Building User Interfaces*

Interaction Design

Structure, Layout, & Navigation

Professor Yuhang Zhao

* Adapted from Prof. Mutlu's slides

Announcements

— React 1 α and React 1 β deadlines extended: *Friday* → *Next Monday*

— Review sandbox code (e.g., CodePen) provided in lectures

What we will learn today?

— What is interaction design?
— Interaction structure
— Visual layout design
— Principles of navigation

What is interaction design?

Interaction Design

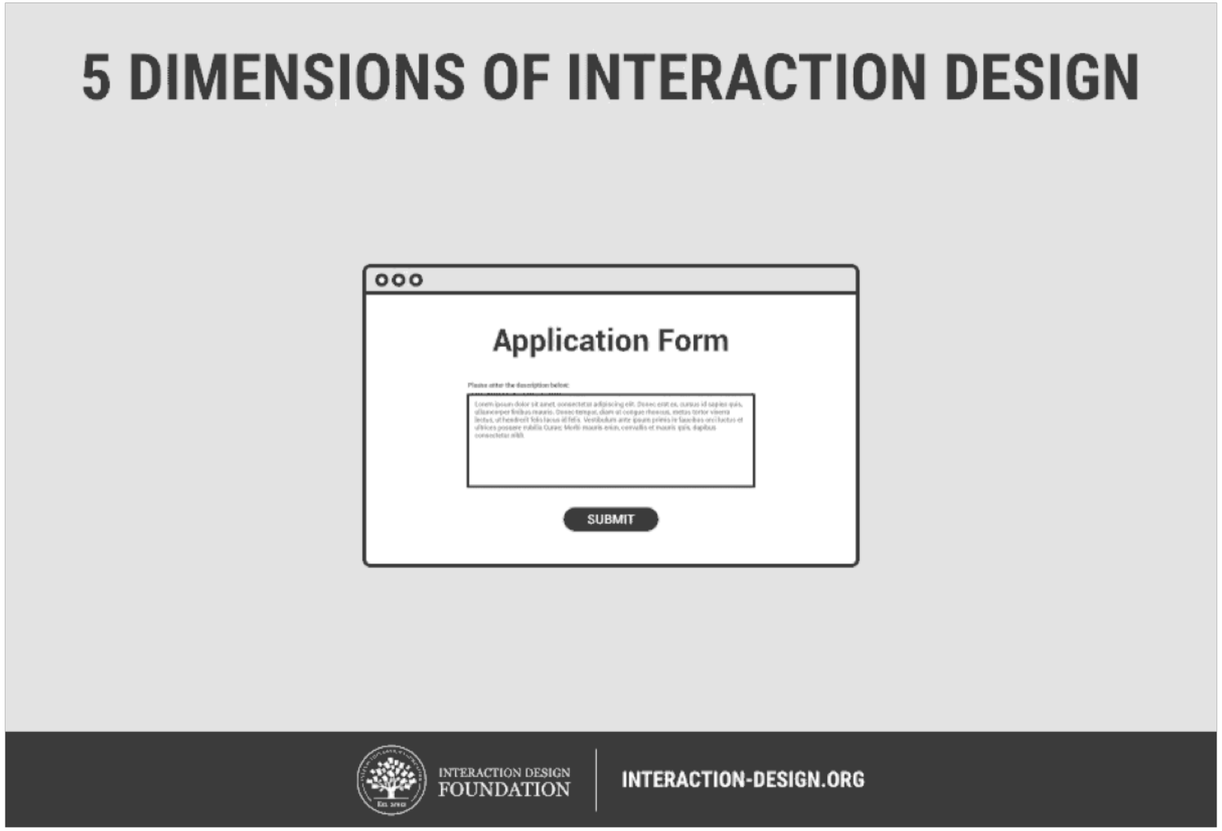
Definition: Defining behaviors for a system that engages the full spectrum of its user's perception, cognition, and movements.

Differs from visual design in its closer and more complex relationship to user behavior and context.

Example: visual designers do not think about navigation models!

Five Dimensions of Interaction Design[1]

1. **1D**: Words
2. **2D**: Visual representations
3. **3D**: Physical objects and space
4. **4D**: Time
5. **5D**: Behavior



[1] Interaction Design Foundation

Interaction Structure

Information Architecture

Definition: The design of the organizing principle of an interactive system.

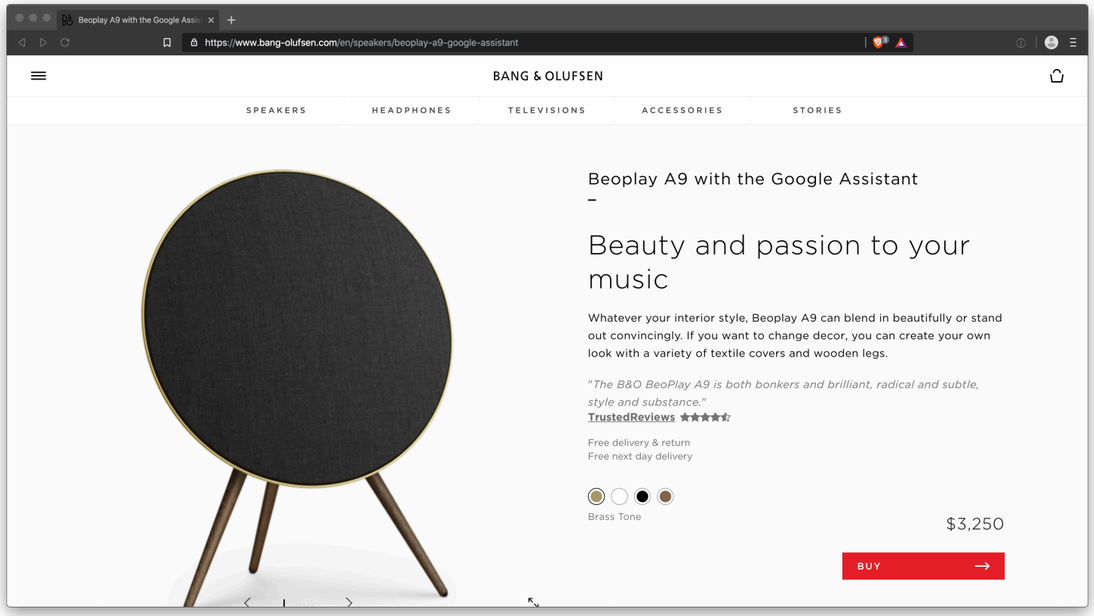
A set of structural categories:[2]

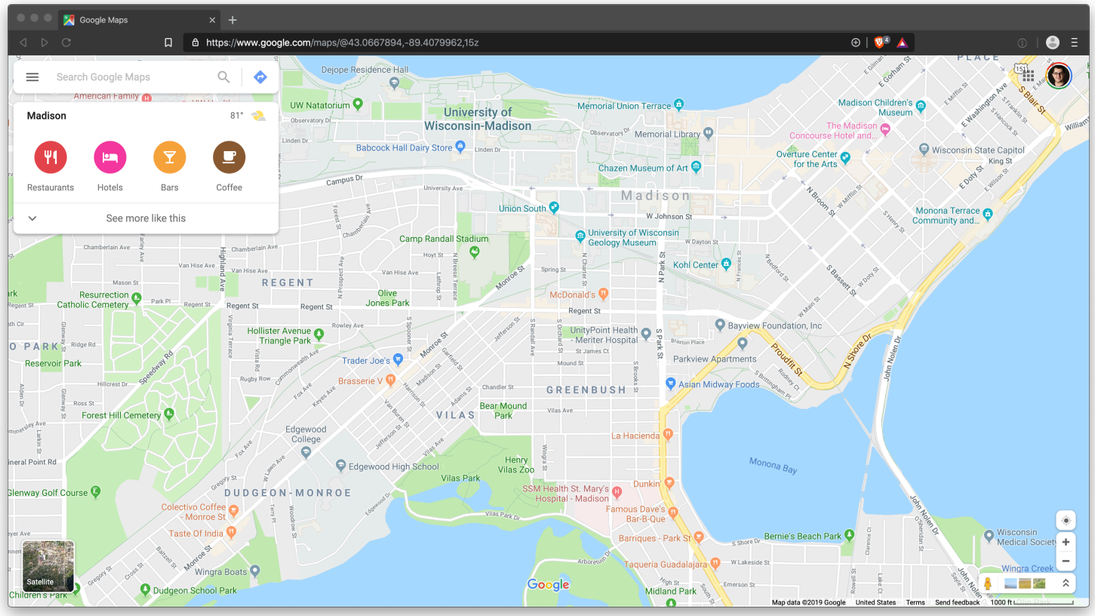
1. "Show one single thing"
2. "Show a list or set of things"
3. "Provide tools to create a thing"
4. "Facilitate a task"

[2] Tidwell, 2010, *Designing Interfaces*

"Show one single thing"

Focuses on conveying information on a specific topic/facilitating a specific activity

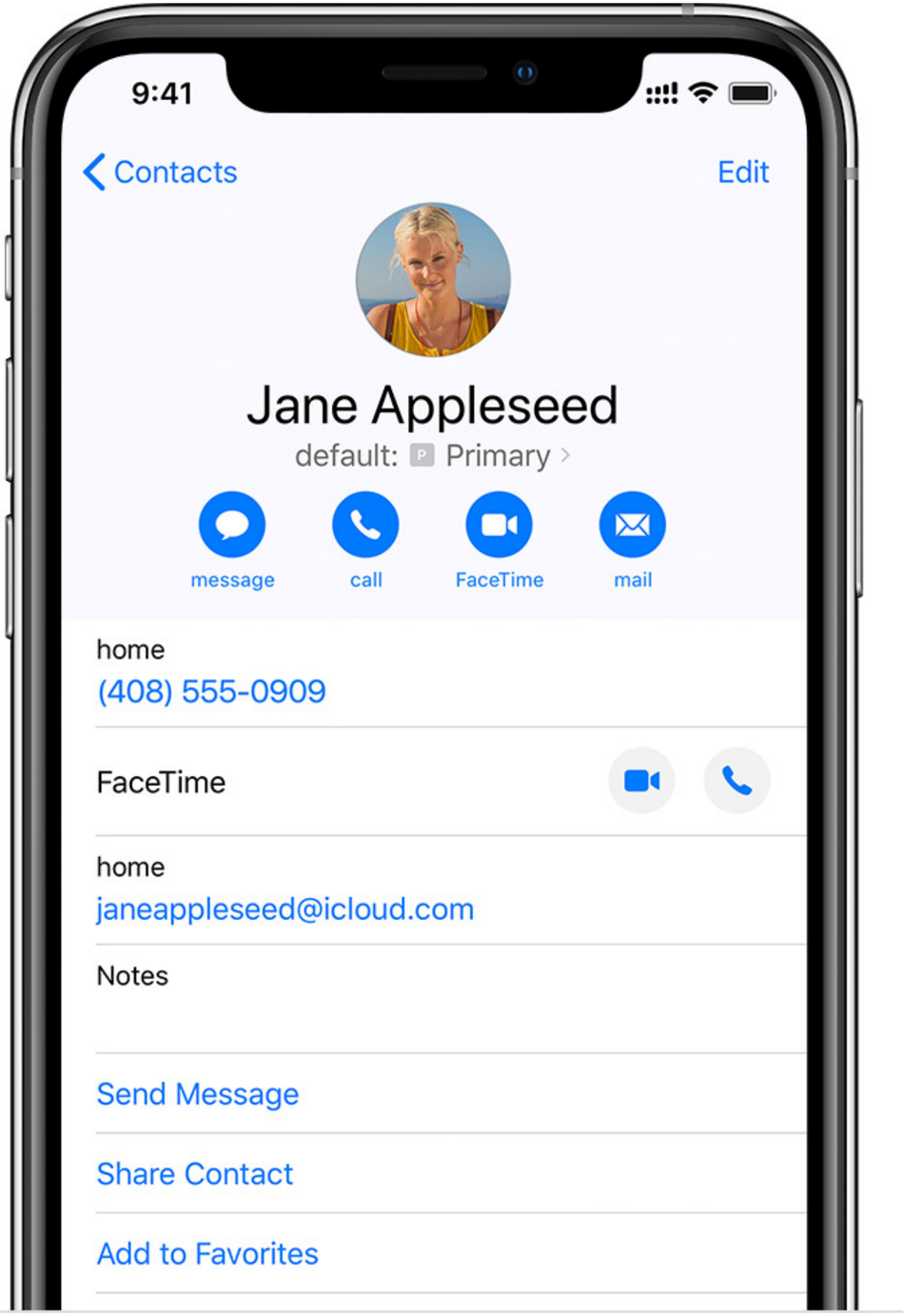




Supports a specific activity, eliminating other distractions.

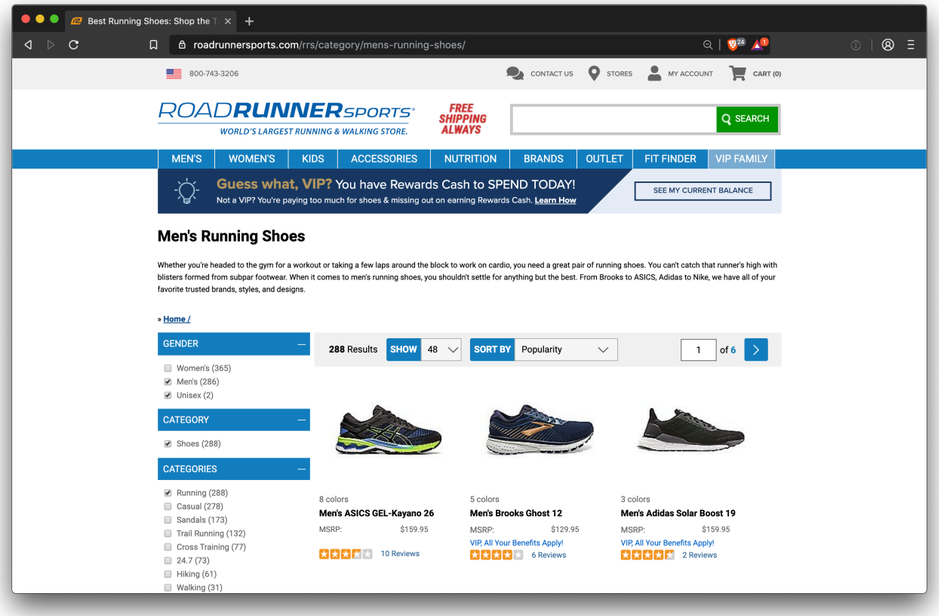
Includes key components:

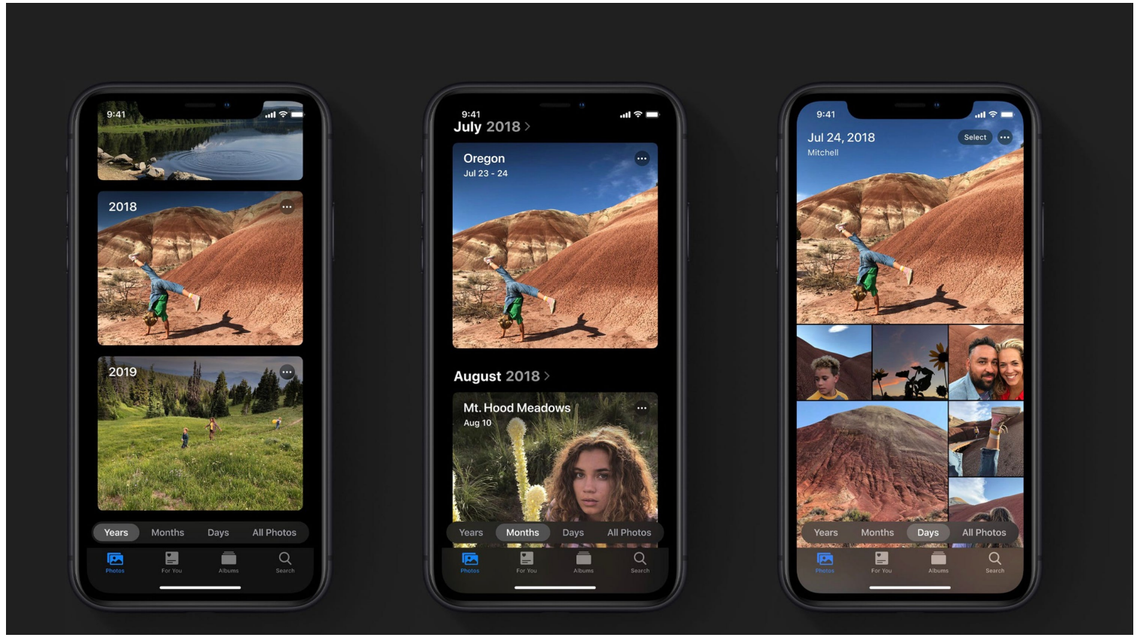
1. Content of the "single thing"
2. Supporting tools that help the user act on the content



"Show a list or set of things"

Provides rows or grids of items of the same kind that provide links to components that focus on that item.

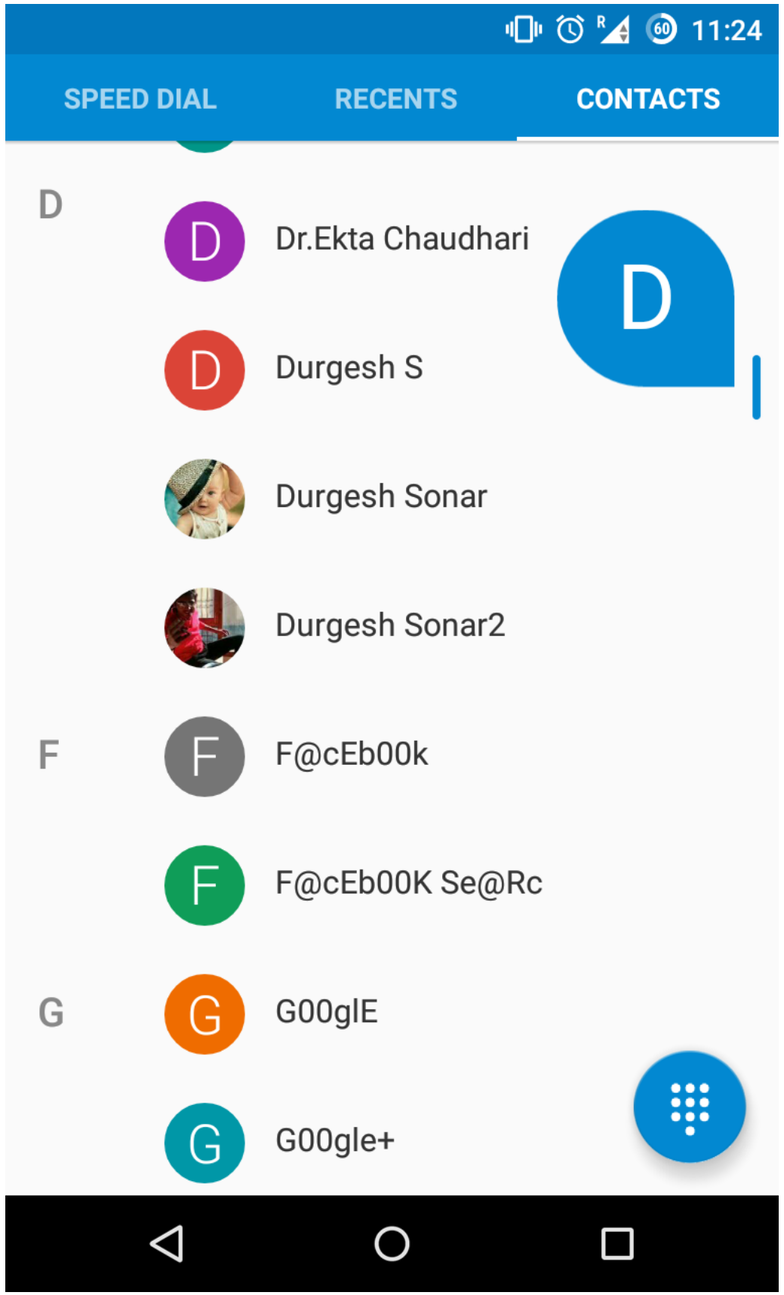




Includes design elements that help the user organize and categorize the lists

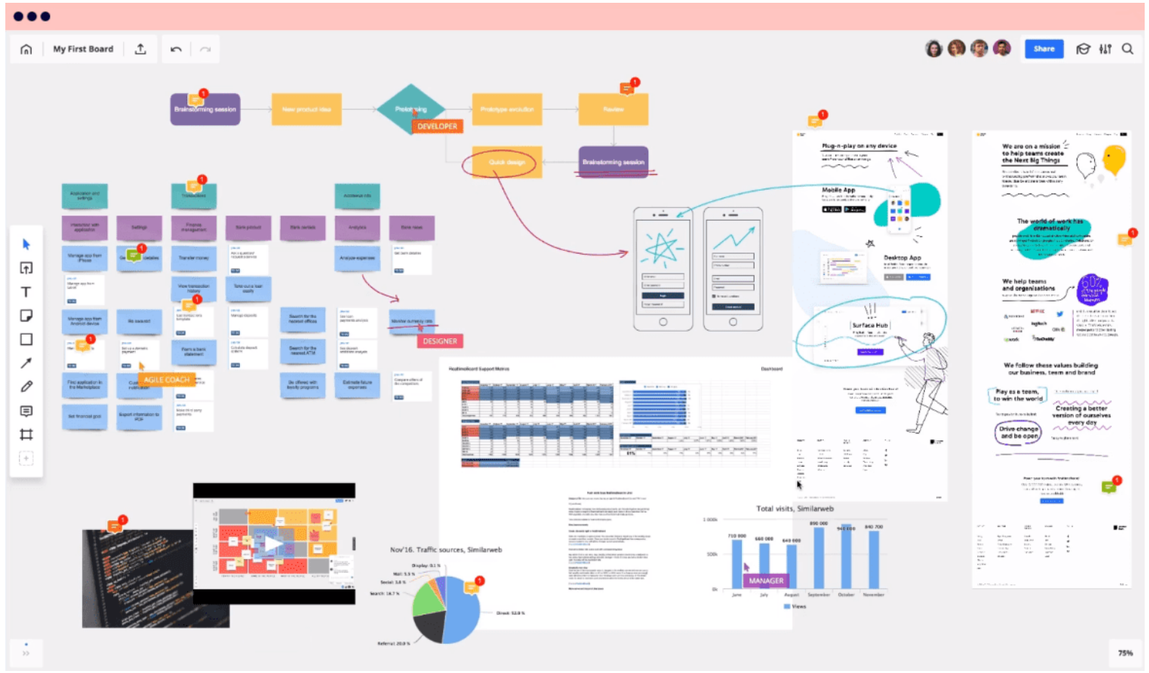
Can be applied hierarchically

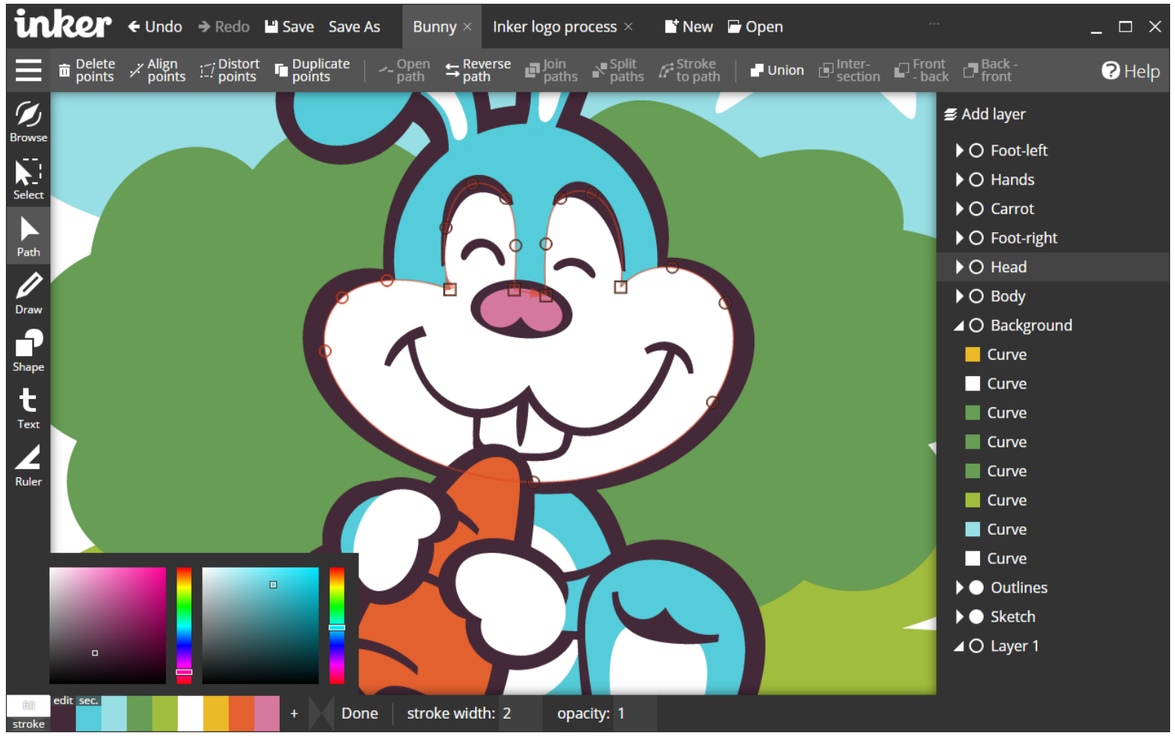
Does this remind you of something we've been discussing?



"Provide tools to create a thing"

Supporting user creation of new content, e.g., a canvas on which to write, draw, paint or structured form for data entry

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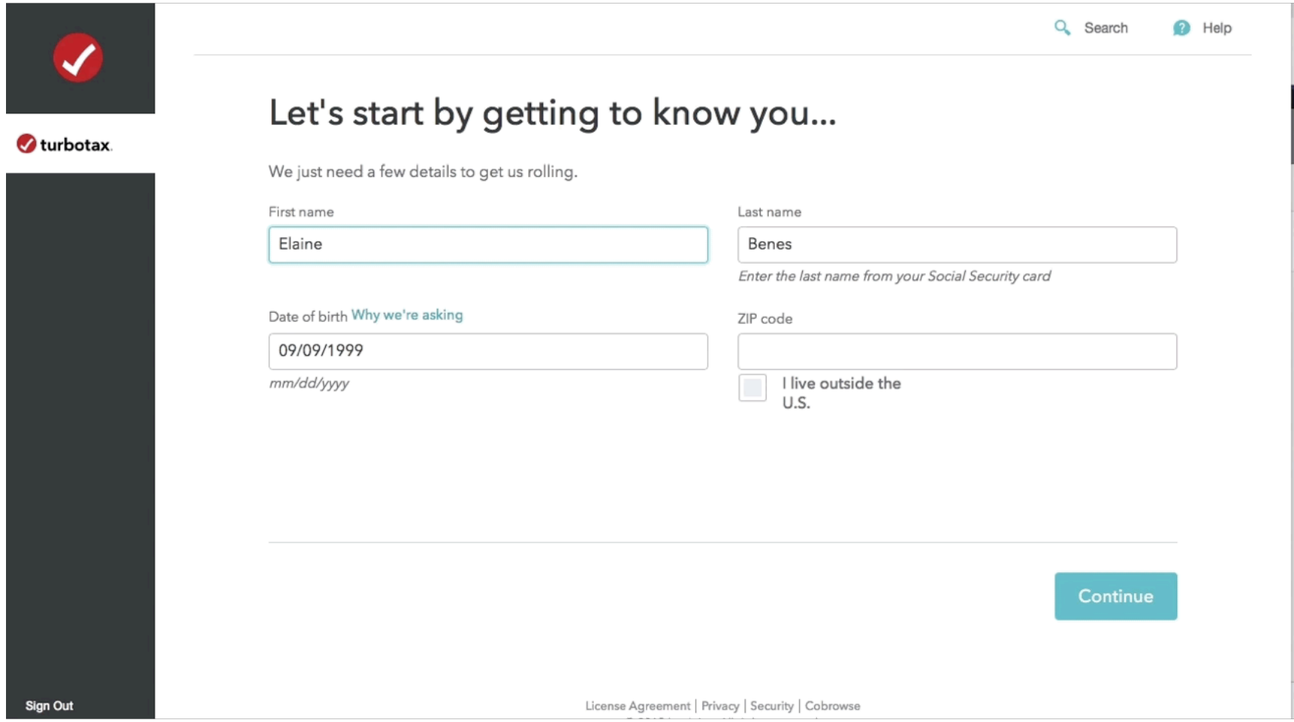
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Let's start by getting to know you...
We just need a few details to get us rolling.
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Benes
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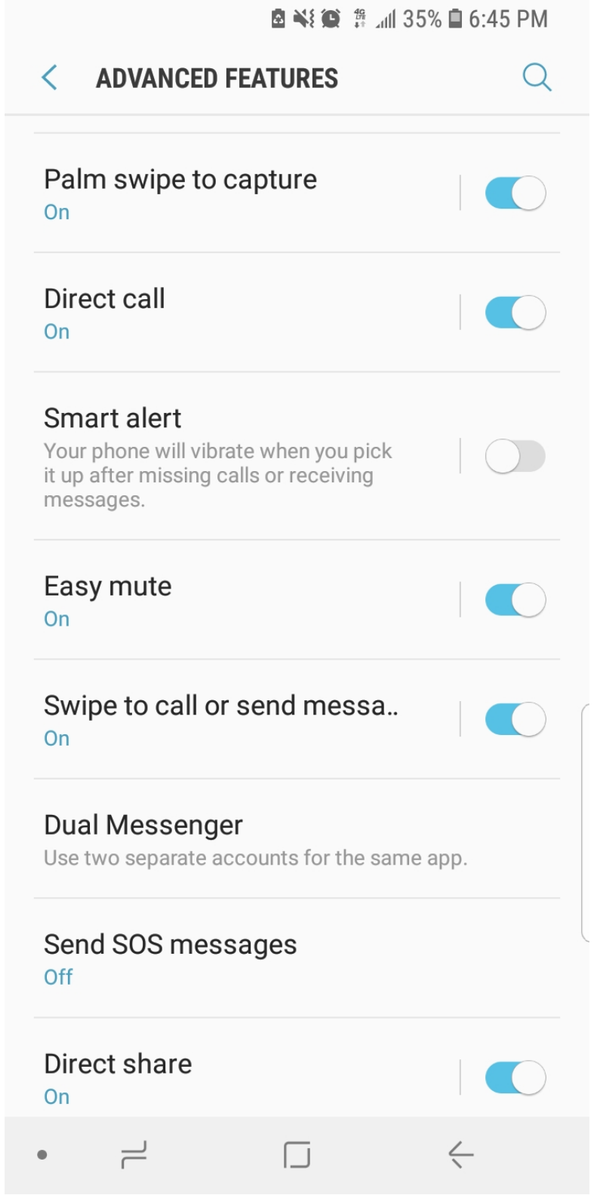
"Facilitate a task"

Provides collections of components or controls that help users perform specific actions, e.g., changing a setting

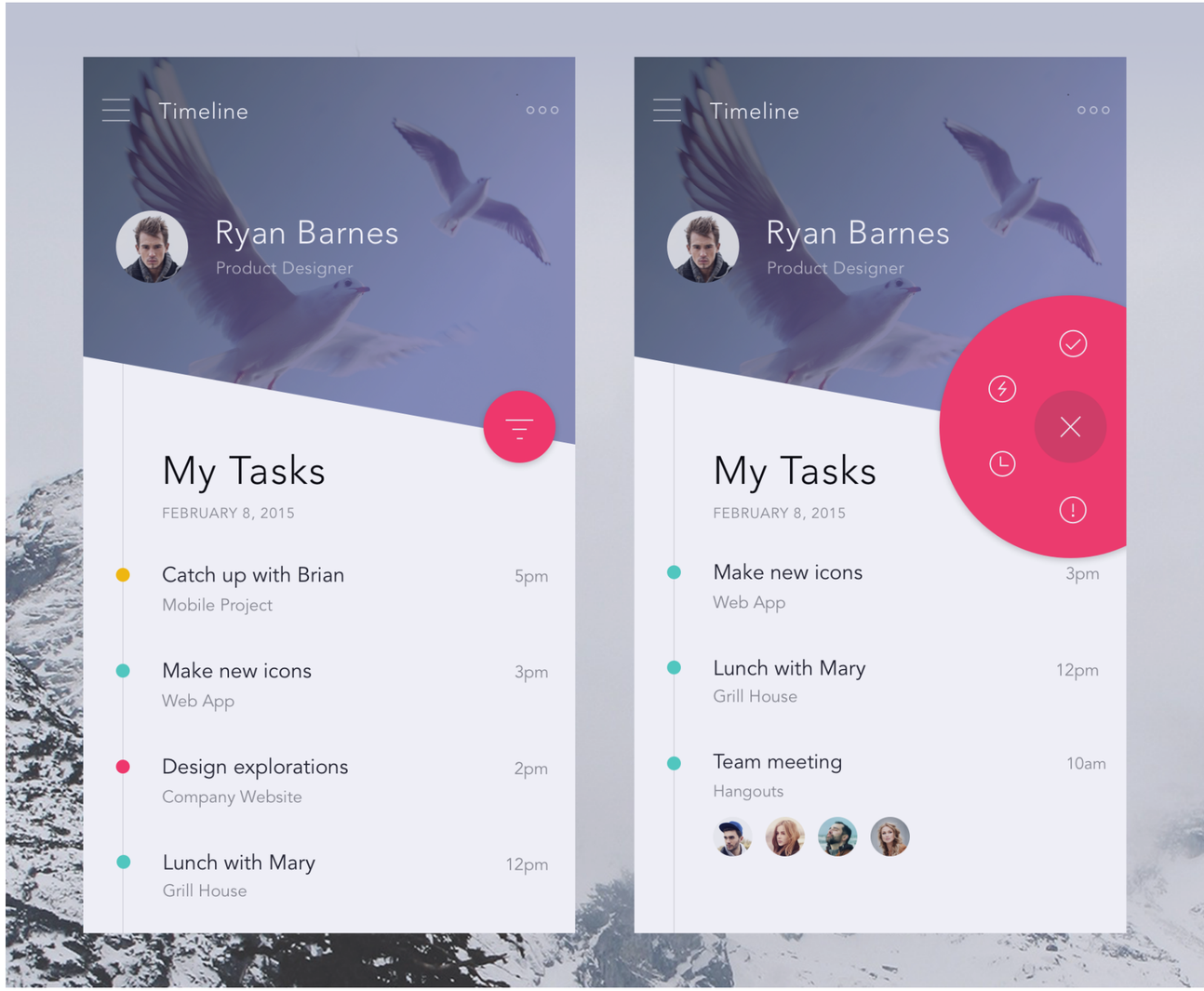
The designer must organize these controls in an effective and logical way



Combining Structures

Any page/component can follow the structure of these components, thus they can be combined to create complex applications

Single-page applications (SPAs) often combine these structures



Layout

Layout

Definition: Arrangement of visual elements on a canvas.[3]

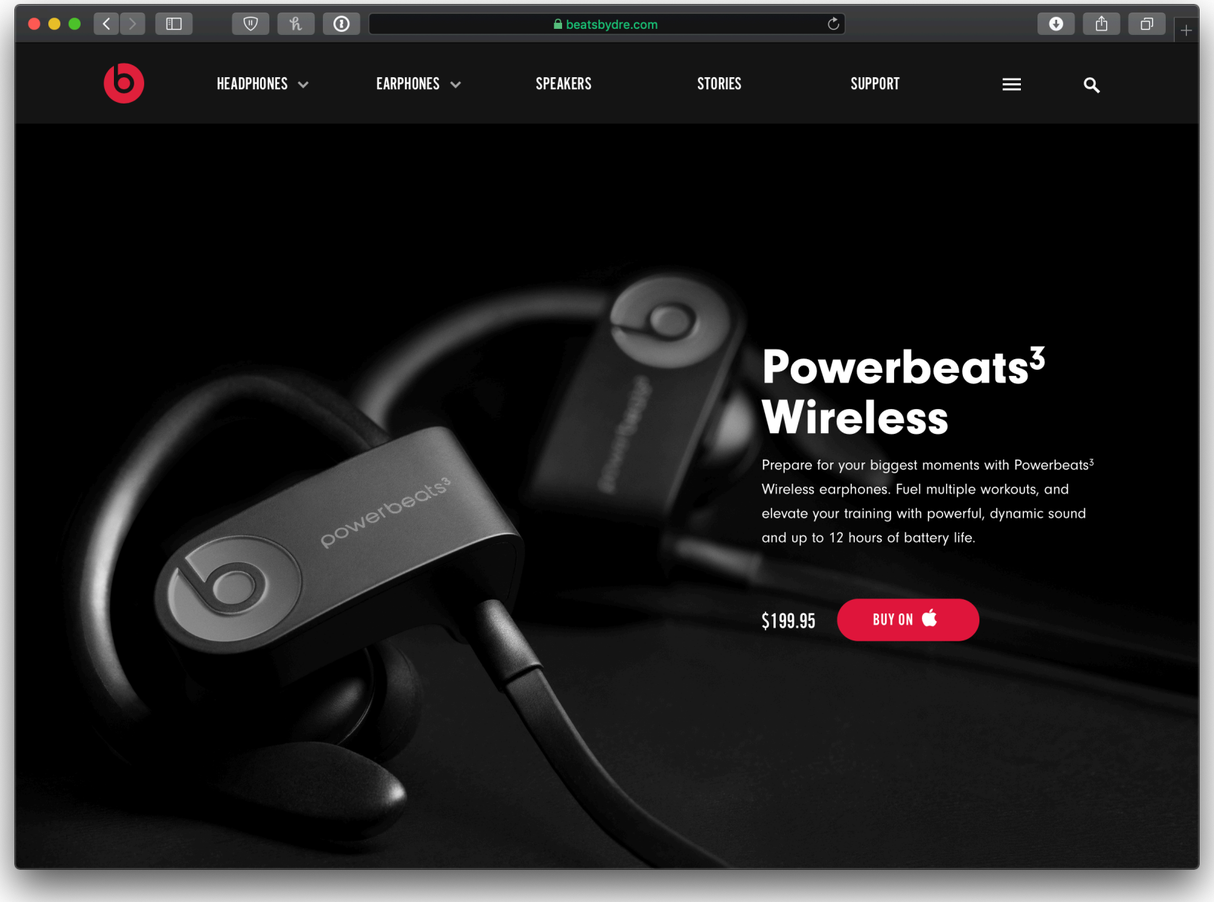
- Creating a focal point
- Following the golden ratio
- Using the rule of thirds
- Effectively using grids
- Integrating type
- Placing imagery
- Using negative space
- Grouping using gestalt theory
- Creating visual hierarchy
- Exploiting visual scan patterns
- Creating contrast/emphasis

[3] These build on the visual design elements/principles that we covered last week.

Creating a focal point

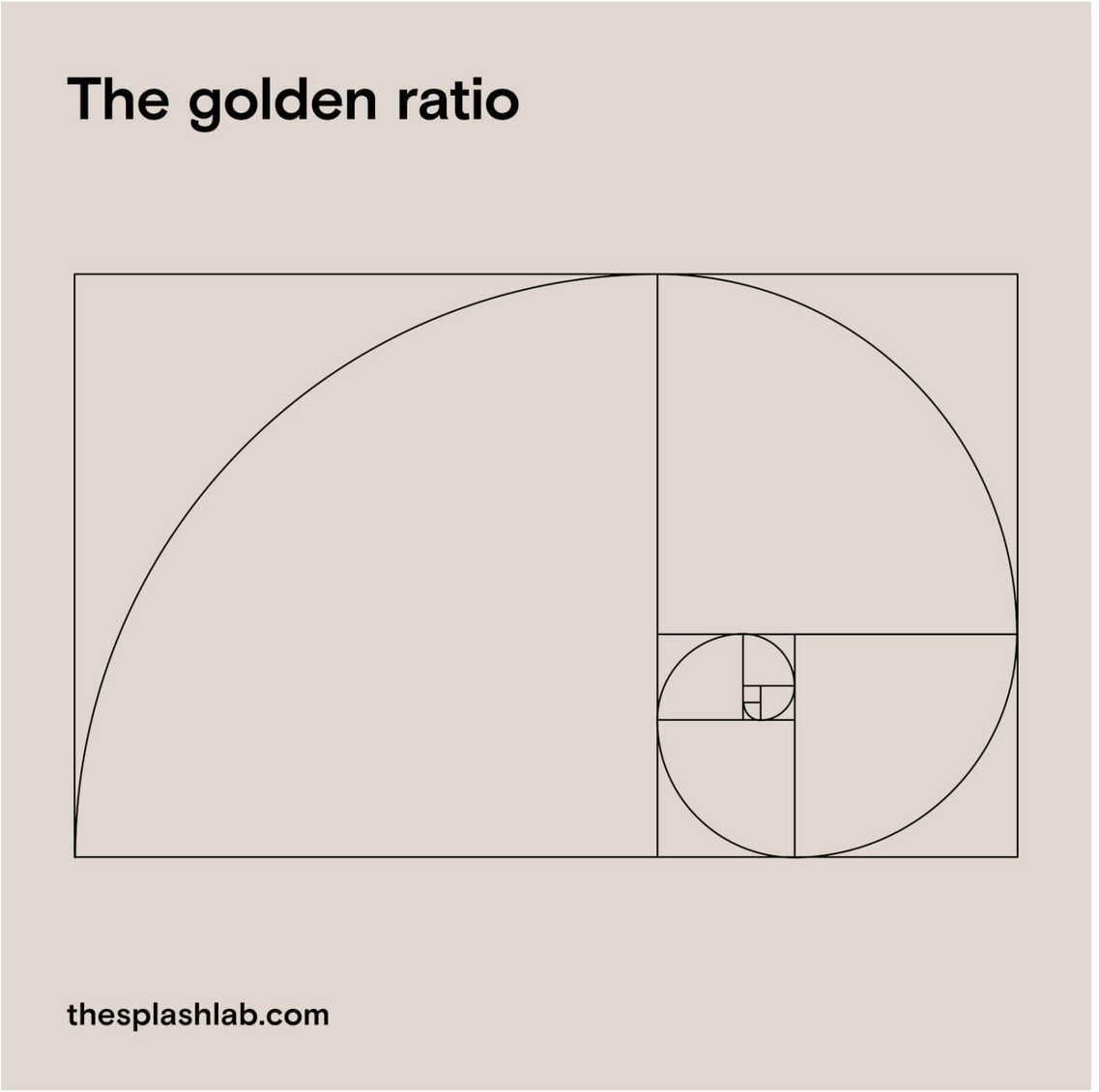
Definition: Aka, center of visual interest, where the design directs the attention of the viewer first.

Pro Tip: Successful use locks attention to the focal point and gently guides it to its next destination.

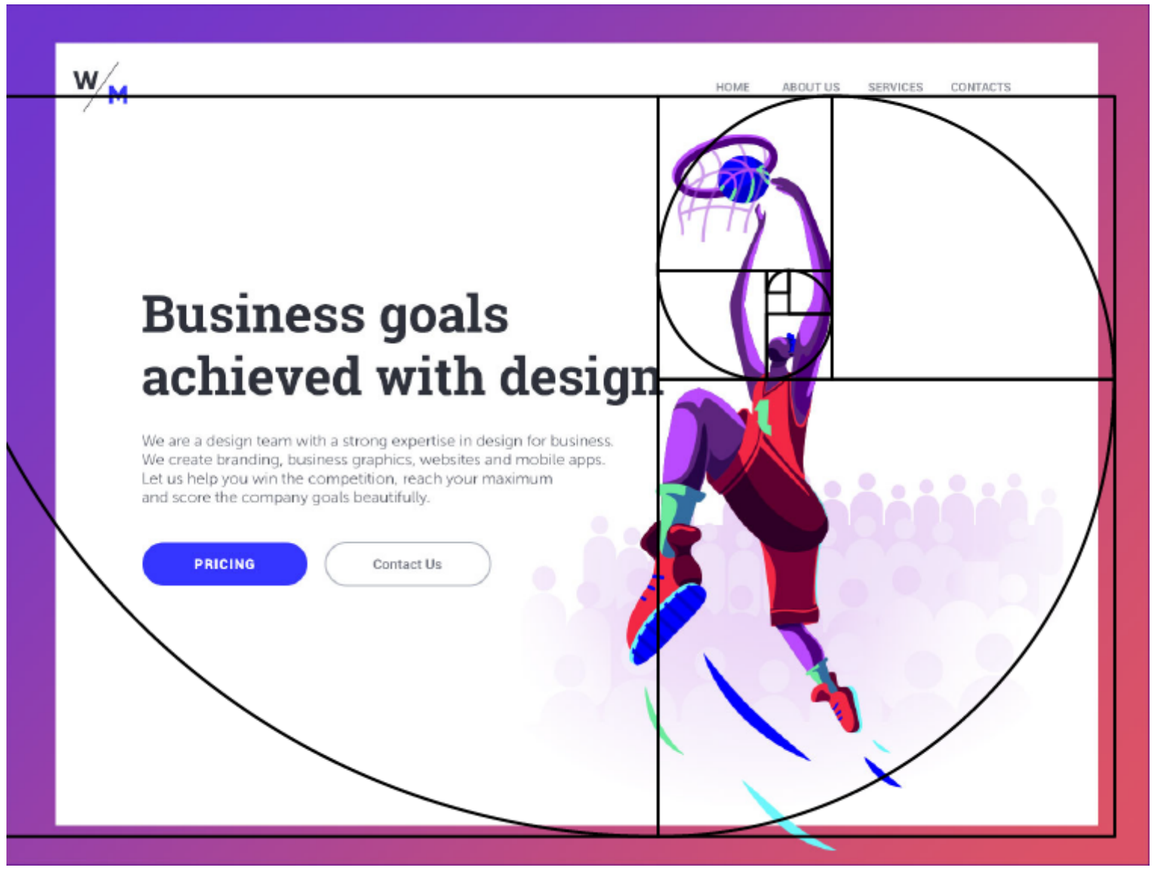


Following the golden proportion[4]

Definition: A ratio, `1:1.618`, which creates a compositional grid that suggests an asymmetrical, but balanced placement of items on a layout and produces a universal aesthetic appeal.



[4] Further reading on the golden ratio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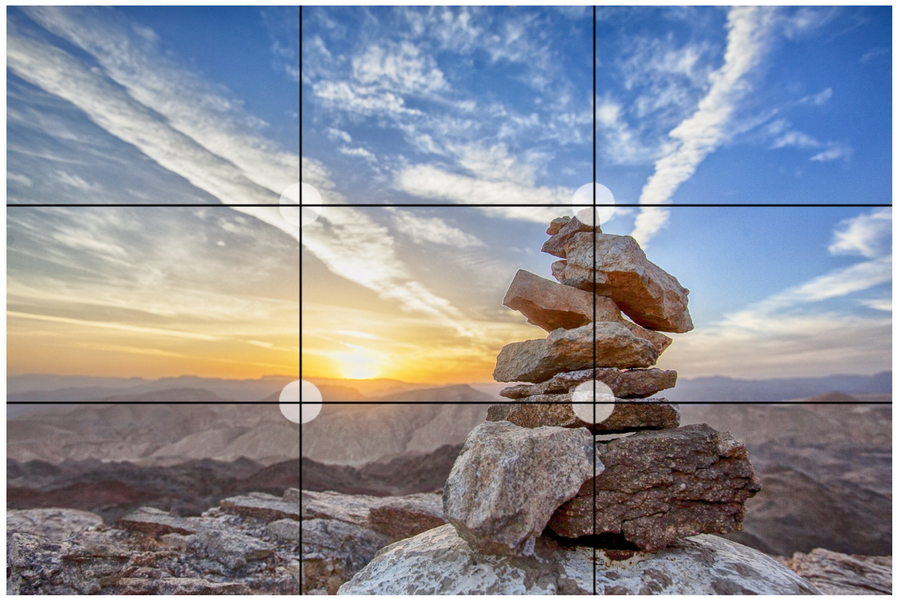
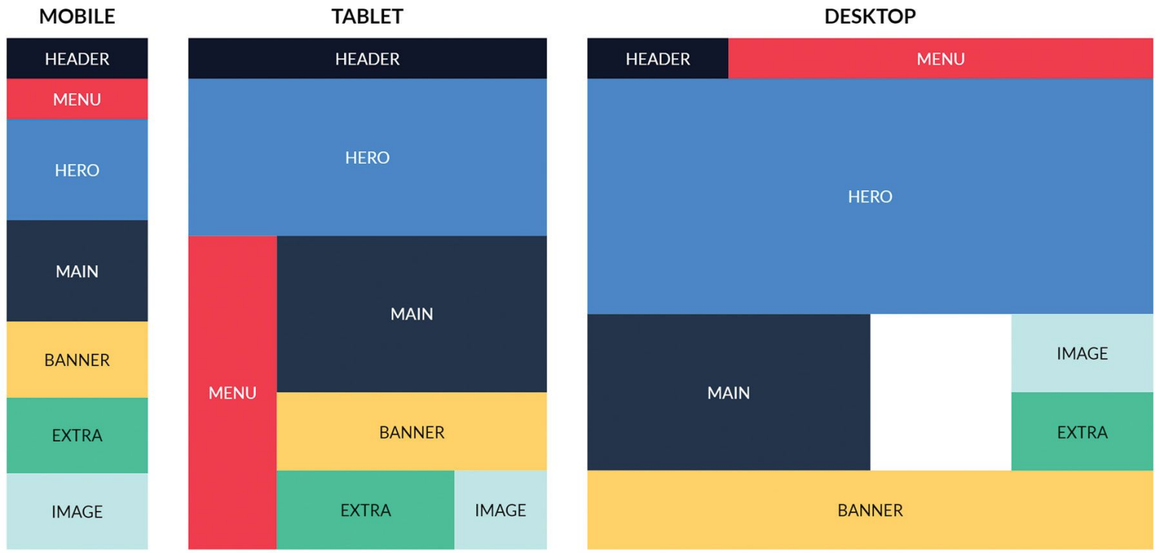
Using the rule of thirds

Definition: An approximation of the golden ratio that is easier and more flexible to use. When the canvas is divided into a 3x3 grid, the intersections serve as focal points.



Effectively using grids

Definition: Grids serve as a visual framework for organizing elements in an orderly and balanced fashion.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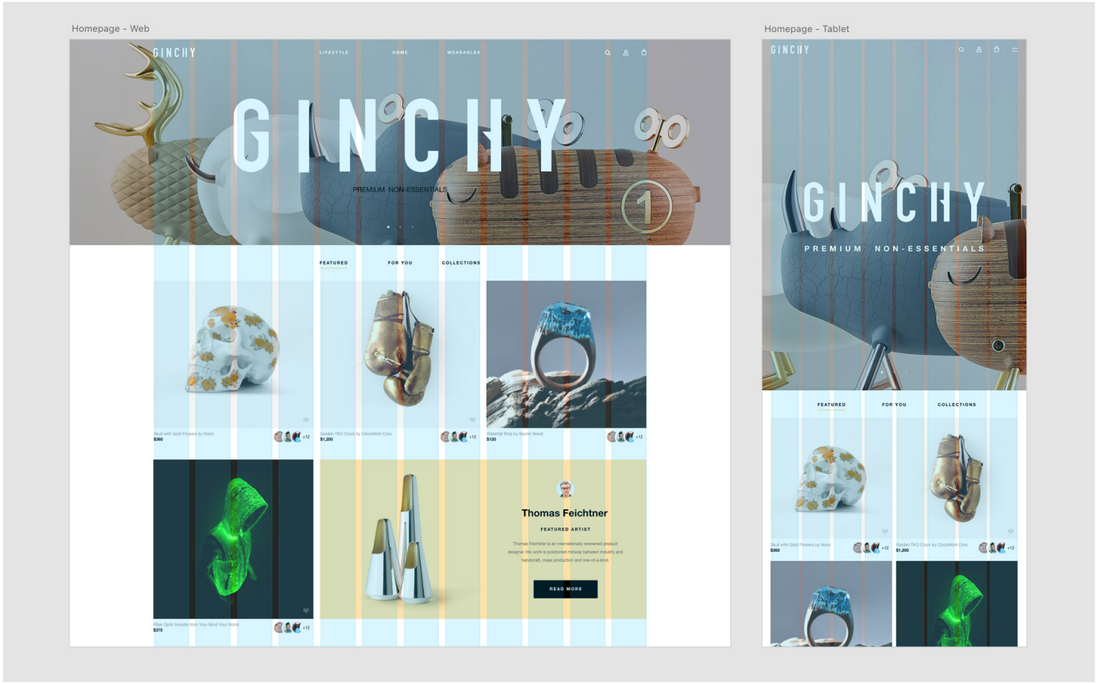
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FEATURED ARTIST
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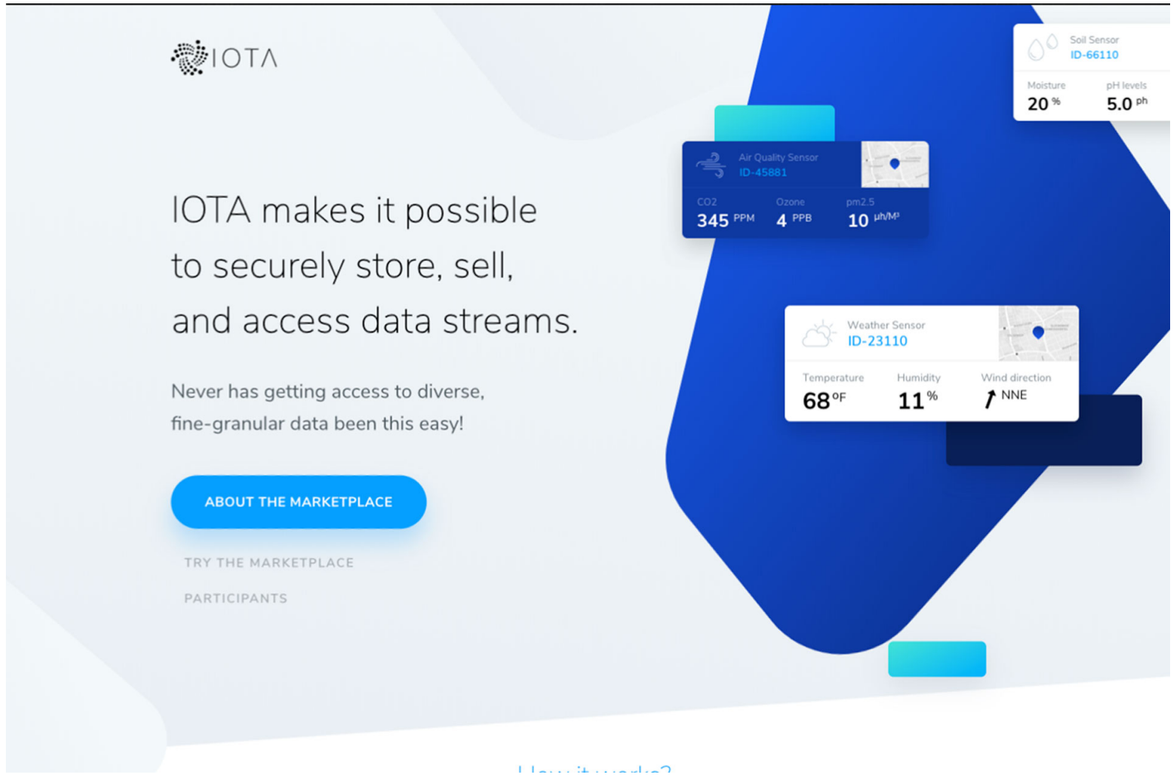
COLLECTIONS

Integrating type

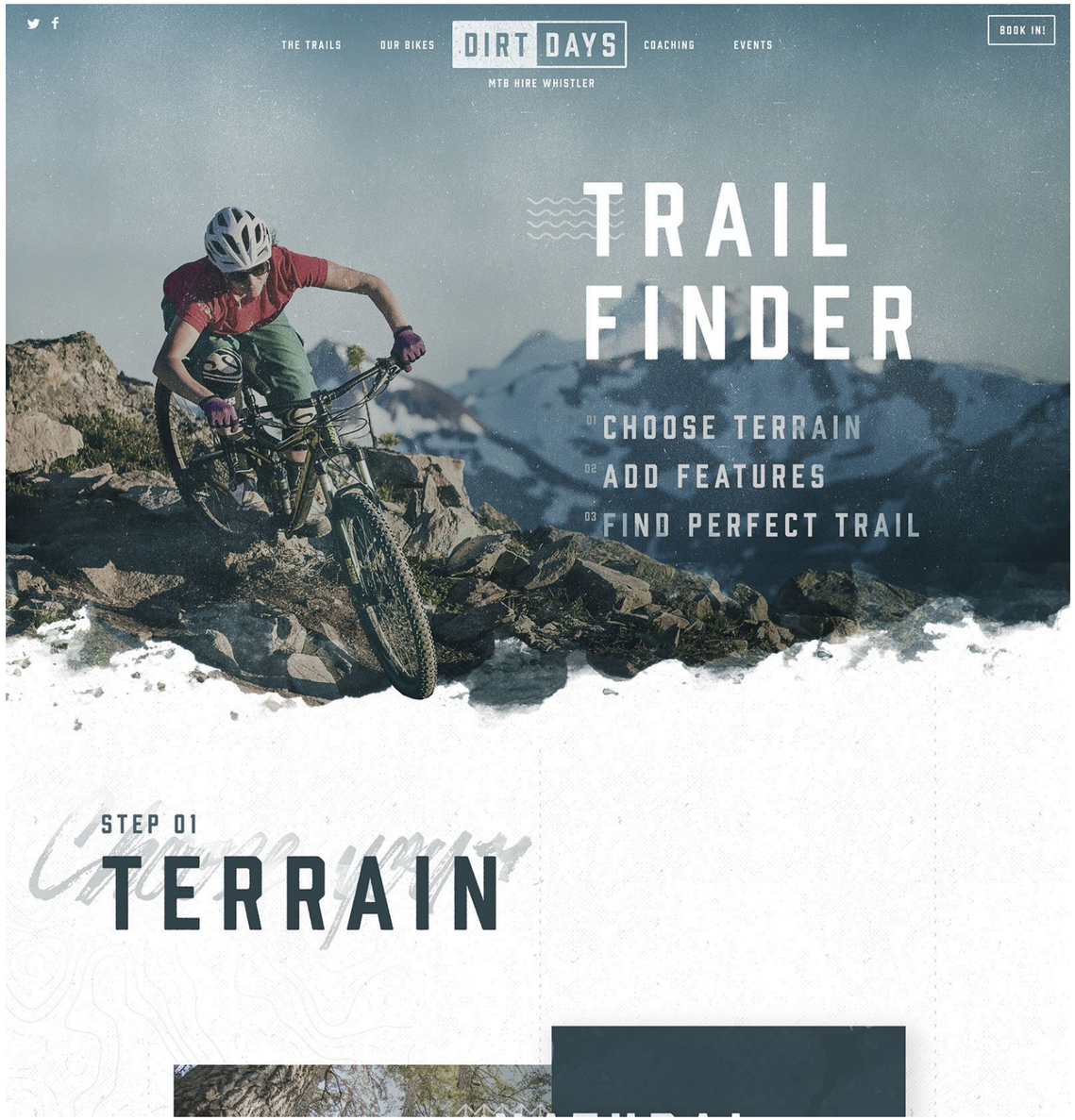
Definition: The use of *headlines* or *blocks of text* to guide the user's attention to messages.



Placing imagery

Definition: The use of imagery to create a focal point or movement on the canvas.

Pro Tips: Place on top, not bottom; direction should be toward next focal point; never flip images; do not interrupt headlines; do not wrap text around images.



Using negative space

Definition: Space left on the canvas from other design elements, used to provide a visual break and create balance.

Media: Diapers-01.jpg
Time: 00:00:00.000 - 00:00:06.033
Participant filter: All
21.75 secs
sensitive skin.
sensitive skin, add the chemicals and moisture
you have diaper rash.
's unique high-absorbency natural-blend cotton
cotton-soft, extra thick, gel-free protection
baby's sensitive skin. The chlorine-free materials and
sorbent polymers is non-toxic and non-irritating. Clinically
tested and pediatrician recommended for babies with allergies
and sensitive skin.
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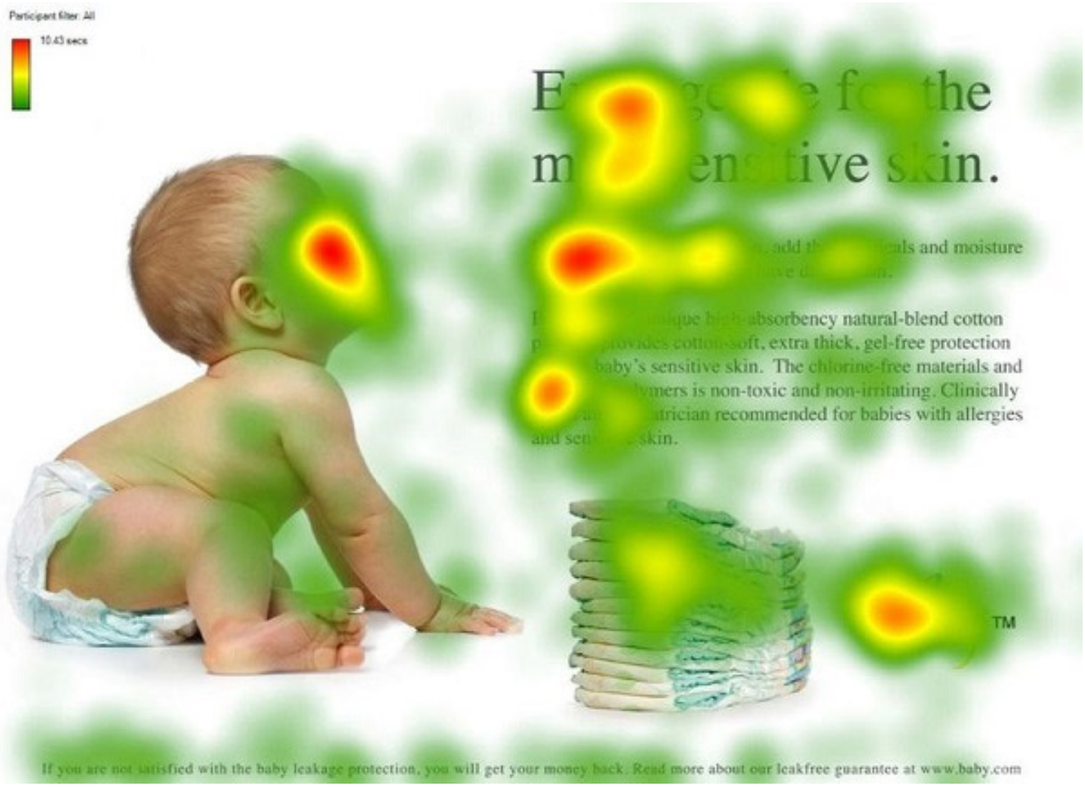
If you are not satisfied with the baby leakage protection, you will get your money back. Read more about our leakfree guarantee at www.baby.com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sensitive skin.
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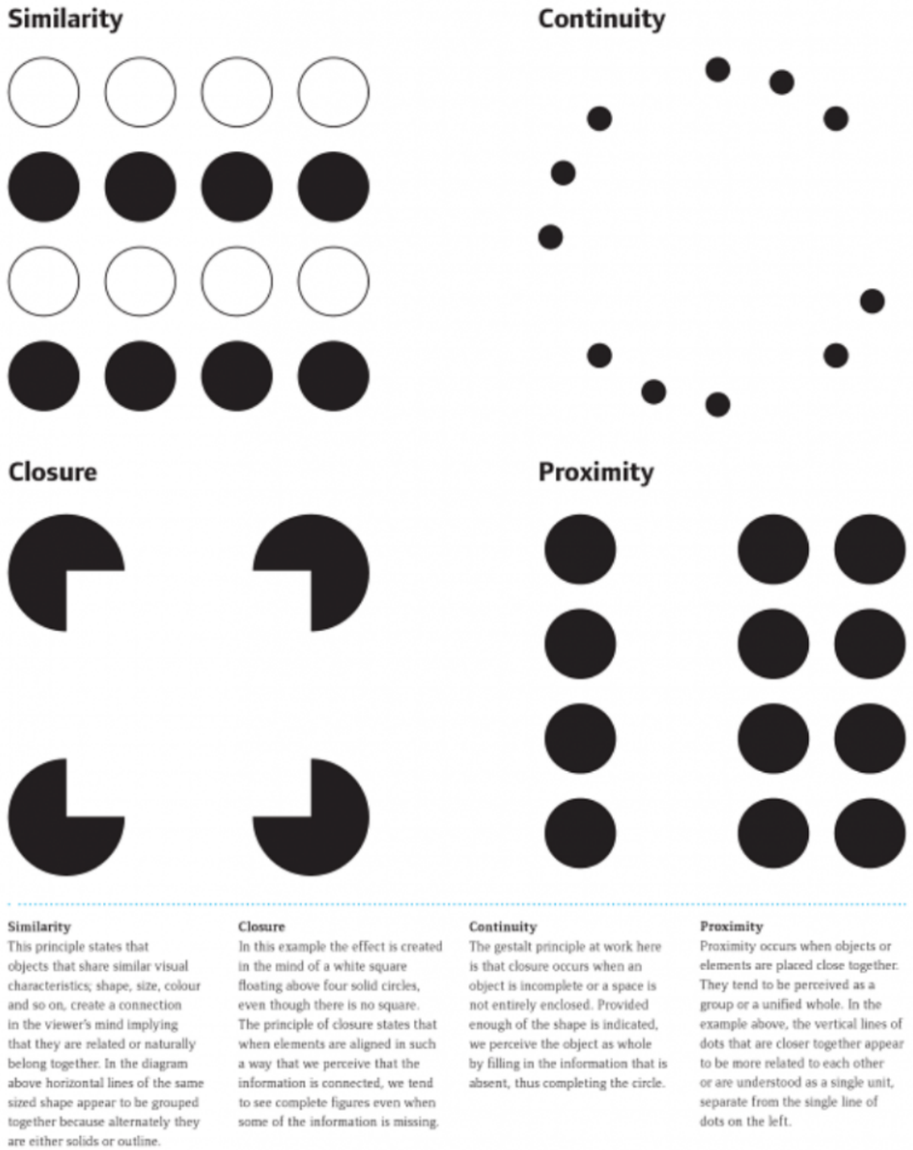
absorbency natural-blend cotton
cotton-soft, extra thick, gel-free protection
baby's sensitive skin. The chlorine-free materials and
mers is non-toxic and non-irritating. Clinically
trician recommended for babies with allergies
skin.
™
If you are not satisfied with the baby leakage protection, you will get your money back. Read more about our leakfree guarantee at www.baby.com

Grouping using Gestalt Theory

Definition: Visual perception principles that predict how users will perceive design elements.

Includes four key principles:

1. Proximity
2. Similarity
3. Continuity
4. Closure

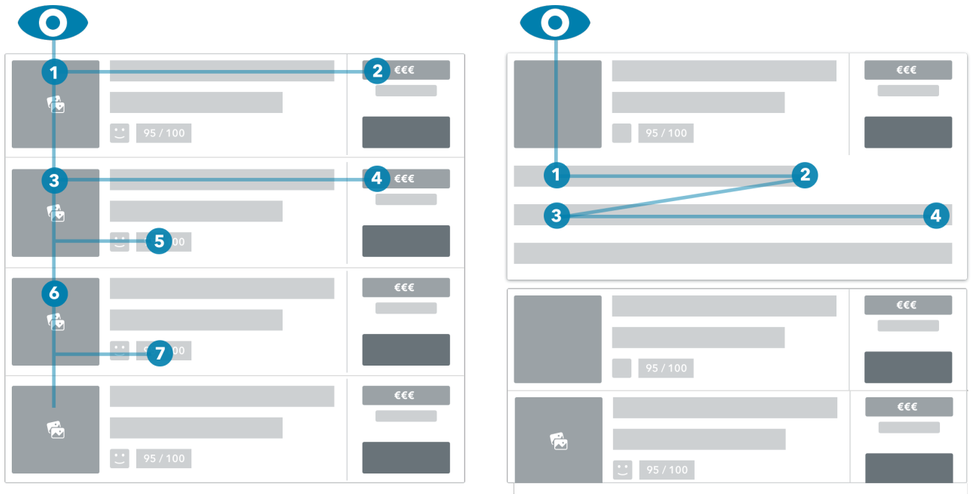


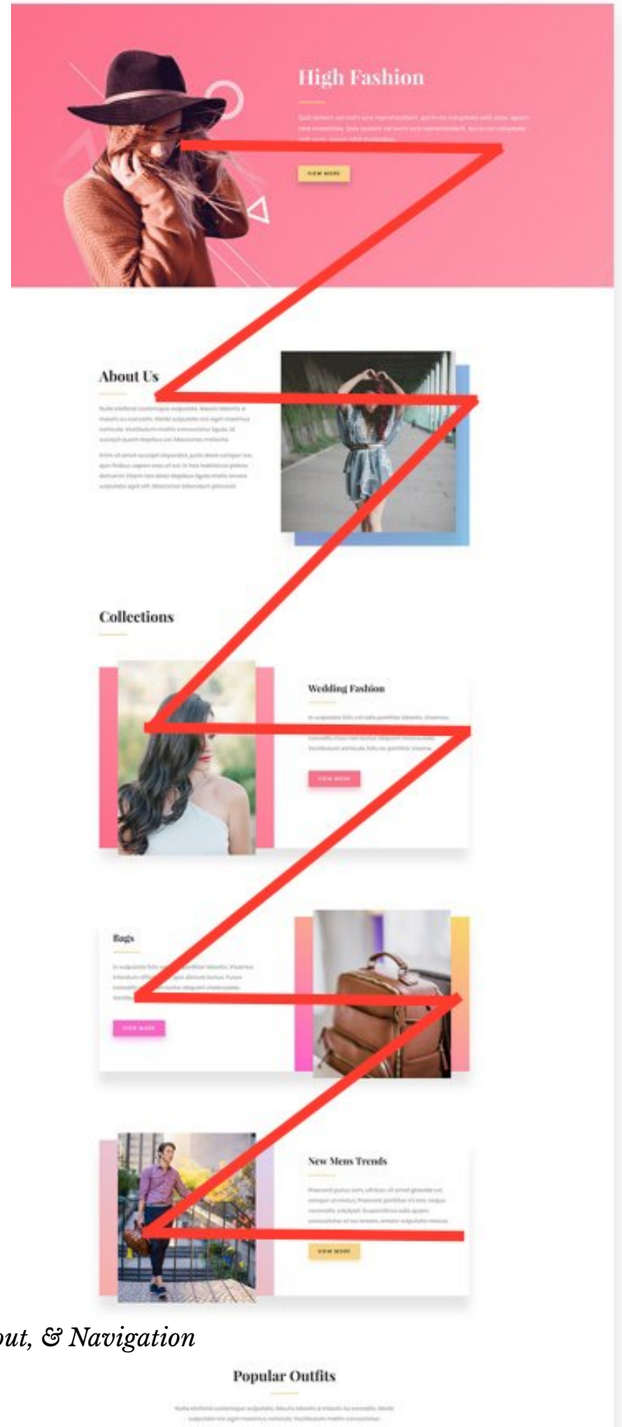
Creating visual hierarchy

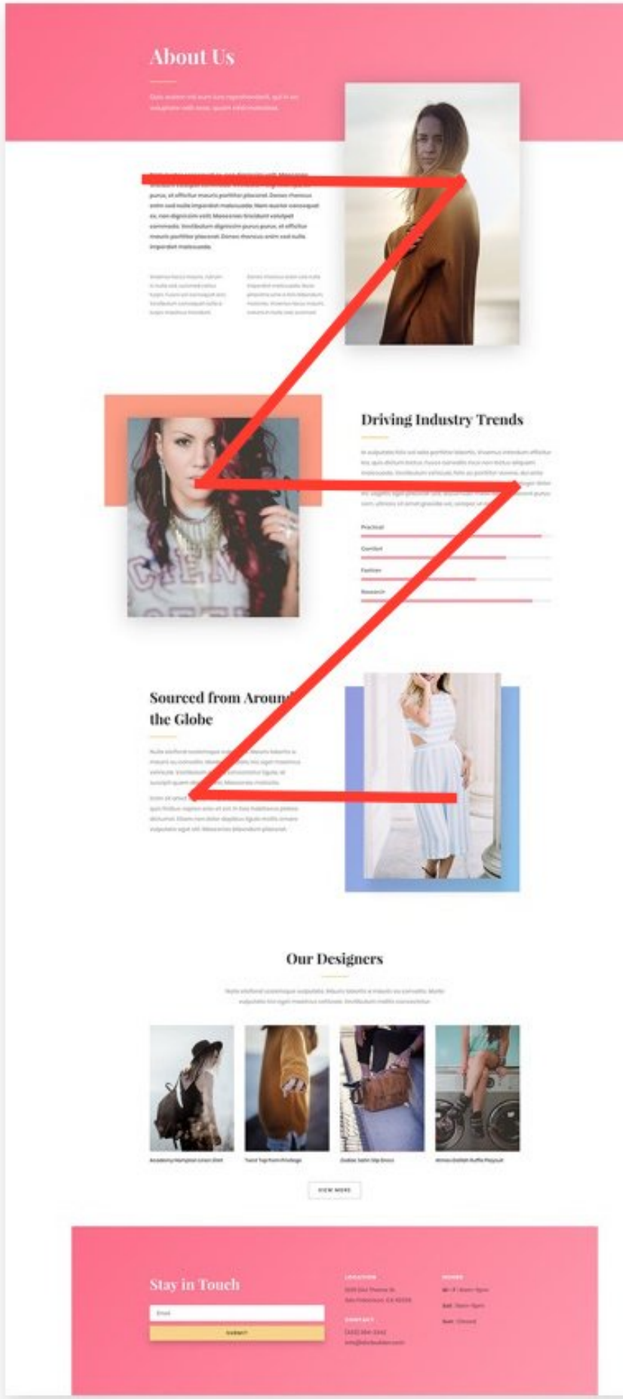
Definition: Using relative positioning and sizing to communicate what design elements are more important and should be looked at first.

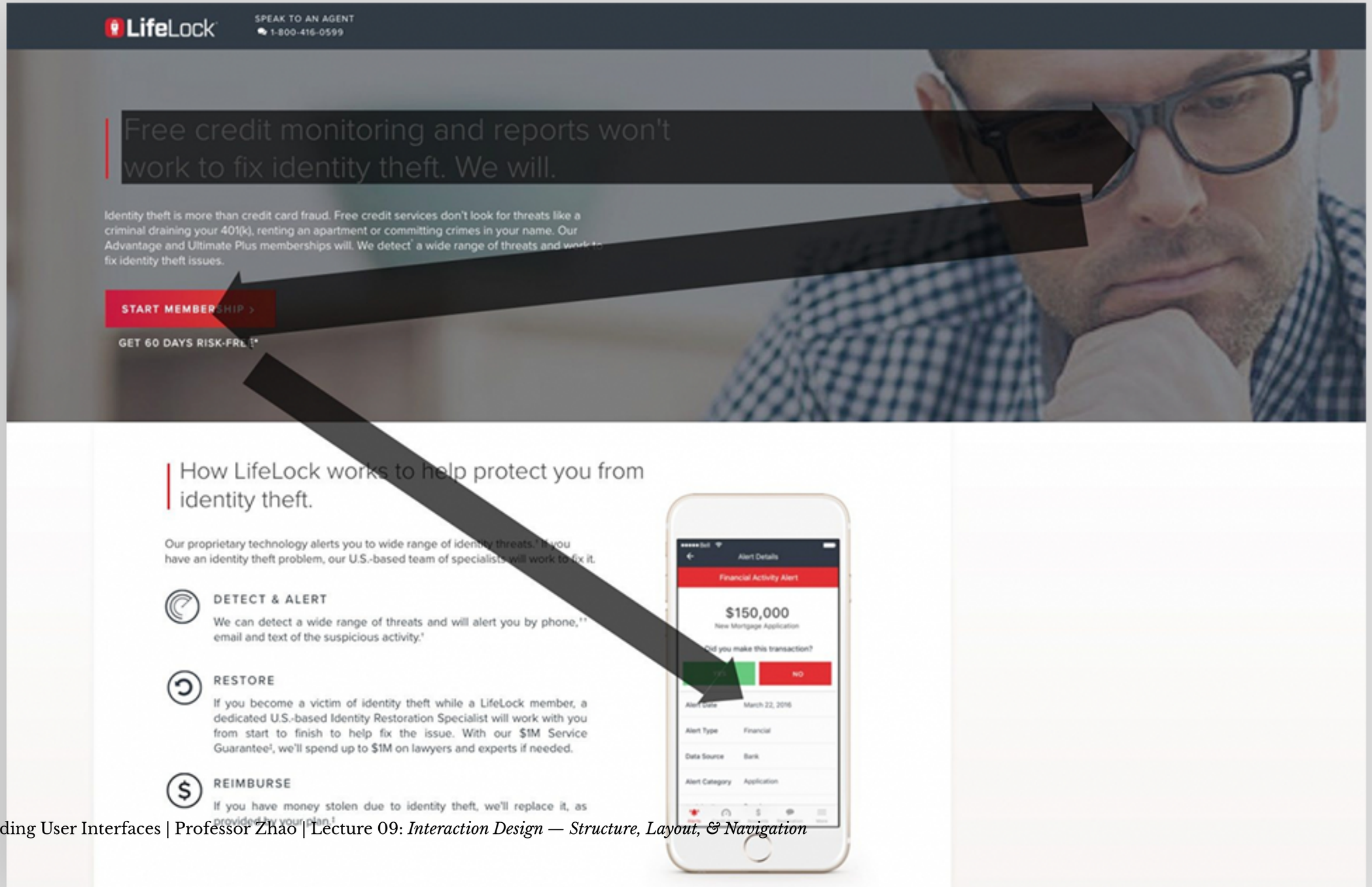
Exploiting visual scan patterns

Definition: Designing layouts that exploit common eye-scanning patterns, e.g., the F-pattern and the Z-pattern.





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Free credit monitoring and reports won't work to fix identity theft. We will.
Identity theft is more than credit card fraud. Free credit services don't look for threats like a criminal draining your 401(k), renting an apartment or committing crimes in your name. Our Advantage and Ultimate Plus memberships will. We detect a wide range of threats and work to fix identity theft issues.
START MEMBERSHIP
GET 60 DAYS RISK-FREE*
How LifeLock works to help protect you from identity theft.
Our proprietary technology alerts you to wide range of identity threats.† If you have an identity theft problem, our U.S.-based team of specialists will work to fix it.
DETECT & ALERT
We can detect a wide range of threats and will alert you by phone,†† email and text of the suspicious activity.†
RESTORE
If you become a victim of identity theft while a LifeLock member, a dedicated U.S.-based Identity Restoration Specialist will work with you from start to finish to help fix the issue. With our $1M Service Guarantee‡, we'll spend up to $1M on lawyers and experts if needed.
REIMBURSE
If you have money stolen due to identity theft, we'll replace it, as
Alert Details
Financial Activity Alert
$150,000
New Mortgage Application
Did you make this transaction?
NO
Alert Type
Financial
Data Source
Bank
Alert Category
Application

Creating contrast and emphasis[5]

Definition: Using contrast and emphasis to establish visual hierarchy by manipulating features of design elements, including position, size, color, typographic characteristics.

TABLE 10.1. Opposing features that can create contrast.

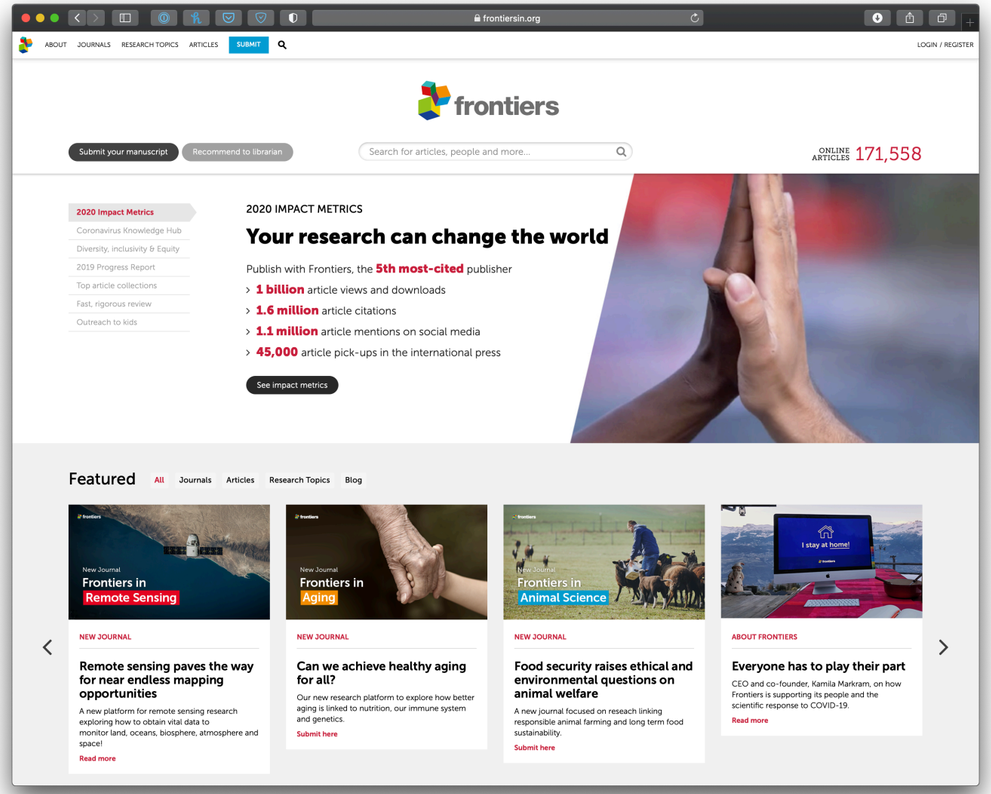
Contrast Type	Feature 1	Feature 2
Spatial contrast	Filled space High density	Empty space Low density
Layout contrast	Top High Right Isolated Symmetrical	Bottom Low Left Grouped Asymmetrical
Form contrast	Simple Representational Geometric Angled	Complex Abstract Organic Curved
Direction contrast	Vertical Static	Horizontal Moving
Style contrast	Technical and precise Playful	Hand-drawn and irregular Serious
Size	Large Long Wide	Small Short Narrow
Color contrast	Dark Black and white Warm colors Vivid	Light Colorful Cool colors Muted
Texture contrast	Fine Smooth	Coarse Rough
Typographic contrast	Serif Roman style (regular)	Sans serf Bold style

[5] Golombisky & Hagen, 2010, *White space is not your enemy*

In-Class Activity 1: Layout Deconstruction

Cheatsheet:

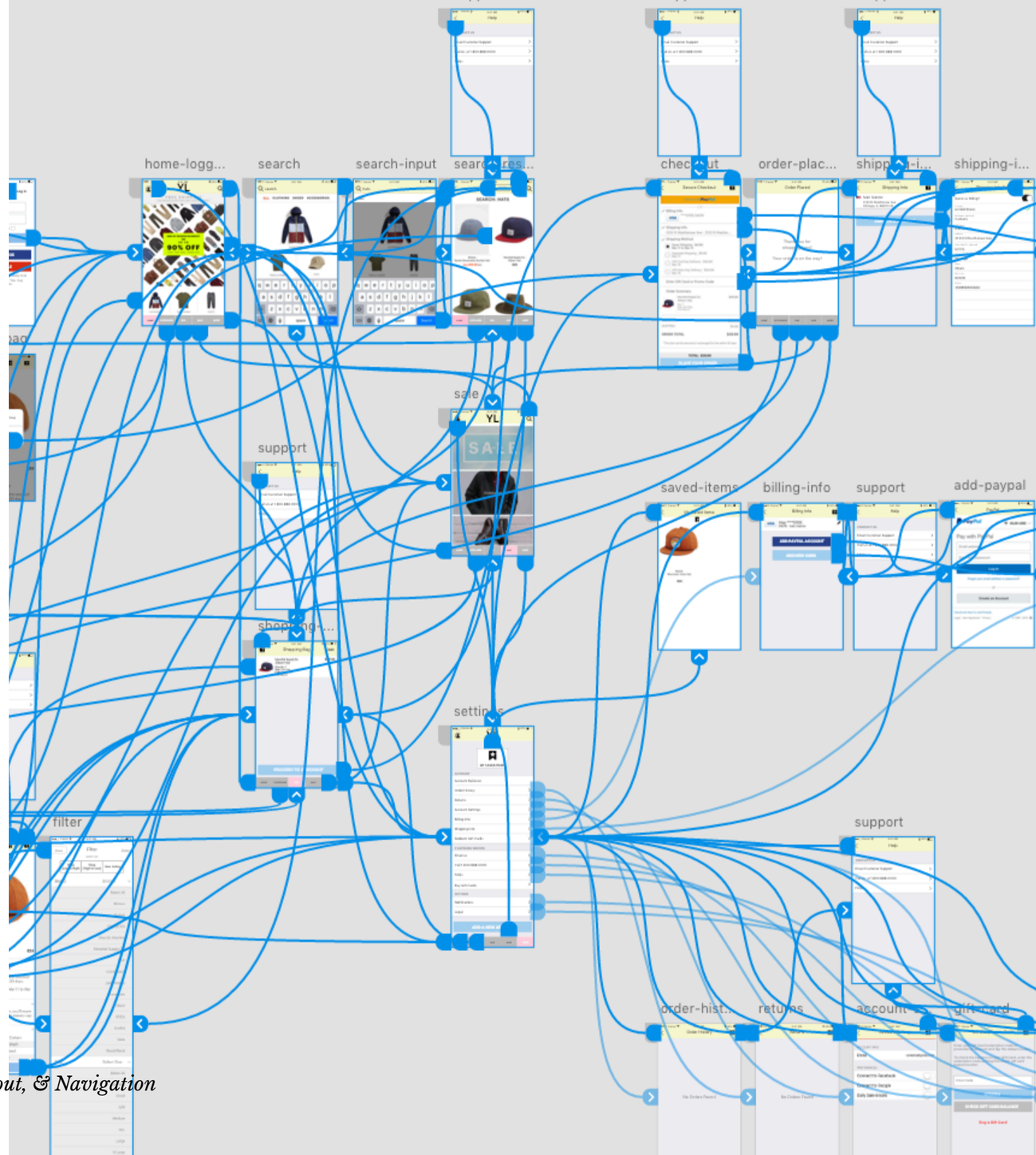
Creating a focal point
Following the golden ratio
Using the rule of thirds
Effectively using grids
Integrating type
Placing imagery
Using negative space
Grouping using gestalt theory
Creating visual hierarchy
Exploiting visual scan patterns
Creating contrast/emphasis



Principles of Navigation

Principles of Navigation[6]

1. Wayfinding
2. Cost
3. Aids
4. Models



[6] Tidwell, 2010, *Designing Interfaces*

Wayfinding

Definition: User behavior where navigation across components follows a particular workflow or supports user goals.

Three key elements:

1. Labels & signage
2. Navigation clues & aids
3. Maps, *e.g.*, site maps

BACK TO SHOP

SECURE CHECKOUT

Complete Your Purchase

NEED HELP?
If you need help, contact us and let us help you. Support is available for 24 hours.
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1 CART — 2 INFORMATION — 3 SHIPPING — 4 PAYMENT

BACK

SHIPPING METHOD

Choose one of the shipping methods below

- Standard Shipping 2-3 Days $3.00
- Special Shipping 1-2 Days $7.50

SHIPPING TO

John Doe
32 Syarifudin Street, West Bogor, West Java, Indonesia 112233
PHONE 012 34 567 89
ETD 1-2 Days

Is this wrong? Change here

ESTIMATION

Order	$137.19
Shipping	$0.00
Discount	$0.00
Tax	$10.00
TOTAL	**$147.19**

GO TO PAYMENT METHOD →

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Size: **12-PC Set**

7-PC Set | 10-PC Set | **12-PC Set**

- Polished cooking surface does not discolor, react with food or alter flavors.
- Cookware also features cool grip handles secured with stainless steel rivets and self-basting, tight fitting lids, Triple-Ply construction

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- Animal welfare
- Chemicals
- Climate positive value cha
- Water
- Business ethics

Get involved
- Care for your clothes
- Recycle your clothes

Sustainability Summary 201

Investors

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Capital Markets Day 2018
The share
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Dividend
Five year summary
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Cost

Definition: The time and effort required by users to navigate between components.

Two key principles:

1. Minimize factors that increase cost of navigation: *context switch*, *errors*, *delays*
2. Minimize travel time by minimizing number of steps and context switches

Aids

Definition: Design elements that aid users in navigating through content.

Three types of navigation aids:

1. Global navigation aids, *e.g.*, menus, tabs, sidebars
2. Utility navigation aids, *e.g.*, sign in, help, print
3. Associative/in-line navigation aids, *e.g.*, related links

Models

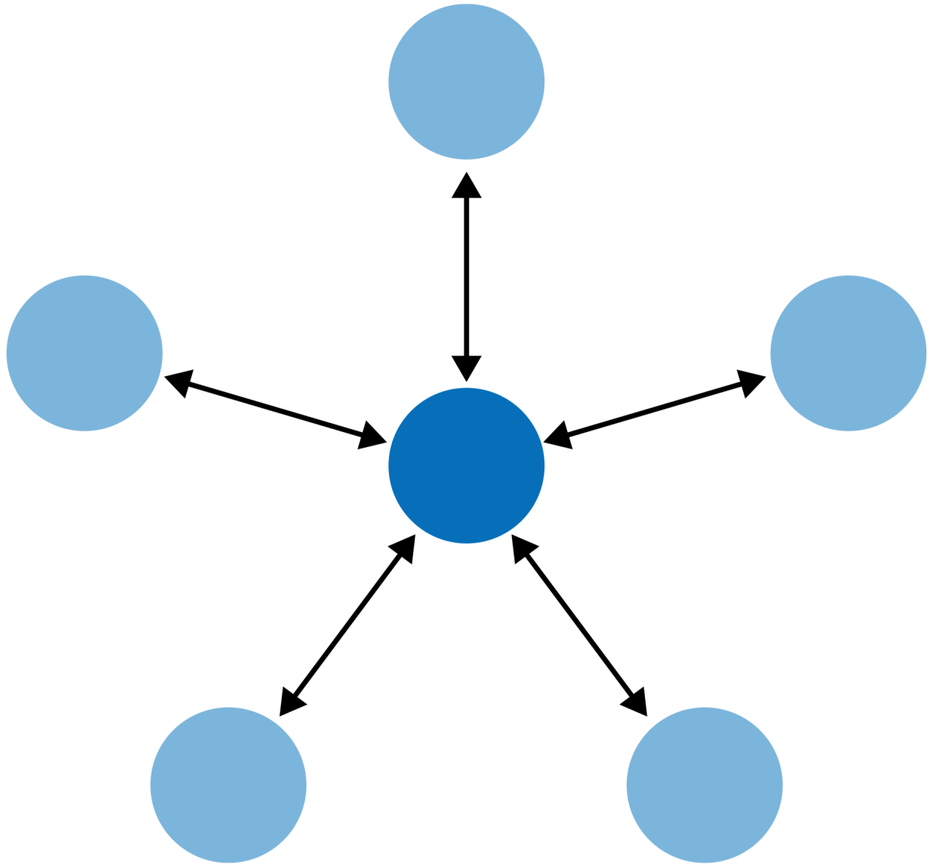
Definition: Commonly used patterns of navigation through interactive applications.

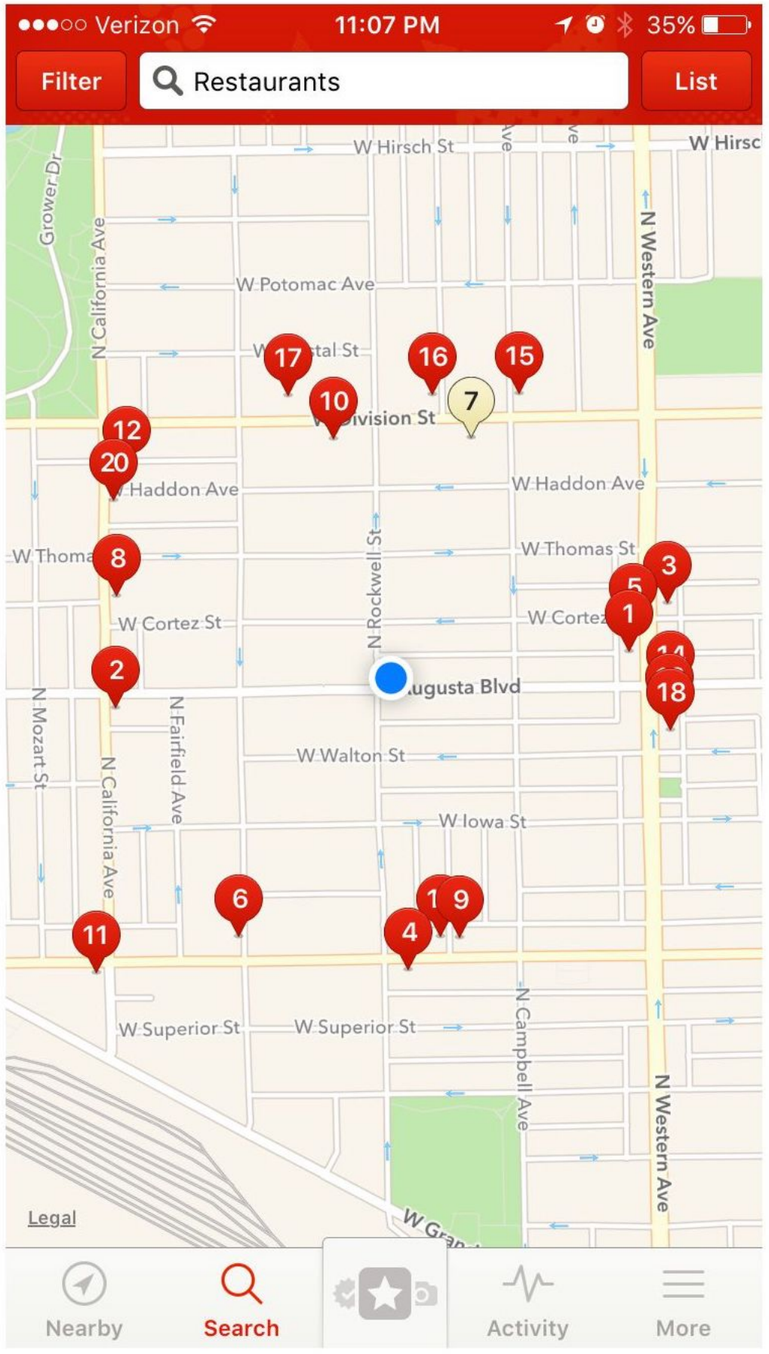
1. Hub and spoke
2. Fully connected
3. Multi-level
4. Stepwise
5. Pyramid

1. Pan-and-zoom
2. Flat navigation
3. Modal panel
4. Clear entry points
5. Bookmarks
6. Escape hatch

Models: Hub & spoke

Definition: Involves a central hub, e.g., a home screen, that provides transitions to and from several specialized components.




Verizon
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Filter
Restaurants
List
W Hirsch St
Grower Dr
N California Ave
W Potomac Ave
N Western Ave
W Division St
W Haddon Ave
W Thomas St
N Rockwell St
W Cortez St
Augusta Blvd
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N Fairfield Ave
W Walton St
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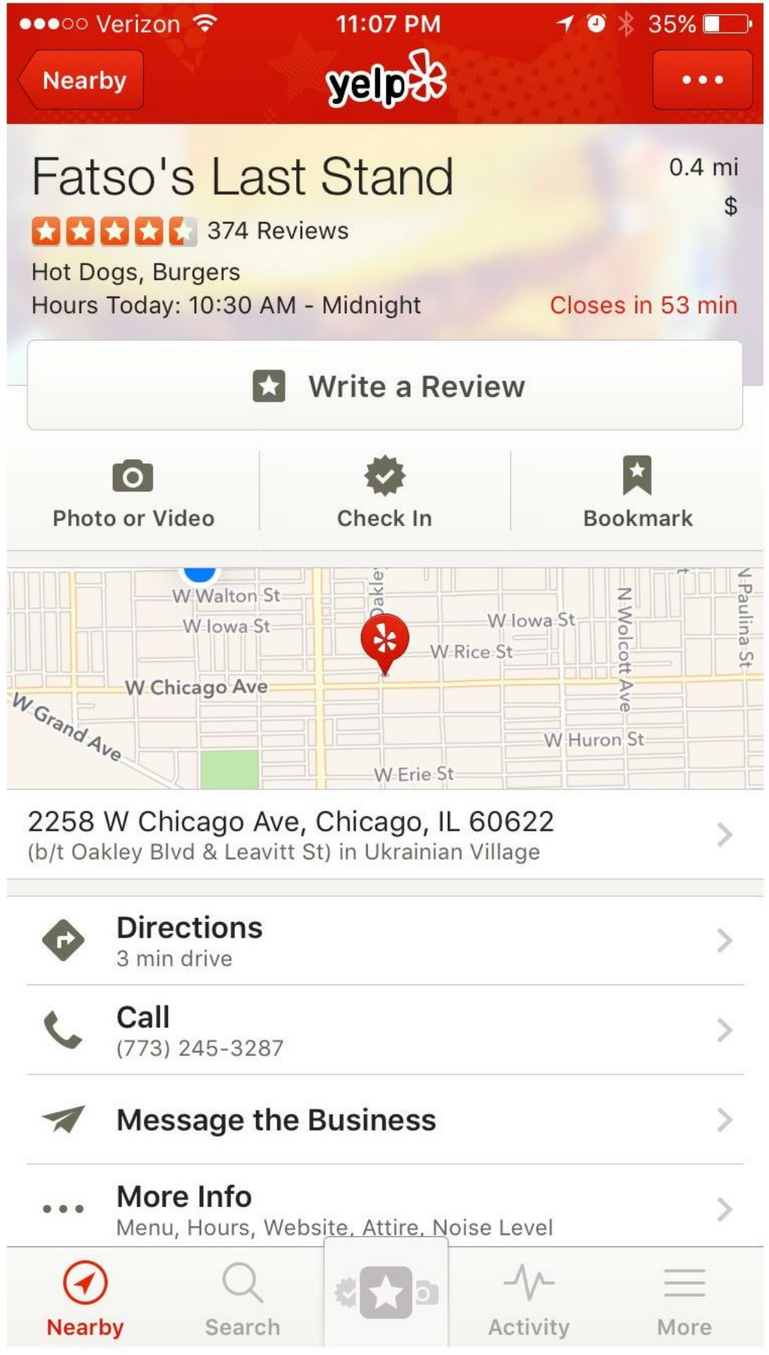
W Superior St
N Campbell Ave
Legal
Nearby
Search
Activity
More


Verizon
11:07 PM
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yelp
Fatso's Last Stand
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374 Reviews
Hot Dogs, Burgers
Hours Today: 10:30 AM - Midnight
Closes in 53 min
Write a Review
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Check In
Bookmark
W Walton St
W Iowa St
W Rice St
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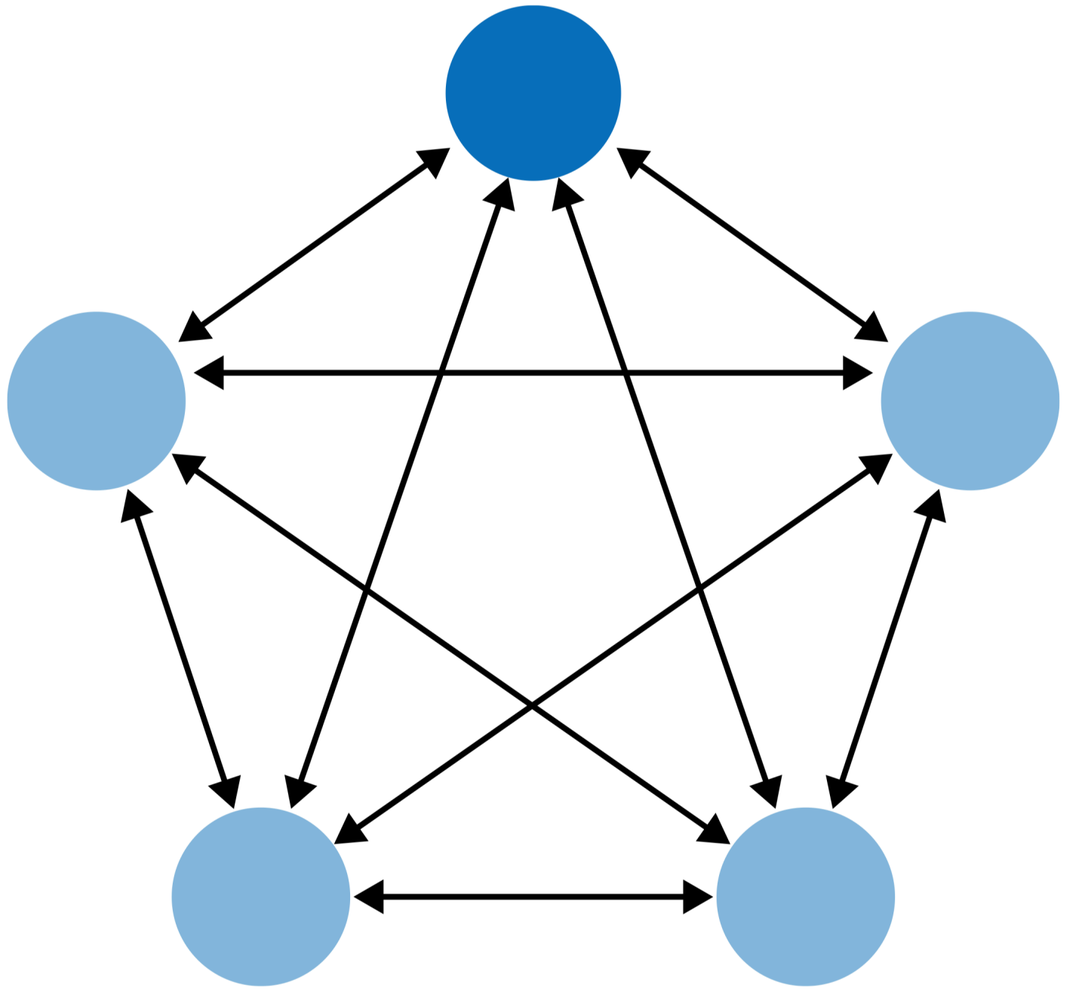
W Huron St
W Erie St
2258 W Chicago Ave, Chicago, IL 60622
(b/t Oakley Blvd & Leavitt St) in Ukrainian Village
Directions
3 min drive
Call
(773) 245-3287
Message the Business
More Info
Menu, Hours, Website, Attire, Noise Level
Nearby
Search
Activity
More

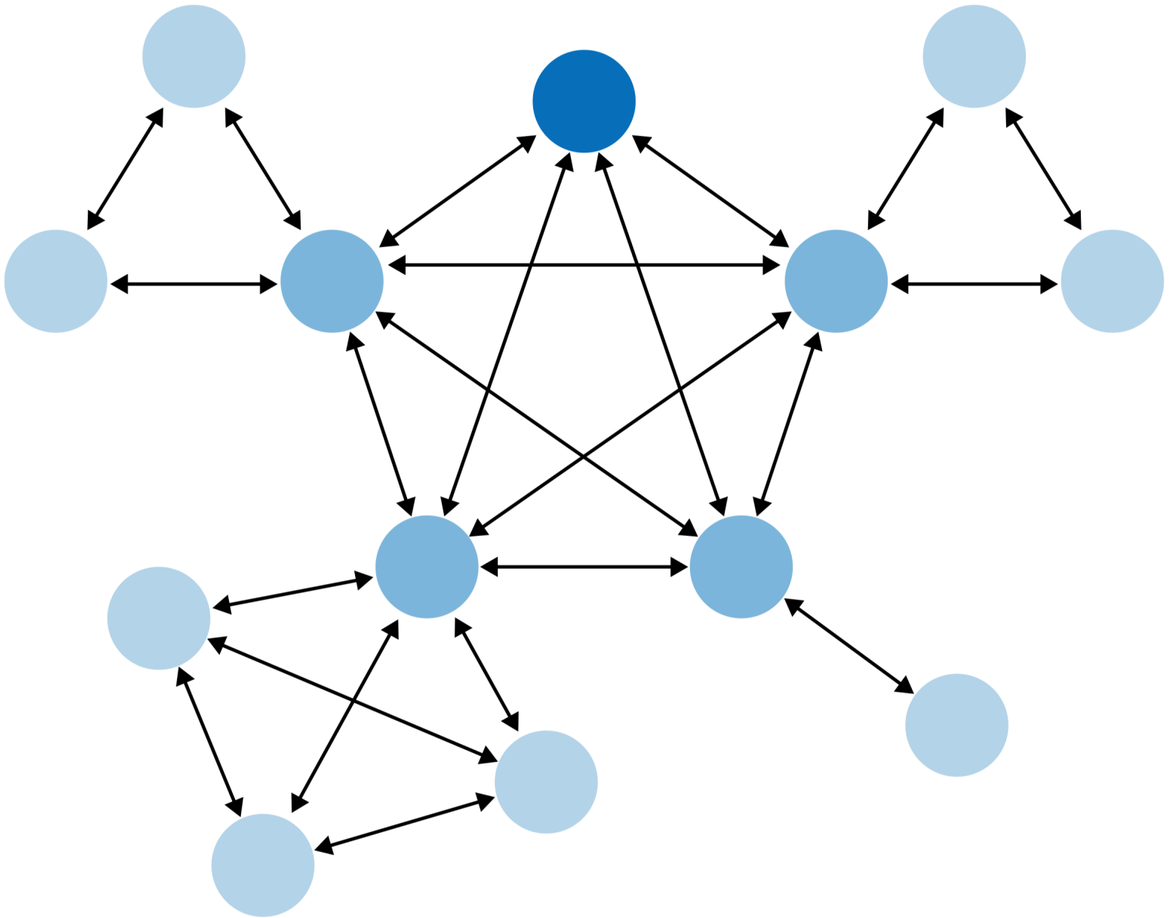
Models: Fully connected

Definition: A central component/page is connected to all other components that are also linked to each other.



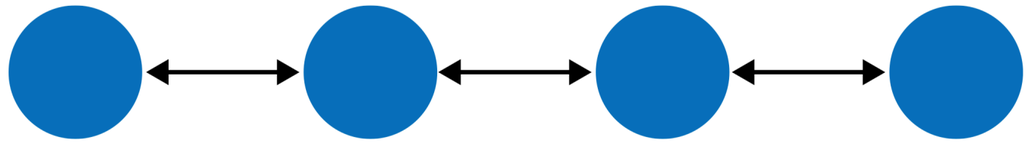
Models: Multi-level

Definition: Involves main components that are fully connected with each other and sub-components that are only connected among themselves.



Models: Stepwise

Definition: Follows a sequential or branching navigation that represents step-by-step process, e.g., checking out on an e-commerce site.



1 Seller agreement — 2 Seller Information — 3 Billing / Deposit — 4 Tax information — 5 Product information

Set up your Amazon selling account

Have the following available:

Business name & address | **Mobile or telephone number** | **Chargeable credit card & valid bank account** | **Tax information** What does this mean?

Legal name

What is a legal name? ▸

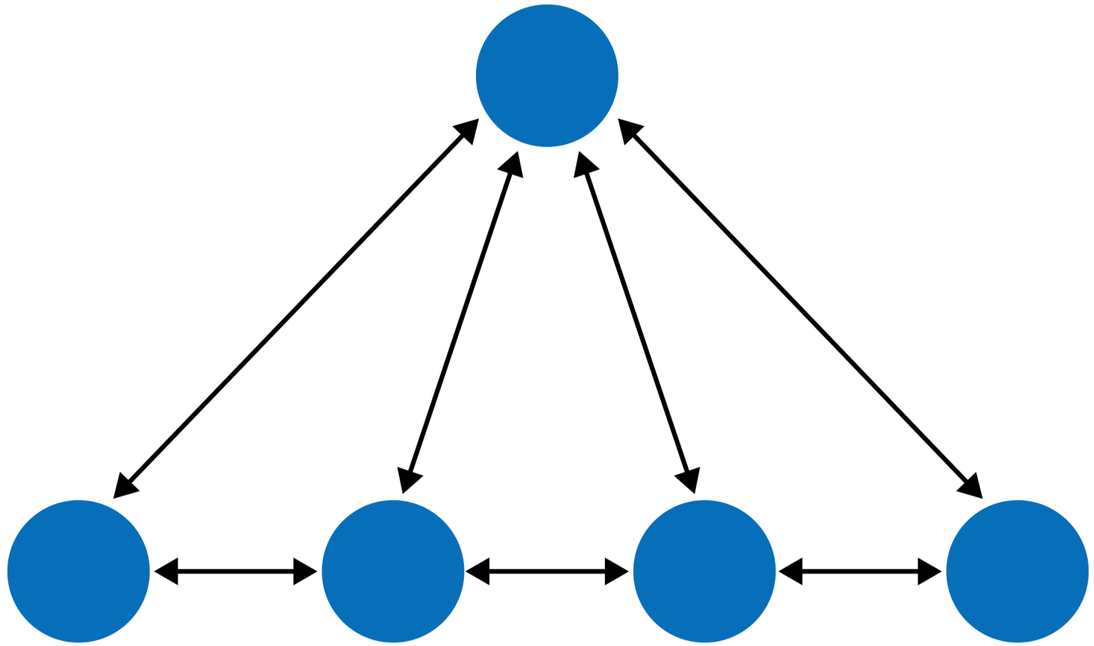
Seller agreement

☐ I have read and accepted the terms and conditions of the Amazon Services Business Solutions Agreement

Please Leave Feedback

Models: Pyramid

Definition: Similar to the stepwise model, but at each step, the user can navigate to the hub and back.



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Federal Refund

$0
NY Refund
(in progress)

Hide

Prepare State | Your State Returns | State Review

Let's get your state taxes done right

Here's what's coming up:

- We'll cover your state requirements
- We'll search for state tax breaks
- We'll help ensure your taxes are accurate

SOFTPEDIA

< Back

Continue

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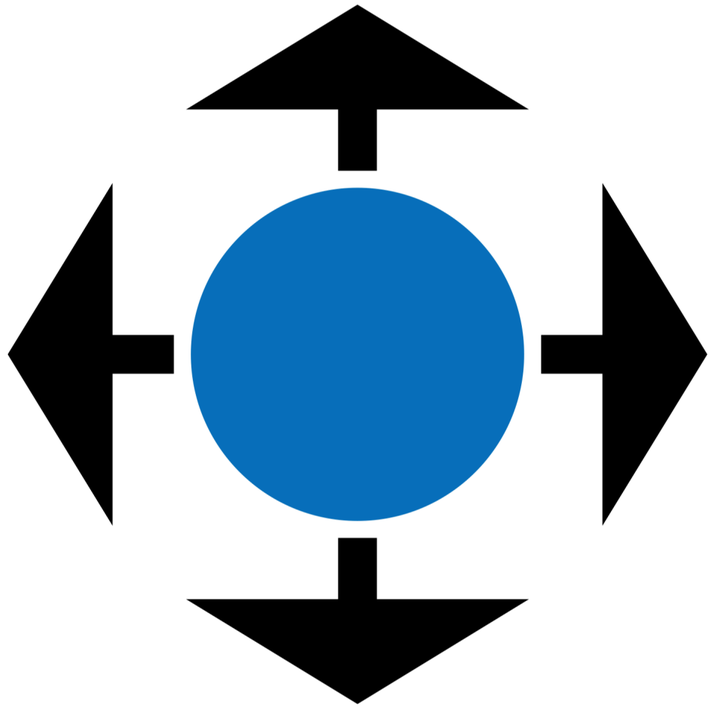
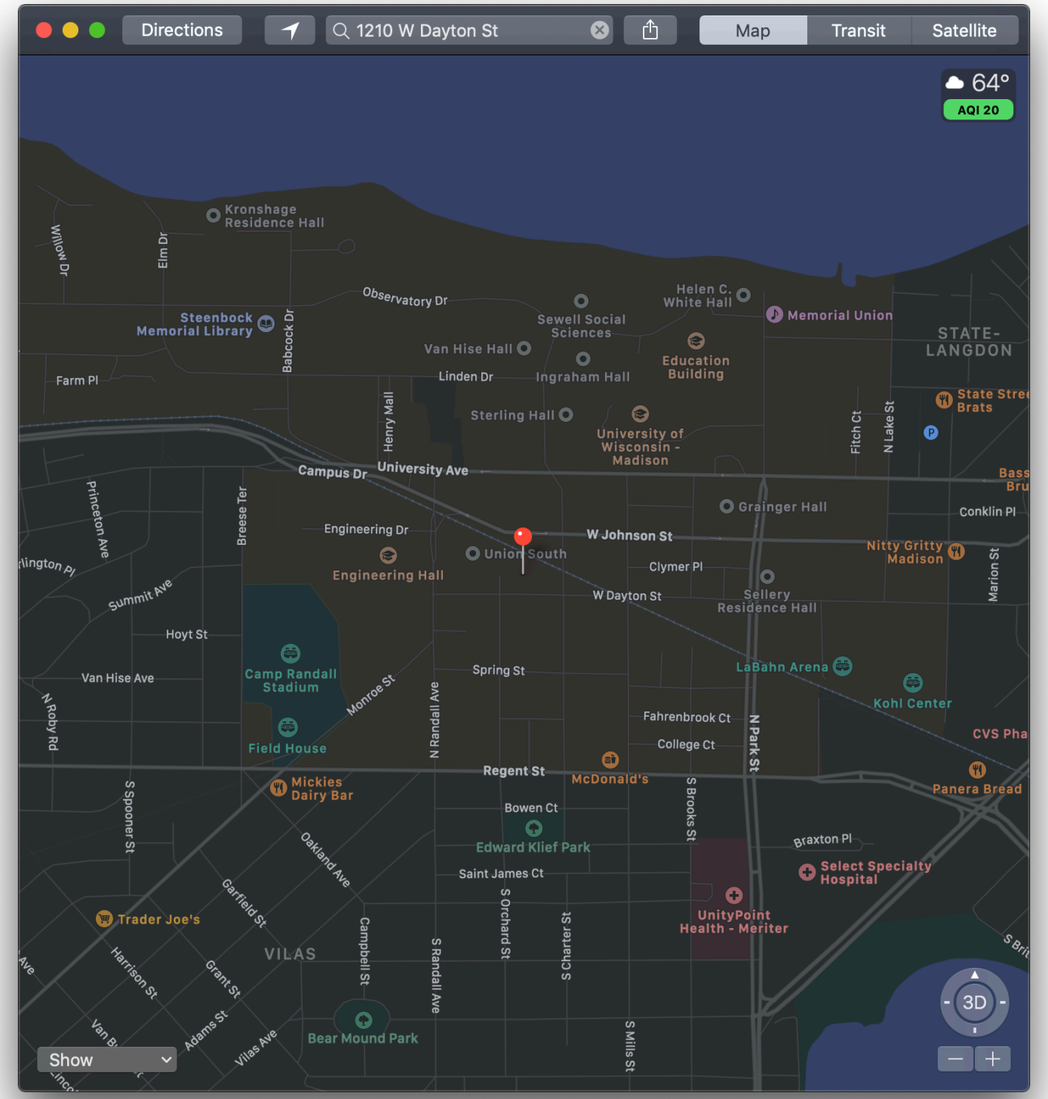
Models: Pan-and-zoom

Definition: Provides users with the ability to continuously navigate across a large space of content, e.g., a map, a list, or a written document.





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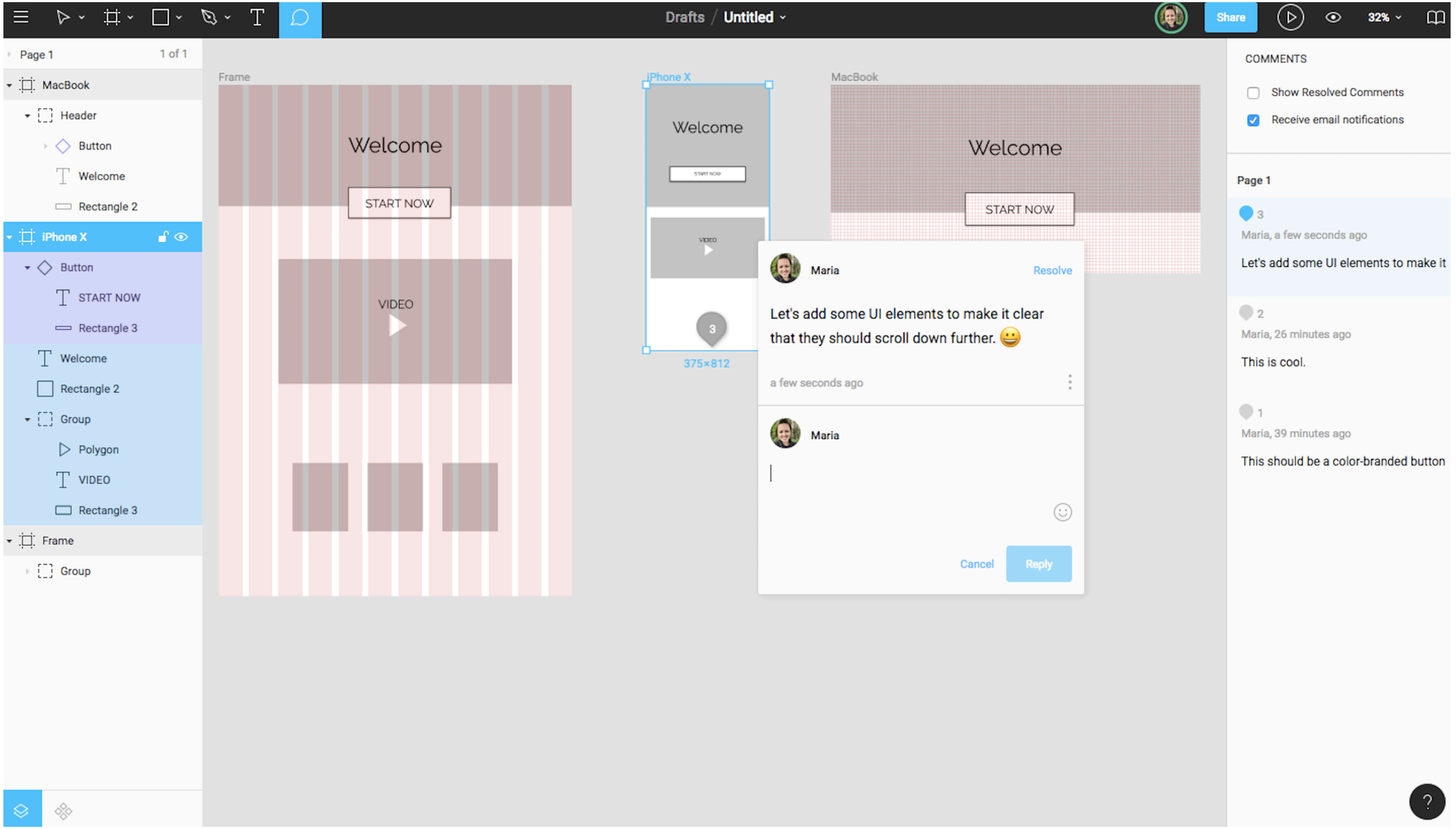
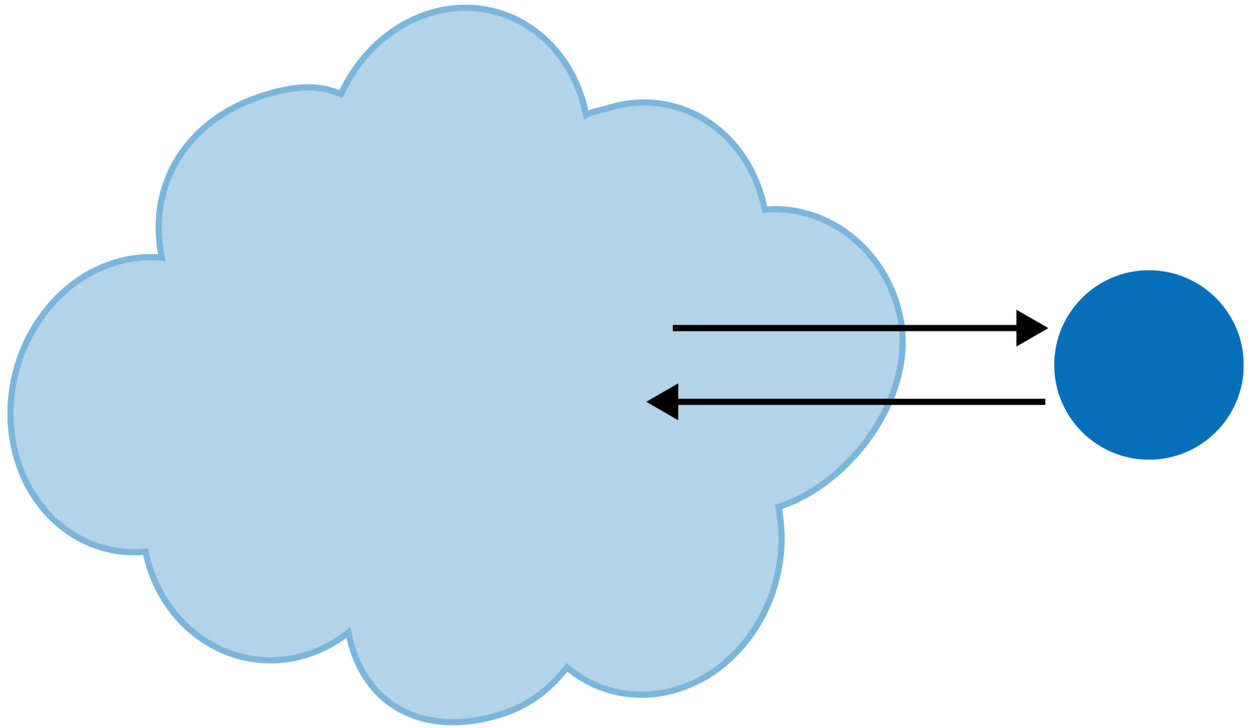
Models: Flat navigation

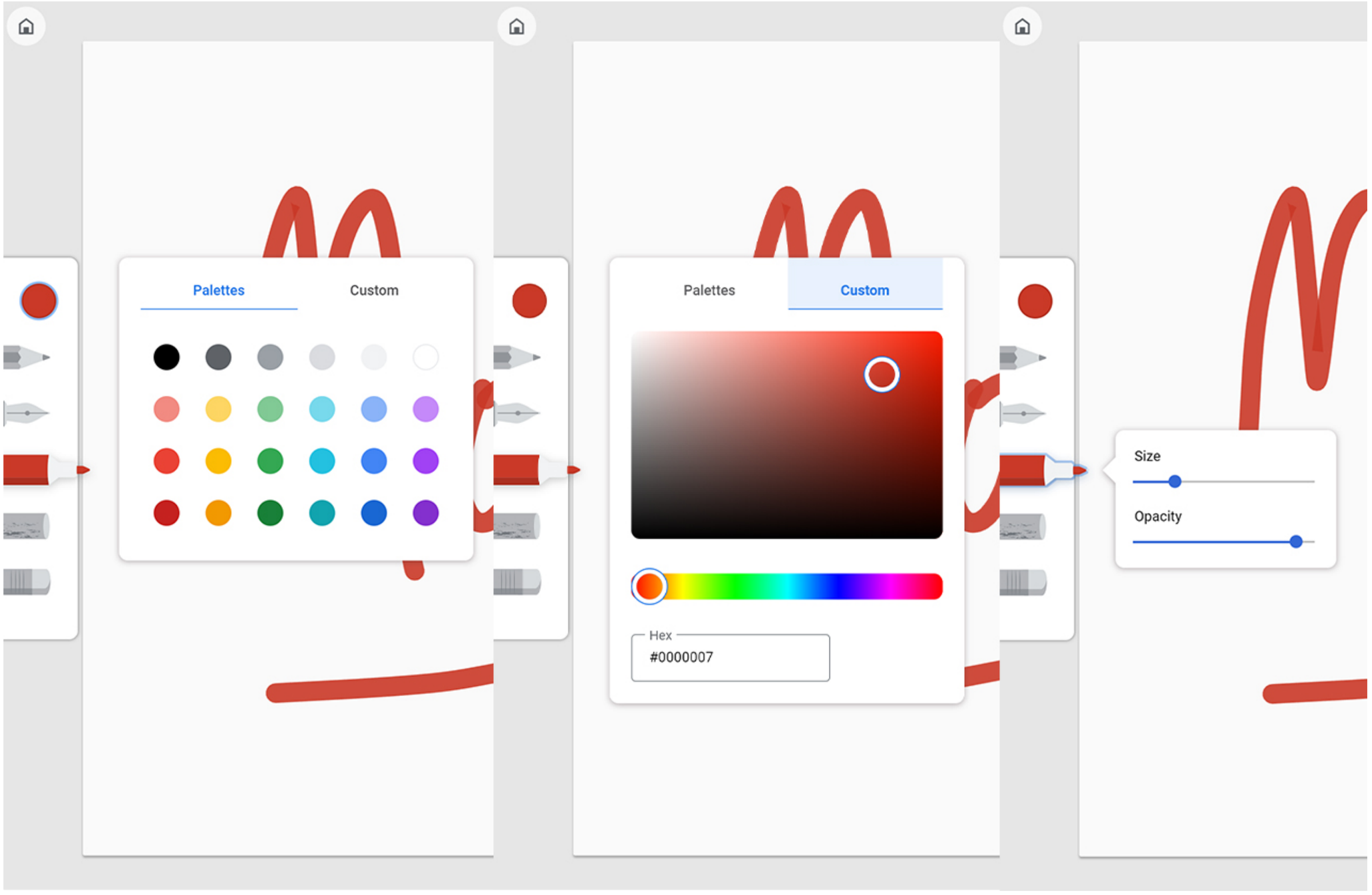
Definition: Involves a central workspace that is always visible and functions that do not require context switches or navigation.


Drafts / Untitled
Share
32%
Page 1
1 of 1
MacBook
Header
Button
Welcome
Rectangle 2
iPhone X
Button
START NOW
Rectangle 3
Welcome
Rectangle 2
Group
Polygon
VIDEO
Rectangle 3
Frame
Group
Frame
Welcome
START NOW
VIDEO
iPhone X
Welcome
START NOW
VIDEO
3
375×812
MacBook
Welcome
START NOW
Maria
Resolve
Let's add some UI elements to make it clear that they should scroll down further.
a few seconds ago
Maria
Cancel
Reply
COMMENTS
Show Resolved Comments
Receive email notifications
Page 1
3
Maria, a few seconds ago
Let's add some UI elements to make it
2
Maria, 26 minutes ago
This is cool.
1
Maria, 39 minutes ago
This should be a color-branded button

Models: Modal panel

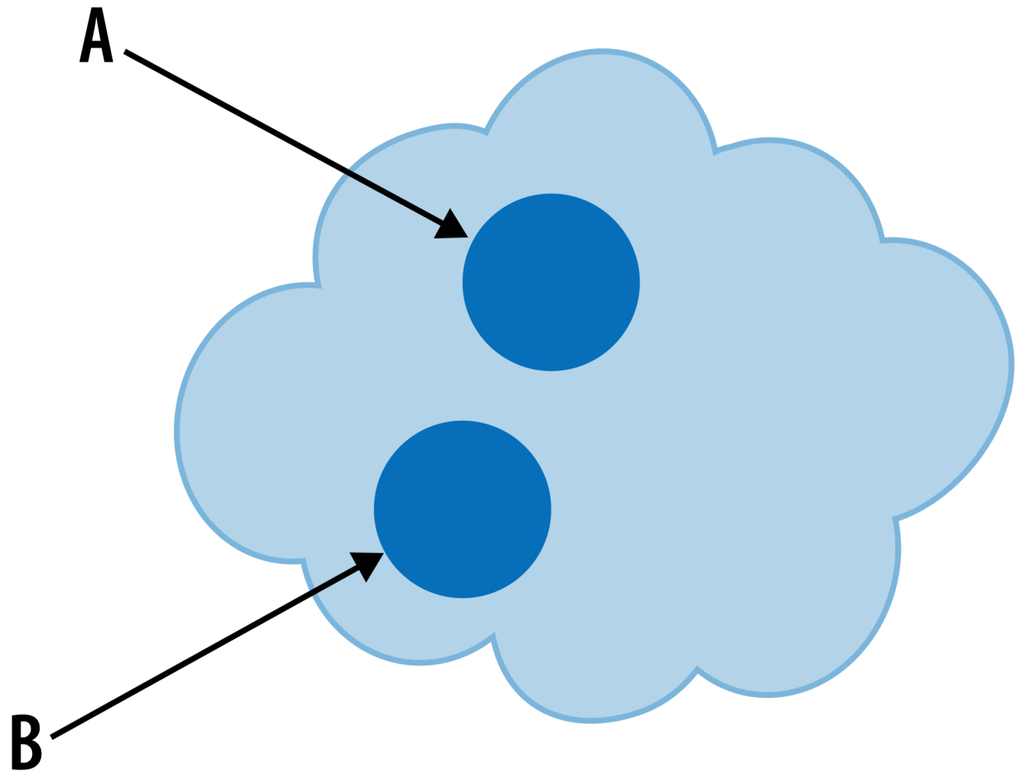
Definition: Follows the flat navigation model except for modal dialogs that are temporarily overlaid on the canvas to help the user perform specific functions.




Palettes
Custom
Palettes
Custom
Hex
#0000007
Size
Opacity

Models: Clear entry points

Definition: Complex applications involve navigational models with clear entry points that guide the user to frequently used or temporary functions without having to go through the hierarchical structure or a step-by-step process.



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Involve everyone who's working on the project.

Acme Co

2020 Marketing

Add/remove people

The client

Message Board

Retouched team photos
✨ FYI — Hey Victor, here's

Logo concept
👋 Question — Hey Victor,

Ad comps
Hey all, take a look at these and

Campaign ideas
Here's a few thoughts I had

Raw shots from the shoot
Here's a few shots from the

To-dos

Requests
- [ ] Company logo — Victor

Business cards
- [ ] finalize overall design — Jul 23 — Annie B.
- [ ] create press-ready files — Annie B.
- [ ] send to printer — Jul 29
- [ ] photograph cards for portfolio

Group Chat

Victor 3:47pm
Sure is!

Victor 3:48pm
Mind if we grab sushi inste...

Victor 3:48pm
I've got a fever and the only...

...

Adam 3:51pm
Ha! Sounds great.

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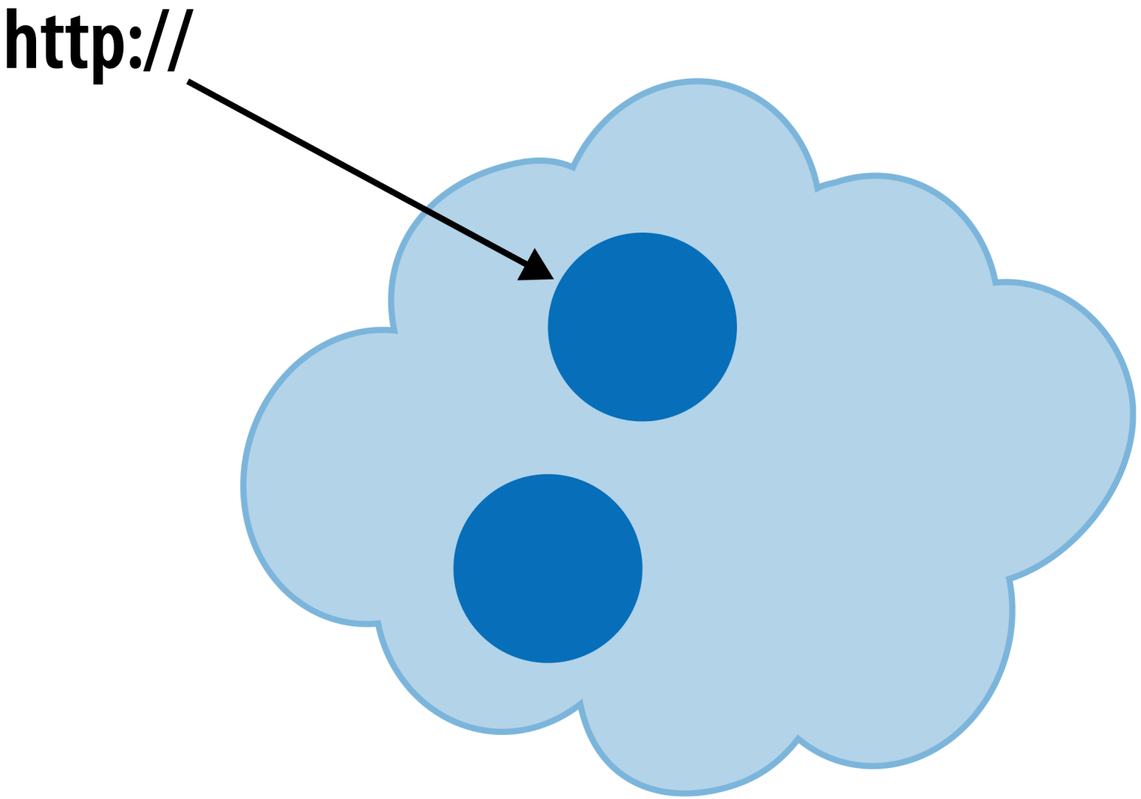
Models: Bookmarks

Definition: Bookmarks allow users to conveniently navigate to a point of his choice, anytime he wants, even if it's deep inside a navigational structure. These give people a way to avoid traversing many links to get to a desired page or state.



what will Doran do? *What will his brother do to avenge our murdered prince?*" She moved closer to the captain. "And you say, *he does not wish to be a*

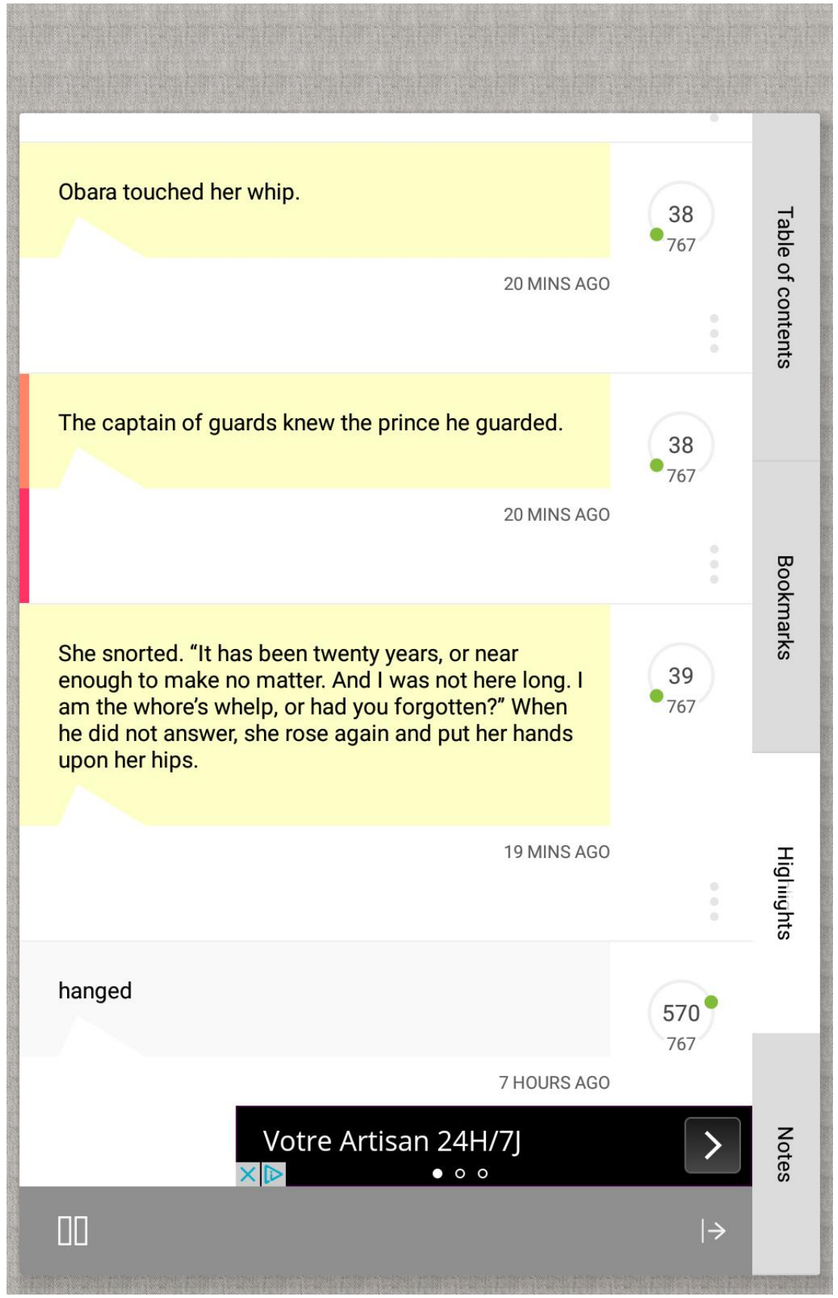
"He do otah said again.

The captain of guards knew the prince he guarded. Once, long ago, a callow youth had come from Norvos, a big broad-shouldered boy with a mop of dark hair. That hair was white now, and his body bore the scars of many battles... but his strength remained, and he kept his longaxe sharp, as the bearded priests had taught him. *She shall not pass,* he told himself, and said, "The prince is watching the children at their play. He is *never* to be disturbed when he is watching the children at their play."

"Hotah," said Obara Sand, "you will remove yourself from my path, else I shall take that longaxe and—"

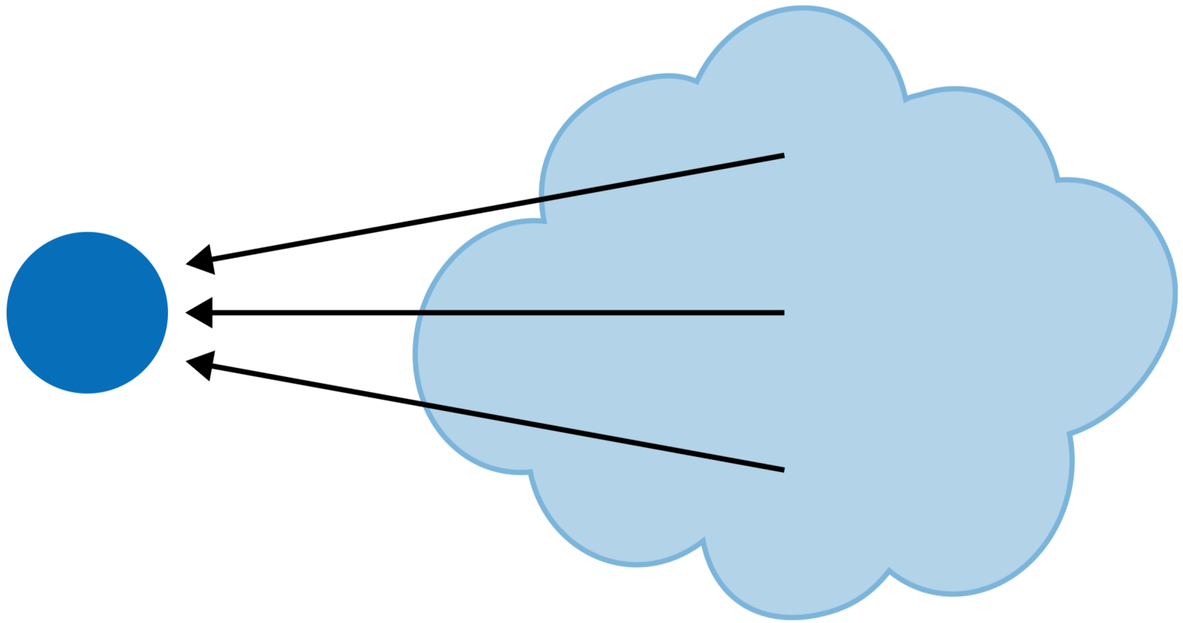
"Captain," came the command, from behind. "Let her pass. I will speak with her." The prince's voice was hoarse.

Areo Hotah jerked his longaxe upright and stepped to one side. Obara gave him a lingering last look and strode past, the maester hurrying at her heels. Caleotte was no more than five feet tall and bald as an egg. His face was so smooth and fat that it was hard to tell his age, but he had been here before the captain, had even served the



Models: Escape hatch

Definition: An "escpape hatch" provides users with the ability to go back to the main component/page in a complex structure without having to trace steps back.



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In-Class Activity 2: Reverse Engineering Navigation Models

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Smart Room

Principles of Navigation

1. Wayfinding
2. Cost
3. Aids
4. Models

What did we learn today?

— Interaction structure
— Visual layout design
— Principles of navigation q