

Politecnico  
di Torino

Introduction to Web Applications

# Designing for the Web

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# Goals

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- Introduce the main concepts of **Information Architecture**
- Understand principles of Visual Design: **text, layout, and colors**
- Understand how to **structure** and **organise** web applications
- Apply widely-accepted **design guidelines**
- Design effective, **accessible**, and **usable** web interfaces

# Information Architecture (IA)

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- “*The structural design of shared information environments*”
- The combination of organisation, labelling, search, and navigation systems within web sites and applications
- A discipline focused on making information **findable** and **understandable**

# Information

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- **Data** is facts and figures
  - Relational databases: highly structured, specific answers to specific questions
- **Knowledge** is the “stuff in people’s heads”
  - Knowledge managers develop tools, processes, and incentives to encourage people to share it
- **Information** is in the middle
  - Often no single “right” answer
  - All shapes and sizes: websites, documents, software applications, images, and more
  - Metadata: terms used to describe and represent content objects (documents, people, processes, ...)

# Users, Context, and Content

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## Users

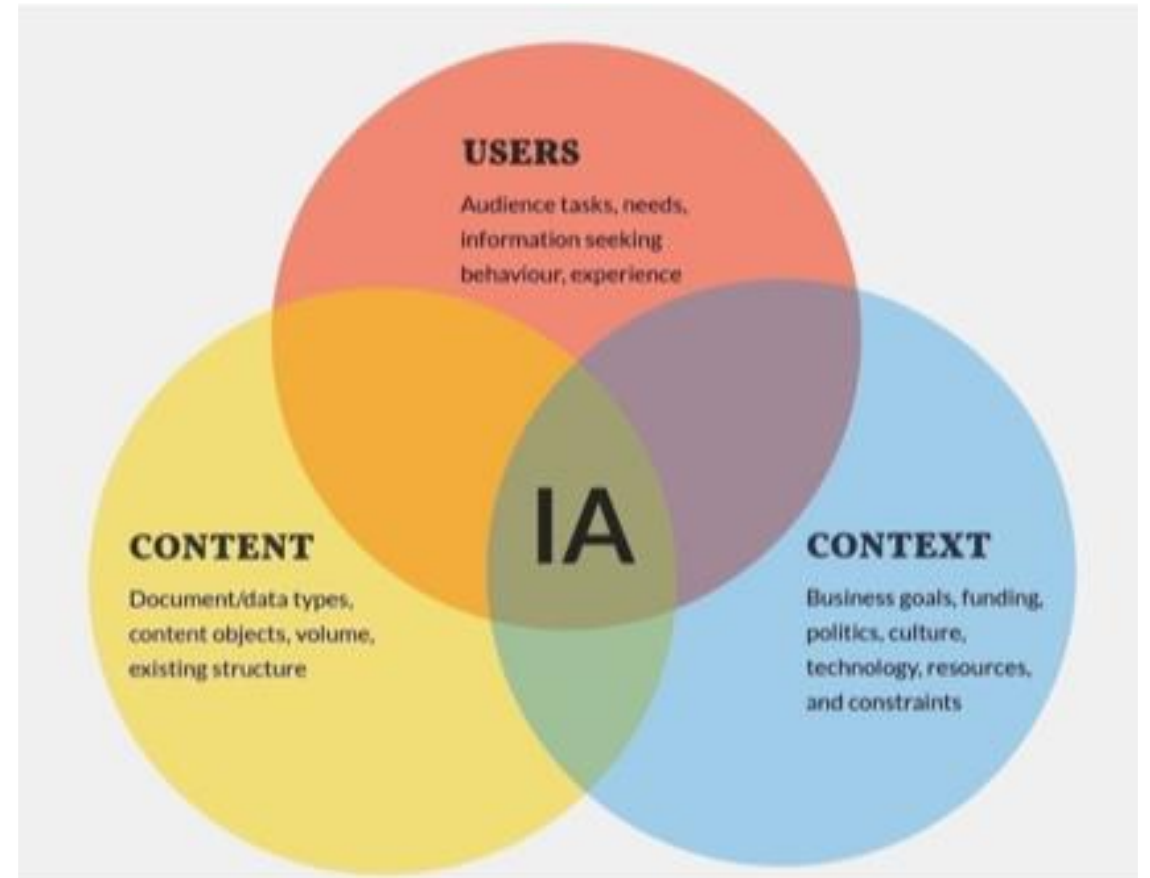
- Who is using your system? How are they using it? What information do they look for?

## Content

- Documents, links, media, ... that people need to use or find in the system

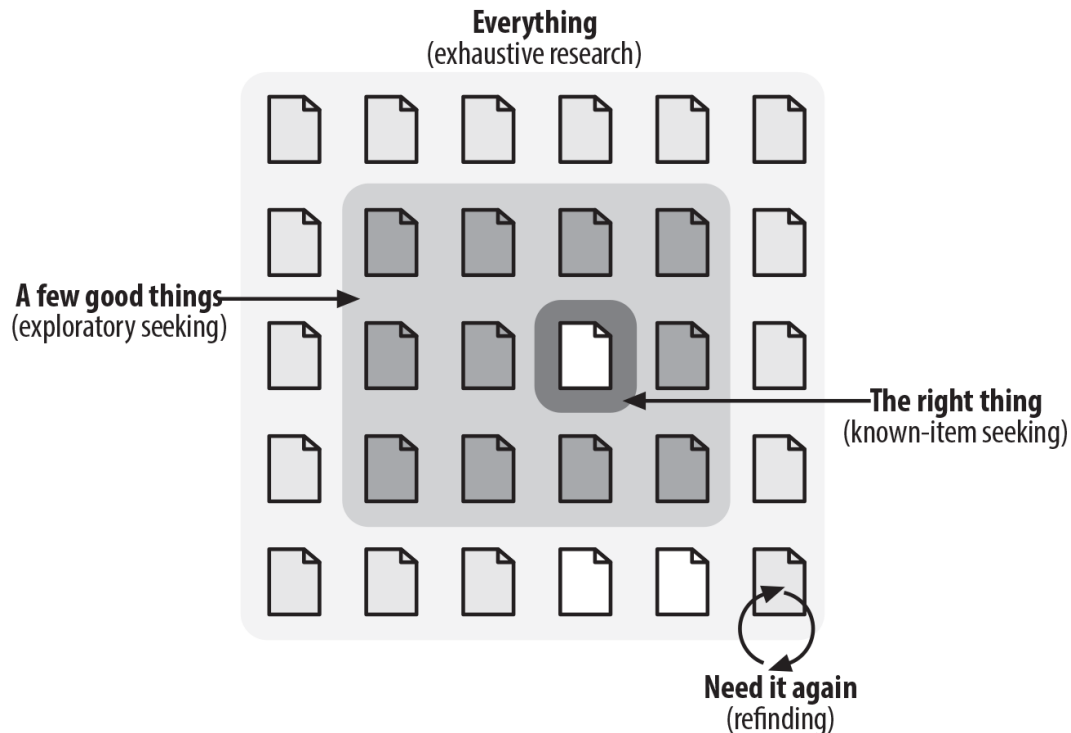
## Context

- All digital system exist within a particular business or organizational context



# Finding and Understanding

Information architecture is focused on making information **findable** and **understandable**



We only *understand* things in relationship to something else

- Example: most bank/university/... buildings are similar; their websites are similar as well



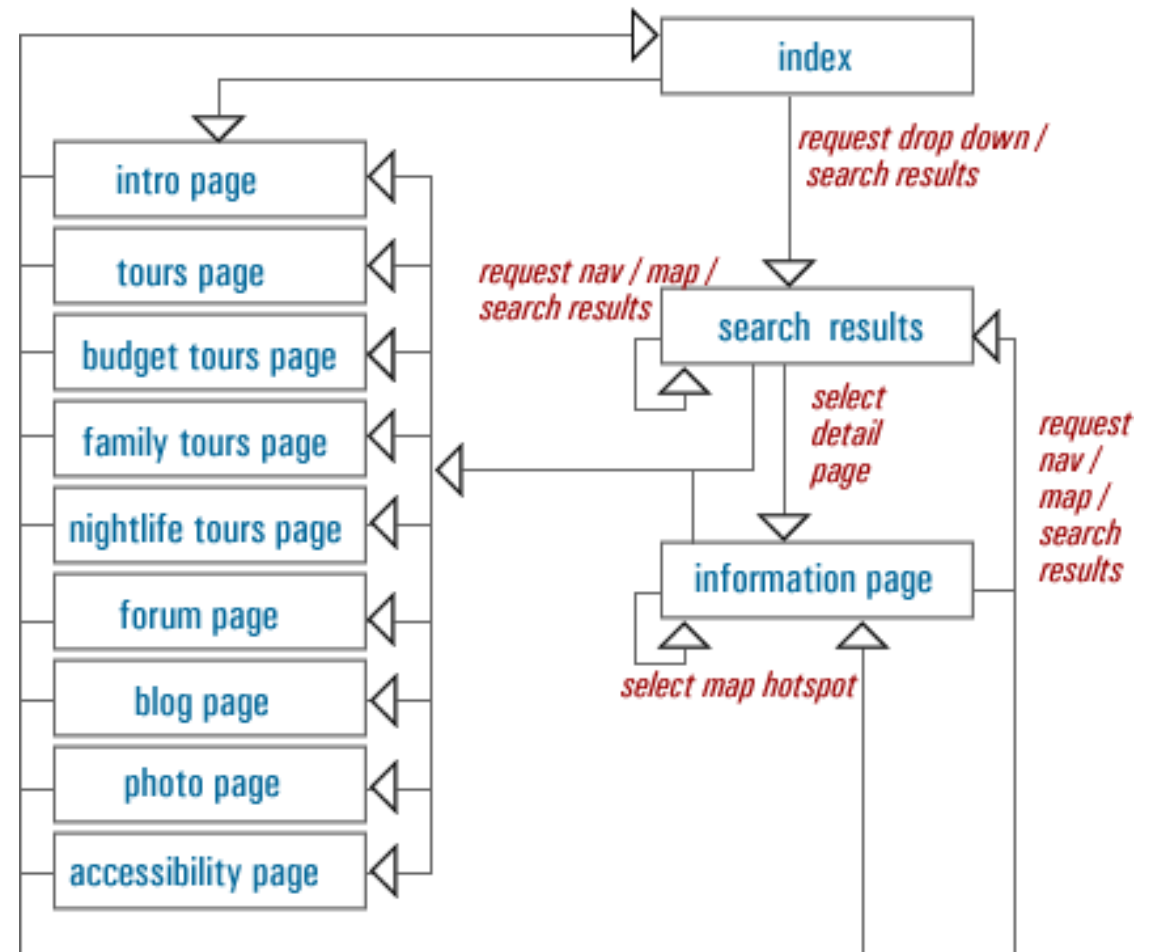
# Sitemaps

Show the **relationships** between information elements

Can be used to portray organization, navigation, and labelling systems

A sitemap is the starting point: *it defines your IA* before a single page is designed

**Levels:** top-level sections → sub-sections → individual pages



# From Sitemaps to Navigation

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- Navigation is how users experience IA: it is the IA made visible and interactive
  - A sitemap with 4 top-level sections should produce a navbar with exactly 4 items, with the same labels
- Every navigation system must answer three questions at a glance: “**Where am I? Where can I go? How do I get back?**”
  - Highlighting the *active page* answers the first; the *full nav* answers the second; *breadcrumbs* or back links answer the third
- Poor navigation is the #1 reason users abandon a site: they expect the **structure to be self-evident**
- **Nav labels** must match page titles exactly: a link labelled “Our Services” leading to a page titled “What We Do” creates doubt that erodes trust

# Main Navigation Patterns

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## Structural Patterns

*Top navbar*: best for flat structures with 5-8 top-level sections; always visible and accessible from every page without scrolling

*Sidebar*: best for deep hierarchies or dashboards with many sub-sections; allows long lists without cluttering the main content area

*Breadcrumbs*: essential for hierarchical content (shop → category → product); never sufficient as a standalone pattern, always combine with a primary nav

## Contextual Patterns

*Tabs*: for switching between peer-level views within a single page, not between pages; do not use tabs and a top navbar to mean the same level of hierarchy

*Bottom bar (mobile)*: the primary nav pattern on small screens; keep to a maximum of 5 items with icon + label for clarity

*Hamburger menu*: hides nav on mobile to save space; use only when screen space is genuinely tight, as it reduces discoverability

# Choosing the Right Pattern

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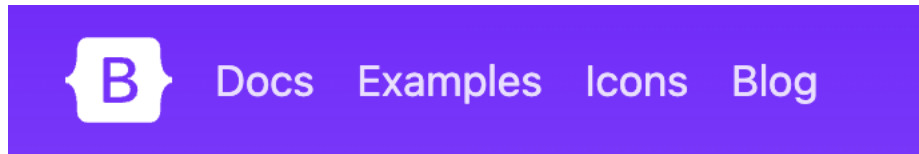
- Match the pattern to your IA depth
  - **Flat** (2 levels): top navbar alone is enough
  - **Medium** (3 levels): navbar + dropdowns, or navbar + breadcrumbs
  - **Deep** (4+ levels): sidebar with collapsible sections + breadcrumbs
- Never use tabs and a top navbar to represent the same level of hierarchy: it forces users to maintain two separate mental models of the structure simultaneously
- Always highlight the current location: use active states, bold labels, or background colours so the user never has to ask “where am I?”
- Consistency matters more than cleverness: a slightly suboptimal pattern that users can predict is better than a clever one they have to learn

# Examples: Navigation Patterns

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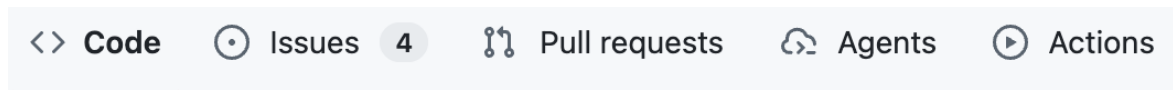
## Top Navbar

Flat structure, e.g., Bootstrap



## Tabs

Peer-level views, e.g., GitHub repo



## Sidebar

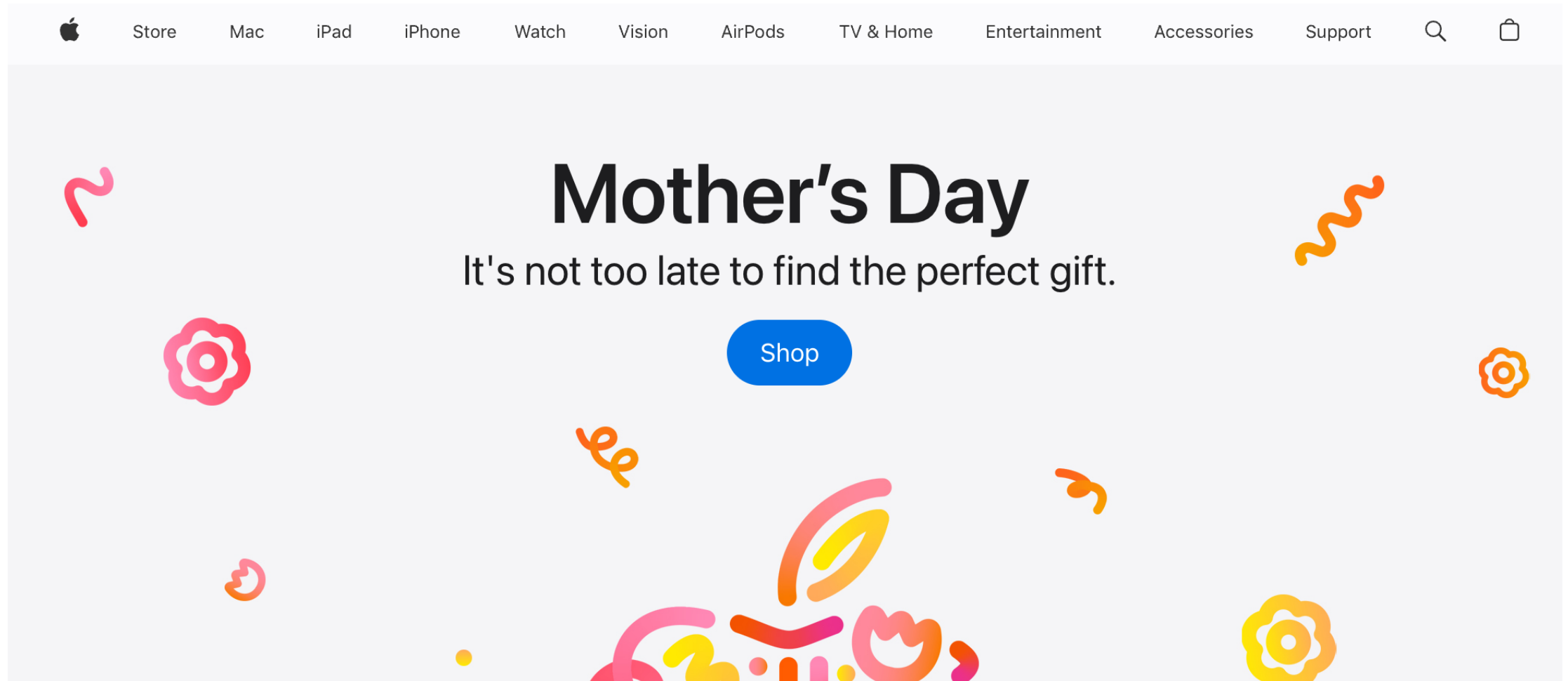
Deep hierarchy, e.g., VS Code Docs

### DOCUMENTATION

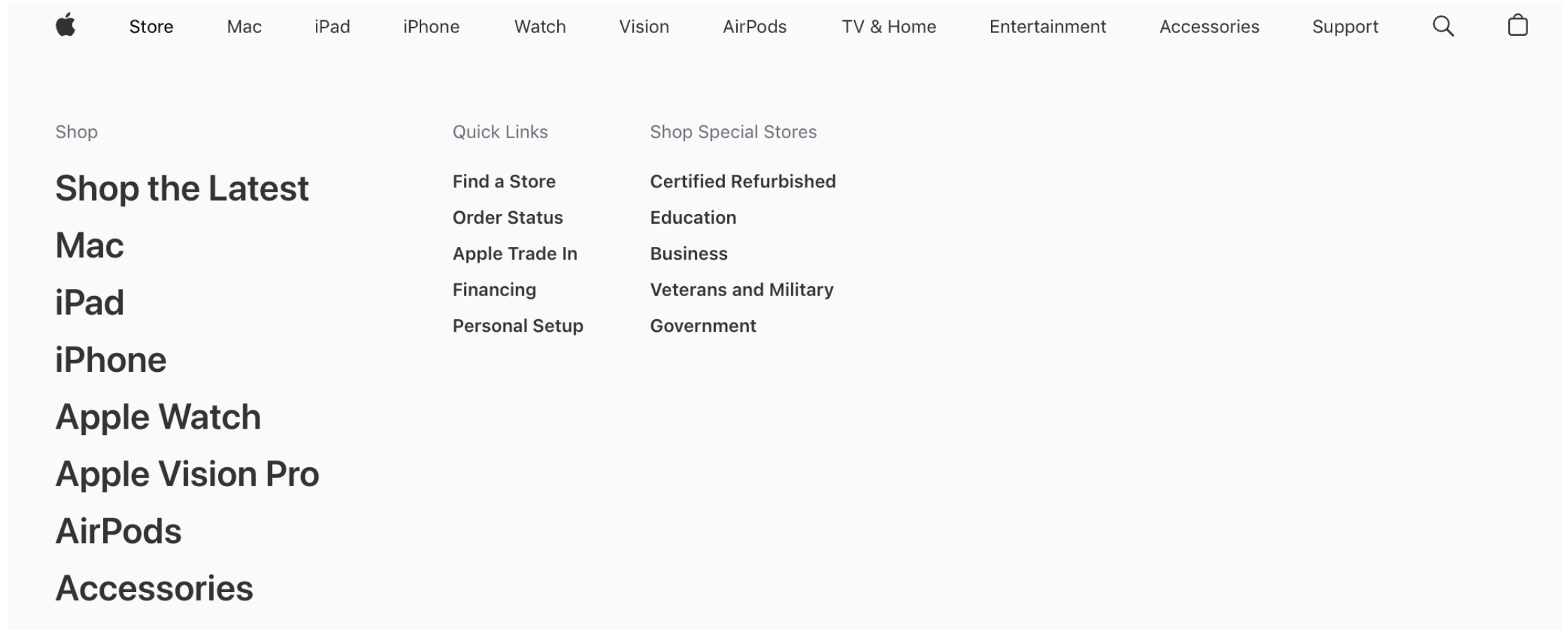
- Overview
- SETUP ▼
- GET STARTED ▼
- GITHUB COPILOT ▼
- CONFIGURE ▼
- EDIT CODE ▼
- BUILD, DEBUG, TEST ▼
- SOURCE CONTROL ▼
- TERMINAL ▼
- ENTERPRISE ▼
- LANGUAGES ▼
- NODE.JS / JAVASCRIPT ▼

# Example: Violation?

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# Example: Violation?



The image shows a screenshot of the Apple Store website's navigation menu. At the top, there is a horizontal navigation bar with the Apple logo on the left and various product categories: Store, Mac, iPad, iPhone, Watch, Vision, AirPods, TV & Home, Entertainment, Accessories, and Support. On the right side of this bar are search and shopping bag icons. Below the navigation bar, the main content area is divided into three columns. The left column, titled 'Shop', lists product categories: Mac, iPad, iPhone, Apple Watch, Apple Vision Pro, AirPods, and Accessories. The middle column, titled 'Quick Links', lists: Find a Store, Order Status, Apple Trade In, Financing, and Personal Setup. The right column, titled 'Shop Special Stores', lists: Certified Refurbished, Education, Business, Veterans and Military, and Government.

Store Mac iPad iPhone Watch Vision AirPods TV & Home Entertainment Accessories Support

Shop

**Shop the Latest**

Mac

iPad

iPhone

Apple Watch

Apple Vision Pro

AirPods

Accessories

Quick Links

Find a Store

Order Status

Apple Trade In

Financing

Personal Setup

Shop Special Stores

Certified Refurbished

Education

Business

Veterans and Military

Government



# Design Around Tasks, Not Just Information

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- Users come to your app with a **goal**, not a curiosity about your information structure
  - A user visiting a bank website wants to check their balance, they do not want to explore the bank's content model
- The right design question is “What is the user trying to accomplish?”, not “Where does this content live?”
  - IA answers the second question; **task-oriented design** answers the first
  - *Both matter!* Good IA without good task flow still produces a frustrating experience
- **Information architecture** → what is on the page and how it is organised
- **User flow** → the sequence of pages and actions the user takes to reach their goal

# The Happy Path

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- The **happy path** is the sequence of steps a user follows to complete their primary goal without errors or interruptions
  - It is the ideal scenario: the user knows what they want, finds it easily, and completes the task
- Always **design the happy path first**. Edge cases and error states come after
- Example: enrolling in a single university course
  - Search courses → view details → check prerequisites → enrol → receive confirmation
  - 5 steps, one primary action per screen, no dead ends, no ambiguous labels
- **Keep each step focused**: one primary action per page, all secondary options visually subordinate so the user always knows what to do next

# Entry Points and User Flows

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- Users rarely enter through the homepage: they arrive via search results, shared links, etc.
  - Every page must be **self-orienting**: What is this page? Where am I in the site? What can I do next?
  - A page that only makes sense if you came from the homepage is a broken page
- Each page should **make the next step obvious**
  - DON'T: offer a page that ends with no clear next action
  - DO: create a confirmation page that offers “View your booking” or “Book another”

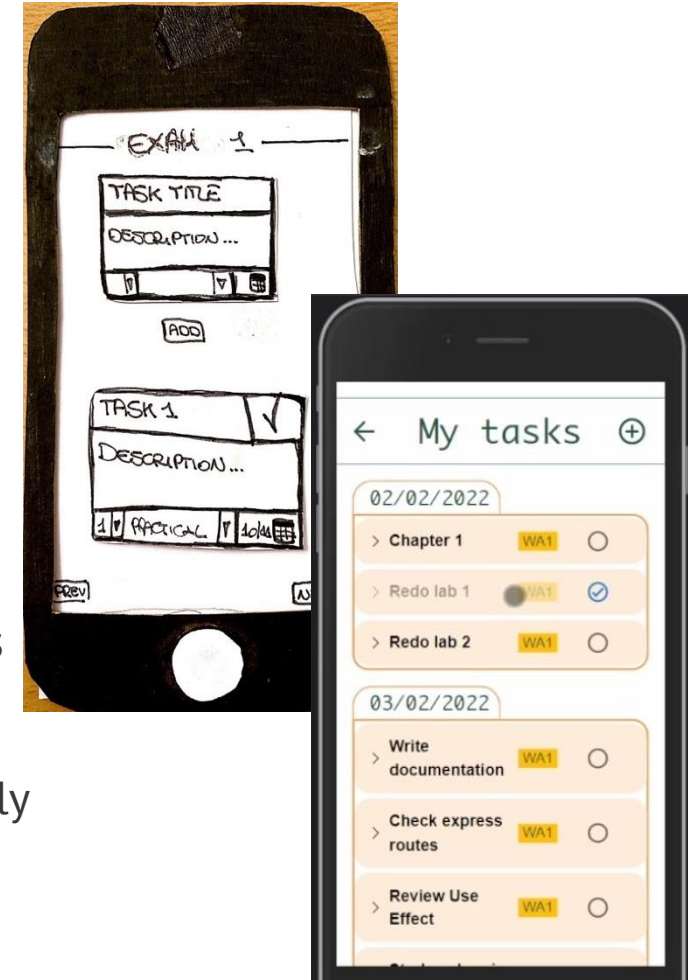
# From Design to Code (a.k.a. Don't Start in the Browser)

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- Sketch the structure first, then build the page in HTML/CSS
- Three levels of fidelity
  - **Sketching on paper**: fastest; use boxes and labels, no colour; good for layout and flow decisions
  - **Wireframing**: a greyscale digital mockup showing structure, hierarchy, and navigation without visual polish
  - **Interactive prototype**: an interactive mockup that simulates real user flows before a line of code is written
- The goal at each stage is to answer a different question:
  - **Sketch**: what goes on this page and how is it arranged?
  - **Wireframe**: does the structure work for the user's task?
  - **Interactive prototype**: does the flow work end to end?
- Discovering a layout problem in a sketch takes 2 minutes to fix; in CSS, it may take 2 hours

# Tools for Designing

- **Paper and pencil**, still the fastest tool for early exploration; no particular skills required
- **Figma**, the current industry standard; free for students and education use (<https://www.figma.com/education/>)
  - Handles wireframes and interactive prototypes in one tool
  - Components, auto-layout, and shared libraries make it practical for team projects
- **Balsamiq**; its sketchy aesthetic discourages stakeholders from commenting on fonts and colours instead of structure (<https://balsamiq.com>)
- For this course: a paper sketch or a Figma wireframe before writing HTML is strongly recommended for your project
  - If you cannot sketch it, you cannot build it cleanly



# Visual Design

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- **Guiding:** conveying structure, relative importance, relationships
- **Pacing:** drawing people into your app, orienting them, and showing where to go, providing hooks to dive deeper
- **Messaging:** expressing meaning and style, breathing life into your content
- Both at the conscious and sub-conscious levels
  
- And also...
- Making everything look aesthetically beautiful (but this is not the goal)

# 🎨 Visual Design vs. Art and Artistic Skills

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- A.k.a. “*Help, I’m not an artist!*”
- Artistic skills help a bit but are neither necessary nor sufficient
- Art does not need to *be practical*; design does
- Real design skills take years to master
- Widely-accepted guidelines are a good and easy start



# The Basic of Visual Design

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Basic visual design involves text, layout, and colors. First let's start with text. Gracefully using whitespace helps separate out logical chunks of content. Next, font size and style differences convey hierarchy. Finally, alignment is crucial for helping readers scan quickly.

# Whitespace

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Basic visual design involves text, layout, and colors. First let's start with text.

Gracefully using whitespace helps separate out logical chunks of content.

Next, font size and style differences convey hierarchy.

Finally, alignment is crucial for helping readers scan quickly.

# Hierarchy

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Basic visual design involves ...

## **Text**

Gracefully using whitespace helps separate out logical chunks of content.

Next, font size and style differences convey hierarchy.

Finally, alignment is crucial for helping readers scan quickly.

## **Layout**

## **Colors**

# Alignment

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BASIC VISUAL DESIGN

## Text

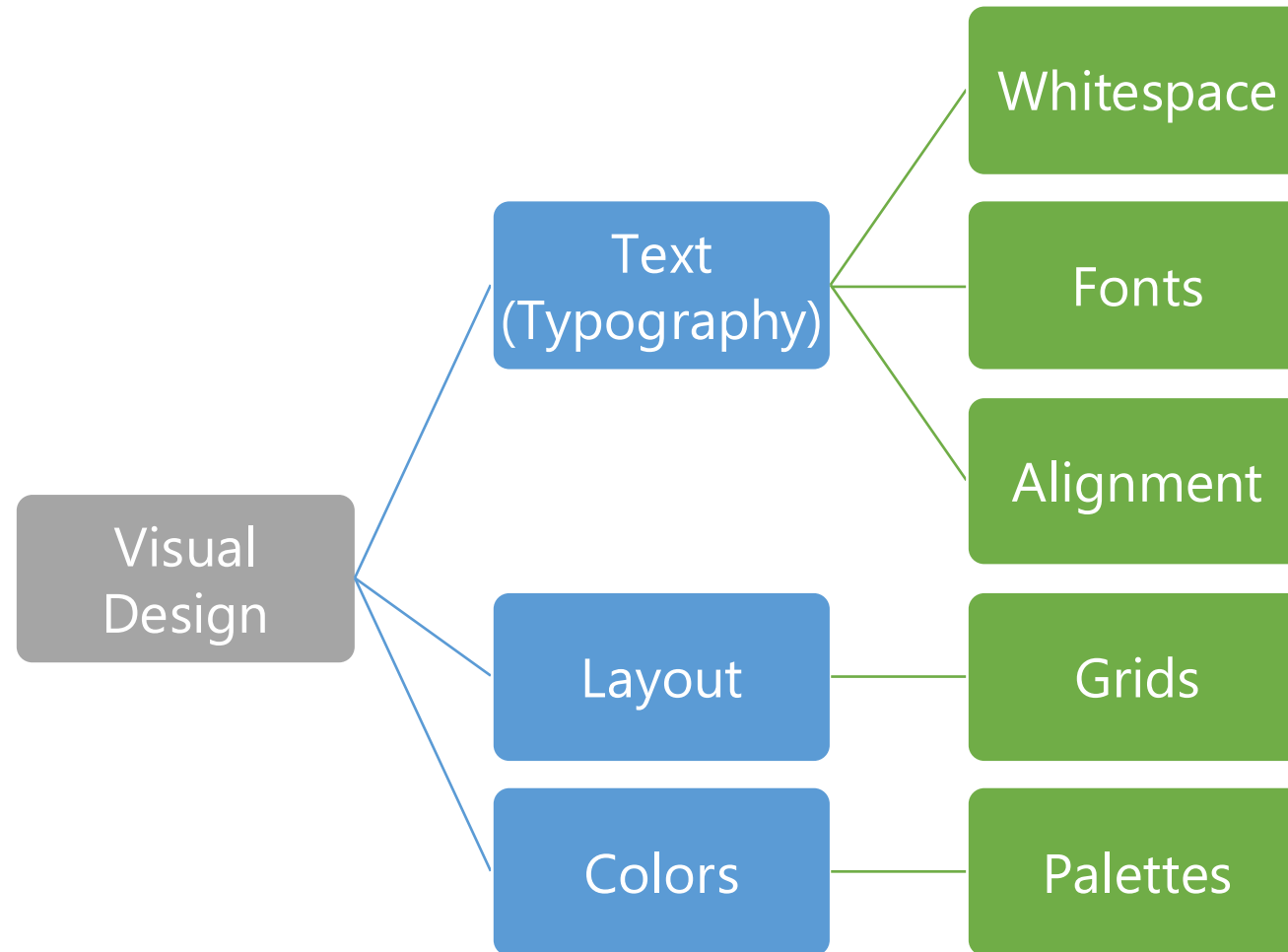
- **Whitespace**: helps separate out logical chunks of content
- **Font**: size and style differences convey hierarchy
- **Alignment**: crucial for helping readers scan quickly

## Layout

## Colors

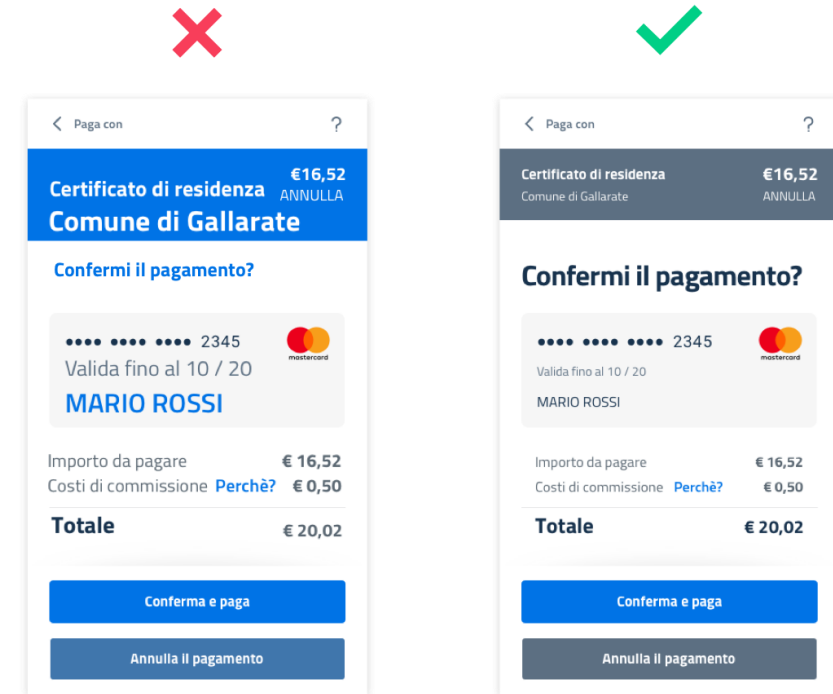
# Key Ingredients

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# Text and Typography

- Font size, color and spacing define a **hierarchy** of visibility and attention
- The visual hierarchy should match the relative importance of the information content



<https://docs.italia.it/italia/designers-italia/design-linee-guida-docs/it/stabile/doc/user-interface/il-disegno-di-un-interfaccia-e-lo-ui-kit.html>

# Typography: Choosing Typefaces

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- Limit yourself to **two typefaces**: one for headings, one for body text
- Pair a higher-contrast display font with a neutral, highly legible body font
- **Free web font sources**: Google Fonts (<https://fonts.google.com>); Bunny Fonts (<https://fonts.bunny.net>, GDPR-friendly alternative)
- Avoid novelty fonts for body text: **readability** always wins
- Legibility vs. Readability
  - *Legibility*: can you distinguish individual characters? (font choice)
  - *Readability*: is it comfortable to read long passages? (size, spacing, line length)

# Typography: Readability Rules

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- **Optimal line length:** 45-75 characters (roughly 600-700 px at 16 px body text)
  - Too short → choppy; too long → hard to find the next line
- **Generous line-height** improves readability: 1.4-1.6× for body, tighter for headings
- Use a consistent spacing scale (e.g., multiples of 4 px or 8 px)

# Text and Layout Convey Meaning

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- The way text is arranged sends signals before a user reads a single word
- **Recognisable** page structures: header, nav, main content, sidebar, footer
- **Conventions** help users orient themselves instantly, so exploit familiarity
- Deviate from convention only for *strategic reasons*
  - unexpected layouts demand more effort

# Text and Layout Convey Meaning

The image compares two real estate listing cards. The left card, marked with a red 'X', uses a list format for attributes. The right card, marked with a green checkmark, uses a more integrated layout with icons and bold text. Annotations on the right card highlight these improvements.

Attribute	Value
Building Type	Detached House
Year Of Construction	2012
Listing Price	\$750,000
Address	742 Evergreen Terrace
Bedrooms	3
Bathrooms	2
Real Estate Agent	Tiffany Heffner
Contact	(555) 555-4321

**Annotations for the right card:**

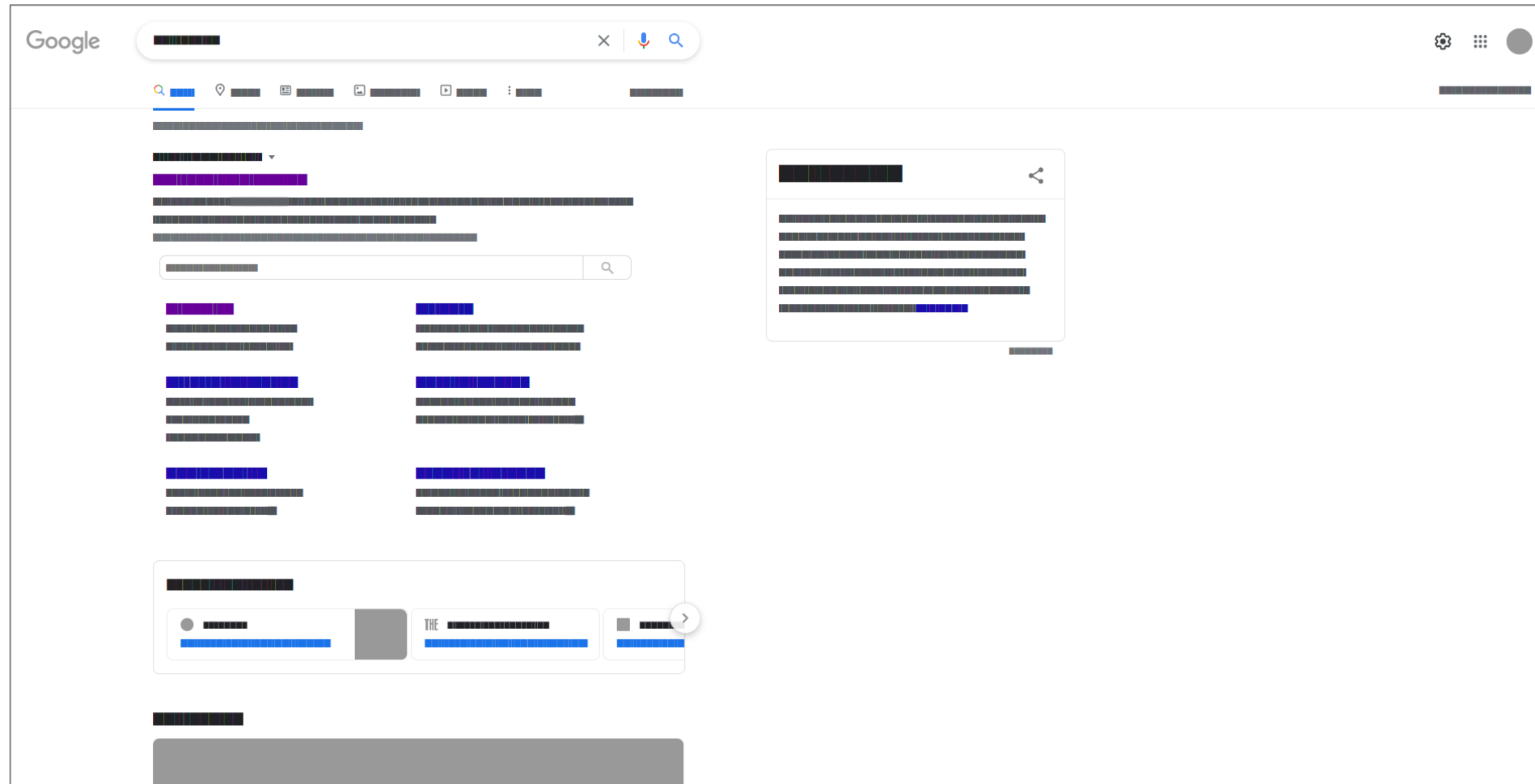
- Present data in a more useful way (pointing to 'DETACHED HOUSE · 5Y OLD')
- Emphasize the most important content (pointing to '\$750,000')
- Combine labels and values into human-readable phrases (pointing to '3 Bedrooms' and '2 Bathrooms')

www.refactoringui.com

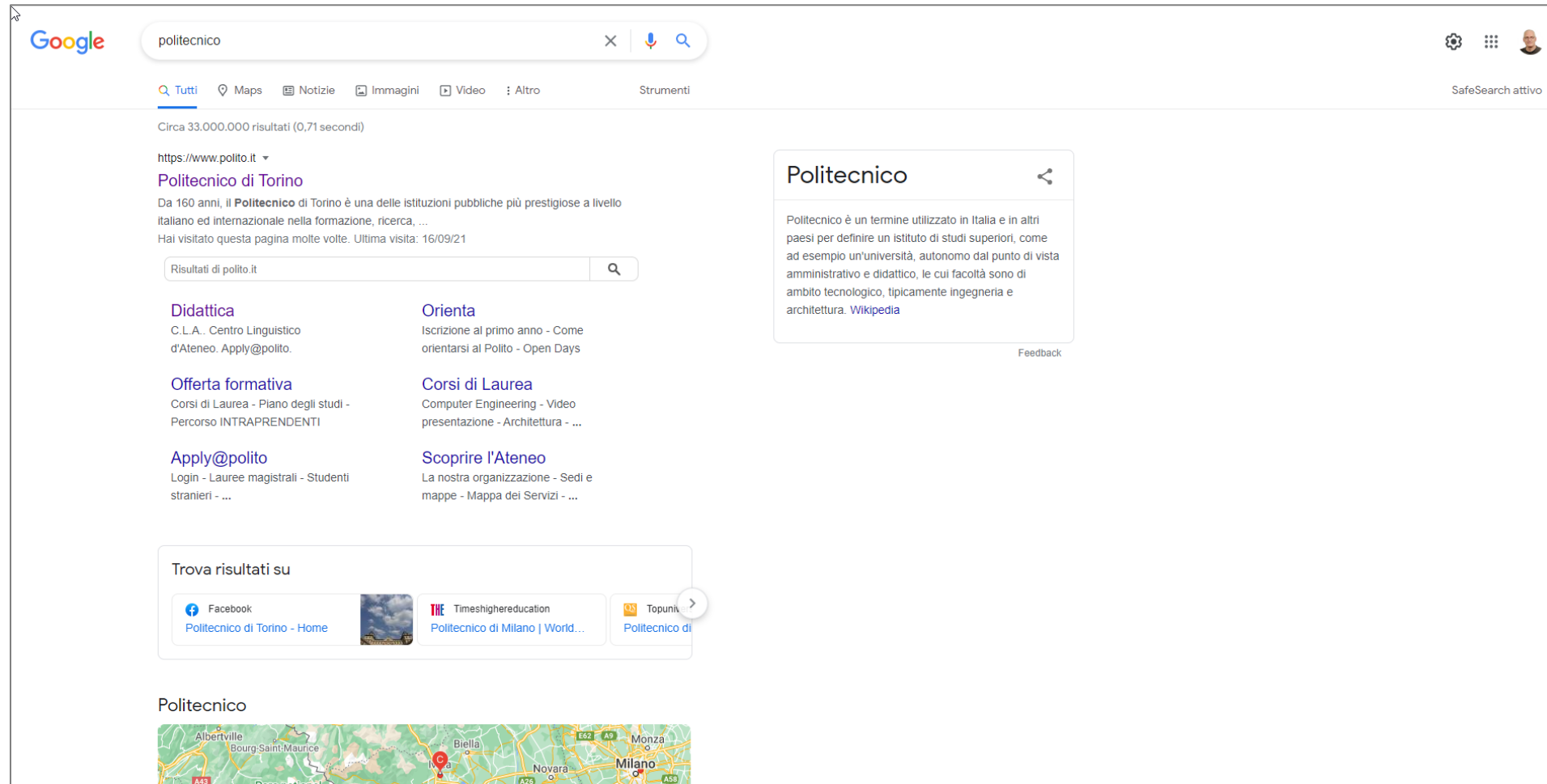
Refactoring UI

# ☒ Recognizable Page Structure

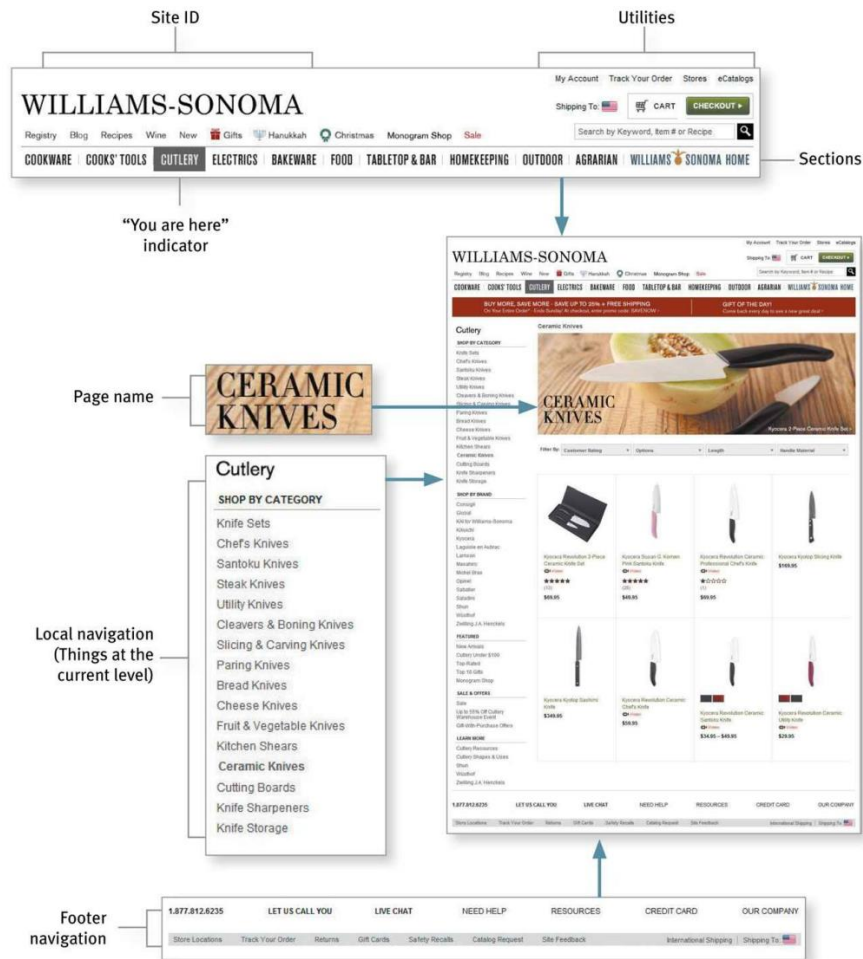
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# ☒ Recognizable Page Structure



# Conventions Help Recognizing Structure





# 'Gestalt' principles

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- Laws from 1920s' psychology: how humans typically see objects by grouping similar elements, recognizing patterns and simplifying complex images
- Designers use these to engage users via powerful -yet natural- “tricks” of perspective and best practice design standards
- *“The whole is other than the sum of the parts” - Kurt Koffka*

# Key Gestalt Principles in Web Design

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- **Proximity** – we group closer-together elements
- **Similarity** – we link elements that share color, shape, or pattern
- **Continuity** – we follow and 'flow with' lines and curves
- **Closure** – we automatically fill in gaps to perceive a complete shape
- **Common Region** – we group elements inside the same closed region
- **Figure/Ground** – foreground catches the eye first
- **Focal Point** – a standout element draws attention first

# Gestalt in Practice

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## Similarity

- consistent button styles signal 'these do the same type of thing'

## Proximity

- form labels placed close to their fields are read as belonging together

## Common Region

- card components group content through background and border

## Continuity

- horizontal nav bars exploit left-to-right reading flow

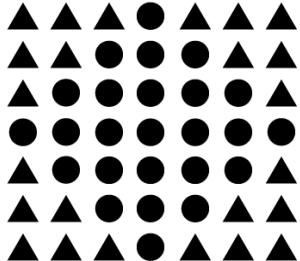
## Closure

- icon outlines with gaps still read as recognisable shapes

## Focal Point

- a single high-contrast button for the next steps stands out on a neutral page

# Example: Similarity



# Example: Proximity



Walmart logo and navigation bar. Search bar with 'All' dropdown and search icon. User account links: 'Hello, Sign In', 'My Account', and a shopping cart icon.

Save big in every department

- Electronics
- Home
- Exercise & Fitness
- Health
- Clothing & Jewelry
- Furniture
- Cold Weather Prep
- TurboTax
- H&R BLOCK
- Jackson Hewitt
- Tax Preparation
- Auto & Tires
- Office Supplies
- Home Improvement
- Outdoor Sports
- Walmart characters (Duke the dog, a baby, a child's face)
- Call of Duty

VICE logo and navigation bar: WATCH, SECTIONS, PHOTOS, MAGAZINE, TOPICS, CITY GUIDES, ELECTION 2016, OPINION, MORE. Search and social media icons.

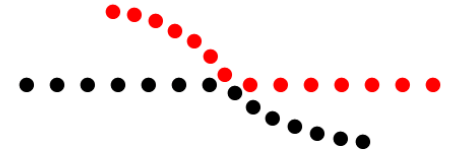
Feb 24, 2016 NEWS

- Medical Marijuana Users in Canada Can Legally Grow Their Own Weed Now**  
A Federal Court judge says former prime minister Stephen Harper's law restricting patients from growing is unconstitutional.
- The Women Who Love Ted Cruz**  
There's one place Ted Cruz doesn't finish third: in these ladies' hearts.
- How Donald Trump Won Nevada's Cliven Bundy Vote**  
If Ted Cruz can't win Bunkerville, where can he win?

Feb 24, 2016 STUFF

- MOTHERBOARD**

# Example: Continuity



## Customers Who Bought This Item Also Bought

Page 1 of 20

Five book recommendations are displayed in a row, each with a left and right navigation arrow. The books are:

- Crossing the Chasm, 3rd Edition: Marketing and Selling Disruptive Products** by Geoffrey A. Moore. 72 pages, Paperback, \$12.35. Prime.
- THE LEAN STARTUP** by ERIC RIES. 1,062 pages, Hardcover, \$16.66. Prime.
- THE INNOVATOR'S DILEMMA** by Clayton M. Christensen. 209 pages, #1 Best Seller in Industrial Management, Paperback, \$10.06. Prime.
- THE INNOVATOR'S SOLUTION: Creating and Sustaining Successful Growth** by Clayton M. Christensen. 22 pages, Hardcover, \$18.33. Prime.
- How Will You Measure Your Life?** by Clayton M. Christensen. 583 pages, Hardcover, \$15.86. Prime.



### Step 1

Choose your meals, drinks and treats from our daily rotating menu.



### Step 2

Our friendly servers organize your food for delivery - hot and ready to eat!

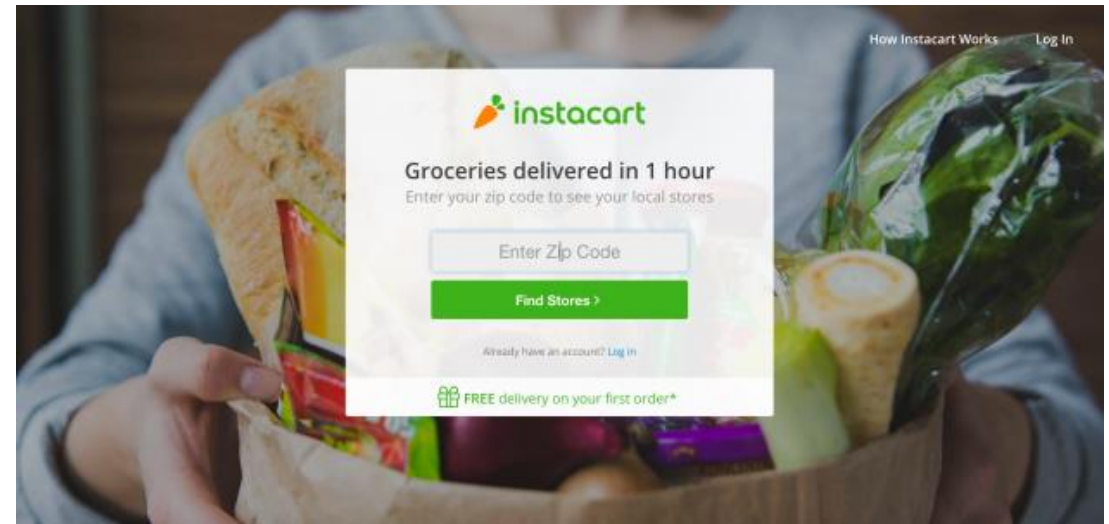
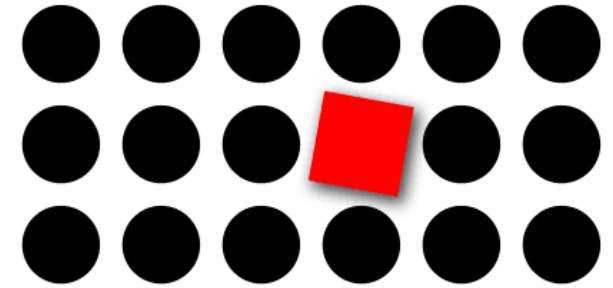


### Step 3

Your meal arrives in around 20 minutes - like a home-cooked meal without the effort!

# Example: Focal Point

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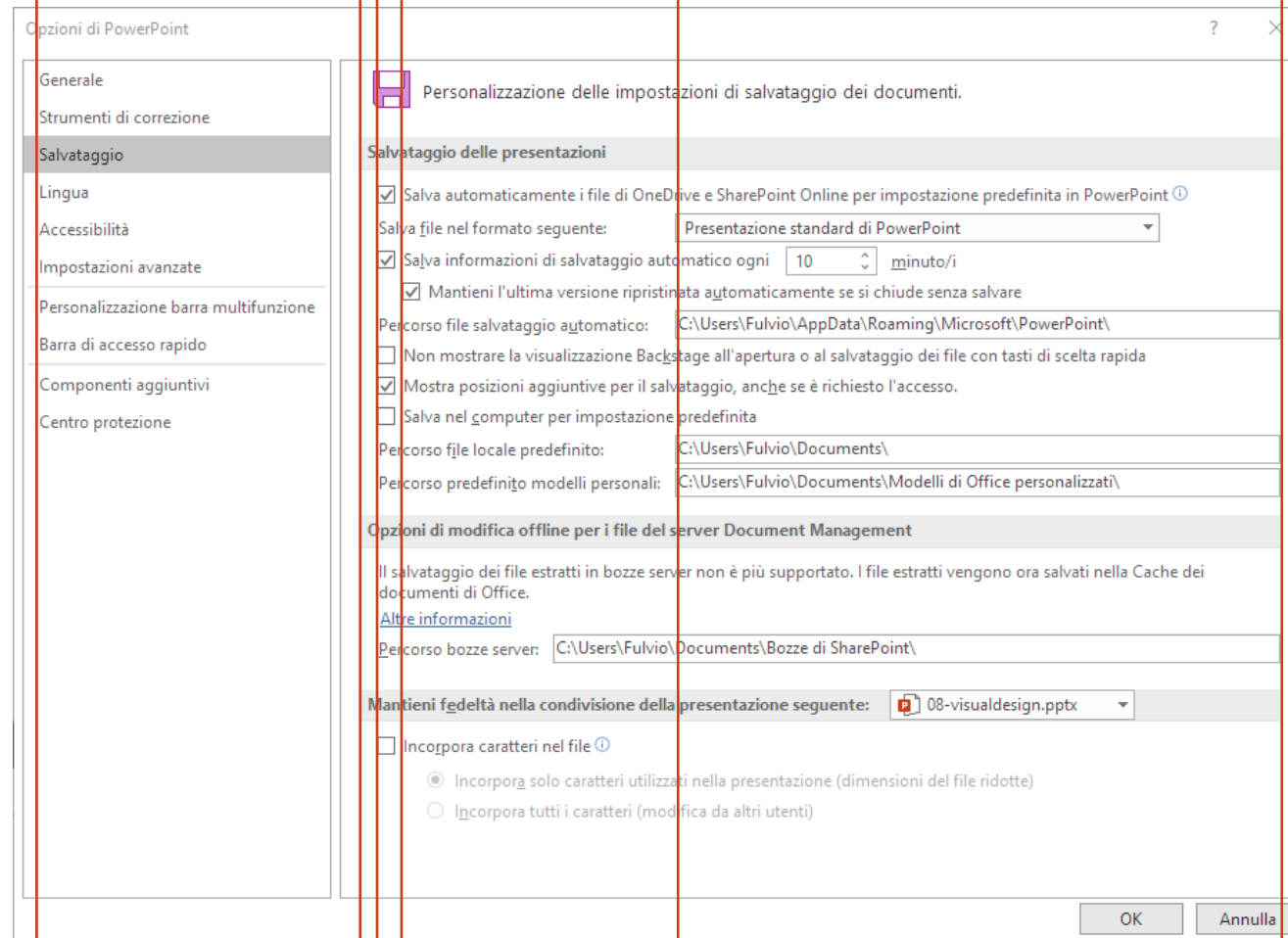


# Alignment

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- Invisible lines that run through the interface and attract element edges
- Vertical and horizontal axes both matter
- Avoid slight misalignments: patterns and deviations are detected automatically by users
  - Deviate from a pattern only for strategic reasons (e.g., to draw attention)

# Example



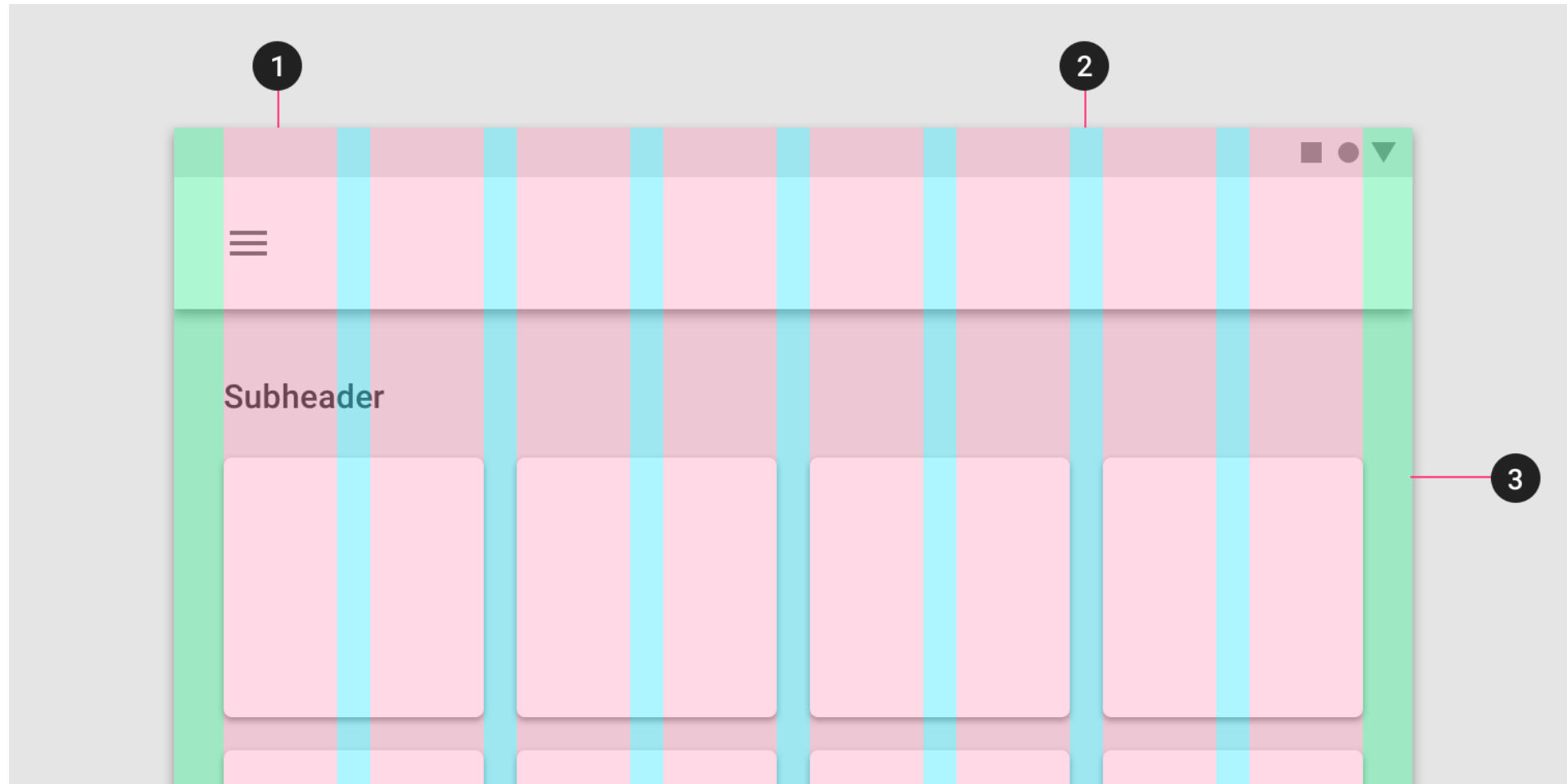


# Grid Layout Ingredients

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- **Column:** A vertical division of content
- **Row:** A horizontal division of content
- **Margins:** The area surrounding your content
- **Gutters:** The margins between columns
- **Hang-line:** A horizontal guide to align content to hang off of
- **Baseline:** The horizontal guide for an element to sit on top of
- **Rhythm:** Proportion systems that can help define the sizing frequency and spacing of each of the above elements.

# Example of Grid-based Layout



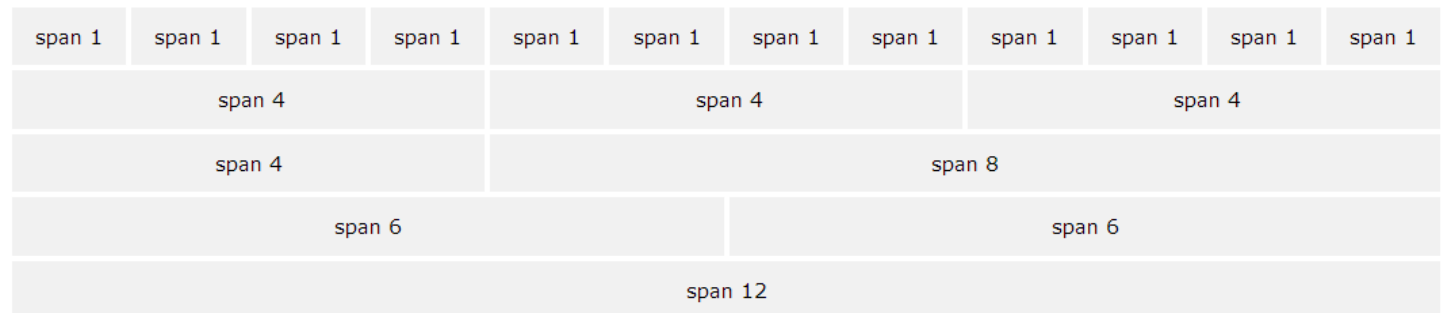
1. Columns
2. Gutters
3. Margins

<https://material.io/design/layout/responsive-layout-grid.html#columns-gutters-margins>

# Example: Bootstrap Grid

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- Always **12 columns** in total
- May choose to span a group of columns
- Each column is tagged according to the **screen size**:
  - xs (phones - <768px)
  - sm (tablets - >=768px)
  - md (small laptops - >=992px)
  - lg (laptops and desktops - >1200px)
- Responsive layout: elements reflow as the viewport shrinks



# Grid Structure

Main body:  
Mix of 2x and 3x  
columns

Alternating row  
types



Title area outside  
the grid

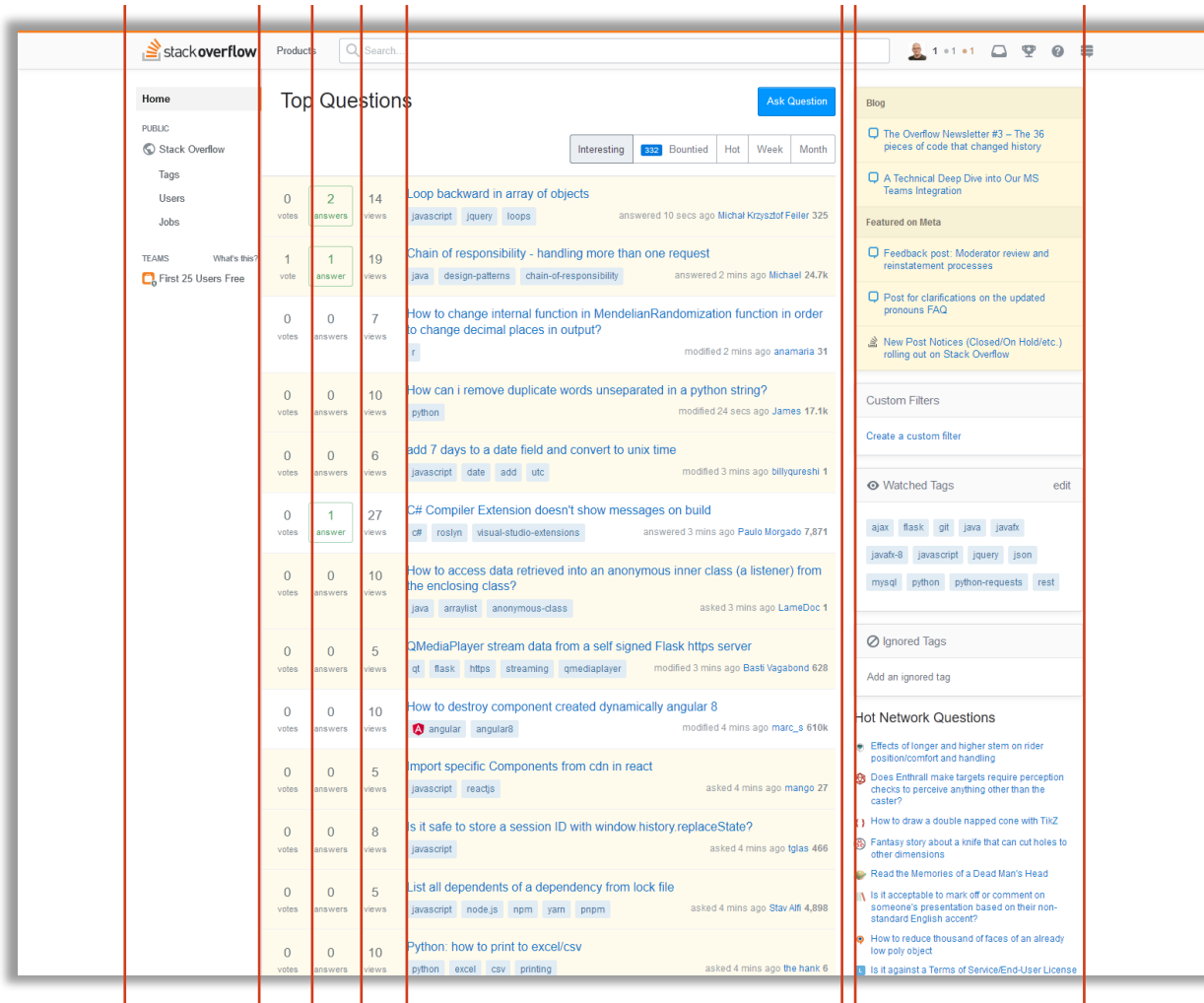
Right column for  
other types of  
articles

# Grid Structure

Main content  
(center, wide)

Navigation  
(left, smaller)

Related content  
(right, smaller)



# Example (2019)

Software									Top
<b>1° anno</b>									
Periodo	Codice	Lingua	Insegnamento	Crediti	Docente	Note	Vincoli		
1	01PDWVOV		Information systems ING-INF/05 (6)	6	M. Morisio	<input type="button" value="v"/>			
1	02GOLOV		Architetture dei sistemi di elaborazione ING-INF/05 (10)	10	P. Bernardi E. Sanchez Sanchez	<input type="button" value="v"/>			
1	02LSEOV		Computer architectures ING-INF/05 (10)	10	P. Montuschi	<input type="button" value="v"/>			
1	01SQJOV		Data Science and Database Technology ING-INF/05 (8)	8	S. Chiusano	<input type="button" value="v"/>			
1	01SQMOV		Data Science e Tecnologie per le Basi di Dati ING-INF/05 (8)	8	E. Baralis	<input type="button" value="v"/>			
1	01OTWVOV		Computer network technologies and services ING-INF/05 (6)	6	M. Baldi	<input type="button" value="v"/>			
1	02KPNVOV		Tecnologie e servizi di rete ING-INF/05 (6)	6	G. Marchetto	<input type="button" value="v"/>			
2	02JEUVOV		Formal languages and compilers ING-INF/05 (6)	6	R. Sisto	<input type="button" value="v"/>			
2	05BIDOV		Ingegneria del software ING-INF/05 (8)	8	G. Bruno	<input type="button" value="v"/>			
2	04GSPOV		Software engineering ING-INF/05 (8)	8	M. Morisio	<input type="button" value="v"/>			
2	01UDFOV		Applicazioni Web I ING-INF/05 (6)	6	E. Masala	<input type="button" value="v"/>			
2	01TXYOV		Web Applications I ING-INF/05 (6)	6	F. Corne	<input type="button" value="v"/>			
2	02GRSOV		Programmazione di sistema ING-INF/05 (10)	10	G. Cabodi	<input type="button" value="v"/>			
2	01NVHOV		System and device programming ING-INF/05 (10)	10	S. Quer	<input type="button" value="v"/>			
<b>2° anno</b>									
Periodo	Codice	Lingua	Insegnamento	Crediti	Docente	Note	Vincoli		
1			Insegnamento a scelta 1	6					
1	01TYMOV		Information systems security ING-INF/05 (6)	6		<input type="button" value="v"/>			
1	01UDUOV		Sicurezza dei sistemi informativi ING-INF/05 (6)	6		<input type="button" value="v"/>			
1	01SQNOV		Software Engineering II ING-INF/05 (6)	6		<input type="button" value="v"/>			
1,2			Crediti liberi	6					
1,2	29EBHOV		Tesi	30					
2			Insegnamento a scelta 2	6					

# Example (same page in 2020)

Software								
1° anno 2020/2021								
Periodo	Codice	SSD	Insegnamento	Lingua	Crediti	Docente	Note	Orario
1	01PDWVOV	ING-INF/05 (6)	Information systems	🇬🇧	6	M. Morisio (118 iscr.)	🟢	🕒
1	02GOLOV	ING-INF/05 (10)	Architetture dei sistemi di elaborazione	🇮🇹	10	P. Bernardi (150 iscr.) E. Sanchez Sanchez (159 iscr.)	🟢 🟢	🕒
oppure								
1	02LSEOV	ING-INF/05 (10)	Computer architectures	🇬🇧	10	P. Montuschi (207 iscr.)	🟢 🟢	🕒
1	01SQJOV	ING-INF/05 (8)	Data Science and Database Technology	🇬🇧	8	S. Chiusano (172 iscr.)	🟢 🟢	🕒
oppure								
1	01SQMOV	ING-INF/05 (8)	Data Science e Tecnologie per le Basi di Dati	🇮🇹	8	E. Baralis (254 iscr.)	🟢 🟢	🕒
1	01OTWVOV	ING-INF/05 (6)	Computer network technologies and services	🇬🇧	6	G. Marchetto (161 iscr.)	🟢 🟢	🕒
oppure								
1	02KPNOV	ING-INF/05 (6)	Tecnologie e servizi di rete	🇮🇹	6	G. Marchetto (253 iscr.)	🟢 🟢	🕒
2	02JEUOV	ING-INF/05 (6)	Formal languages and compilers	🇬🇧	6	R. Sisto (60 iscr.)	🟢 🟢	🕒
2	05BIDOV	ING-INF/05 (8)	Ingegneria del software	🇮🇹	8	G. Bruno (132 iscr.)	🟢 🟢	🕒
oppure								
2	04G5POV	ING-INF/05 (8)	Software engineering	🇬🇧	8	M. Morisio (202 iscr.)	🟢 🟢	🕒
2	01UDFOV	ING-INF/05 (6)	Applicazioni Web I	🇮🇹	6	E. Masala (91 iscr.) L. De Russis (57 iscr.)	🟢	🕒
oppure								
2	01TXYOV	ING-INF/05 (6)	Web Applications I	🇬🇧	6	F. Corno (185 iscr.)	🟢	🕒
2	02GRSOV	ING-INF/05 (10)	Programmazione di sistema	🇮🇹	10	G. Cabodi (100 iscr.) A. Savino (112 iscr.)	🟢 🟢	🕒
oppure								
2	01NYHOV	ING-INF/05 (10)	System and device programming	🇬🇧	10	S. Quer (108 iscr.)	🟢	🕒
2° anno 2021/2022								
Periodo	Codice	SSD	Insegnamento	Lingua	Crediti	Docente	Note	Orario
1			Insegnamento a scelta 1		6		🟢	
1	01TYMOV	ING-INF/05 (6)	Information systems security	🇬🇧	6		🟢	🕒
oppure								
1	01UDUOV	ING-INF/05 (6)	Sicurezza dei sistemi informativi	🇮🇹	6		🟢	🕒
1	01SQNOV	ING-INF/05 (6)	Software Engineering II	🇬🇧	6		🟢	🕒
1,2			Crediti liberi		6		🟢	
1,2	29EBHOV		Tesi		30		🟢	
2			Insegnamento a scelta 2		6		🟢	

# Grid Design Guidelines

---

- When designing a template, *start from the longest block of text*
- *Left-aligned text* is (usually) faster to skim
- *Alignment* guides the eye and reduces clutter
- Use *visual proximity and scale* to convey semantic information
- **Common patterns:** 2-column (content + sidebar), 3-column (nav + content + related), full-width hero

# Design Vocabulary CSS Properties

---

Whitespace between elements

margin, padding, gap

Line spacing for readability

line-height: 1.5 (body)

Type hierarchy

font-size (12, 14, 16, 20, 24, 32 px)

Grid columns and gutters

display: grid; grid-template-columns: repeat(12, 1fr); gap: 1.5rem

Font pairing

Two @import calls from Google Fonts; one for headings, one for body

Contrast and focus states

outline, outline-offset

- A powerful tool to improve interfaces by communicating **key information**
- Inappropriate use of colors can severely **reduce the performance** of an interactive system



The screenshot shows the LINGSCARS.com website interface, which is heavily decorated with a colorful, busy pattern. The interface includes a navigation menu, a main banner with a video player, a "Leader of the Pack" section, a "MY BEST SELLING CAR LEASING DEALS!" section with car listings, and a "1 DELIVERY TODAY" section with a list of cars.

**Navigation Menu:**

- Home
- Cars
- Vans
- Customers
- About Ling
- Fun stuff
- Free stuff
- Live staff

**CARS A-Z**

**ABARTH**

- 124 Spider
- Convertible
- 595 Convertible
- 595 Hatchback
- 695 Convertible

**ALFA ROMEO**

- Giulia Saloon
- Giulietta
- Stelvio Estate

**AUDI**

**Leader of the Pack**

"[Ling Valentine is] Britain's **BIGGEST** individual seller of new cars."

**MY BEST SELLING CAR LEASING DEALS!**

**500 IDEAS!** **NICOLE...PAPA!** **MEGA-HATCH!**

Car Model	Price	Leasing Term
Fiat 500	£127/mth	3 year cheap car leasing
Renault Clio	£152/mth	3 year cheap car leasing
Citroen C3	£157/mth	2 year cheap car leasing

**1 DELIVERY TODAY**

Car Model	Customer Name
Ford Ka+	Arthur
Renault Captur	Cath
Mercedes GLC Coupe	Bill
BMW 2 Series Convert...	Pingu
Nissan Qashqai	Arlene
Volvo XC60 Estate	Saif
Seat Leon	Ben
Skoda Kodiaq Estate	Hannah
Renault Clio	Paul
Renault Clio	Paul
Seat Arona	Steve
Seat Leon	Adam
Audi A3 Sportback	Chris

# Working with Colors

---

- Be **careful**, do not exaggerate
- Design in **grayscale** first: ensure information is conveyed by text and layout
- When adding colors, try to conserve the **same luminance** of the grayscale design
- Assign **meaning** to color and use it consistently throughout the application
- Use a limited, consistent **palette** with slight tonal variations

# Example

The screenshot shows the Stack Overflow homepage with the following elements:

- Header:** Stack Overflow logo, search bar, and user profile.
- Left Sidebar:** Navigation menu including Home, PUBLIC (Stack Overflow), Tags, Users, Jobs, TEAMS (What's this?, First 25 Users Free).
- Main Content:** "Top Questions" section with a filter bar (Interesting, Bountied, Hot, Week, Month). A list of questions with their respective vote counts, answer counts, view counts, tags, and timestamps. For example, the top question is "Loop backward in array of objects" with 2 answers and 14 views.
- Right Sidebar:** "Blog" section with a list of articles, "Featured on Meta" section with a list of posts, "Custom Filters" section, "Watched Tags" section with a list of tags (ajax, flask, git, java, java8, etc.), "Ignored Tags" section, and "Hot Network Questions" section with a list of trending questions.

This screenshot shows a different view of the Stack Overflow homepage, with the following elements:

- Header:** Stack Overflow logo, search bar, and user profile.
- Left Sidebar:** Navigation menu including Home, PUBLIC (Stack Overflow), Tags, Users, Jobs, TEAMS (What's this?, First 25 Users Free).
- Main Content:** "Top Questions" section with a filter bar (Interesting, Bountied, Hot, Week, Month). A list of questions with their respective vote counts, answer counts, view counts, tags, and timestamps. For example, the top question is "Loop backward in array of objects" with 2 answers and 14 views.
- Right Sidebar:** "Blog" section with a list of articles, "Featured on Meta" section with a list of posts, "Custom Filters" section, "Watched Tags" section with a list of tags (ajax, flask, git, java, java8, etc.), "Ignored Tags" section, and "Hot Network Questions" section with a list of trending questions.

# Example

ITA | ENG | Login | argomenti o persone

POLITECNICO DI TORINO

SCOPRIRE L'ATENEO | DIDATTICA E STUDENTI | IL MONDO DELLA RICERCA | INNOVAZIONE PER LE IMPRESE | CAMPUS INTERNAZIONALE

## festival della TECNOLOGIA

TORINO, 7-10 NOV 2019

*Tecnologia è Umanità*

È online il programma del Festival della Tecnologia

**EVENTI** Tutti gli eventi

<b>Dal 14.06</b>	<b>Walking Beyond: camminate urbane attraverso la città contemporanea</b> <small>Giugno - Dicembre 2019</small>	<b>Dal 23.10</b>	<b>The Polar oceans and global climate change</b> <small>23 October - 18 November 2019</small>
<b>Dal 04.11</b>	<b>Network dynamics in the social, economic and financial sciences</b> <small>4-8 November 2019</small>	<b>Dal 05.11</b>	<b>OptArch2019</b> <small>5 - 7 November 2019</small>

**AVVISI E SCADENZE** Tutti gli avvisi

<small>10 settembre 2019</small> <b>Comitato Leonardo: nuovi bandi per i Premi di Laurea</b>	<small>Scadenza presentazione abstract 15 novembre 2019</small> <b>A4CH - Artificial Intelligence in geomatics for cultural heritage</b>
<small>Scadenza Call for participation: 15 novembre 2019</small> <b>Progetti resilienti di natura in città in Francia e in Italia</b>	<small>Deadline online registration: 18 November 2019</small> <b>Wireless charging of vehicles (WCV2019)</b>

**ACCESSO RAPIDO**

**Apply@PoliTo**  
iscrizioni online

- Orientamento
- Corsi di studio
- Orario delle lezioni
- Tasse e riduzioni
- Dottorato di ricerca
- Dipartimenti
- Centri interdipartimentali
- Per le imprese
- Servizi web Amministrazione
- Sedi e mappe
- Concorsi e selezioni
- PoliToComunica
- Rassegna stampa
- Alumni

ITA | ENG | Login | argomenti o persone

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**ACCESSO RAPIDO**

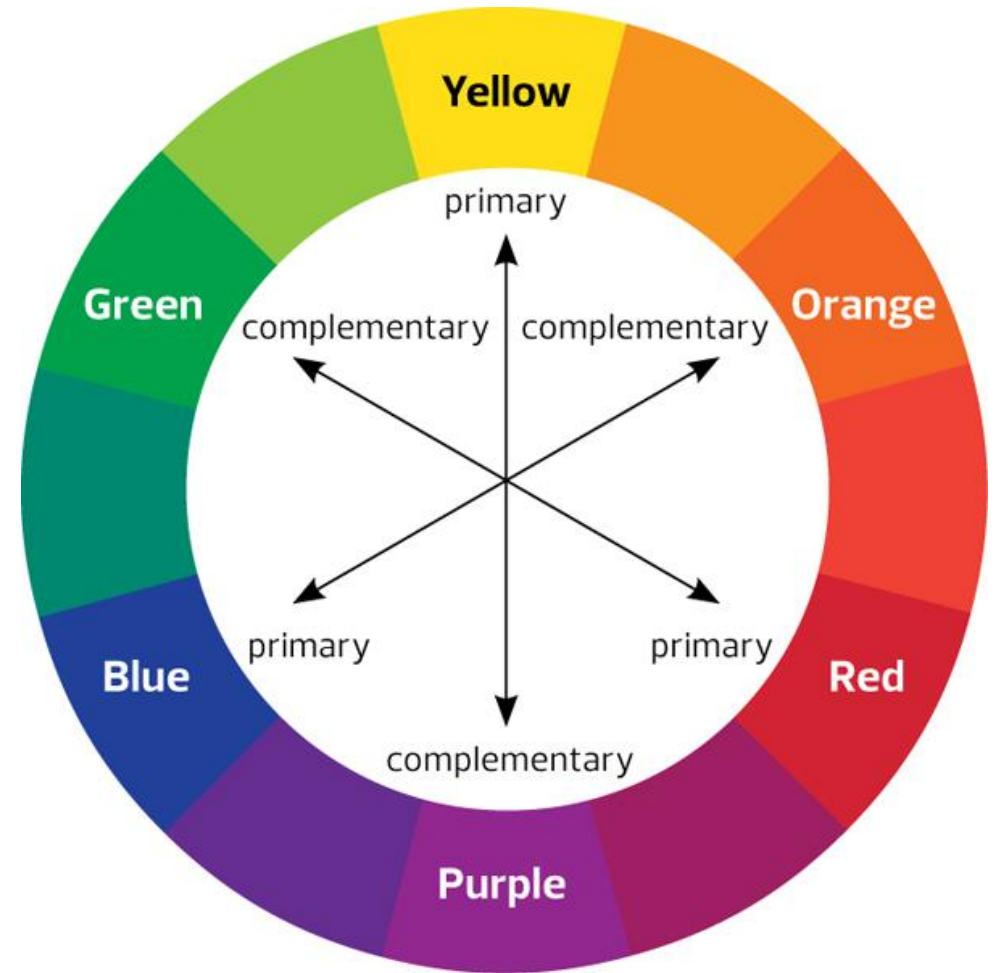
**Apply@PoliTo**  
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- Orientamento
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- Dipartimenti
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- Per le imprese
- Servizi web Amministrazione
- Sedi e mappe
- Concorsi e selezioni
- PoliToComunica
- Rassegna stampa
- Alumni

# The Color Wheel

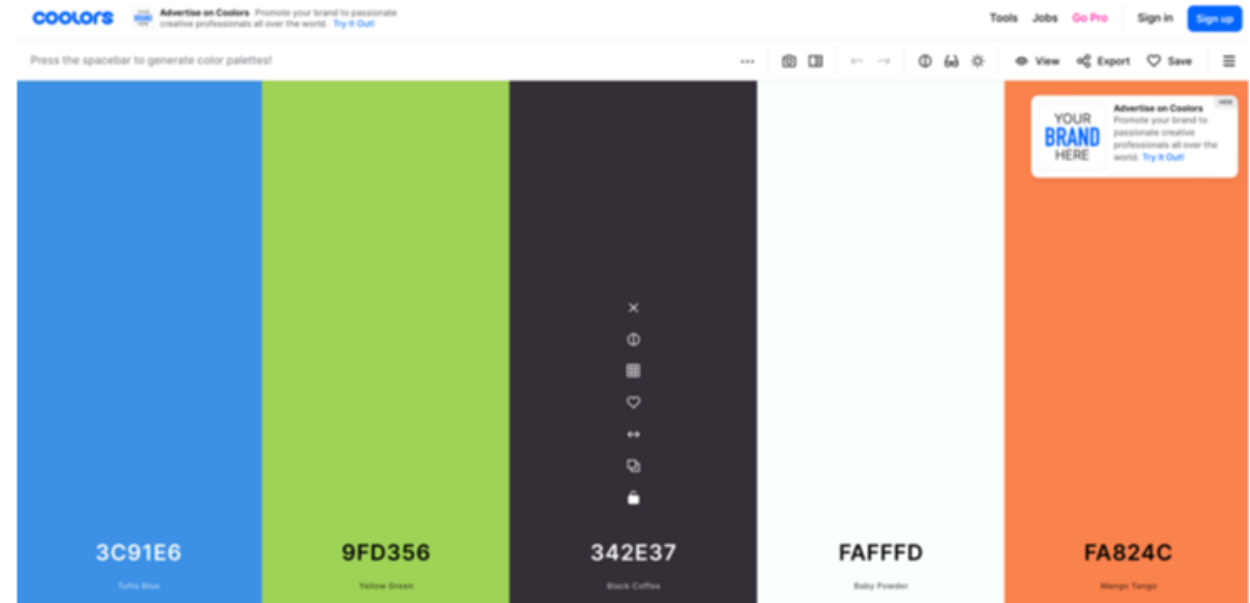
---

- A.k.a. the Hue Circle
- Pick non-adjacent colors
- Opponent colors go well together
- Complementary colors
  
- Read more at <https://www.canva.com/colors/color-wheel/>



# Color Palettes

- Start from a primary brand colour, then derive neutrals and an accent
- Use tools: Colors (<https://colors.co>), Material Design color system, ...
- Tints (lighter) and shades (darker) of a single hue create harmony
- **Limit** yourself: 1 primary + 1 accent + neutrals (black, white, greys) is usually enough
- Never rely on colour alone to convey information: always add a text or icon cue



# Palettes – PoliTo

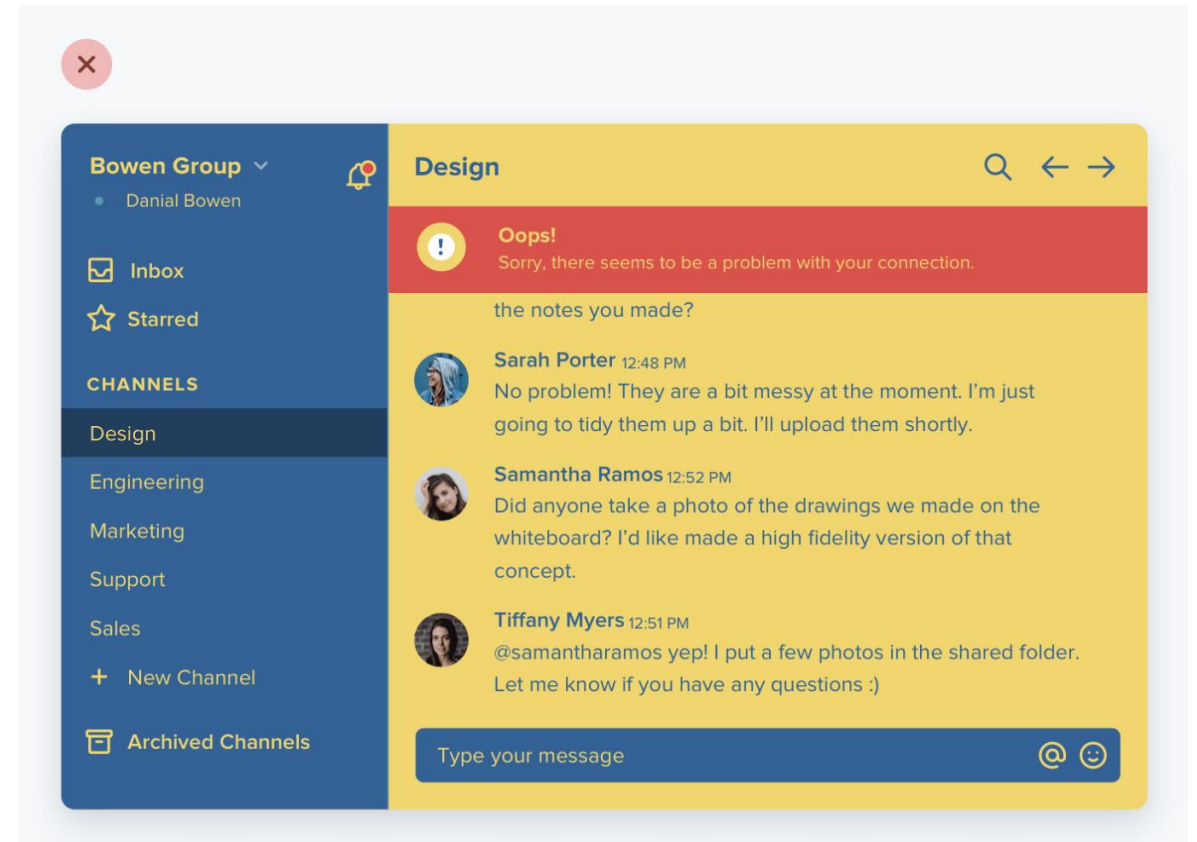
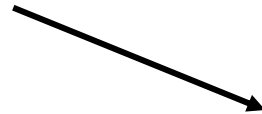
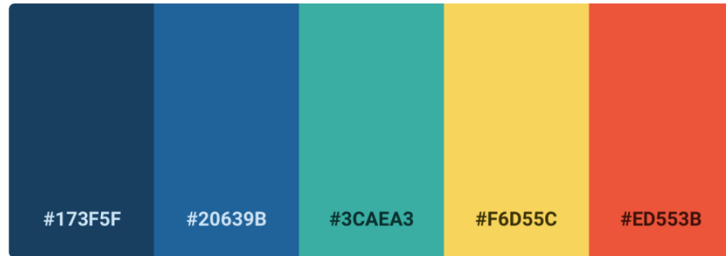
---

## GERARCHIA COLORI

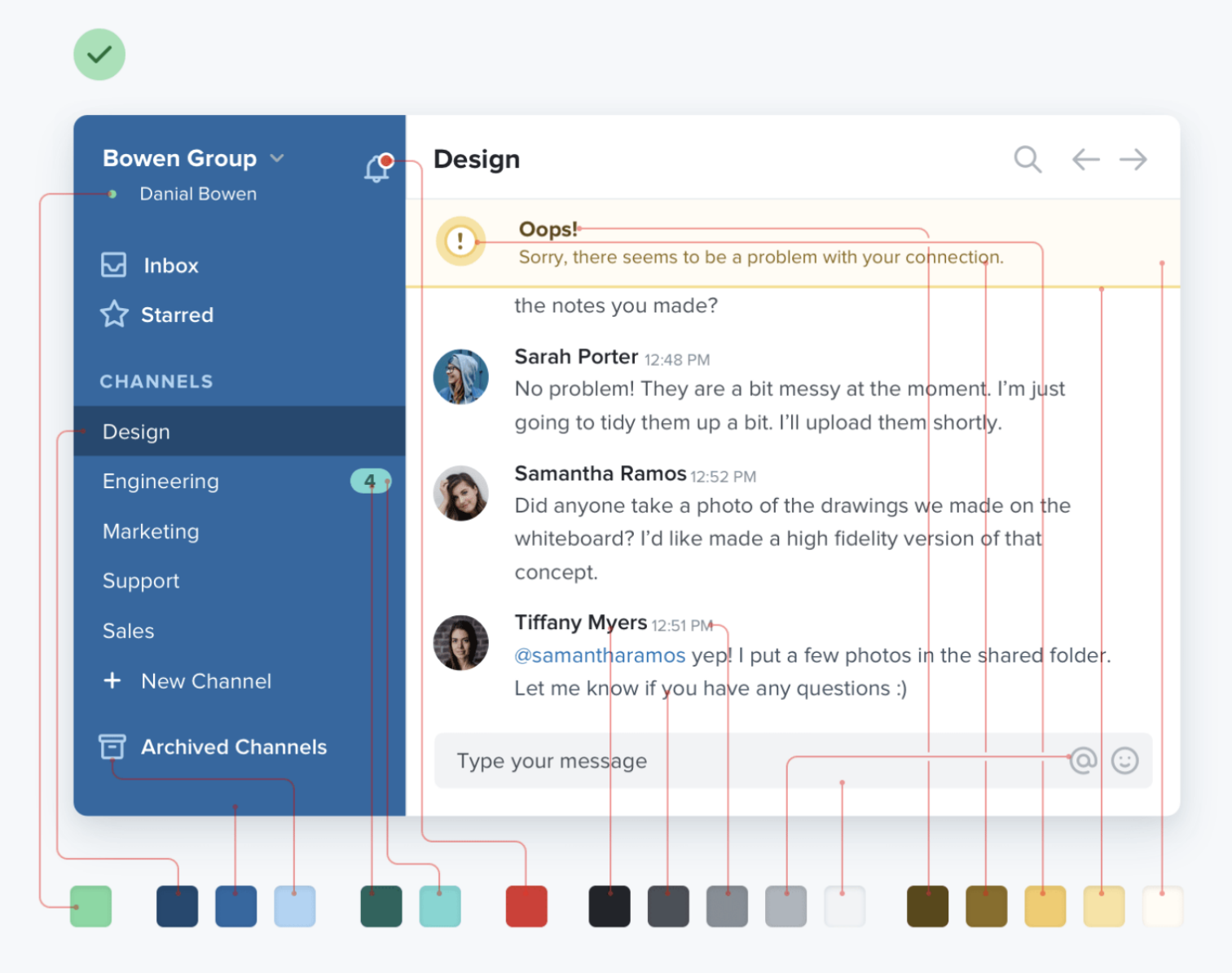


<https://www.polito.it/ateneo/chi-siamo/immagine-coordinata-e-marchio>

# Using Palettes



# Using Palettes

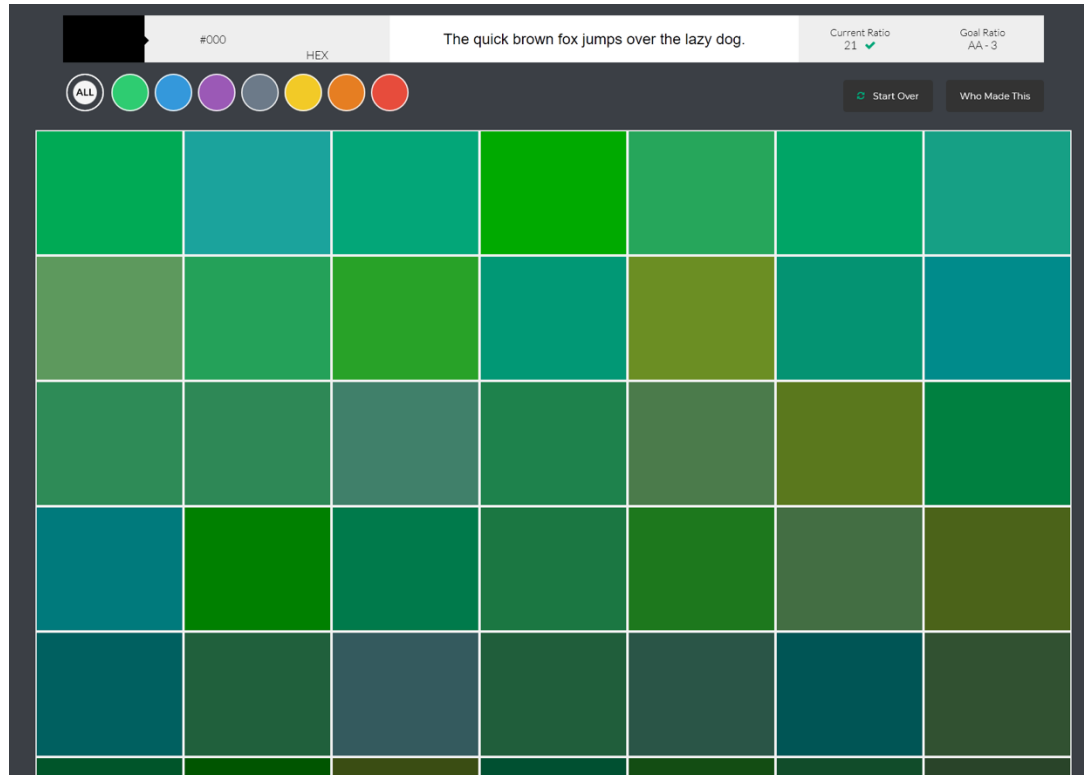


# Color Contrast

---

- Text must have sufficient **contrast** against its background to be readable
- *Minimum contrast ratios* according to the Web Content Accessibility Guidelines (WCAG standard):
  - 4.5:1 for normal text
  - 3:1 for large text (18 px+ regular, or bold 14 px+)
- Tools to verify: colorsafe.co, browser DevTools, ...
- Never use colour as the *only* way to signal information (e.g., “errors shown in red”)

# Color Contrast



<http://colorsafe.co/>

Default type color On light			Default type color On dark		
Primary	#000000	1a	Primary	#FFFFFF	1a
Secondary	#000000	0.54a	Secondary	#FFFFFF	0.54a
Disabled	#000000	0.26a	Disabled	#FFFFFF	0.26a
Link	#3367D6	1a	Link	#7BAAF7	1a
Positive	#0B8043	1a	Positive	#57BB8A	1a
Negative	#C53929	1a	Negative	#E67C73	1a
Warning	#EA6100	1a	Warning	#F7CB4D	1a

Google Chrome Palette

# Example

- Colors needing an explanation legend
- Time intervals are shaded with 2 different colors
  - “why is the first hour filled with a different color?”
- No indication of the “fill level”

**Turni disponibili - Aule Studio - Sala studio al Secondo Piano di C.so Castelfidardo 39**

Legenda turni prenotazione

Disponibile   Passato   Non prenotabile   Prenotazioni non attive   Turno al quale sei prenotato

Tutti gli orari sono da intendersi espressi secondo il fuso orario italiano

A partire da giorno 15 Luglio 2020, è consentito l'uso della seguente Sala Studio della Sede Centrale:  
- Sala studio al Secondo Piano di C.so Castelfidardo 39, codice locale TO\_CIT11\_XP02\_001

Le sale studio sono aperte dalle ore 9.00 alle ore 18.00 dal lunedì al venerdì. L'accesso sarà consentito su due turnazioni orarie, dalle ore 9.00 alle 13.00 e dalle ore 14.00 alle ore 18.00

<< Oggi >> 21 Set 2020 - 27 Set 2020   1 giorno   3 giorni   Settimana lavorativa   **Settimana**

	Lunedì 21 Set 2020	Martedì 22 Set 2020	Mercoledì 23 Set 2020	Giovedì 24 Set 2020	Venerdì 25 Set 2020	Sabato 26 Set 2020	Domenica 27 Set 2020
09:00	09:00 - 13:00 - prenotazioni: 36/36	09:00 - 13:00 - prenotazioni: 36/36	09:00 - 13:00 - prenotazioni: 35/36	09:00 - 13:00 - prenotazioni: 36/36	09:00 - 13:00 - prenotazioni: 34/36		
10:00							
11:00							
12:00							
13:00							
14:00	14:00 - 18:00 - prenotazioni: 36/36	14:00 - 18:00 - prenotazioni: 36/36	14:00 - 18:00 - prenotazioni: 34/36	14:00 - 18:00 - prenotazioni: 34/36	14:00 - 18:00 - prenotazioni: 26/36		
15:00							
16:00							
17:00							

# Interaction and Visual Feedback

---

- **Affordance:** a visual cue that signals how an element can be used
  - It communicates “you can interact with me, and here is how”
  - A raised button affords pressing; an underlined blue word affords clicking; a text field affords typing
- *Don't break conventions:* buttons should look like buttons; links should look like links
- **Rule of thumb**
  - if users need a tooltip or an explanation to understand what an element does, the affordance has failed
  - *rethink* the design, not the documentation

# Communicating State

---

- Every interactive element exists in multiple states, and each state must be visually distinguishable from the others
  - **Default**, the resting state the user sees on arrival
  - **Hover**, the user is considering the element; a subtle cue that it is interactive
  - **Active/Pressed**, the action is in progress; provides immediate confirmation
  - **Focused**, the element is selected via keyboard; never suppress this with 'outline: none'
  - **Disabled**, the element is unavailable; reduce opacity and remove pointer events; if possible, explain why
  - **Loading**, the system is processing; provide feedback or users will assume nothing happened
- Two states should not look identical: it will cause errors, repeated clicks, and user frustration



# Feedback Loops

---

- Every user action must produce a **visible reaction**
  - Silence after an action is never correct
- **Feedback** must be proportional to the action and the wait time
  - < 100 ms: instant visual change, such as button press animation, checkbox state flip
  - 100 ms - 1 s: subtle indicator, such as spinner, progress bar, button label changes to “Saving...”
  - 1 s+: explicit message, such as “Your changes have been saved” redirect to confirmation page
- **Error prevention** is better than error messages: where possible, make invalid actions impossible
  - Examples: disable the “Submit” button until all required fields are filled and valid; show a character counter on a field with a maximum length

# Accessibility

---

- ~16% of the global population has some form of disability, either visual, motor, auditory, or cognitive (WHO)
  - It is a **substantial** fraction of every audience
- Accessibility is a legal requirement in many jurisdictions
  - EU Web Accessibility Directive (public sector websites and apps)
  - EN 301 549, the European standard that references WCAG
  - Italian's Stanca Act (Law 4/2004)
- **Accessible design benefits everyone**
  - Think about: captions? high contrast? Keyboard navigation? large tap targets on a phone?
- **Practical target:** WCAG 2.1 Level AA; Level AAA is aspirational

# Web Content Accessibility Guidelines (WCAG)

The screenshot displays the W3C Web Accessibility Initiative (WAI) website. At the top, there is a navigation bar with links for "Skip to Content", "Change Text Size or Colors", "This page in: English • Español • Français", "All Translations", and "Hide Options". Below this is the W3C logo and the text "Web Accessibility Initiative WAI" with the tagline "Strategies, standards, resources to make the Web accessible to people with disabilities". There are also links for "Get Involved" and "About W3C WAI", and a search box.

The main navigation menu includes: "Accessibility Fundamentals", "Planning & Policies", "Design & Develop", "Test & Evaluate", "Teach & Advocate", and "Standards/Guidelines".

The breadcrumb trail reads: "Home / Standards/Guidelines / Web Content - WCAG 2".

The left sidebar, titled "Standards/Guidelines", contains a list of links: "Web Content - WCAG 2" (highlighted), "How to Meet WCAG 2 (Quick Reference)", "At a Glance", "The Documents", "Applying to Non-Web ICT", "New in 2.2 Draft", "New in 2.1", "Translations", "Commenting", "Conformance Logos", "FAQ", "WCAG 3 Draft", and "Authoring Tools - ATAG".

The main content area is titled "WCAG 2 Overview" and includes a "Summary" section. The summary text states: "This page introduces the Web Content Accessibility Guidelines (WCAG) international standard, including WCAG 2.0, WCAG 2.1, and WCAG 2.2. WCAG documents explain how to make web content more accessible to people with disabilities. A different page [introduces WCAG 3](#). WCAG is not an introduction to accessibility. For introductions, see [Accessibility Fundamentals Overview](#)." Below the summary are "Quick links to resources:" which include: "How to Meet WCAG 2 (Quick Reference)", "WCAG 2.2 Draft, **What's New in WCAG 2.2 Draft with status and timeline**", "WCAG 2.1 Standard", and "WCAG 2.0 Standard".

At the bottom of the main content area is a "Page Contents" section with links to: "Introduction", "WCAG 2.0, 2.1, 2.2", "Who WCAG is for", and "What is in WCAG 2".

<https://www.w3.org/WAI/standards-guidelines/wcag/>

# Remember Semantic HTML?

---

- HTML5 landmark elements give structure **semantic meaning** and Semantic HTML is free accessibility
  - `<nav>`, `<main>`, `<header>`, `<footer>`, `<article>`, `<section>`, `<aside>`
  - Screen readers use these as navigation shortcuts
- Heading levels (h1-h6) define the document hierarchy
  - DON'T: using `<h3>` because it “looks right” skipping h2
  - DO: choosing the level based on position in the outline; adjust size with CSS
- Always use the **correct element for its semantic role**
  - `<button>` for actions (submit, delete, toggle)
  - `<a href>` for navigation

# Quick Wins for Accessible Interfaces

---

- **Images:** every `<img>` needs an alt attribute
  - Descriptive alt text for informative images and empty alt for decorative images (it tells screen readers to skip the image entirely)
- **Forms:** every input needs a visible, associated `<label>` element
  - Placeholder text disappears on focus and has low contrast, so it is not a substitute for a label
  - Associate labels explicitly: `<label for='email'>` linked to `<input id='email'>`
- **Keyboard navigation:** every interactive element must be reachable and operable without a mouse
  - Test this: put your mouse away and try to complete a core task using only Tab, Enter, and arrow keys
  - Focus indicators must be visible: never use `'outline: none'` without providing a custom replacement
- **Color contrast:** verify all text meets WCAG AA ratios before shipping (see before)

# Design for What Can Go Wrong

---

- Happy-path design is always incomplete. Every real user session will encounter at least one of:
  - A form field filled in incorrectly
  - A search that returns no results
  - A page that no longer exists (404)
  - A server that fails to respond (500)
- **Error and empty states** are high-stress moments for users, as they feel lost or that something is broken
  - A well-designed error state can recover the experience; a missing one will end it

# Form Validation


---


- **Validate inline**, as soon as a field loses focus (on blur), not only when the user submits the entire form
  - Submitting and receiving a list of errors is frustrating; catching them one at a time, immediately, is forgiving
- Error messages must be specific, visible, and actionable: tell the user exactly what to fix and how
  - DON'T: *“Invalid input”* → the user has no idea what went wrong
  - DO: *“Email address must contain an @ symbol”* → specific and immediately actionable
  - DO: *“Password must be at least 8 characters, including one number”* → sets expectations before the mistake
- Place the error message close to the field it refers to
- Combine color + an icon (⚠) + text for accessibility

# Example

Already have an account? [Sign in](#) →

## Sign up for GitHub

 Continue with Google

 Continue with Apple

or

Email\*

test

⚠ Email is invalid or already taken

Password\*

...

⚠ Password is too short

Password should be at least 15 characters OR at least 8 characters including a number and a lowercase letter.

Username\*

123

⚠ Username 123 is not available.

Username may only contain alphanumeric characters or single hyphens, and cannot begin or end with a hyphen.

Your Country/Region\*

Italy

For compliance reasons, we're required to collect country information to send you occasional updates and announcements.

Email preferences

Receive occasional product updates and announcements

Create account >

By creating an account, you agree to the [Terms of Service](#). For more information

# Empty States

---

- An **empty state** is shown when a container has no content to display:
  - First use, the user has not yet created any data (e.g., a task list on day one)
  - No results, a search or filter returned nothing
  - Cleared, the user has deleted everything
- Never show a blank area or a bare “No results found”: it reads as broken and leaves the user stranded
- A well-designed empty state has three elements
  1. A **visual anchor**, an illustration or icon that sets the tone and confirms this is intentional
  2. A **brief explanation**, “You haven’t added any tasks yet” is warmer and clearer than “No tasks”
  3. A **primary action**, give the user an immediate way forward: “+ Add your first task”
- Empty states are also a chance to educate: briefly explain what will appear here and why it matters

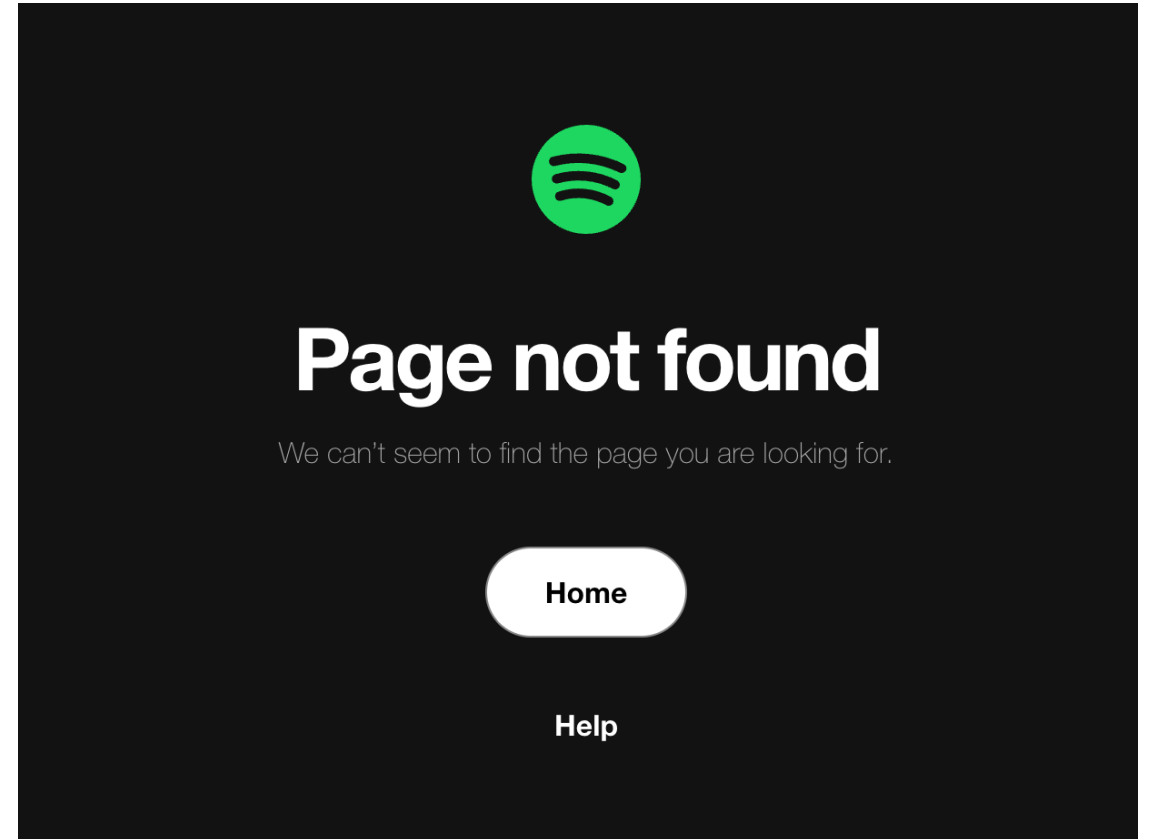
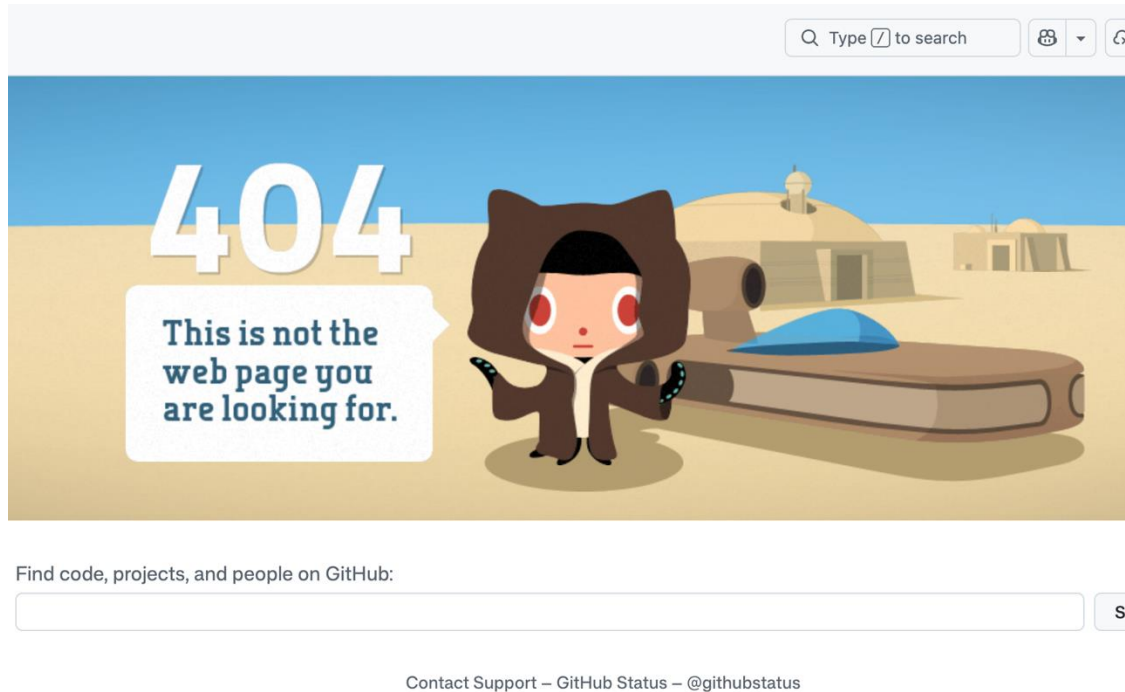
# Error Pages (404 and 500)

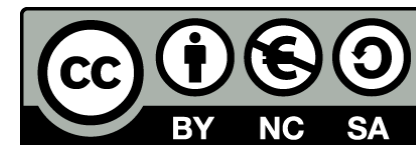
---

- **404 Page Not Found:** the user followed a broken or outdated link
  - DON'T: use accusatory language like “You entered an invalid URL” (maybe it’s the developer’s fault)
  - DO: provide a clear explanation, a search box, a link to the homepage or the most relevant section
- **500 Server Error:** something went wrong on your end
  - Be honest: “Something went wrong on our side... we're looking into it”
  - Give a way forward: a link to the homepage, a retry button, or support contact details
- Both error pages must preserve your full site navigation and tracked in your analytics

# Examples

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# License

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