

Interactive Multimedia Applications

User Centered Design Model: Design

Design: Goals

- **Building various application design solutions (prototypes)**
- **Evaluation with users to select the proposal to implement**
- **Output**
 - Prototype to implement



Design: Types of Prototypes (I)

- **Interaction Scenarios**

- Descriptions of users performing tasks

- ***Storyboards***

- Sequences of drawings that represent how the interface would be used

- **Paper Prototypes**

- Low Fidelity: hand-drawn sketches
 - High Fidelity - printed computer sketches



Design: Types of Prototypes (II)

- **Wizard-of-Oz**

- User interacts with the PC or mobile device but its input is transmitted to the Wizard that changes the interface

- **Functional or Computational Prototypes**

- Computer programs that perform all or some of the features but are not prepared to be launched in the market



Design: Prototype Example (I)

- **Interaction Scenarios**

- Describe the physical actions performed by the users on the elements of the interface and the responses of the user to their actions

- **Example**

- Elaborate an interaction scenario for the task of buying a train ticket to and from Porto, paying with debit card and receipt request



Design: Interaction Scenario Example (I)

- João, a young businessman from Santarém, needed to go to Porto for a business meeting. To move, he decided to go by train. Arrived at the station, João went to the new ticket vending machine, chose his destination by clicking on the **button** corresponding to Porto, then selected a return ticket by choosing the respective **option**.
- When a **dialog window** appeared to confirm the information entered, John pressed the '**OK**' **button** and the system went to the **payment screen**, selecting John the '**multibanco**' **payment option**.



Design: Interaction Scenario Example (II)

- John put the debit card in the slot and entered the PIN using the **virtual keyboard** that was presented to him on the screen. After selecting the digits of his code, he clicked '**Confirm**'.



Design: Interaction Scenario Example (III)

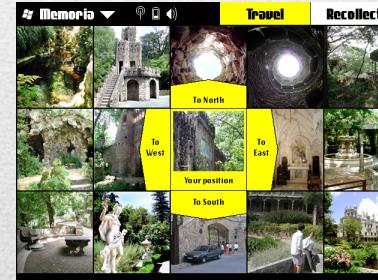
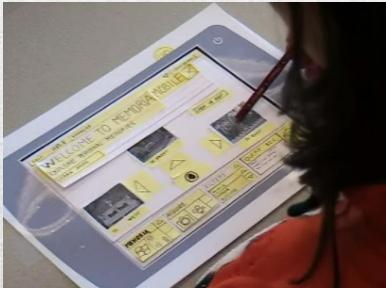
- Finally, John pressed the '**Receipt**' button to get a receipt for his operation. The system provided an **informational message** that it was printing the ticket and the receipt and the time it took to complete the printout.
- After printing, the system issued a **warning** that the customer could remove the ticket and receipt from the machine slot. With the ticket and the receipt in hand, Joao went to line 4, as the train was about to arrive.



Design: Prototype Example (II)

■ Paper Prototypes

- Sketch the interface layouts on paper
- The contents and the interactive elements are represented in different sheets to allow adjustment of the arrangement of the elements on the screen



Design: Paper Prototypes

- **Advantages**
 - Allow user feedback in the initial phase (without making code)
 - Rapid Prototyping
- **Disadvantages**
 - They present difficulties in evaluating some of the more complex usability characteristics (e.g., drag & drop)
 - Reaction of users is different when using paper



Design: Building Prototypes

■ Structure

- Define the structure of the application

■ Layouts

- Organization of the interaction elements and the multimedia content in time and space

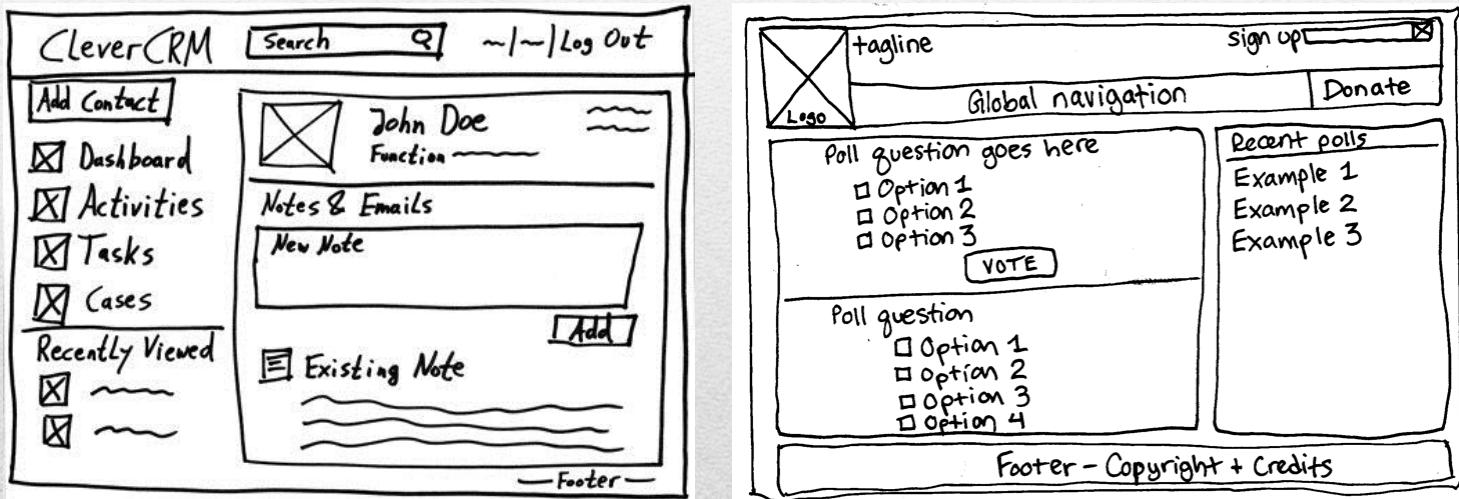
■ User Interaction

- Combining the contents with the interaction elements that implement the navigation system



Design: Wireframes (I)

- Technical representation of a screen using skeletal lines
 - User interface blueprints



- Goal
 - Represent an early-stage design of our product idea

Design: Wireframes (II)

- **Wireframes should include the product details**
 - **Structure** of the user interface components
 - **Content** (specifications of each image, text block, graphic object, including dimensions and durations)
 - **Information Hierarchy** (how to organize the information)
 - **Functionality** (how the user interface will work)
 - **Behaviour** (how the user interface behaves)

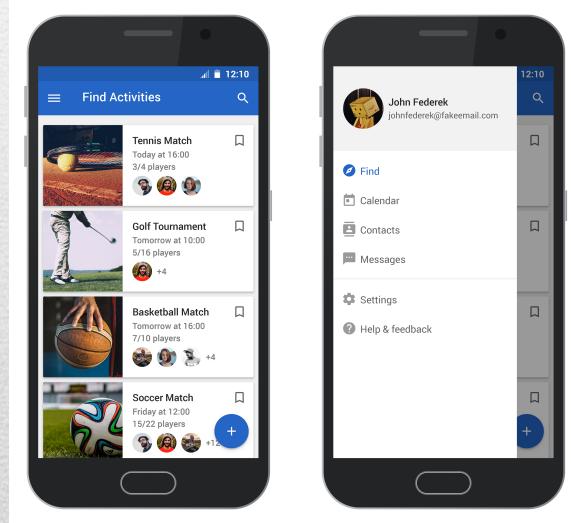
Design: Wireframes (III)

- **Wireframes should NOT include**
 - Colors
 - Images
 - Special Fonts

- **Tools**
 - Wireframe.cc, Moqups, InVision, UXPin, ...

Design: Mockups (I)

- **Mockups are replicas of the final design of the product**
 - It Includes the same functional aspects described in wireframe and the proper visual features of each element

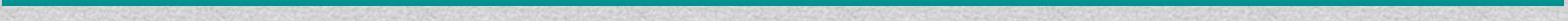


- **Goal**
 - To build an interactive prototype of the application

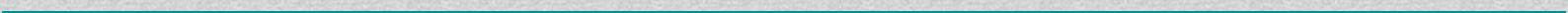
Design: Mockups (II)

■ Tools

- MarvelApp
- **Figma**
- Xd Adobe
- Origimi.Design
- Justinmind
- Flinto
- InVision
- ...



Visual Design



Visual Design: Introduction

- Focuses on the aesthetics of the application
 - Combines different elements that will give a better shape to the application
 - Covers both sides of the design categories
 - Graphic-Design
 - User-Interface Design



Visual Design: User Interface (Example)

The screenshot shows the homepage of stopbullying.gov. Several design elements are highlighted with callout lines:

- Contrast:** Points to the logo "stopbullying.gov" which is white text on a red background.
- Shape:** Points to the rounded rectangular search bar.
- Hierarchy:** Points to the main navigation menu items: WHAT IS BULLYING, CYBER BULLYING, WHO IS AT RISK, PREVENT BULLYING, RESPOND TO BULLYING, and GET HELP NOW.
- Line:** Points to the vertical line separating the sidebar from the main content area.
- White Space:** Points to the large amount of negative space on the left side of the page.
- Features:** Points to the "FEATURES" section in the sidebar, which includes "Know the Facts", "Prevent Cyberbullying", "Be More Than a Bystander", and "Mental Health".
- Dominance:** Points to a large photograph of a woman looking at her phone, which is the central visual element of the "Prevent Cyberbullying" section.
- Texture:** Points to the circular "Learn more >" button, which has a textured appearance.
- Updates:** Points to the "UPDATES" section at the bottom left, which contains news briefs and social media links.
- State Policies & Laws:** Points to the "STATE POLICIES & LAWS" section at the bottom right, which features a map of the United States.
- Scale:** Points to the size of the map in the "STATE POLICIES & LAWS" section.

Visual Design: Why is it Important?

- **Visual Communication**

- Directions arrows are used created by lines
- Important areas of danger are illustrated with colours

- **Basic Elements of Visual Design**

- Lines
- Shapes
- Colors
- Font/Typography
- Textures
- Forms



Visual Design: Lines (I)

Basic Kinds of Lines

Solid
A solid line is an unbroken line.


Broken
A broken line
is a line interrupted by space


Thick
A thick line is wide

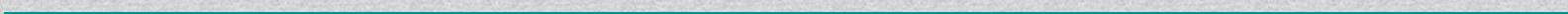


Thin
A thin line is narrow


- **Solid, Broken, Thick and Thin**
- **Horizontal, Vertical or Diagonal**
- **Straight, Angled or Curved**

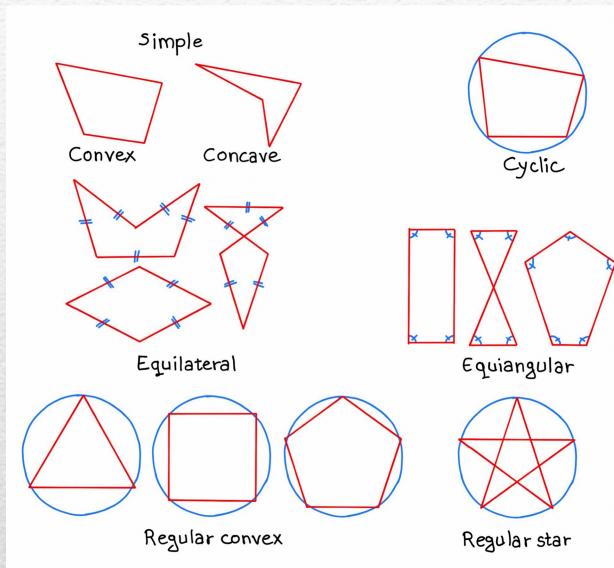
Visual Design: Lines (II)

- **Lines are used for**
 - Organising the design elements by **separating or grouping** them
 - **Creating different patterns** used during the visual design phase
 - **Guiding the human eye** using arrows created by lines
 - Using different sizes of lines and different contrasts **to highlight**



Visual Design: Shapes (I)

- Represent its own unique message to users



- Regular or Irregular
- Organic or Inorganic
- Angular or Round
- Open or closed
- 2D or 3D

Visual Design: Shapes (II)

- **Shapes are used for**
 - **Organising information** by connect or separate specific components
 - **Differencing the ideas** using symbols
 - **Creating movements, depth and textures**
 - **Emphasising and creating entry points** for the most relevant areas
 - **Giving directions** to the user



Visual Design: Shapes (III)

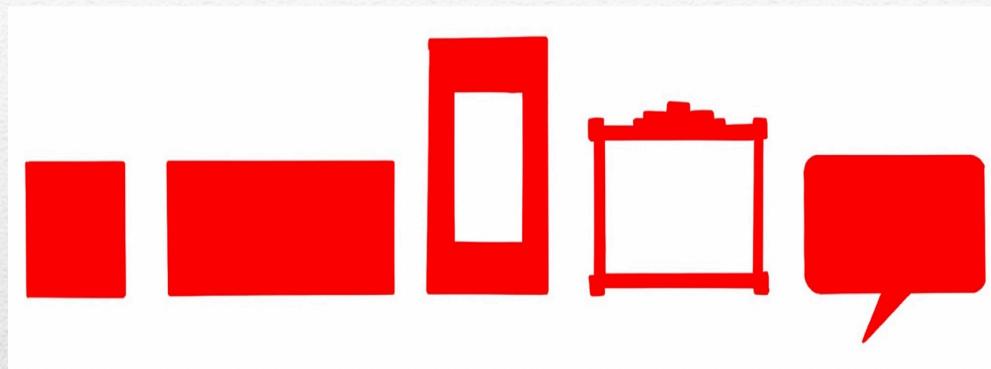
■ Circles



- To represent daily elements or thinks like the **sun, moon or universe**
- Represent infinite, unity and harmony

Visual Design: Shapes (IV)

- **Geometric shapes**



- Squares or rectangles usually represent **honesty**
- Also represent **conformity, solidity, security** and **equality**

Visual Design: Shapes (V)

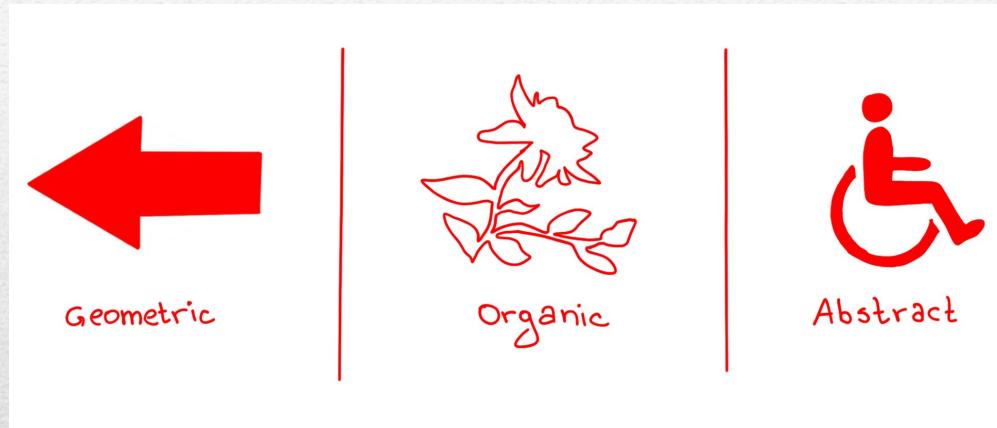
- **Spiral shapes**



- Used to express creativity
- To convey the ideas of fertility, birth, death, transformation, or expansion

Visual Design: Shapes (VI)

- **Organic or freeform shapes**



- Represent sense of informality and spontaneity
- To show the outline of a human gesture, organic things, or products

Visual Design: Color (I)

■ Warm and Cold

Example of Warm Colors



Energy
Happiness
Passion
Fire
Comfort

Example of Cool Colors



Calm
Cold
Melancholy
Trust
Sadness
Professionalism

Visual Design: Color (II)



Light, purity, virginity



Energy, danger, warning, courage, desire, passion, action or love



Nature, optimism, growth, hope, fresh, wealth, safety, healing or fertility



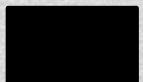
Cold, calm, breathing, loyalty, confidence, expertise or stability



Warmth, happiness, wisdom or joy



Security or maturity



Elegance, evil, formality or mystery



Creativity, success, attraction, strength

Visual Design: Color Recommendations (I)

- **Red**
 - Used in buttons to get our users to make impulsive actions
- **Yellow**
 - Used to mentally stimulate an activity or generate muscle energy
- **Orange**
 - Used to increase appetites
- **Blue**
 - Used in **corporate websites or products** to show maturity, professionalism, strength and stability



Visual Design: Color Recommendations (II)

- **Green**
 - Used in medical products to indicate safety
- **White and Gray**
 - neutral colours that should be used with accent colours to highlight specific areas
- **Keep in mind** that the meaning of color can depend on the culture and other circumstances



Visual Design: Color Recommendations (Dix, 1993; Faulkner, 1998)

- Colors used should be as distinct as possible and this distinction should not be affected by **contrast changes**



- Blue** should not be used to present **critical information**

Visual Design: Color Recommendations I(Dix, 1993; Faulkner, 1998)

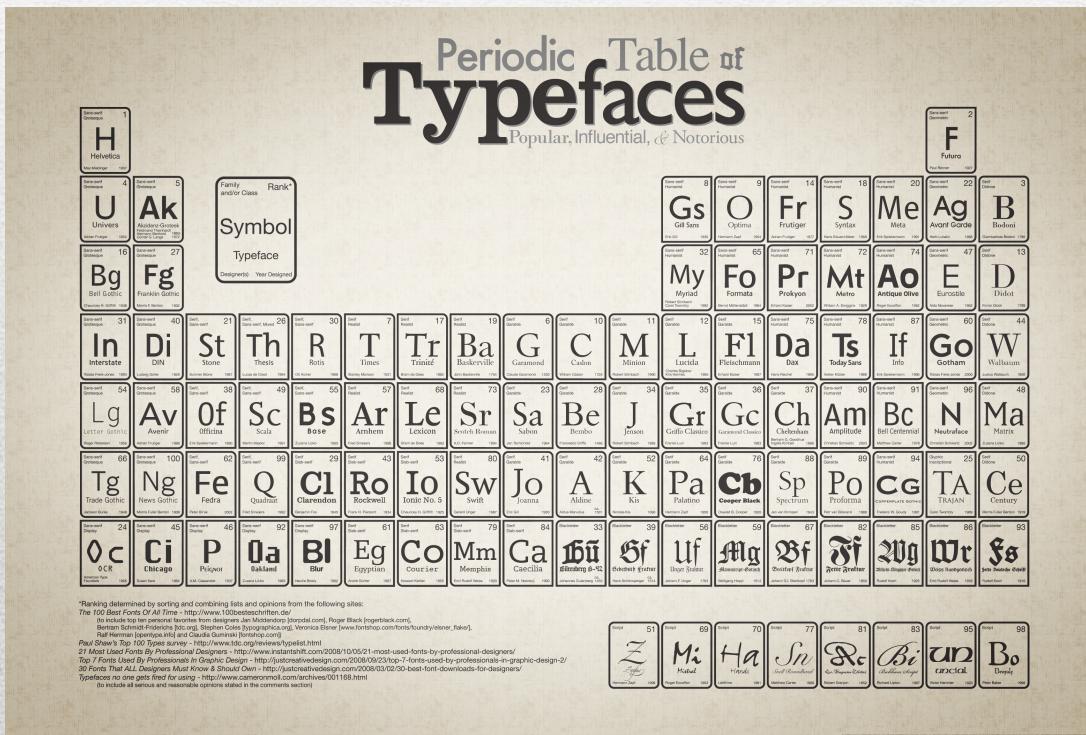
- When using **color as an indicator**, additional information should be included for users with **disabilities in color perception**
- **Society conventions** should be followed (e.g., **green** to advance, **red** to stop or **yellow** to wait)



Visual Design: Typography (I)

■ Typeface

- Visual design element in letterform which is used to communicate with the user



Visual Design: Typography (II)

■ Font

- How the visual design element is presented to the user
- Fonts are part of typeface
 - Typeface can be a family of fonts (e.g., Arial or Helvetica)
 - Font is a single member of a family (e.g., Arial Italic or Arial Extra Bold)



Visual Design: Typography (III)

■ Typeface Categories

- Serif (Times New Roman, Cambria or Georgia)
- Sans-Serif (Arial, Verdana or Helvetica)
- Decorative (The fonts which do not fit in the other categories)

Example of Serif font

For this example we will use *Gergoja* font which is under 'SERIF' category of typefaces

Packt Publishing

The edges in the finishing lines of the fonts
which are known as 'SERIF'

Example of Sans-Serif font

For this example we will use *Arial* font which is under 'SANS-SERIF' category of typefaces

Packt Publishing

The edges in the finishing lines of the fonts
do not include the 'SERIFS' like in above example.

Visual Design: Typography (IV)

■ Typefaces - Mixing Categories

Example of mixing categories of typefaces inside our content

Packt

Packt Publishing is the leading UK provider of Technology eBooks, Coding eBooks, Videos and Blogs; helping IT professionals to put software to work.

Good combination and pairing. We are using here Serif for header (title) and Sans-Serif for the content.

Packt

Packt Publishing is the leading UK provider of Technology eBooks, Coding eBooks, Videos and Blogs; helping IT professionals to put software to work.

Good combination and pairing. We are using here Sans-Serif for header (title) and Serif for the content.

Packt

Packt Publishing is the leading UK provider of Technology eBooks, Coding eBooks, Videos and Blogs; helping IT professionals to put software to work.

Good combination and pairing. We are using here Decorative for header (title) and Sans-Serif for the content.

Packt

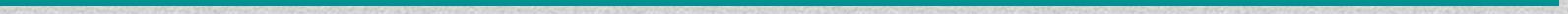
Packt Publishing is the leading UK provider of Technology eBooks, Coding eBooks, Videos and Blogs; helping IT professionals to put software to work.

Bad combination and pairing. Decorative fonts are bad approach for using them for content or body text.

Visual Design: Typography (V)

■ Typeface Categories Usage

- Serif
 - Most used in headlines, website headings or narratives
- Sans-Serif
 - Most used in very small screens in web pages or mobile content
- Decorative
 - To show some creative text
 - It is not preferred to be used for the body text or content because sometimes it is hard to read

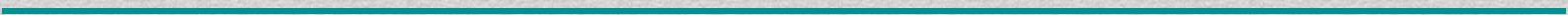


Visual Design: Typography (VI)

- No more than **2 or 3 types** of text fonts should be user interface throughout the GUI
- **Avoid using serif** text fonts in graphical user interfaces
- Text should be **left-aligned**
- Text alignment should not be **justified (right alignment)** because it may give rise to discontinuities in the middle of the text



Design Principles for Creating a Visual Design



Design Principles (I)

- **Alignment** (aligned elements can enhance pleasure using the user Interface)
 - **Hierarchy** (size, shape, placement can help to understand relevance)
 - **Contrast** (grabbing the user's attention and creating a focus on a specific area)
 - **Repetition** (e.g., color and shapes repetition to help the user identifying connected elements or tasks)
-

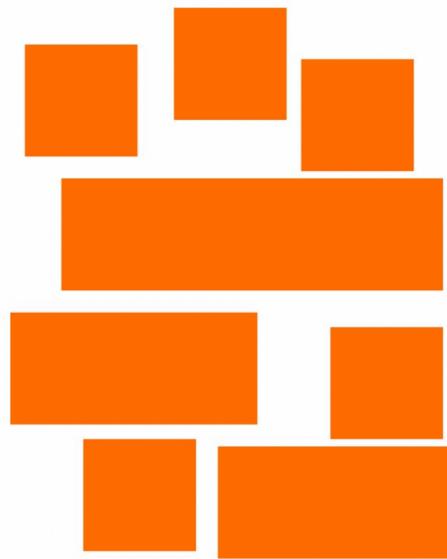
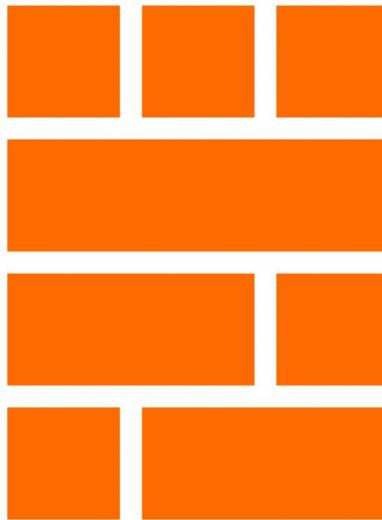
Design Principles (III)

- **Proximity** (grouping similar elements together and creating a relationship between those elements)
- **Balance** (e.g., same size, color, shape or properly distribution across the entire visual design)
- **Space** (blank parts should also be considered)



Design Principles - Alignment

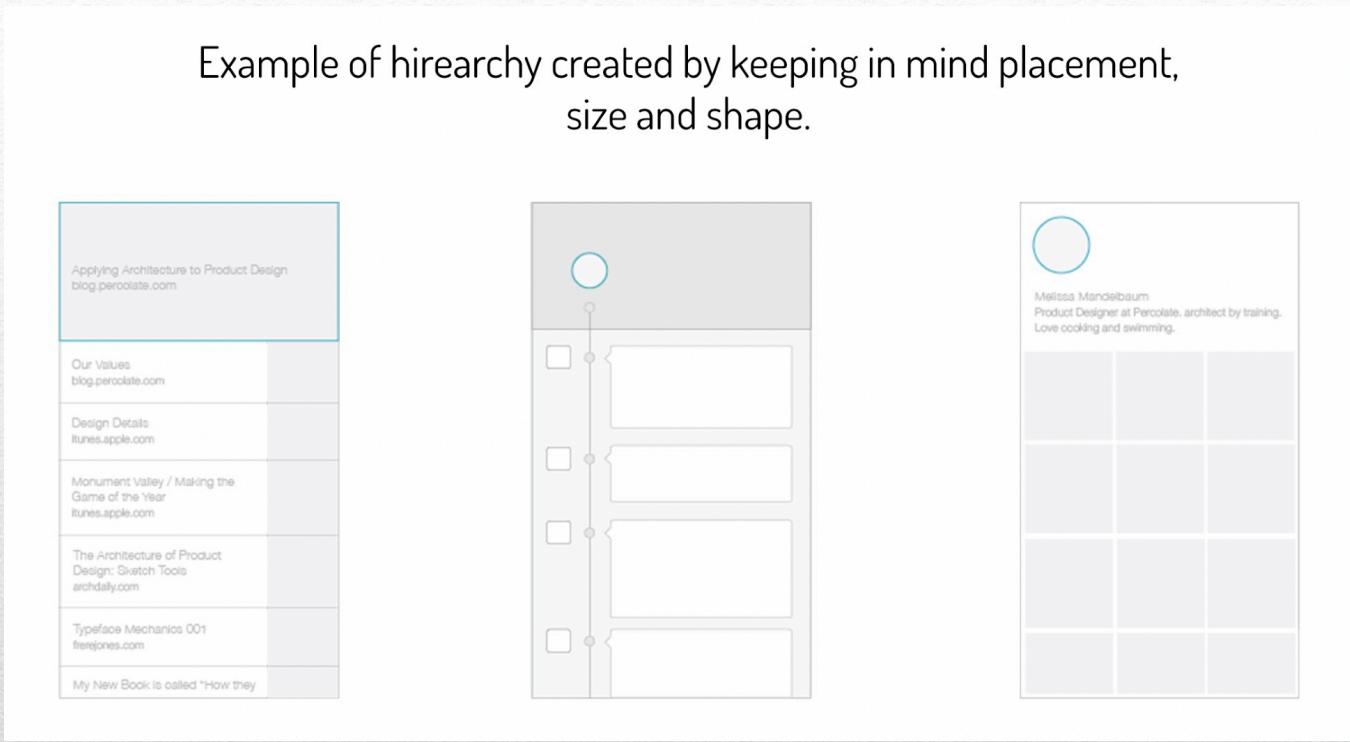
Example of alignment user on good and bad way



- Alignment will eliminate the **distractions** and **messiness** of our design and will align objects in the proper way so that users see a clean design
- We are not talking only about a specific one, but about all visual design elements, such as **colors, sizes, fonts, and shapes**

Design Principles - Hierarchy

Example of hierarchy created by keeping in mind placement, size and shape.



- Design principle that puts more important elements in the forefront and places the less-important elements in the background
- Size, Shape and Placement are important components to “highlight” elements

Design Principles - Contrast

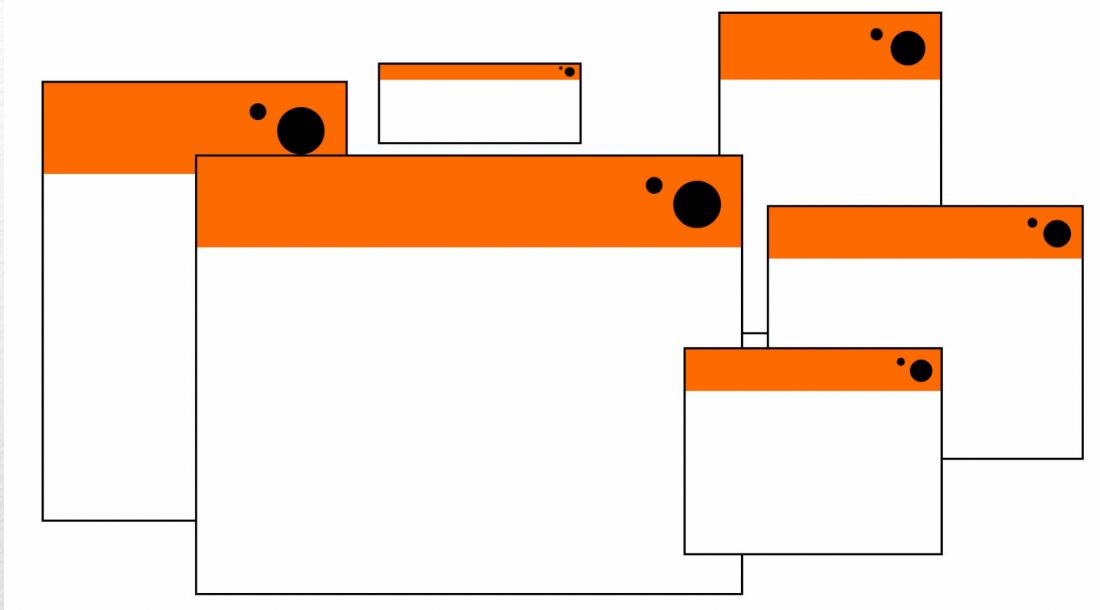
Example of creating contrast with typography and color



Packt Publishing

- Can be used to add emphasis to important elements
- Can be created on different elements of visual design, for example, using texture, typography, shapes, or colors, or even by combining all of those elements together

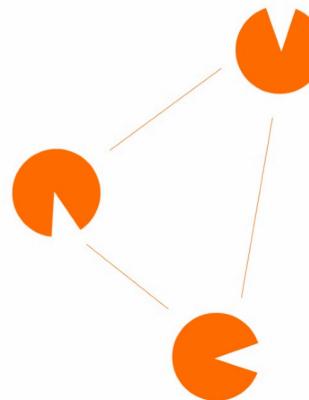
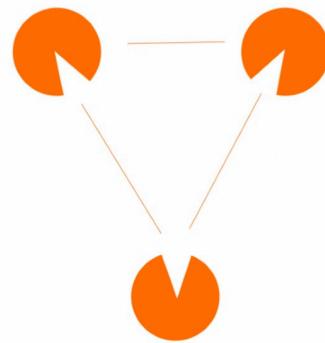
Design Principles - Repetition



- Repeating the same single element of design many times throughout our entire visual design will create a strong consistent visual design
- Can be achieved using any of the visual design elements, such as shapes, colors, or textures

Design Principles - Proximity

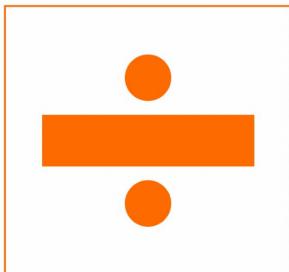
Example of connecting and creating relationship between objects



- Groups similar objects together to provide meaning to design
 - To provide a connection between design elements and create a visual relationship between them
 - For separating or breaking the structure of elements that have no connection between each other

Design Principles - Balance

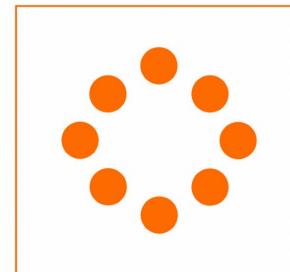
Example of symmetrical, asymmetrical and radial balance



Symmetrical balance



Asymmetrical balance

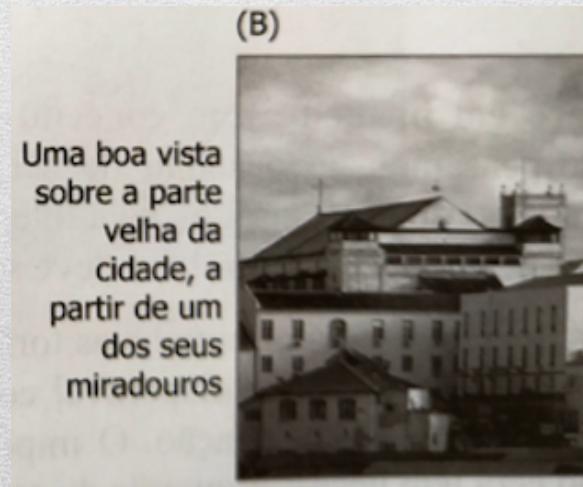
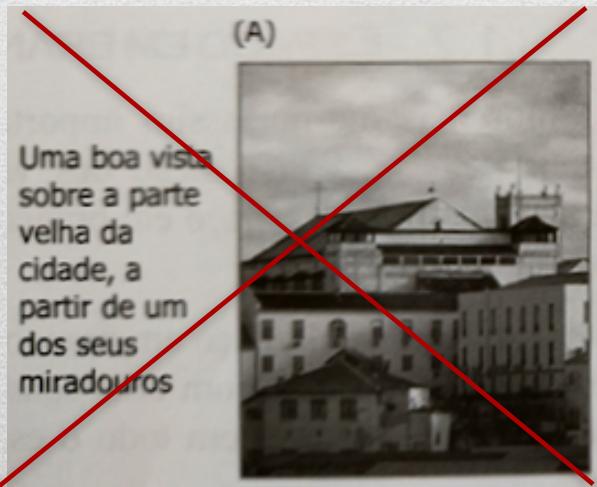


Radial balance

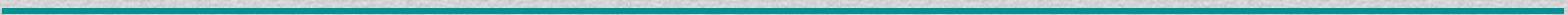
- Used for giving form and stability to our visual design
- Divided into three groups: **symmetrical**, **asymmetrical**, and **radial**
 - **Symmetrical** - each side of the design should have the same weight of elements
 - **Asymmetrical** - contrast can be used to even our design elements (if we have dark elements on our design, they should be balanced by light ones)
 - **Radial** - created when all the elements of the design radiate from a center point, which can be another element of design

Design Principles - Space

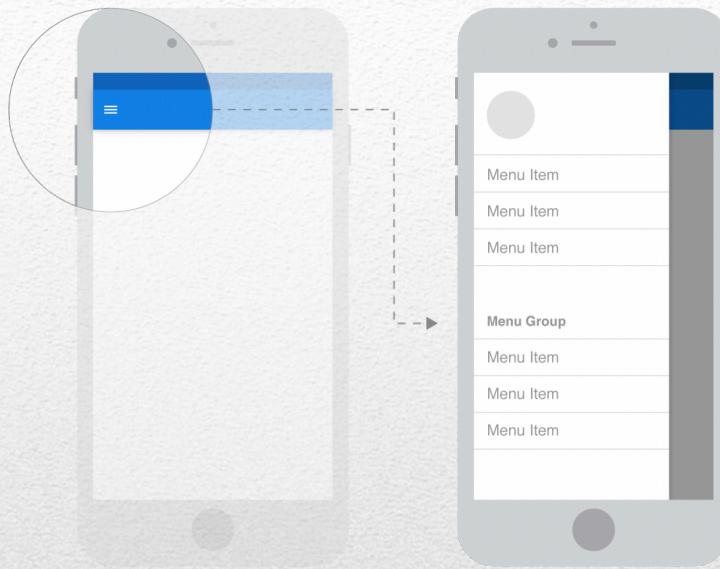
- As much as we care about what type of elements we are filling our visual design with, we should also consider its **blank parts**.
- White space or blank space can help us highlight important components of our visual design in the right way so that it can visually communicate with our users



Mobile User Interface Patterns



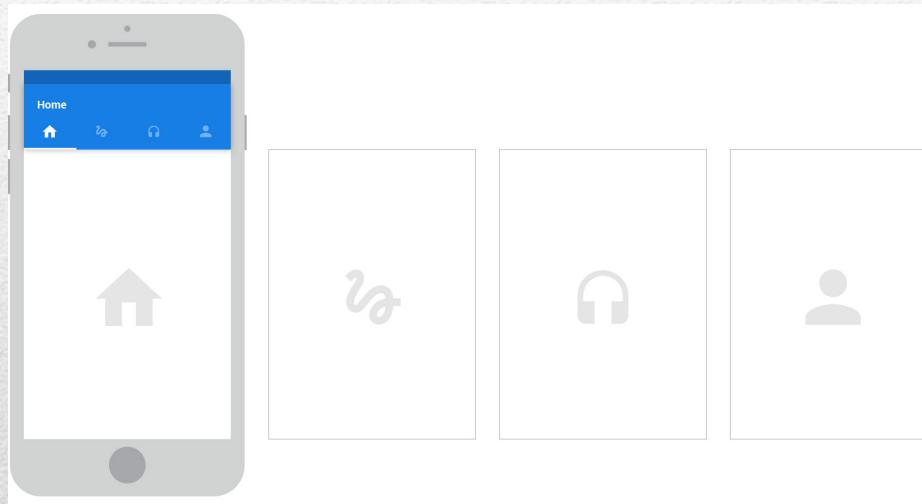
Navigation: Sliding Drawer (Hamburger Menu)



- Android or in mobile Web browser based apps
- Allows to have an indefinite number of elements without cluttering the initial experience
- Suitable to applications with many sections with equal importance
- Higher number of entries and submenus are the major problems

Navigation: Upper Area Tabs

- **Web apps and native applications, being more common in Android applications**



- Not good for many menu options
- Useful for users not accustomed to the mobile interfaces
- Can coexist alongside hamburger menus

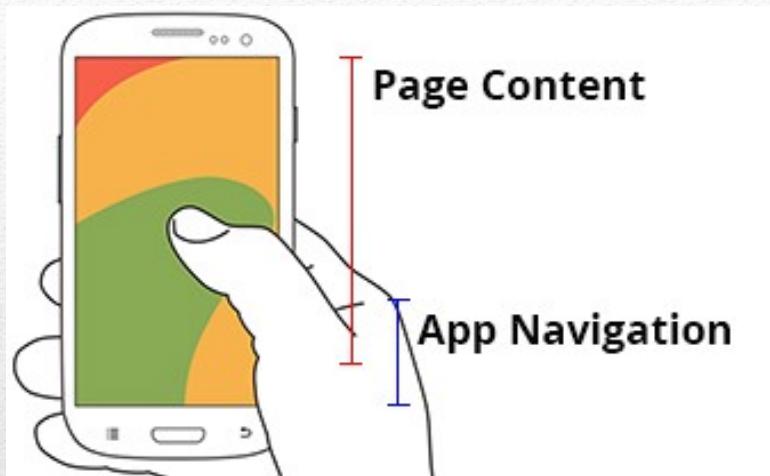
Navigation: Bottom Menu

- Current trend in Android and iOS



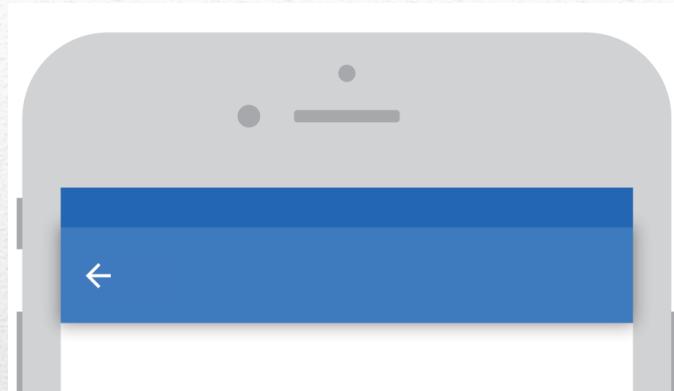
- Bottom menus are close to the user's thumb (easy to change with one hand)
- Dividing the content of the application into a maximum of five sections (all the sections always visible and with enough touchable space)
- Needs other navigation techniques for more than five sections

Navigation: Action in the Screen



- Mobile screens are generally getting bigger over the recent years
- Important to locate the most often used actions near the thumb area
- Steven Hoober discovered that 49% of the people use the mobile with one hand

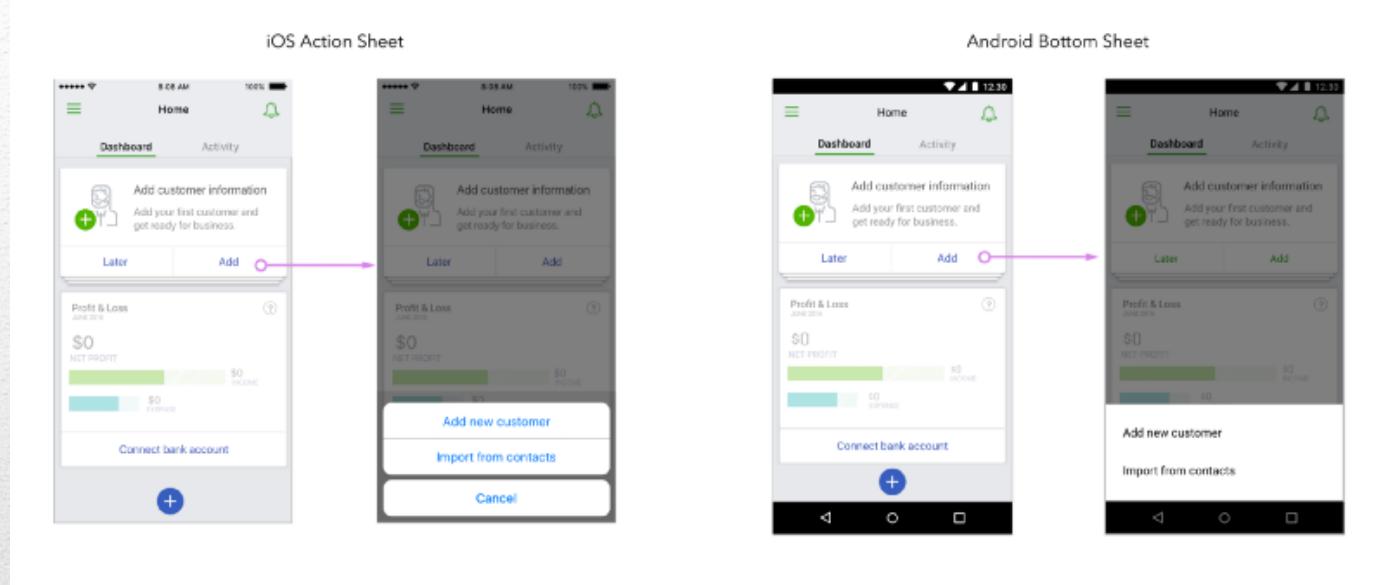
Navigation: Back Button



- Used in complex processes with several steps
- Used when a user visits a detail of any item found in a previous screen

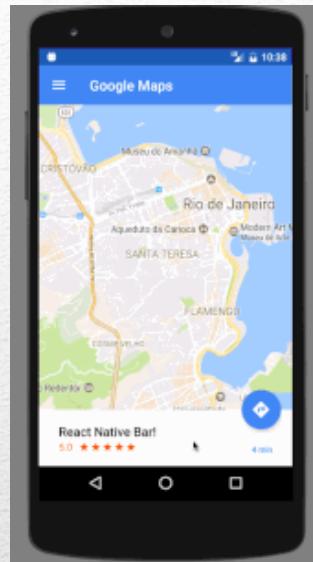
- Placed on the top-left (as in desktop browsers)
- Languages written from right to left (e.g., Arabic or Hebrew)
 - Arrow will be placed and pointing to the right-hand side

Navigation: Floating Action Buttons



- Used in applications to highlight a functionality over the other elements on the screen
- Usually located in the bottom area of the screen because of its proximity to the thumb area

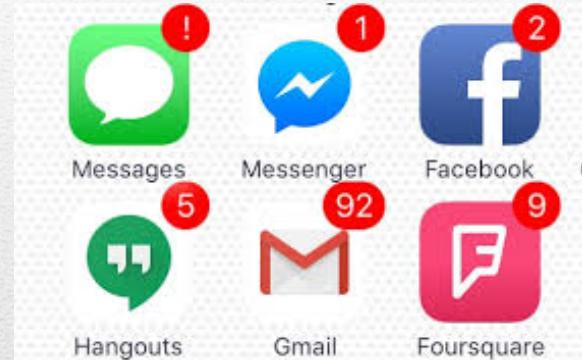
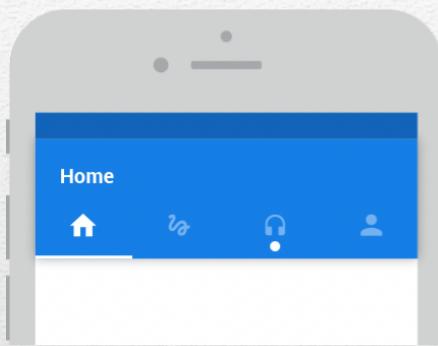
Navigation: Bottom Sheets



- For sub-flows instead of drop-downs, hamburgers side drawers or pop-up dialogues
- Facilitate vertical scroll for additional content and horizontal scroll (carousel) for similar content without jumping screens

Notifications: Circle Hint

- Notifications can cause unnecessary distraction to users



- Circle indicating something has changed is fairly accepted
- It is common to find it both with a number inside
 - The number represents the number of new items

Dialogs: Careful Use



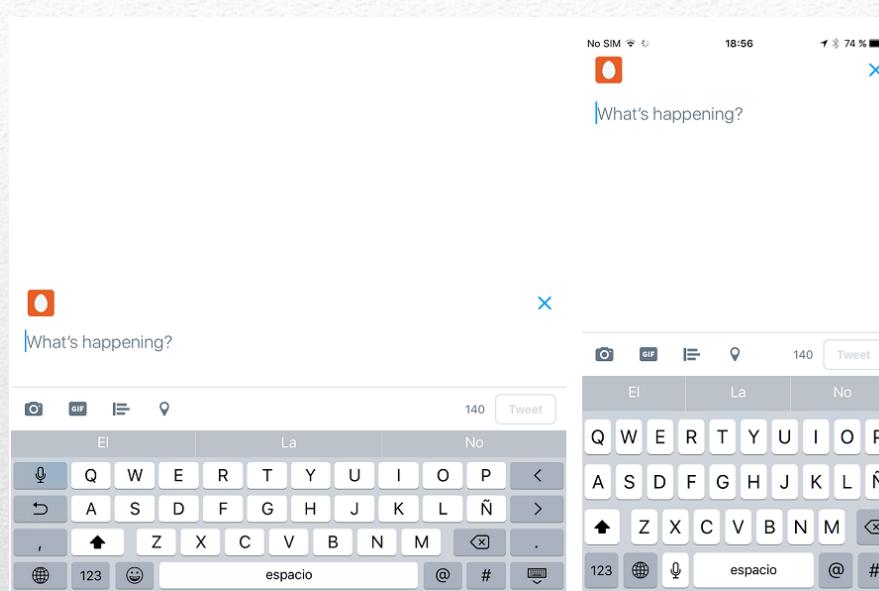
- Block any other user activity forcing users to reply immediately
 - This makes dialogs quite intrusive and annoying
- Used only when the application can not continue without user interaction
- Better to use different design options like options that appear from the bottom (bottom sheets)

Galleries with Miniatures



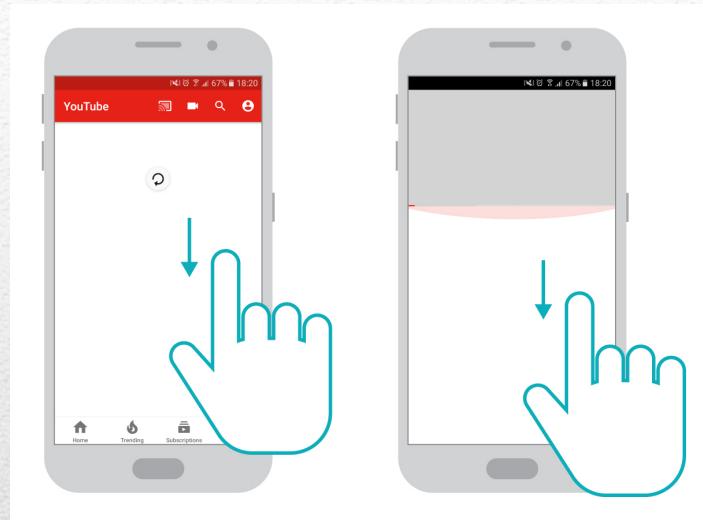
- Display lists of items in a graphical way in applications and mobile systems
- Items shown as thumbnails should be interactive

Portrait and Landscape Orientations



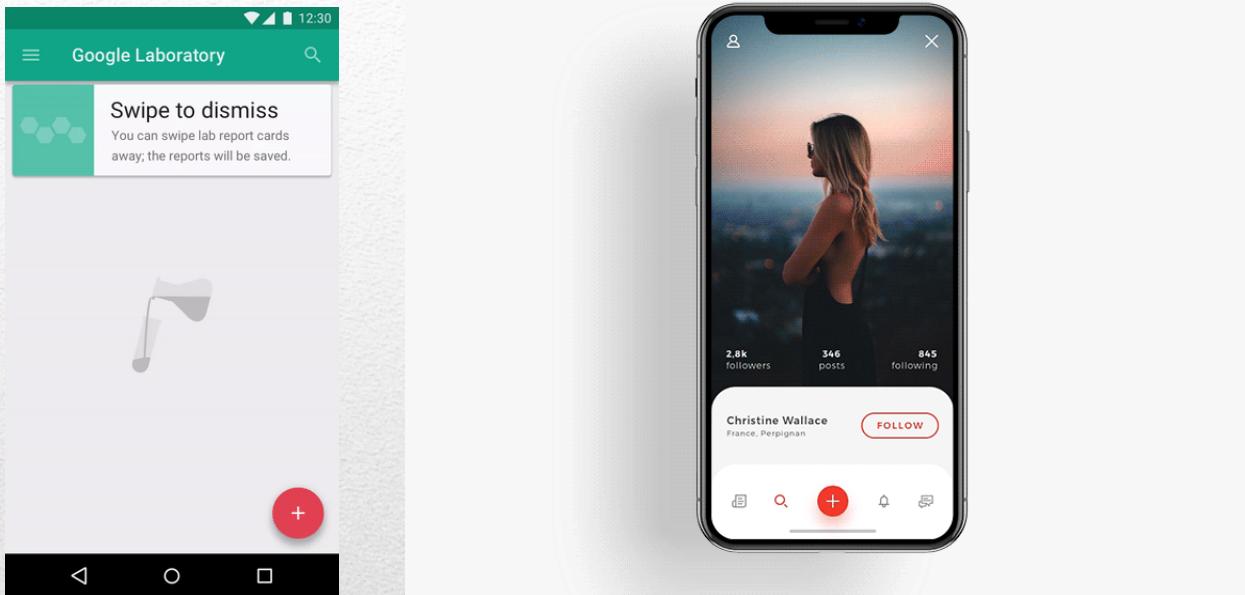
- Most users use their mobile in portrait position
- Applications may take advantage of the use of the landscape position by introducing new ways of viewing content
- Twitter show a larger keyboard in horizontal position

Swipe Down to Refresh



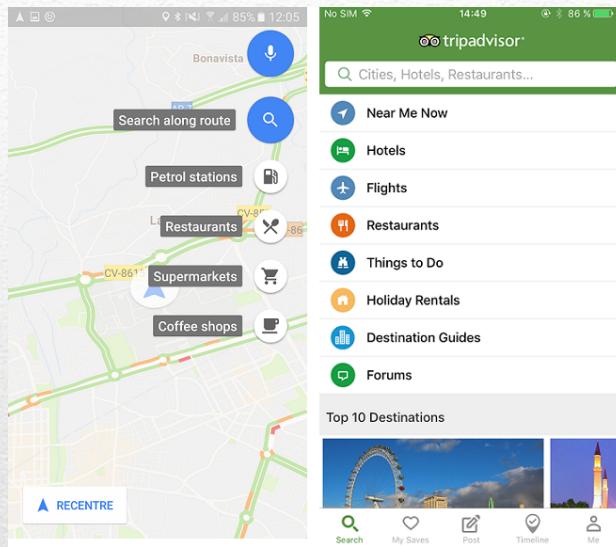
- Important to give feedback to the user
- Screens that not support this type of interaction should add clues to make the user understands

Gestures with Animations



- Animations are used to make clear what interaction are available
- Animations to clarify the spatial relationships between user interface elements
- Animations to provide feedback on the interaction

Search Suggestions



- In complex applications it is difficult to reach all content just by browsing menus
- Search boxes can help the user finding the content
- Search boxes with suggestions can help the user and reduce de user input

Full-Screen Experiences



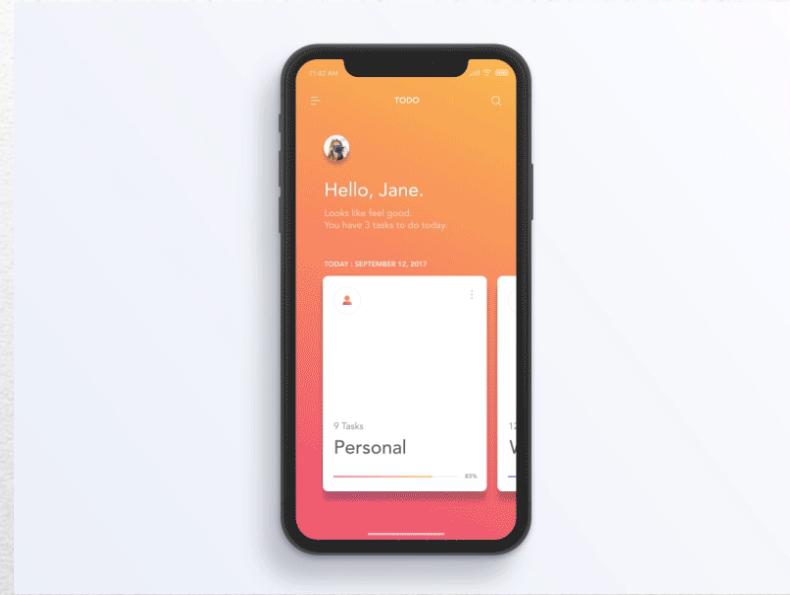
- More screen space available for users
- Images should not appear pixelated on mobile screen

Video Dominance



- According to Hubspot, 78% of people watch videos online every week, and 55% watch videos online every day
- Adapting Video for Portrait Orientation (94% of the time the mobile is used in portrait orientation)
- The average human attention span has fallen from 12 seconds in 2000, to 8 seconds in 2015. Video presentation should be adapted to this change

Color As Functional Element



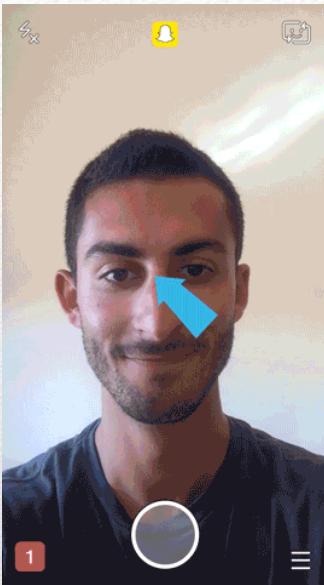
- In mobile apps, color is not only for aesthetics but it is also a part of the functional experience
- For instance, use color to visually separate different types of notifications

Mimic Emotions In UI Feedback

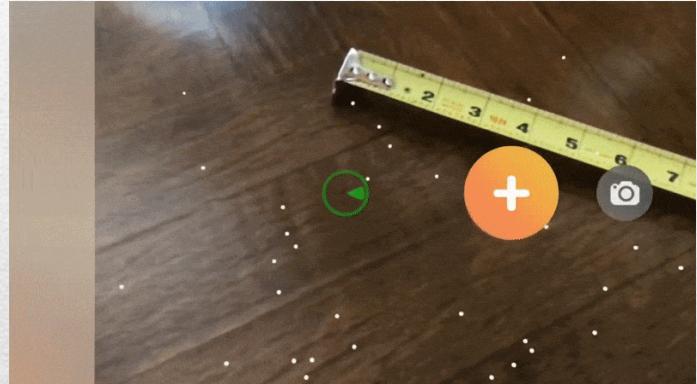


- Humans establish an emotional connection with all products they use
- Humans expect some level of human-like feedback when they interact with products
- Even though humans know that the products are not humans and can not feel emotions, users want to believe that they can

Augmented Reality



Entertainment Applications



Real-life Problems

Bibliography

- <https://design.google/resources/>
- [Native-mobile-app-design-overall-principles-and-common-patterns-2017](#)
- [UXpin/uxpin_mobile_ui_design_patterns_2014.pdf](#)
- [12-mobile-ux-design-trends-for-2018](#)
- <https://uxdesign.cc/ux-trends-2019-3ddadf853ca>
- <https://www.mindinventory.com/blog/mobile-app-ui-ux-design-trends-2020/>