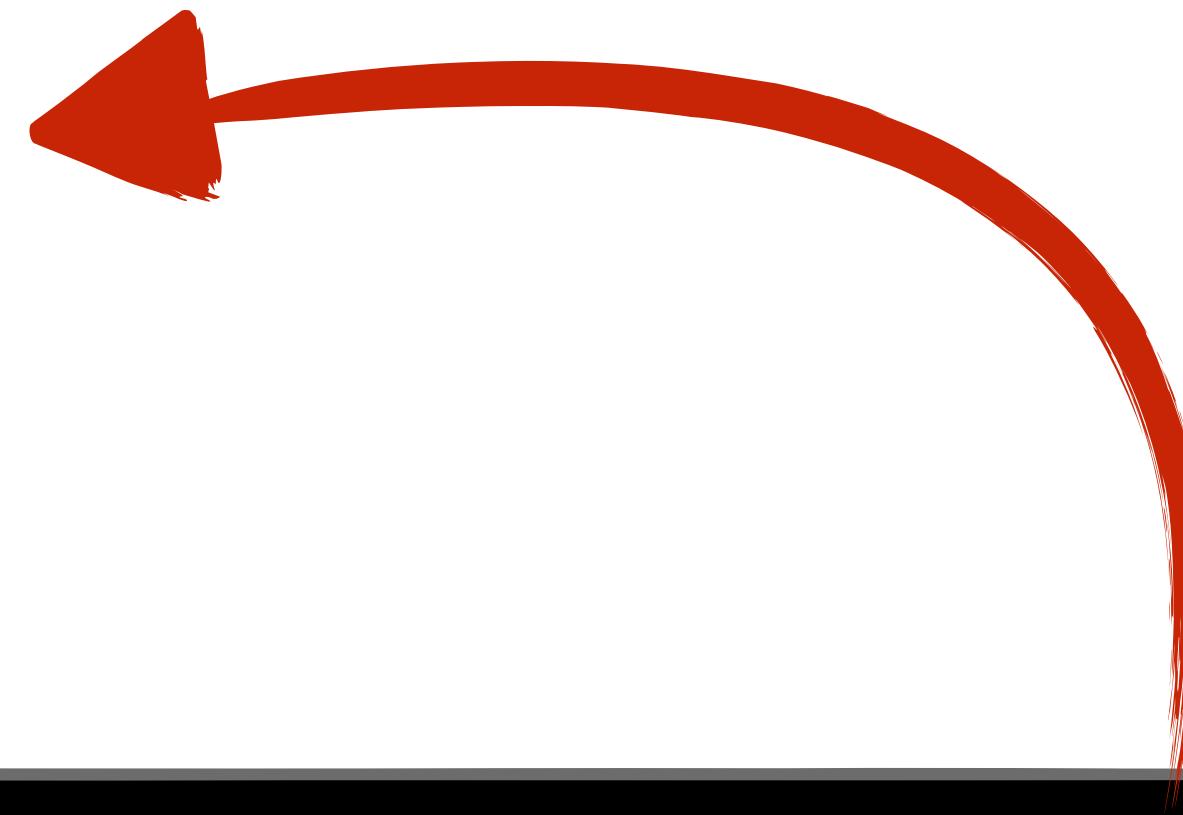


Visual Design

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

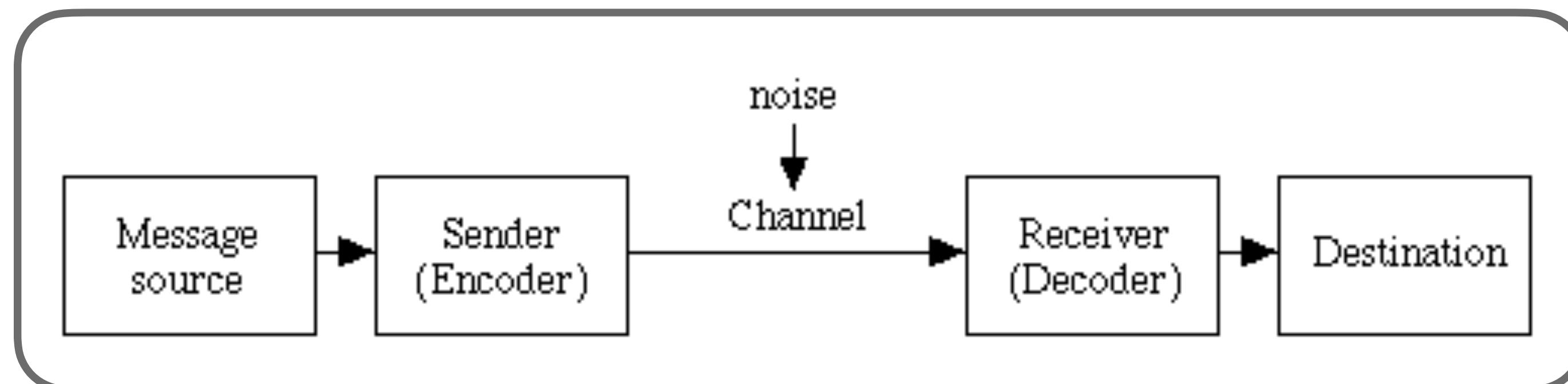


Visual Design

- *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

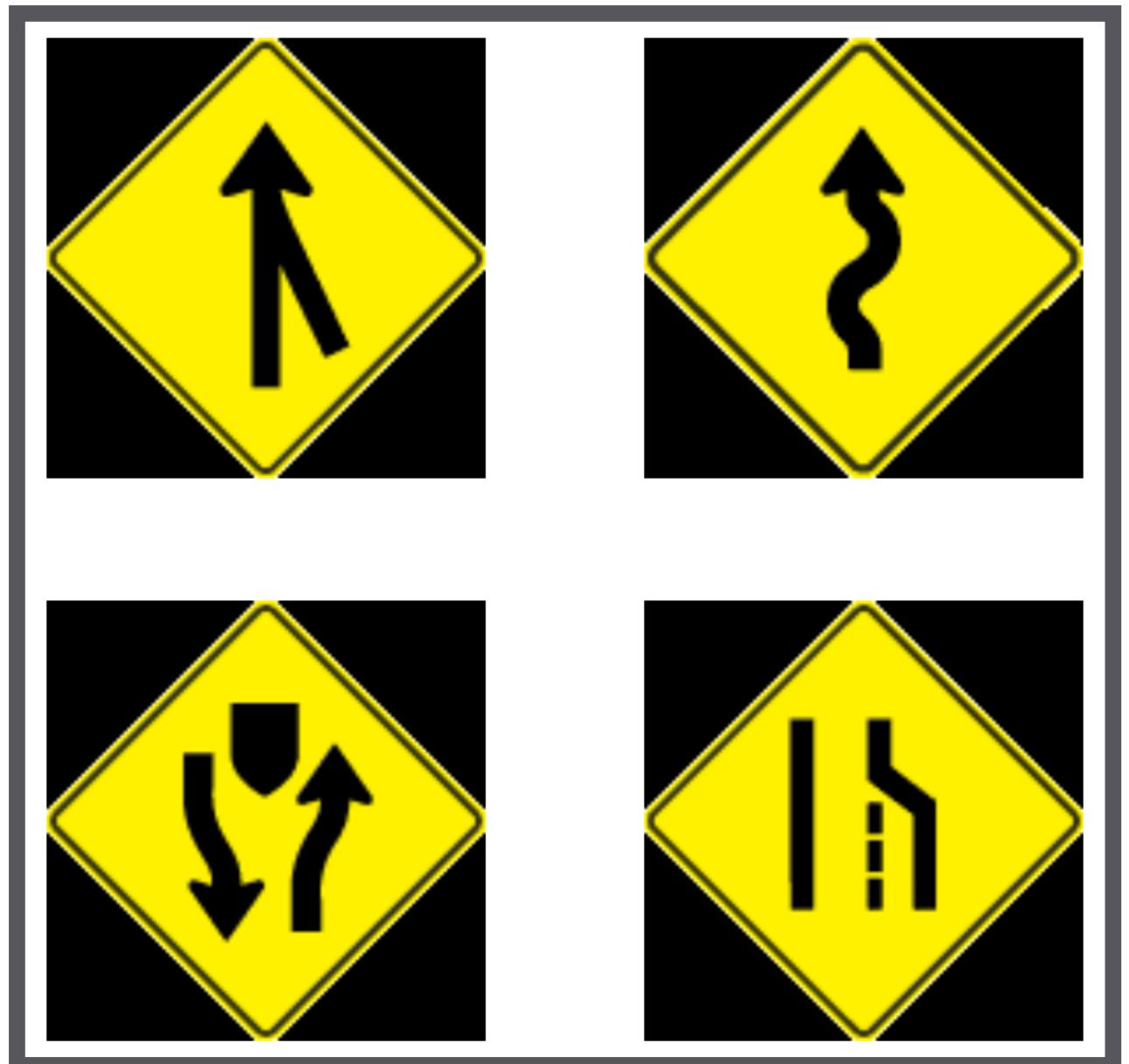


Marc Berthier. Tykho Radio. 1997. Synthetic rubber and other materials, 5 1/2 x 5 1/2 x 1 5/8" (14 x 14 x 4.1 cm). Manufactured by Lexon, France. The Museum of Modern Art, New York. Gift of the manufacturer.

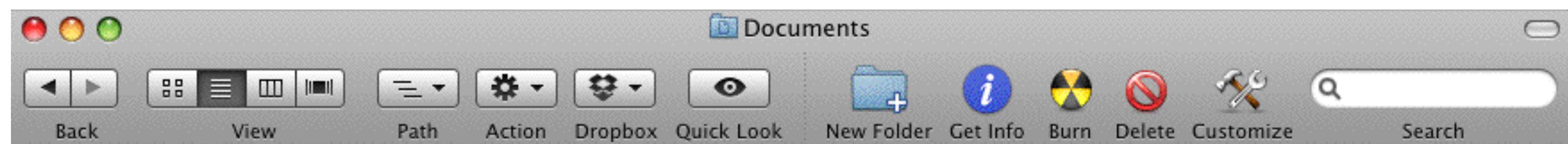
Reducing a Design to its Essence

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

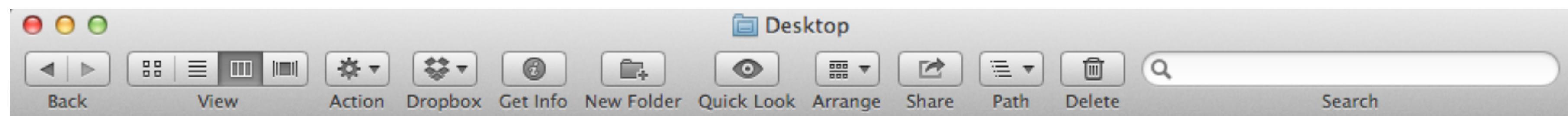
1. *Determine essential qualities & information to be conveyed*
2. *Critically examine each element & ask how design would suffer without it.*
3. *Try removing elements. What happens?*



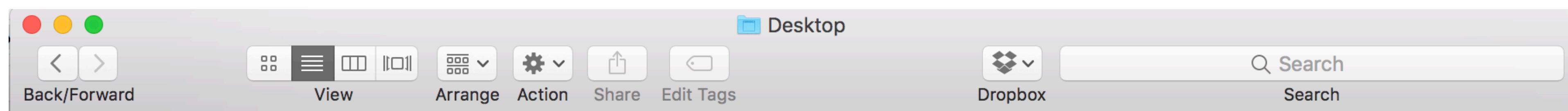
Trade-offs in Simplicity



OSX c.2010



OSX c.2011

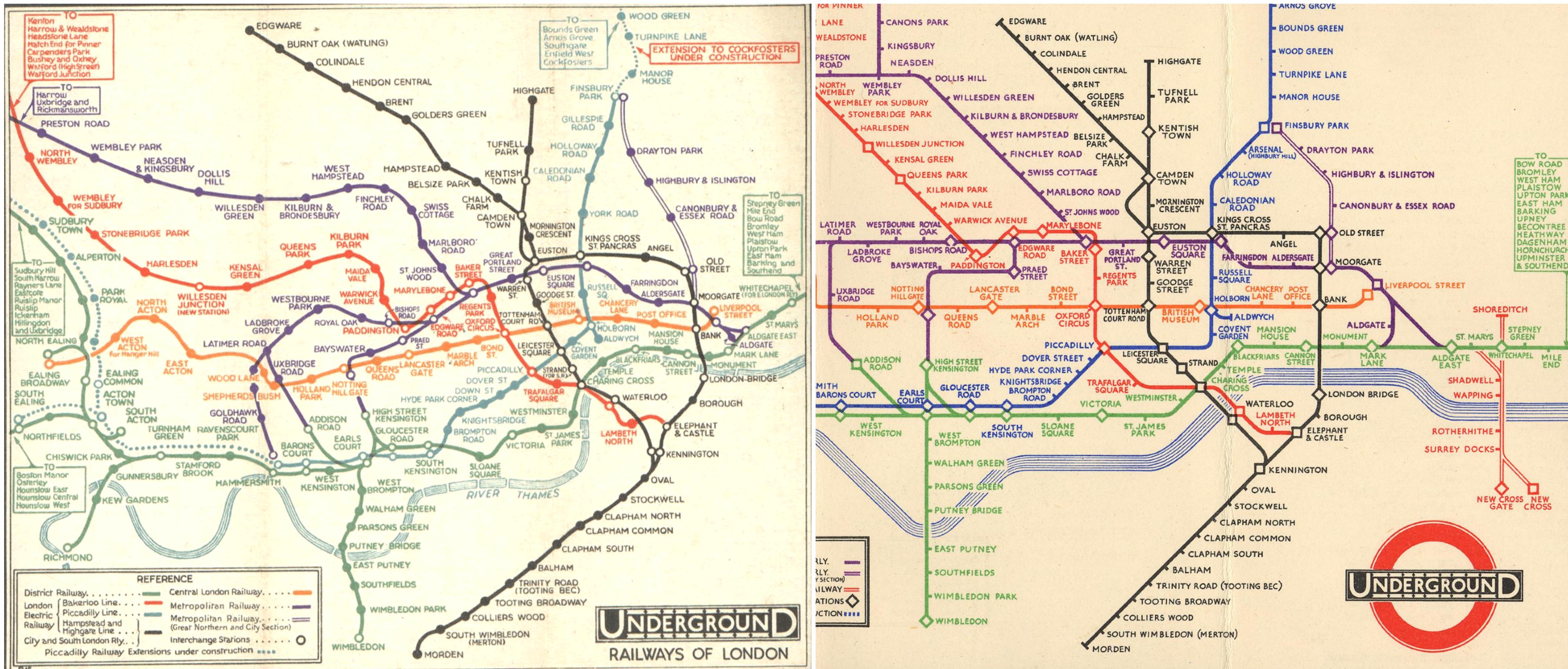


OSX c.2016



OSX c.2021

Guidelines for Visual Design

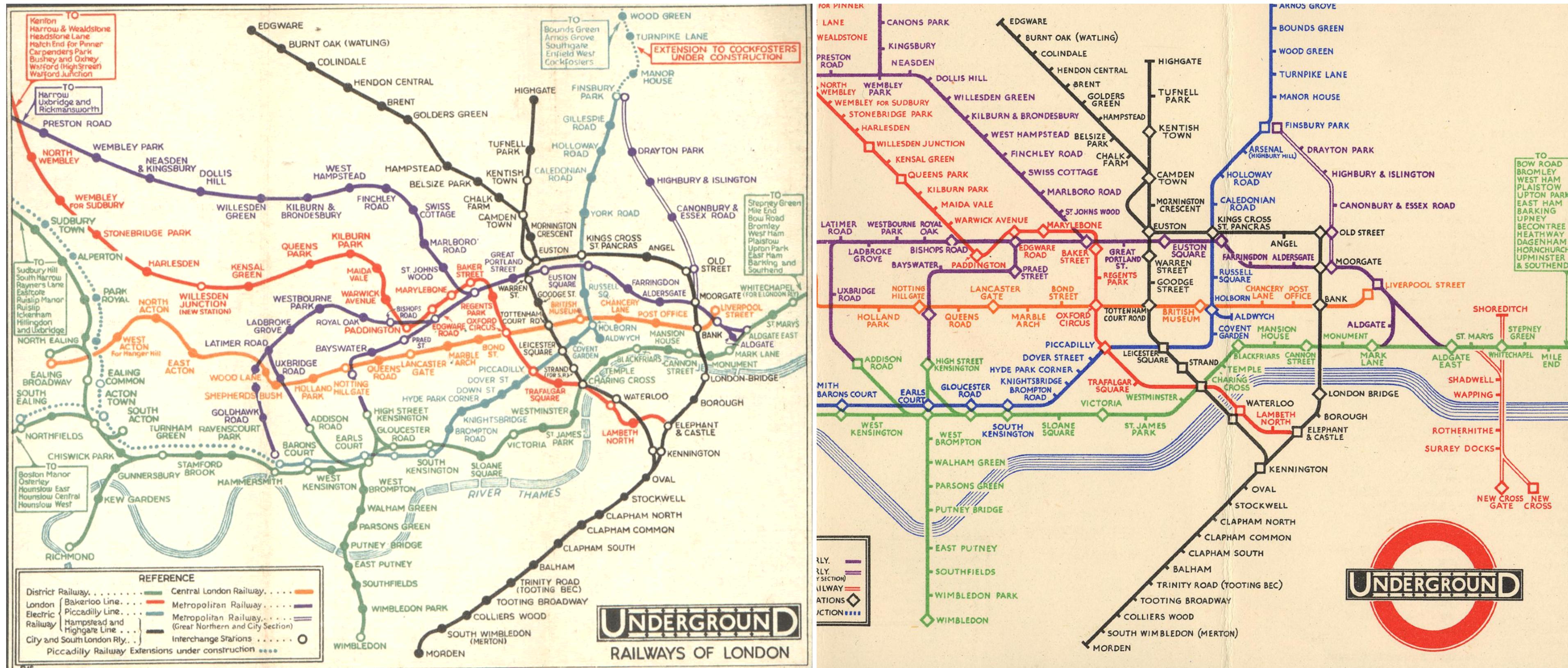


Reduction in new map: relative distances don't matter

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

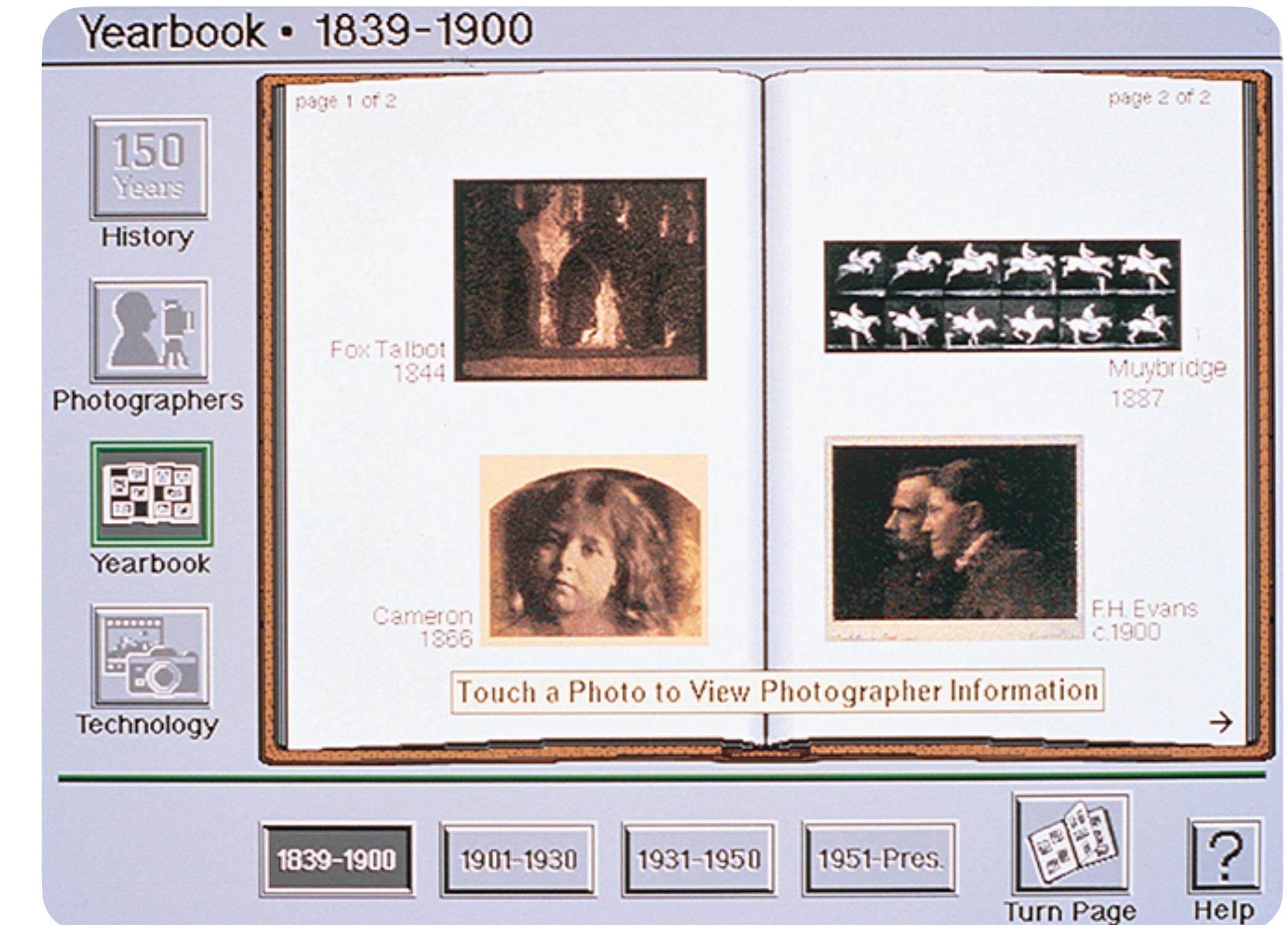
Guidelines for Visual Design



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
Gift Ted Faszer's Birthday	all-day
Gift Mike Yutzy's Birthday	all-day
Thursday	July 4
Gift Cherie Yvette's Birthday	all-day
Monday	July 15
Gift Allie Johnson's Birthday	all-day
Orange Dr Stoll	8:45 AM to 9:45 AM
Thursday	July 18
Gift Richard Gintowt's Birthday	all-day
Blue Jacks birthday	11 AM to Noon
Monday	July 22
Gift Alisha Campbell's Birthday	all-day
Saturday	July 27

Ted Faszer's Birthday

Wednesday, July 3, 2013

all-day events

Gift Mike Yutzy's Birthday
Gift Ted Faszer's Birthday

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

Details

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 +

November 2016

Day Week Month Year

Q +

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

Today

Calendars

Inbox

Scale, Contrast, & Proportion

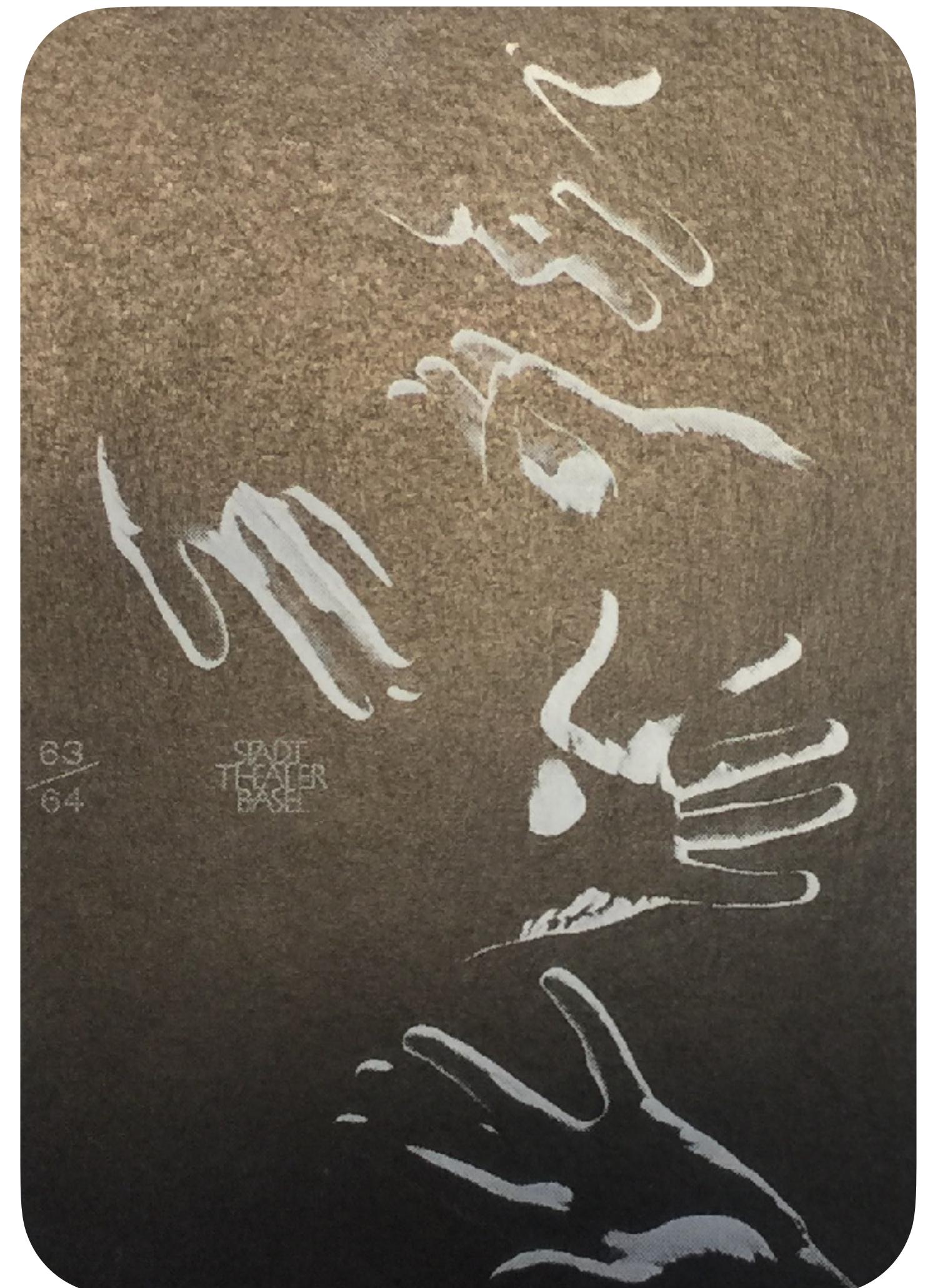
Scale, Contrast, & Proportion

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

Individual visual variables of design that encode information

Terminology

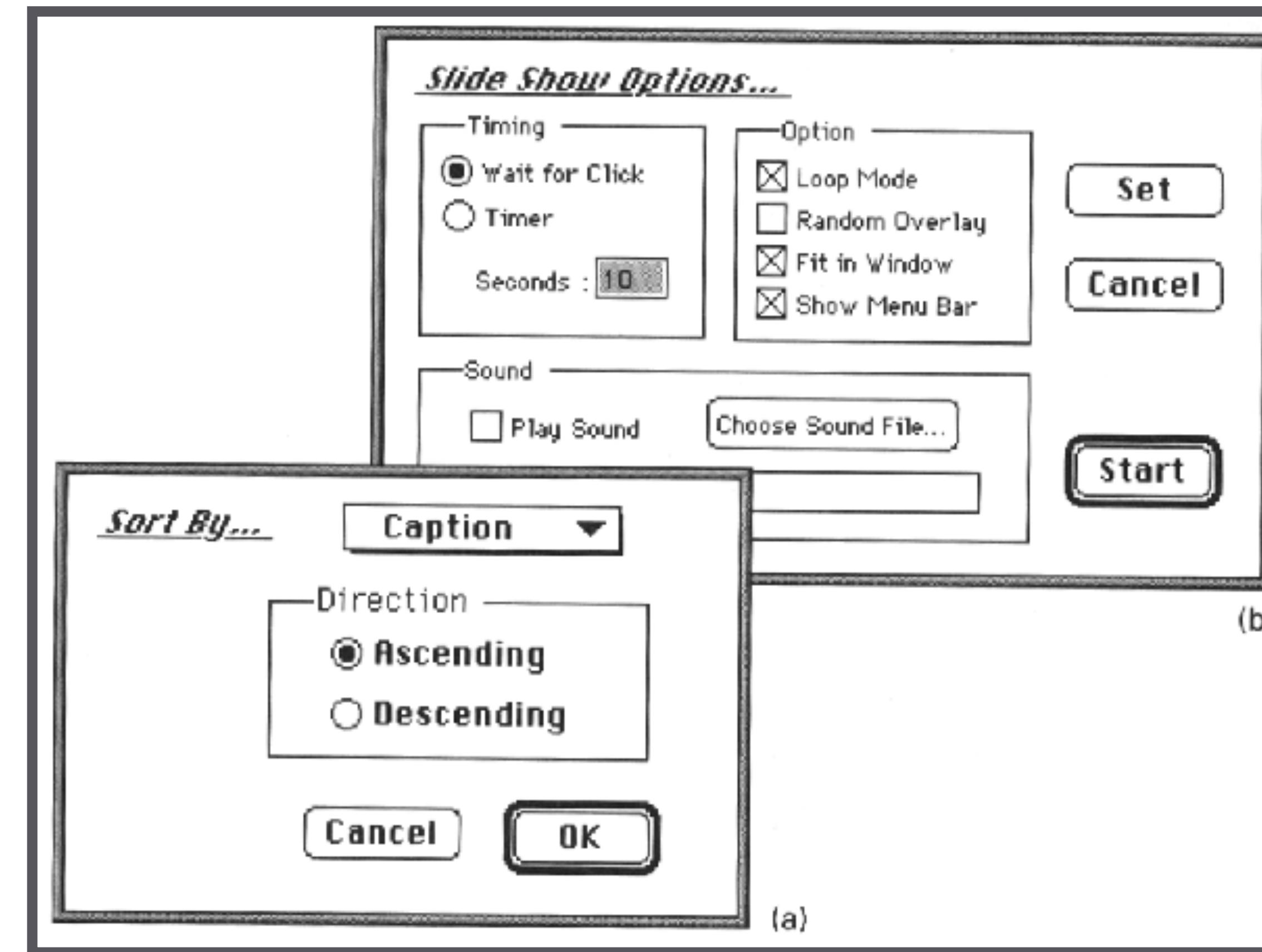
- Scale - relative size or magnitude of element in comparison to related elements
- Contrast - visually noticeable distinctions along a common visual dimension
- Proportion - ratio and balance between elements
- Emphasis - contrasts can emphasize important elements or areas & add visual interest by creating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

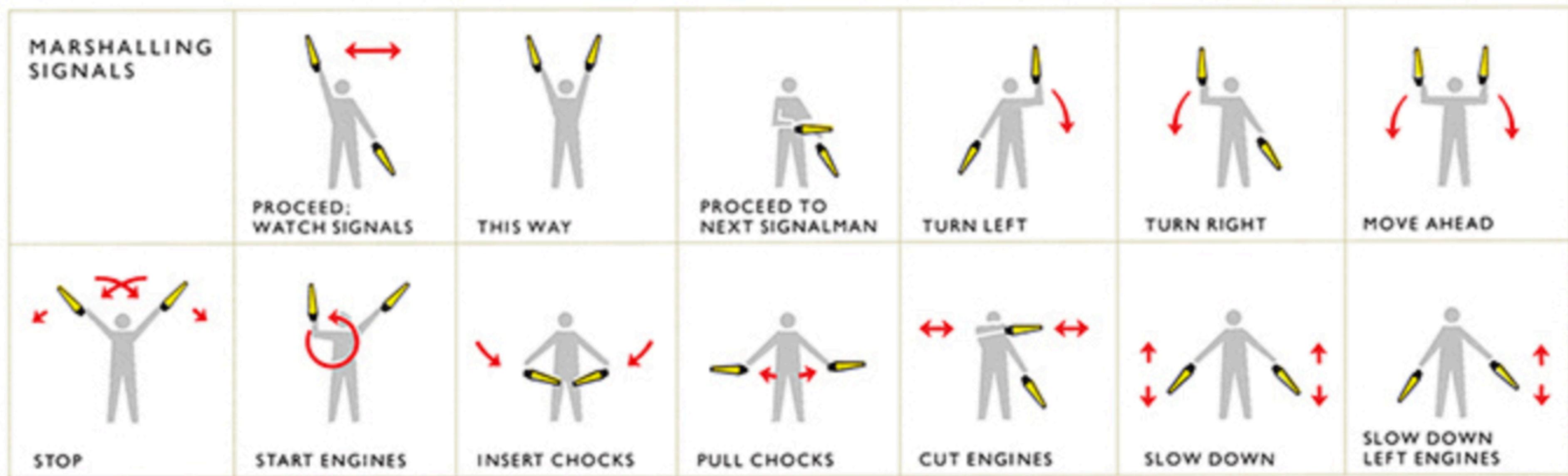
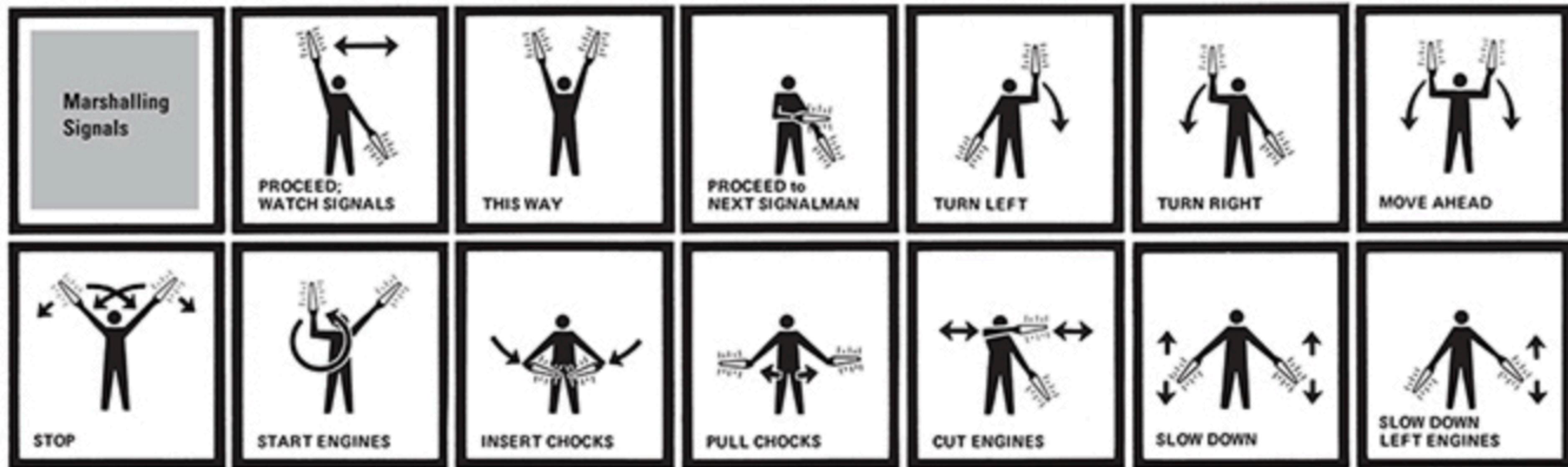
- Contrasting color, value, texture can segregate information into separate layers
- Supports overlapping information in displays, allowing selective processing of specific sets of elements
- Allows different layers to be read and interpreted separately



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

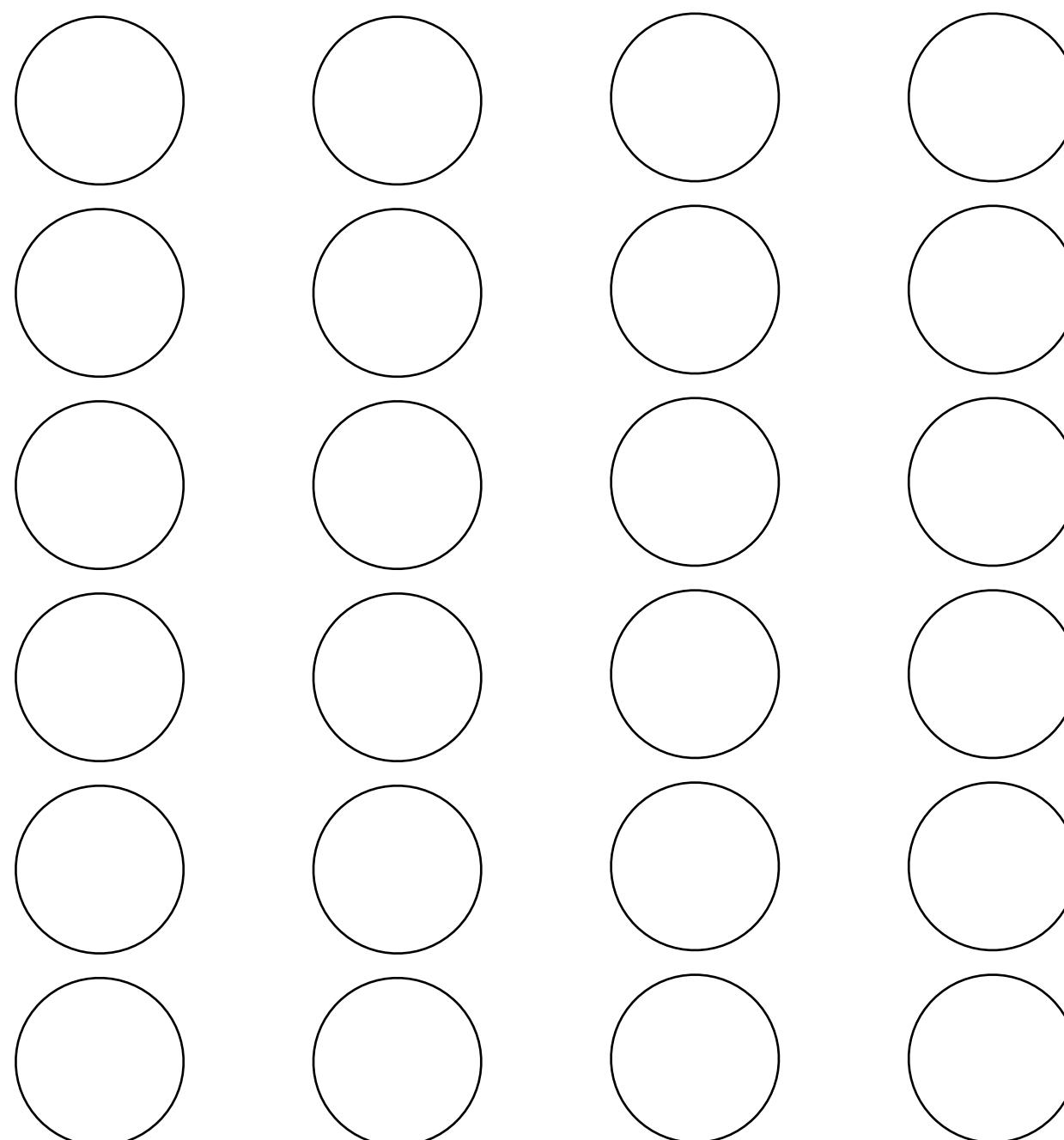
- Organization needs to be *designed*
- Benefits
 - Unity - ties together related elements so that they work **together**
 - Integrity & readability - offers structure that helps user to easily scan & make comparisons
 - Control - determines where user will focus **attention** in the design
 - Gestalt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

Gestalt Principle - Proximity

- Elements associated most strongly w/ nearby elements

parsed as 4 columns based on close vertical spacing

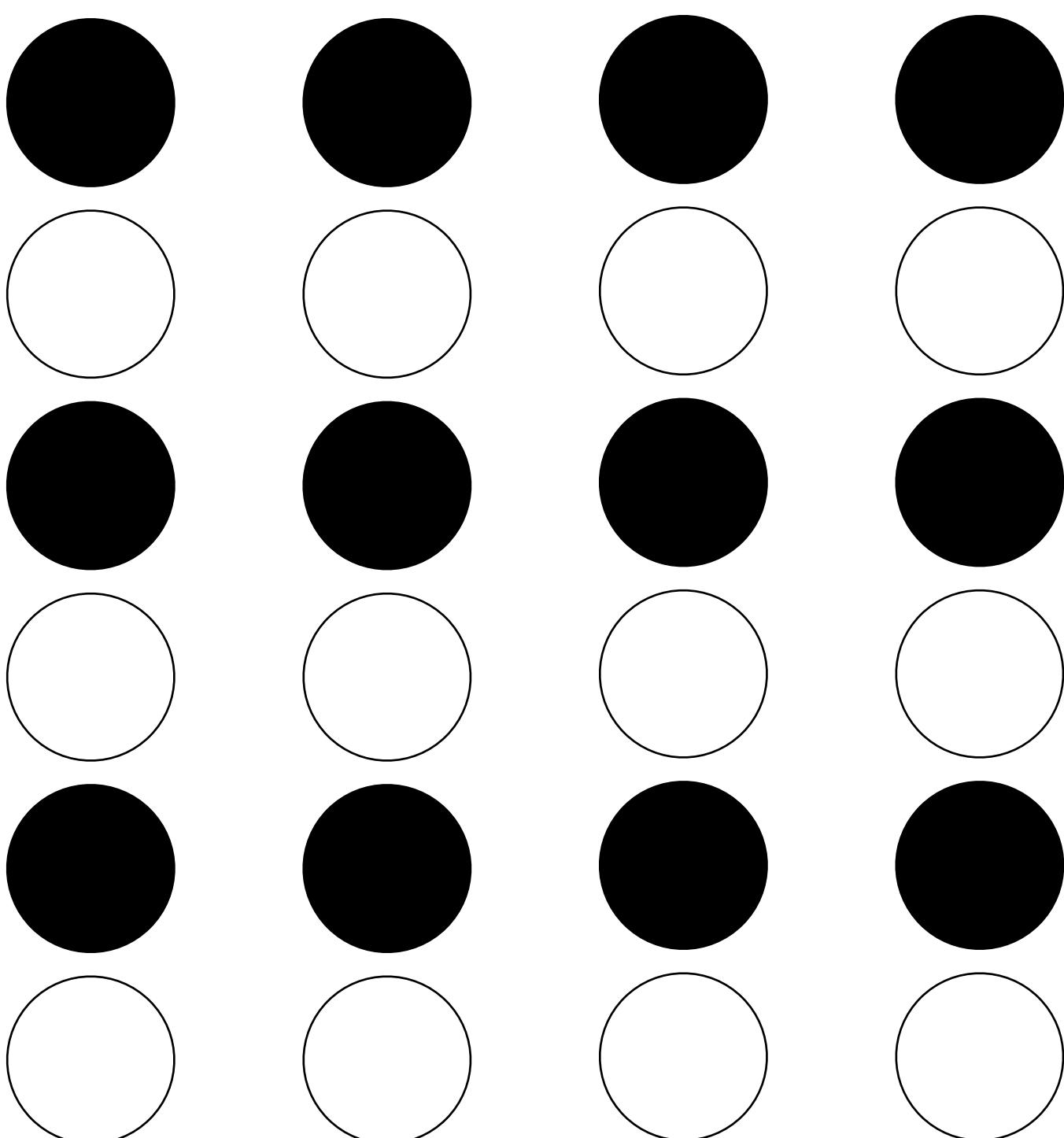
then parsed as two sets of two columns based on spacing



Gestalt Principle - Similarity

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

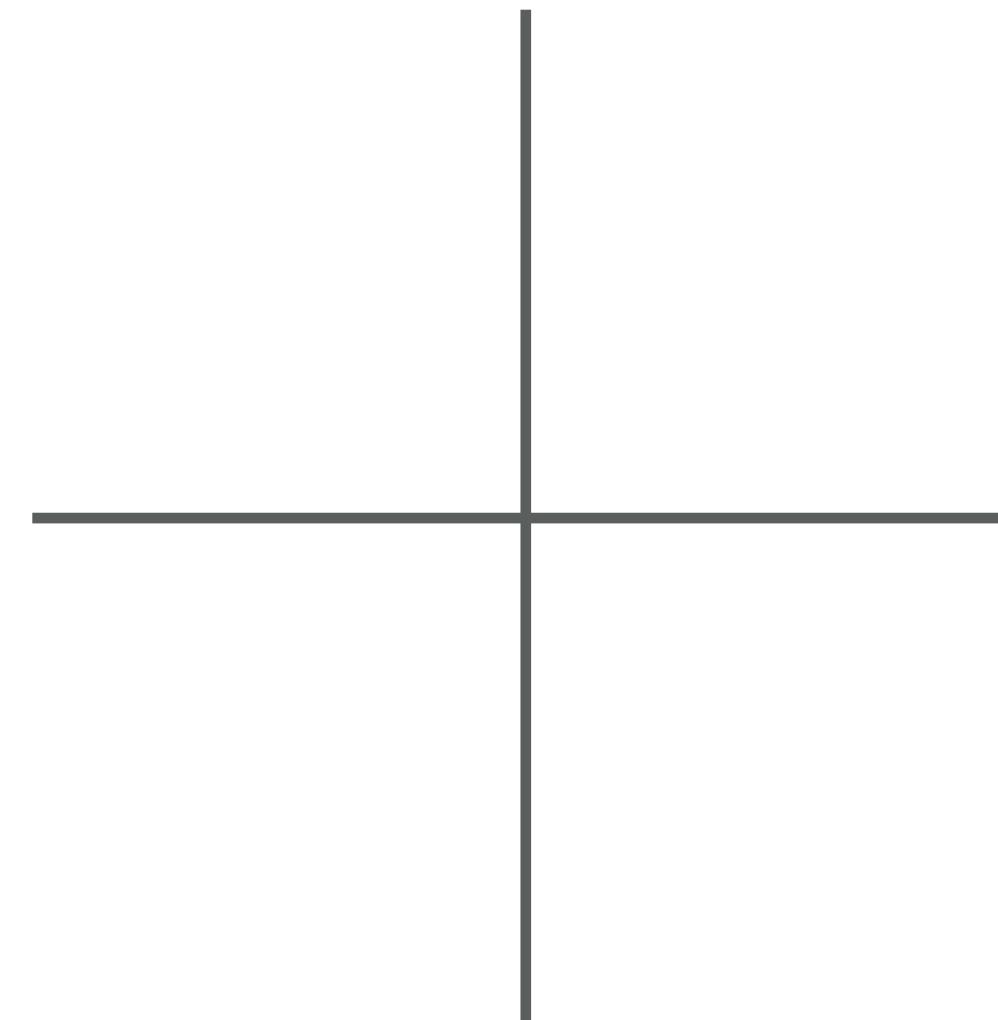
parsed as rows based on fill similarity,
despite closer column spacing



Gestalt Principle - Continuity

- Preference for simplest physical explanation of complex figure

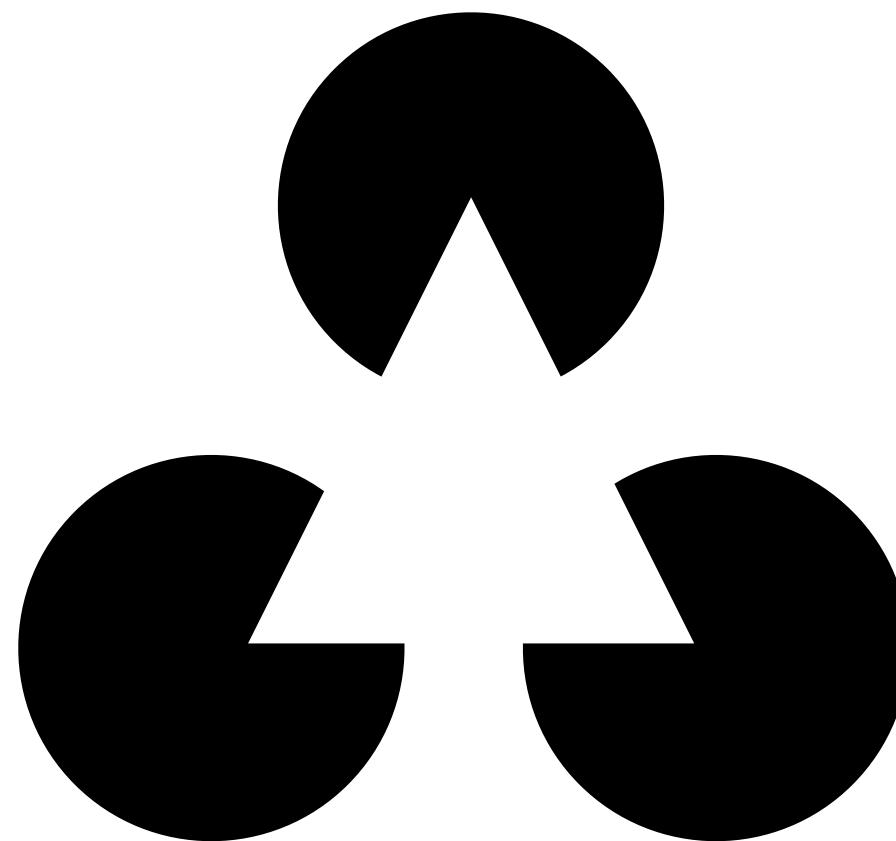
parsed as two lines, rather than 4 separate lines or 4 opposing angles



Gestalt Principle - Closure

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

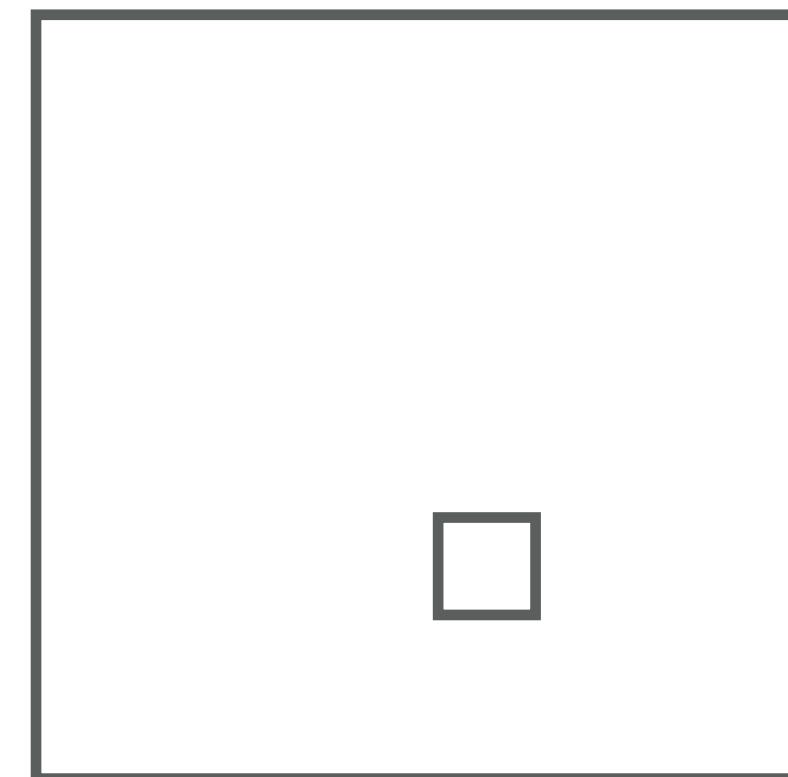
Parsed as triangle superimposed on 3 complete circles, even though none of these is actually present



Gestalt Principle - Area

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

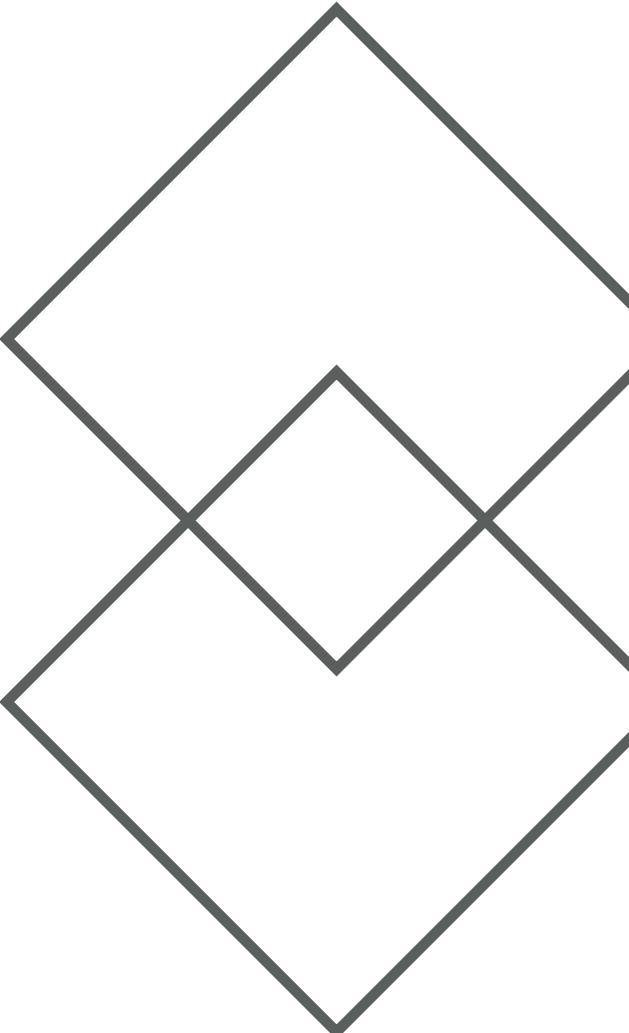
Small rectangle parsed as small rectangle on top of larger, rather than hole



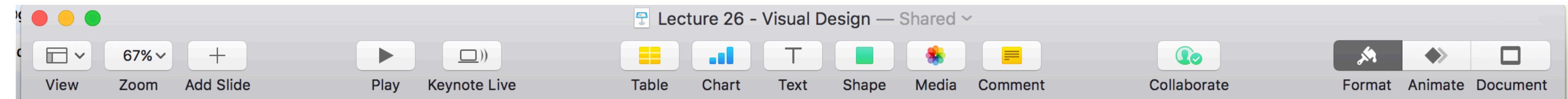
Gestalt Principle - Symmetry

- Preference to interpret ambiguous form as multiple symmetric elements

Parsed as two overlapping objects rather than
3 separate shapes

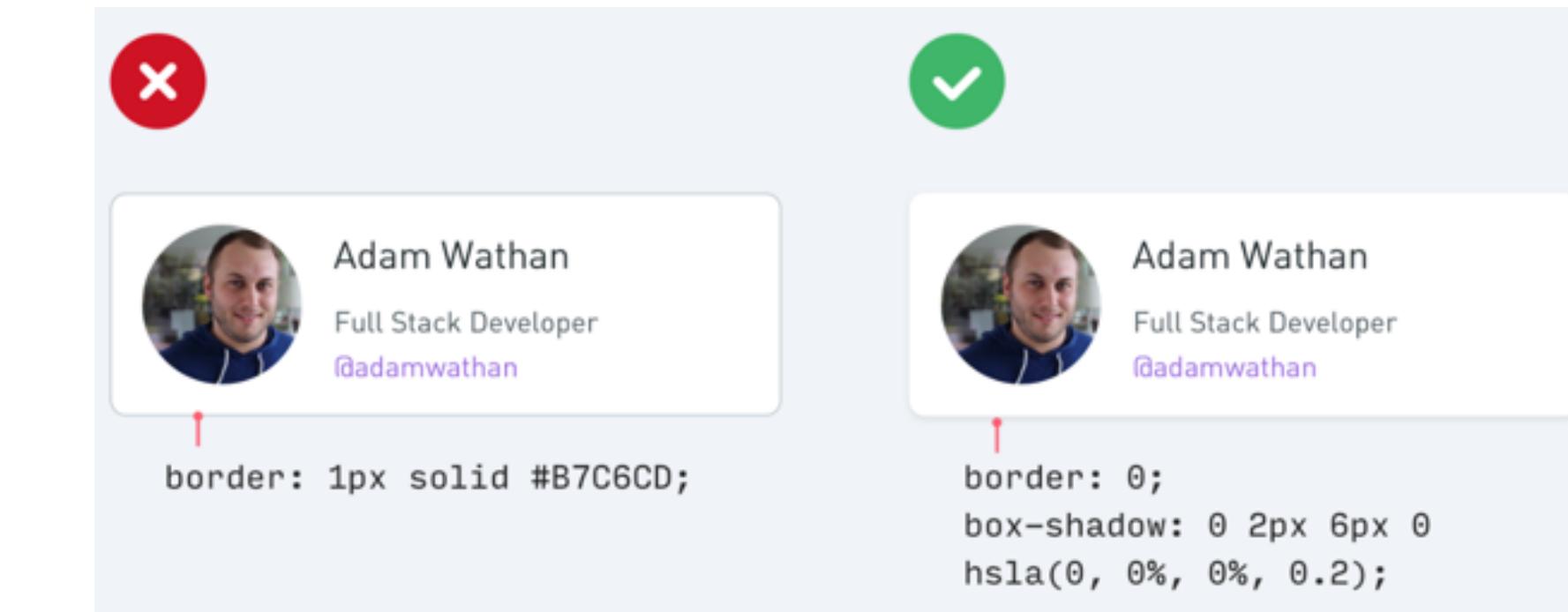
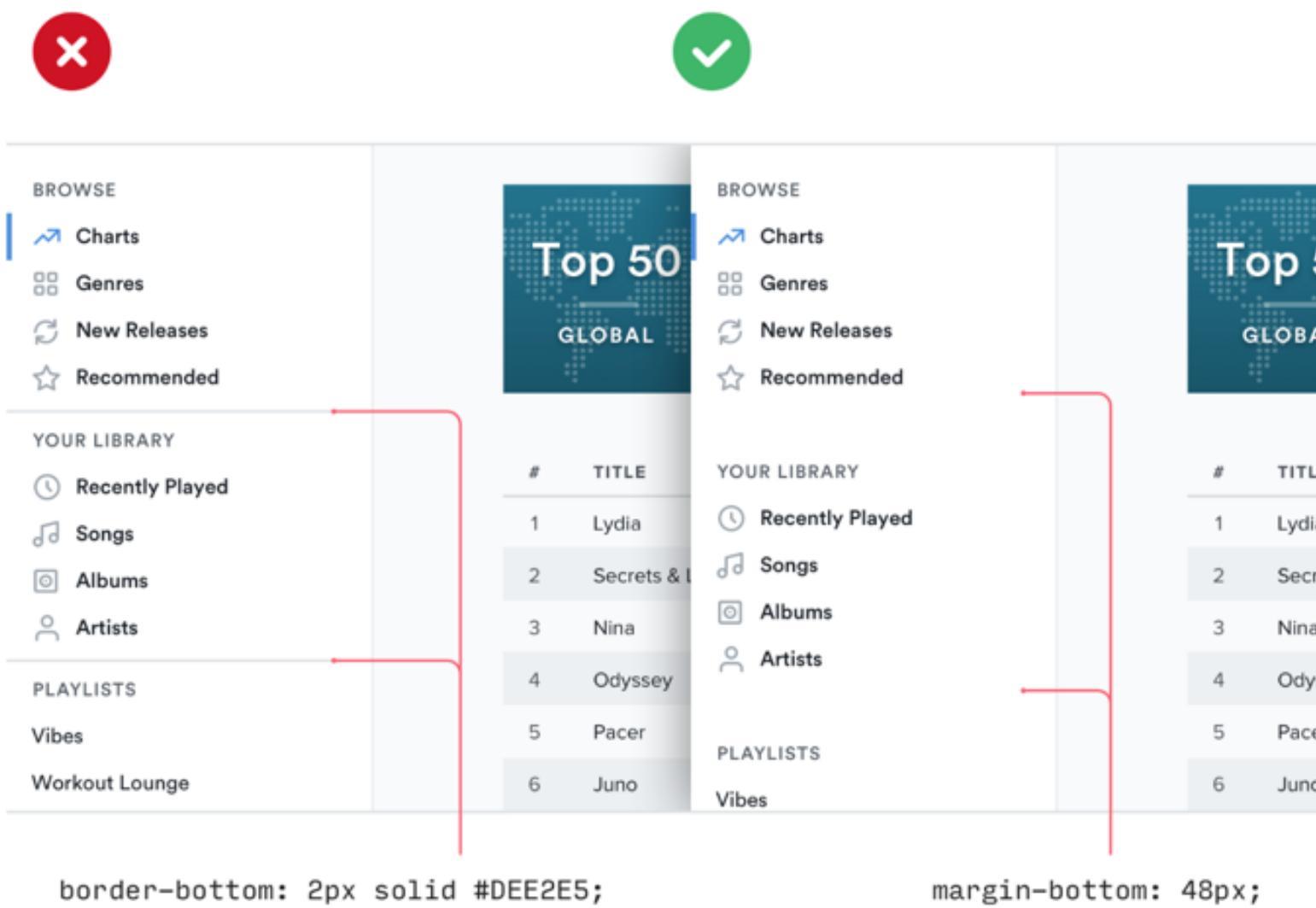


Grouping



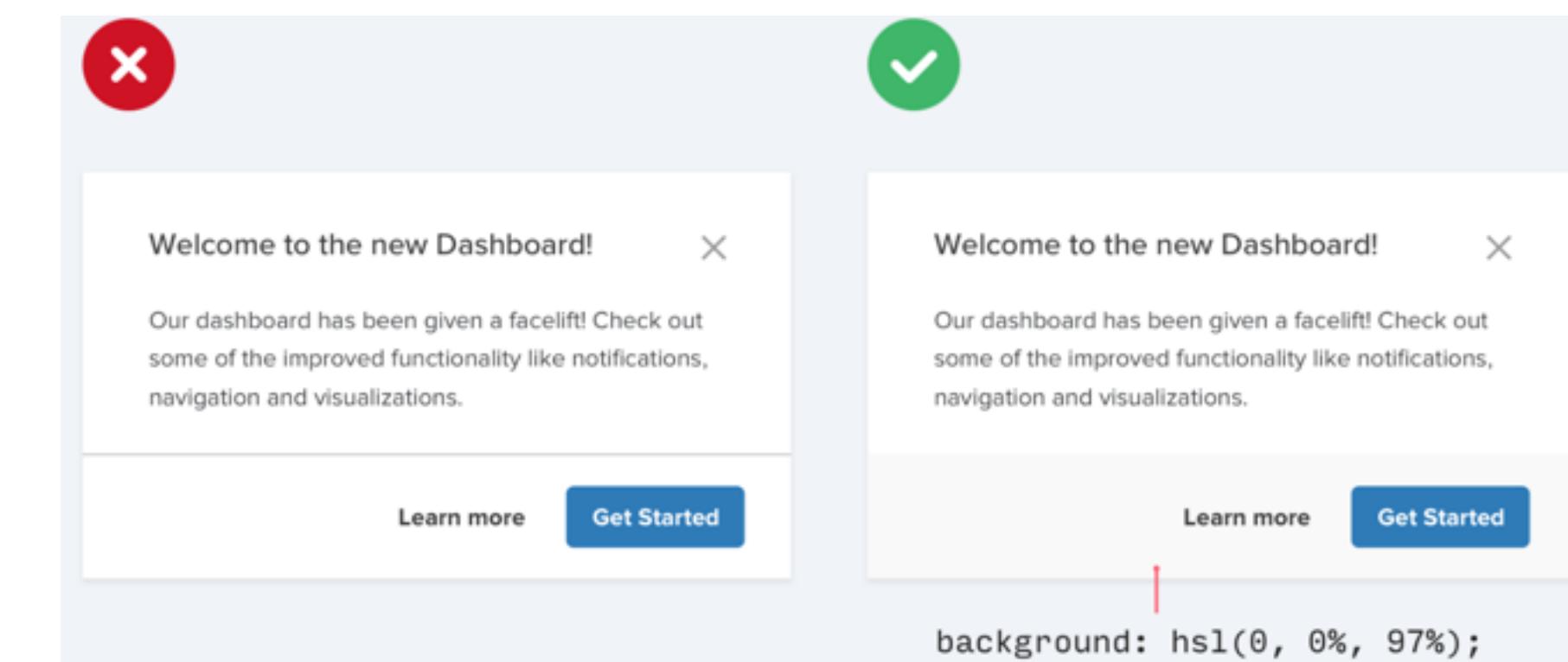
- Binding UI elements tightly together while distinguishing them from surrounding controls
- “Showing” not “telling”
- Can be achieved through
 - Bounding boxes (not recommended)
 - Negative space & contrasts
 - Arrangement & alignment

Use Fewer Borders



box shadows

negative space



different backgrounds

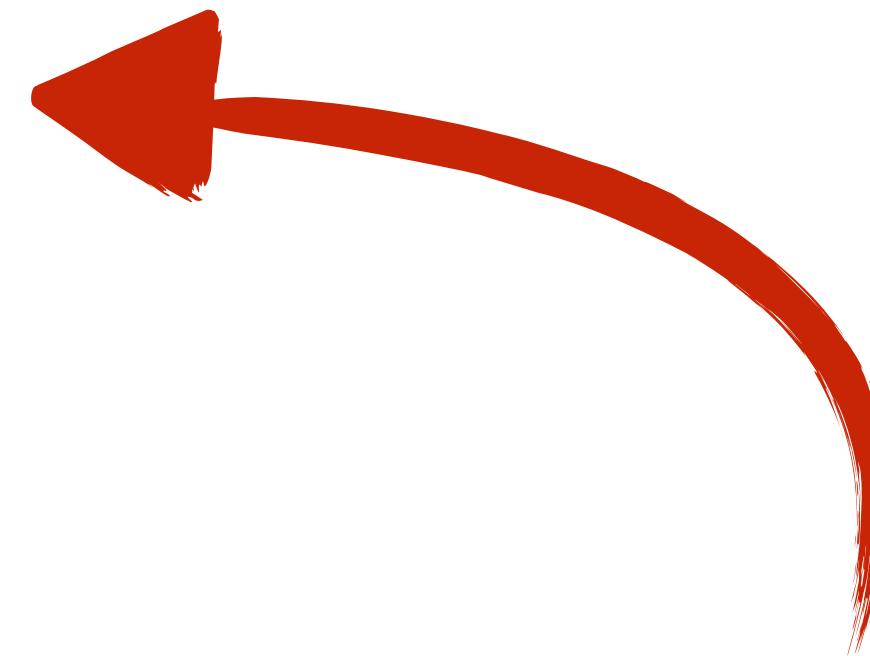
Hierarchy

Order groups based on perceptual prominence corresponding to intended reading sequence

Can help solve “skimming” problems

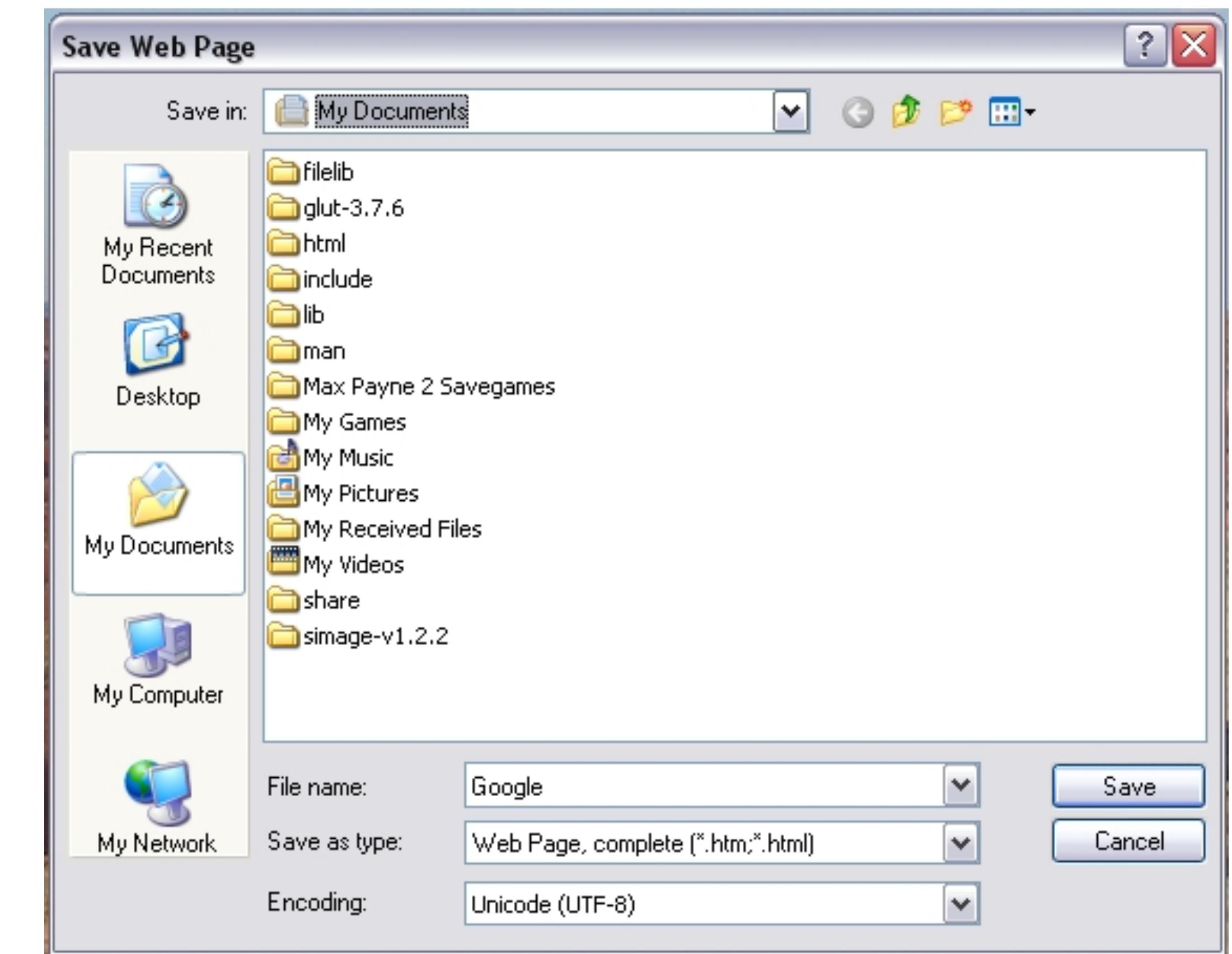
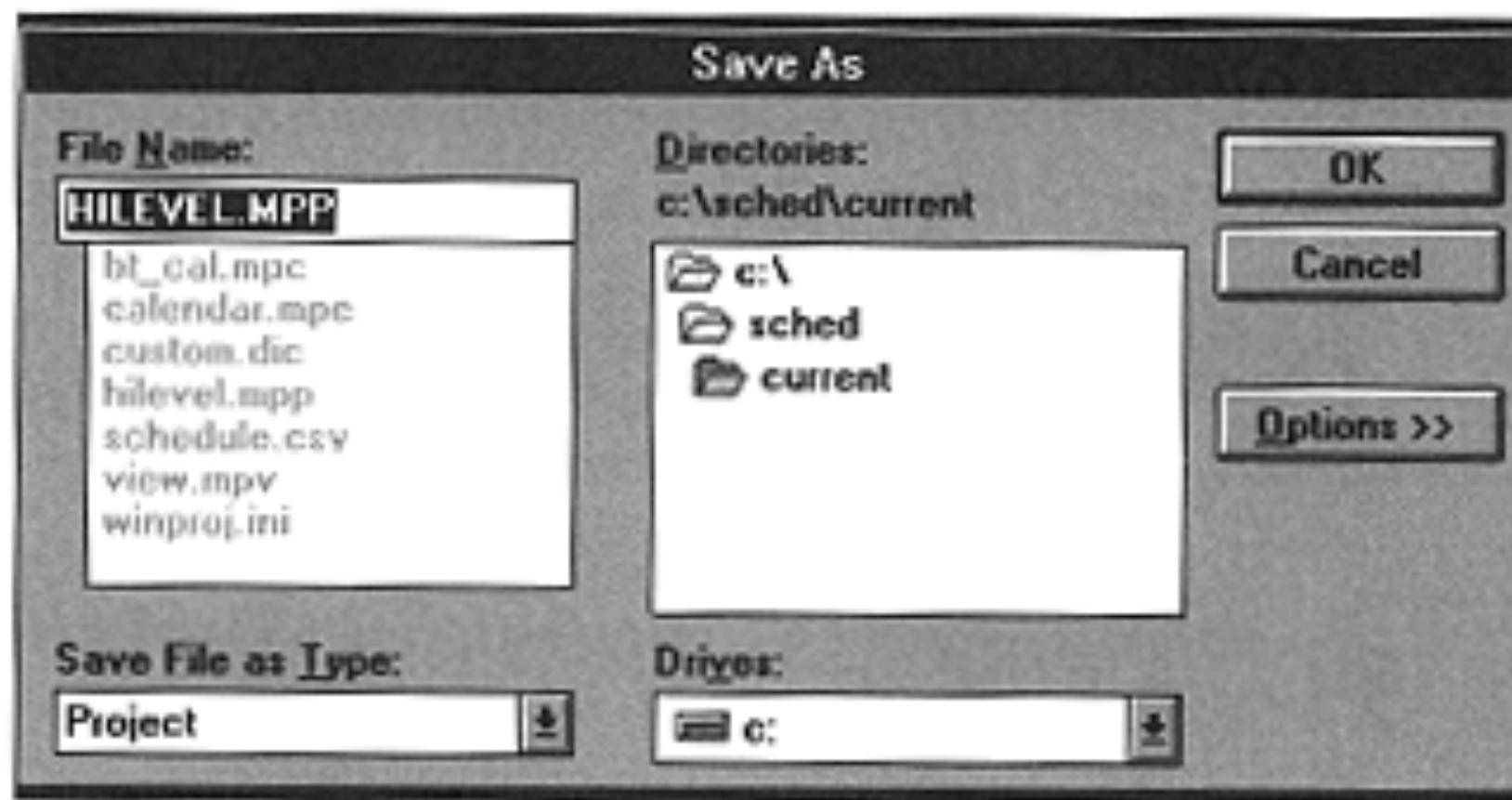
Structure can help people focus attention on key parts

Key points might **get lost though.**



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

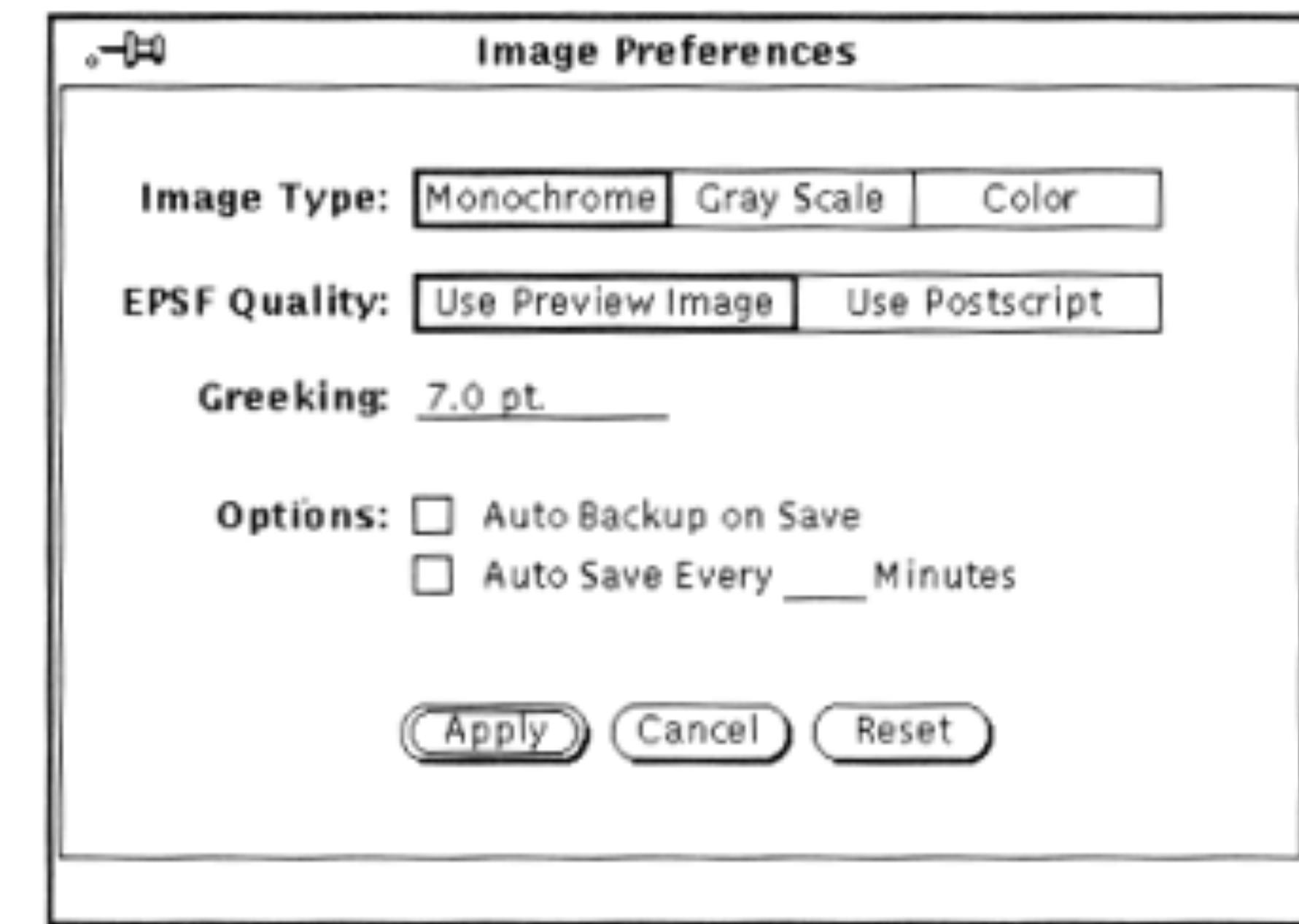
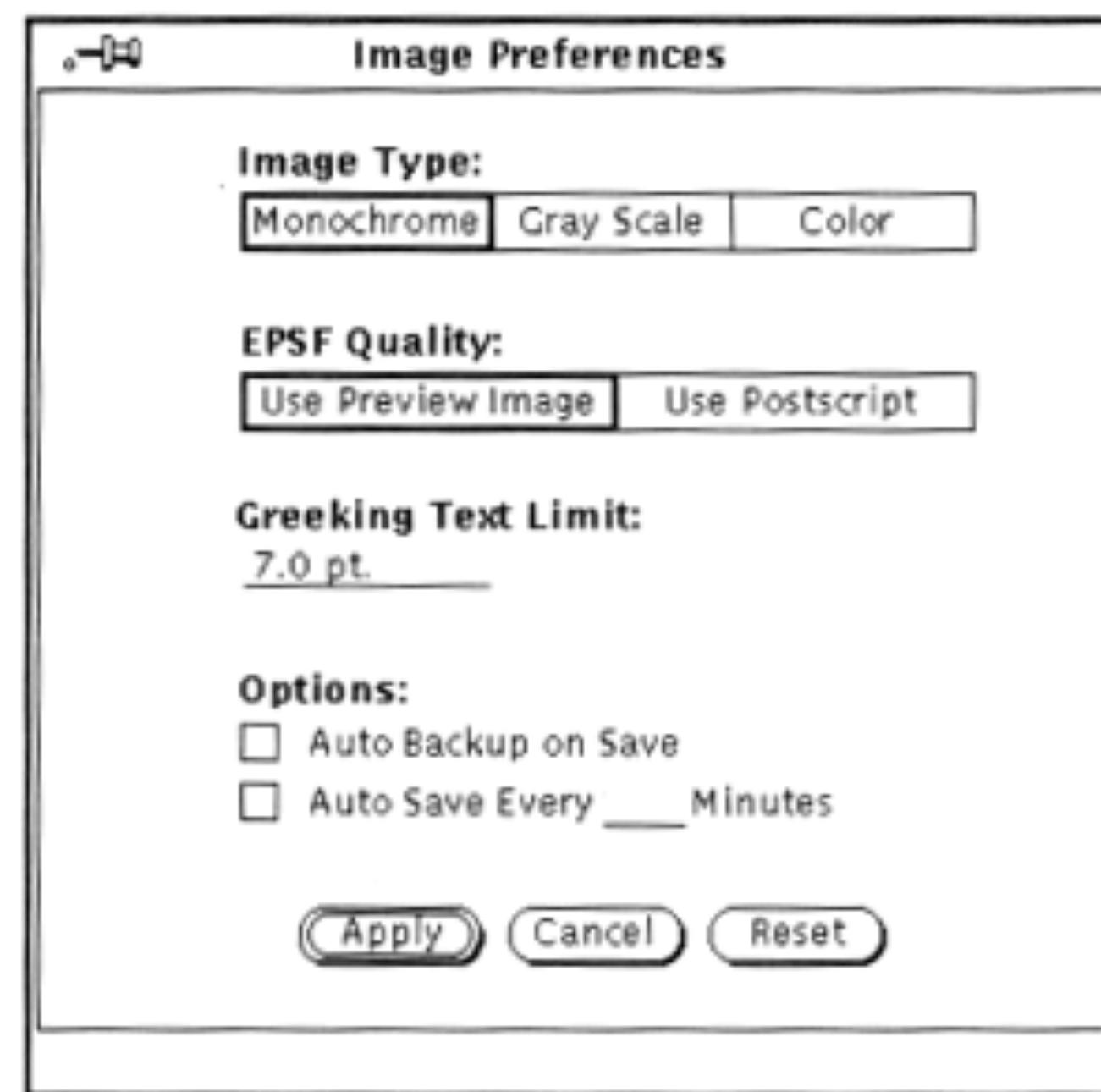
Hierarchy in UIs



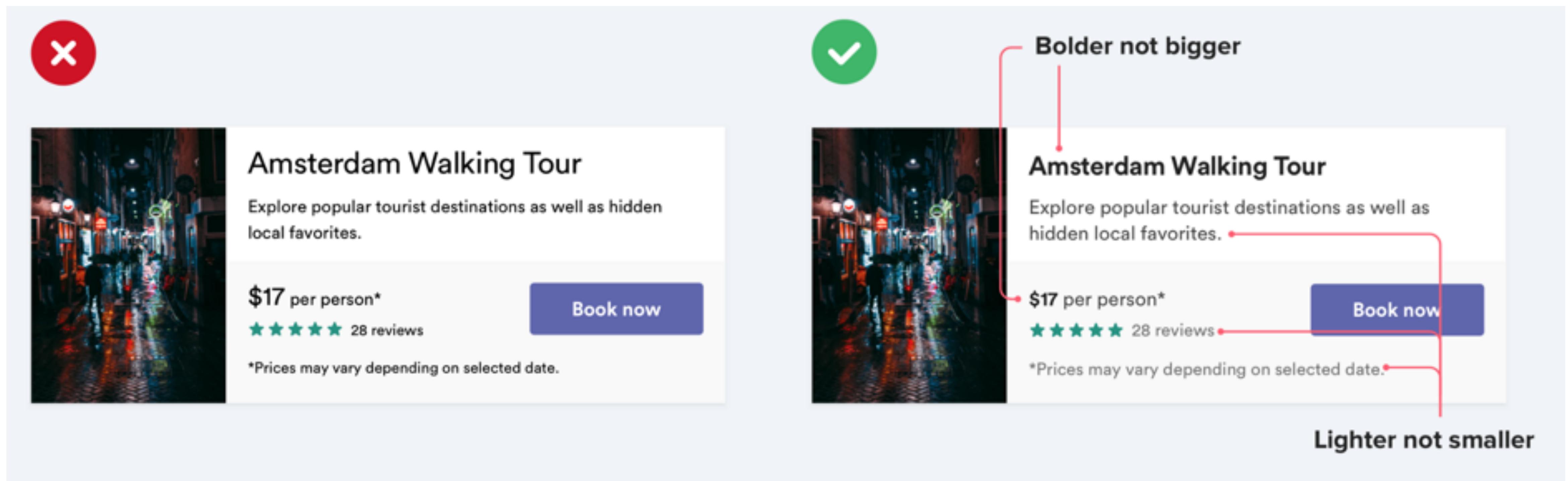
Use Negative Space

- 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



Amsterdam Walking Tour

Explore popular tourist destinations as well as hidden local favorites.

\$17 per person*  28 reviews

Book now

*Prices may vary depending on selected date.

Bolder not bigger

Amsterdam Walking Tour

Explore popular tourist destinations as well as hidden local favorites.

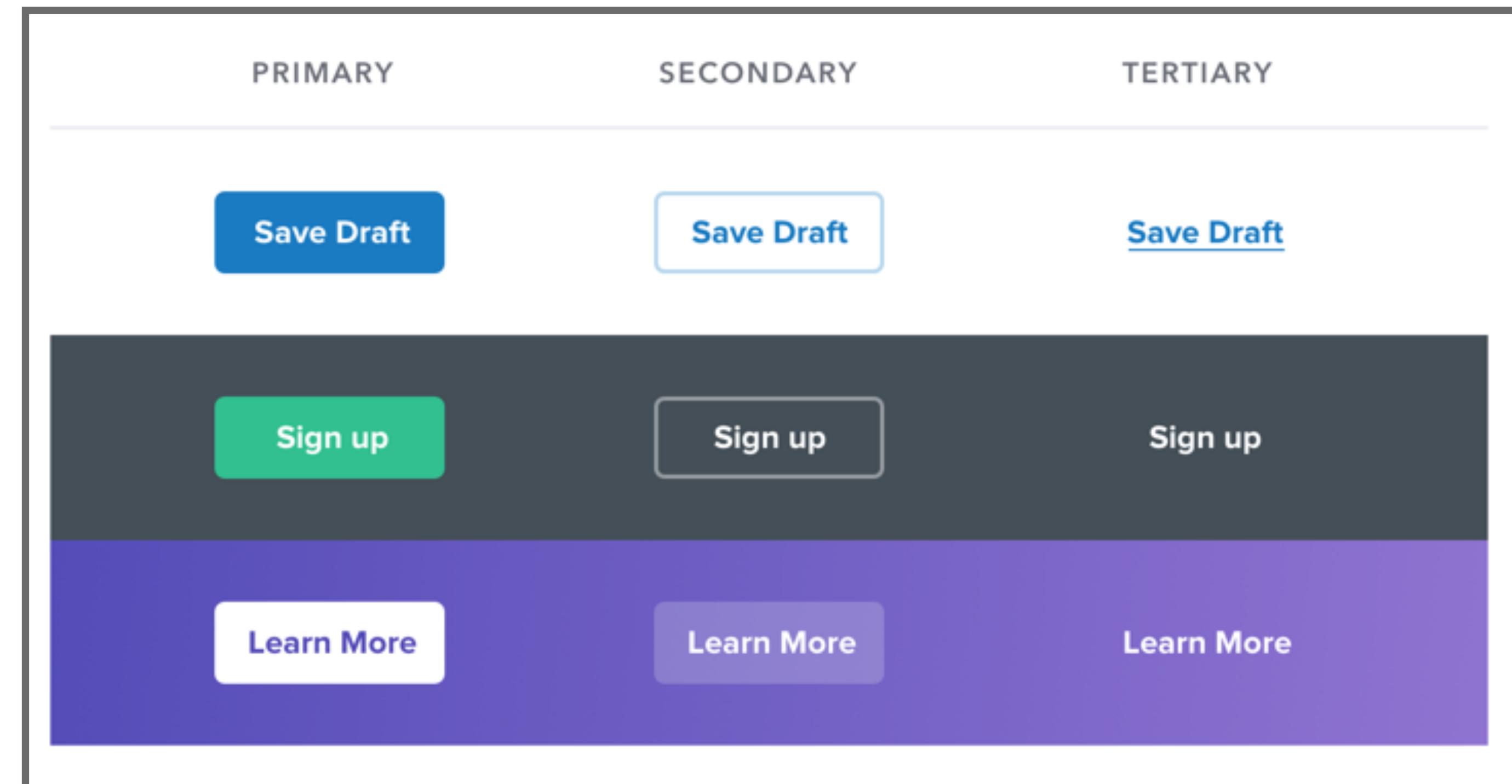
\$17 per person*  28 reviews

Book now

*Prices may vary depending on selected date.

Lighter not smaller

Signal Importance of Action



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

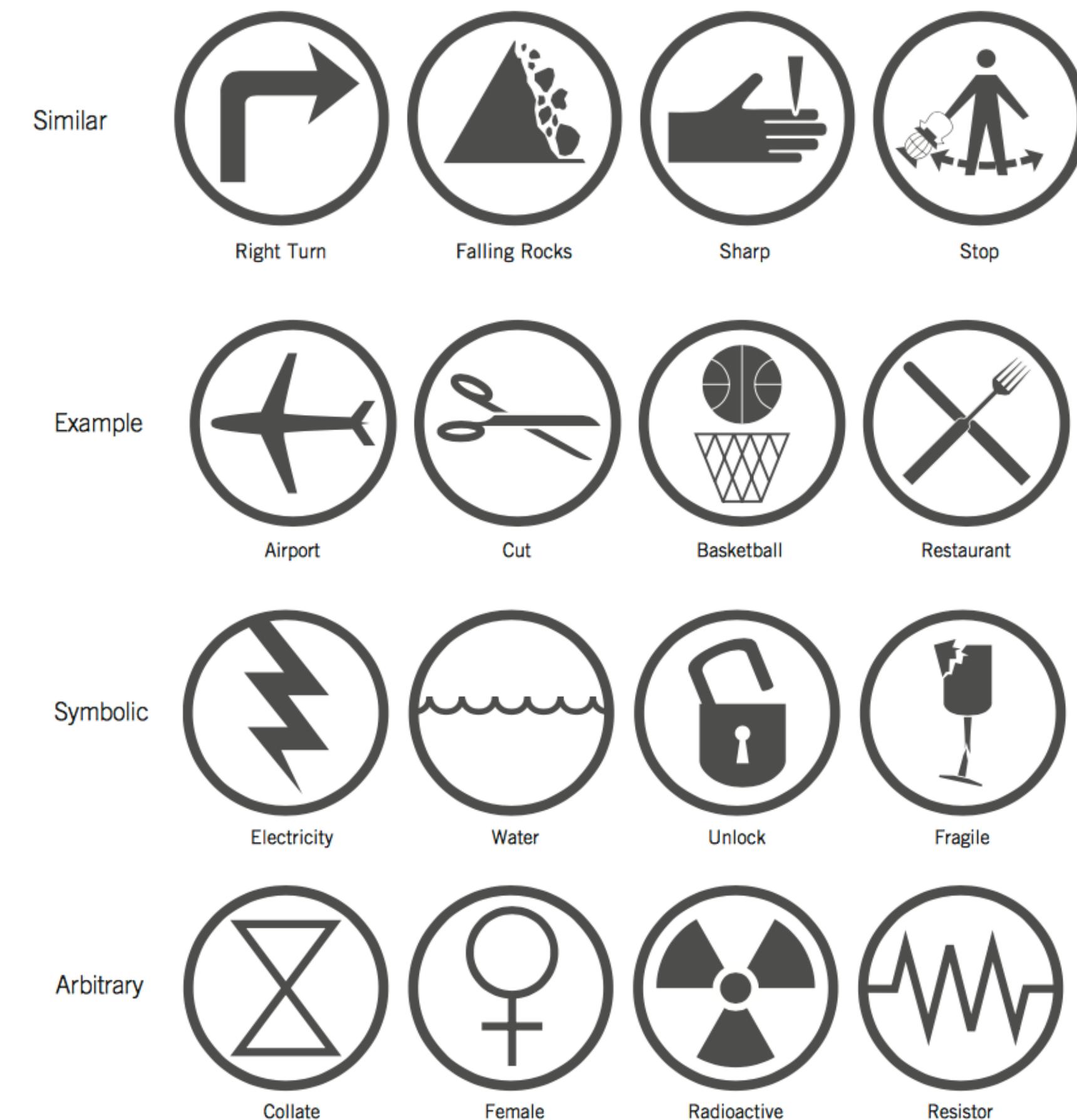
Images & Icons

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



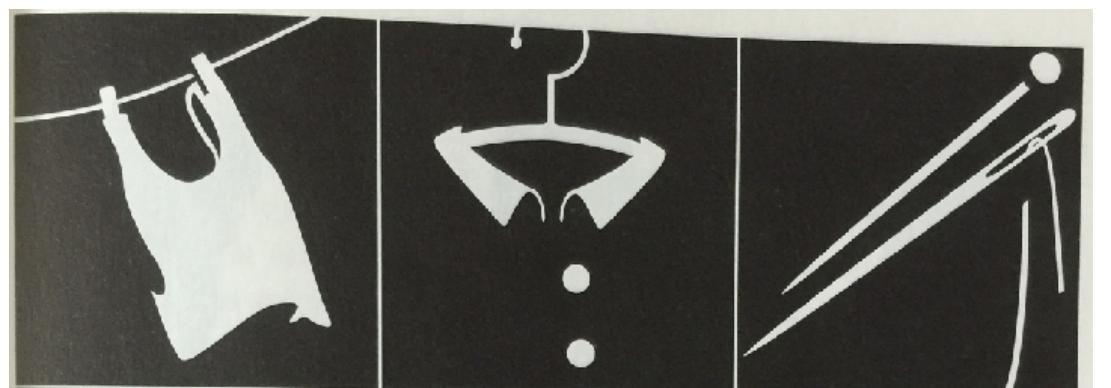
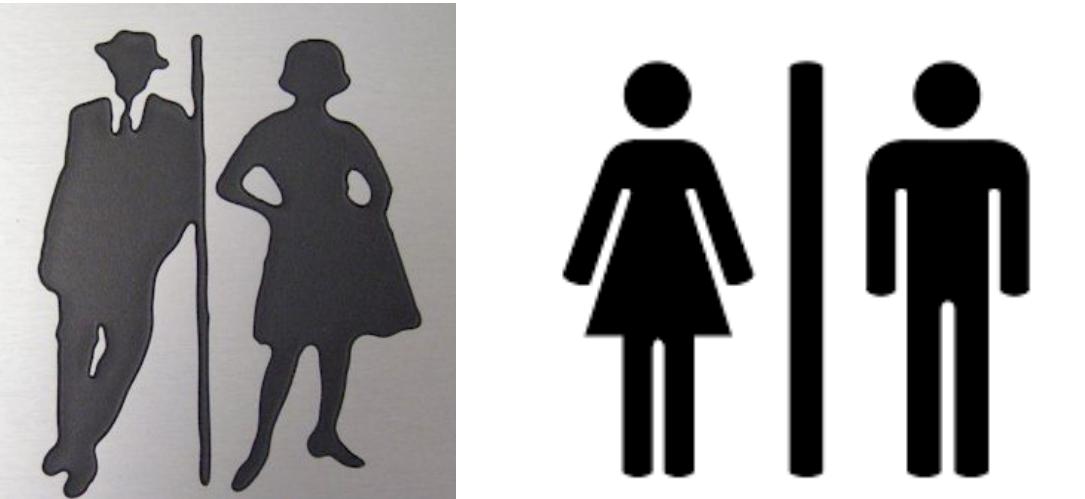
Use of Abstraction

- 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

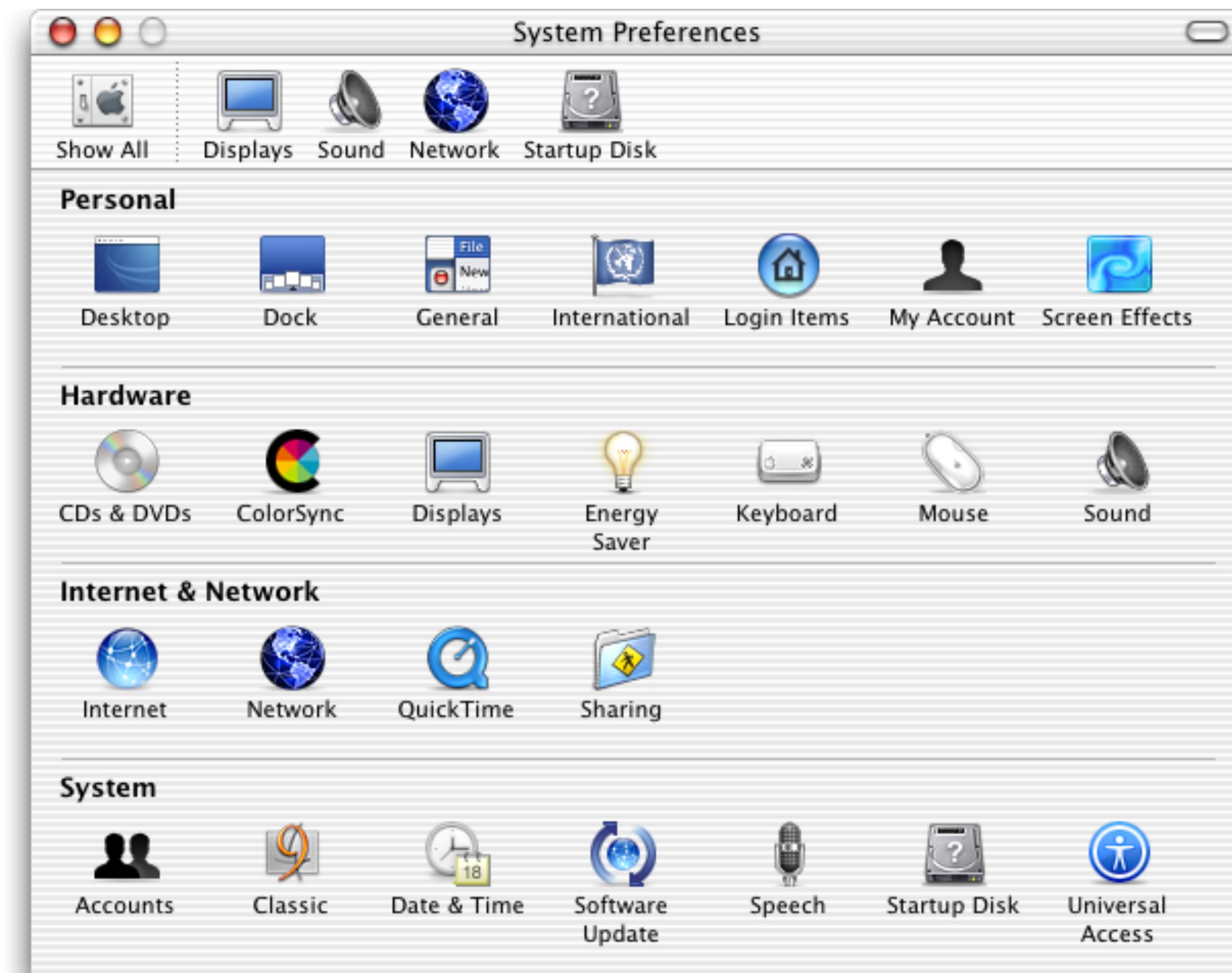
- Immediacy - can be perceived effortlessly & involuntarily by being **bold**, clear, balanced
- Generality - represents a **class** of items, rather than an individual element, by removing details that may vary
- Cohesiveness - set of icons that function **together** by sharing visual variables
- Characterization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

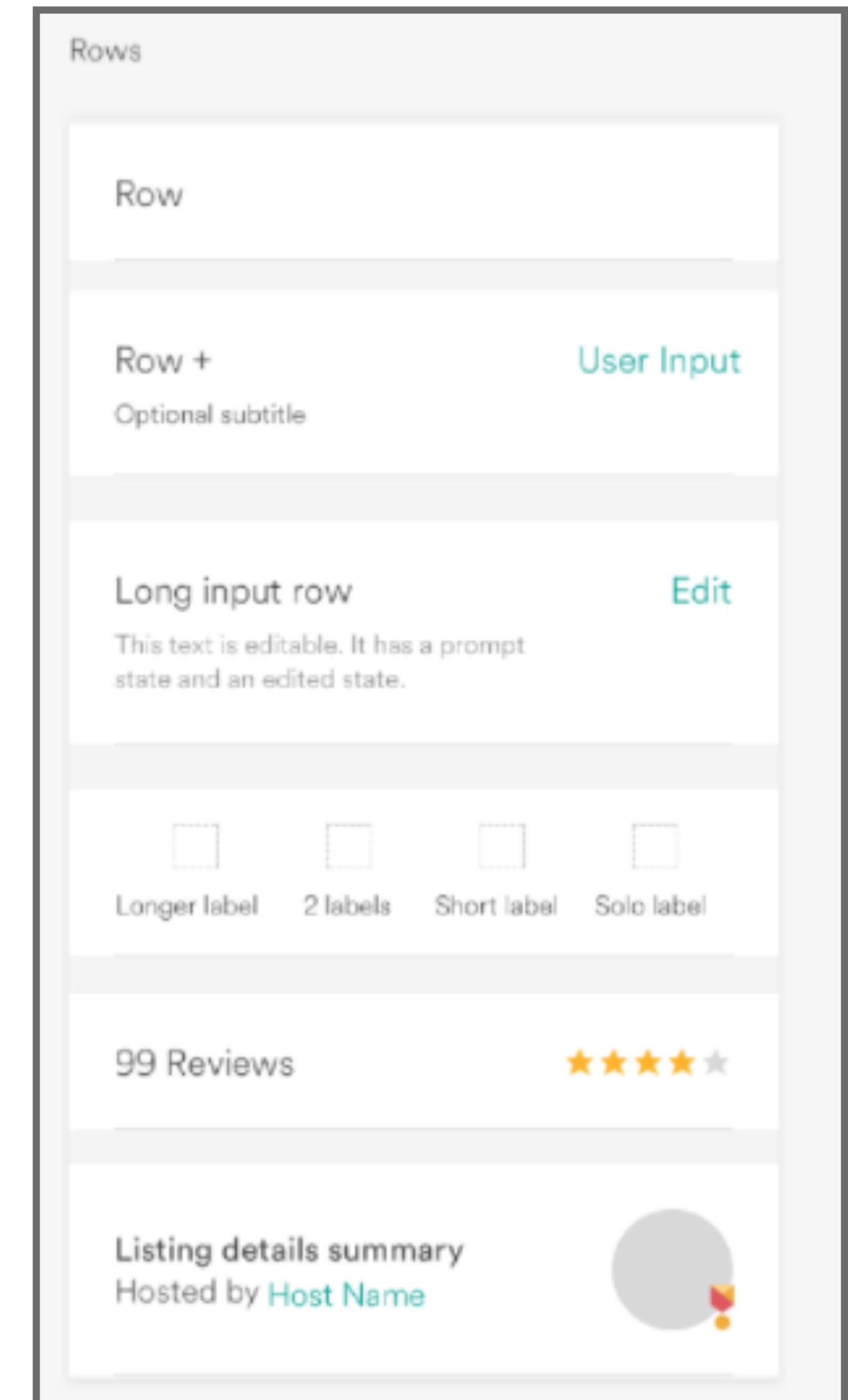
Activity: OS 10.15 Preferences Icons



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 moi
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 Se where

New York Times - www.cmu.edu/ Oct 1, 1996 by Andy Harper source
all 633 related »

cmu [definition]. (0.48 seconds) 1 - 37 of 37 details
4,285,199,774 web pages last 16 minutes ago

Reuters ©2004 Google Sponsored Links fluff
(Note: Setting preferences will

Graduating? Cor more » at CMU Inbox (2) Compose Mail

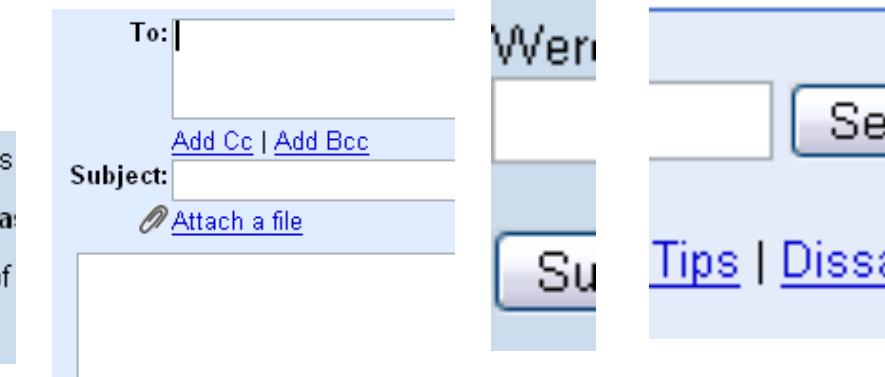
Move to Inbox Search News I'm Feeling L Go Archive action

Invite 7 frie New Featu New! Never lose ai act now

Example: Syntax, Google 2004

task

Find results
with **all** of the words
with the **exact phrase**
with **at least one** of
without the words



Results Window

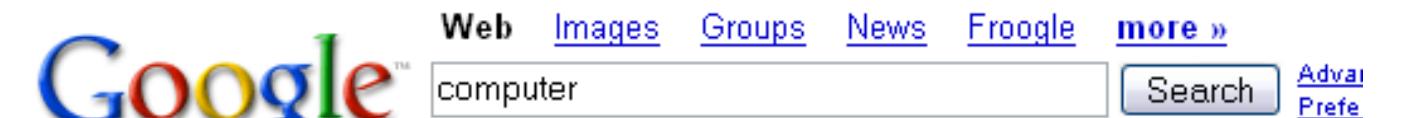
C

Loading...

placeholder

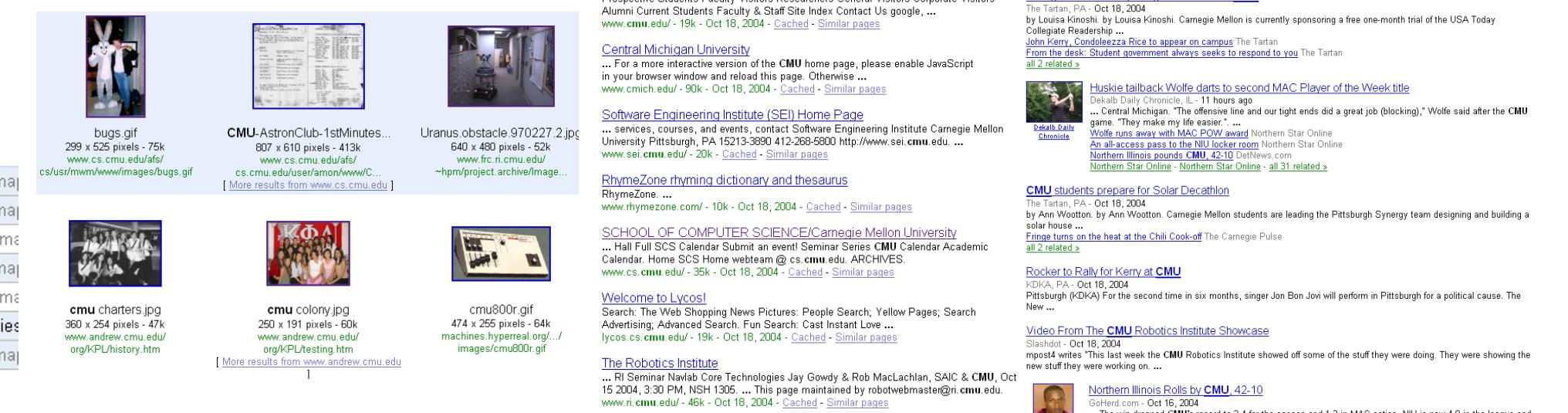


toolbar

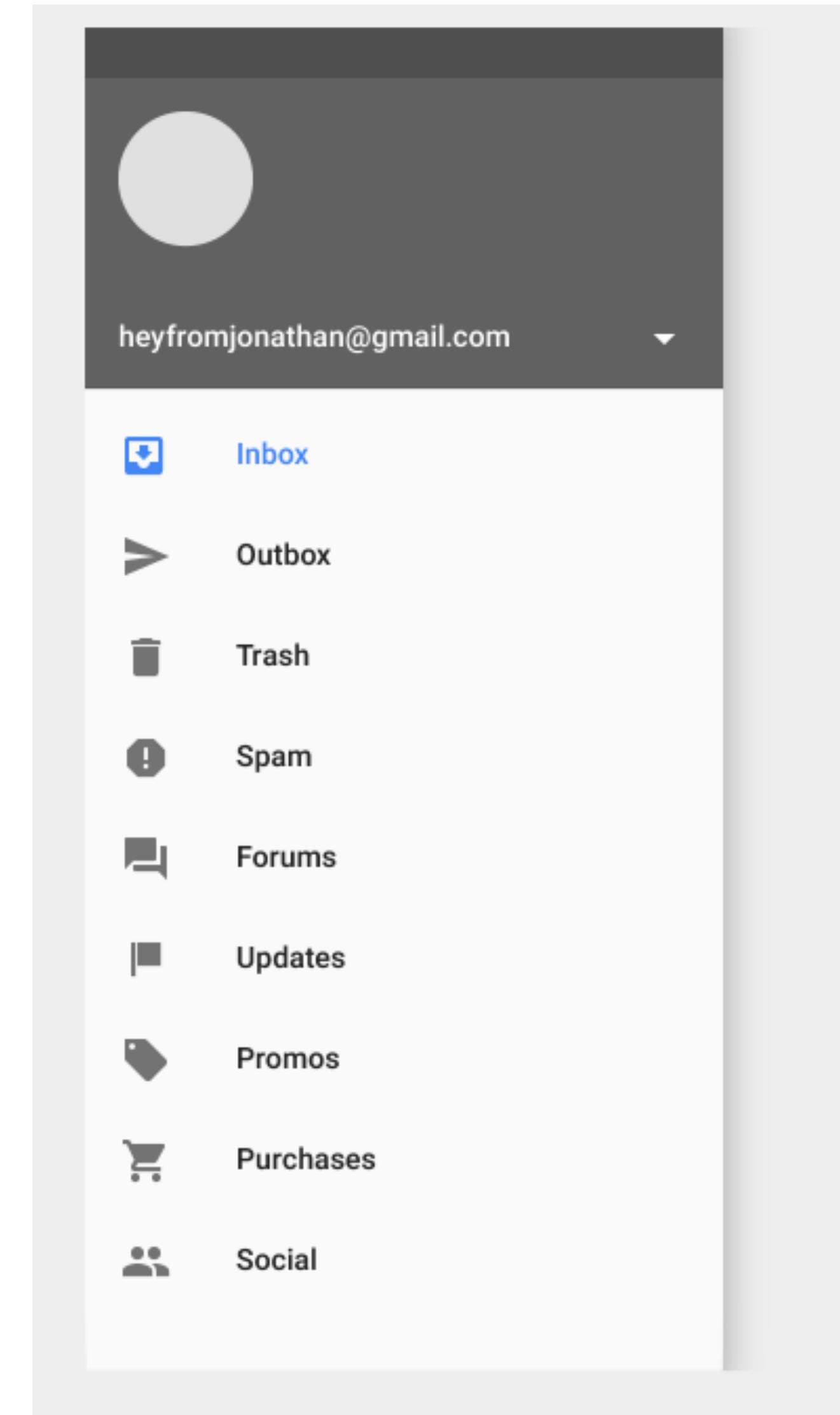
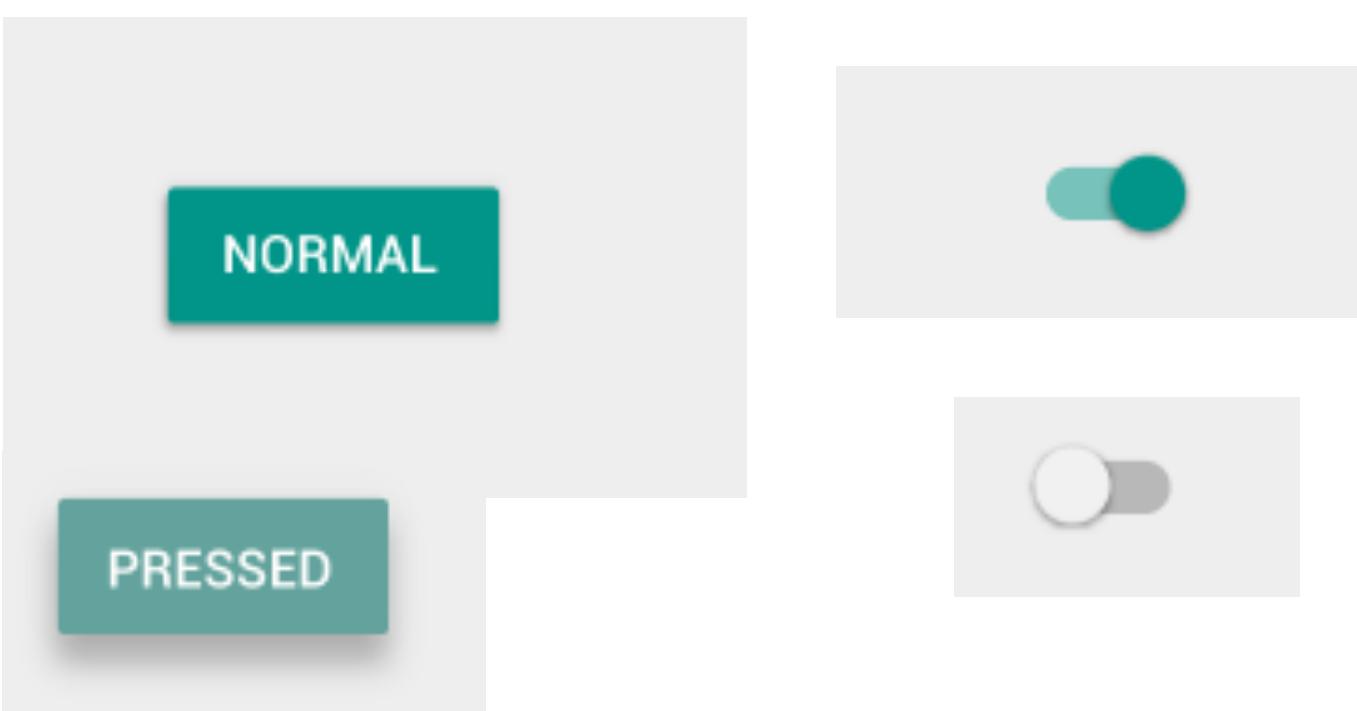
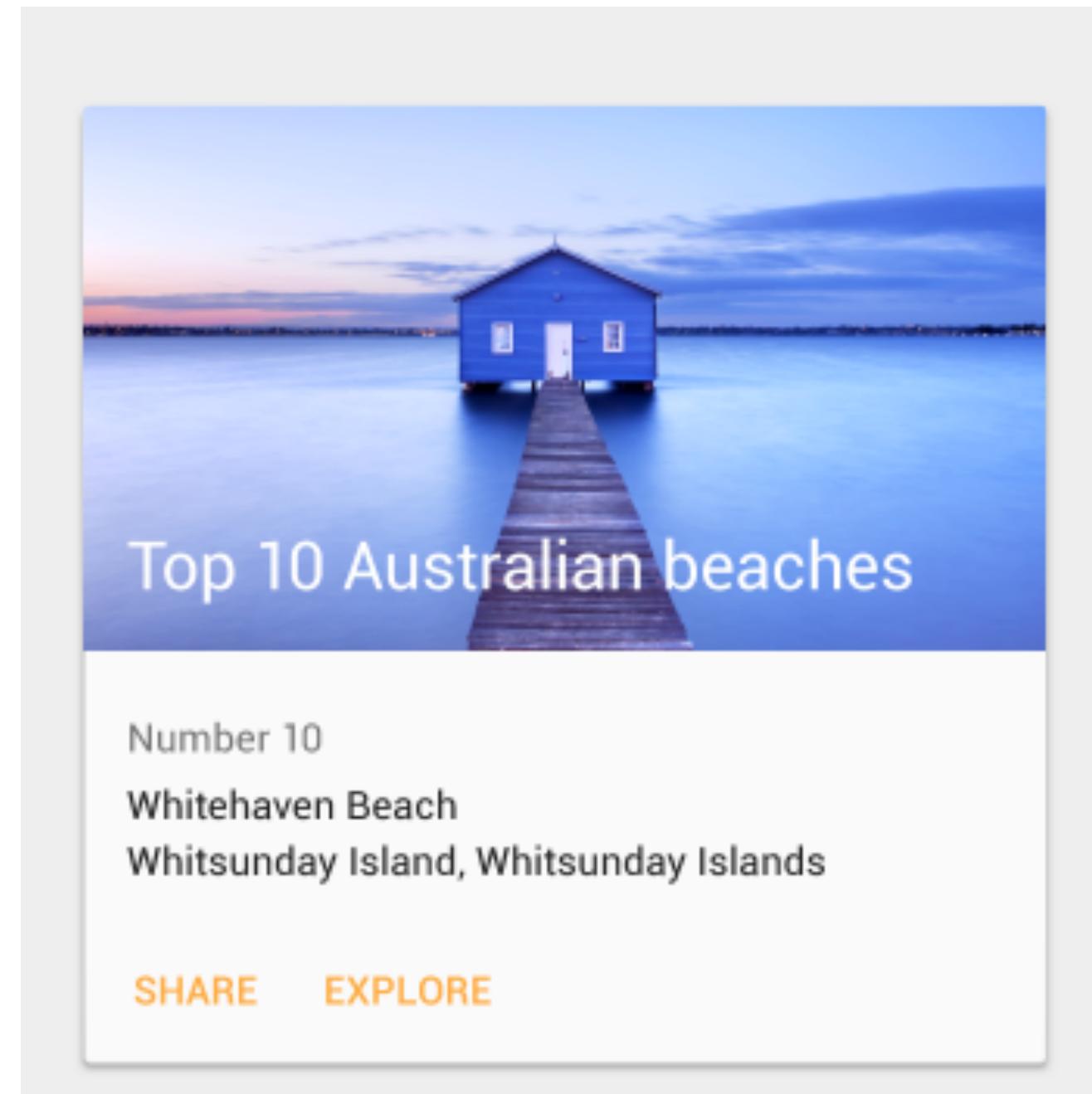


list

✉ (unknown sender) (no subject) - Received: from imaj...
✉ (unknown sender) (no subject) - Received: from imaj...
✉ (unknown sender) (no subject) - Received: from imaj...
✉ (unknown sender) (no subject) - Received: from imaj...
✉ (unknown sender) (no subject) - Received: from imaj...
✉ Thomas LaToza > FW: Bb F04-17651: My apologies
✉ (unknown sender) (no subject) - Received: from imaj...



Examples: Google 2016

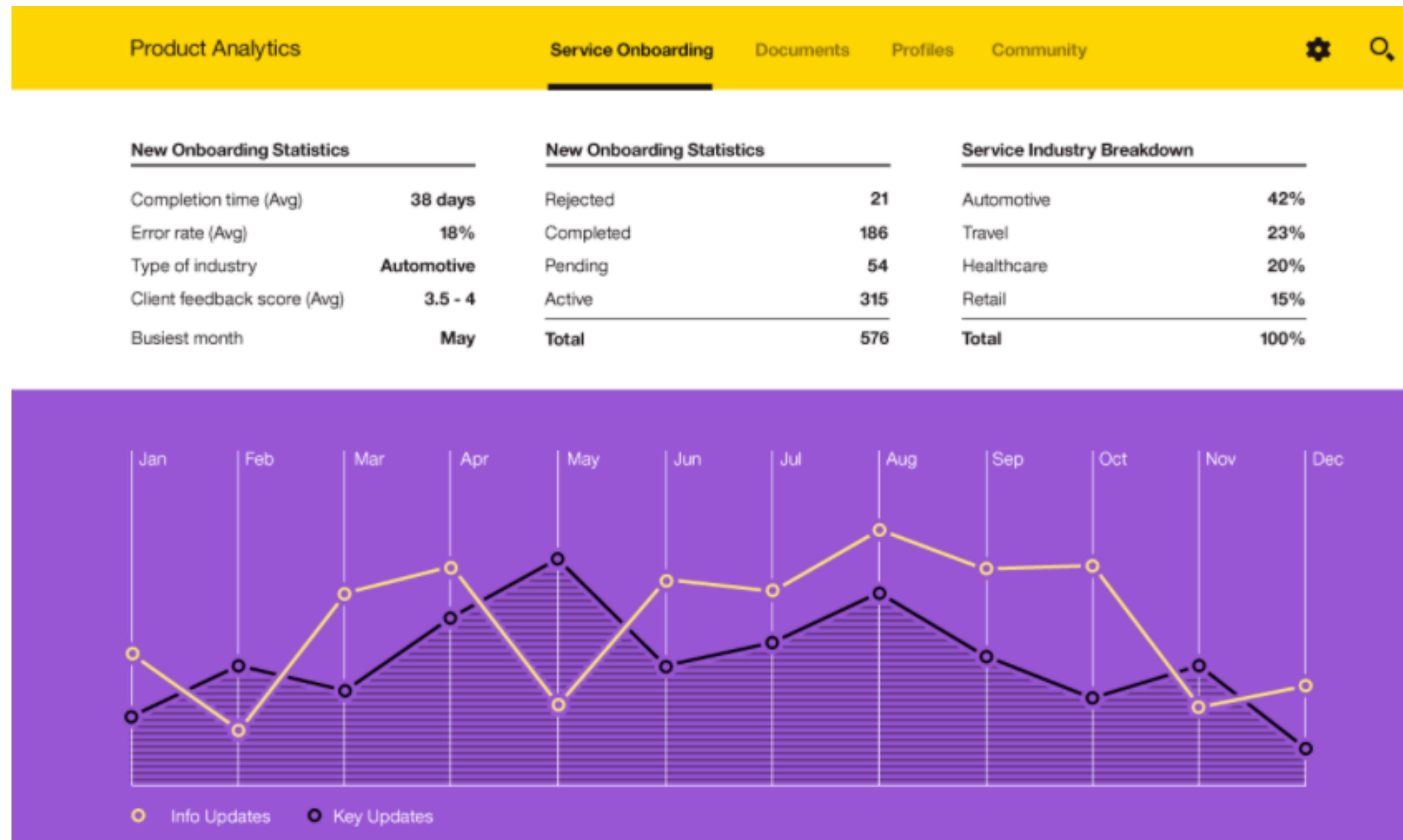


Examples: Google 2016

The image displays three screenshots of Google's 2016 user interface, illustrating the design language of that era.

- Google Drive:** The left screenshot shows the Google Drive interface. It features a sidebar with icons for "My Drive", "Shared with me", "Recent", "Google Photos", "Starred", and "Trash". Below this is a storage summary: "26 GB of 36 GB used" and a "Upgrade storage" button.
- App Engine:** The middle screenshot shows the App Engine dashboard. The top navigation bar includes the App Engine logo and the text "App Engine". The main content area is titled "Dashboard" and lists various management options: Services, Versions, Instances, Task queues, Security scans, Quotas, Blobstore, Memcache, Search, and Settings.
- Google Analytics:** The right screenshot shows the Google Analytics interface for the "Google Merchandise Store". The top navigation bar includes the Google Analytics logo and the text "1 Master View". The main content area is titled "Google Merchandise Store" and lists reports categorized under "CUSTOMIZATION", "Reports", "REAL-TIME", "AUDIENCE", "ACQUISITION", "BEHAVIOR", and "CONVERSIONS". A red circle with the number "1" is overlaid on the "Dashboards" link under "CUSTOMIZATION".

Examples: IBM



Examples: IBM



Examples: IBM

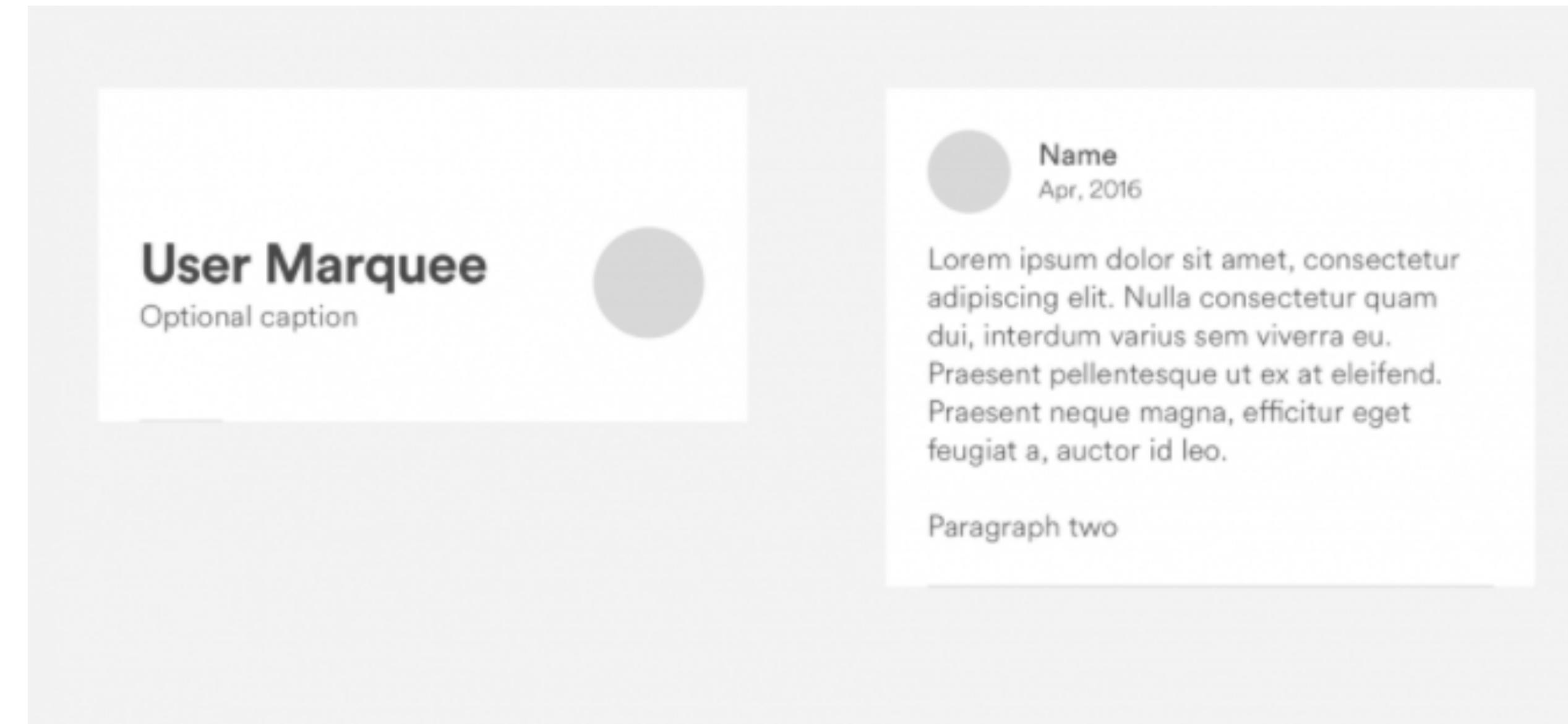
Application data

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

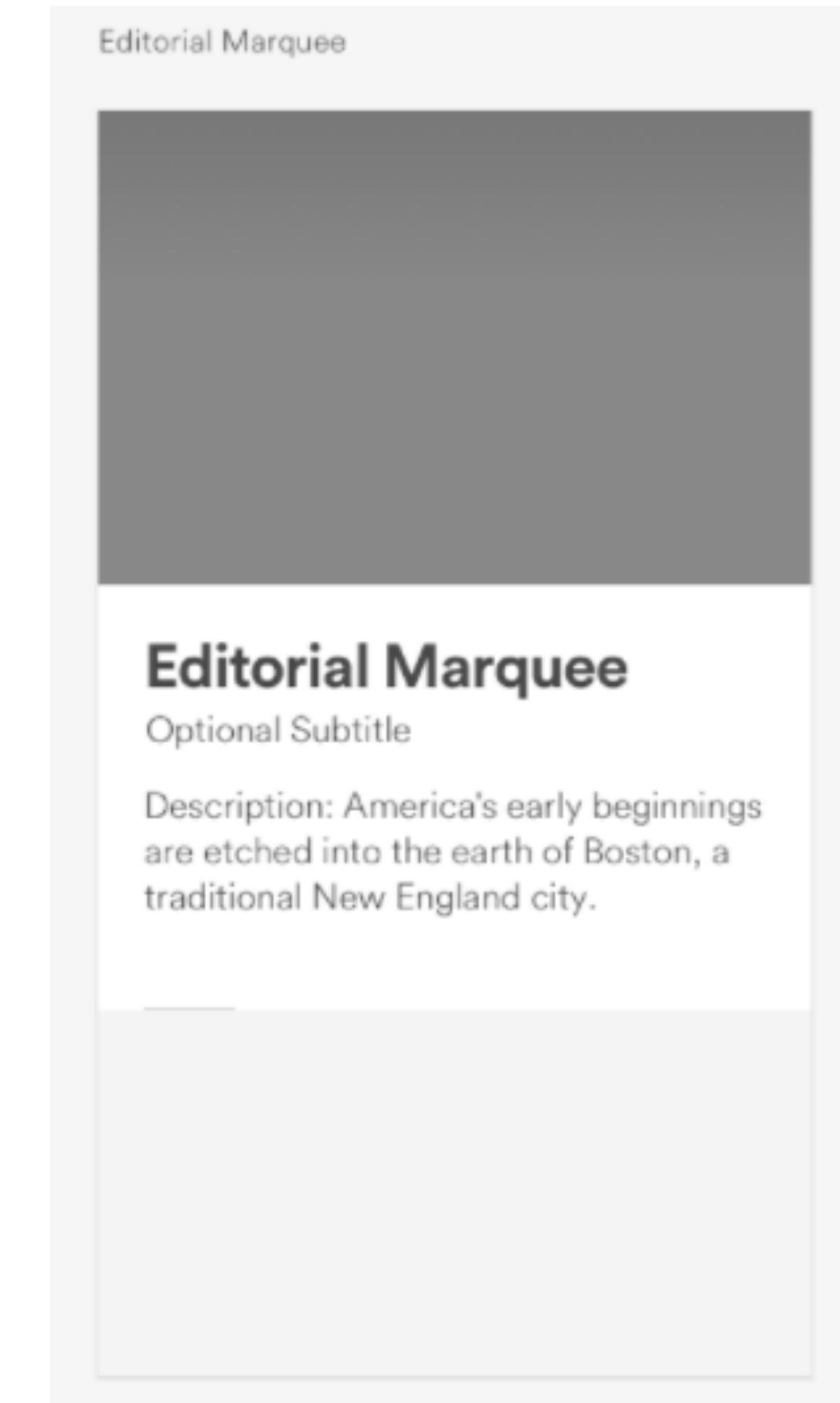
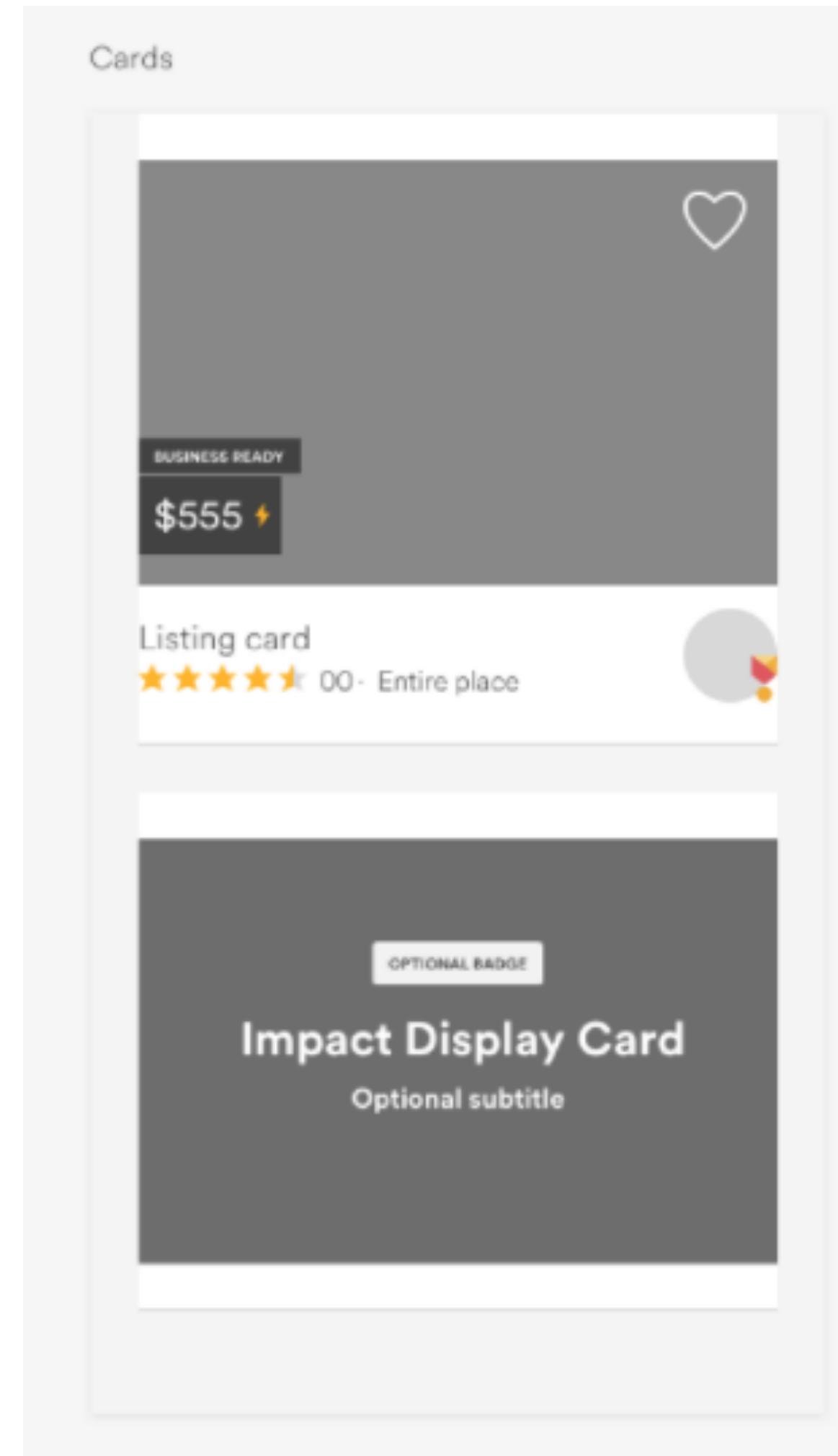
The interface shows a sidebar with icons for Configure, People, Save, and Chat. The main area is titled 'Application data' and contains a table with 19 rows of data. The table has columns for Title, Title, Value, Date, and Value. The sidebar and the main content area are separated by a vertical line. To the right of the main content area is a dark vertical bar.

The interface shows a sidebar with icons for Configure, User, Save, Catalog, Chat, and Repository. The main content area is dark and mostly empty, with a vertical line separating it from the sidebar.

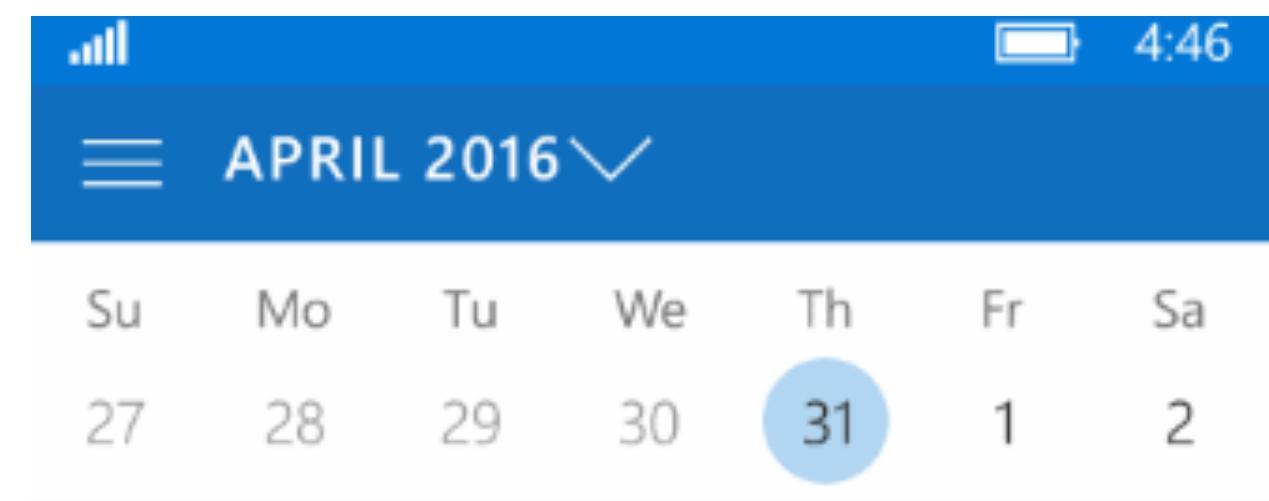
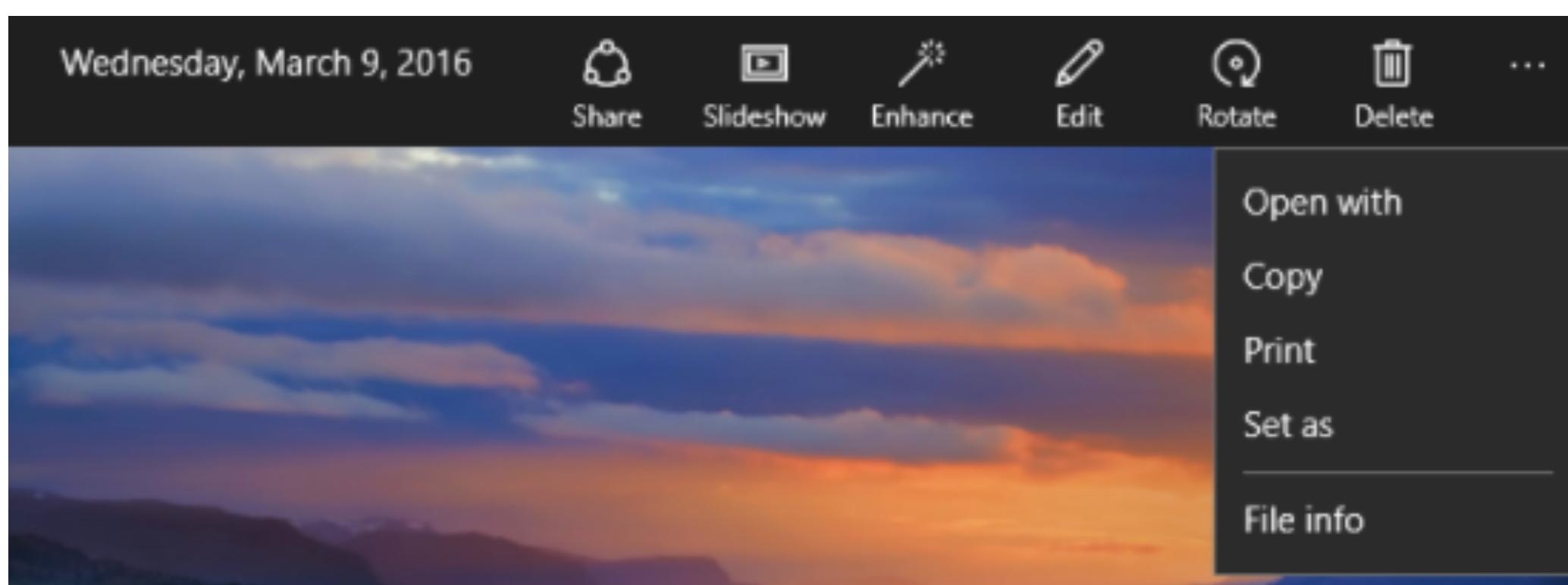
Examples: Airbnb



Examples: Airbnb



Examples: Microsoft



Thursday 31

Friday 1

Saturday 2

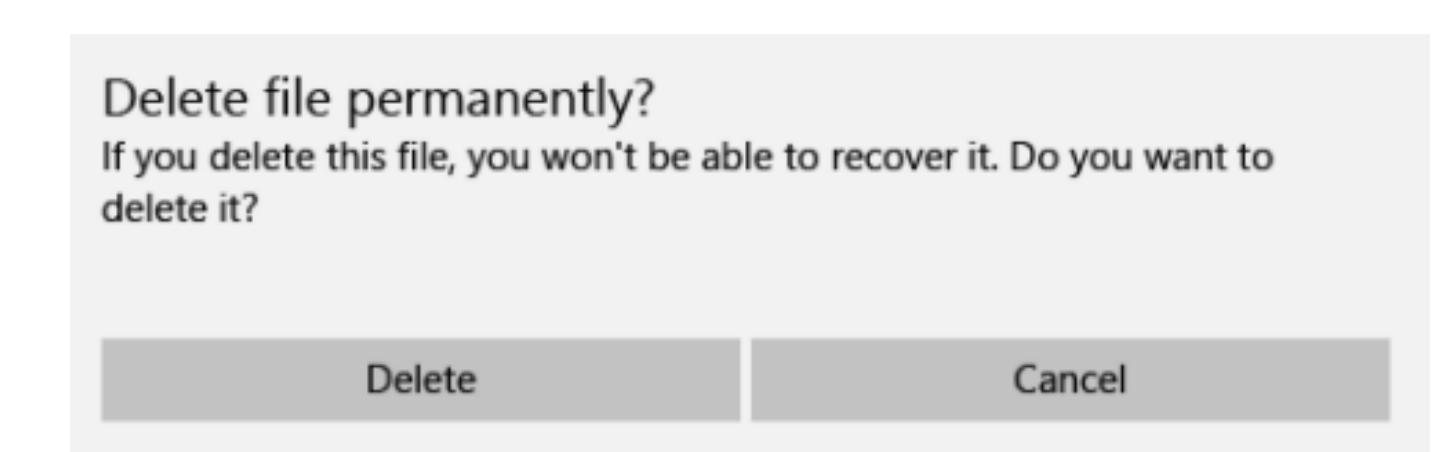
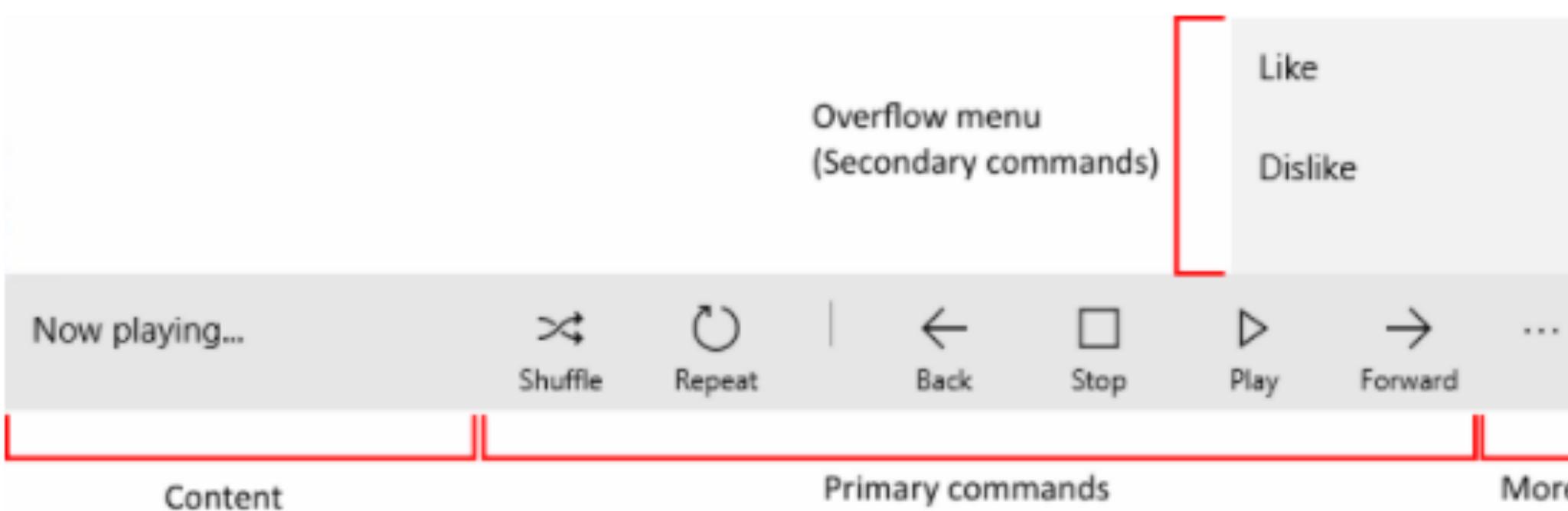
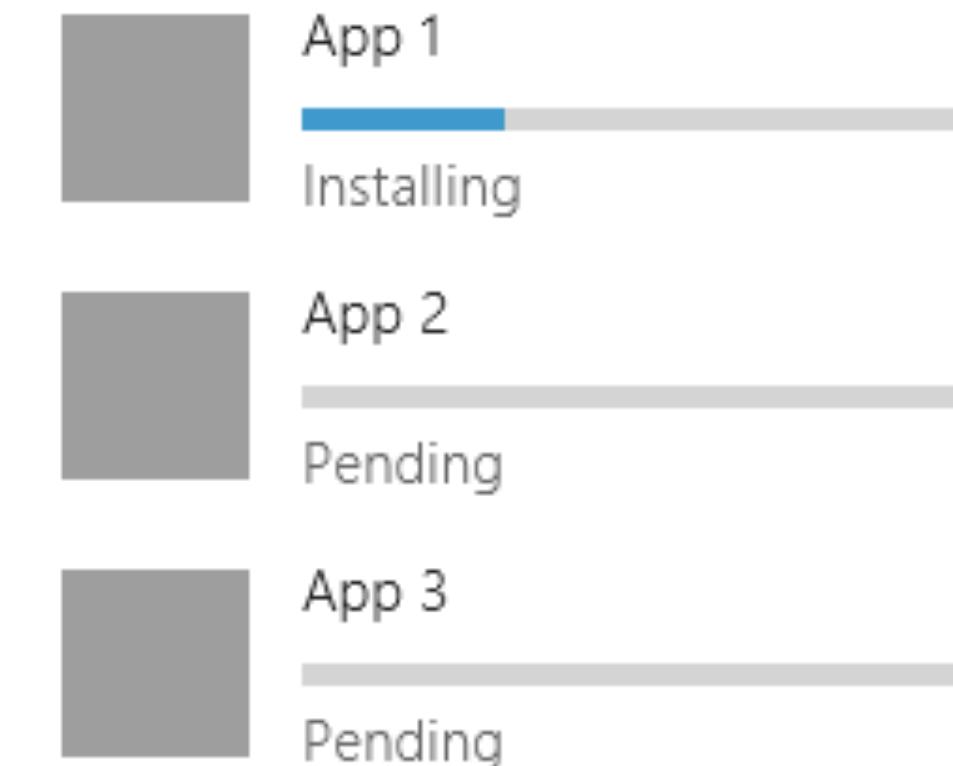
Sunday 3

Monday 4

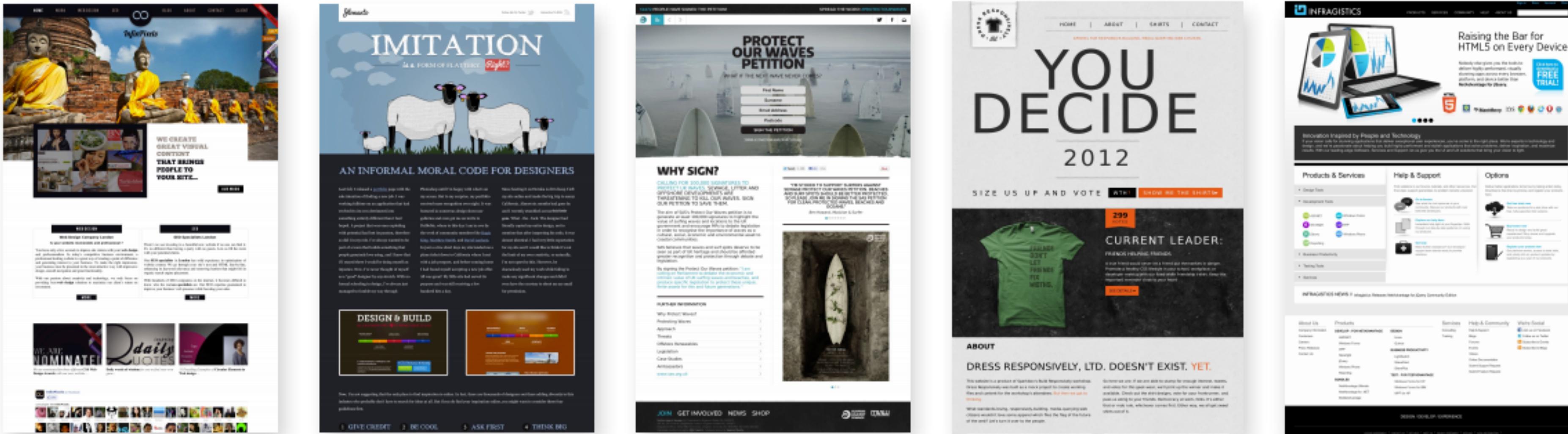
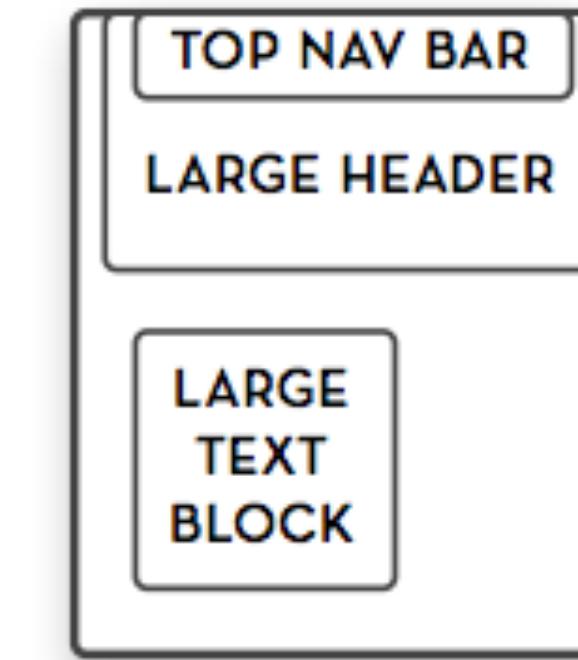
Tuesday 5



Examples: Microsoft



Example: Header with text blocks layout

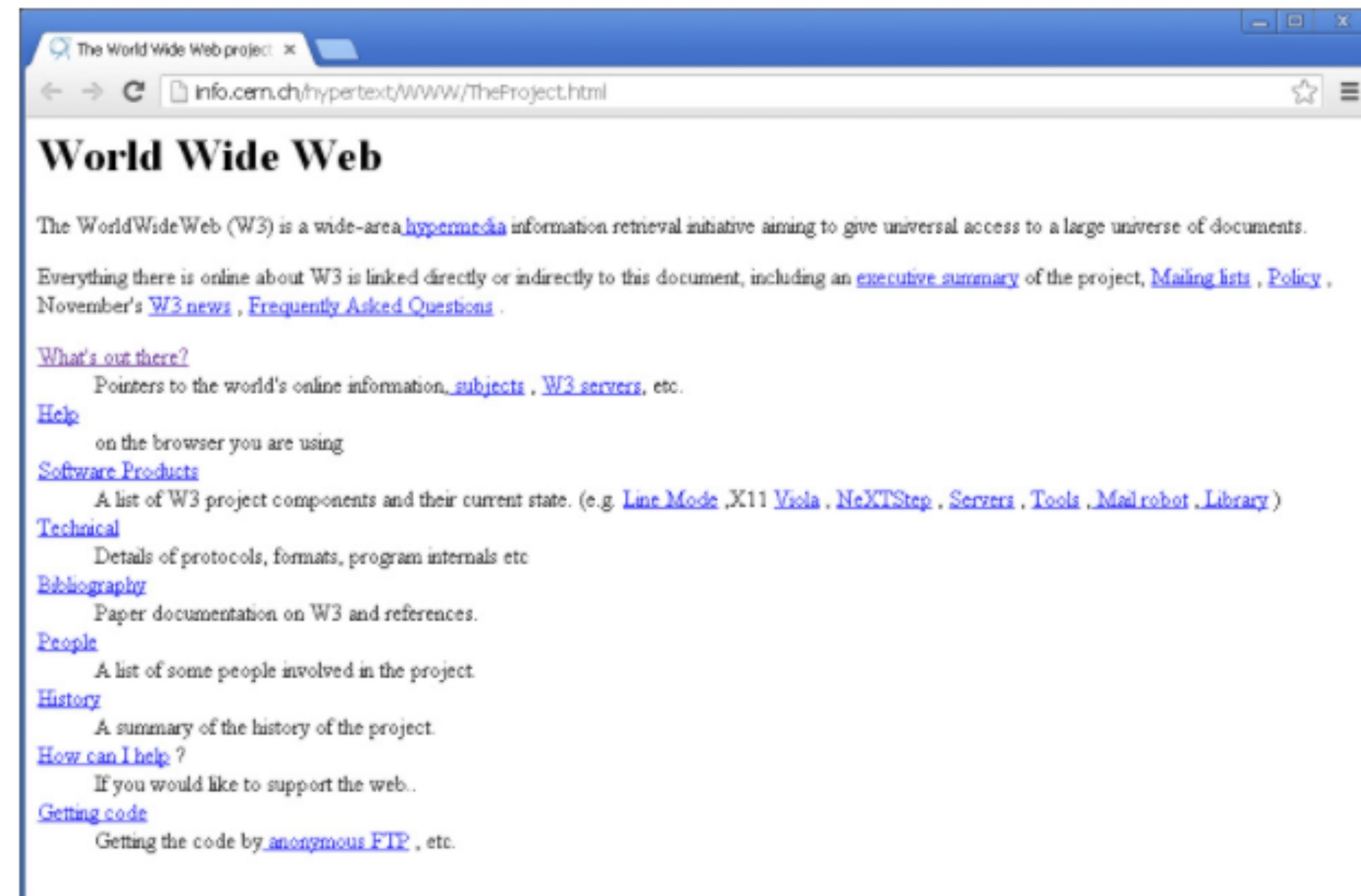


<http://ranjithakumar.net/resources/webzeitgeist.pdf>

Position Encodes Meaning and Function



Web Design Languages Over Time



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

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JULY 14

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Consumer

A photograph of three young people (two girls and one boy) dancing together in a white studio. The girl on the left wears a red and white striped shirt, the boy in the middle wears a green shirt, and the girl on the right wears a straw hat and a patterned shirt.

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[Digital](#)

[Teens](#)

Commercial

A small thumbnail image showing two people in a car, possibly a Polaroid advertisement.

[Polaroid Education Program](#)

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[OEM](#)

[Artist's Studio](#)

[Polaroidwork.com](#)

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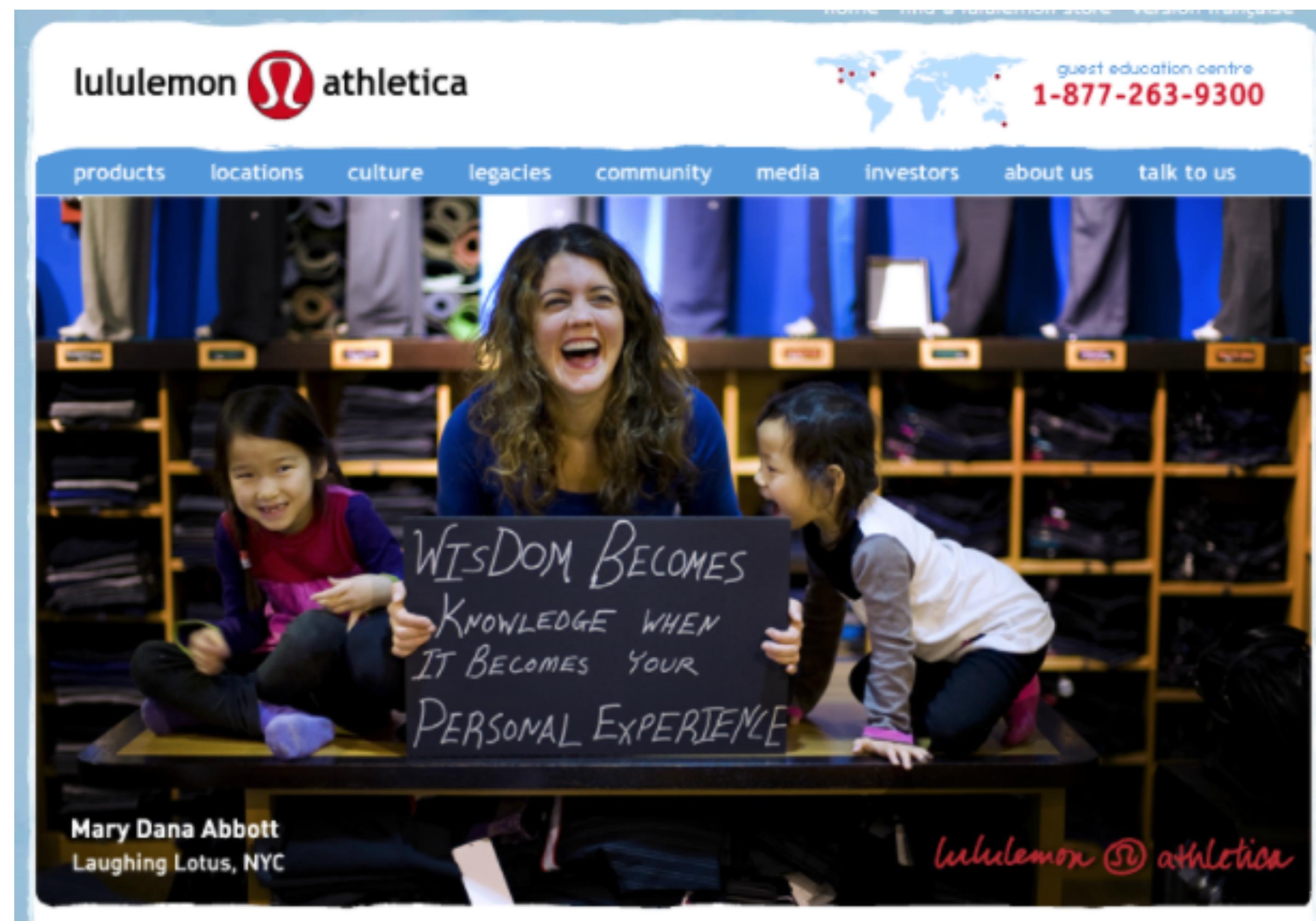
 [Digital](#)

 [Work](#)

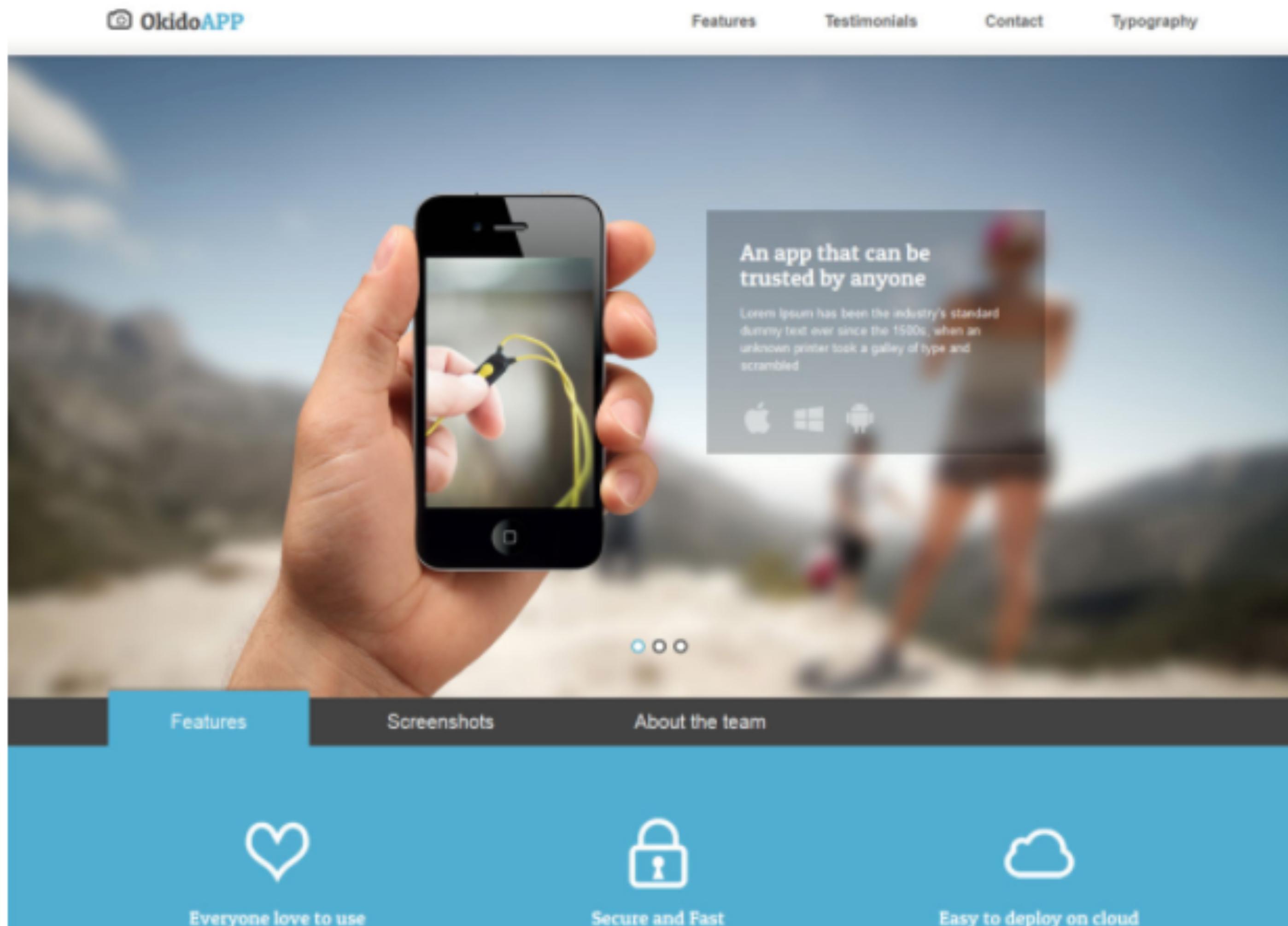
 [Worldwide](#)

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Web Design Languages Over Time

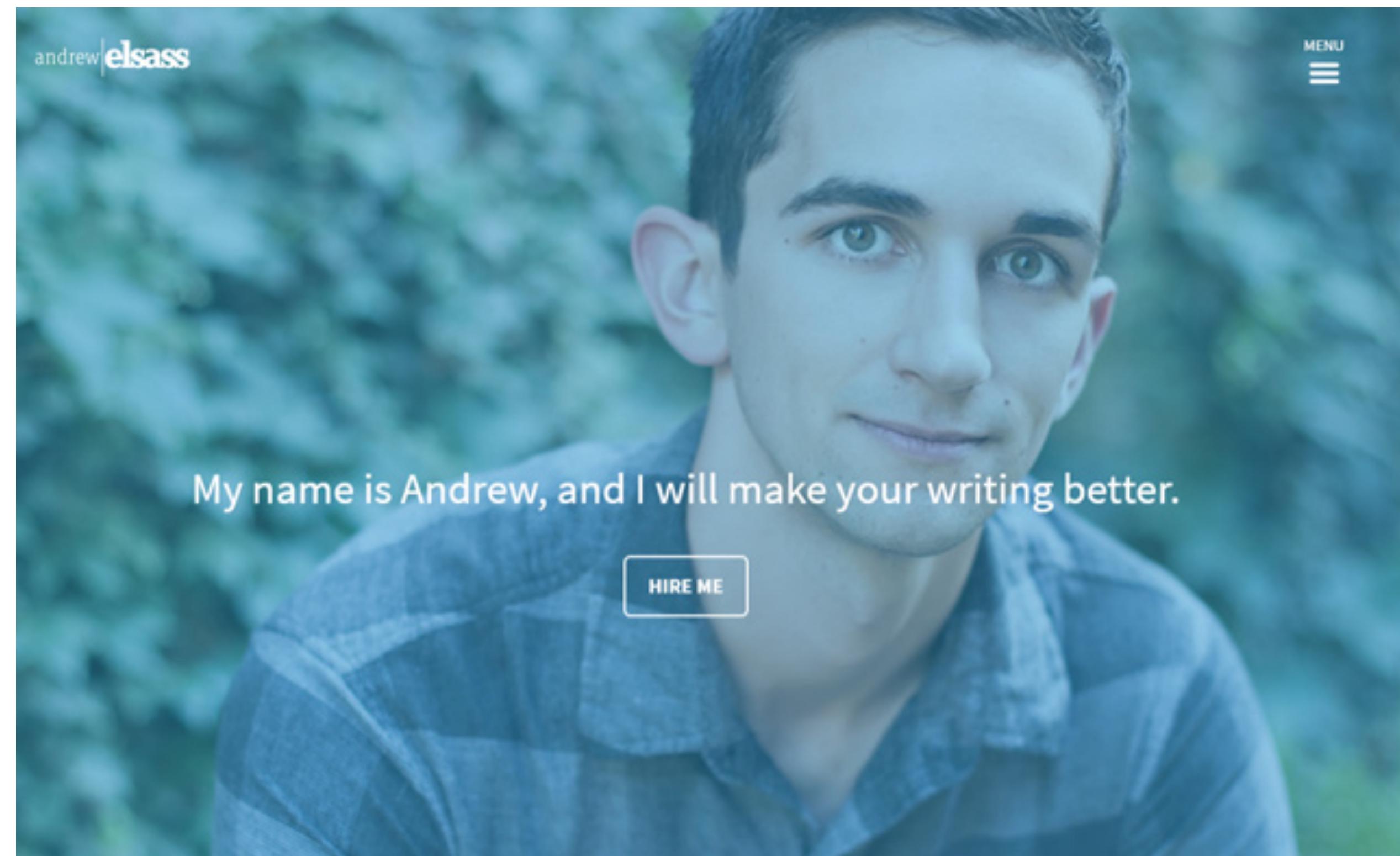


Web Design Languages Over Time



Common Visual Idioms, Circa 2016

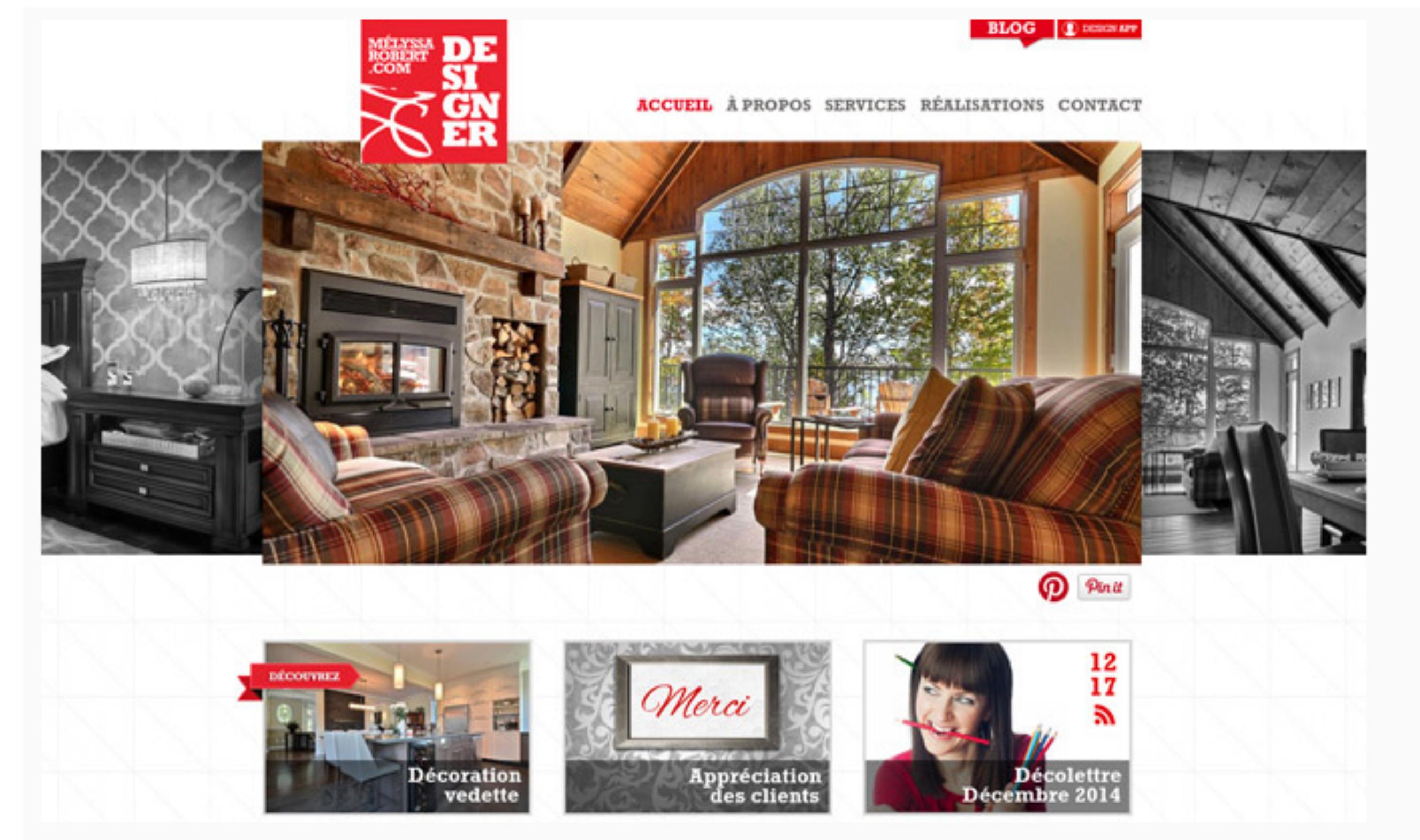
- Hero images: large attractive header image



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

Common visual idioms, circa 2016

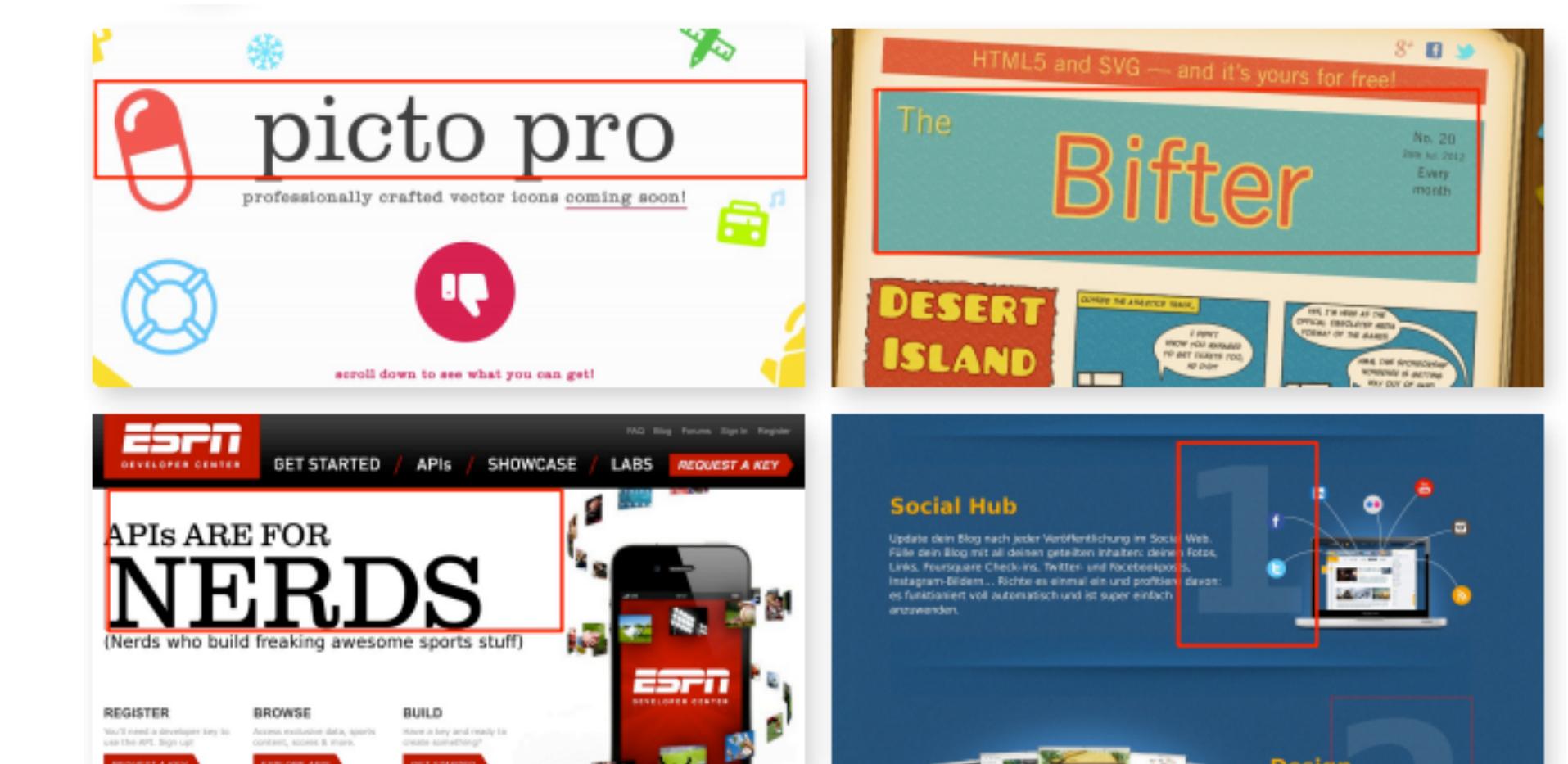
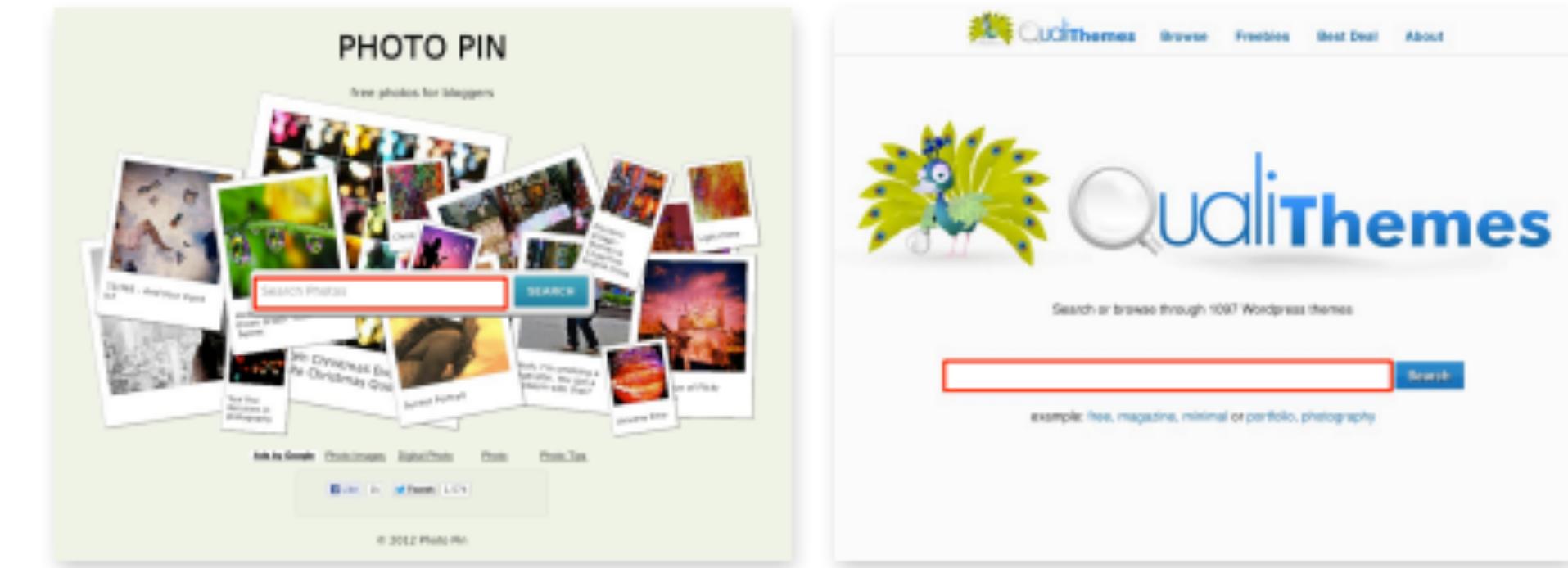
- Rotating image galleries (carousels)



<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/>