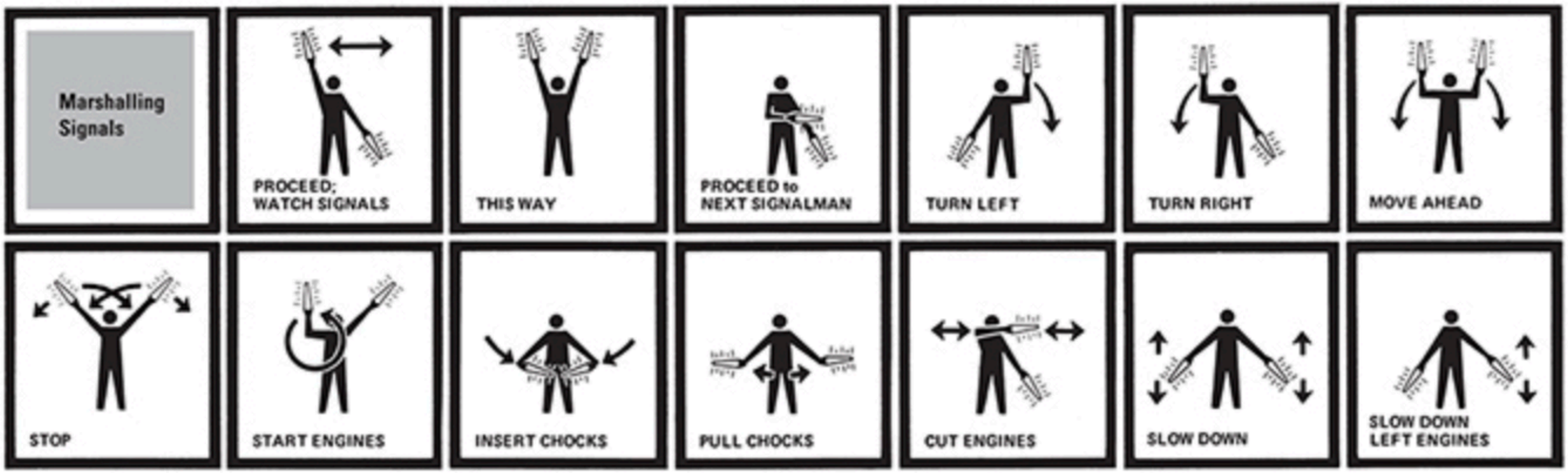
3. Use perceptual variables (size, value, hue, etc.) to establish layering effect

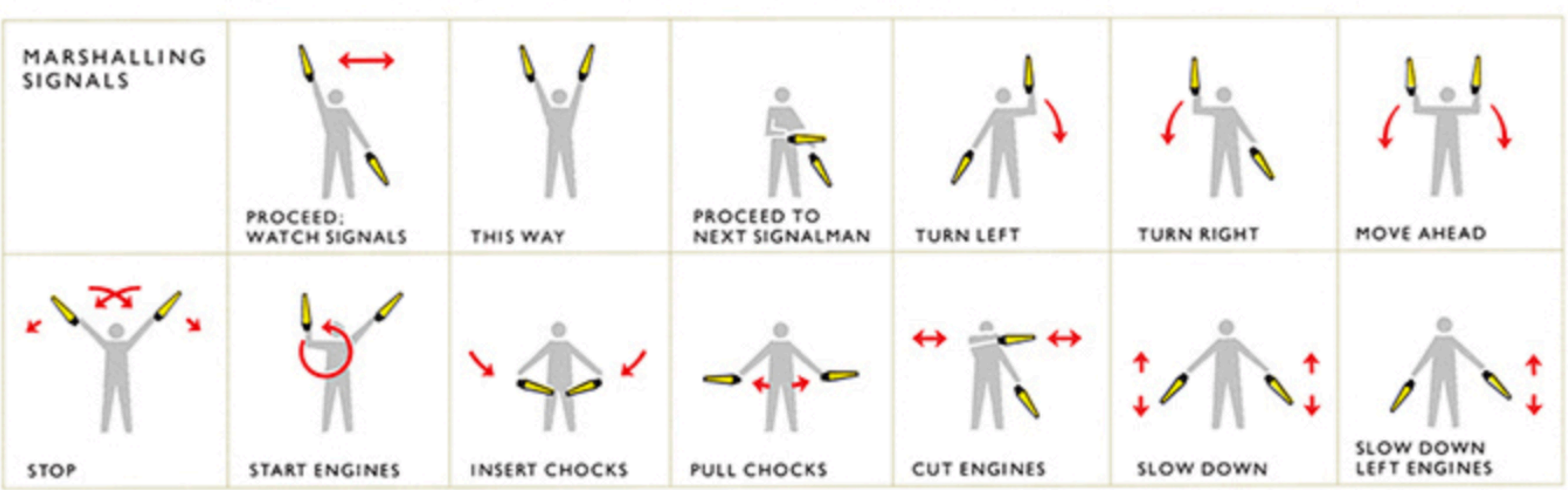
4. Maximize differences between groups while minimizing differences within groups

5. Use squint test to ensure elements in group retain together but visually separated

Layers


Marshalling Signals
PROCEED; WATCH SIGNALS
THIS WAY
PROCEED to NEXT SIGNALMAN
TURN LEFT
TURN RIGHT
MOVE AHEAD
STOP
START ENGINES
INSERT CHOCKS
PULL CHOCKS
CUT ENGINES
SLOW DOWN
SLOW DOWN LEFT ENGINES


Marshalling Signals
PROCEED; WATCH SIGNALS
THIS WAY
PROCEED to NEXT SIGNALMAN
TURN LEFT
TURN RIGHT
MOVE AHEAD
STOP
START ENGINES
INSERT CHOCKS
PULL CHOCKS
CUT ENGINES
SLOW DOWN
SLOW DOWN LEFT ENGINES


MARSHALLING SIGNALS
PROCEED; WATCH SIGNALS
THIS WAY
PROCEED TO NEXT SIGNALMAN
TURN LEFT
TURN RIGHT
MOVE AHEAD
STOP
START ENGINES
INSERT CHOCKS
PULL CHOCKS
CUT ENGINES
SLOW DOWN
SLOW DOWN LEFT ENGINES

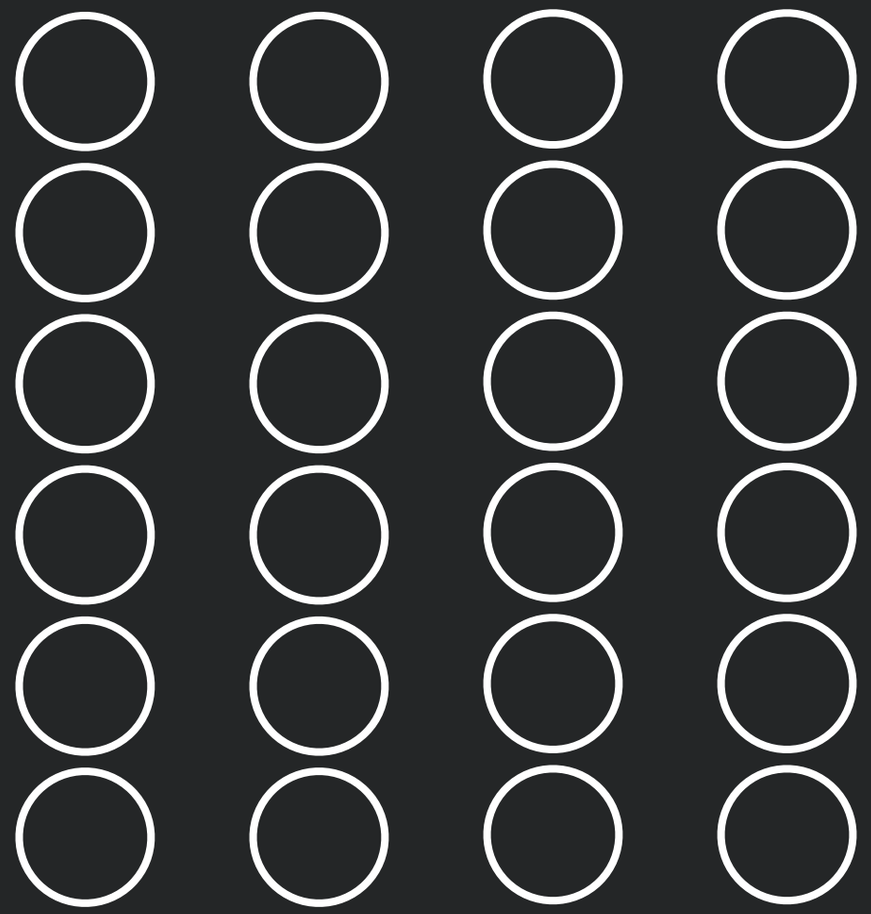
Organization & Structure

Organization & Structure

- Organization needs to be ***designed***
- Benefits
  - Unity - ties together related elements so that they work **together**
  - Integrity & readability - offers structure that helps user to easily scan & make comparisons
  - Control - determines where user will focus **attention** in the design
- Gestalt -> psychology of perception

Gestalt Principle - Proximity

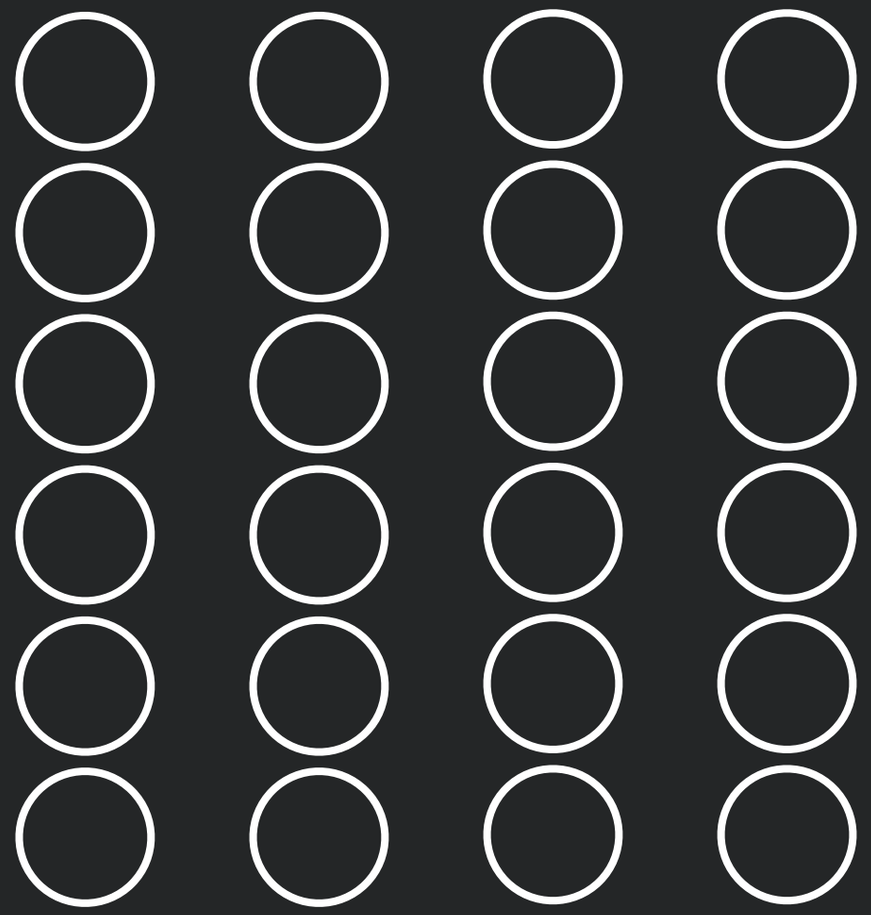
- Elements associated ***most*** strongly w/ nearby elements



Gestalt Principle - Proximity

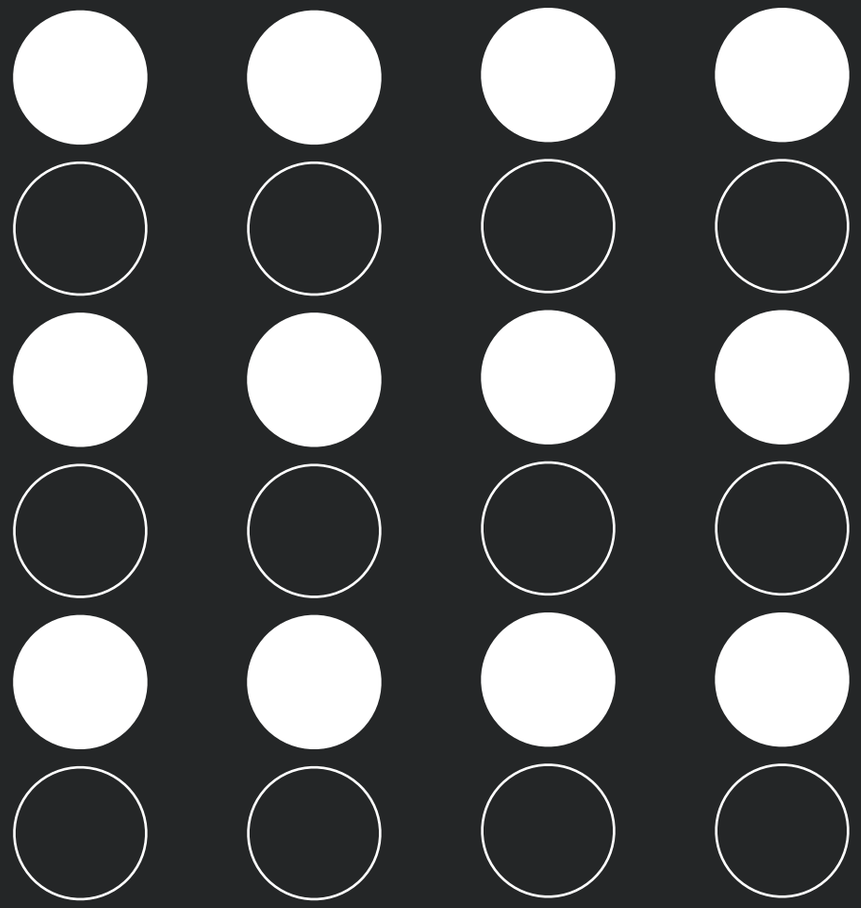
- Elements associated ***most*** strongly w/ nearby elements

parsed as 4 columns based on close vertical spacing
then parsed as two sets of two columns based on spacing



Gestalt Principle - Similarity

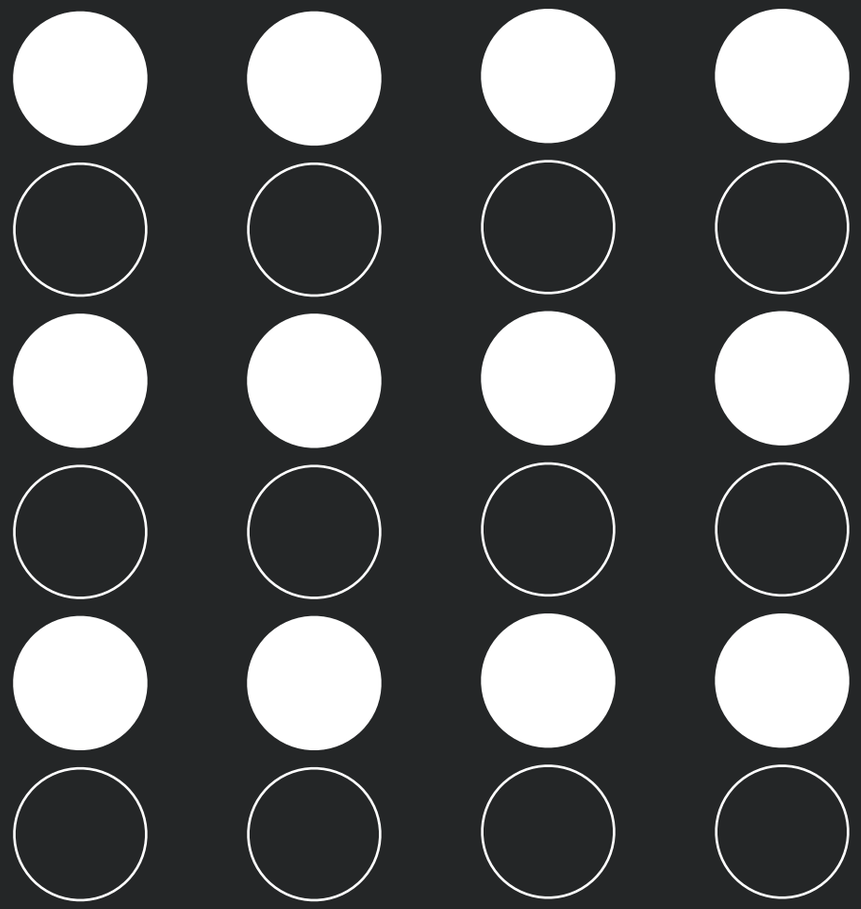
- Elements associated more strongly when share common visual attributes than when they differ



Gestalt Principle - Similarity

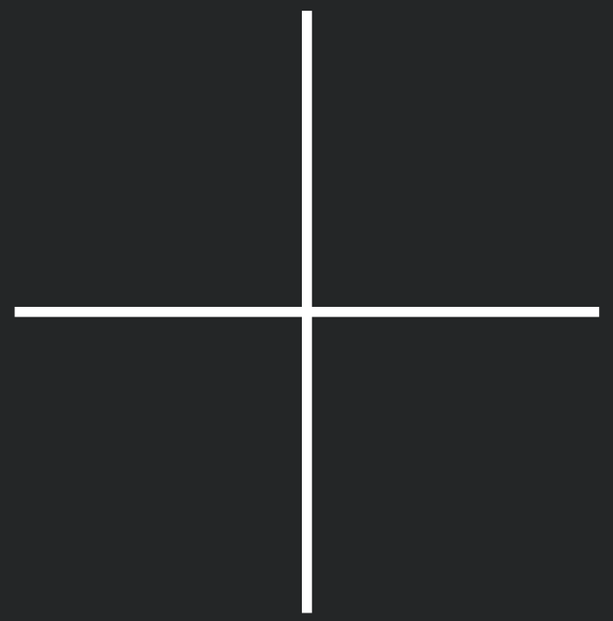
- Elements associated more strongly when share common visual attributes than when they differ

parsed as rows based on fill similarity, despite closer column spacing



Gestalt Principle - Continuity

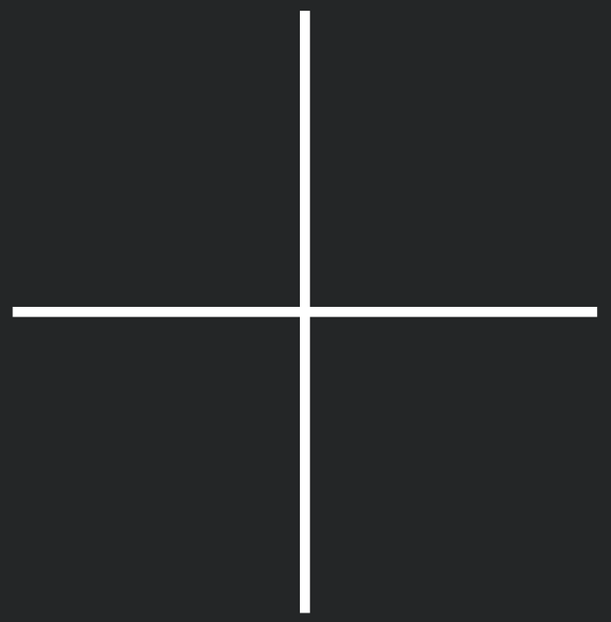
- Preference for ***simplest*** physical explanation of complex figure



Gestalt Principle - Continuity

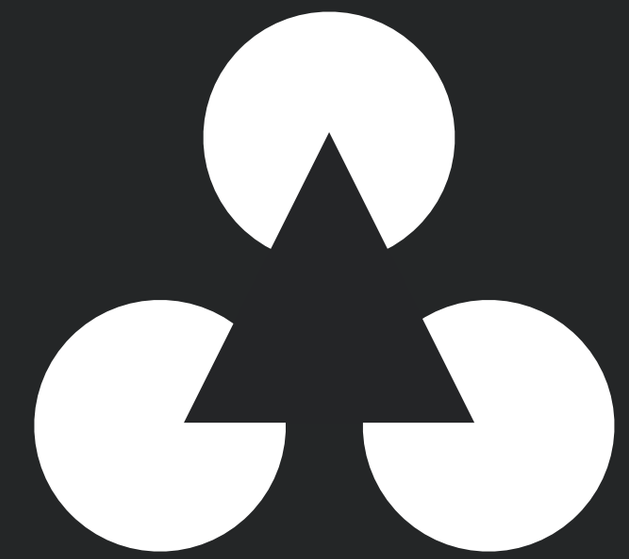
- Preference for ***simplest*** physical explanation of complex figure

parsed as two lines, rather than 4 separate lines or 4 opposing angles



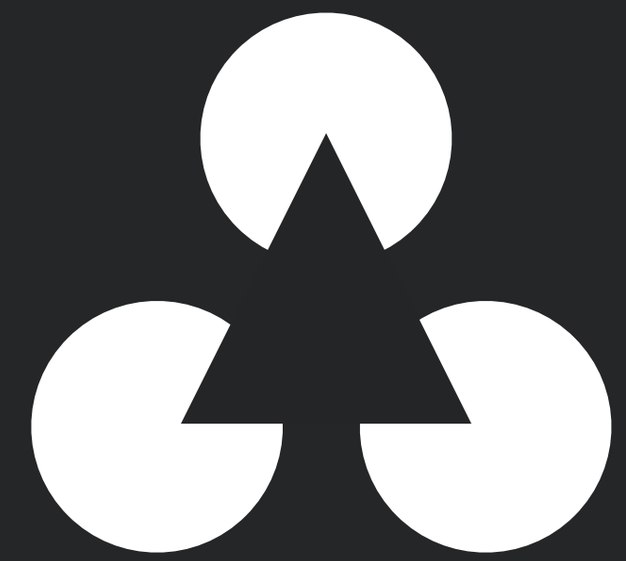
Gestalt Principle - Closure

- Preference to interpret figures as complete, even when missing information



Gestalt Principle - Closure

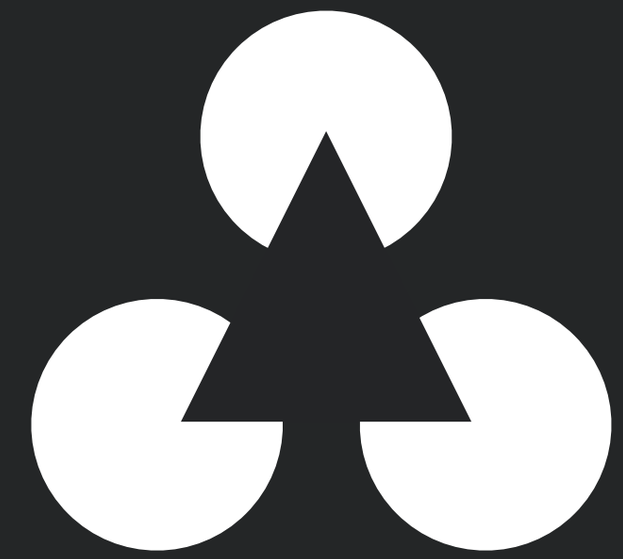
- Preference to interpret figures as complete, even when missing information



Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present

Gestalt Principle - Closure

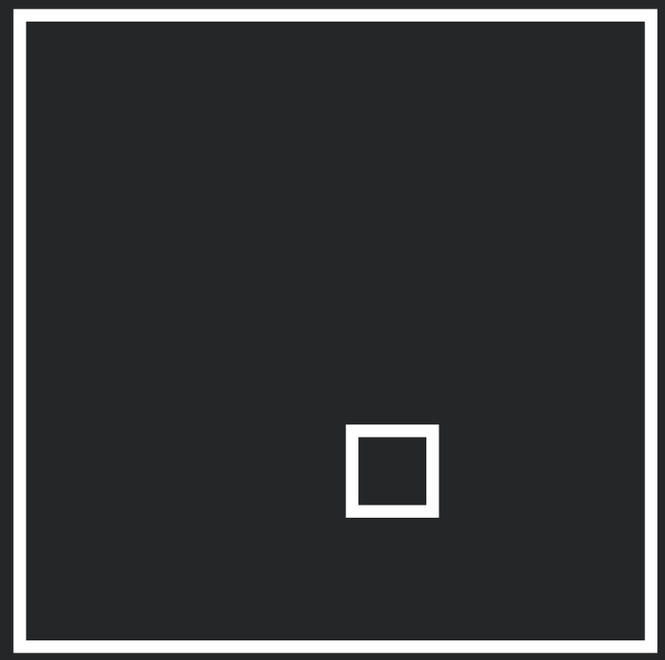
- Preference to interpret figures as complete, even when missing information



Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present

Gestalt Principle - Area

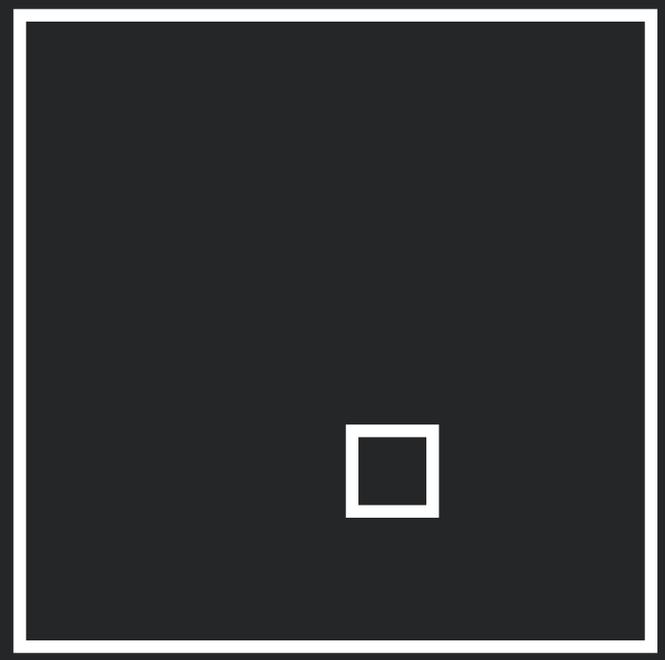
- Preference to interpret smaller overlapping elements as figure, larger as ground



Gestalt Principle - Area

- Preference to interpret smaller overlapping elements as figure, larger as ground

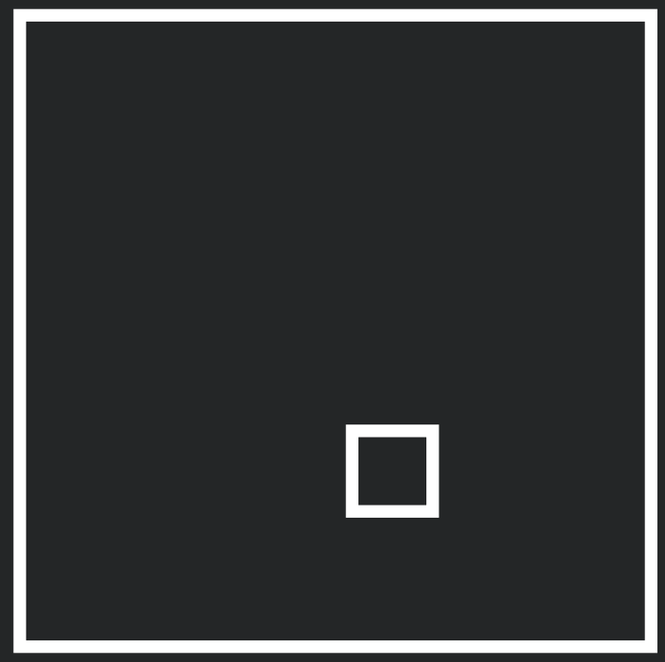
Small rectangle parsed as small rectangle on top of larger, rather than hole



Gestalt Principle - Area

- Preference to interpret smaller overlapping elements as figure, larger as ground

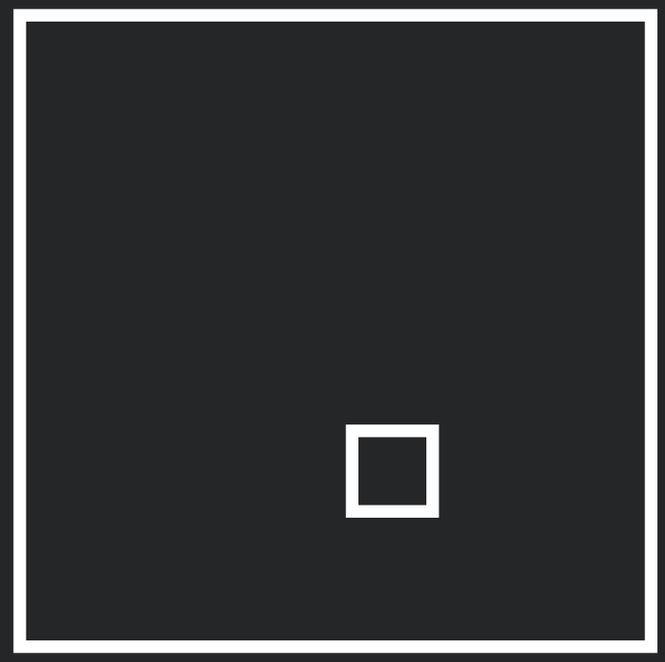
Small rectangle parsed as small rectangle on top of larger, rather than hole



Gestalt Principle - Area

- Preference to interpret smaller overlapping elements as figure, larger as ground

Small rectangle parsed as small rectangle on top of larger, rather than hole



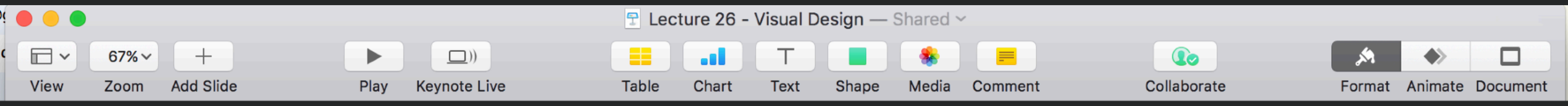
Gestalt Principle - Symmetry

- Preference to interpret ambiguous form as multiple symmetric elements

Parsed as two overlapping objects rather than 3 separate shapes

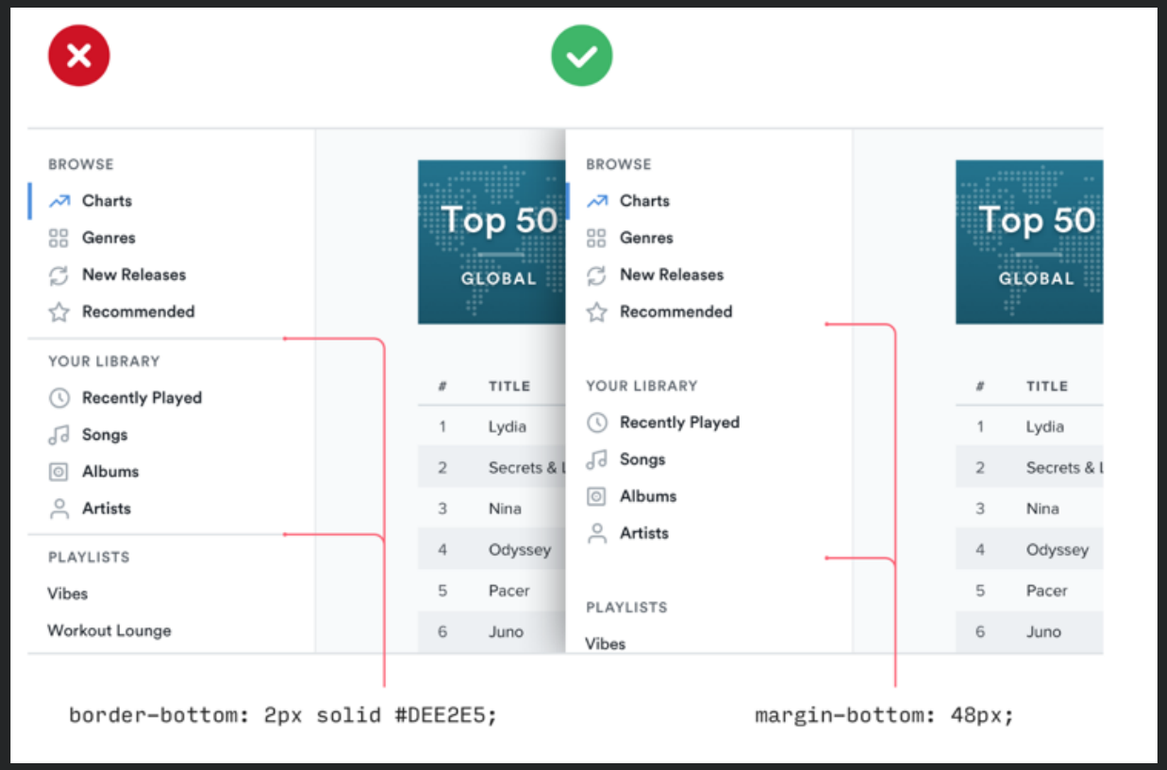
Grouping

- Binding UI elements tightly together while distinguishing them from surrounding controls
- “Showing” note “telling”
- Can be achieved through
  - Bounding boxes (not recommended)
  - Negative space & contrasts
  - Arrangement & alignment

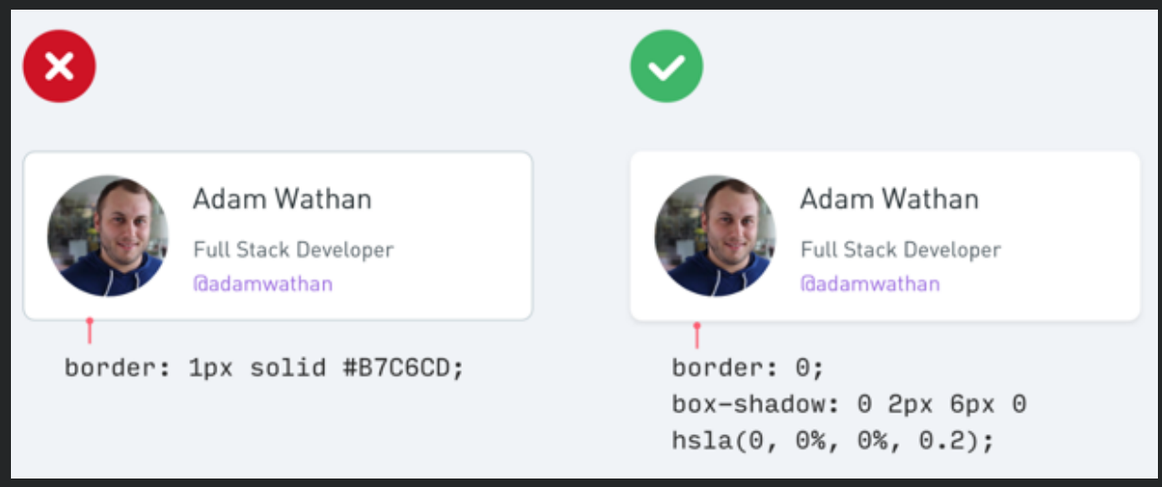


Use Fewer Borders

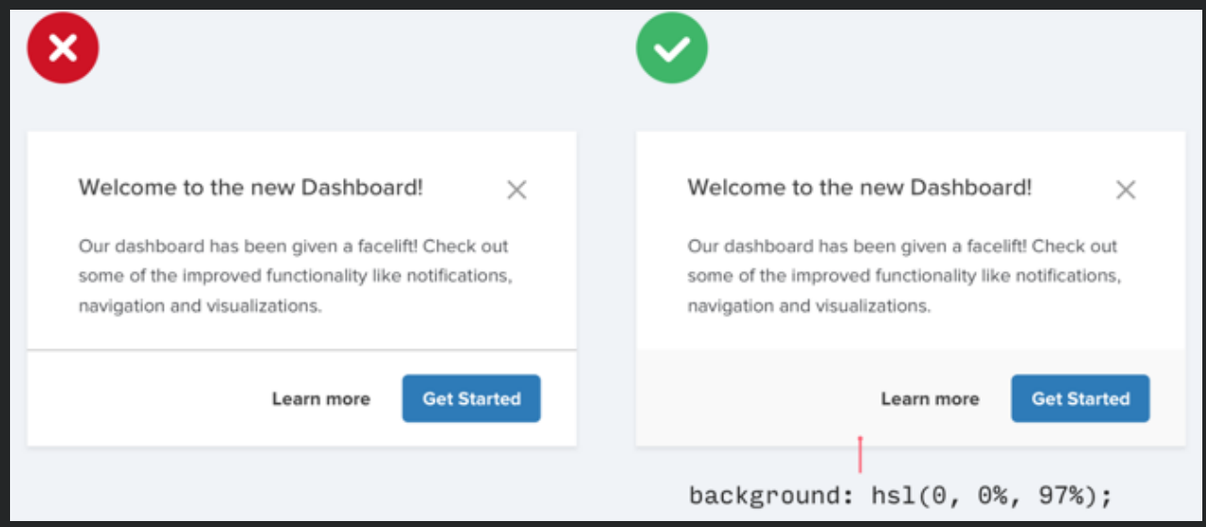
https://medium.com/refactoring-ui/7-practical-tips-for-cheating-at-design-40c736799886



negative space



box shadows



different backgrounds

Hierarchy

Order groups based on perceptual prominence corresponding to intended reading sequence

Can help solve “skimming” problems

Structure can help people focus attention on key parts

Key points might **get lost though.**

Hierarchy

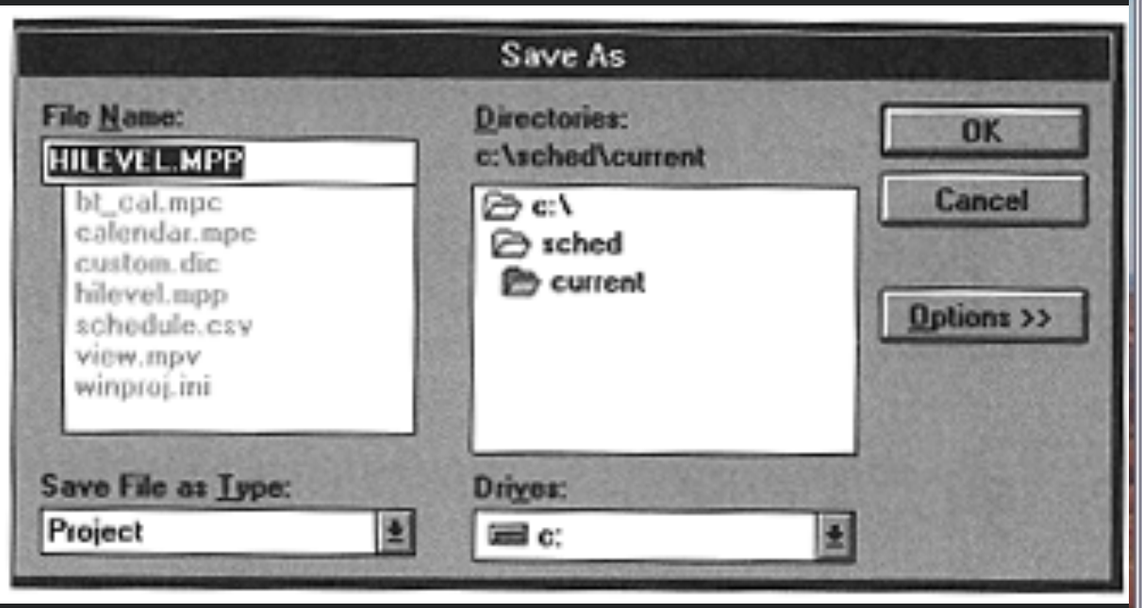
Order groups based on perceptual prominence corresponding to intended reading sequence

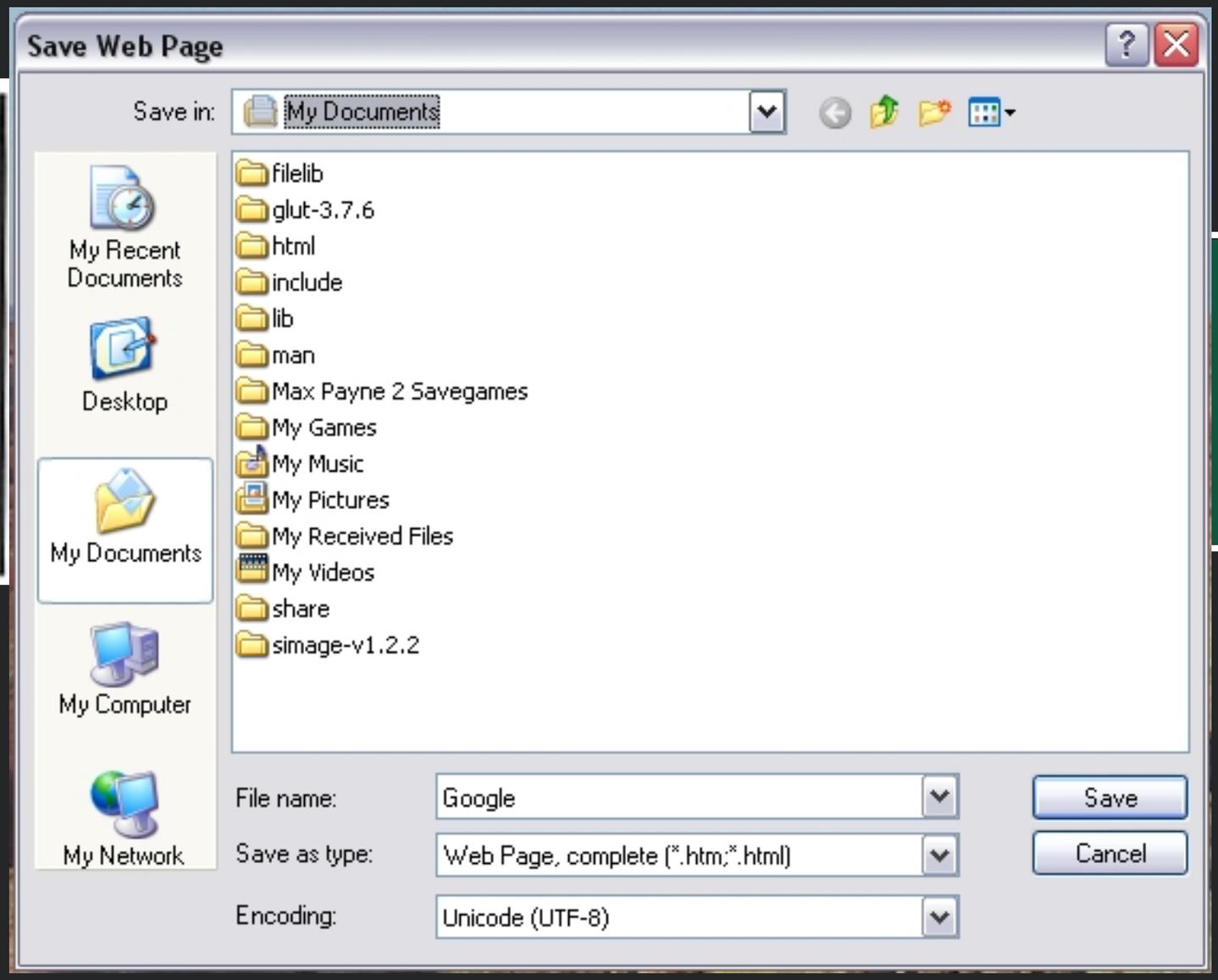
Can help solve “skimming” problems

Structure can help people focus attention on key parts

Key points might **get lost though.**

But bolding helps! Plus this obnoxious red arrow and text in a totally different font!


Save As
File Name:
HILEVEL.MPP
bt_cal.mpc
calendar.mpc
custom.dic
hilevel.mpp
schedule.csv
view.mpv
winproj.ini
Directories:
c:\sched\current
c:\
sched
current
OK
Cancel
Options >>
Save File as Type:
Project
Drives:
c:


Save Web Page
Save in:
My Documents
My Recent Documents
Desktop
My Documents
My Computer
My Network
filelib
glut-3.7.6
html
include
lib
man
Max Payne 2 Savegames
My Games
My Music
My Pictures
My Received Files
My Videos
share
simage-v1.2.2
File name:
Google
Save as type:
Web Page, complete (*.htm;*.html)
Encoding:
Unicode (UTF-8)
Save
Cancel

Use Negative Space

- Directs ***attention*** to critical regions of display

1. Review design, prioritizing groups

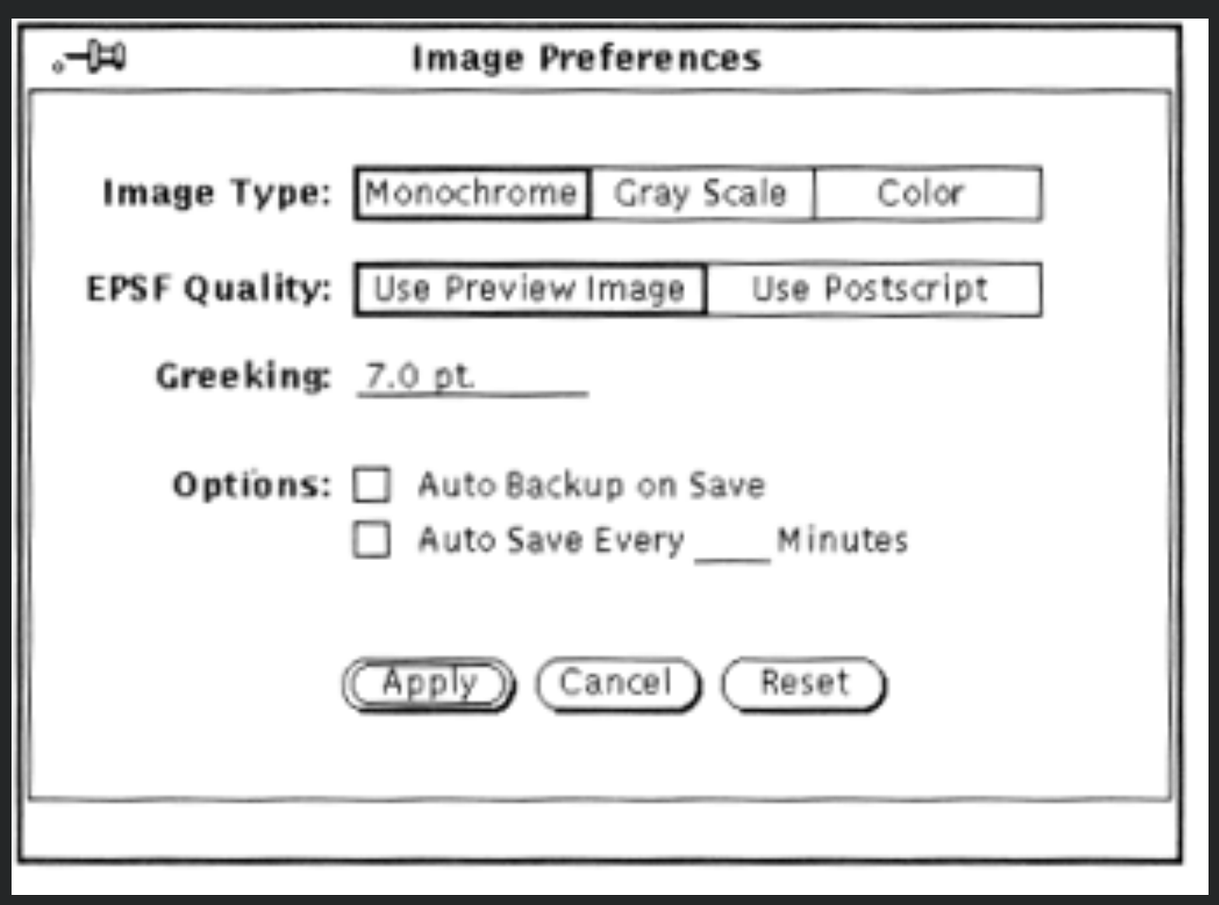
2. Add extra ***space*** to ensure spatial separation & emphasis, particularly for important elements

Use Negative Space

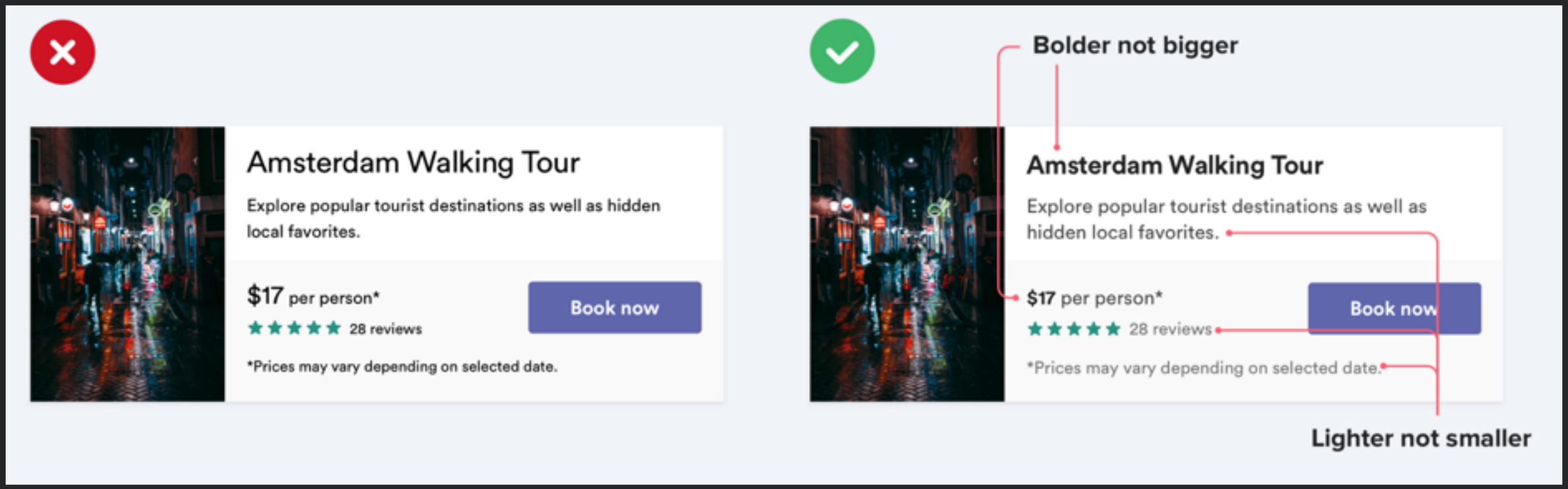
- Directs ***attention*** to critical regions of display

1. Review design, prioritizing groups

2. Add extra ***space*** to ensure spatial separation & emphasis, particularly for important elements

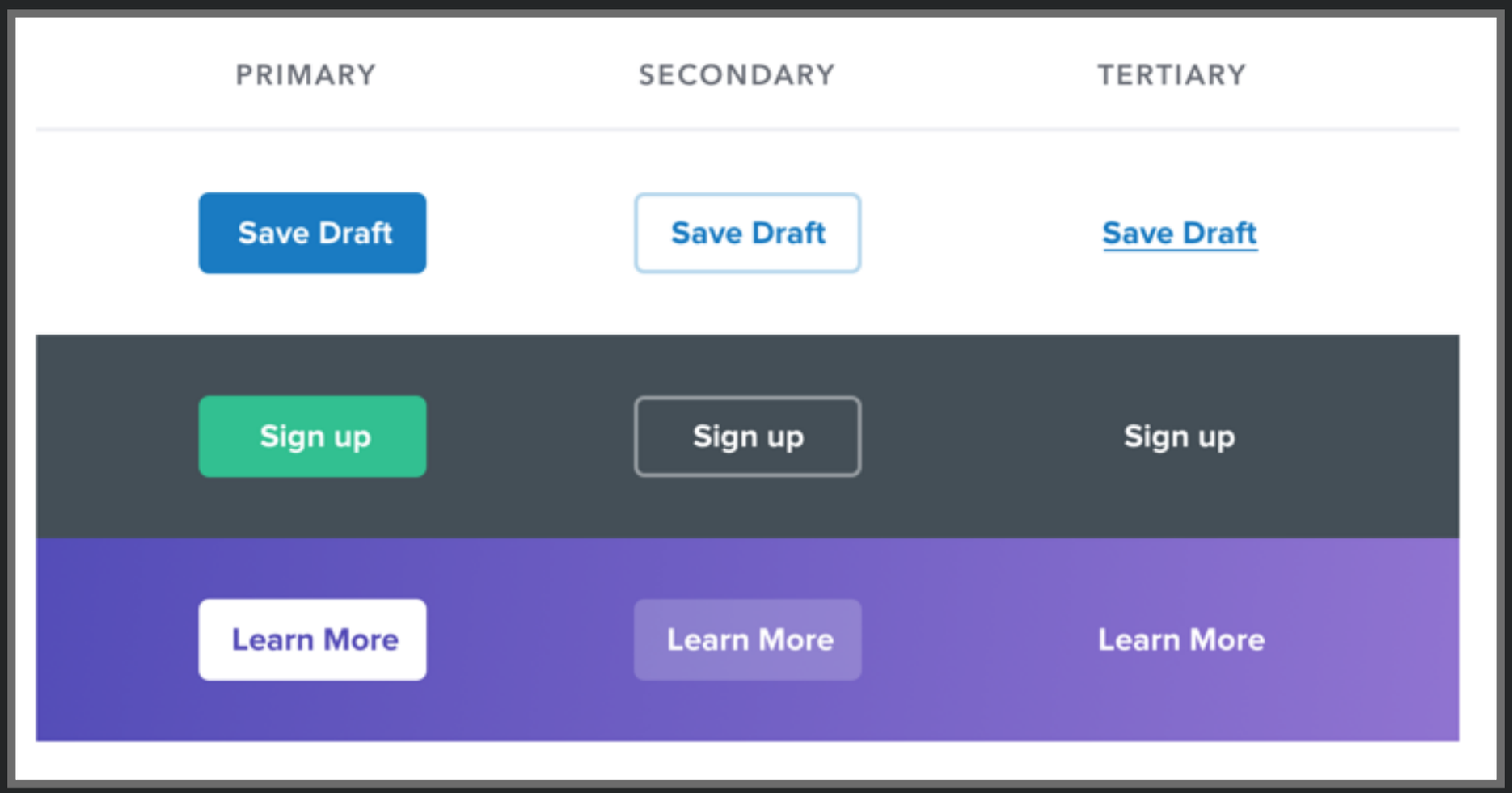


Creating Hierarchy: Color and Weight Instead of Size



https://medium.com/refactoring-ui/7-practical-tips-for-cheating-at-design-40c736799886

Signal Importance of Action



https://medium.com/refactoring-ui/7-practical-tips-for-cheating-at-design-40c736799886

Images & Icons

Images & Icons

- Benefits
  - Identification - images are easy to recognize
  - Expression - breadth of artistic expression that can make design more engaging & enjoyable

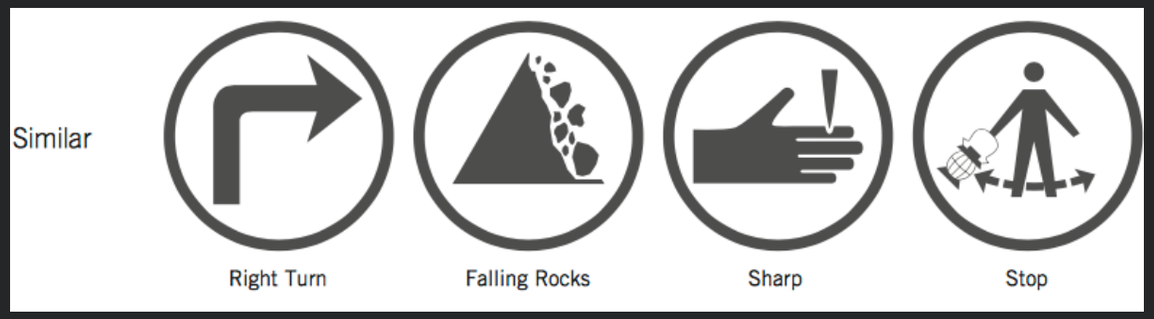
Types of Iconic Representation

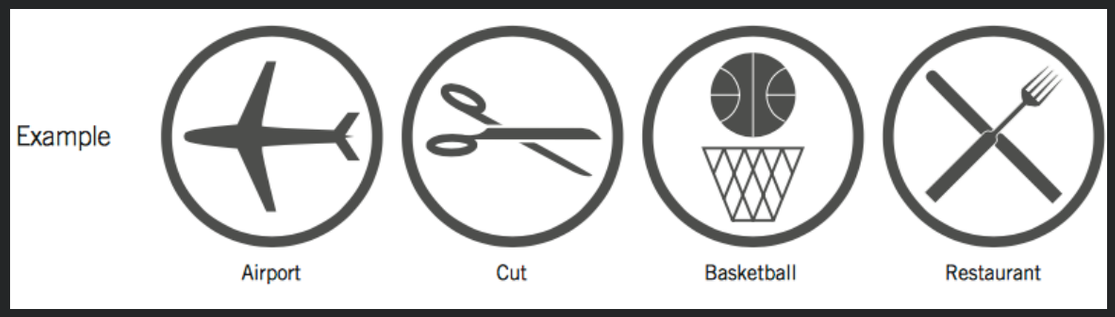
Types of Iconic Representation

- Similar - visually ***analogous*** to action, object, concept

Types of Iconic Representation

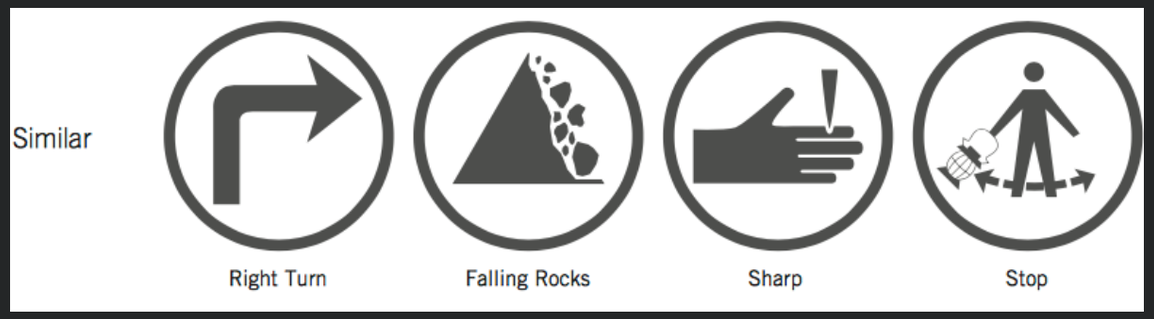
- Similar - visually ***analogous*** to action, object, concept
  - Example - things that exemplify or are commonly associated

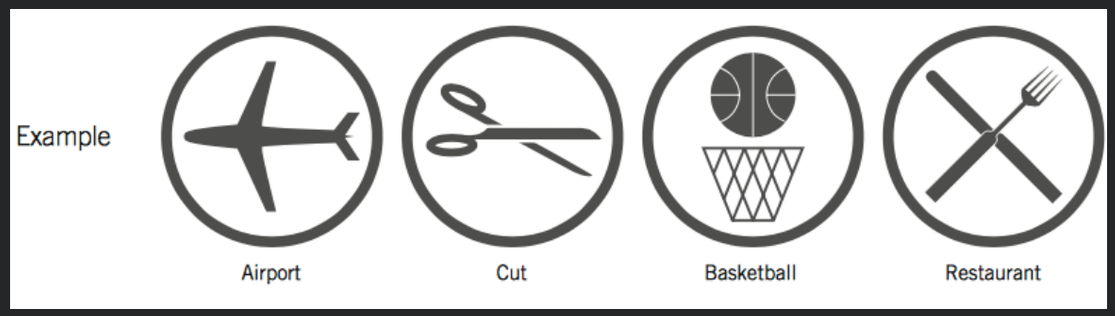


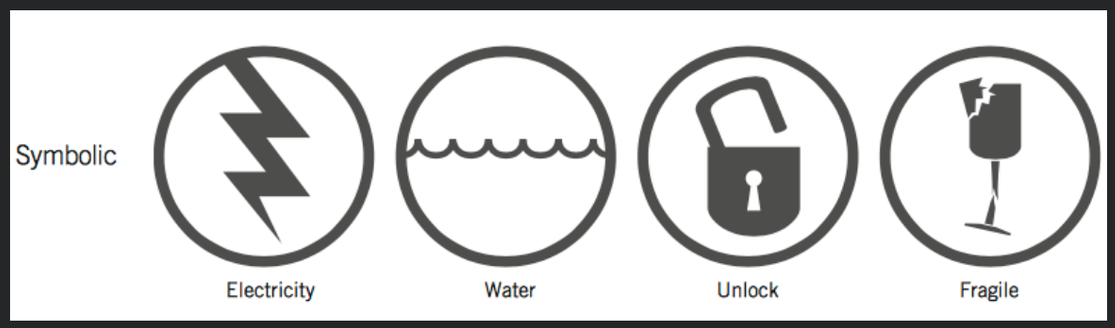


Types of Iconic Representation

- Similar - visually ***analogous*** to action, object, concept
  - Example - things that exemplify or are commonly associated
- Symbolic - represent concept at higher level of ***abstraction***

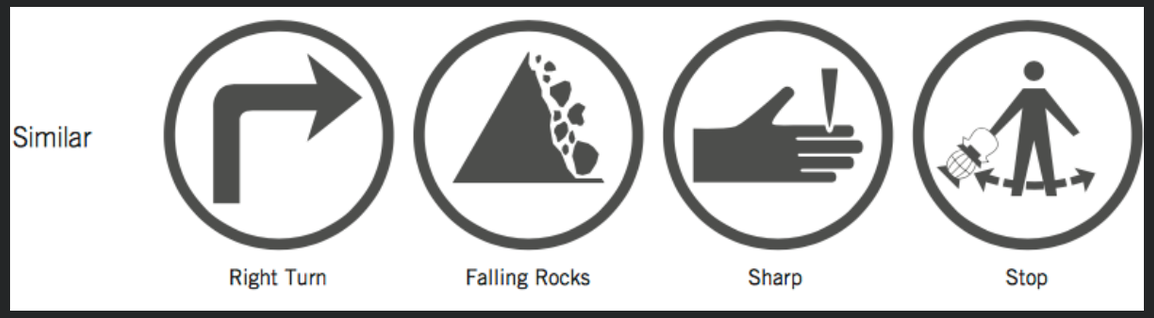


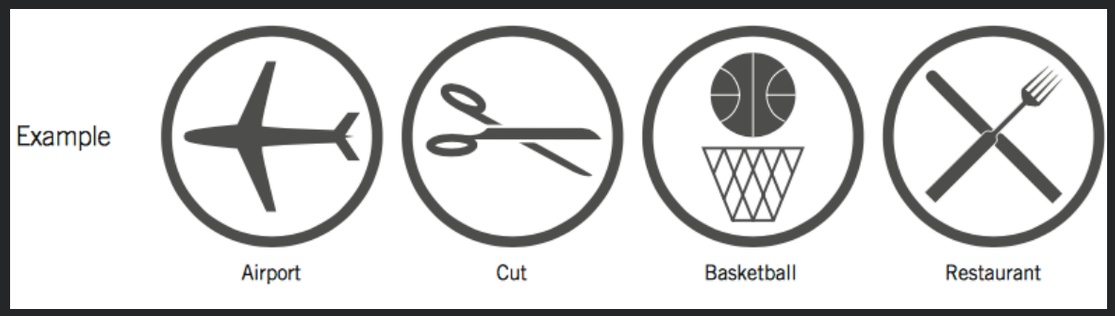


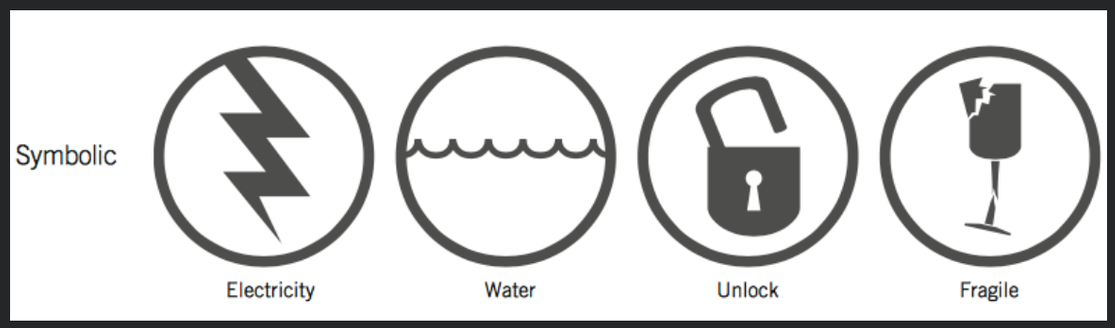


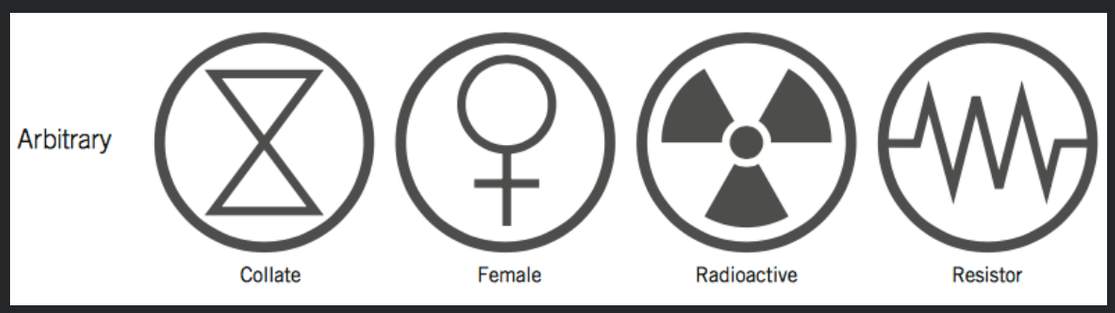
Types of Iconic Representation

- Similar - visually ***analogous*** to action, object, concept
  - Example - things that exemplify or are commonly associated
- Symbolic - represent concept at higher level of ***abstraction***
- Arbitrary - little or no relationship to concept, must be learned through ***standard***









Use of Abstraction

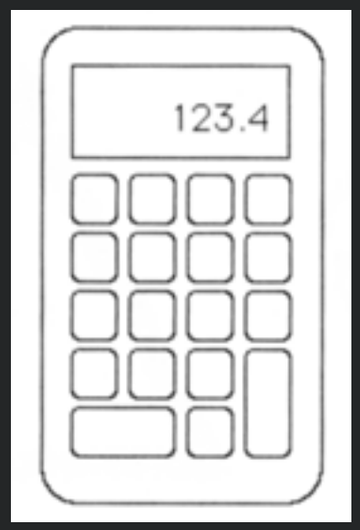
- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex

Use of Abstraction

- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex

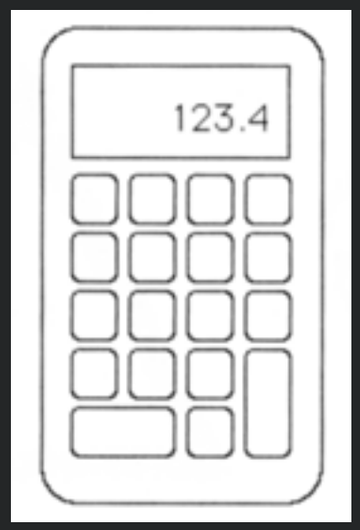
Use of Abstraction

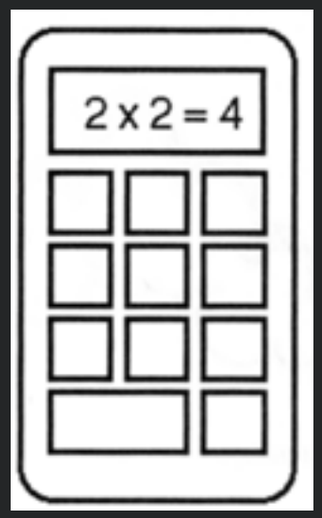
- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex



Use of Abstraction

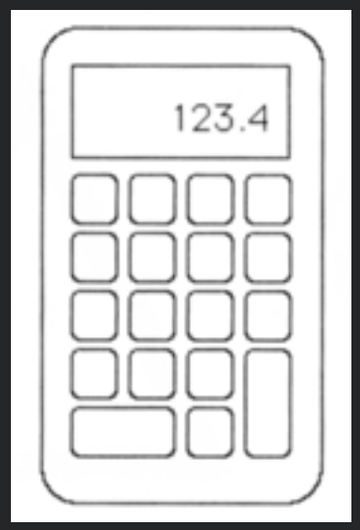
- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex

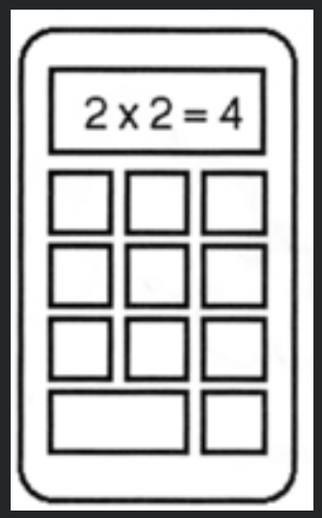


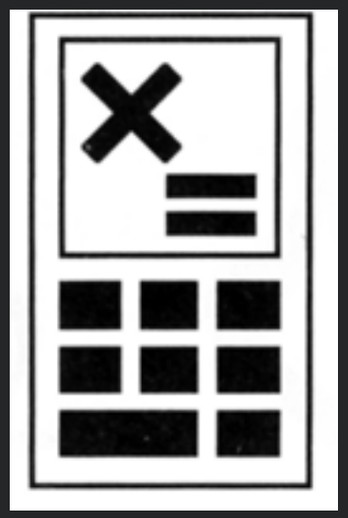


Use of Abstraction

- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex

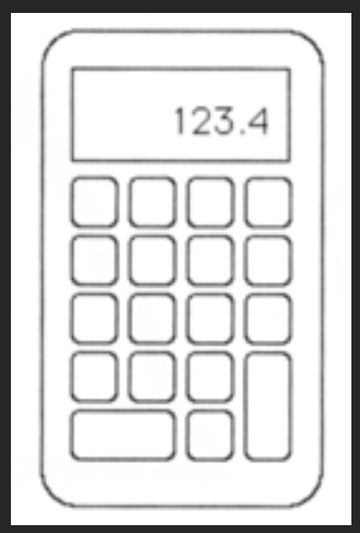


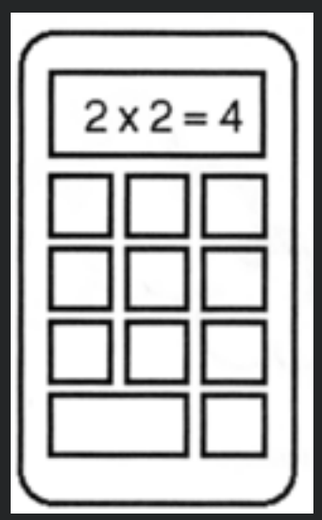


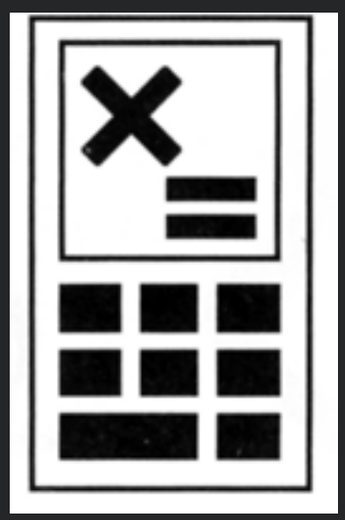


Use of Abstraction

- Simplifying highly concrete, realistic representations makes them easier to interpret up to the point at which further abstraction obscures icon's semantics
- Makes icon more generic, more canonical, less complex







Principles of Icon Design

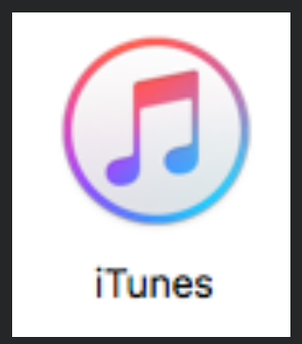
Principles of Icon Design

- Immediacy - can be perceived effortlessly & involuntarily by being ***bold***, clear, balanced

Principles of Icon Design

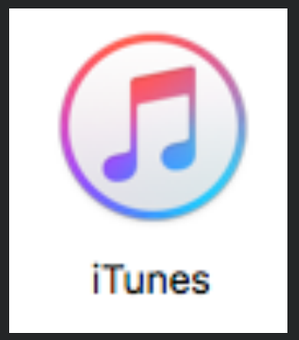
- Immediacy - can be perceived effortlessly & involuntarily by being ***bold***, clear, balanced
- Generality - represents a ***class*** of items, rather than an individual element, by removing details that may vary

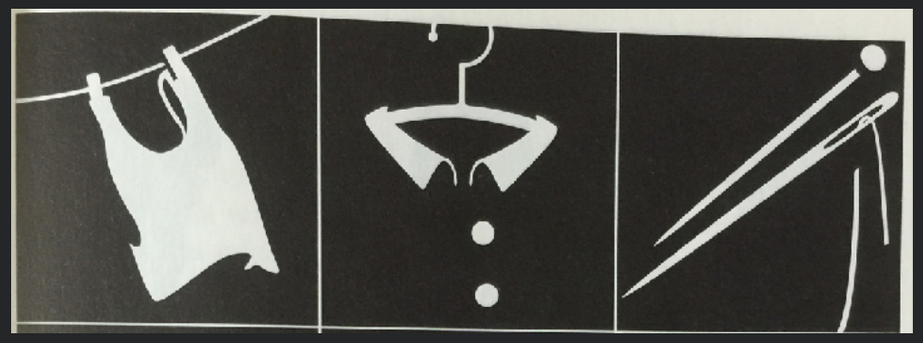
Principles of Icon Design



- Immediacy - can be perceived effortlessly & involuntarily by being ***bold***, clear, balanced
- Generality - represents a ***class*** of items, rather than an individual element, by removing details that may vary
- Cohesiveness - set of icons that function ***together*** by sharing visual variables

Principles of Icon Design





- Immediacy - can be perceived effortlessly & involuntarily by being ***bold***, clear, balanced
- Generality - represents a ***class*** of items, rather than an individual element, by removing details that may vary
- Cohesiveness - set of icons that function ***together*** by sharing visual variables
- Characterization - call to mind one or more ***distinctive*** features

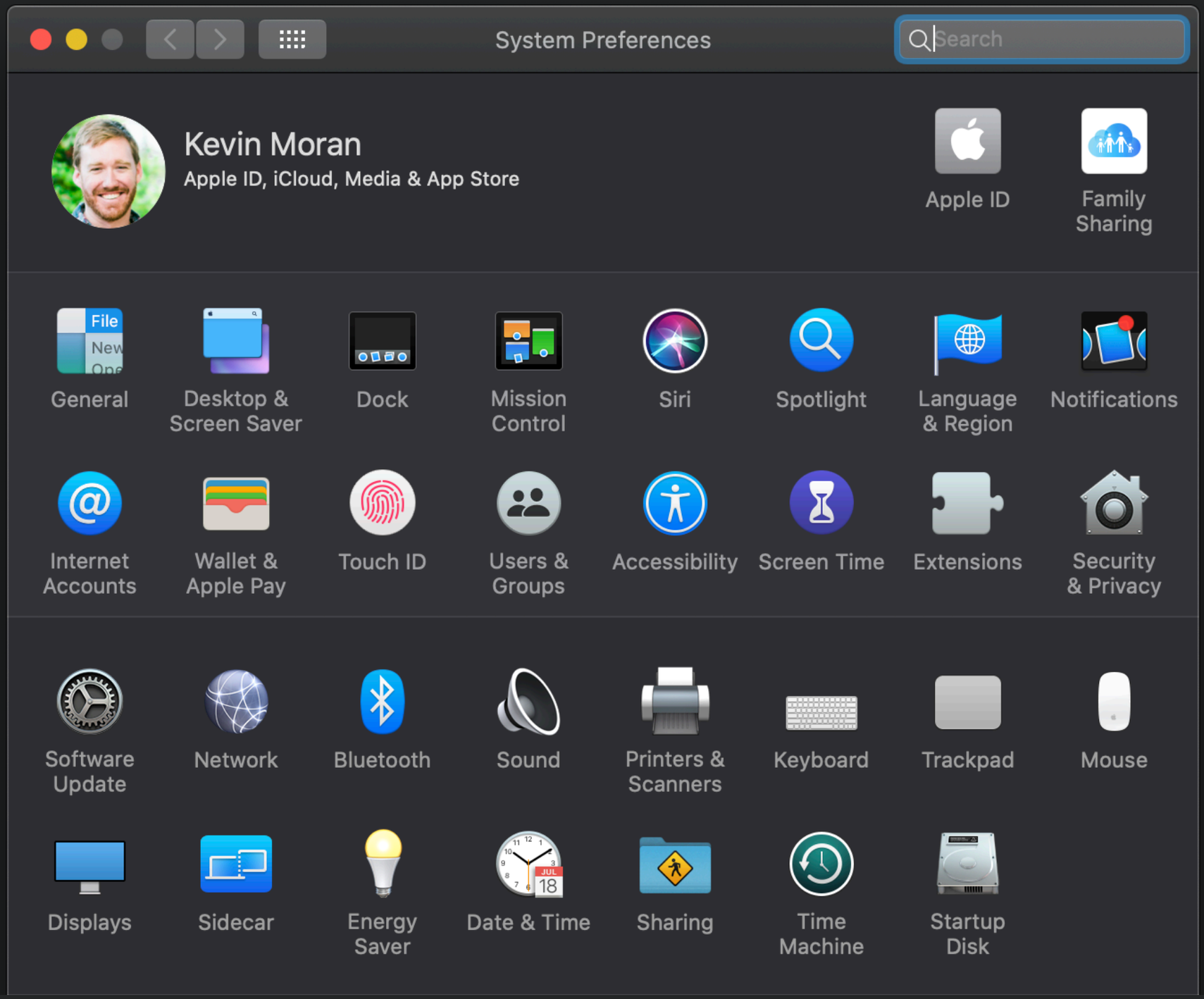
Selecting the Right Type of Icon

- If concept is concrete, familiar, tangible, use similar or example icon
- If concept will be used repeatedly, consider using more symbolic or arbitrary icon based on convention
- If concept is abstract process or subtle, use textual label

Activity: OS 10.2 Preferences Icons

Best 3, worst 3 and why? Then: How to make worst 3 better?

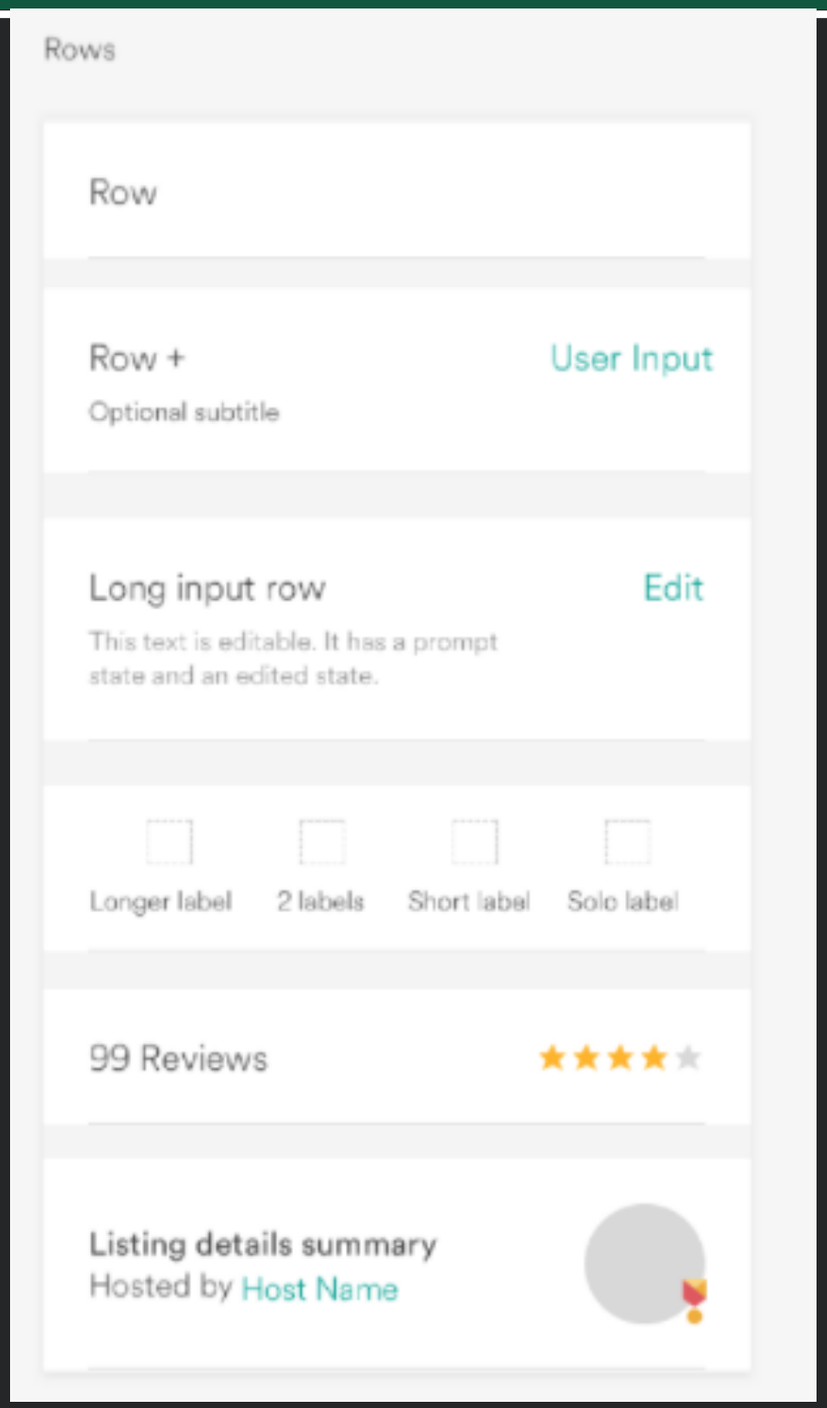
Activity: OS 10.15 Preferences Icons



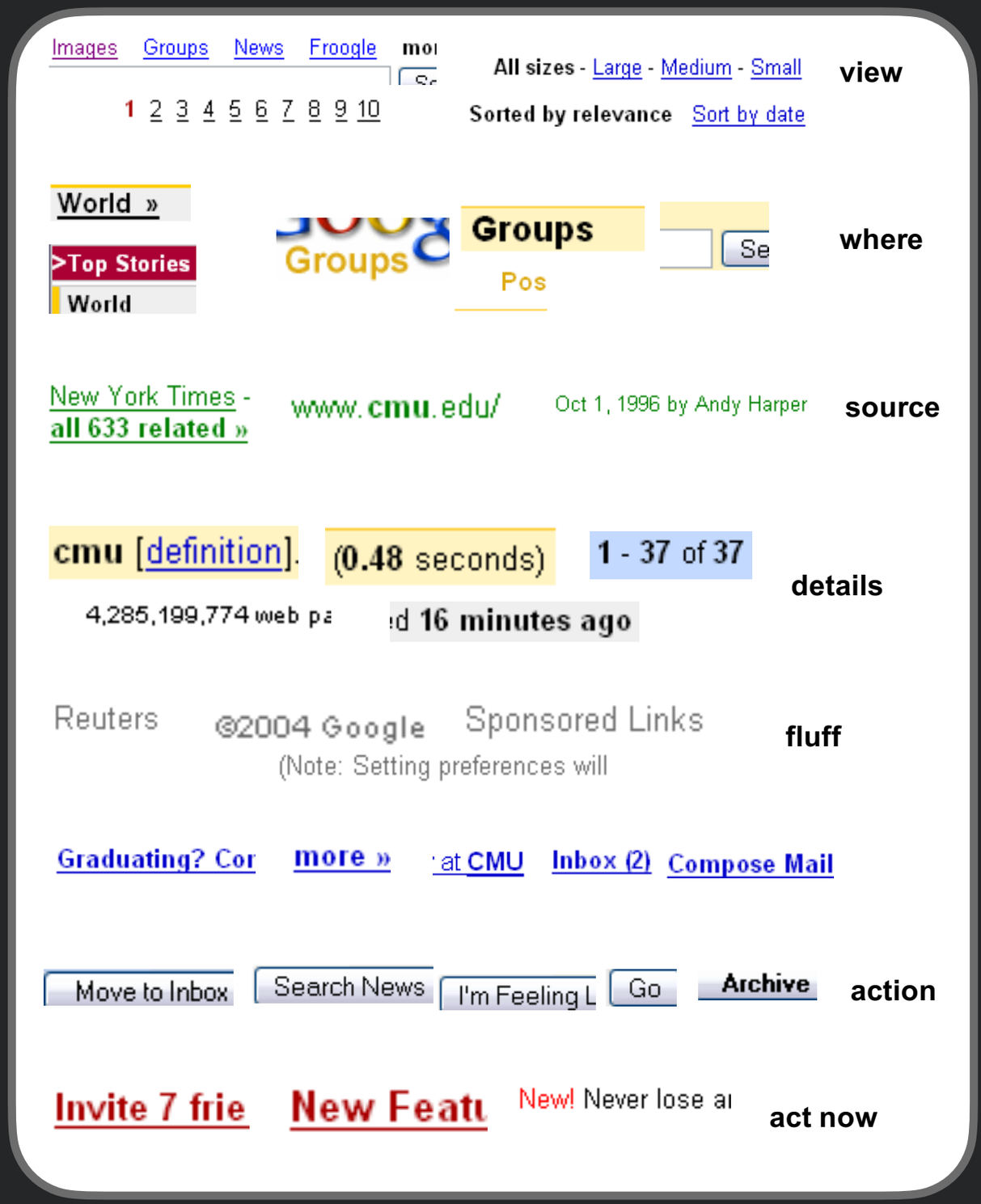
Design Languages

Design Languages

- Many, ***many*** choices about visual variables and syntax of composition
  - How do you ensure choices are made consistently across web app?
- Solution: design language
  - Describes how to express ideas and concepts in the interface
  - May be communicated through Human Interface Guideline documentation
  - (Example of consistency and standards)

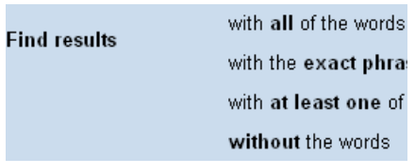


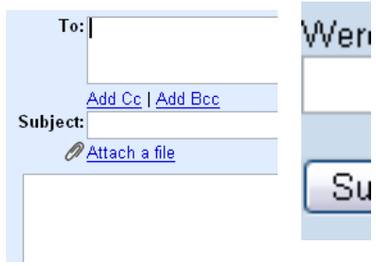
Example: Elements, Google 2004



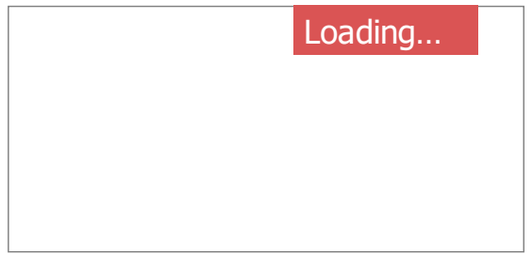
Example: Syntax, Google 2004

task

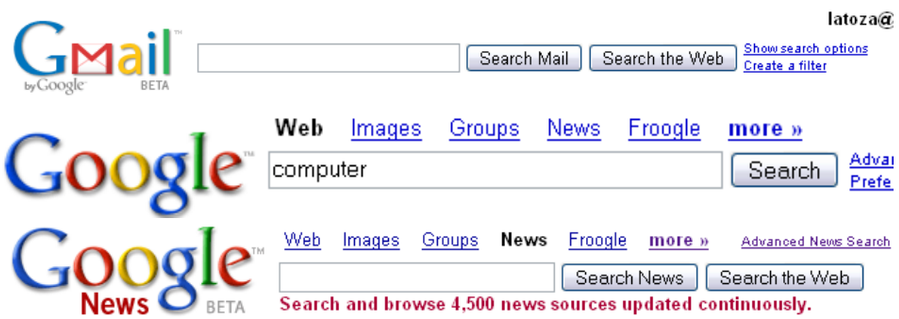




placeholder

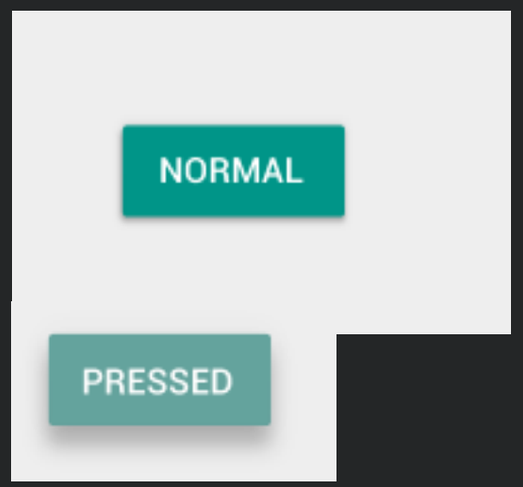


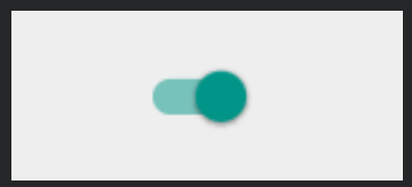
toolbar

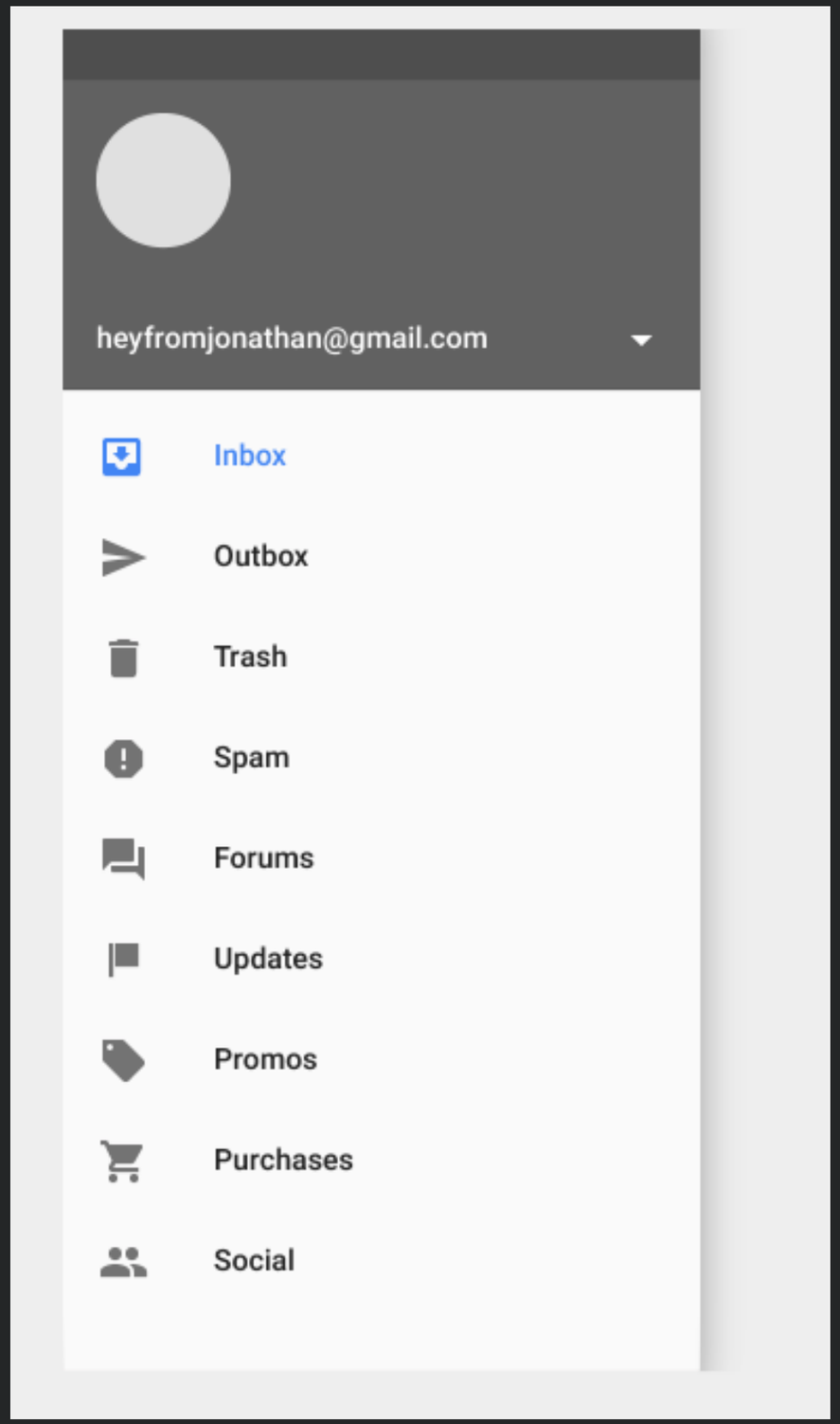


list

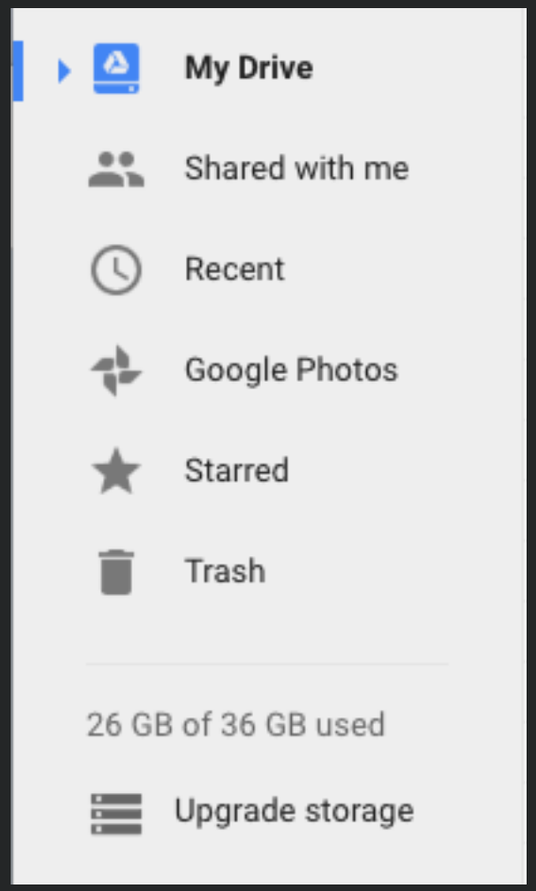
Examples: Google 2016

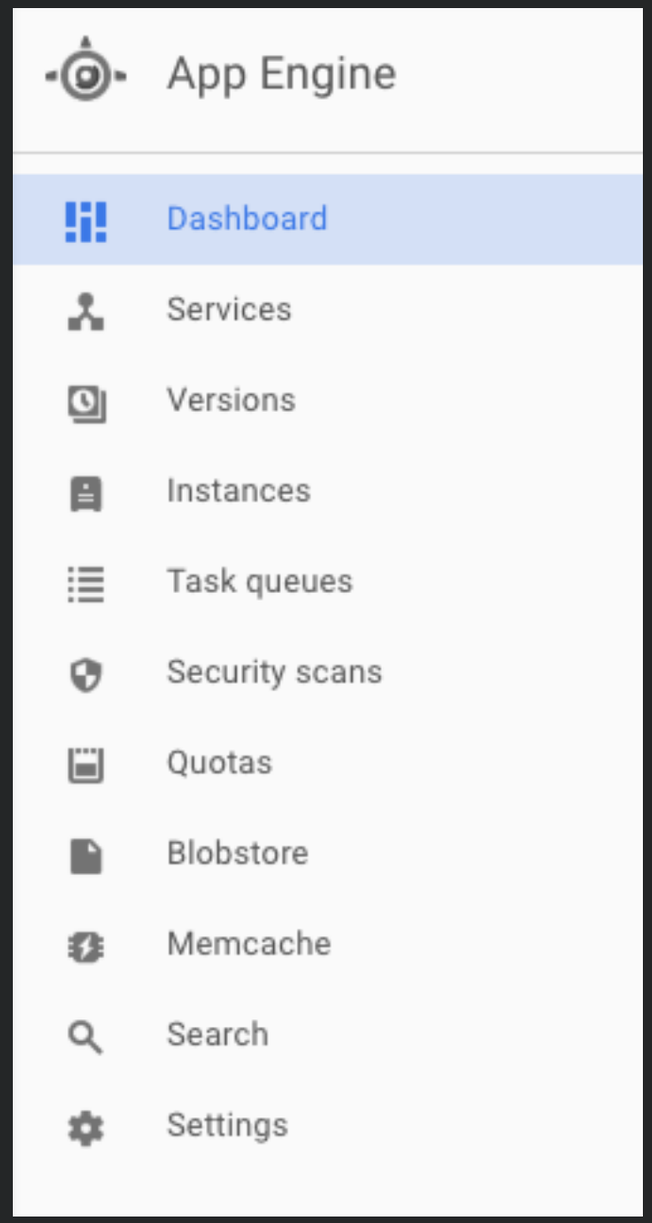


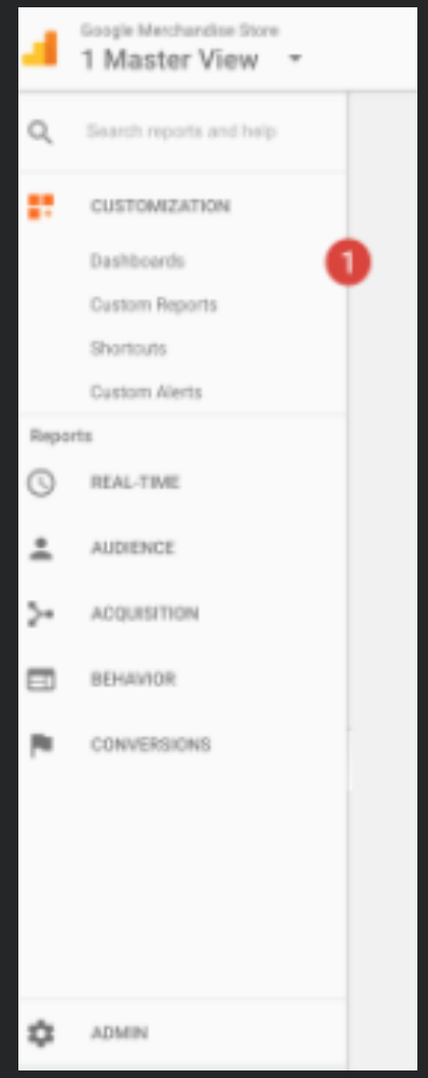




Examples: Google 2016







Examples: IBM

Product Analytics

Service Onboarding | Documents | Profiles | Community

New Onboarding Statistics

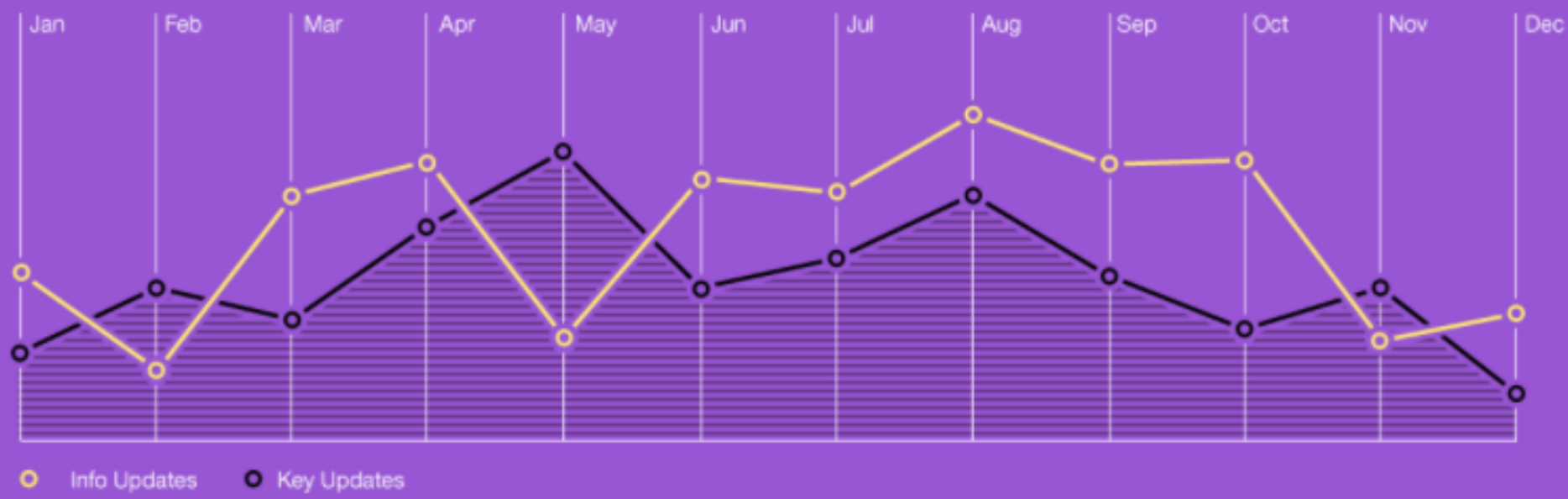
Completion time (Avg)	**38 days**
Error rate (Avg)	**18%**
Type of industry	**Automotive**
Client feedback score (Avg)	**3.5 - 4**
Busiest month	**May**

New Onboarding Statistics

Rejected	**21**
Completed	**186**
Pending	**54**
Active	**315**
Total	**576**

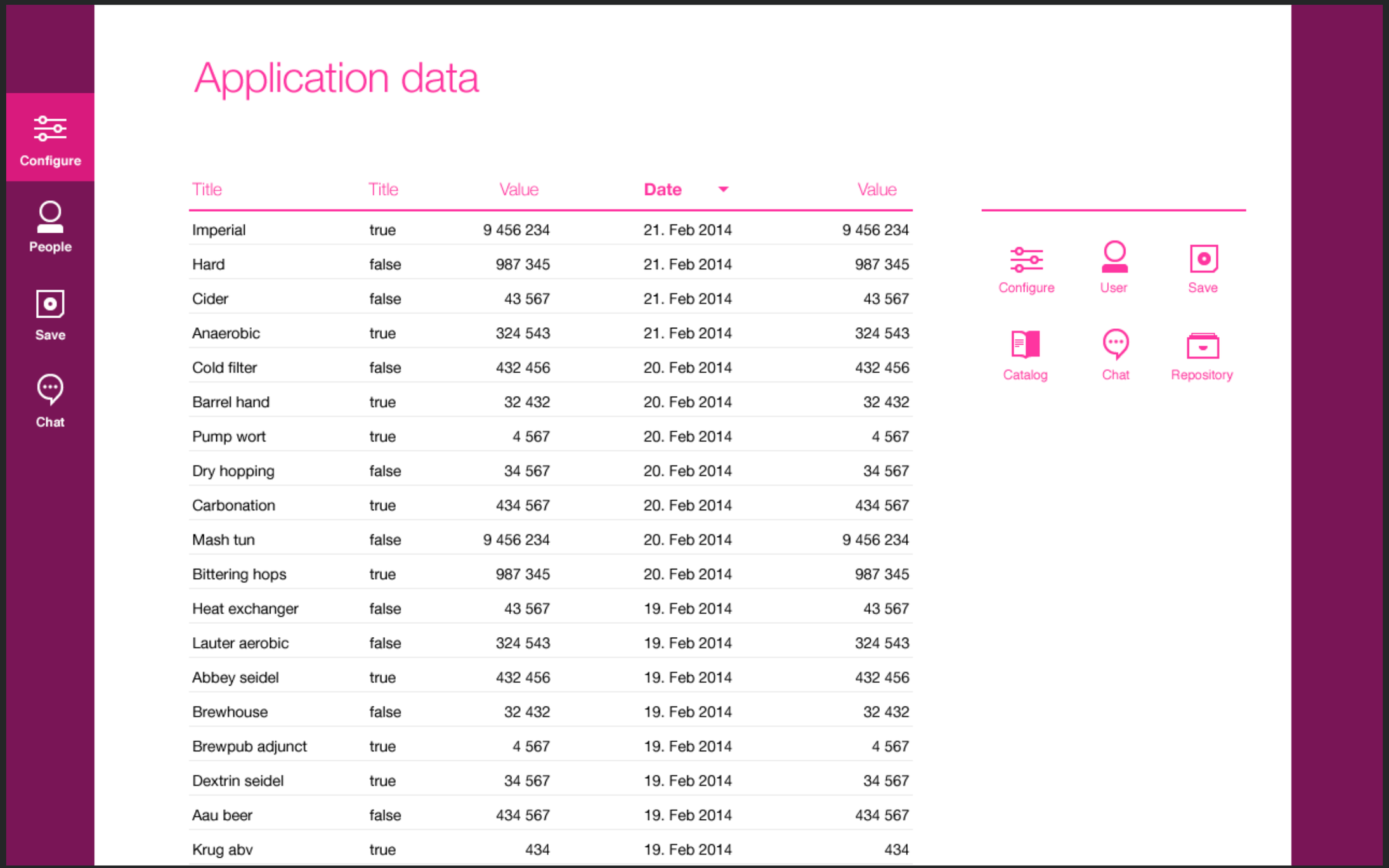
Service Industry Breakdown

Automotive	**42%**
Travel	**23%**
Healthcare	**20%**
Retail	**15%**
Total	**100%**

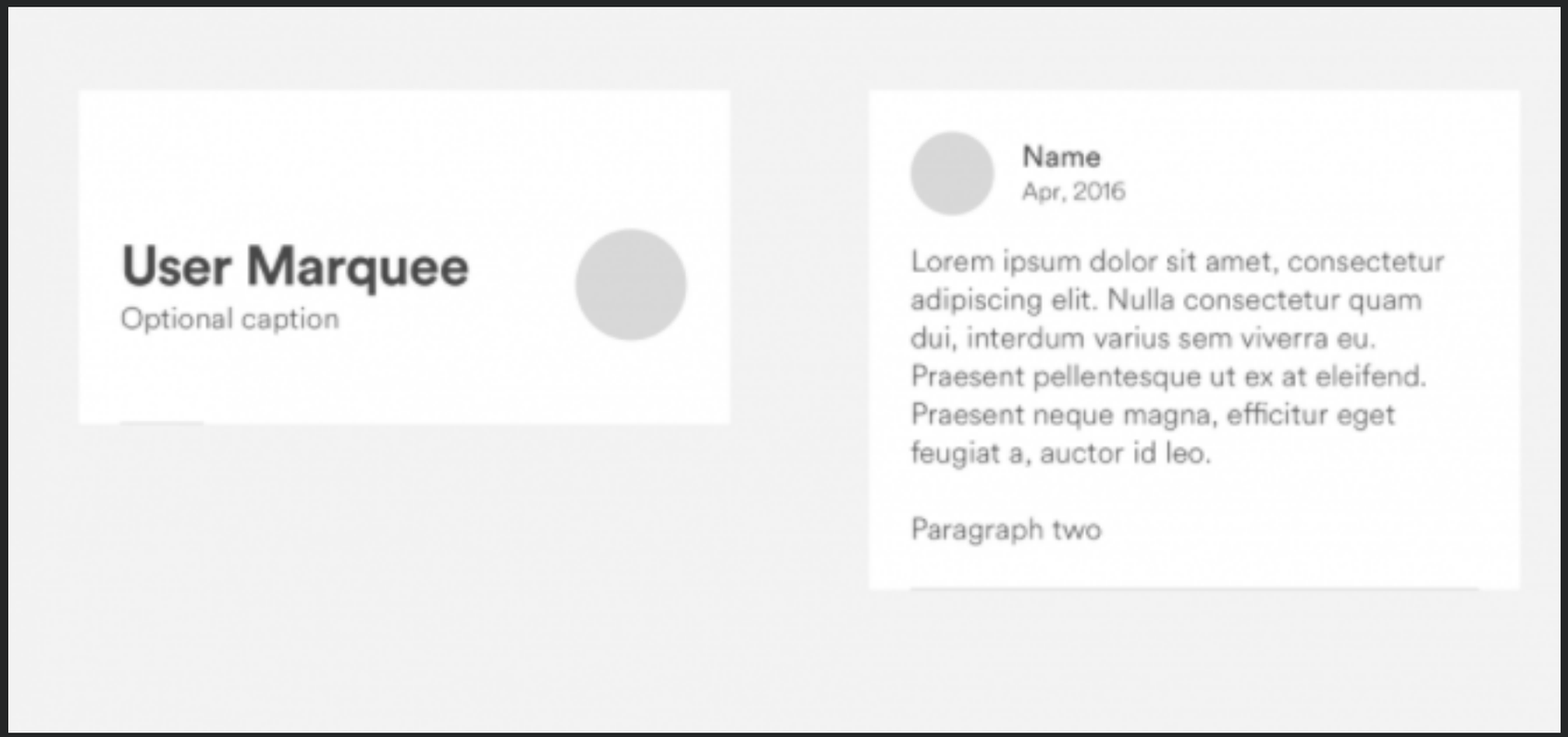


Examples: IBM

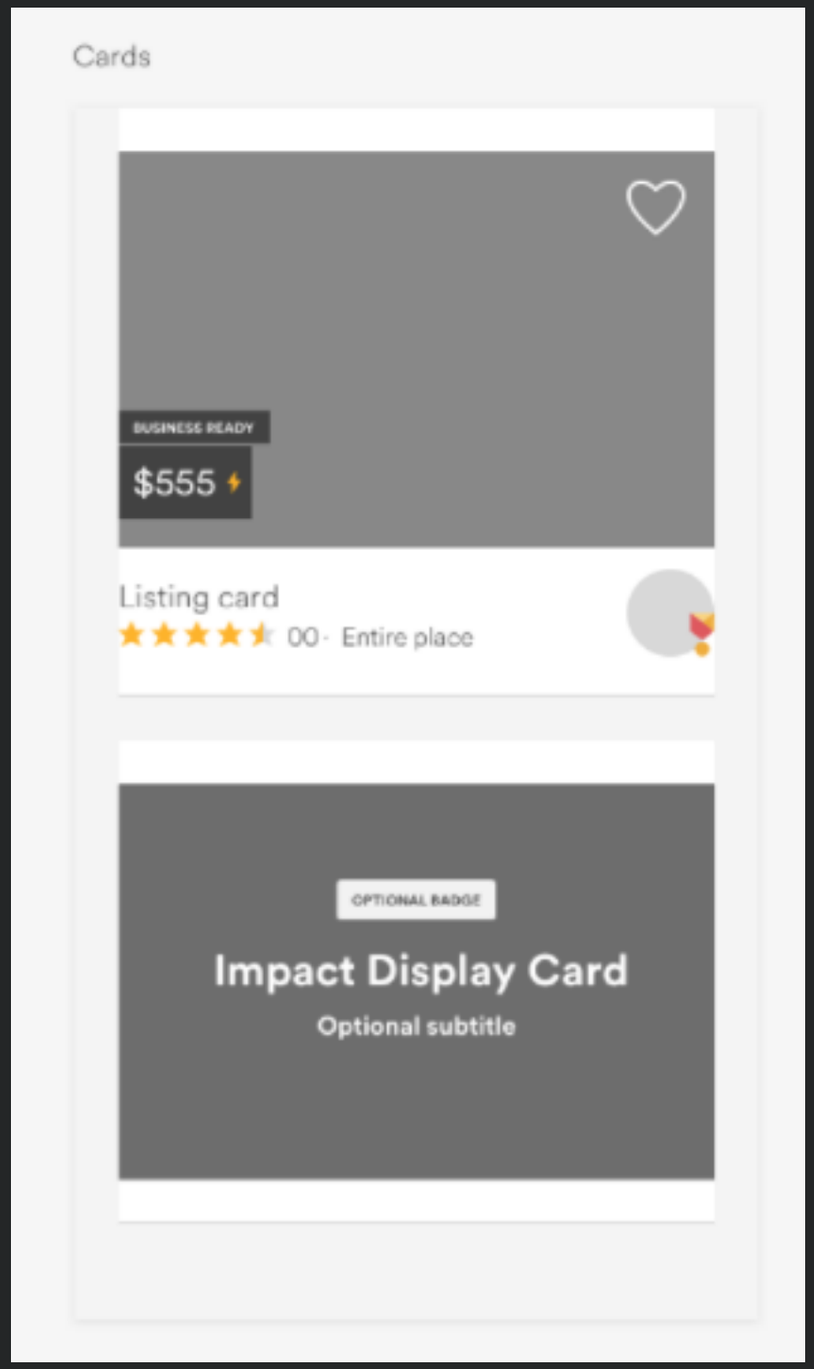
Examples: IBM

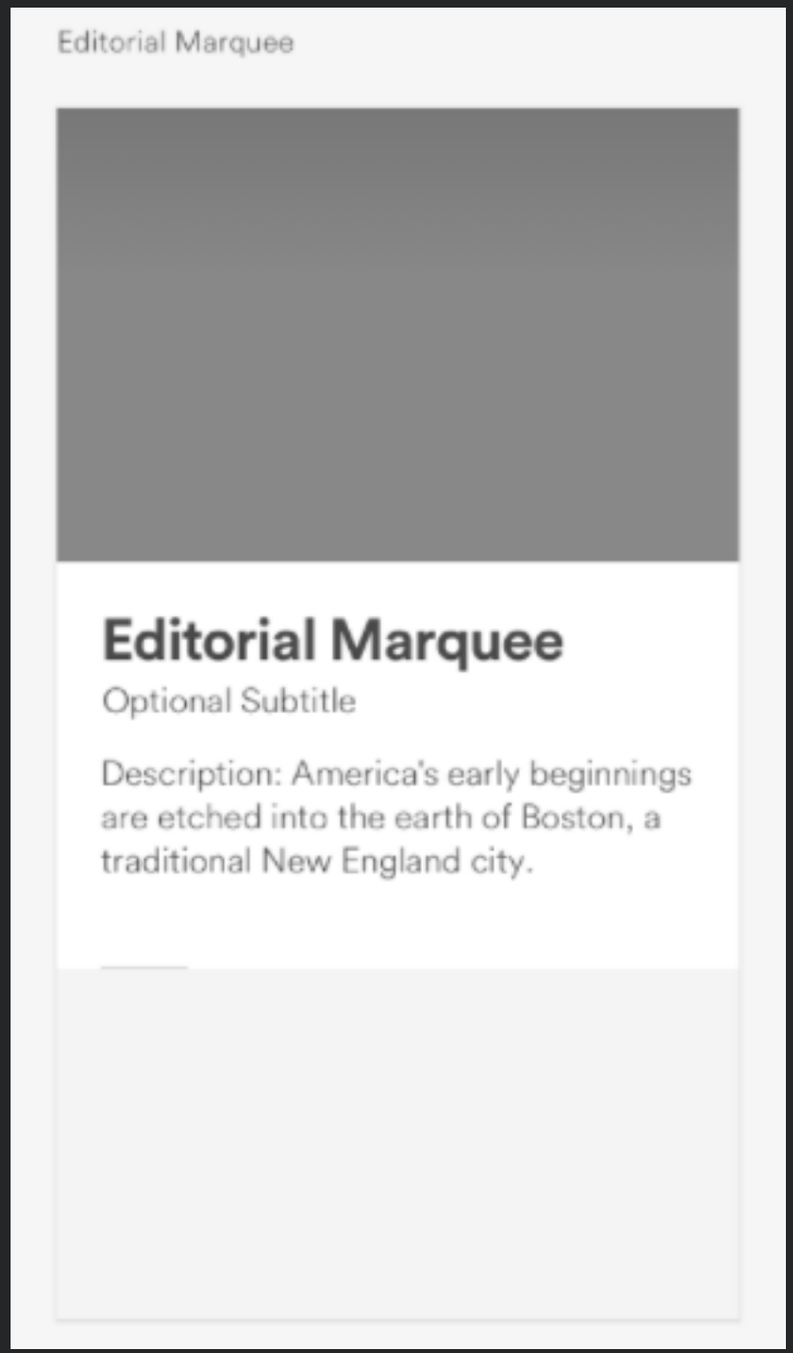


Examples: AirBnb

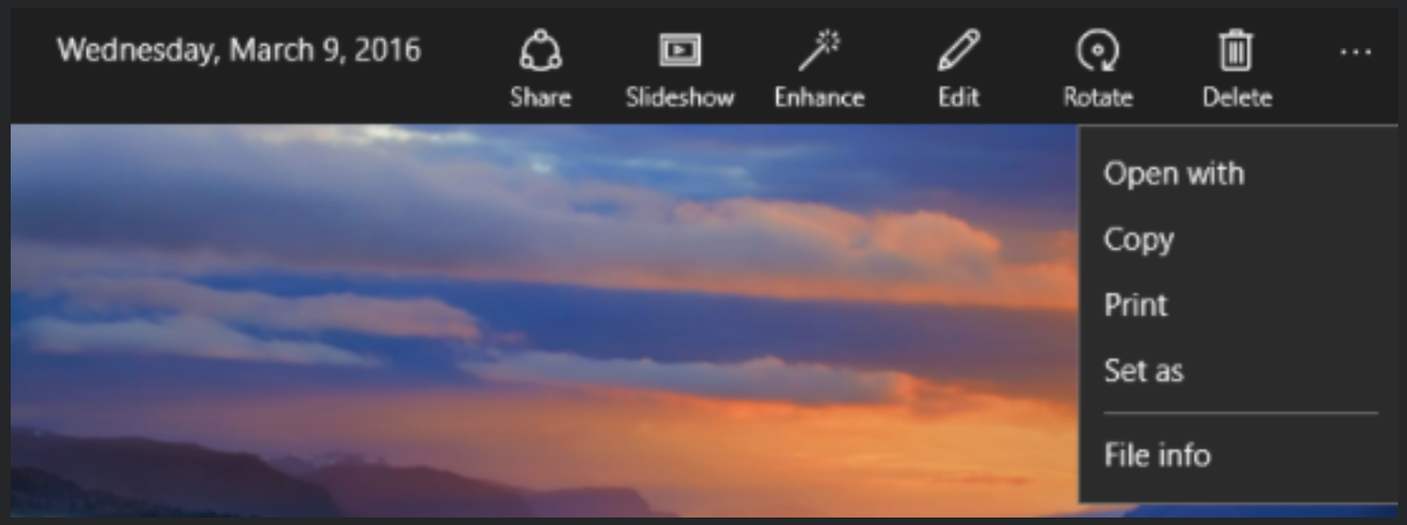


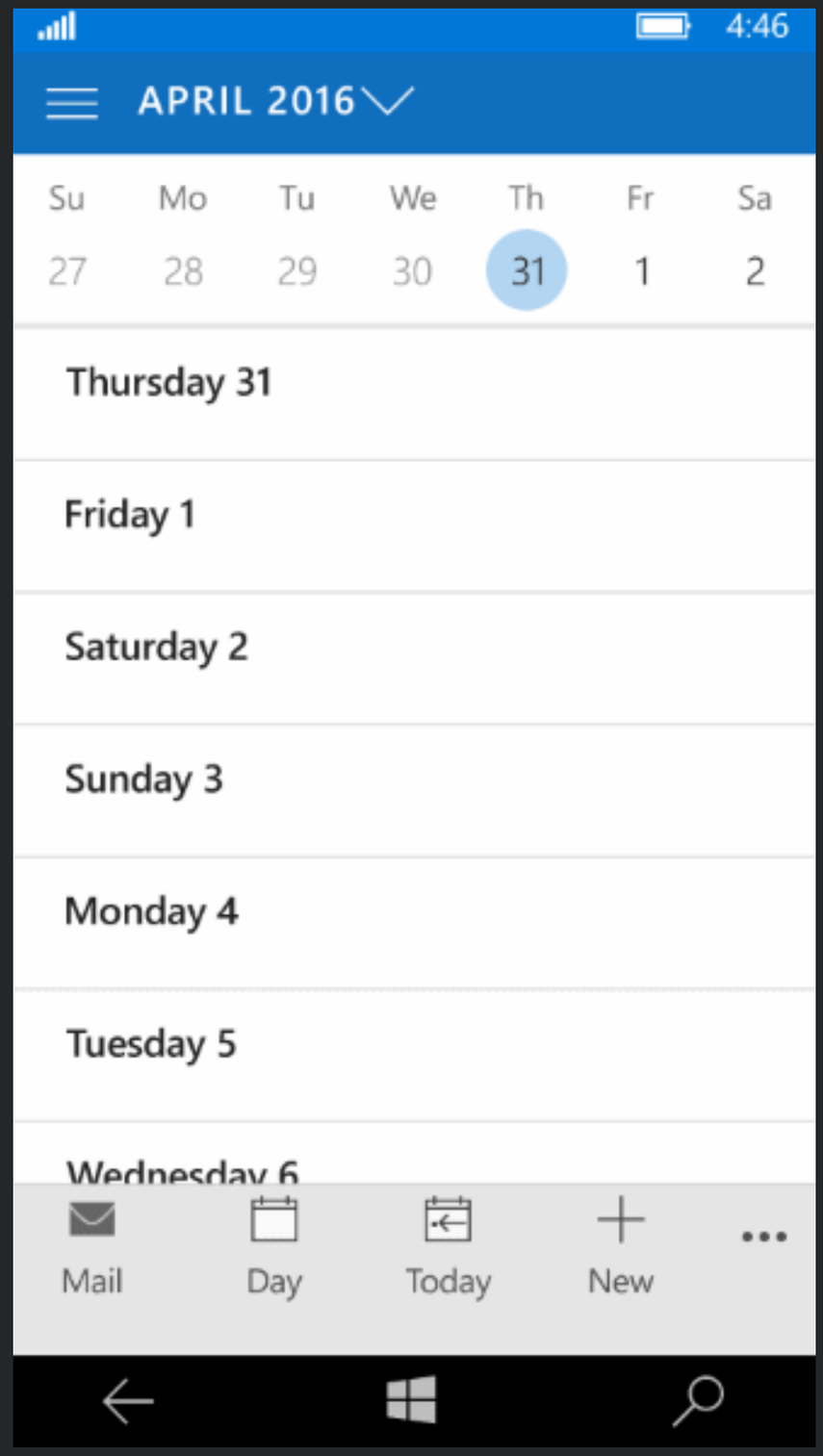
Examples: AirBnb



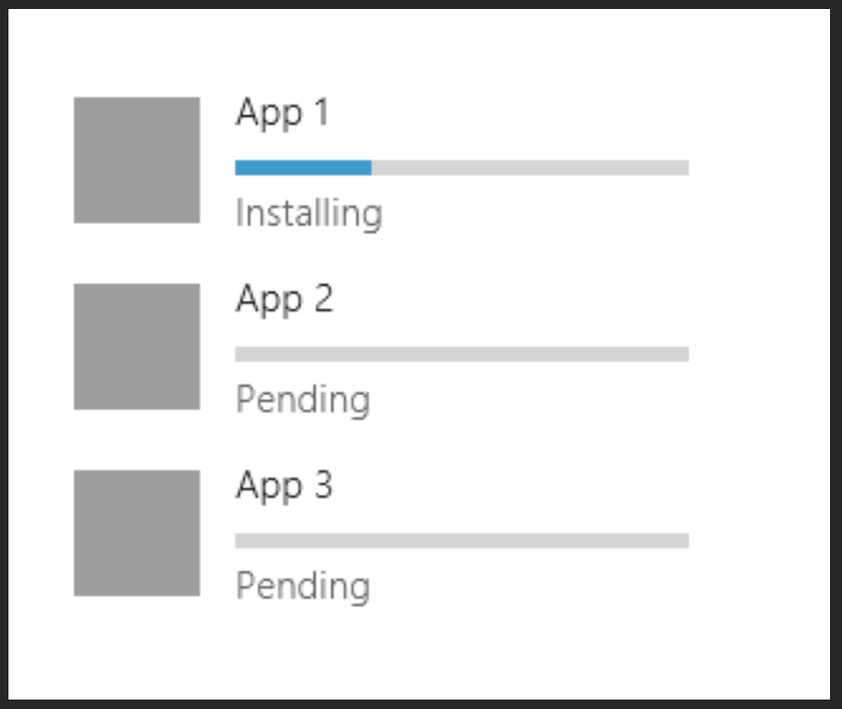


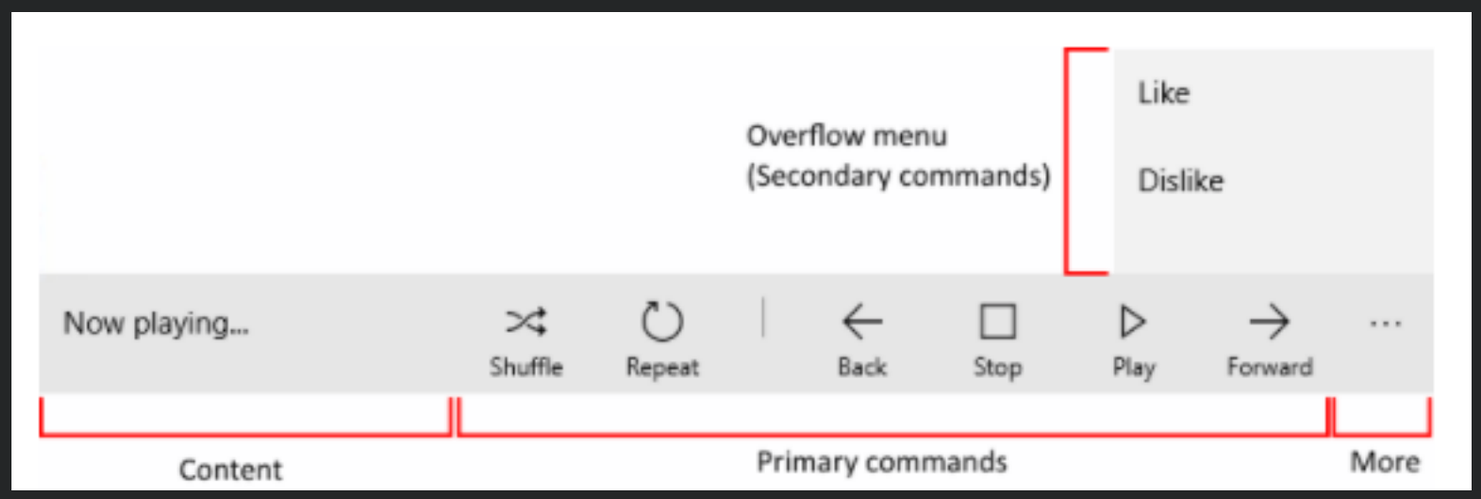
Examples: Microsoft

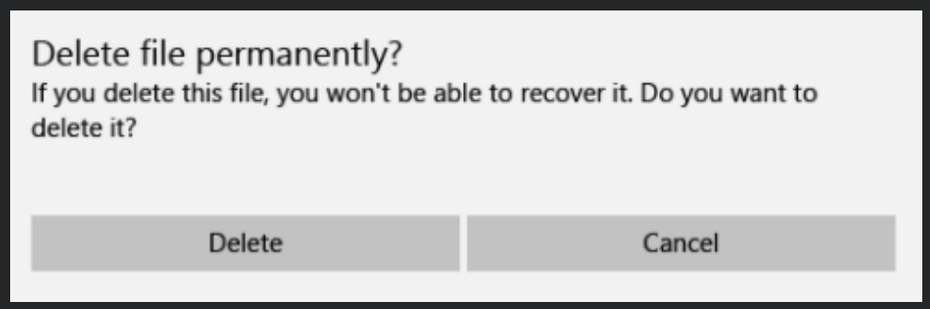




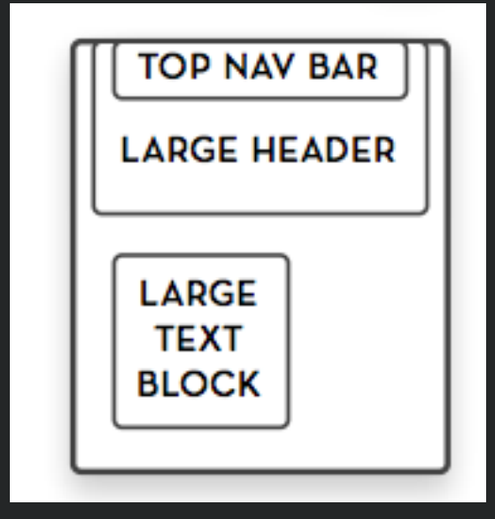
Examples: Microsoft

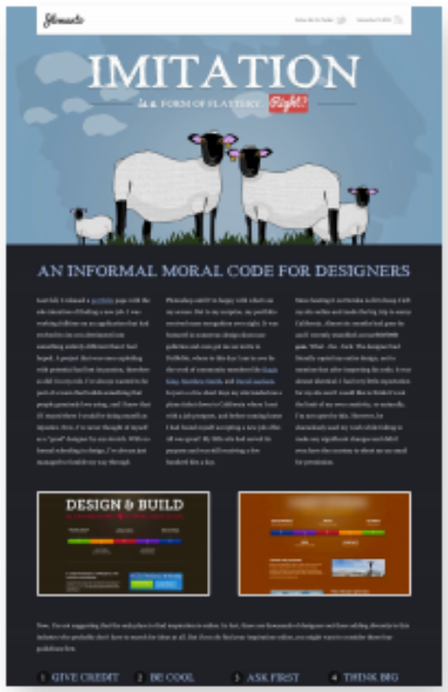






Example: Header with text blocks layout



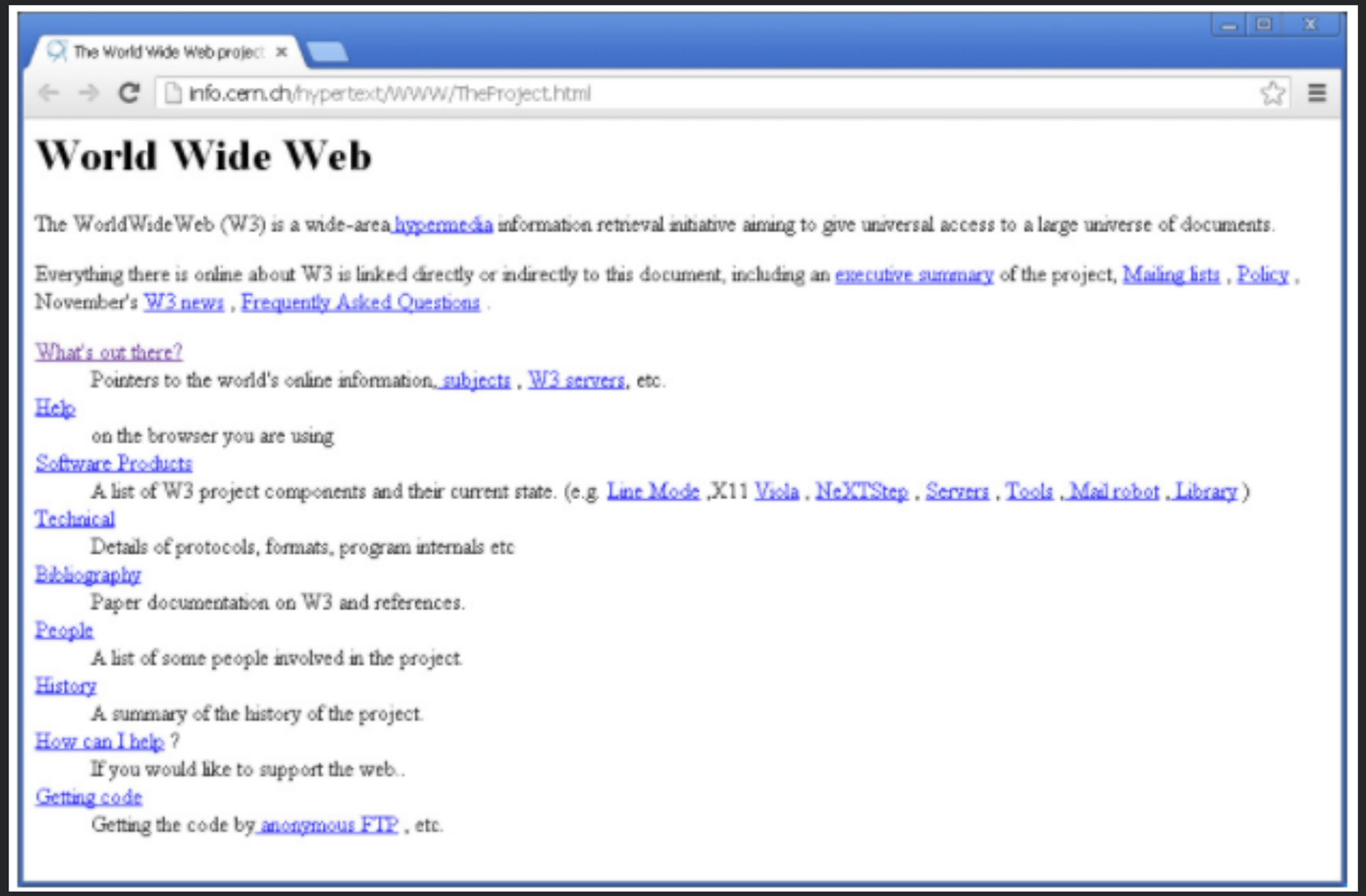


http://ranjithakumar.net/resources/webzeitgeist.pdf

Position Encodes Meaning and Function

http://ranjithakumar.net/resources/webzeitgeist.pdf

Web Design Languages Over Time



https://blog.hubspot.com/marketing/look-back-20-years-website-design#sm.00000ip14jejk1d51u53crk6cwrns

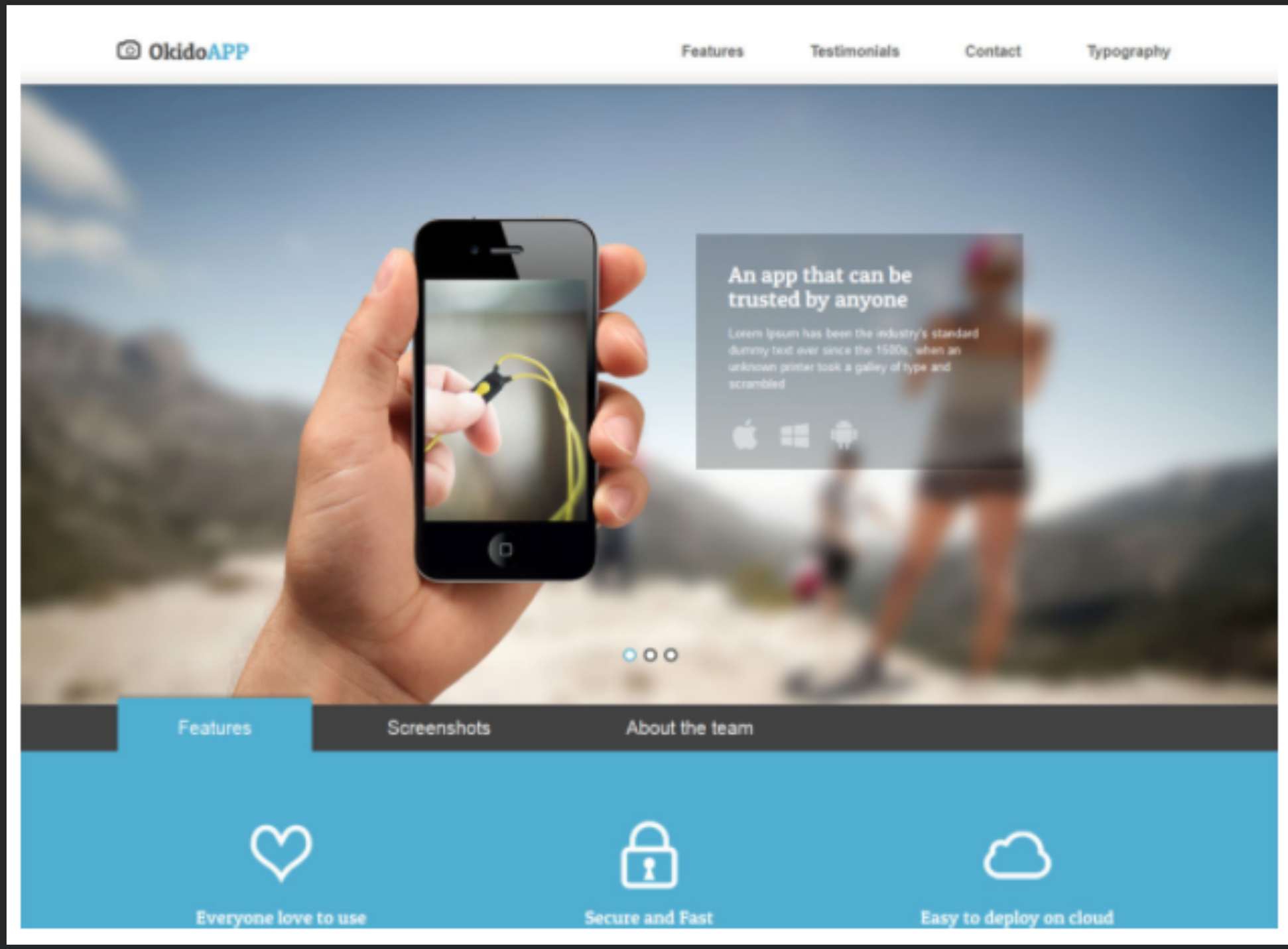
Web Design Languages Over Time

Web Design Languages Over Time

Web Design Languages Over Time

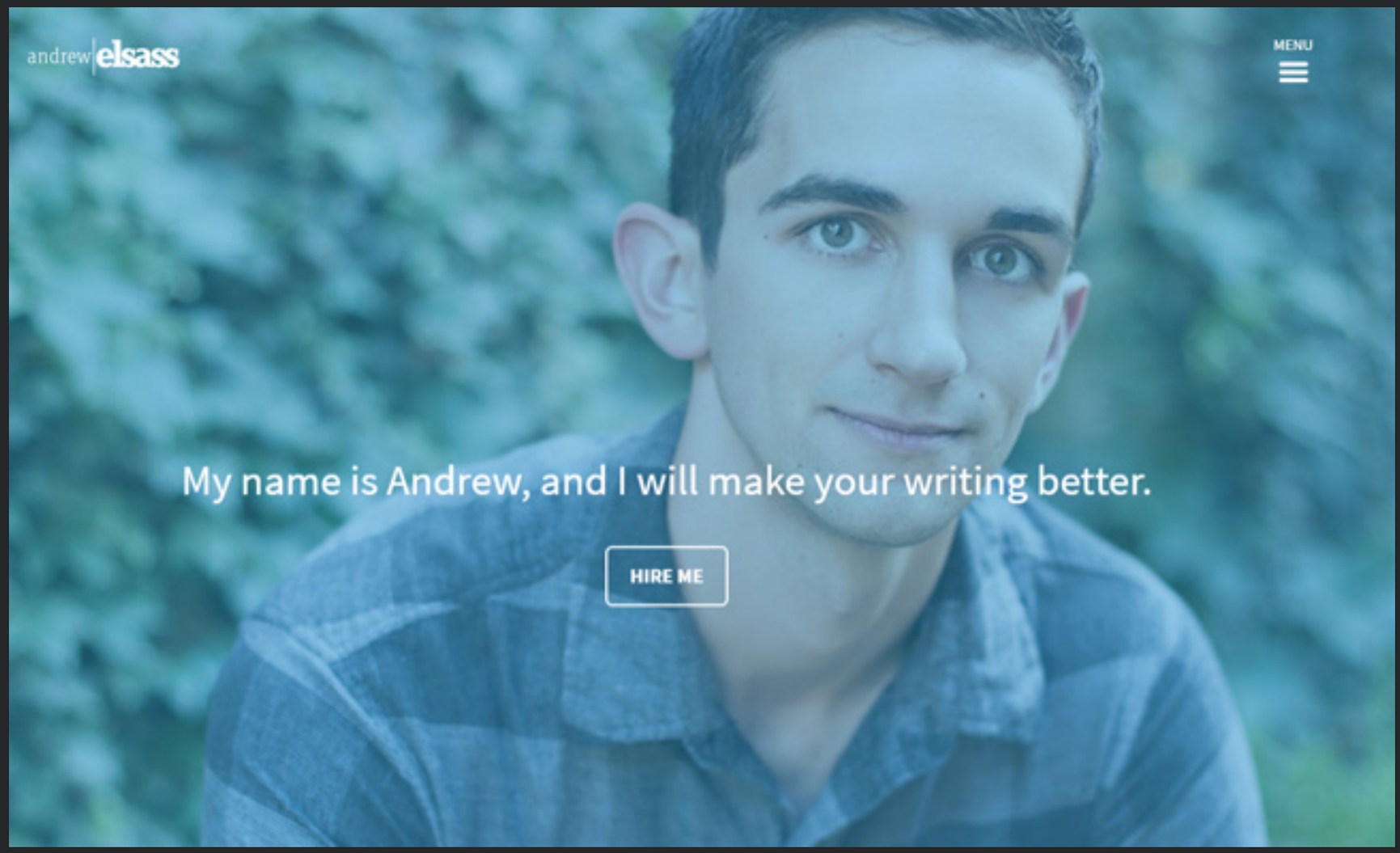
Web Design Languages Over Time

Web Design Languages Over Time



Common Visual Idioms, Circa 2016

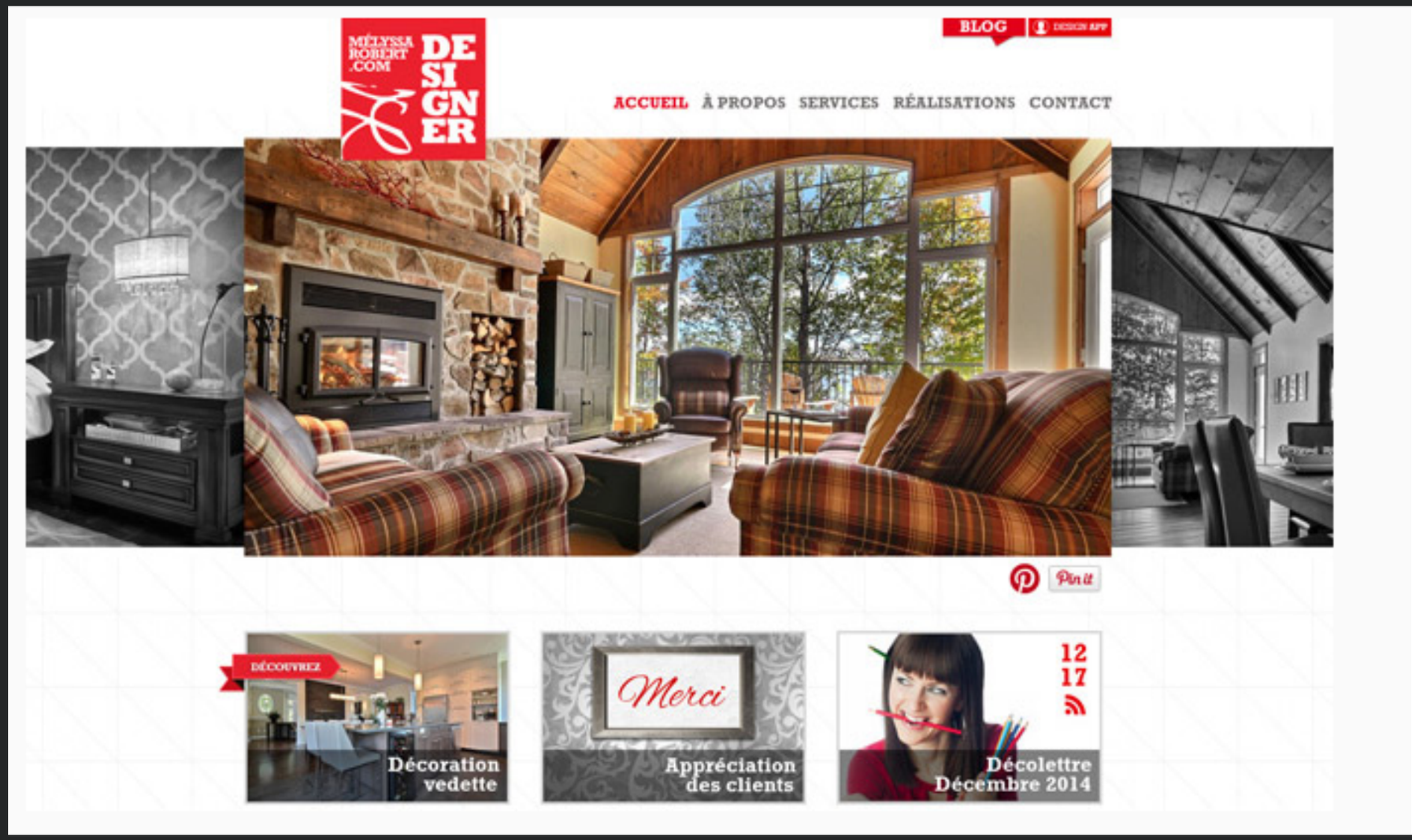
- Hero images: large attractive header image



https://envato.com/blog/exploring-hero-image-trend-web-design/

Common visual idioms, circa 2016

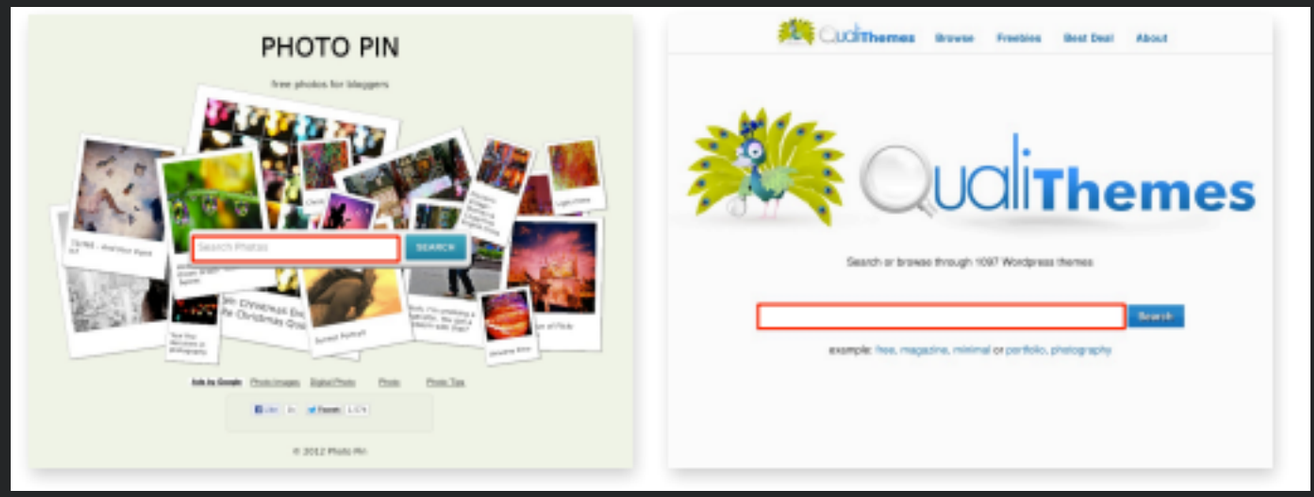
- Rotating image galleries (carousels)



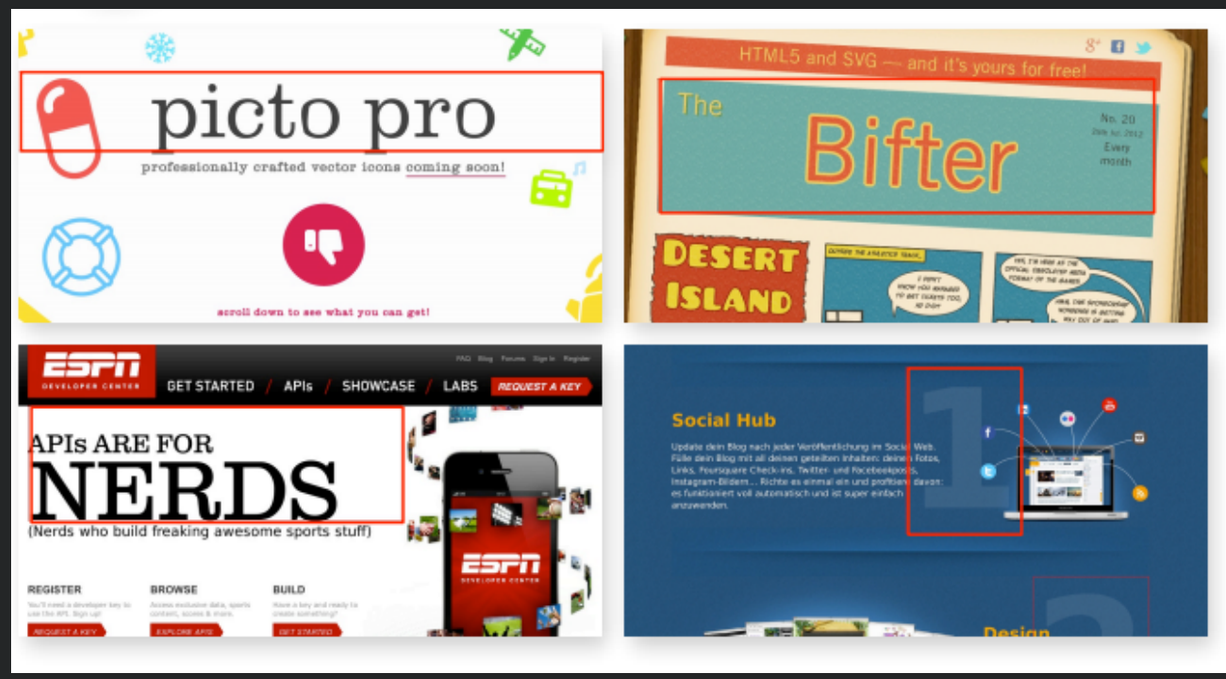
https://envato.com/blog/exploring-hero-image-trend-web-design/

Why it Matters

- Users will have idioms they expect to see, particularly if suggested by other related elements



- Branding: Users will see your website and have particular associations based on what it exemplifies



Goals in Designing a Design Language

- Offer guidance and options on
  - Colors: examples of color palettes
  - Typography: justification, sizes, fonts, different heading levels
  - Organization
- Support different resolutions, devices
- Support universal design
  - Visually impaired, color blind users

7 Minute Break

SWE 632 - Design & Development of User Interfaces

George Mason University

Instructor:
Dr. Kevin Moran

Teaching Assistant:
David Gonzalez Samudio

Class will start in:

07:00

In the Chat, describe one aspect of effective ***visual design***

SWE 632 - Design & Development of User Interfaces

George Mason University

Instructor:
Dr. Kevin Moran

Teaching Assistant:
David Gonzalez Samudio

Class will start in:

07:00

In the Chat, describe one aspect of effective ***visual design***

In-Class Activity

Activity: Design a Design Language

- Brainstorm an idea for a new company, and then design a Design Language for the new company.
- You should identify the key elements of the design language. Some of these key elements might include Typography, Colors, Translucency, and Animations.
- For each element that you define you should identify:
- What differentiates from other mainstream designs?
- What does it mean/What is it's purpose?
- In which situations can it be used?

Activity: Design a Design Language

- Some example visual design guidelines from well-known companies:
  - https://developer.apple.com/design/human-interface-guidelines/macos/visual-design/
  - https://material.io/design
  - https://brand.gmu.edu
  - https://docs.microsoft.com/en-us/windows/uwp/design/

Acknowledgements

- Slides adapted from Dr. Thomas Latoza's SWE 632 course