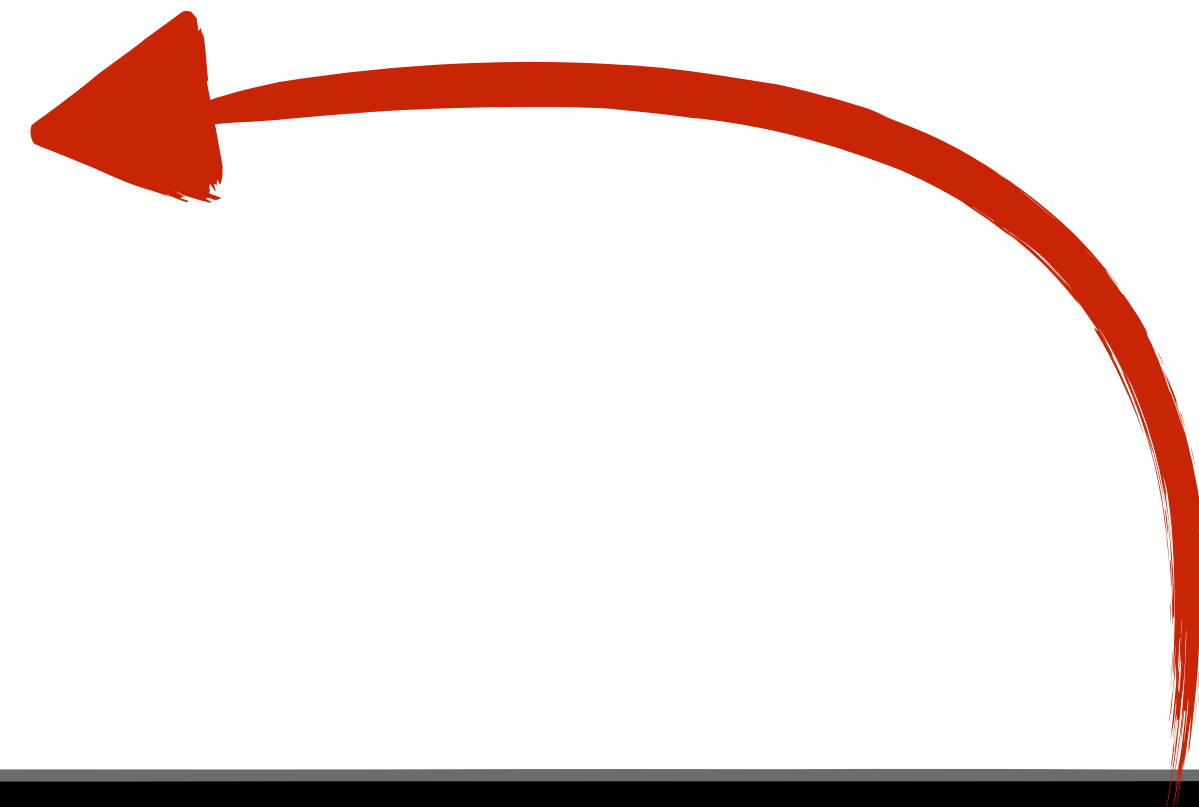


Visual Design

SWE 632

Fall 2024



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

Administrivia

- HW6 due on 11/19
- No SWE Subject Pool Studies this semester
 - Everyone will get full credit

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

Overview of Visual Design

Elements of Visual Design

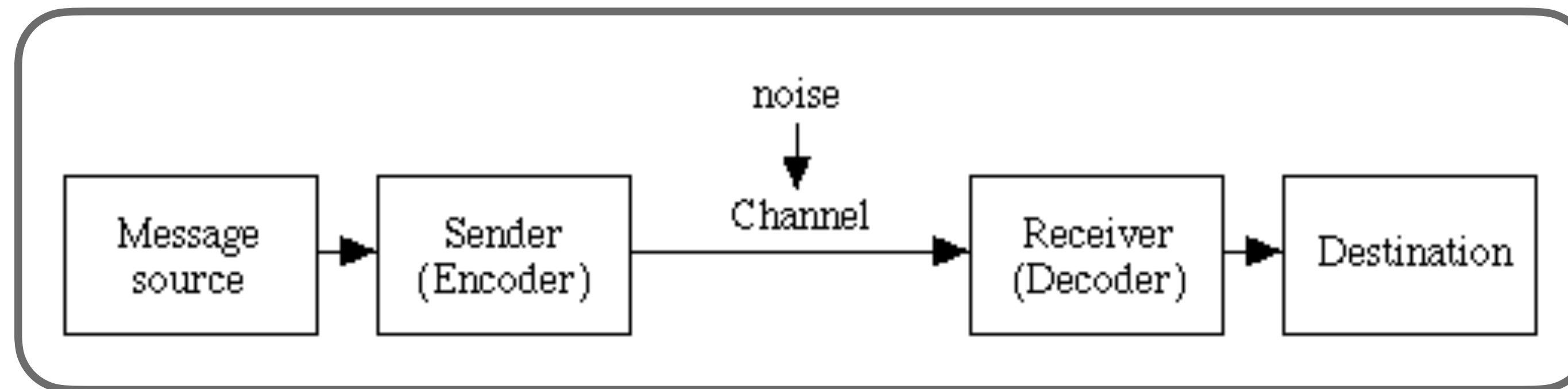


Visual Design

- *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

General 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

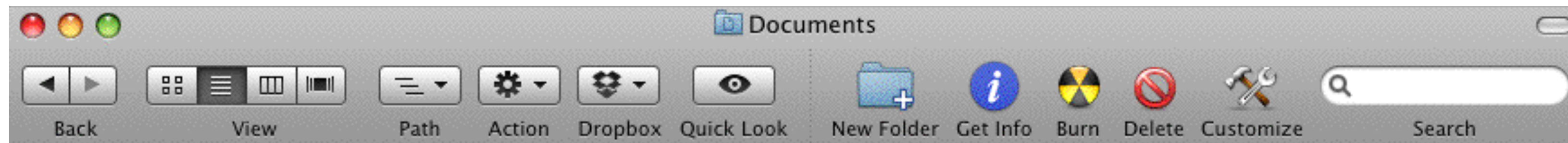
1. *Determine essential qualities & information to be conveyed*

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

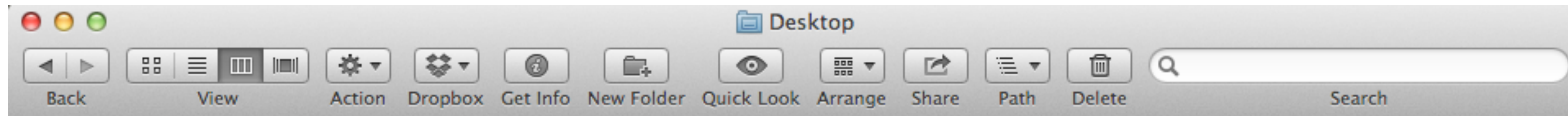
3. *Try removing elements. What happens?*



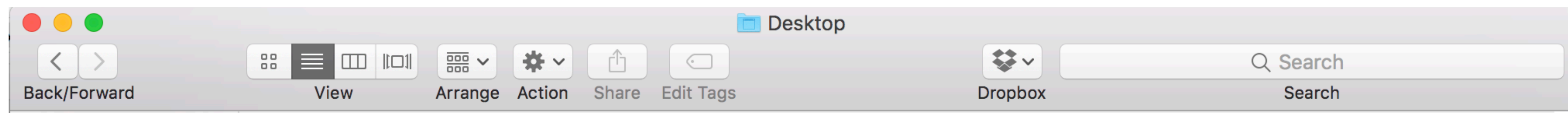
Trade-offs in Simplicity



OSX c.2010



OSX c.2011

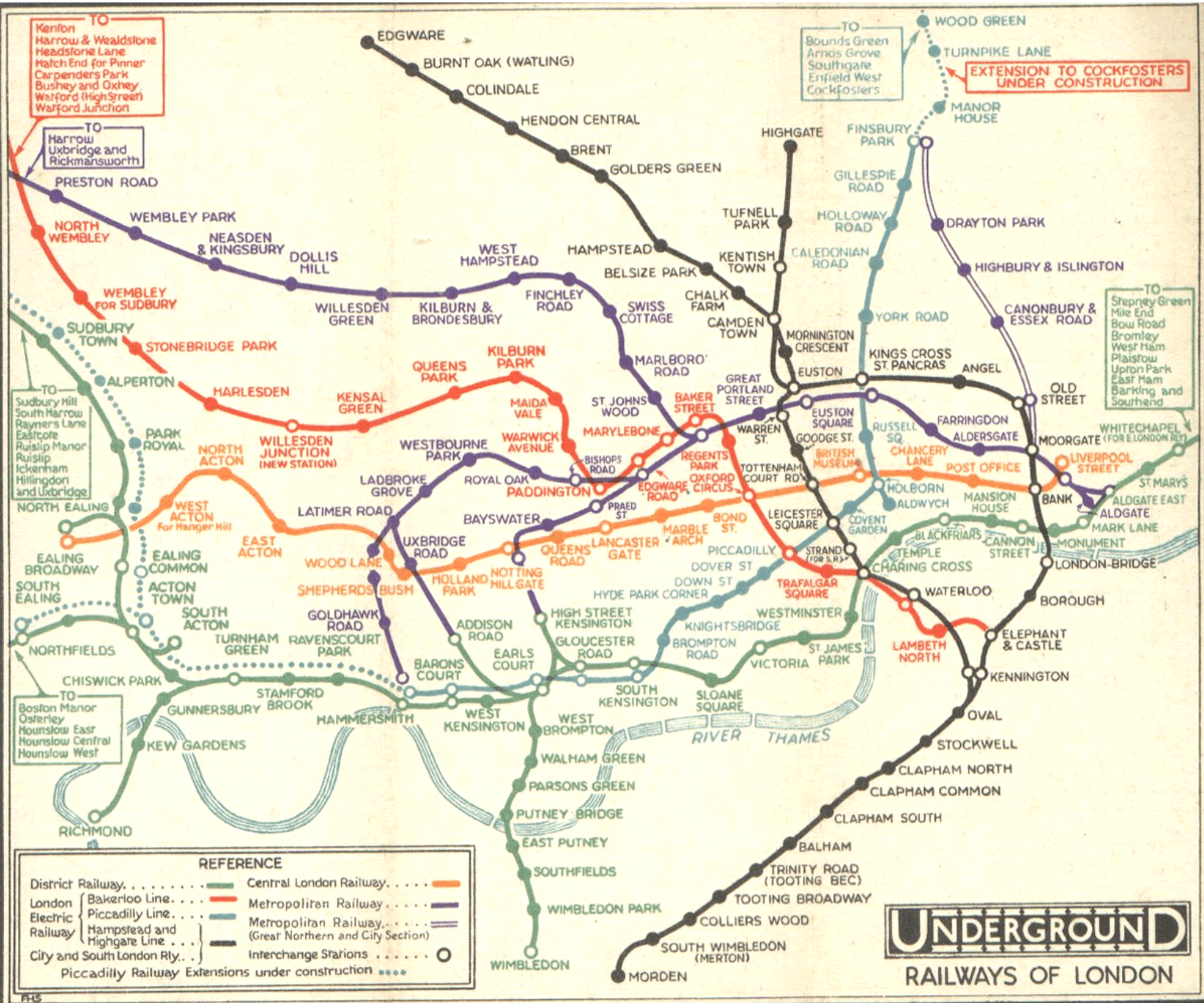


OSX c.2016



OSX c.2021

Guidelines for Visual Design

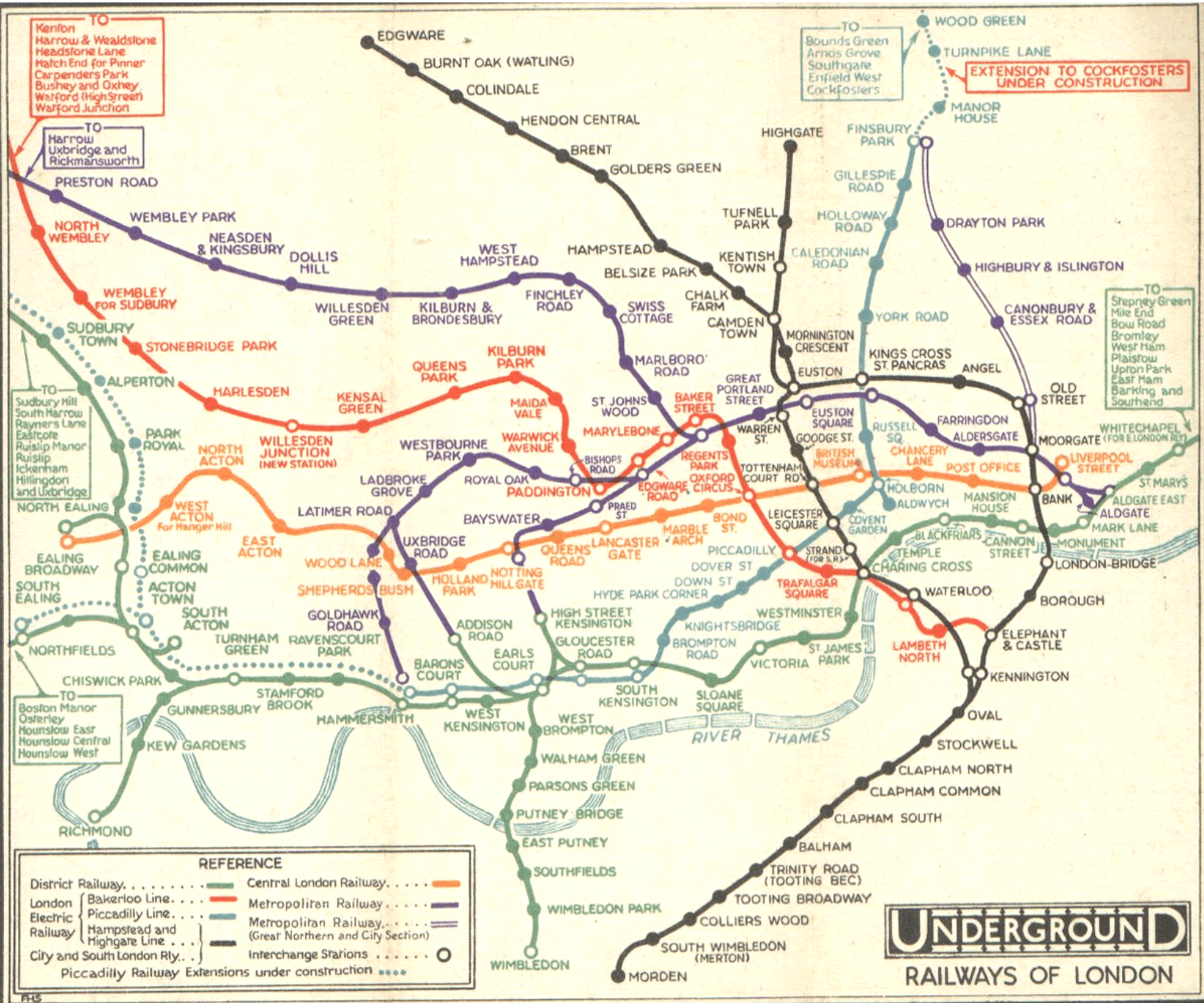


Reduction in new map: relative distances don't matter

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

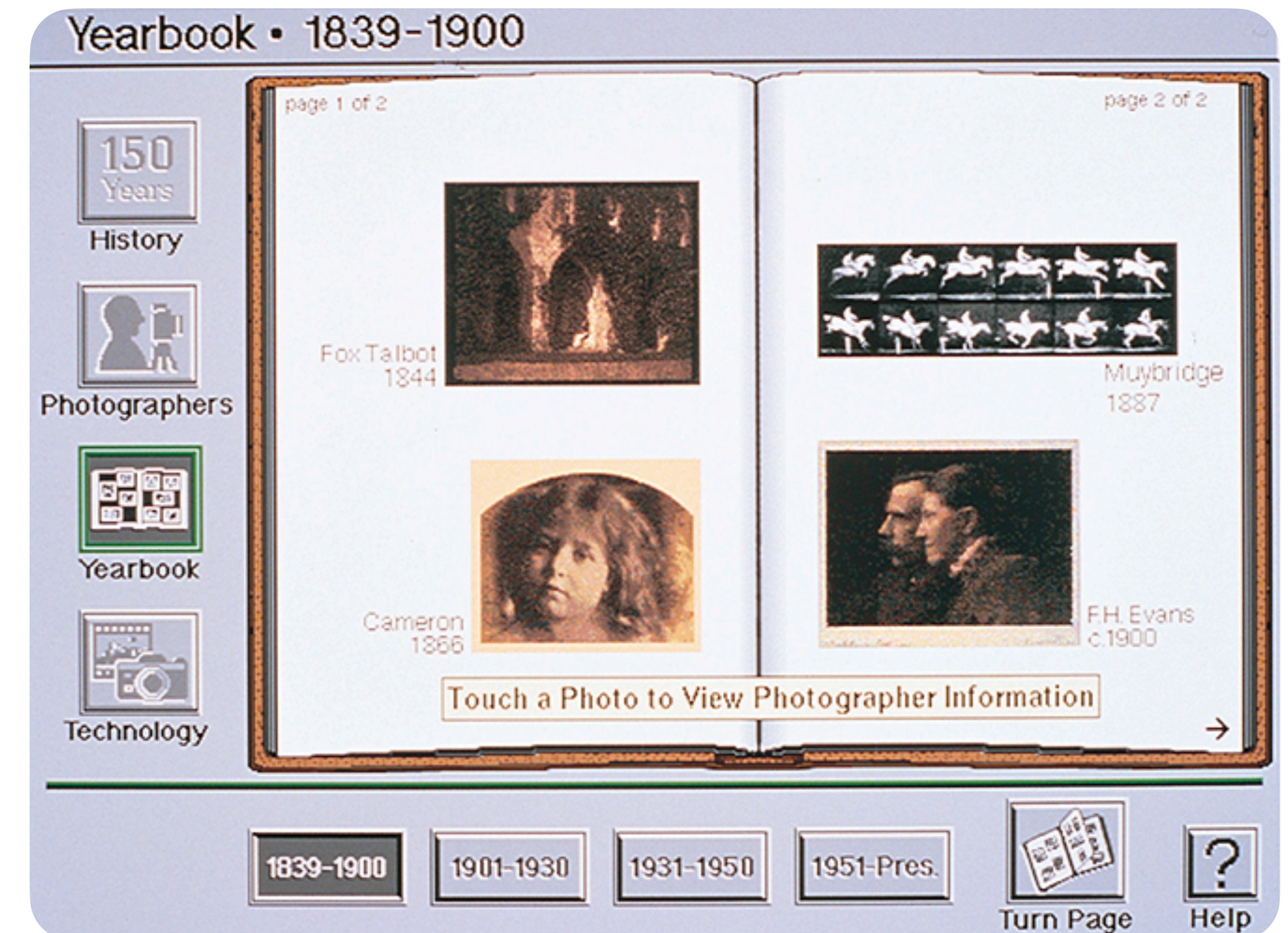
Guidelines for Visual Design



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



Calendars

Invitations (0)

Day

Week

Month

Year

List

Search

July 2013

Wednesday

July 3

 Ted Faszter'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 Faszter's Birthday

Details

Wednesday, July 3, 2013

all-day events

 Mike Yutzy's Birthday Ted Faszter's Birthday

2 PM

3 PM

4 PM

5 PM

6 PM

7 PM

8 PM

9 PM

Today



Jun

Jul

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

Aug



iPad

2:01 PM

92%

November 2016

Day

Week

Month

Year

Sun

Mon

Tue

Wed

Thu

Fri

Sat

SWE 432

20

SWE meeting

21

11 AM

Office Hours

SWE 432

22

10:30 AM

Noon

23

SWE 432

24

Noon

25

26

27

28

Office Hours

SWE 432

29

10:30 AM

Noon

30

Dec 1

2

3

SWE 432

Noon

4

5

Office Hours

SWE 432

6

10:30 AM

Noon

7

SWE 432

8

Noon

9

10

11

12

Office Hours

13

10:30 AM

14

15

16

17

Today

Calendars

Inbox

Scale, Contrast, & Proportion

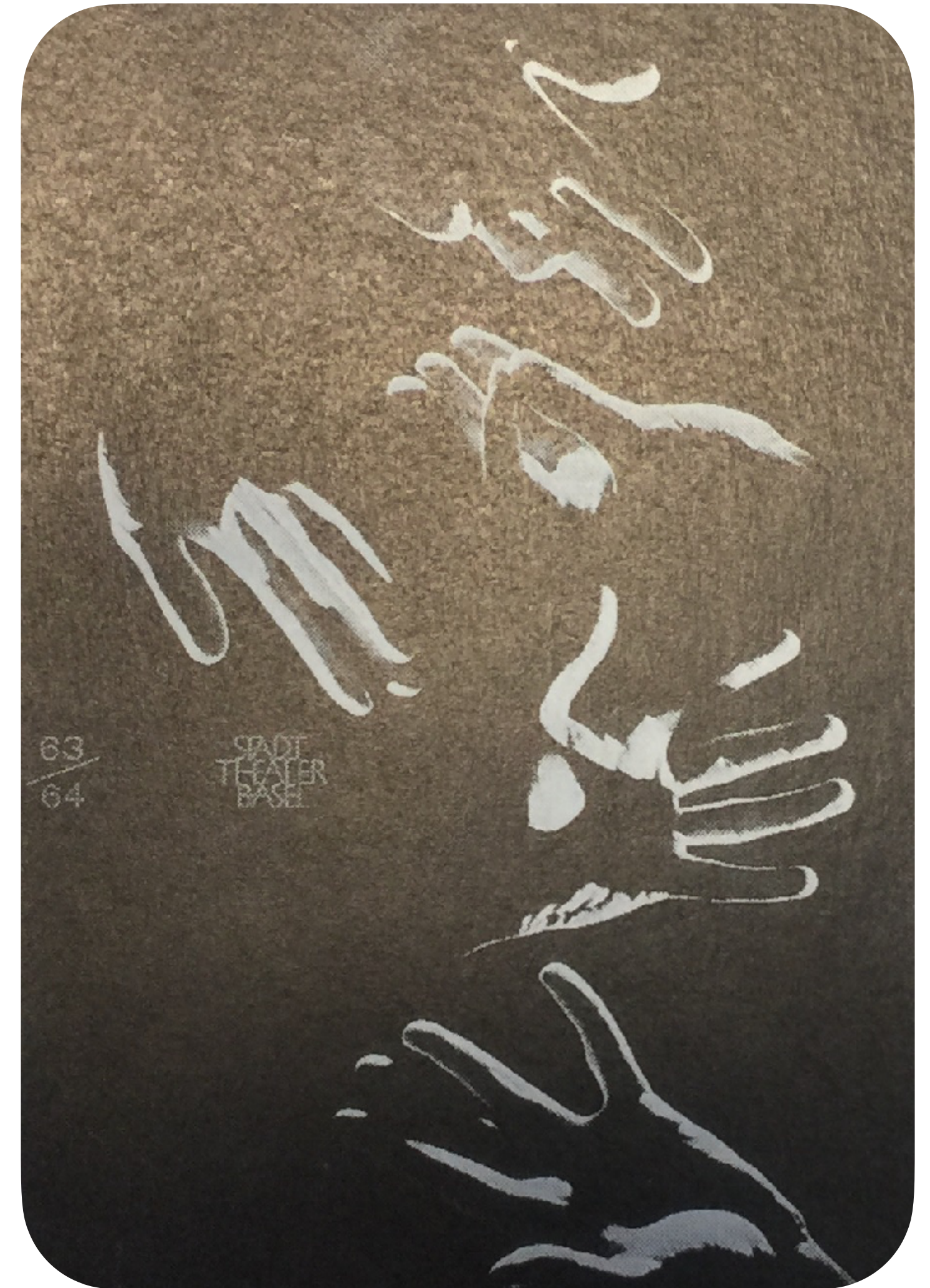
Scale, Contrast, & Proportion

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

Individual visual variables of design that encode information

Terminology

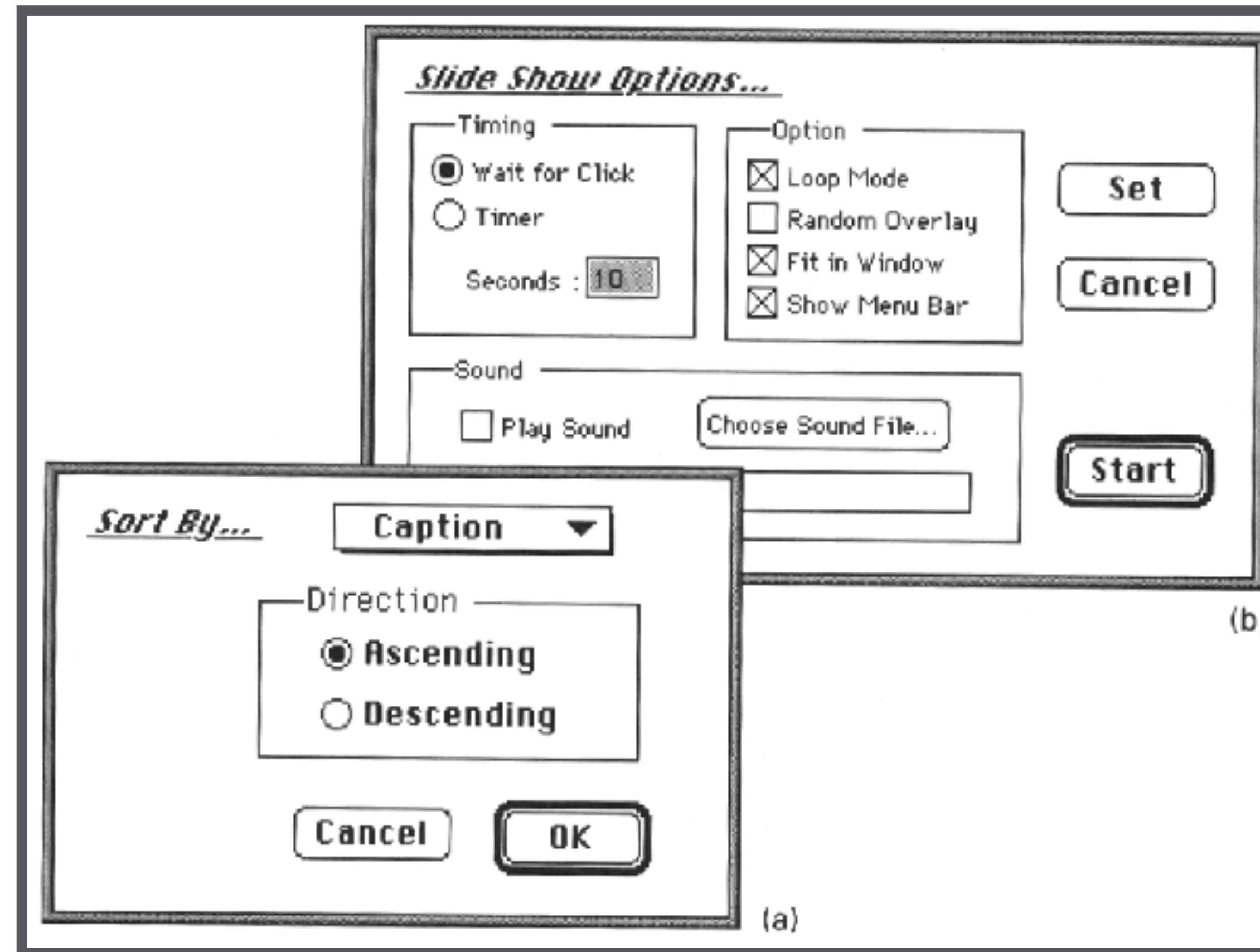
- Scale - relative size or magnitude of element in comparison to related elements
- Contrast - visually noticeable distinctions along a common visual dimension
- Proportion - ratio and balance between elements
- Emphasis - contrasts can emphasize important elements or areas & add visual interest by creating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

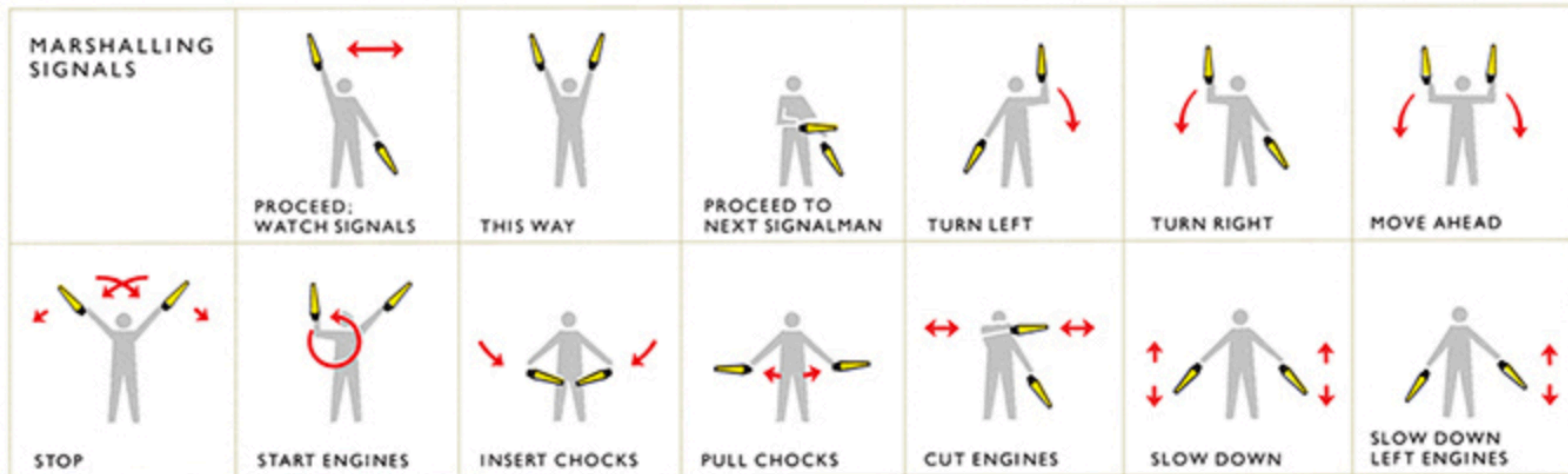
- Contrasting color, value, texture can segregate information into separate layers
- Supports overlapping information in displays, allowing selective processing of specific sets of elements
- Allows different layers to be read and interpreted separately



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



Organization & Structure

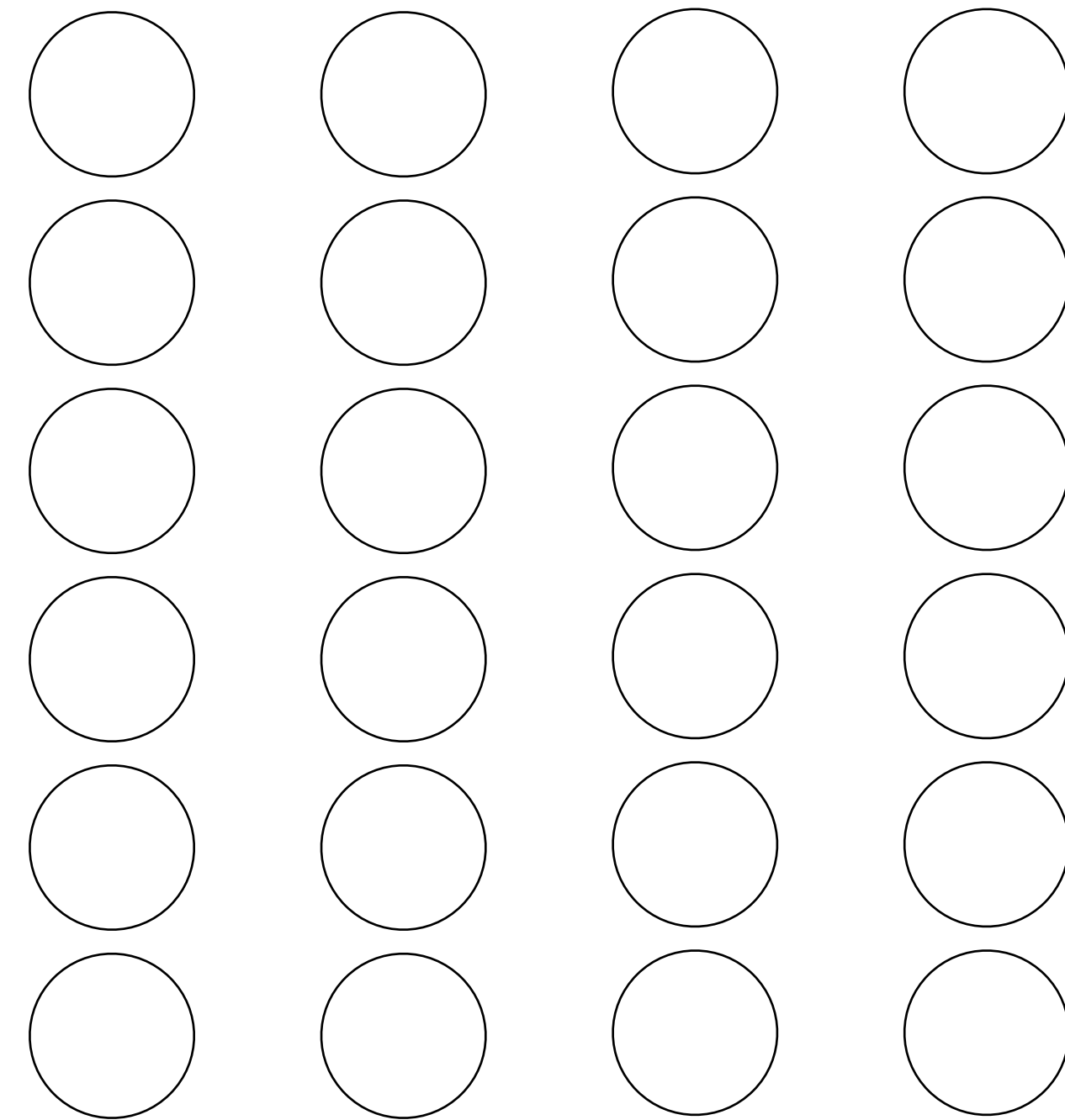
Organization & Structure

- 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

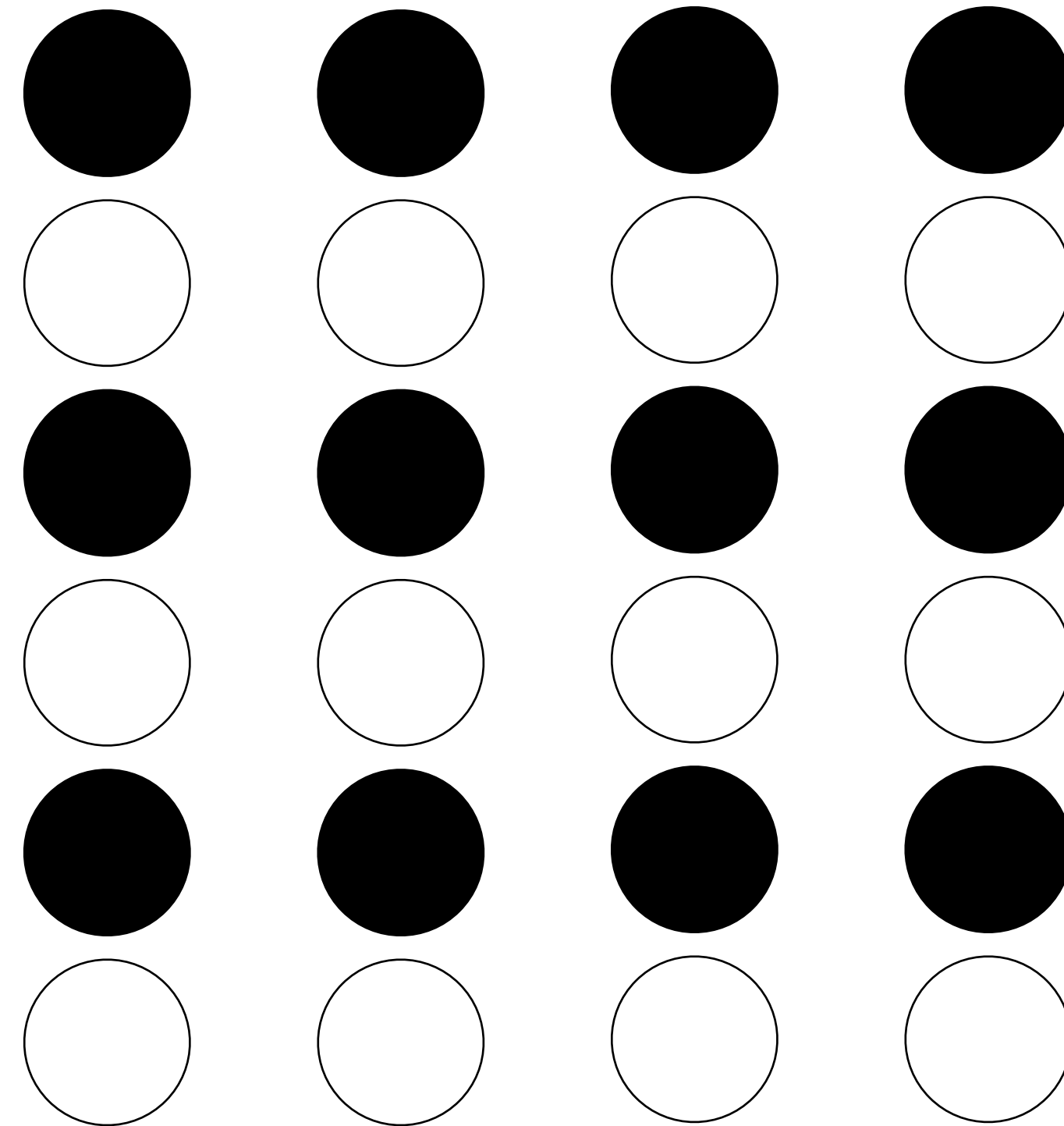
parsed as 4 columns based on close vertical
spacing
then parsed as two sets of two columns
based on spacing



Gestalt Principle - Similarity

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

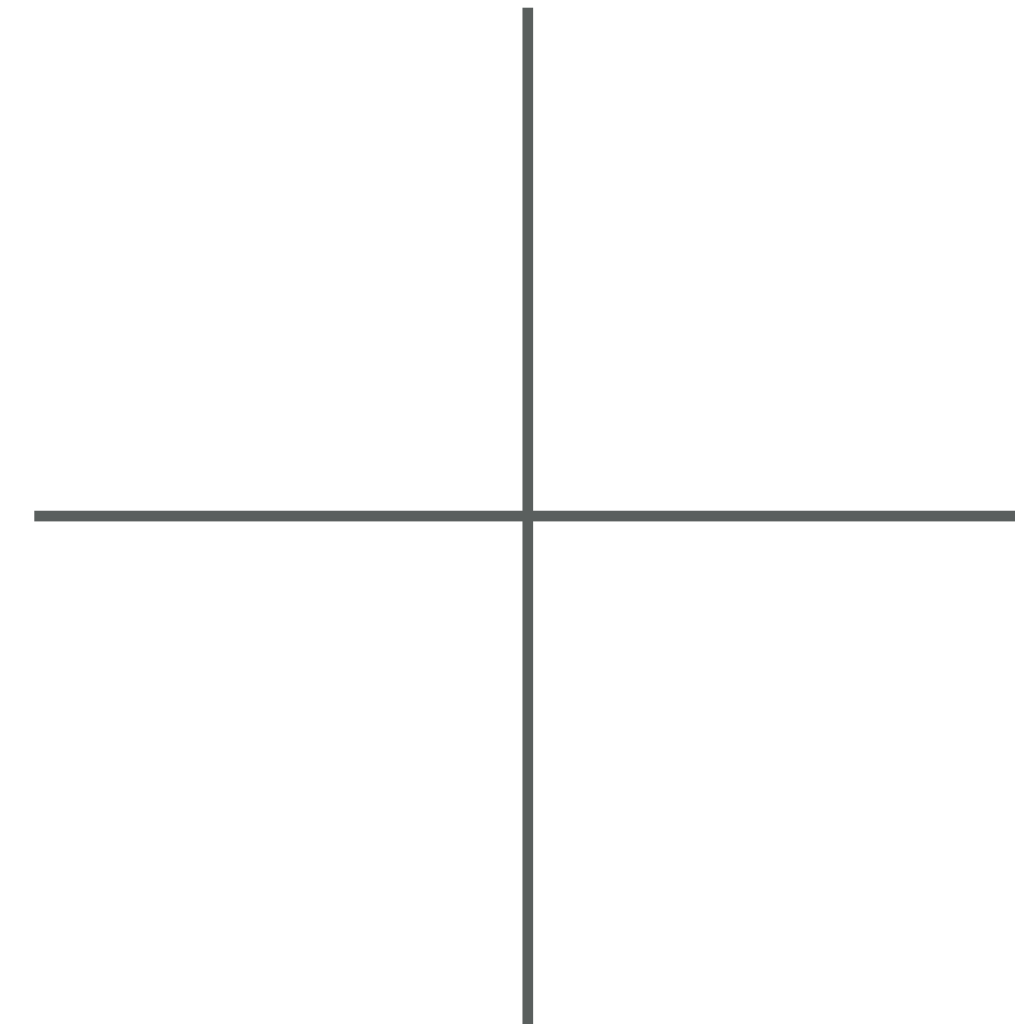
parsed as rows based on fill similarity,
despite closer column spacing



Gestalt Principle - Continuity

- Preference for *simplest* physical explanation of complex figure

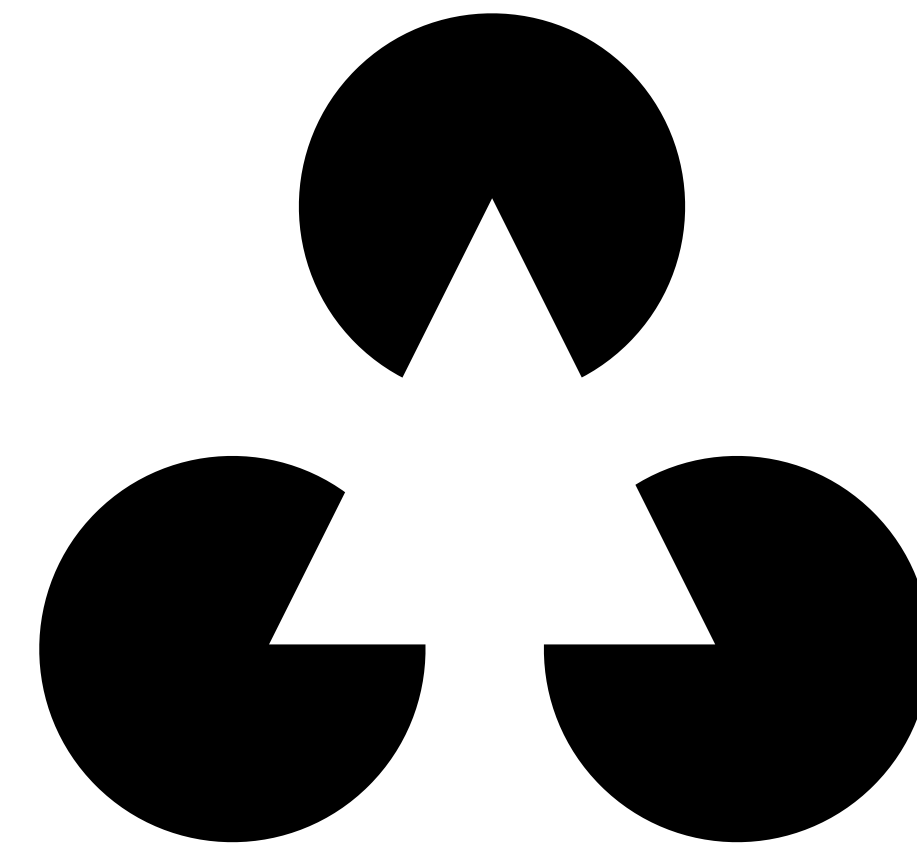
parsed as two lines, rather than 4 separate lines or 4 opposing angles



Gestalt Principle - Closure

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

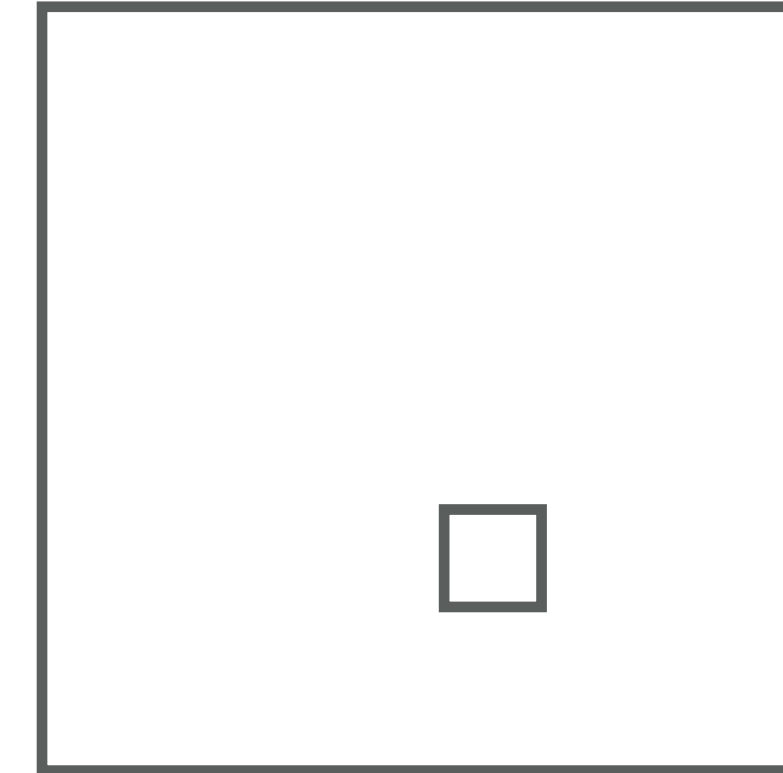
Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present



Gestalt Principle - Area

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

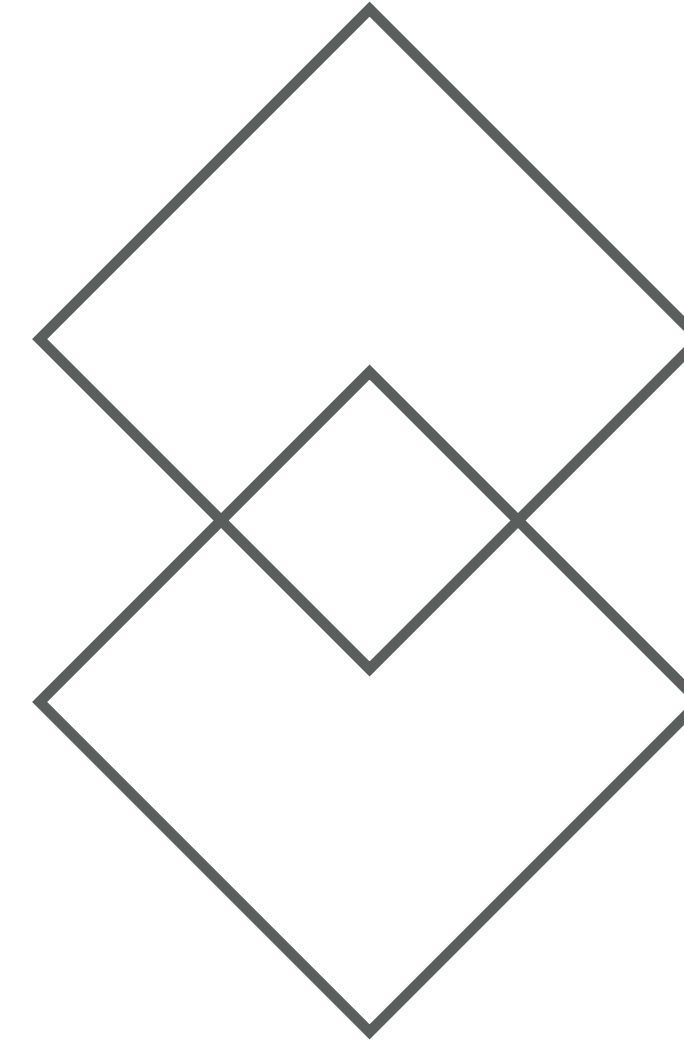
Small rectangle parsed as small rectangle
on top of larger, rather than hole



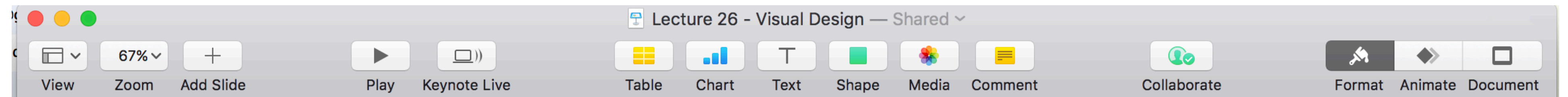
Gestalt Principle - Symmetry

- Preference to interpret ambiguous form as multiple symmetric elements

Parsed as two overlapping objects rather than
3 separate shapes

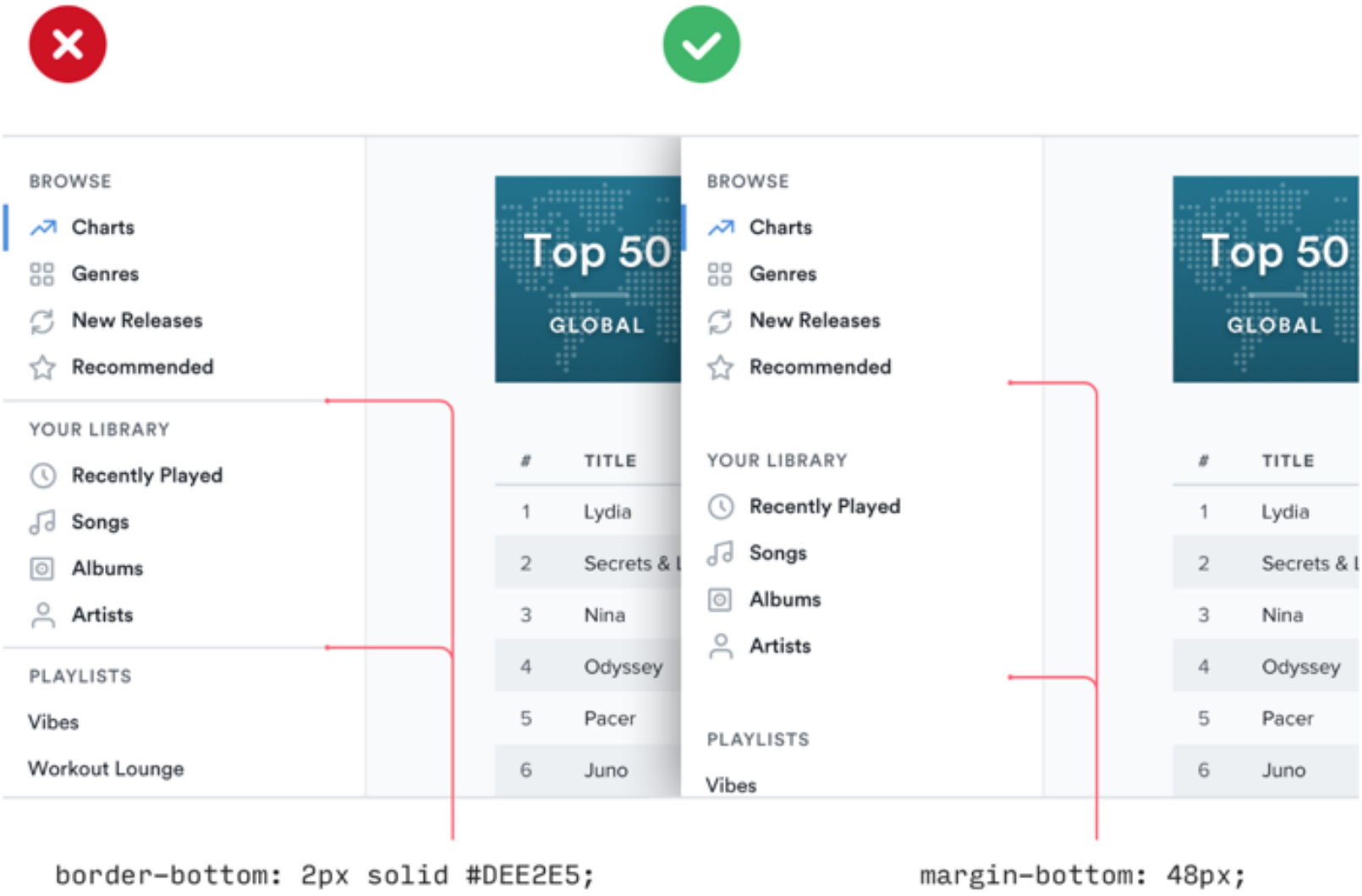


Grouping

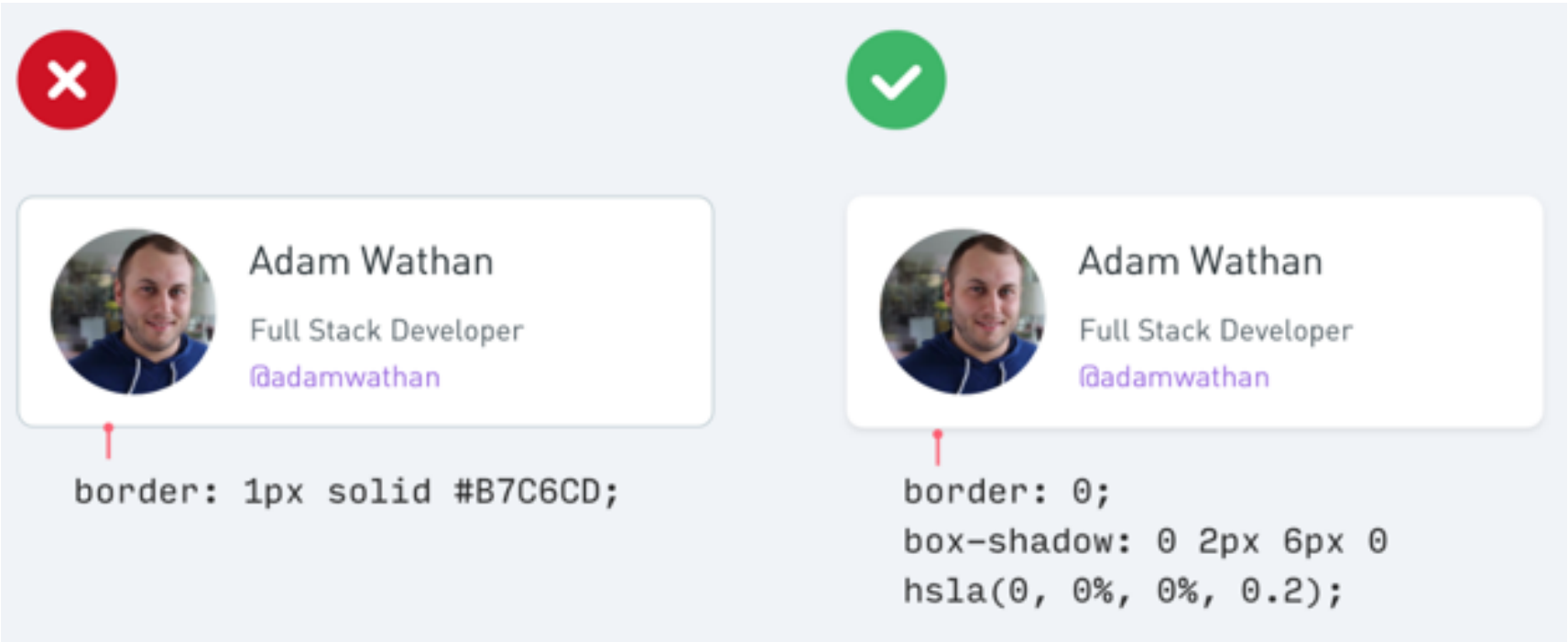


- Binding UI elements tightly together while distinguishing them from surrounding controls
- “Showing” not “telling”
- Can be achieved through
 - Bounding boxes (not recommended)
 - Negative space & contrasts
 - Arrangement & alignment

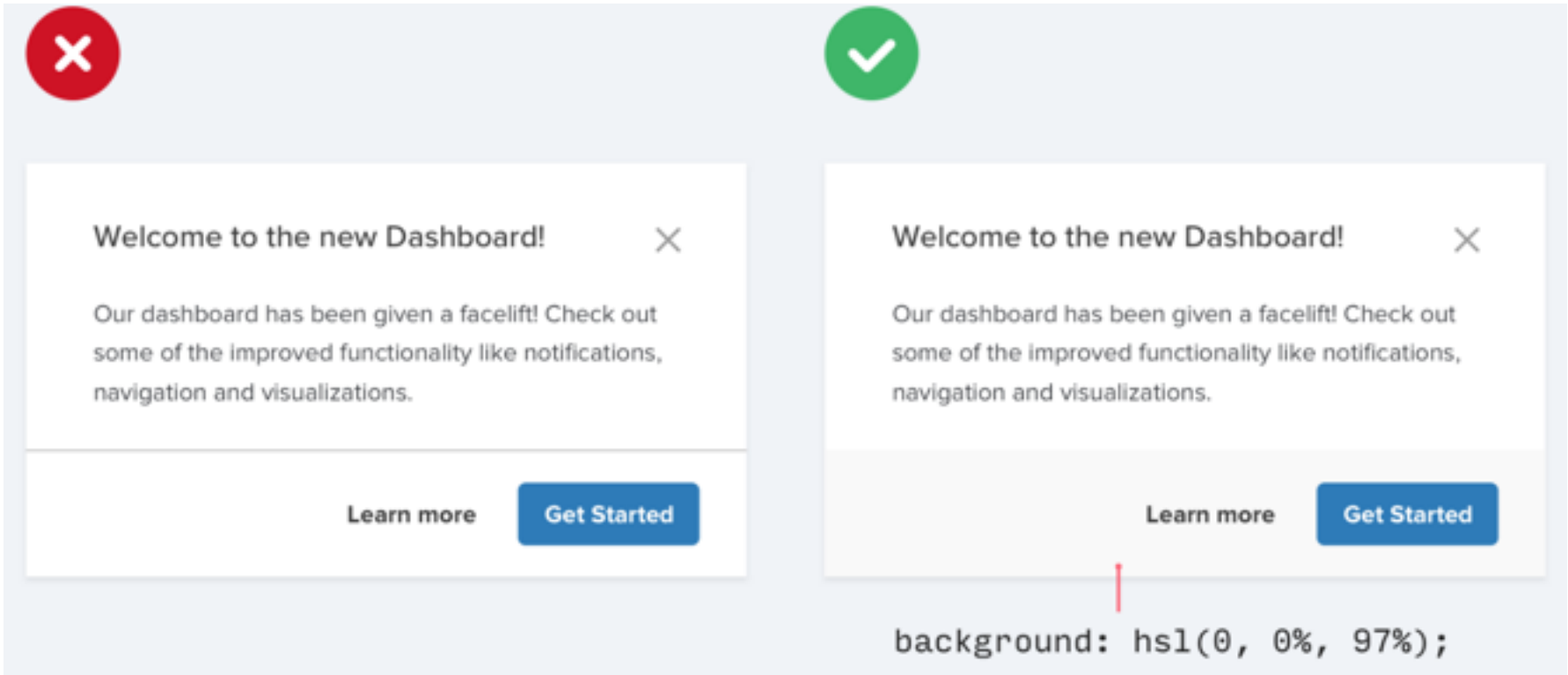
Use Fewer Borders



negative space



box shadows



different backgrounds

Hierarchy

Order groups based on perceptual prominence corresponding to intended reading sequence

Can help solve “skimming” problems

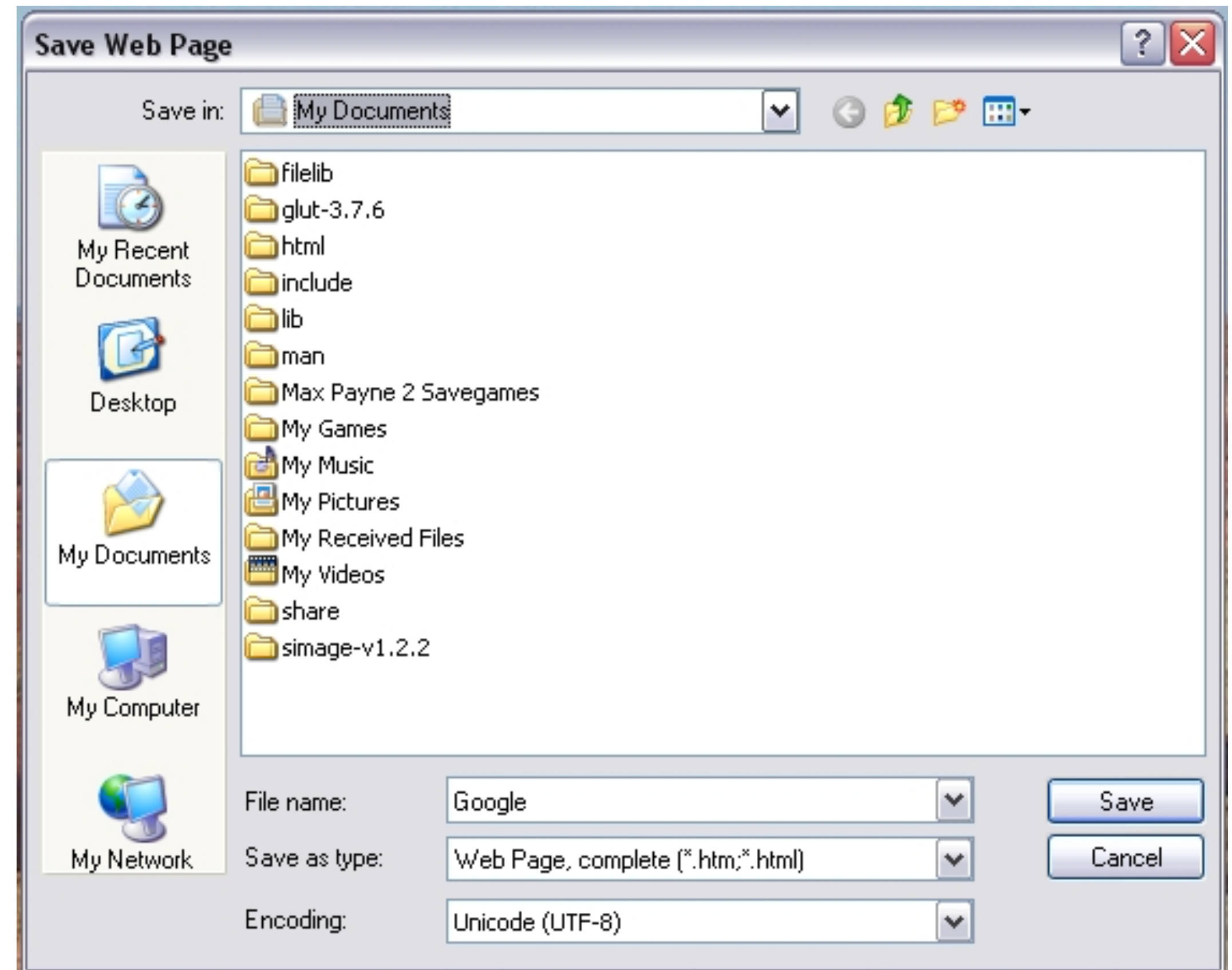
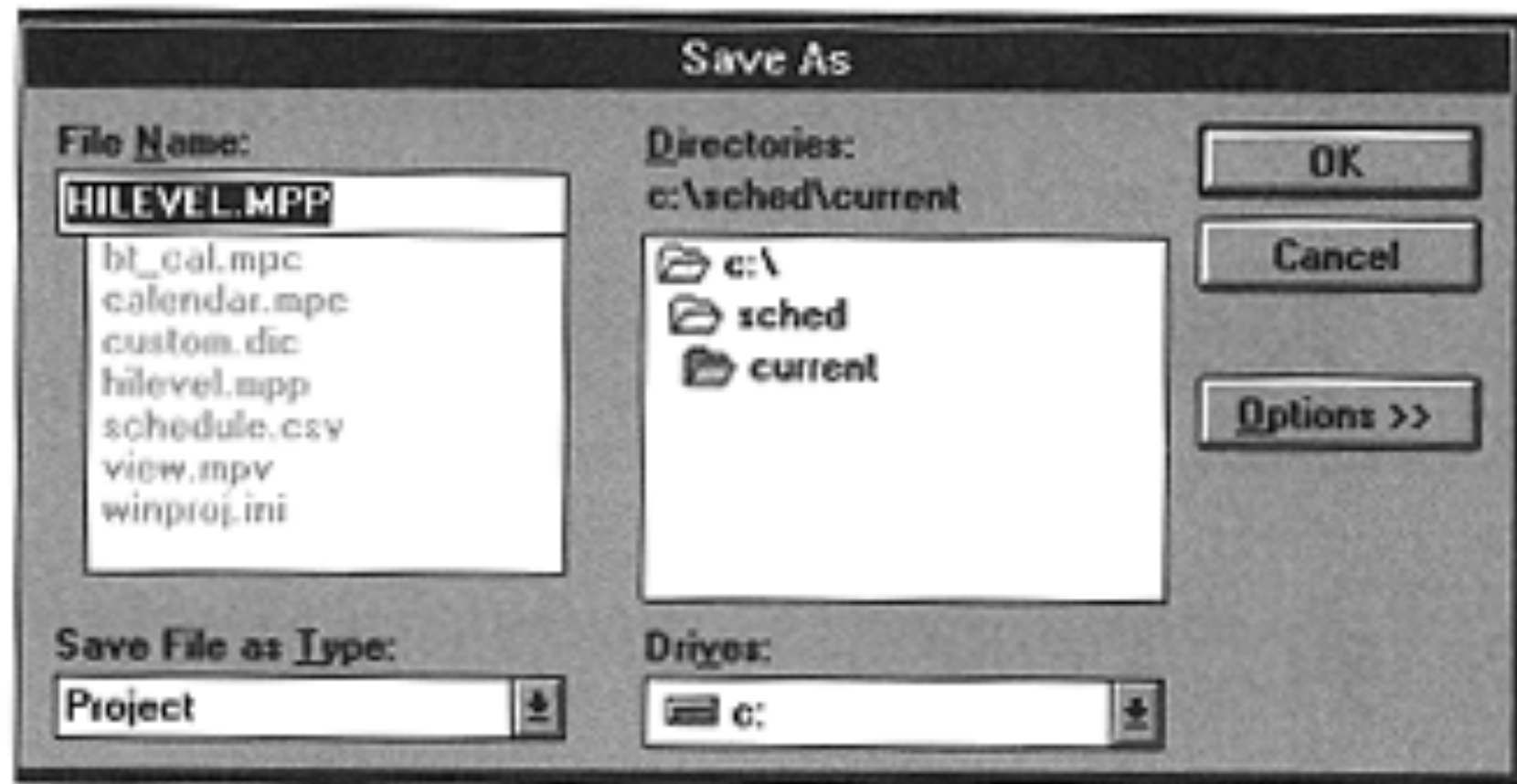
Structure can help people focus attention on key parts

Key points might **get lost** though.

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



Hierarchy in UIs

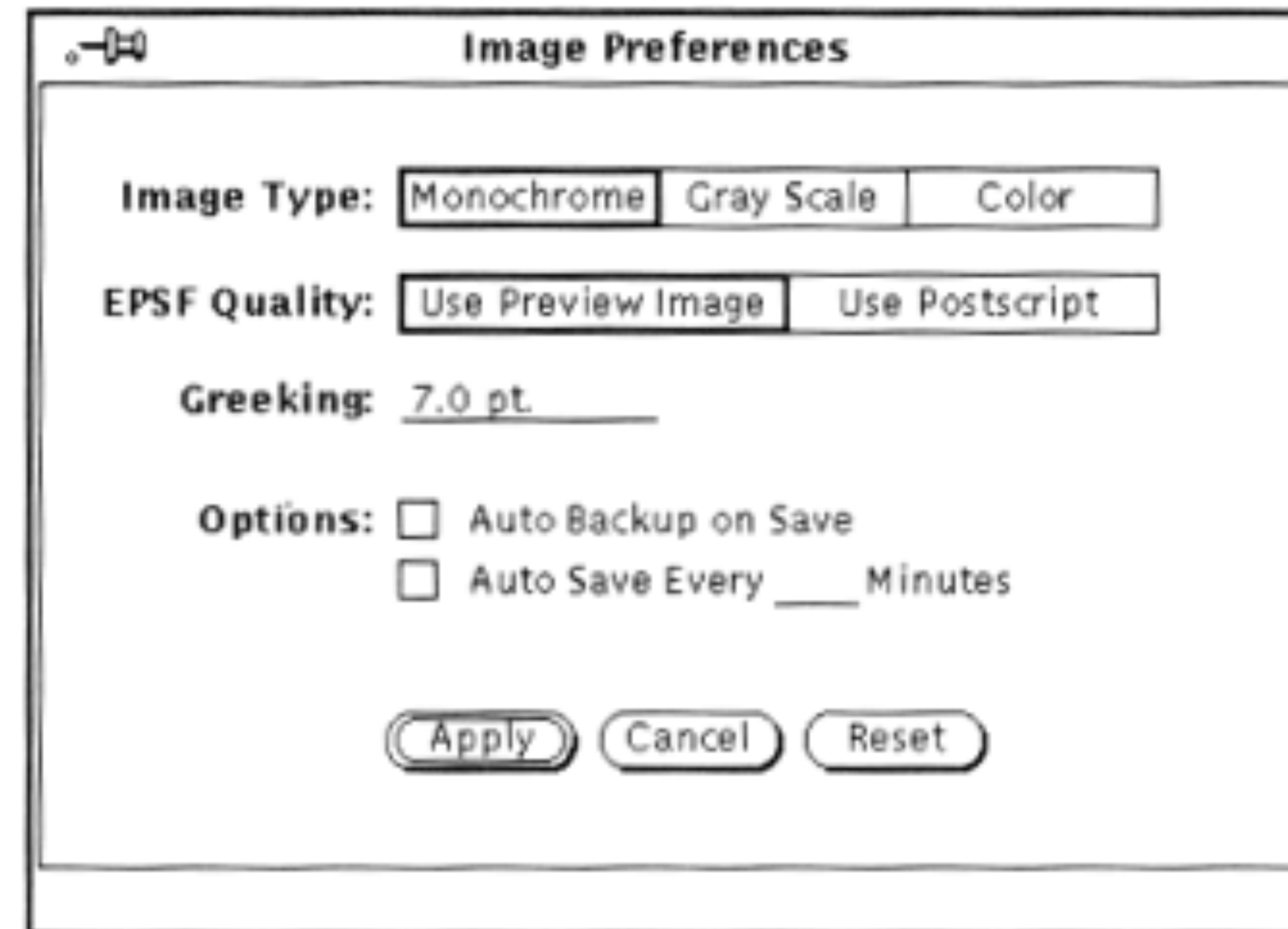
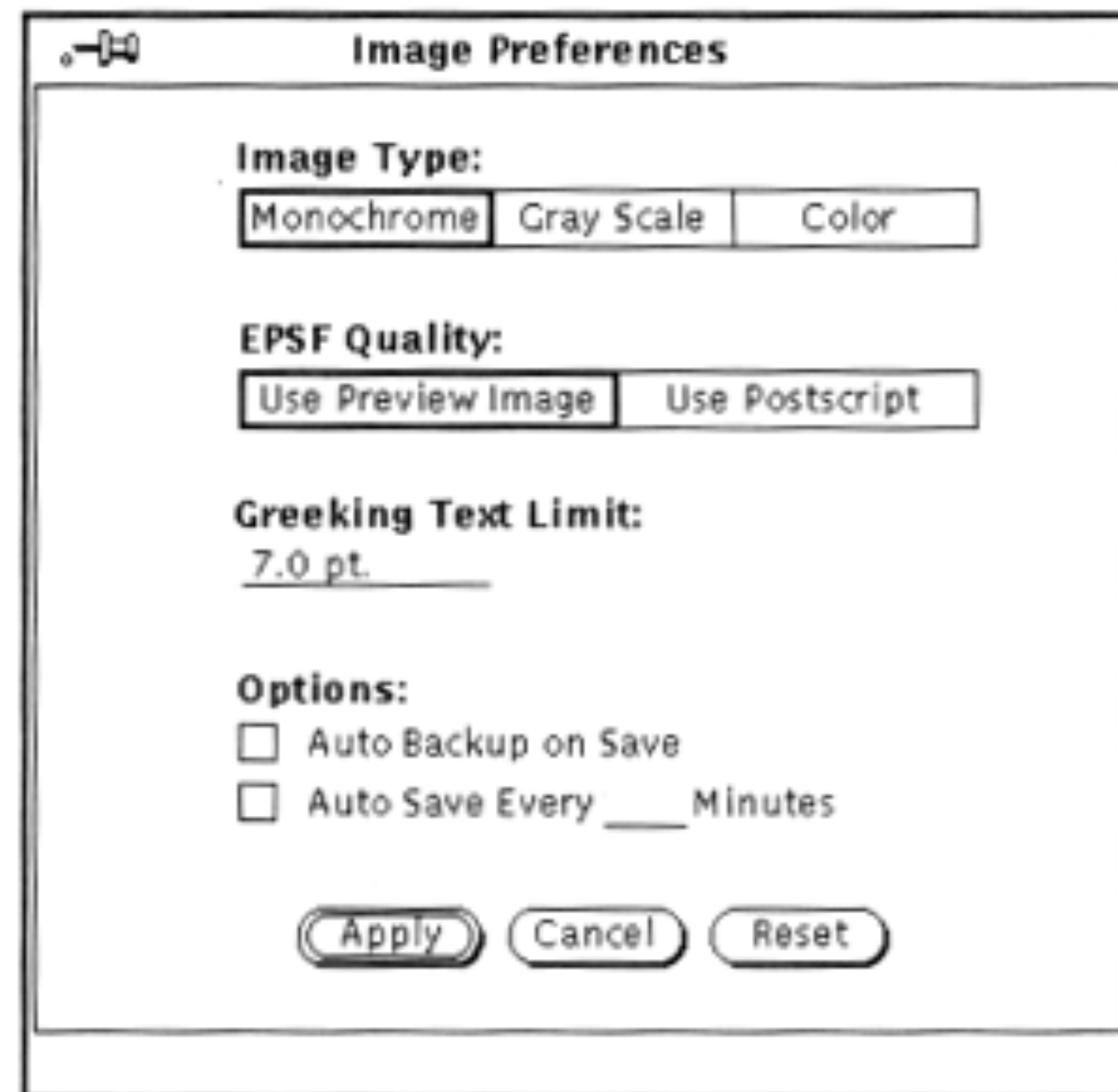


Use Negative Space

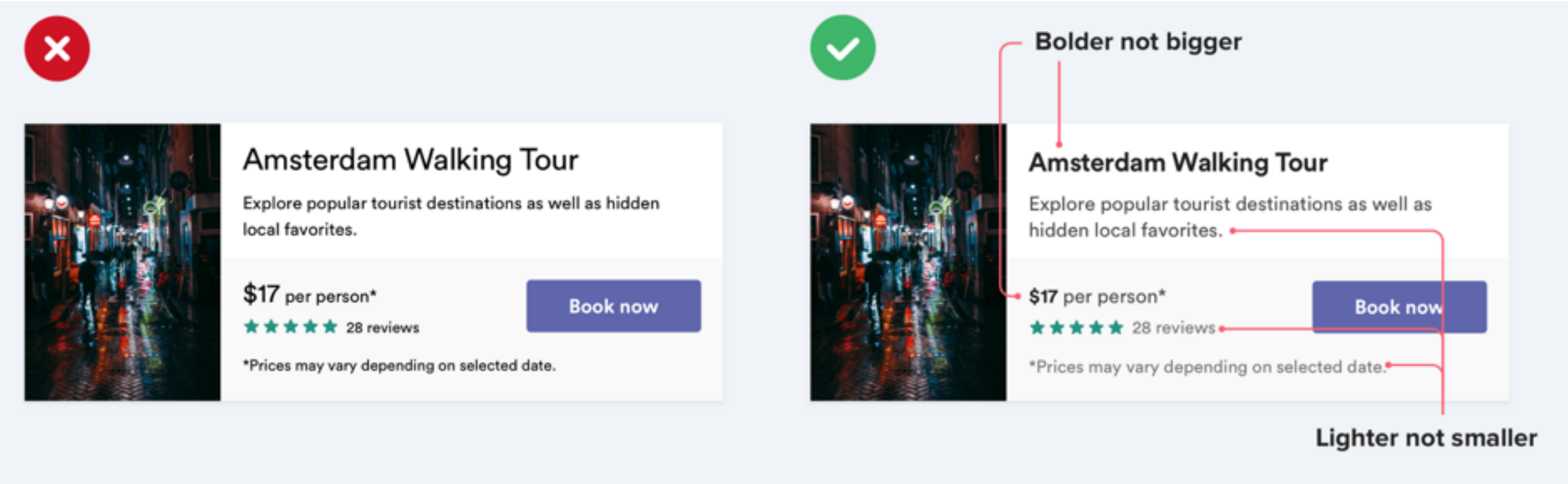
- Directs attention to critical regions of display

1. Review design, prioritizing groups

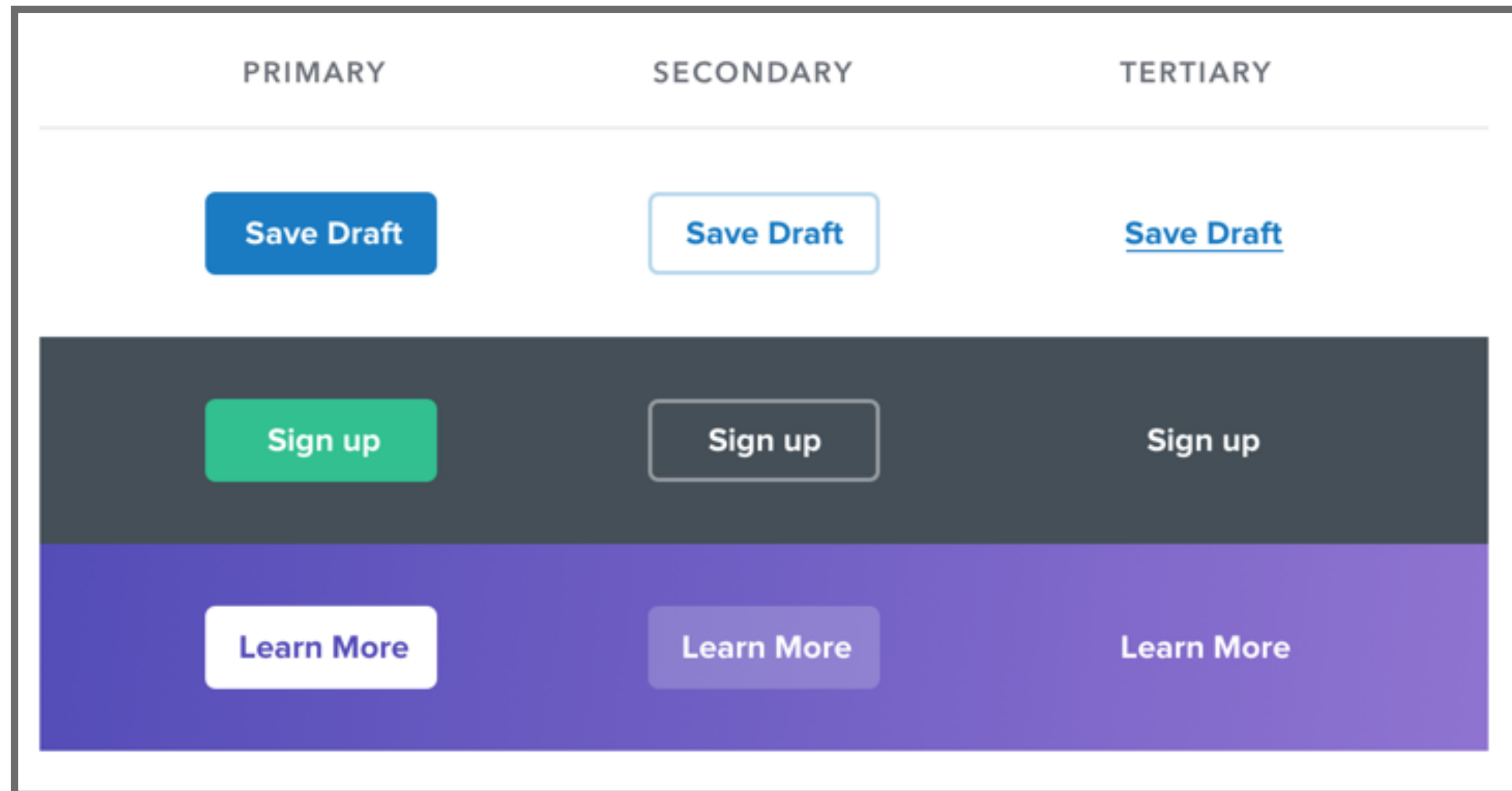
2. Add extra space to ensure spatial separation & emphasis, particularly for important elements



Creating Hierarchy: Color and Weight Instead of Size



Signal Importance of Action



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

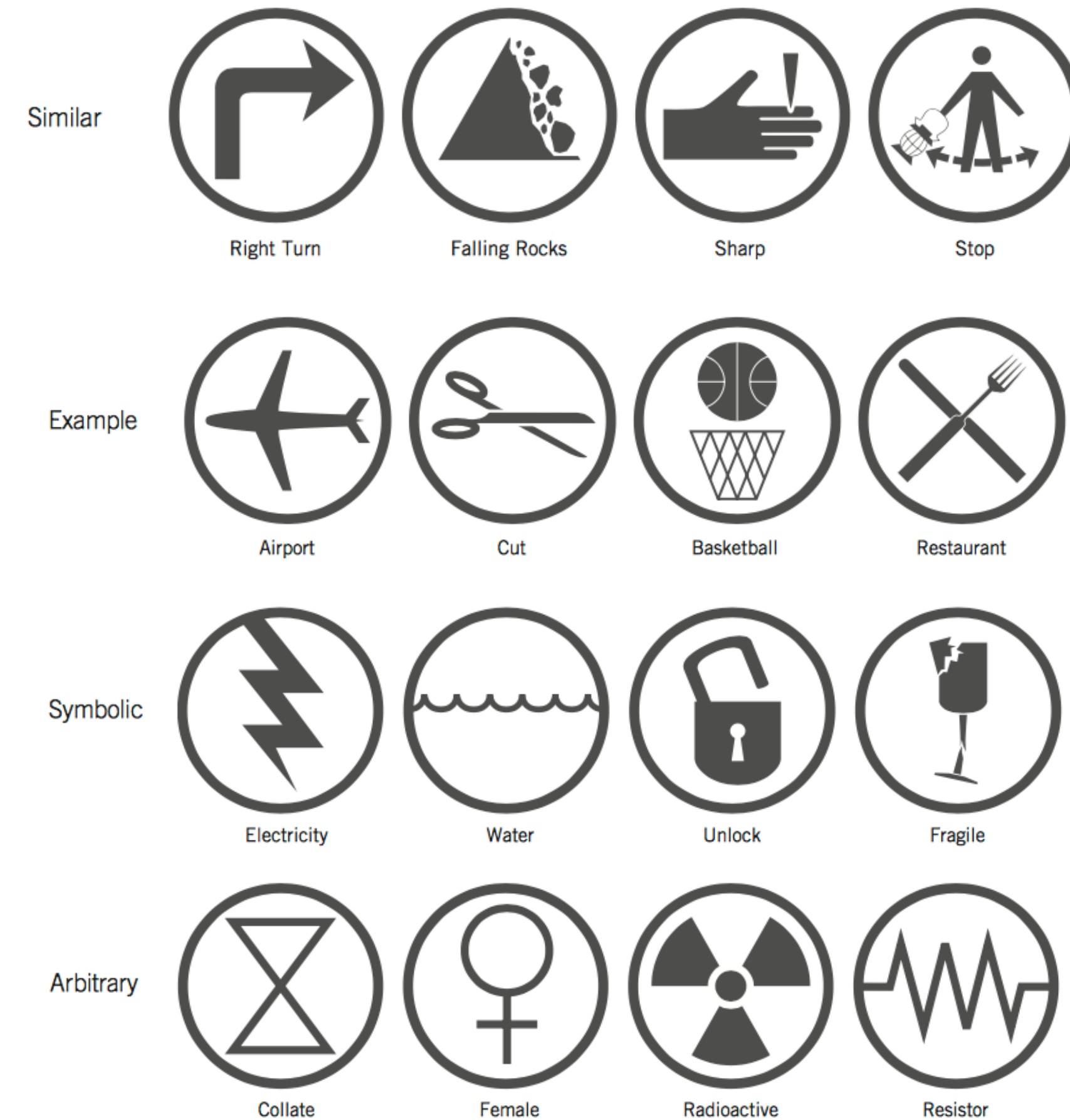
Images & Icons

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

- 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



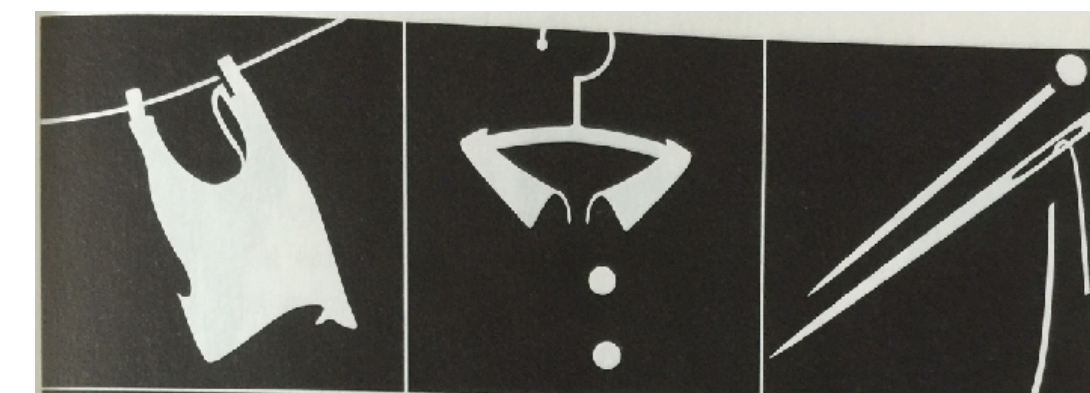
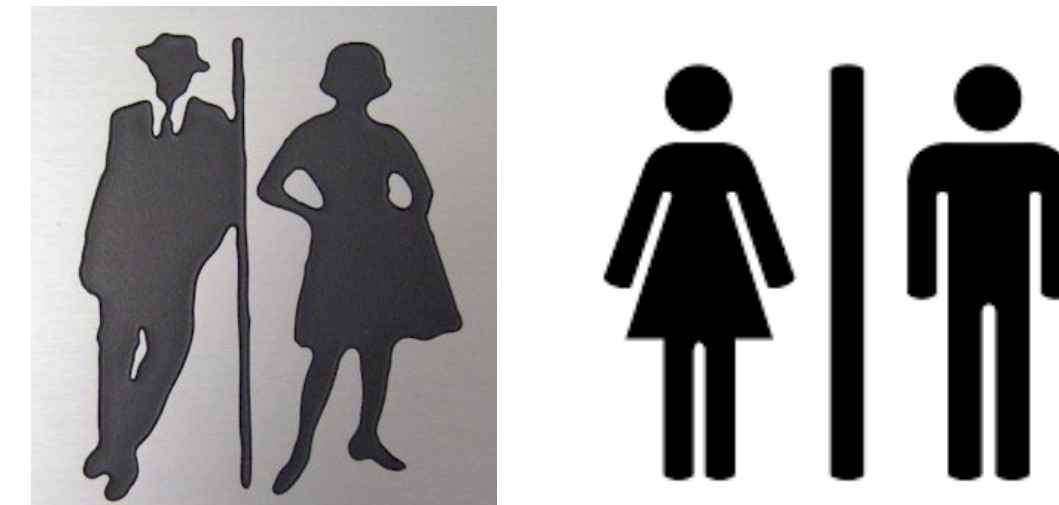
Use of Abstraction

- 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



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

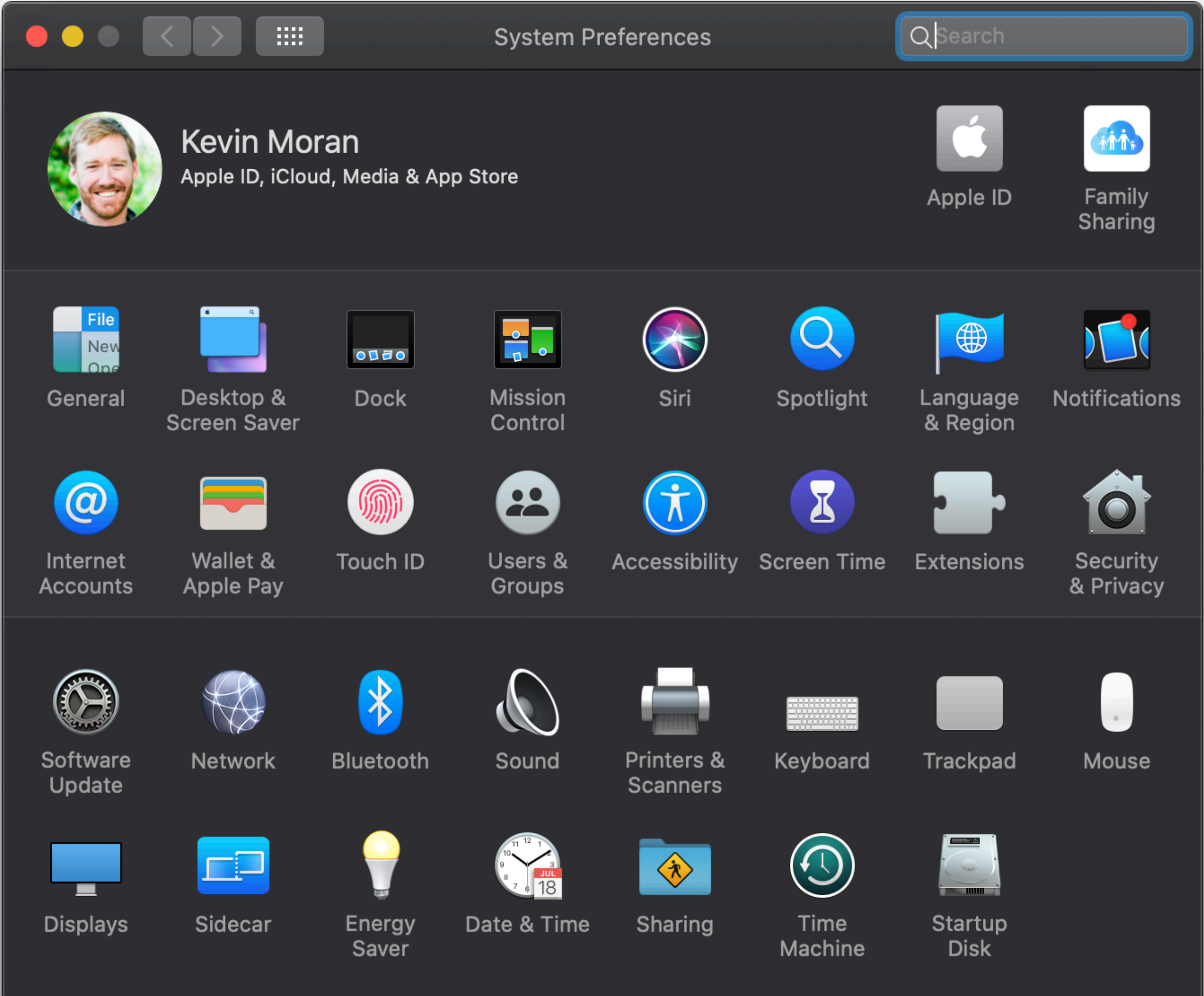
- If concept is concrete, familiar, tangible, use similar or example icon
- If concept will be used repeatedly, consider using more symbolic or arbitrary icon based on convention
- If concept is abstract process or subtle, use textual label

Activity: OS 10.2 Preferences Icons



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

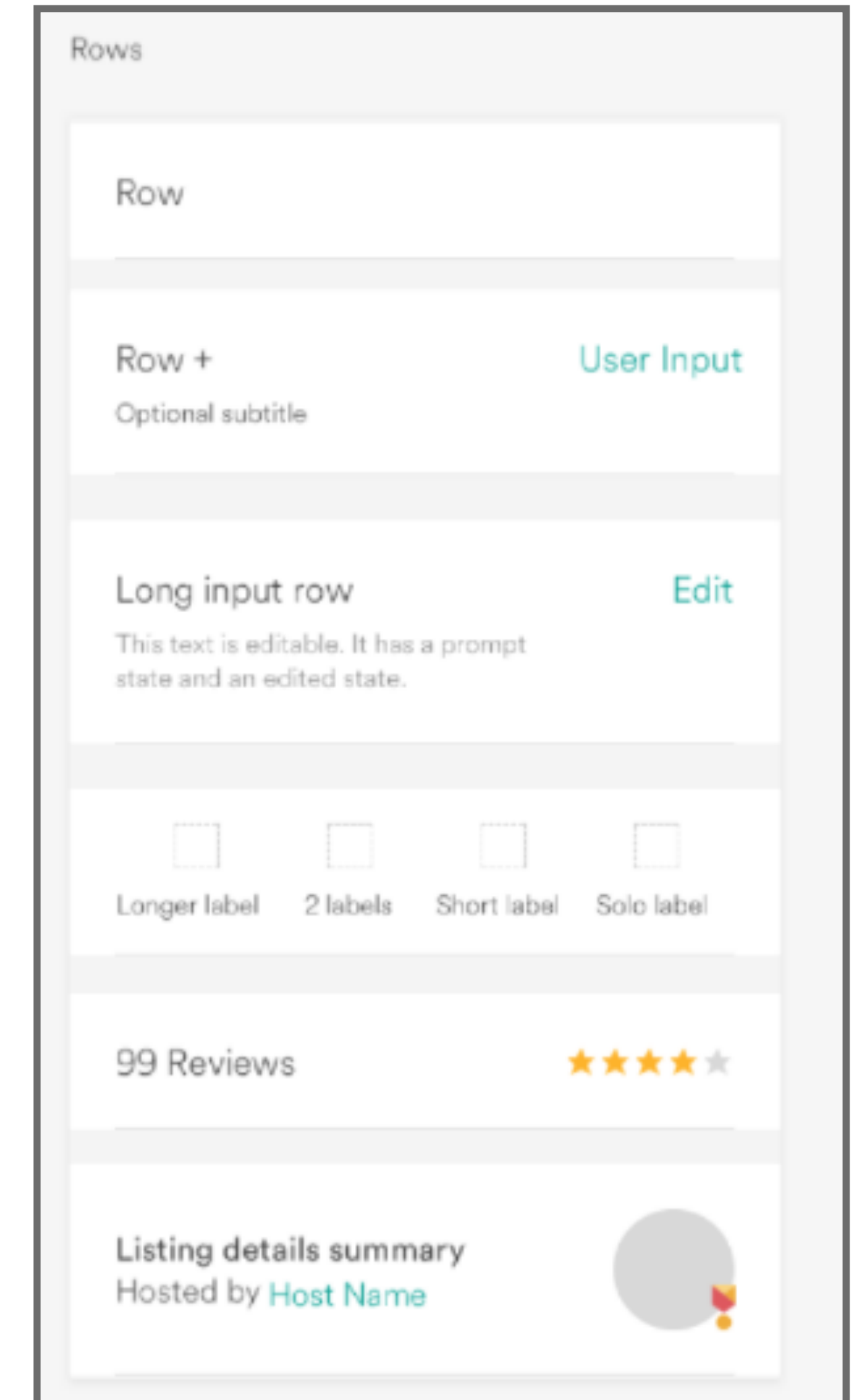
Activity: OS 10.15 Preferences Icons



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

Images

Groups

News

Froogle

more

1

2

3

4

5

6

7

8

9

10

All sizes - Large - Medium - Small

view

Sorted by relevance

Sort by date

World »

>Top Stories

World

Groups

Pos

where

Se

New York Times - all 633 related »

www.cmu.edu/

Oct 1, 1996 by Andy Harper

source

cmu [definition].

(0.48 seconds)

1 - 37 of 37

details

4,285,199,774 web pages

16 minutes ago

Reuters

©2004 Google

Sponsored Links

fluff

(Note: Setting preferences will)

Graduating? Cor

more »

at CMU

Inbox (2)

Compose Mail

Move to Inbox

Search News

I'm Feeling L

Go

Archive

action

Invite 7 frie

New Featu

New! Never lose ai

act now

53

Example: Syntax, Google 2004

task

Find results

with **all** of the words

with the **exact phrase**







with **at least one** of

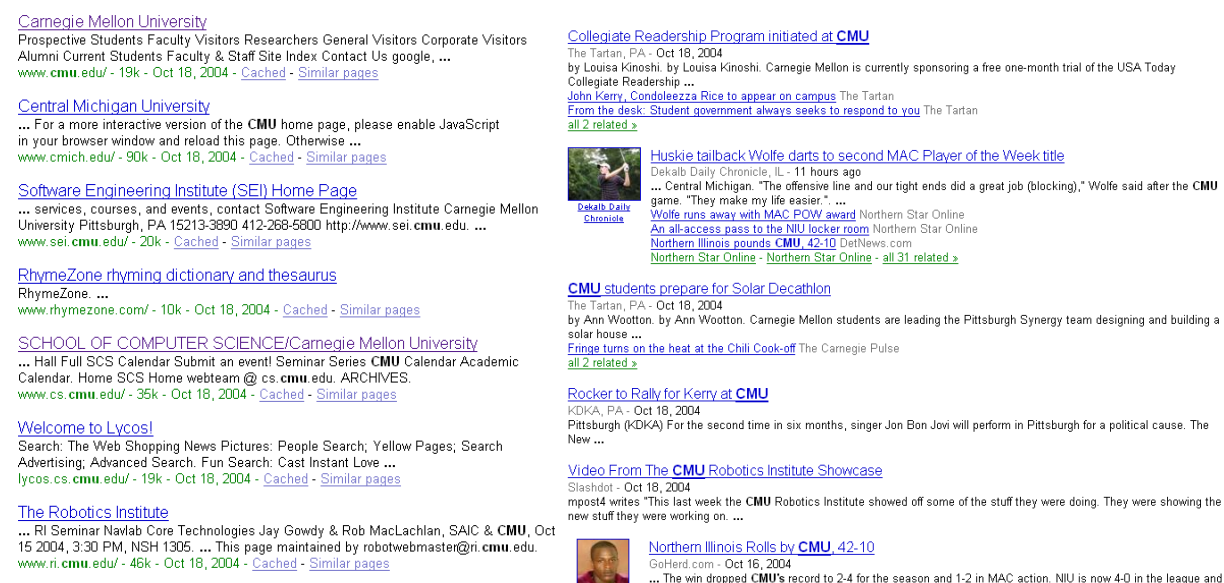
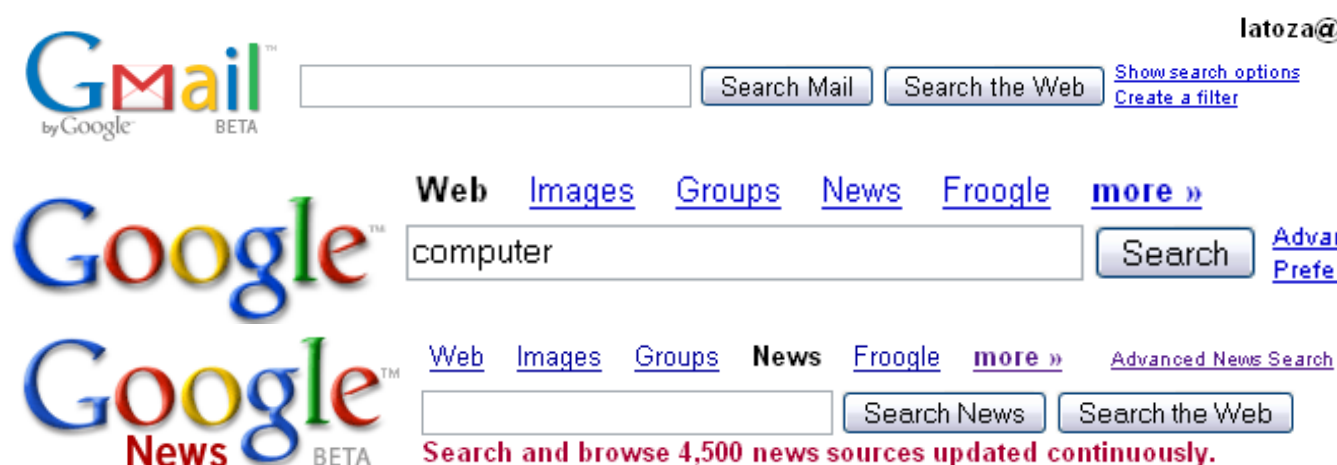
without the words

placeholder

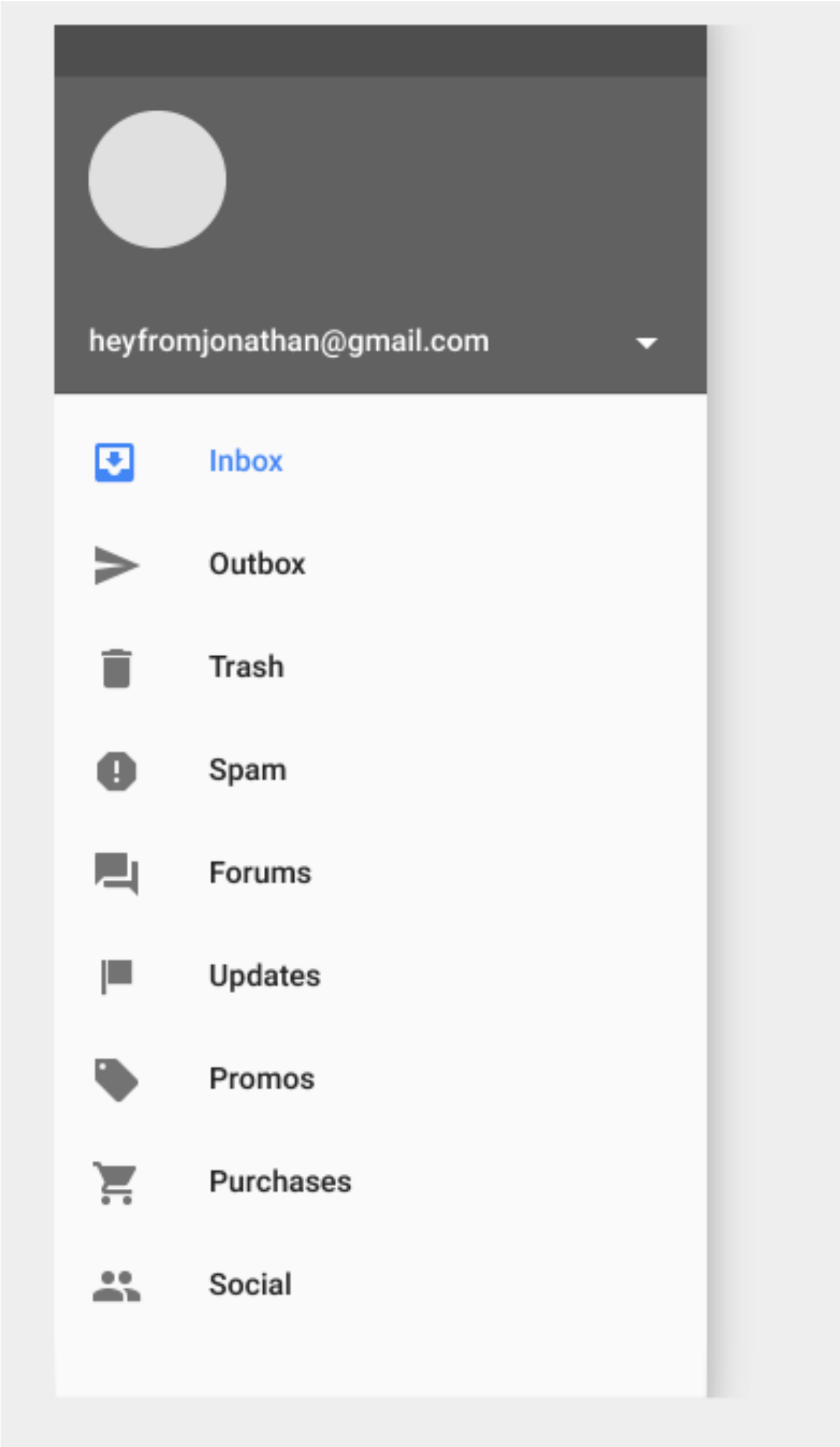
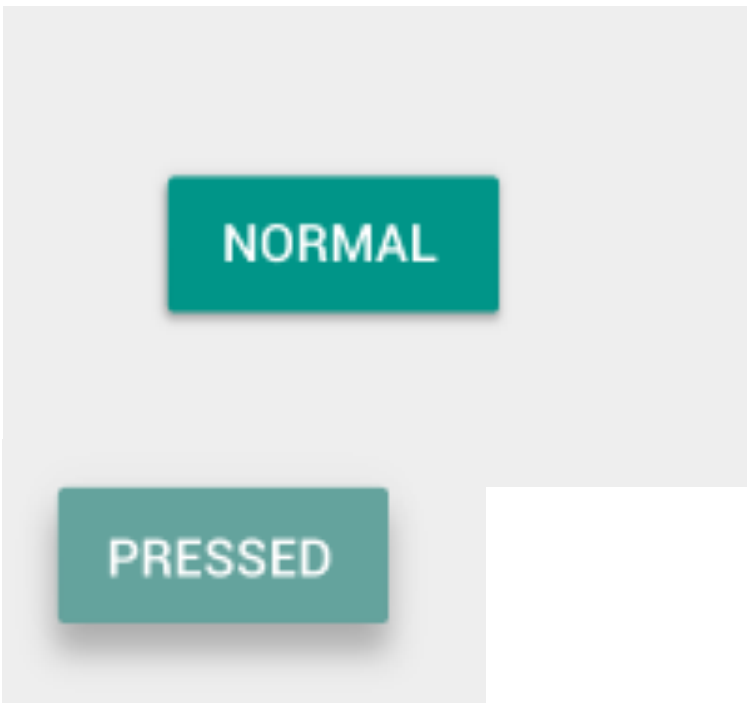
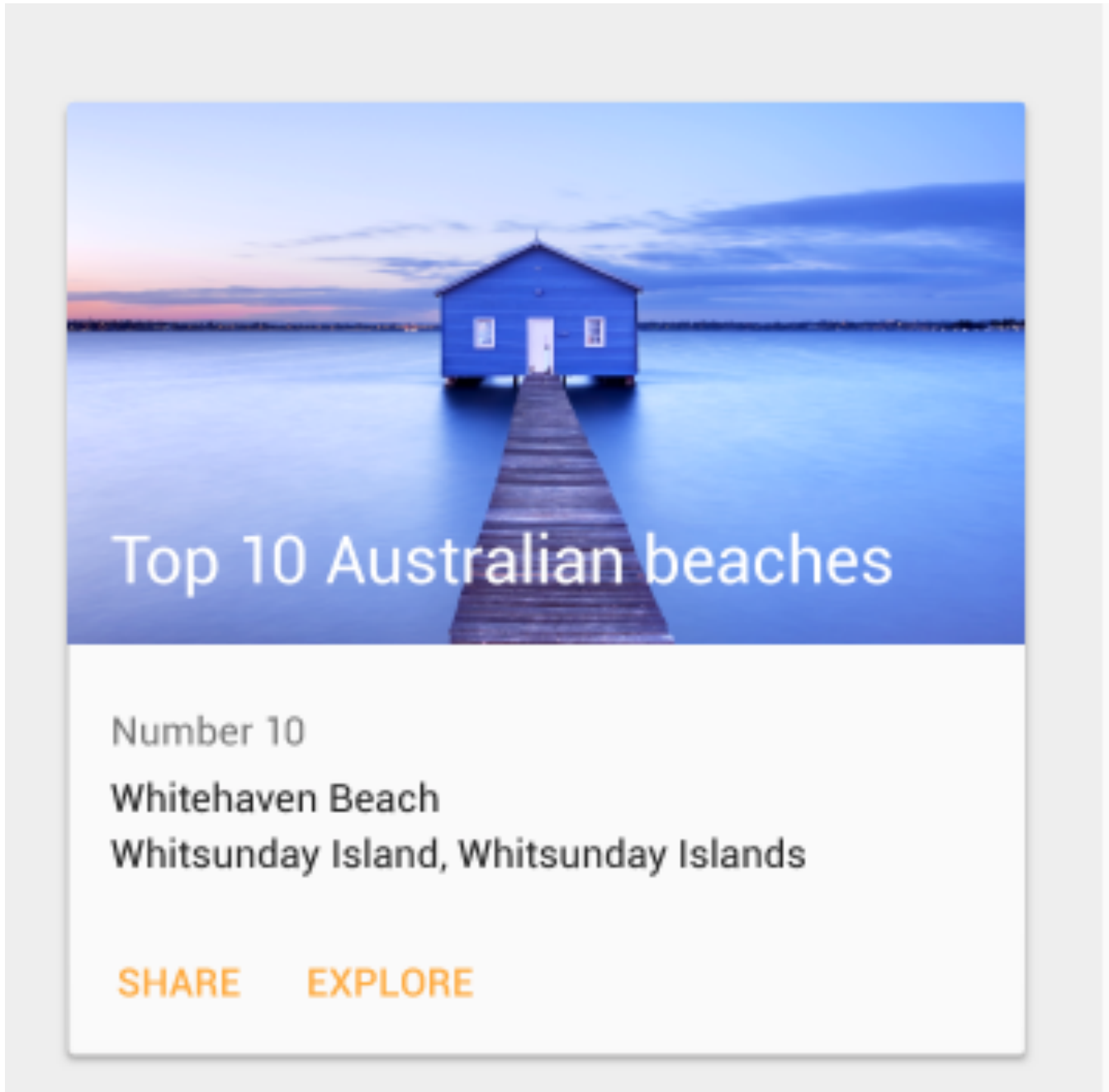
toolbar

list

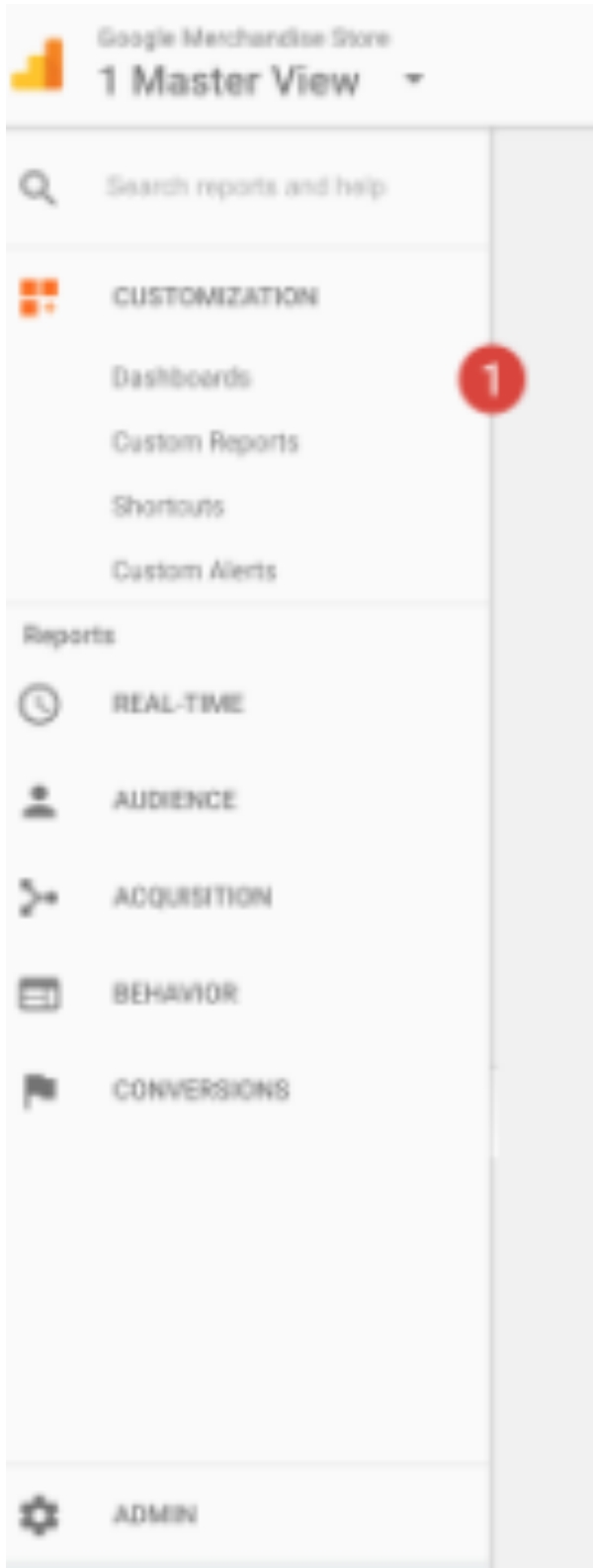
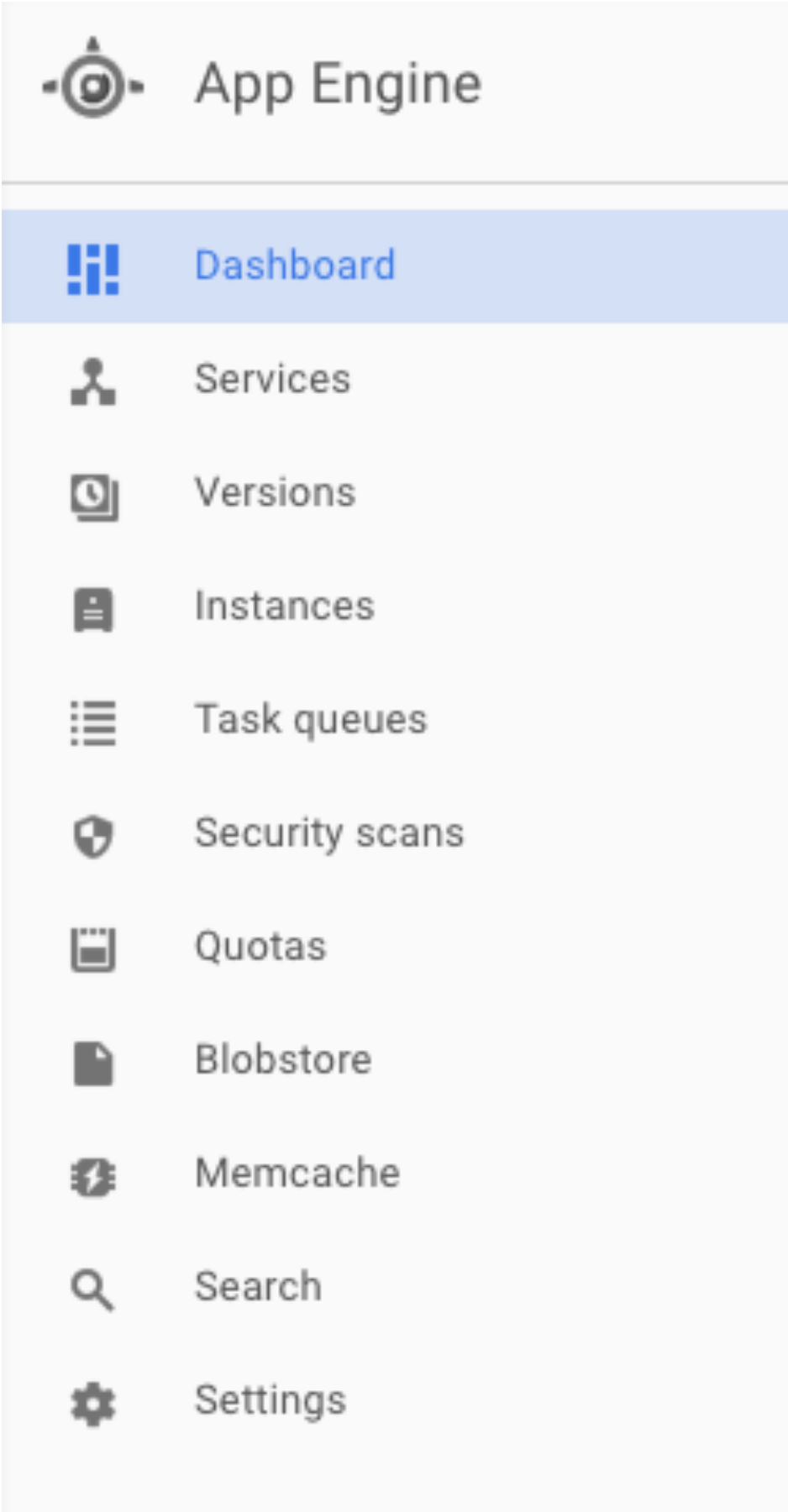
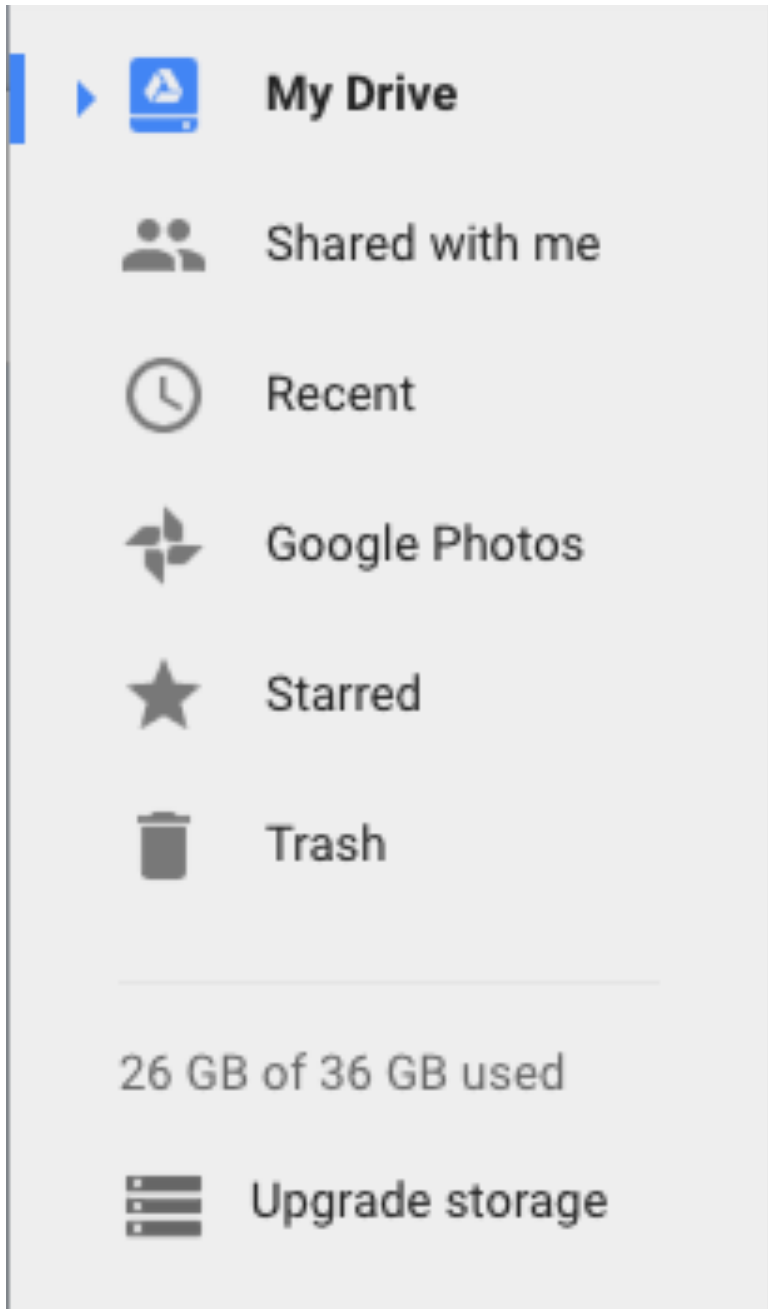
 (unknown sender)	(no subject) - Received: from ima
 (unknown sender)	(no subject) - Received: from ima
 (unknown sender)	(no subject) - Received: from ima
 (unknown sender)	(no subject) - Received: from ima
 (unknown sender)	(no subject) - Received: from ima
 Thomas LaToza	» FW: Bb F04-17651: My apologies
 (unknown sender)	(no subject) - Received: from ima



Examples: Google 2016



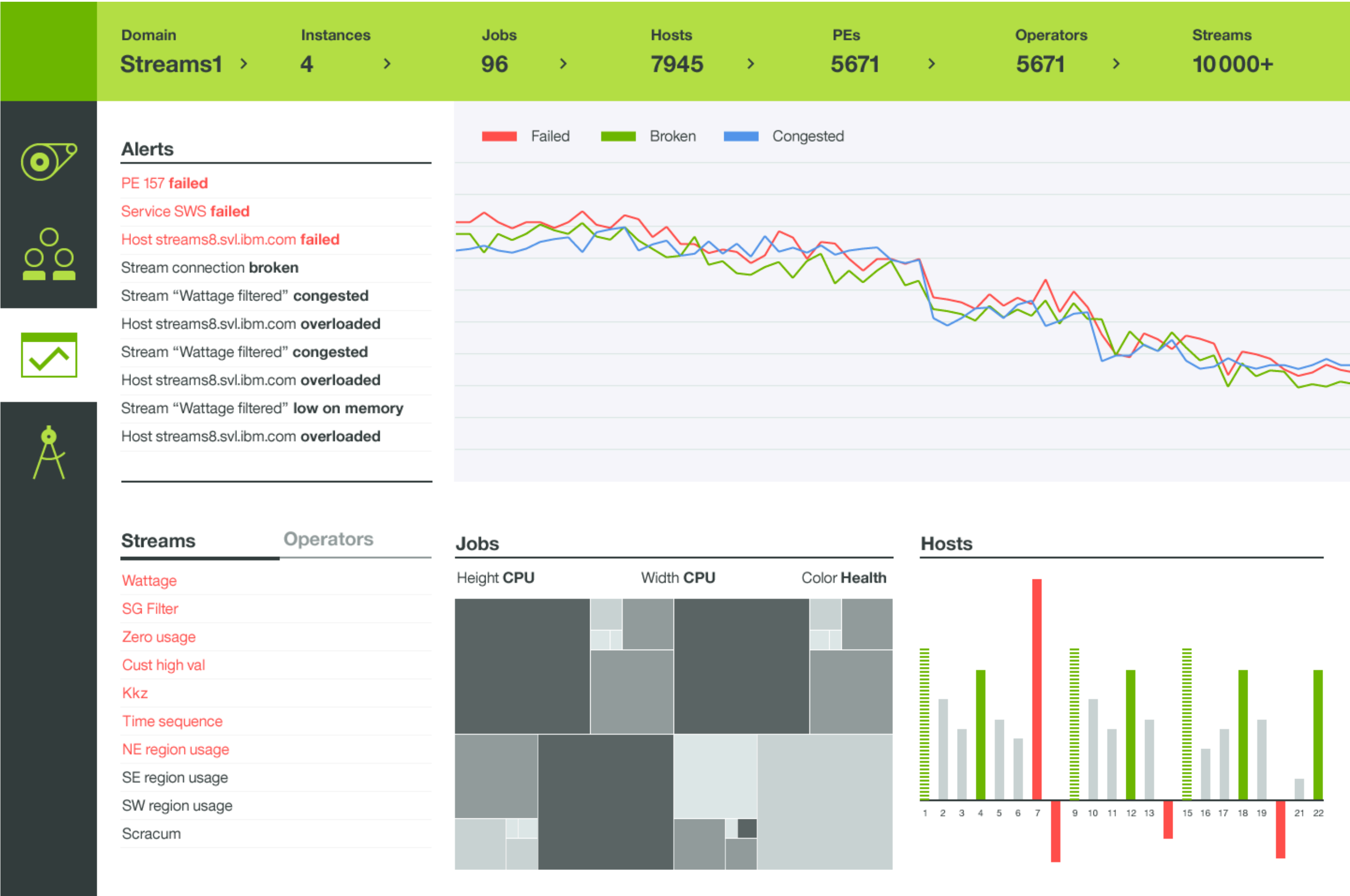
Examples: Google 2016




Examples: IBM





Examples: IBM




Examples: IBM


Configure



People



Save



Chat


Application data


Title	Title	Value	Date ▼	Value
Imperial	true	9 456 234	21. Feb 2014	9 456 234
Hard	false	987 345	21. Feb 2014	987 345
Cider	false	43 567	21. Feb 2014	43 567
Anaerobic	true	324 543	21. Feb 2014	324 543
Cold filter	false	432 456	20. Feb 2014	432 456
Barrel hand	true	32 432	20. Feb 2014	32 432
Pump wort	true	4 567	20. Feb 2014	4 567
Dry hopping	false	34 567	20. Feb 2014	34 567
Carbonation	true	434 567	20. Feb 2014	434 567
Mash tun	false	9 456 234	20. Feb 2014	9 456 234
Bittering hops	true	987 345	20. Feb 2014	987 345
Heat exchanger	false	43 567	19. Feb 2014	43 567
Lauter aerobic	false	324 543	19. Feb 2014	324 543
Abbey seidel	true	432 456	19. Feb 2014	432 456
Brewhouse	false	32 432	19. Feb 2014	32 432
Brewpub adjunct	true	4 567	19. Feb 2014	4 567
Dextrin seidel	true	34 567	19. Feb 2014	34 567
Aau beer	false	434 567	19. Feb 2014	434 567
Krug abv	true	434	19. Feb 2014	434



Configure


User

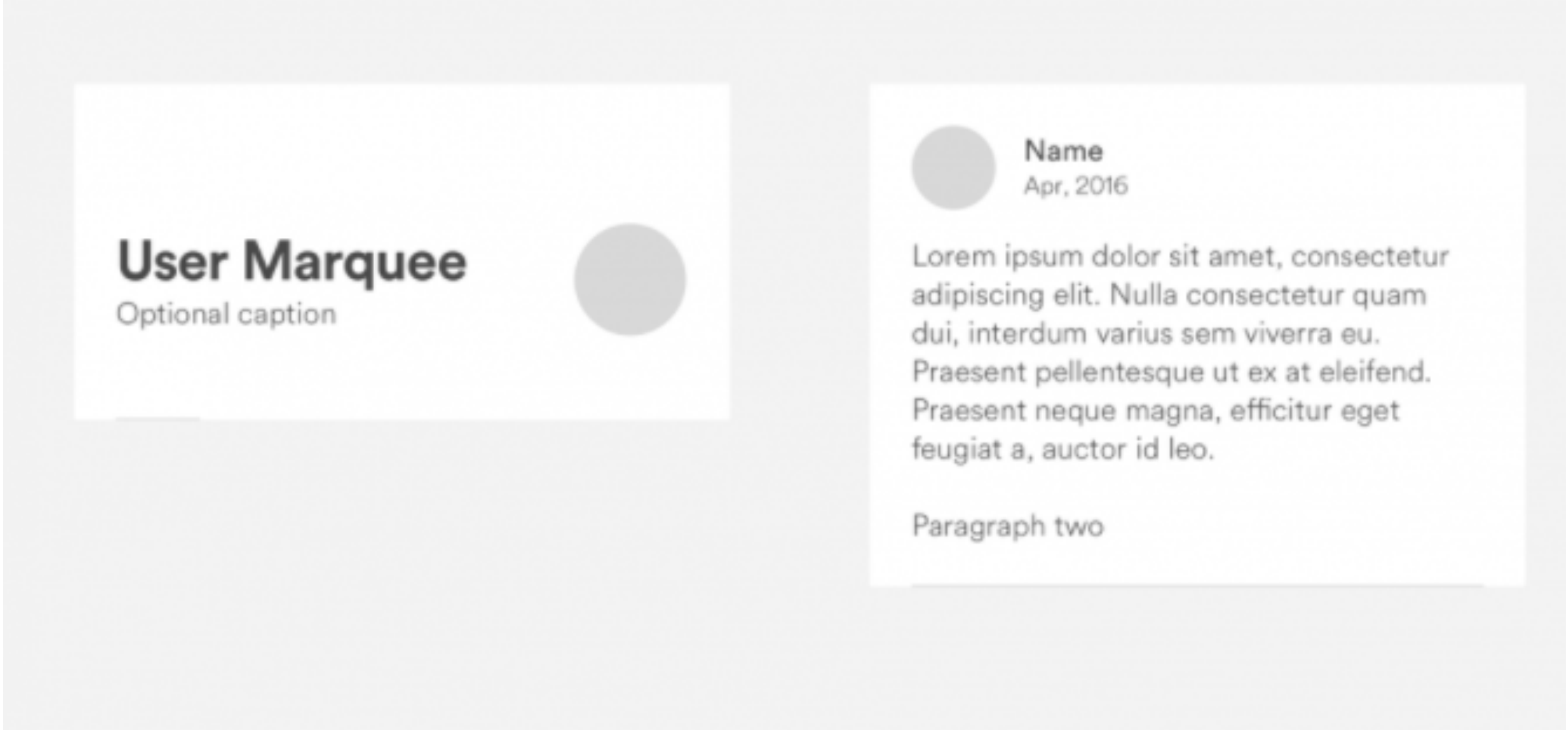

Save


Catalog

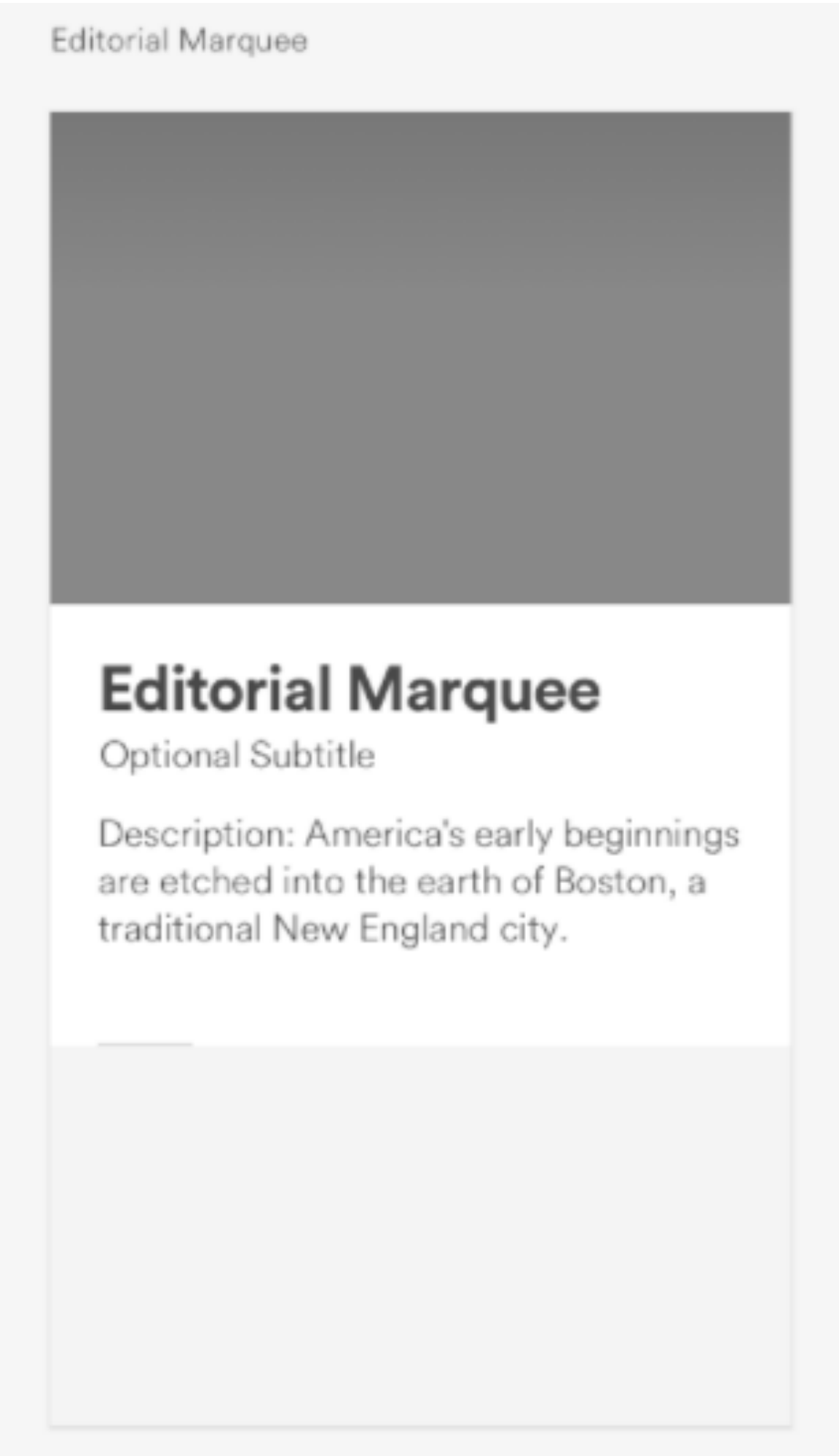
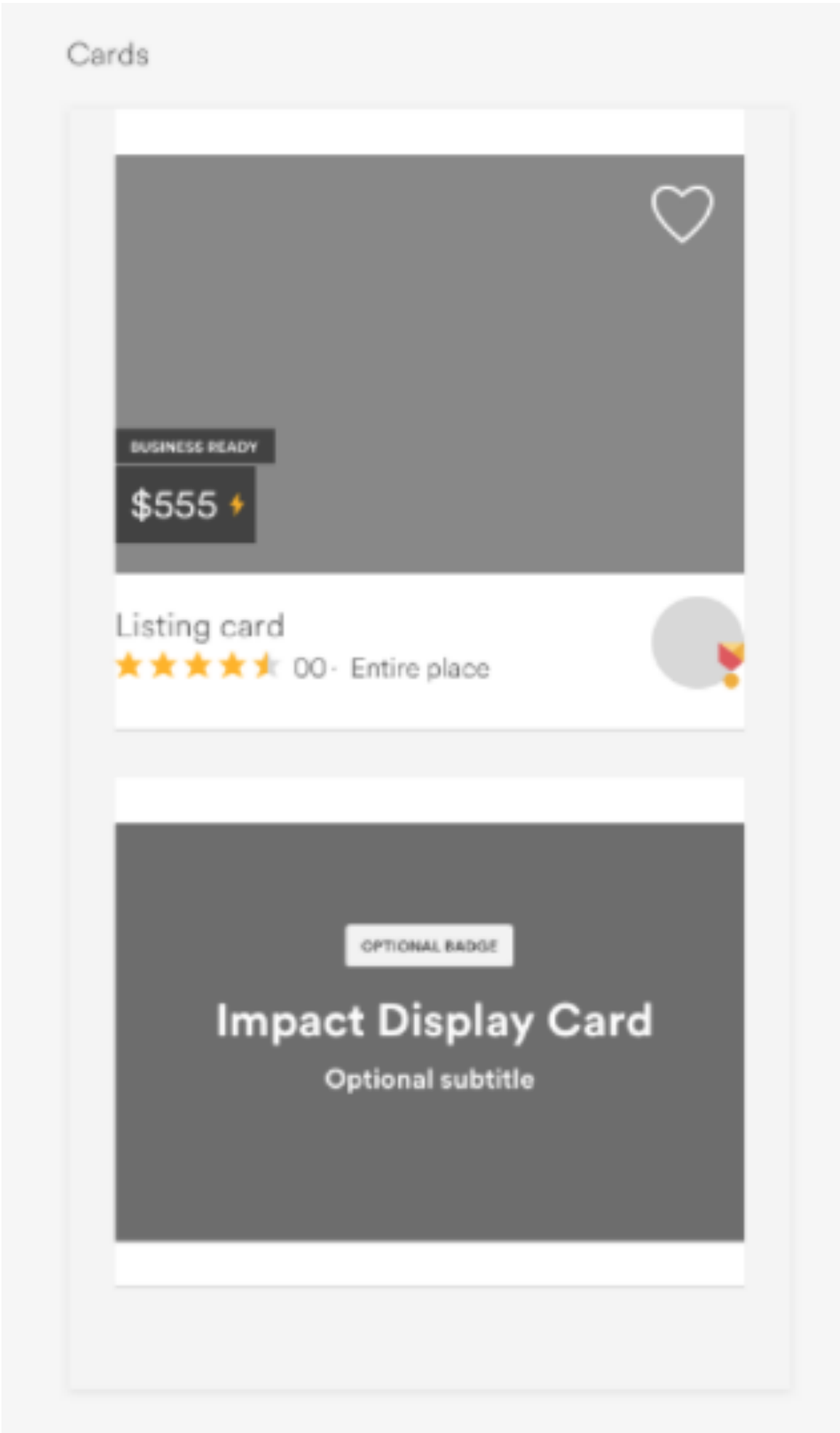

Chat


Repository

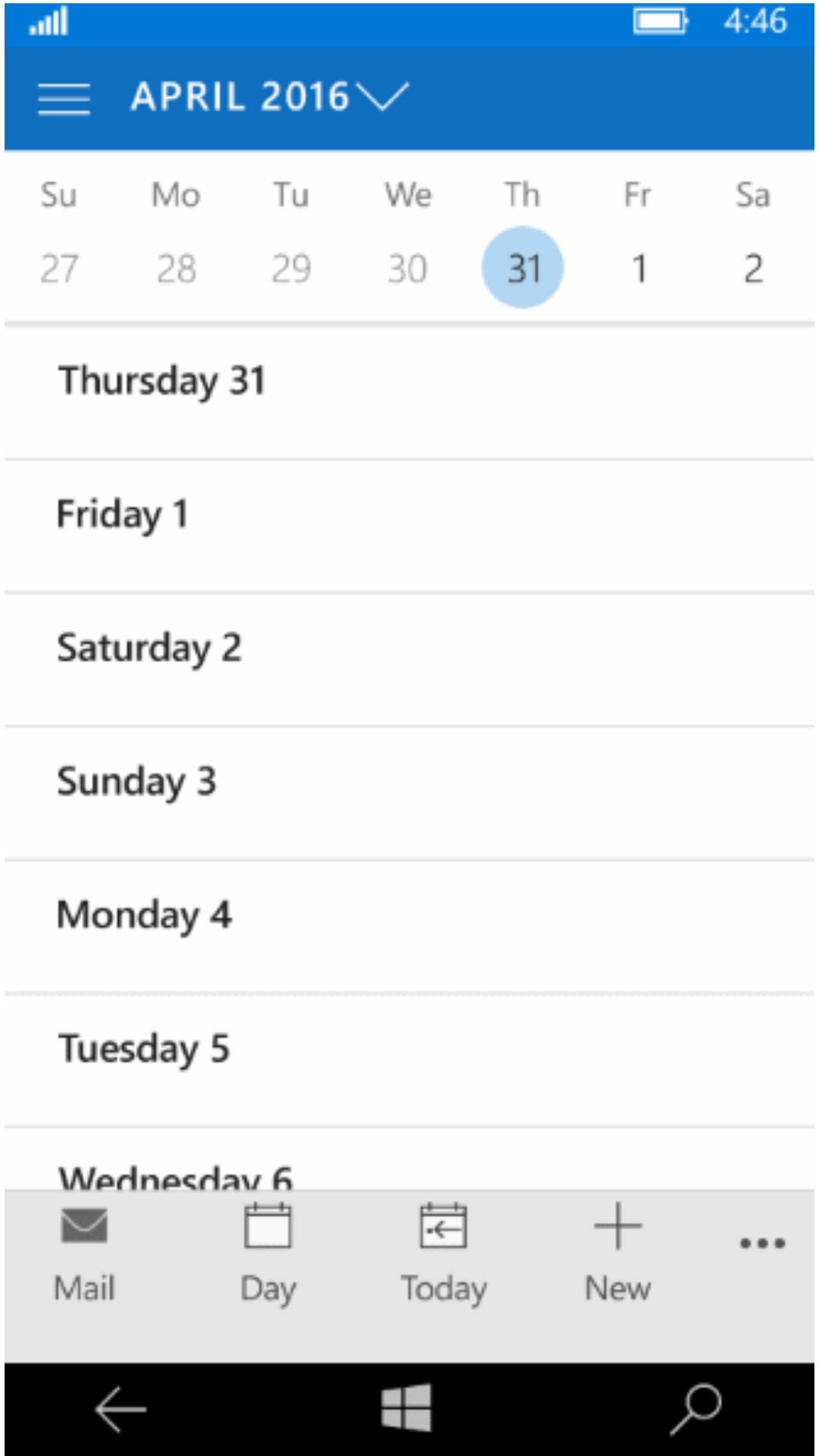
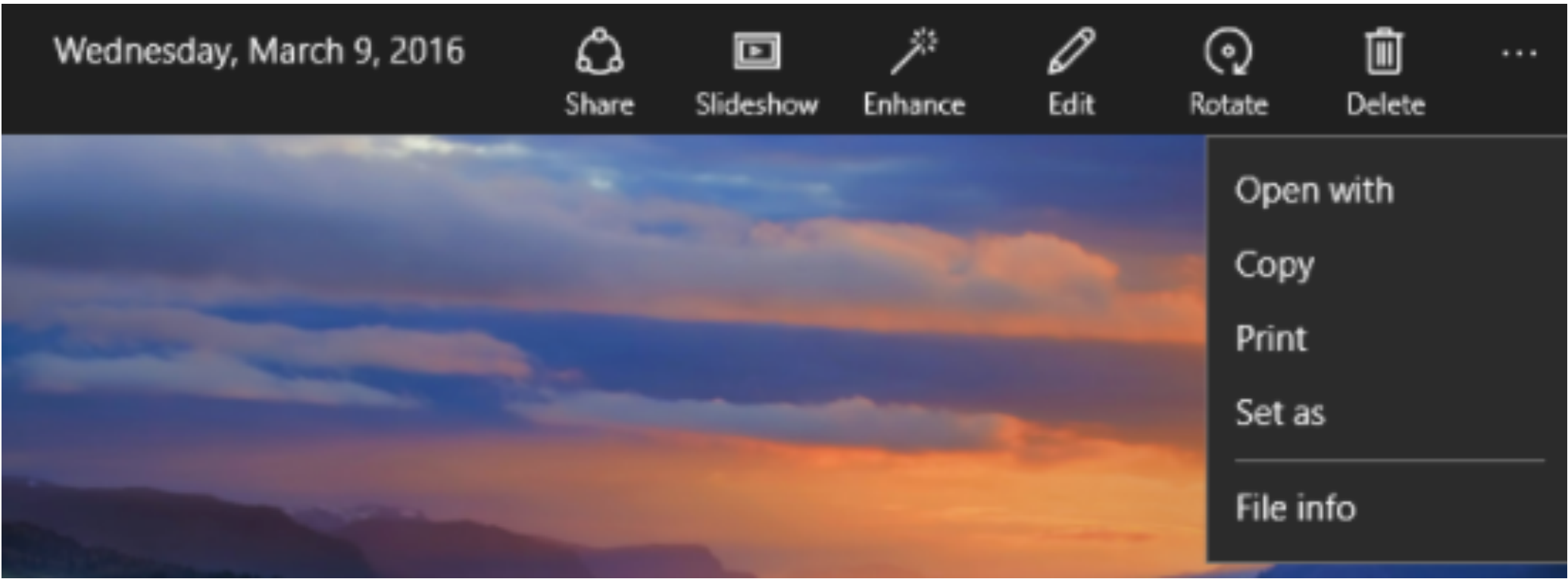
Examples: AirBnb



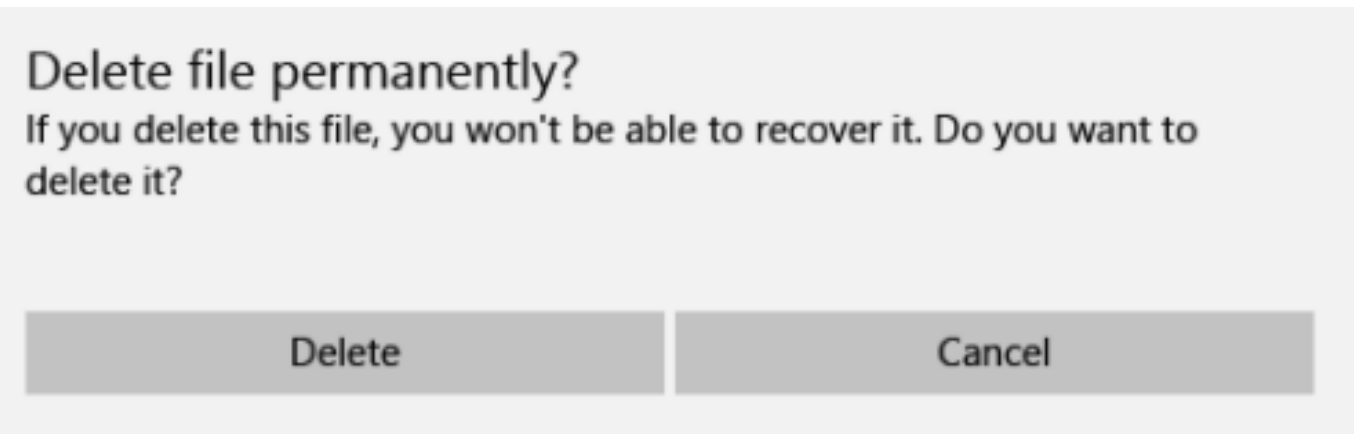
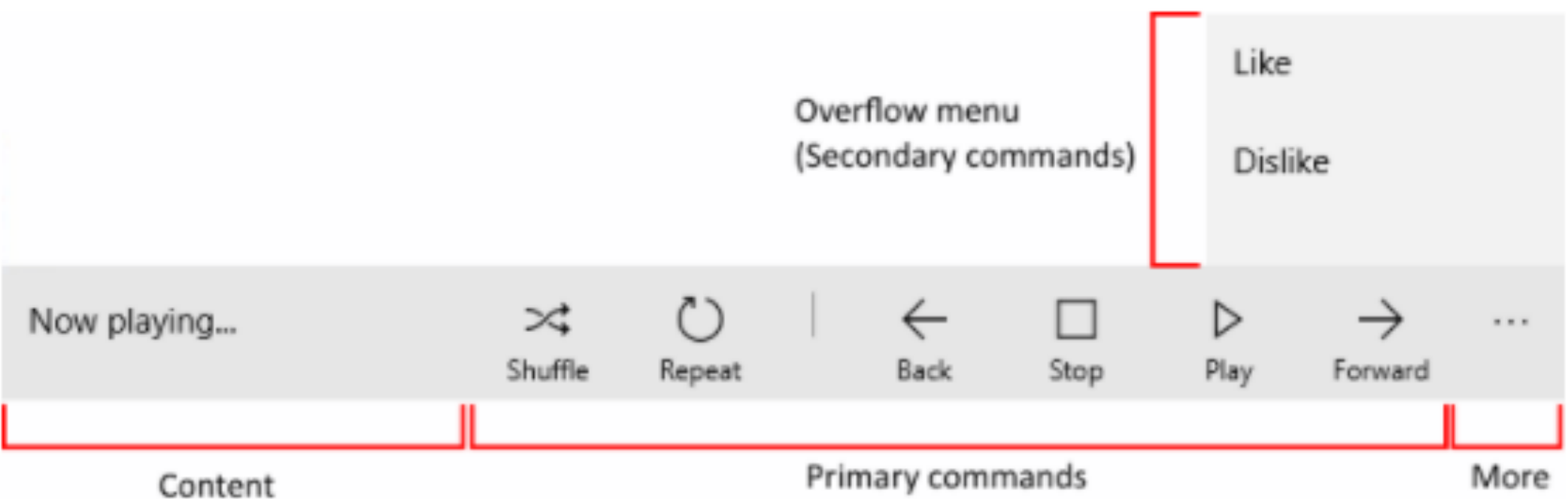
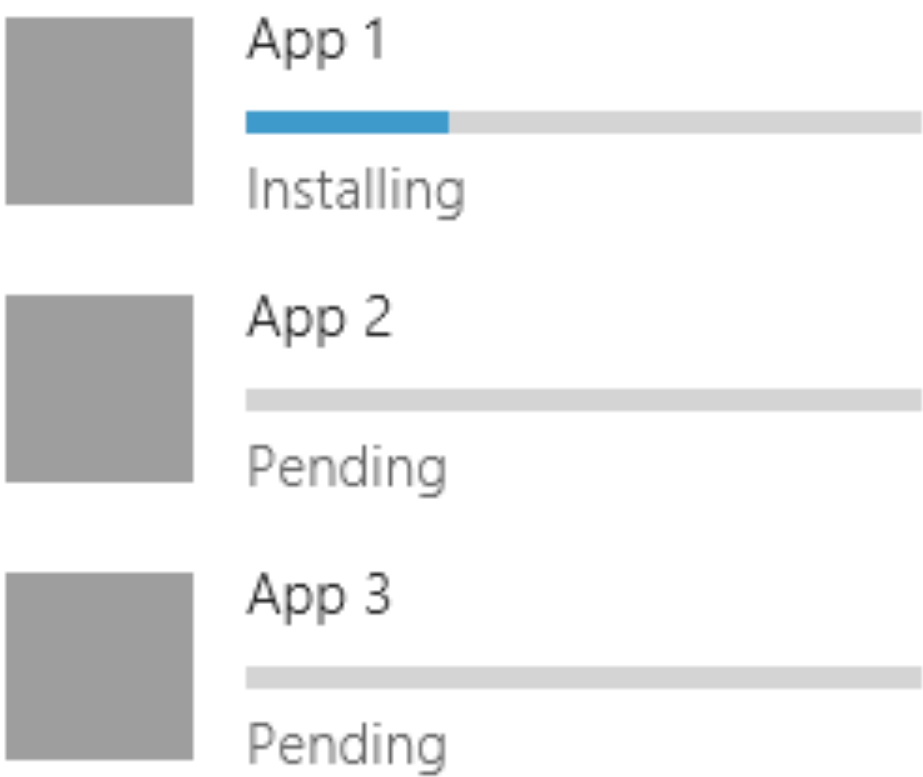
Examples: AirBnb



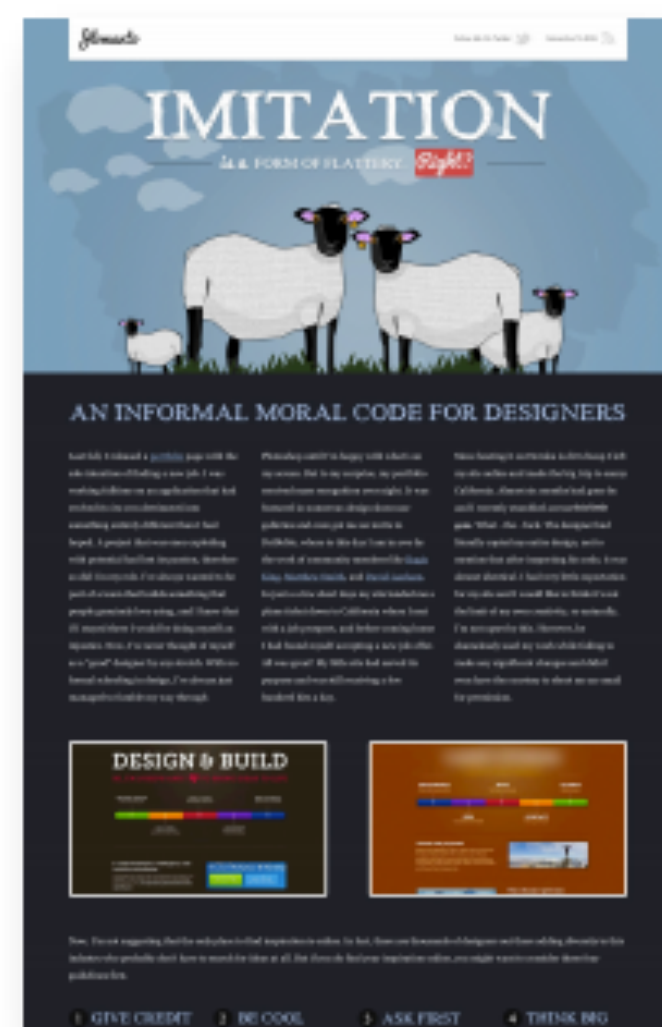
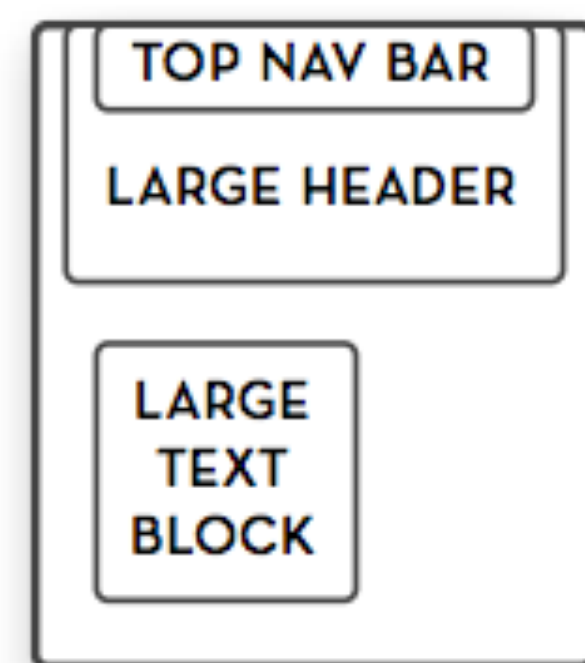
Examples: Microsoft



Examples: Microsoft



Example: Header with text blocks layout

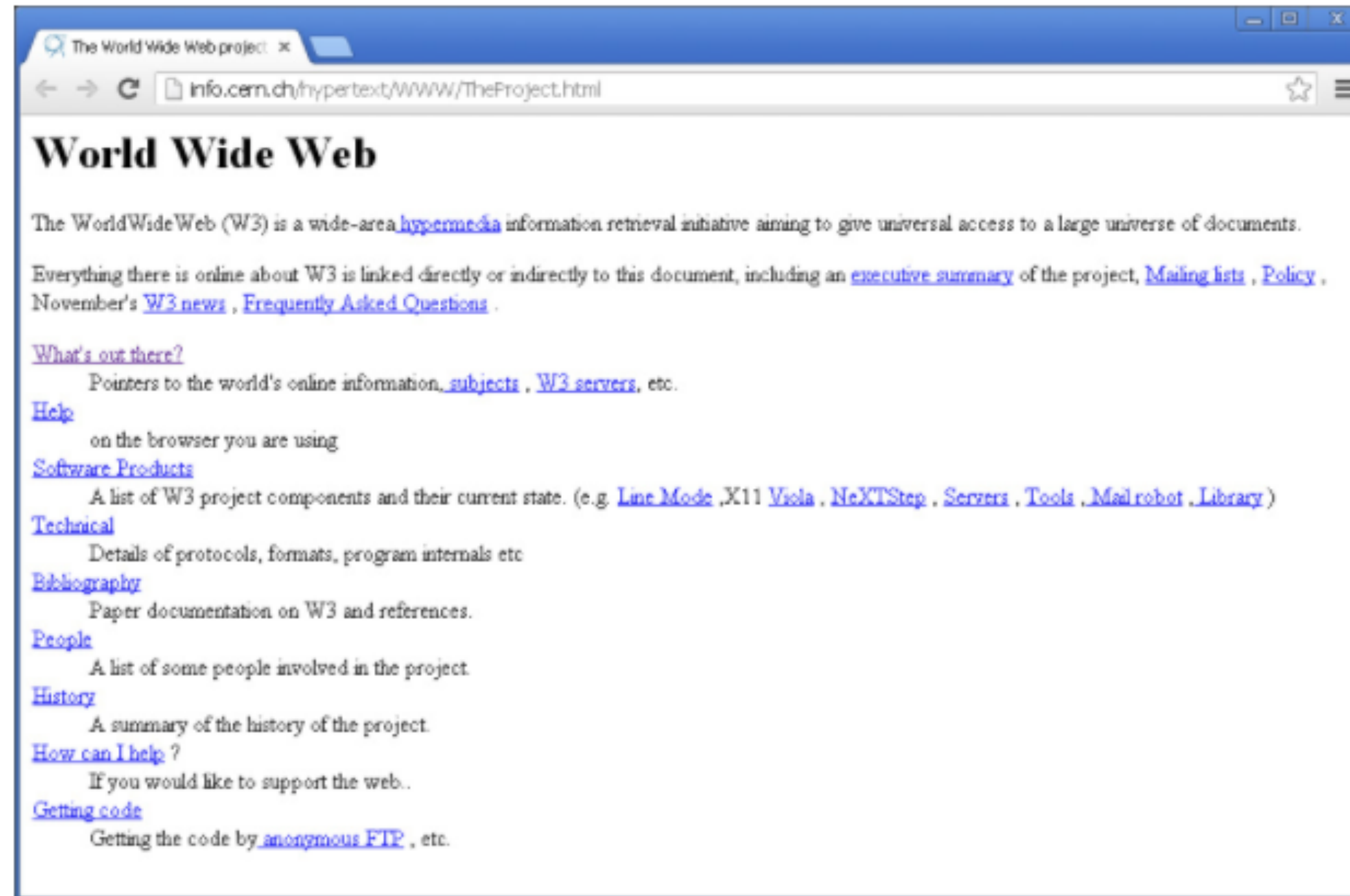


<http://ranjithakumar.net/resources/webzeitgeist.pdf>

Position Encodes Meaning and Function



Web Design Languages Over Time



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

Web Design Languages Over Time



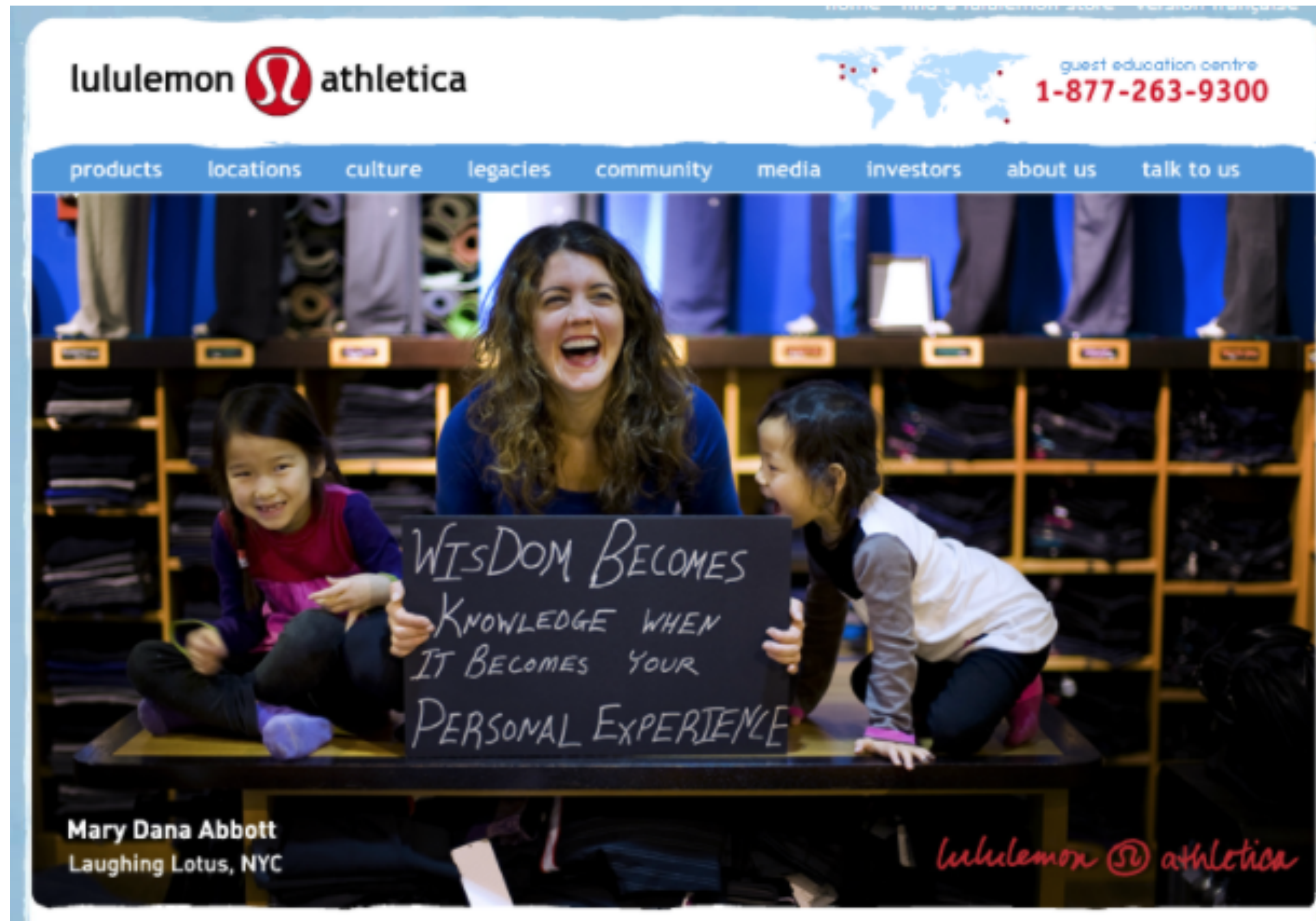
Web Design Languages Over Time



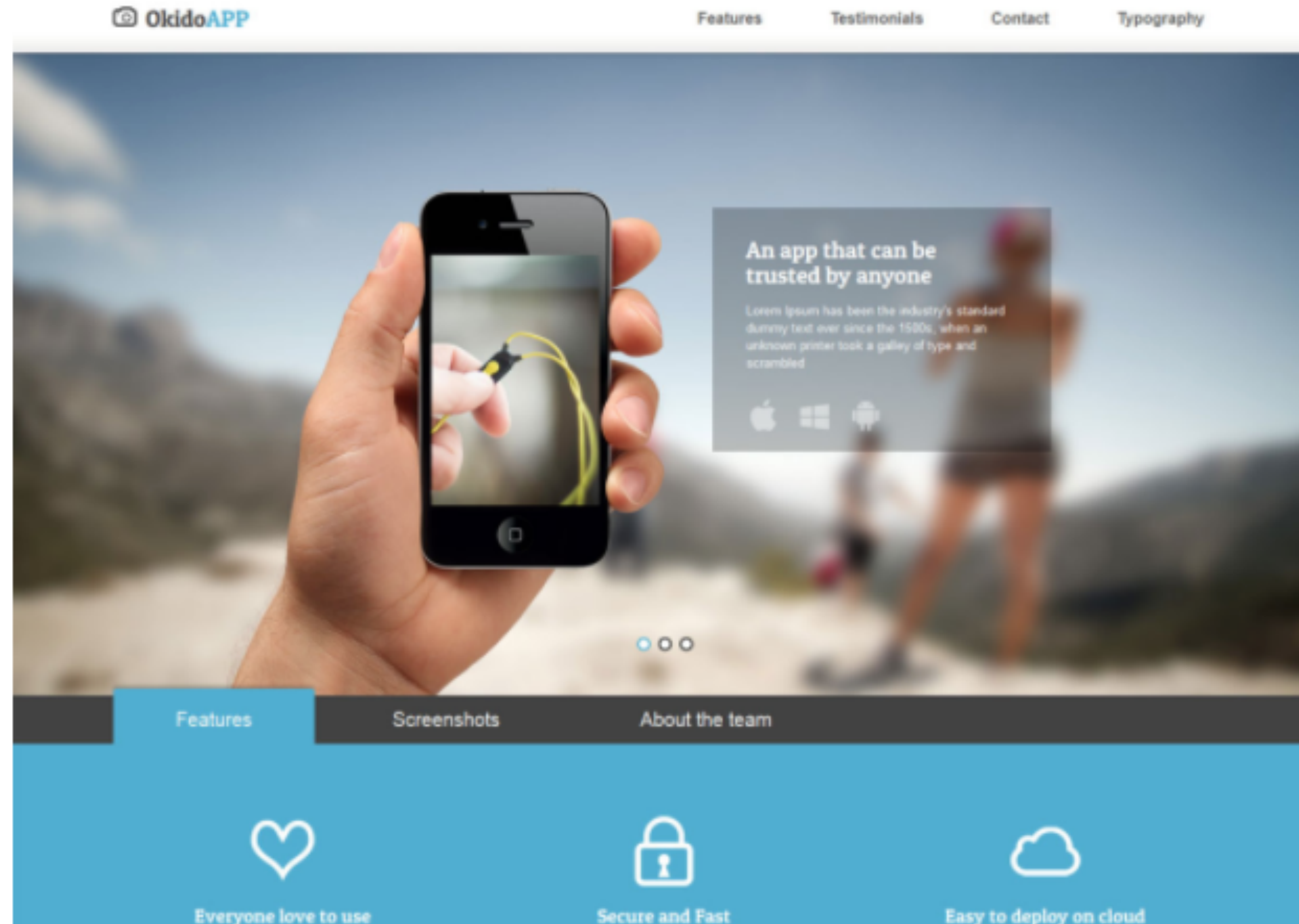
Web Design Languages Over Time



Web Design Languages Over Time

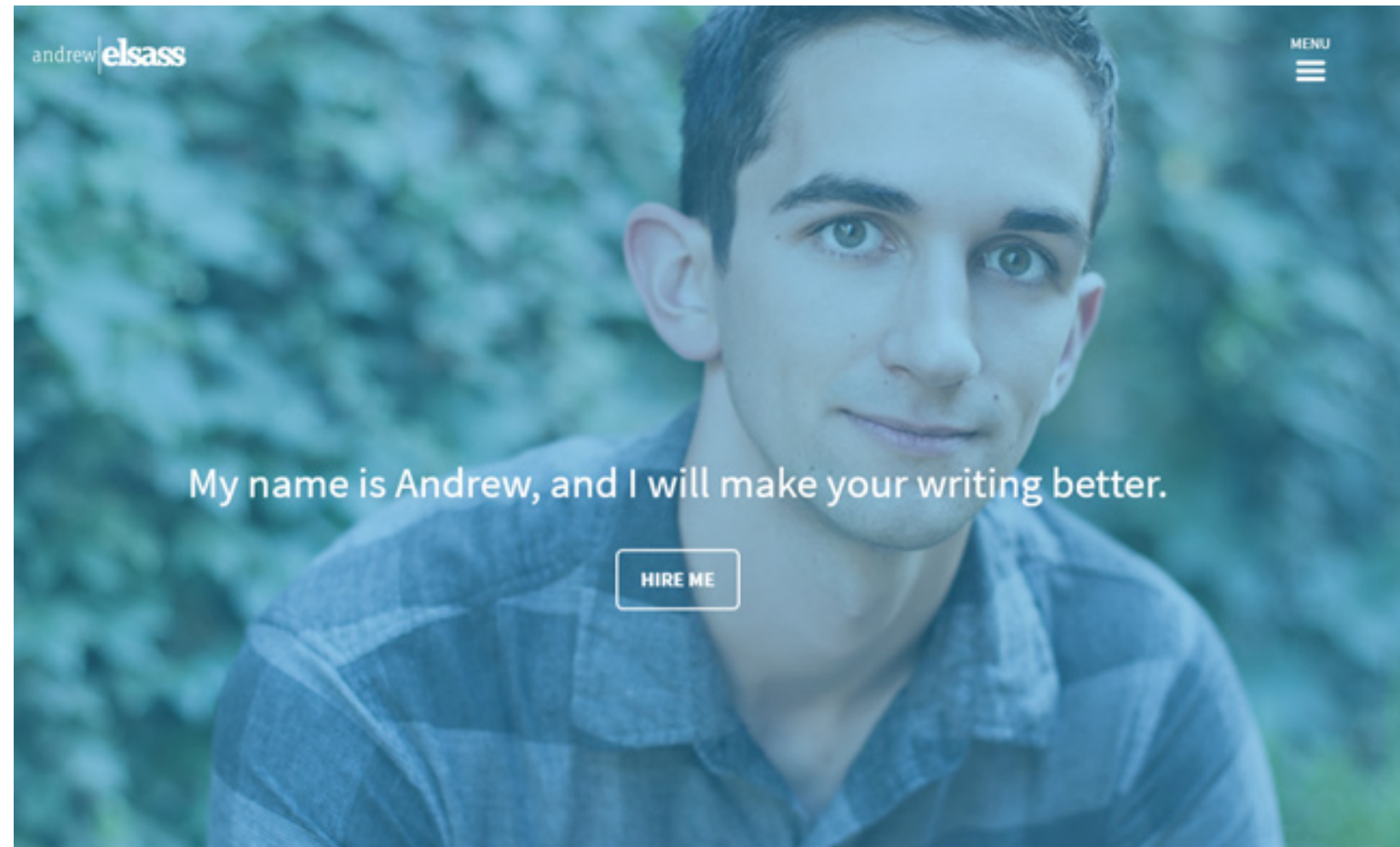


Web Design Languages Over Time



Common Visual Idioms, Circa 2016

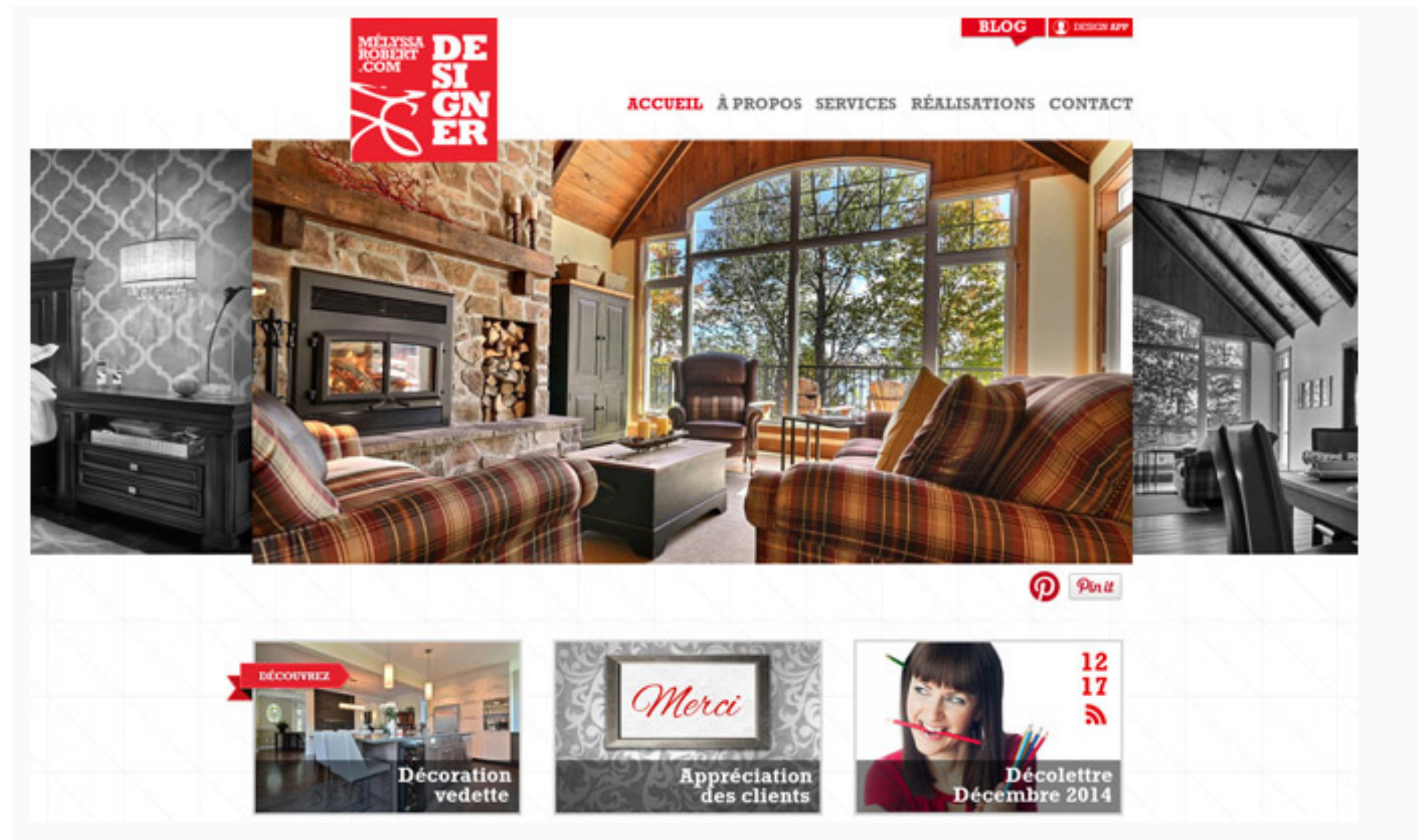
- Hero images: large attractive header image



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

Common visual idioms, circa 2016

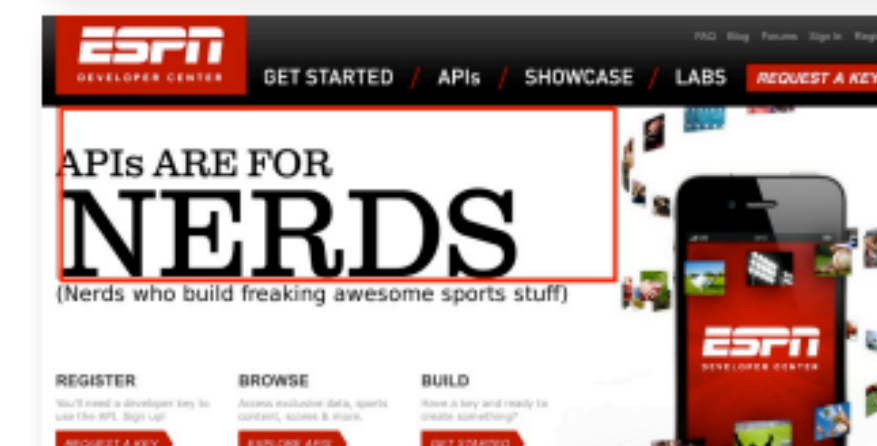
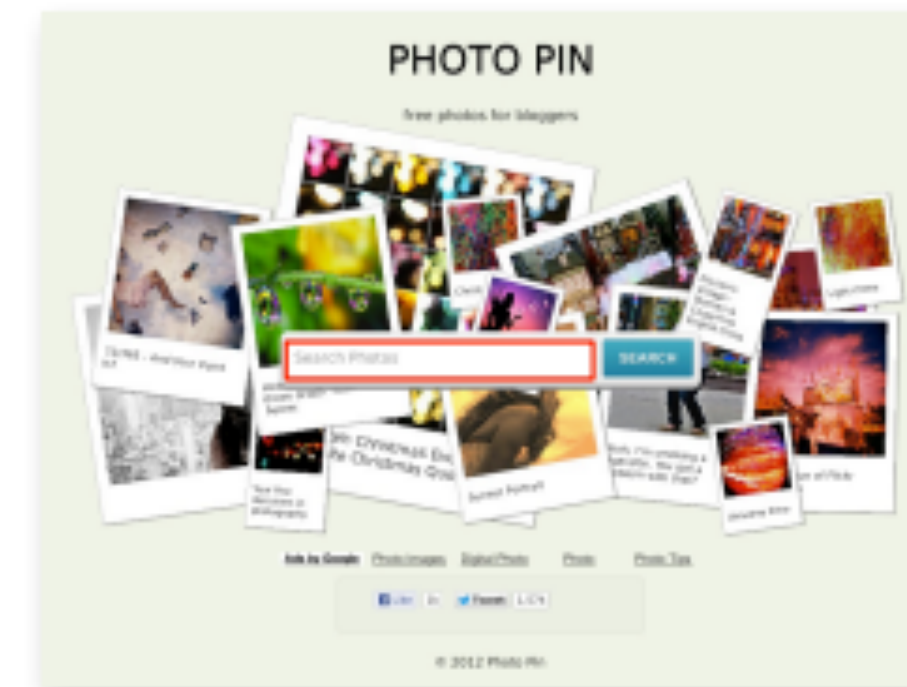
- Rotating image galleries (carousels)



<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

In-Class Activity

Activity: Design a Design Language

- In groups of 2 or 3, brainstorm an idea for a new company, and then design a Design Language for the new company.
- Your design language should include at least 10 types of elements. For each type of element you should:
 - (1) To identify each category of element, describe (1.1) what is its purpose (e.g., marque image caption, detail text, footer detail text), (1.2) in what situations might it be used
 - (2) Define a style, describing its visual characteristics.
- Deliverables
 - Brief description of company
 - Description of design language with at least 10 types of elements
 - Brief description of how design language helps establish and communicate the brand of the company

Activity: Design a Design Language

- Some example visual design guidelines from well-known companies:
 - <https://developer.apple.com/design/human-interface-guidelines>
 - <https://m3.material.io>
 - <https://docs.microsoft.com/en-us/windows/uwp/design/>