Building User Interfaces

Design Paradigms, Patterns, & Languages

Professor Bilge Mutlu

What we will learn today?

- Design paradigms
- Design patterns
- Design languages

Recap: 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.

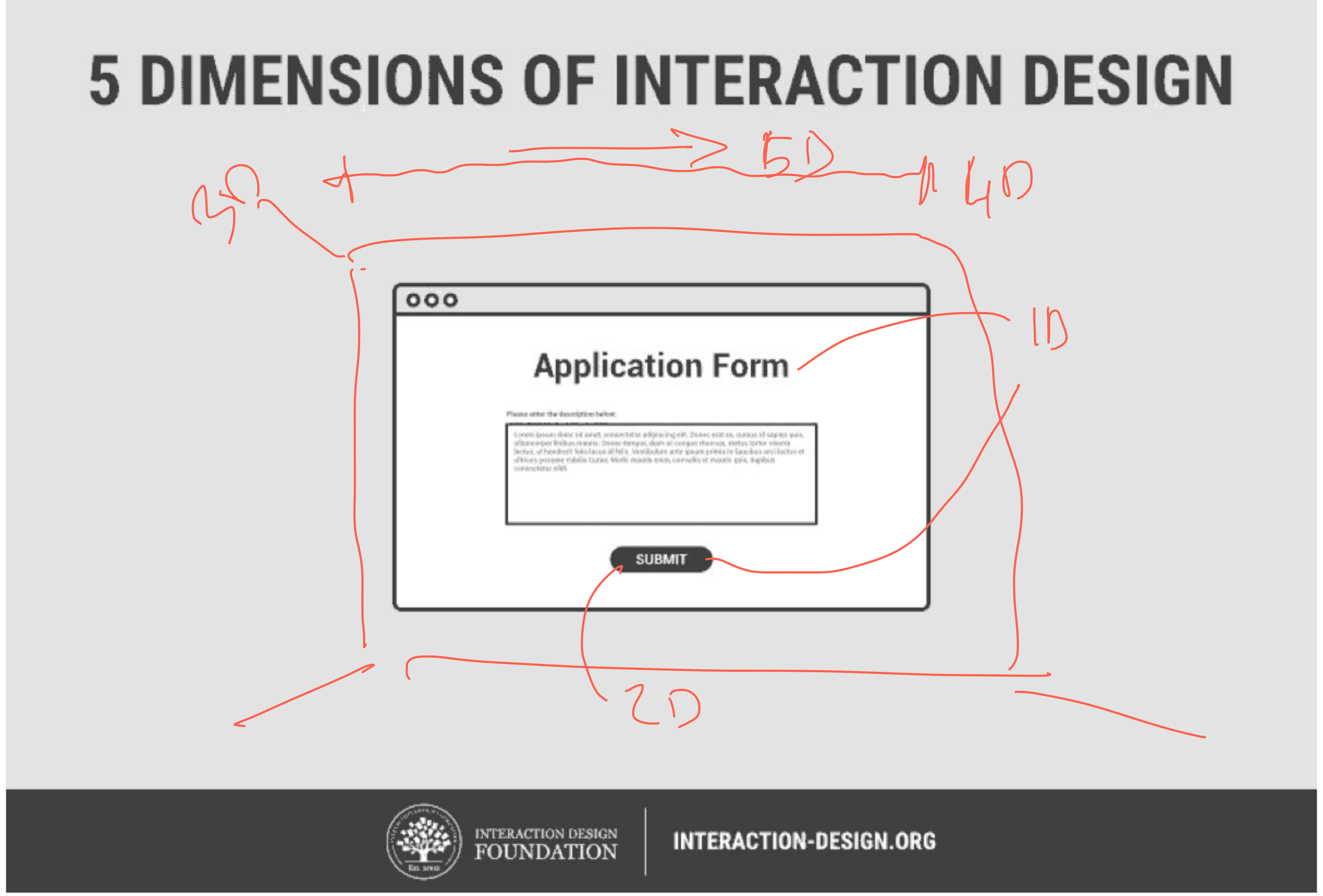
Differs from visual design in its closer and more complex relationship to user behavior and context.

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

We talked about *visual design* and *navigation*, but how do we address all these dimensions?


5 DIMENSIONS OF INTERACTION DESIGN
5D
4D
3D
1D
2D
Application Form
SUBMIT
INTERACTION DESIGN FOUNDATION
INTERACTION-DESIGN.ORG

[1] Interaction Design Foundation

Interaction Design Paradigms

What is a Design Paradigm?

Definition: An archetypal solution or an approach to solving design problems.

Historical Interaction Design Paradigms

1. Implementation-centric
2. Metaphoric
3. Idiomatic

Implementation-centric Design

Definition: Interaction design maps directly to how system functions are implemented.

Pros & Cons of Implementation-centric Design

Pros:

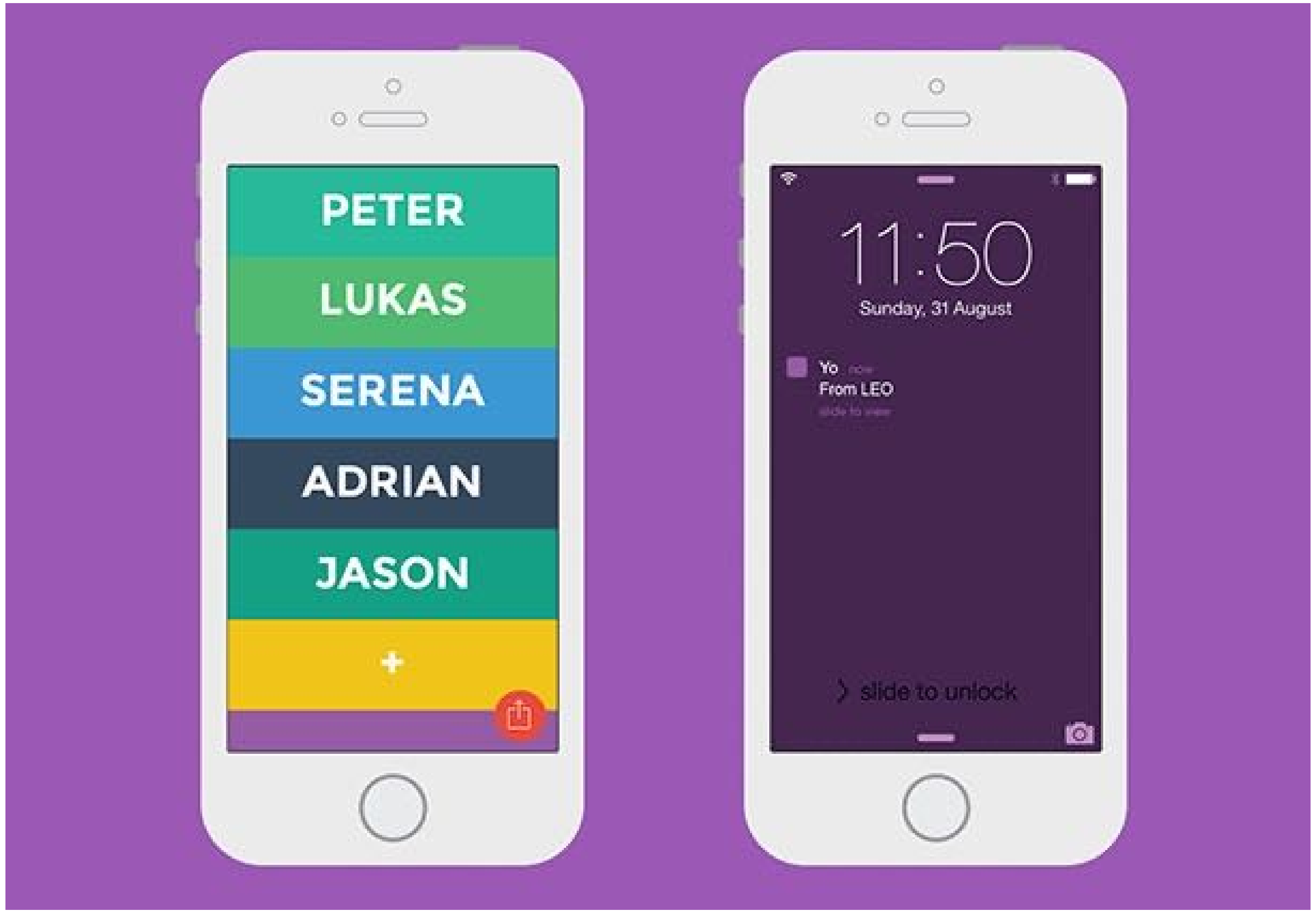
1. Very easy to build, easy to debug, easy to troubleshoot

Cons:

1. Requires learning how the functions work
2. Requires skills in using the functions
3. The system cannot perform high-level actions

Source[2] [3]

Yo



[2] Pintrest

[3] Entrepreneur Magazine

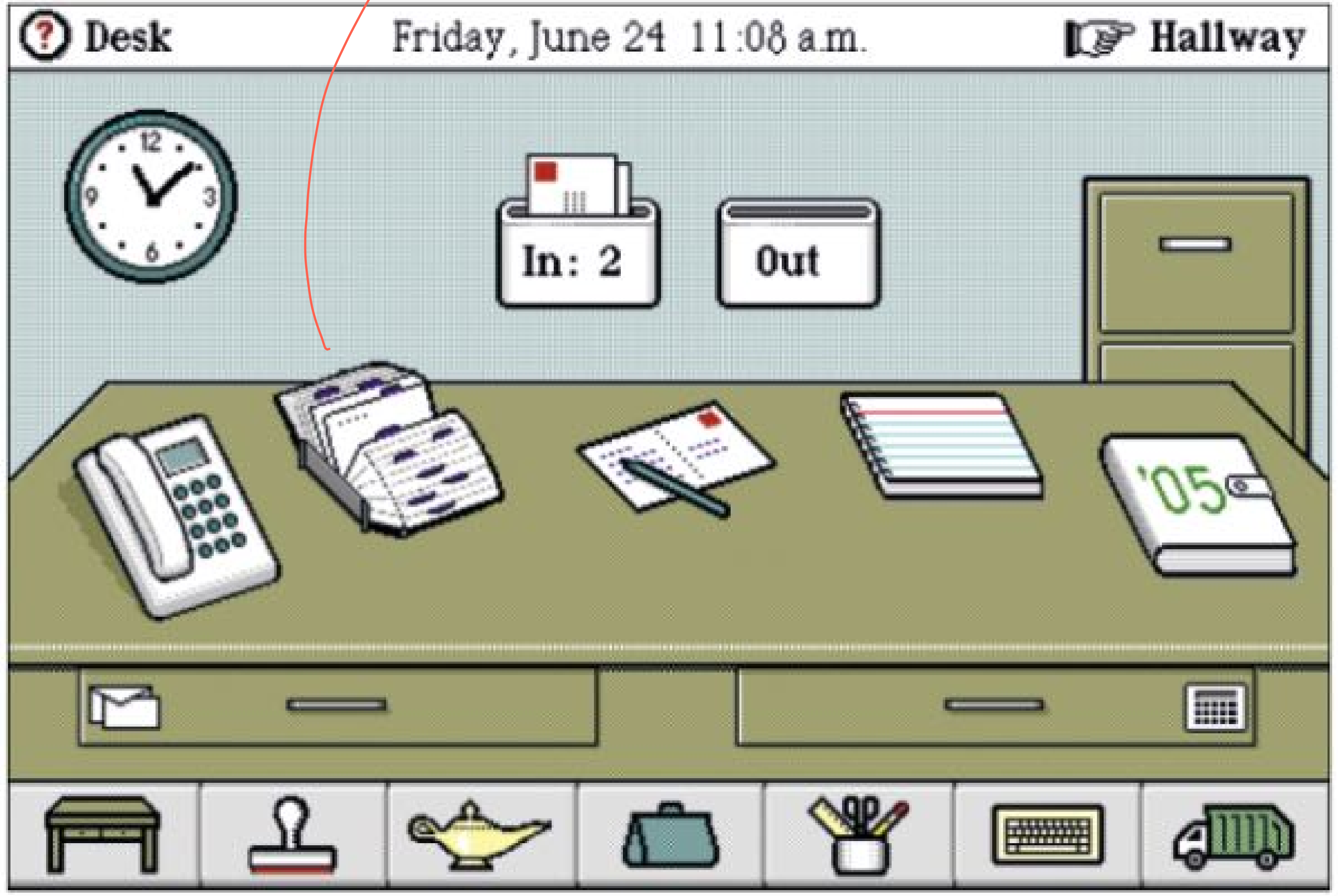
Metaphorical Design

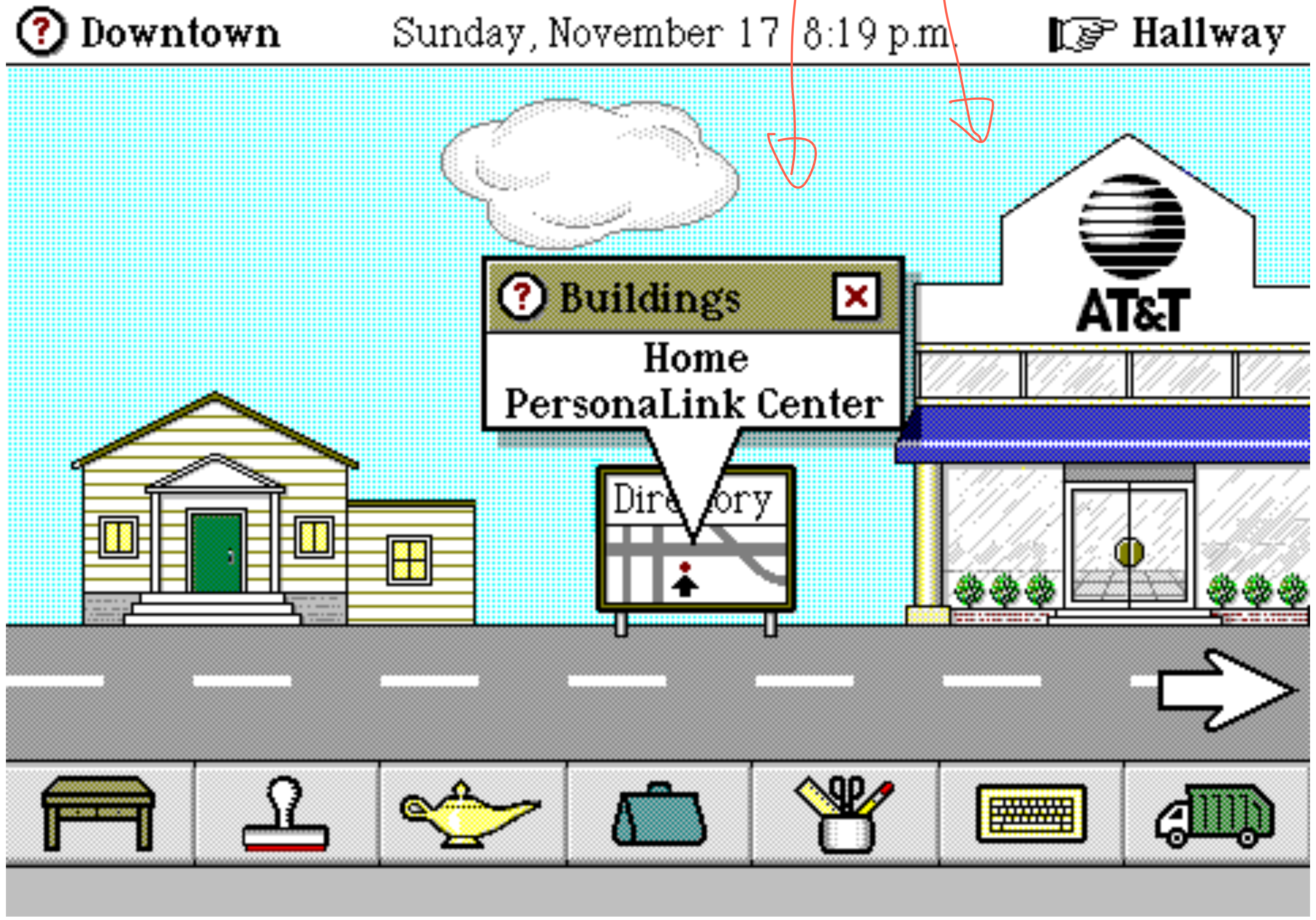
Definition: Following a real-world metaphor that users are expected to be familiar with.

Metaphorical designs "jump-start" user mental models, rely on their existing knowledge of how things work in the real-world, and thus eliminate learning.

Source[4]

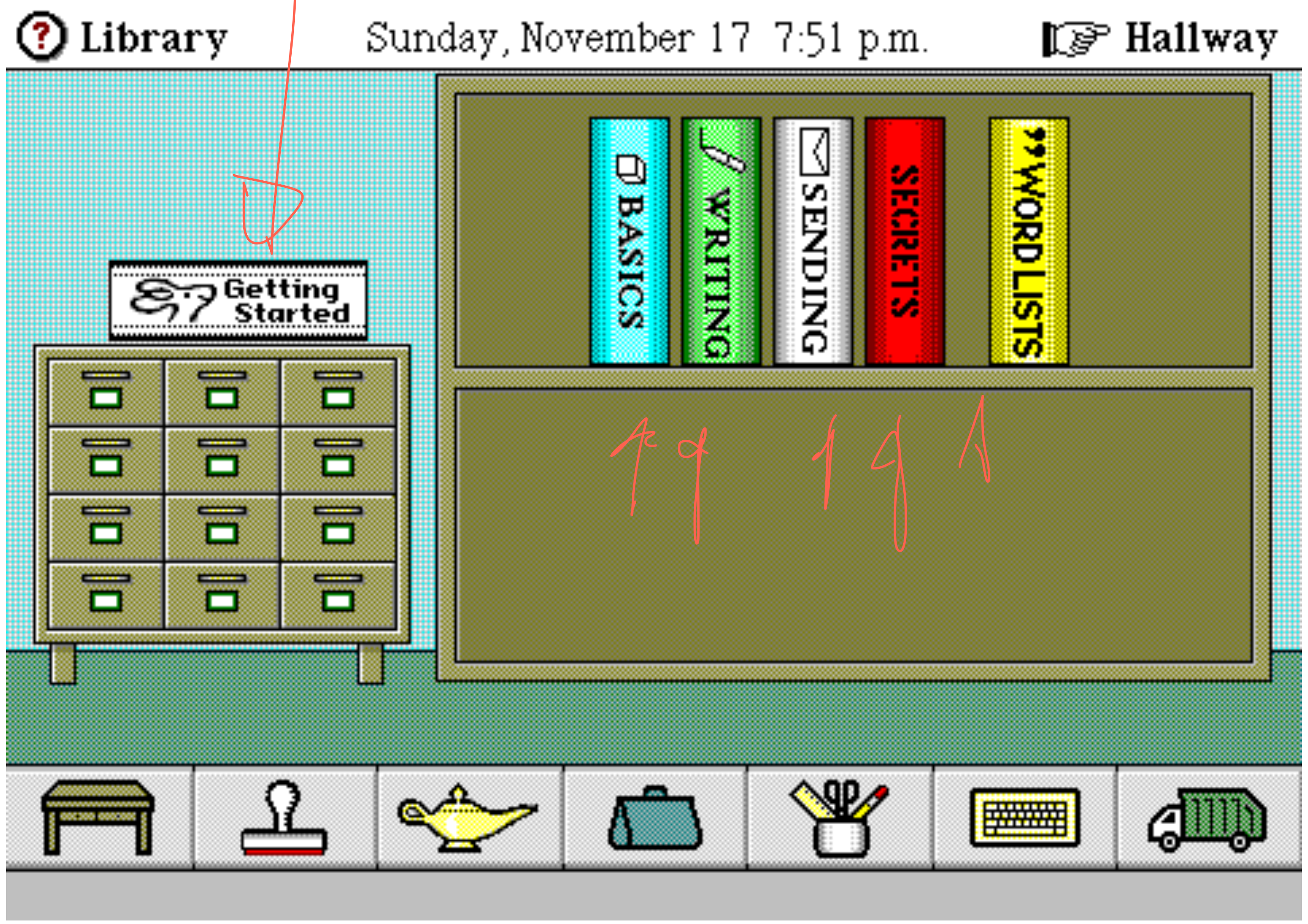
Rolodex

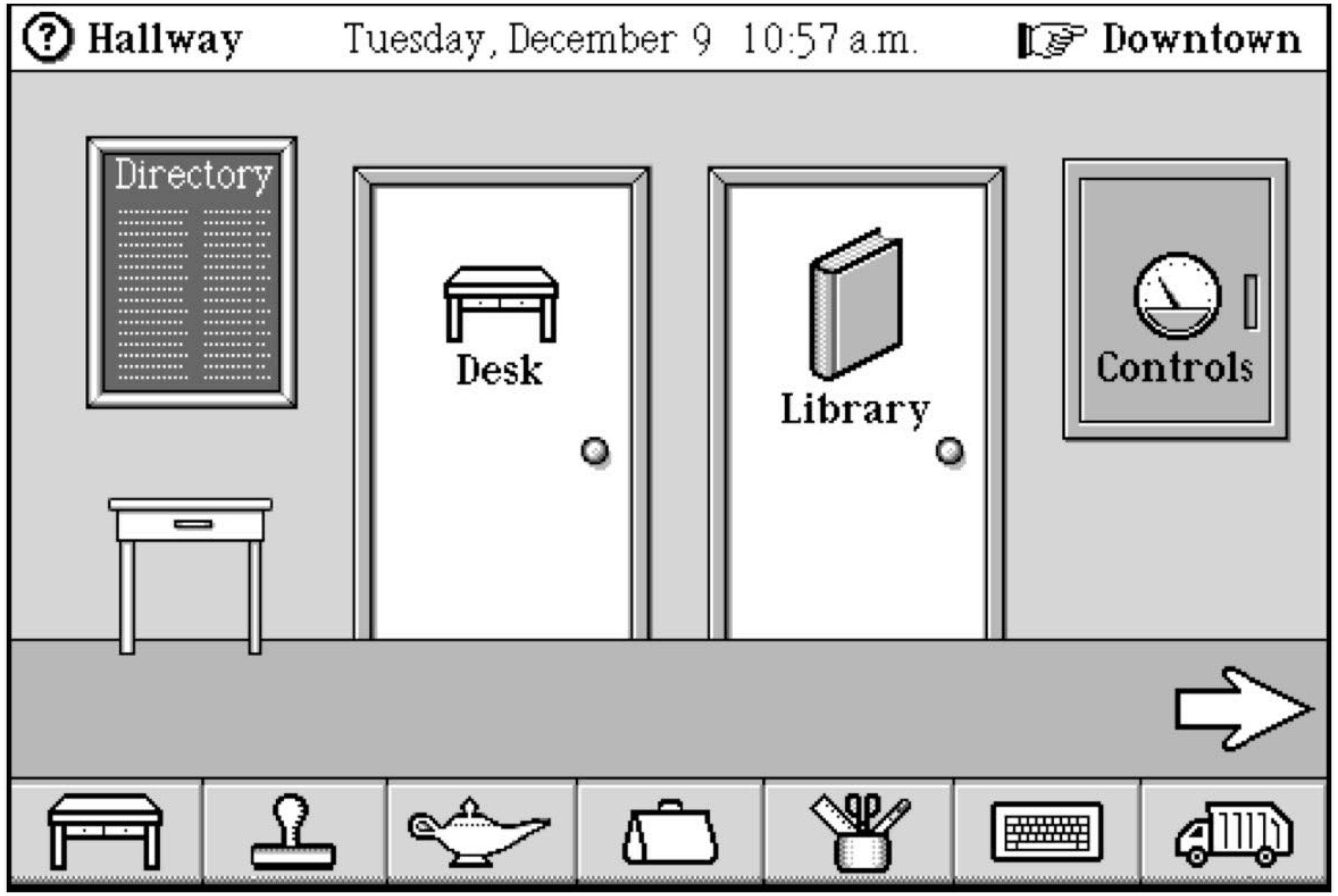




[4] Wikipedia: Magic Cap

Source[5][6]

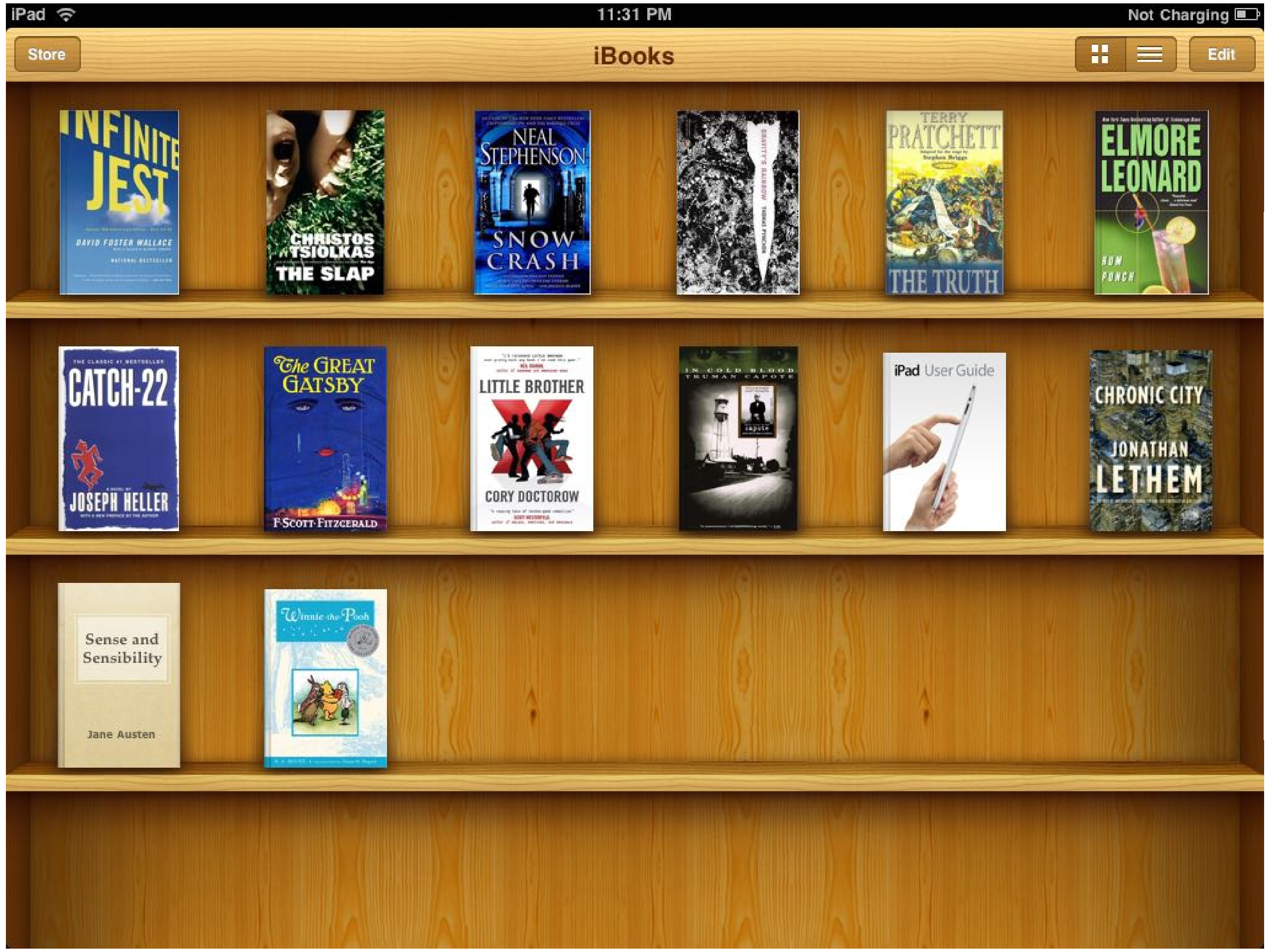


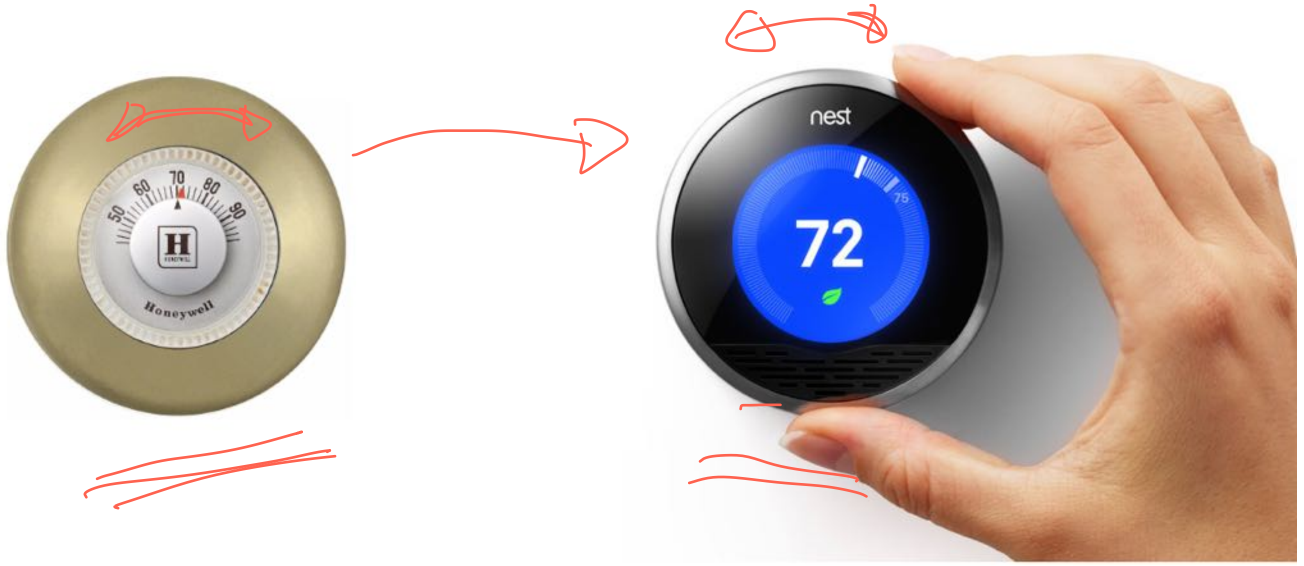


[5] Wikipedia: Magic Cap

[6] NN Group: The Anti-Mac Interface

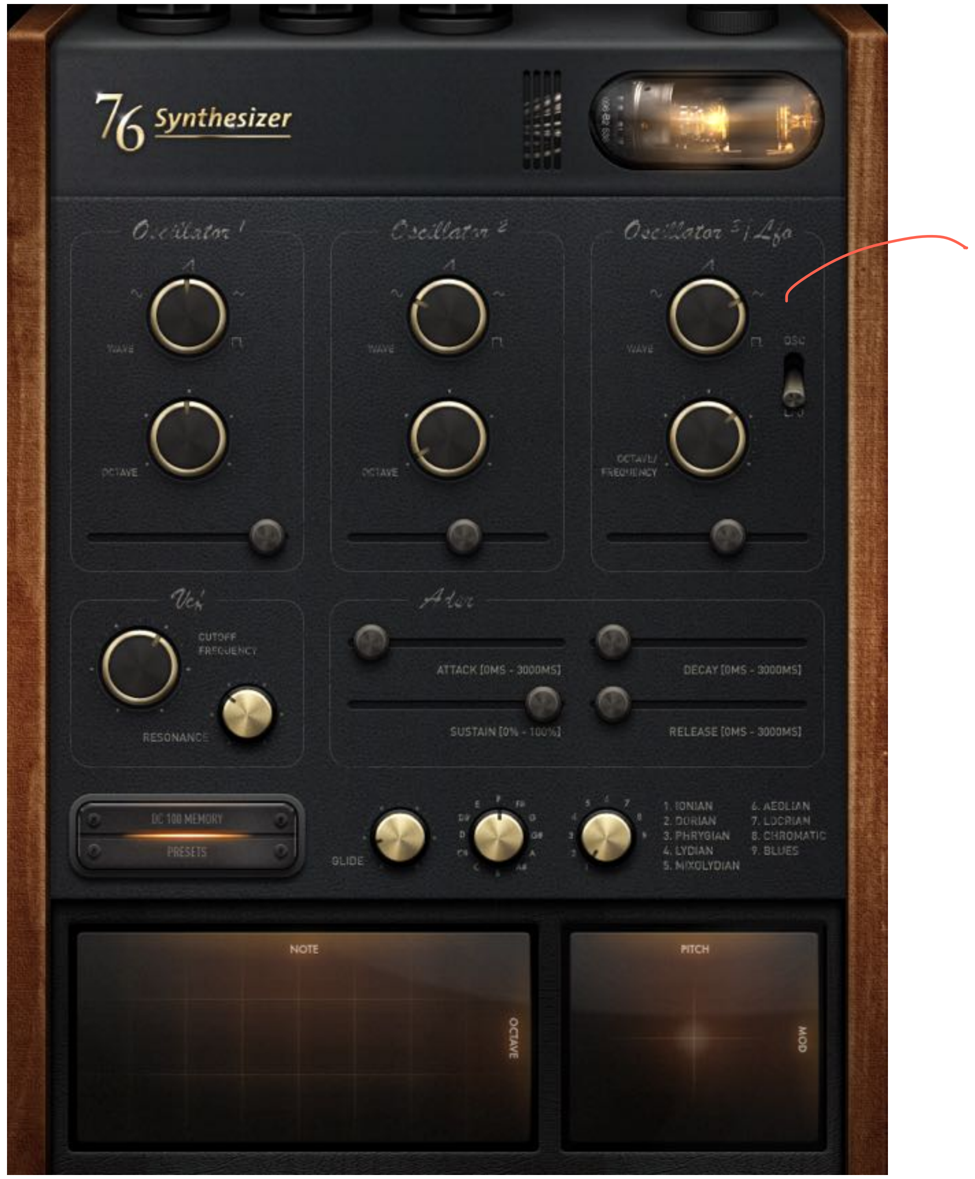
Source[7]

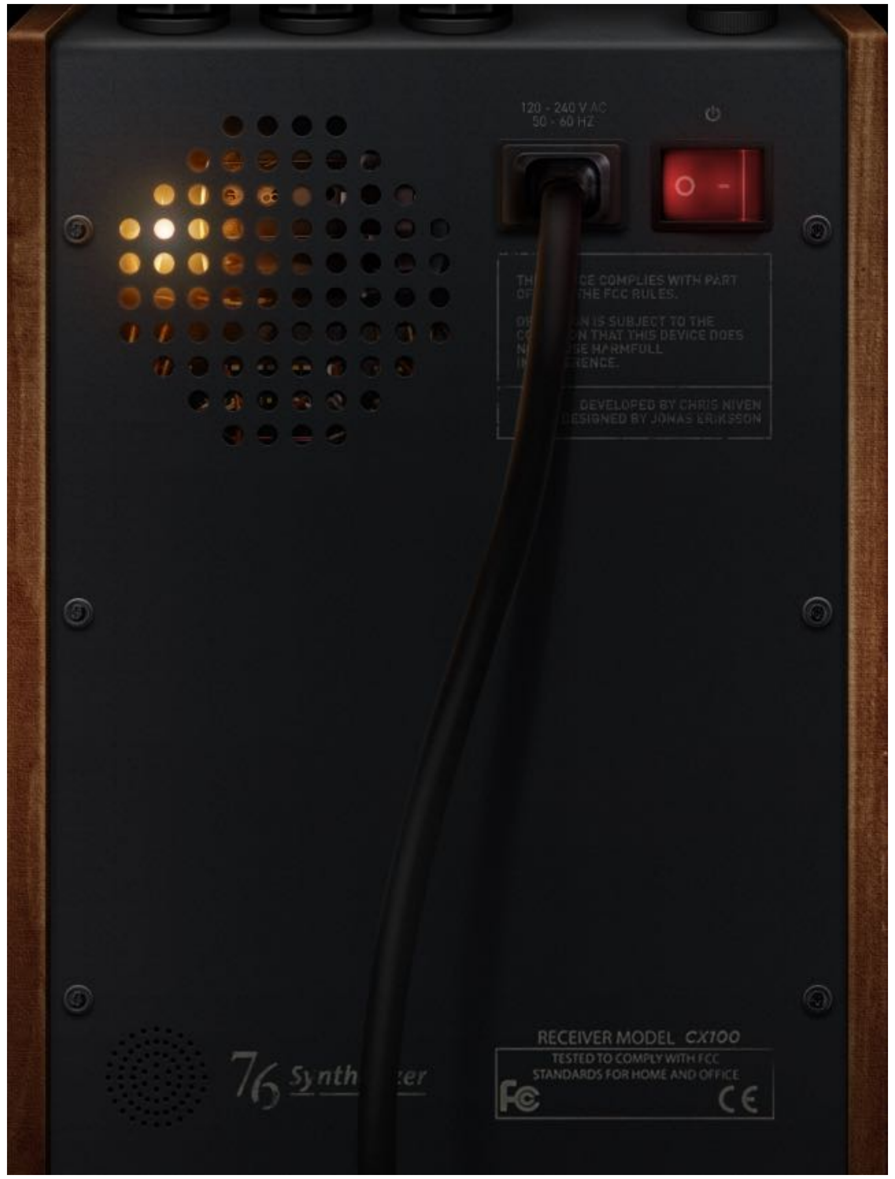




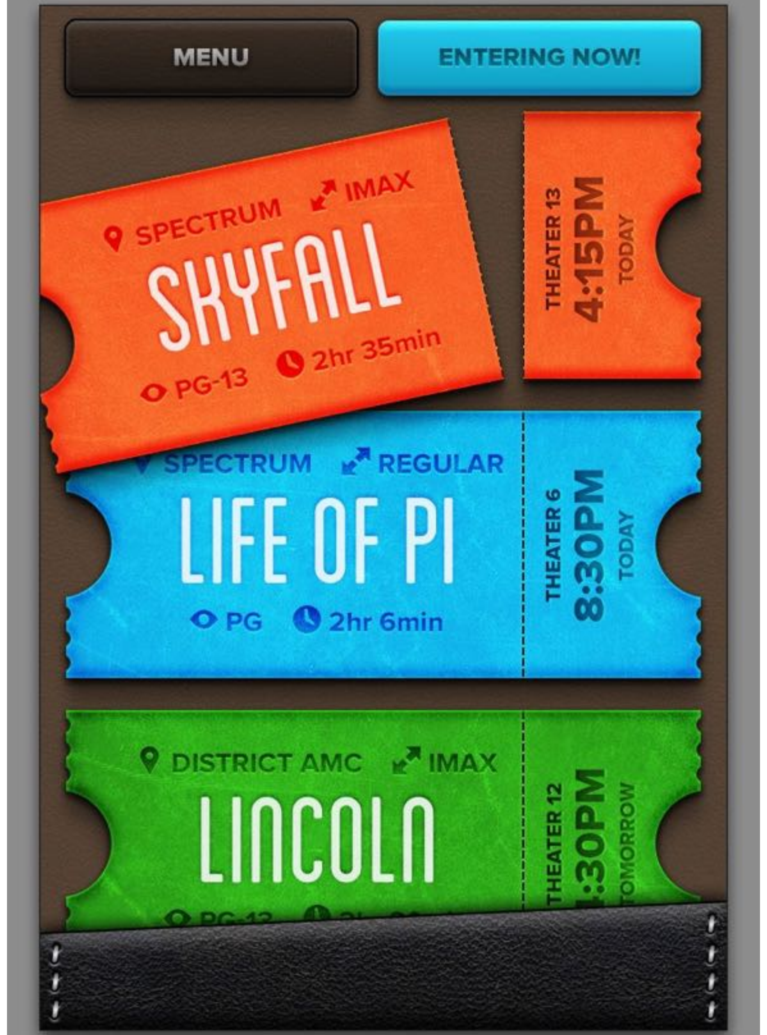
[7] UX Planet: Metaphorical Design

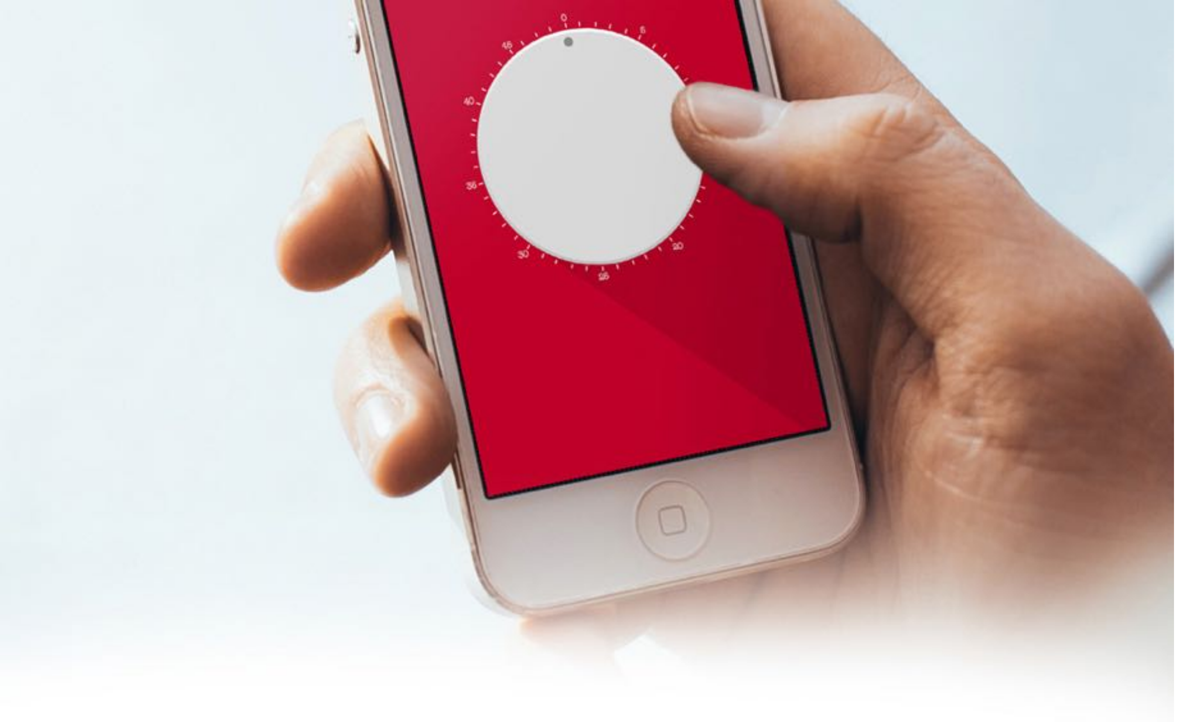
Source[8]

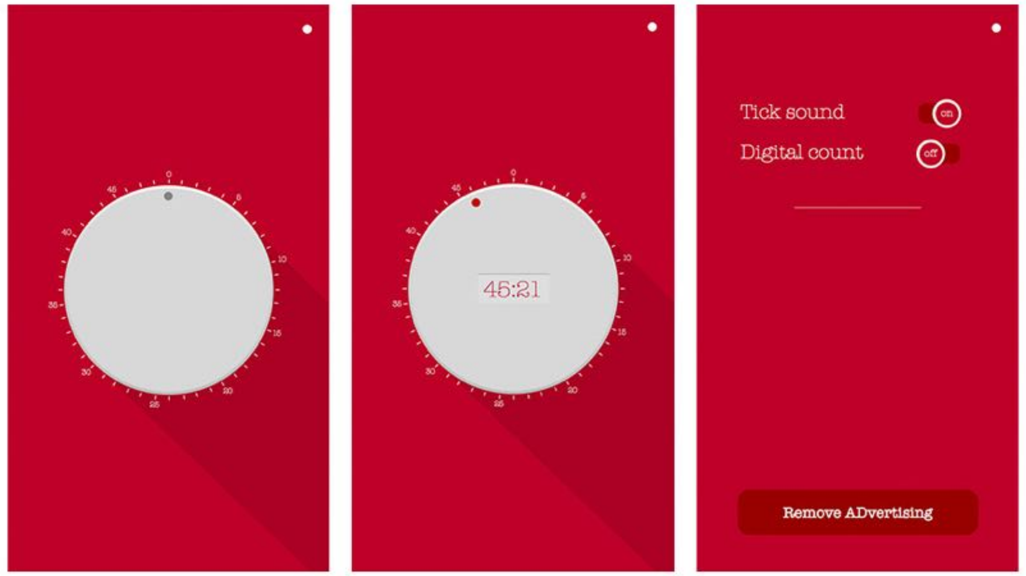




[8] Apple App Store: 76 Synthesizer







AND REDESIGN FOR APPLE WATCH

Pro Tip 1: Metaphors use a familiar model from another domain (*e.g.*, building vs. computer windows); *analogues* are similar to models in the same category (*e.g.*, physical cards vs. e-cards).

Pro Tip 2: Metaphors can be applied at different levels of abstraction.

Pro Tip 3: Mixed metaphors bring together models from different domains in a single design.

Global Metaphor[9]

Definition: A *global metaphor* provides a single, overarching framework for all the metaphors in the system (*e.g.*, Magic Cap).

Pros: They work well in expert interfaces where the interface simulates a real-world system.

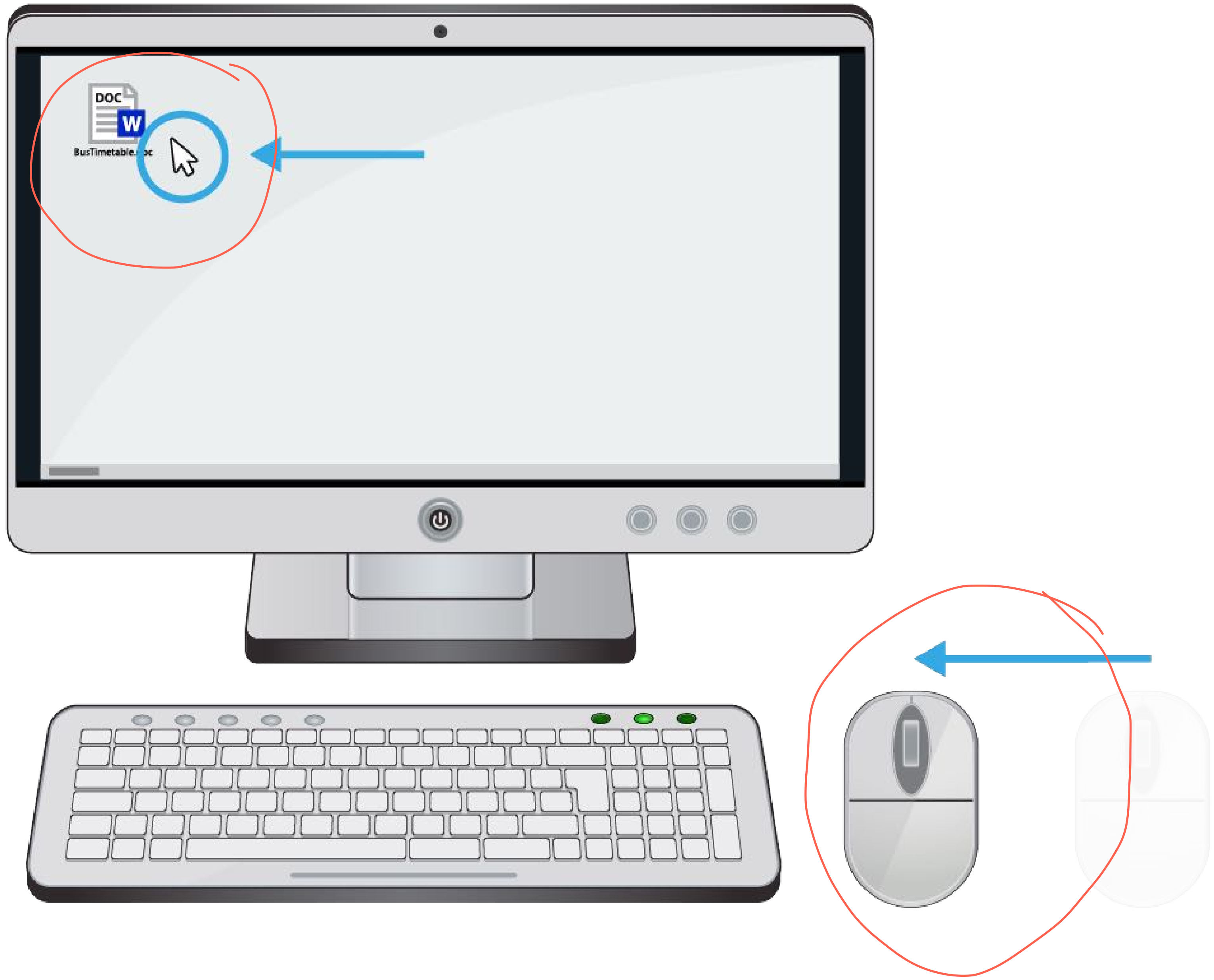
Cons: Inability to scale; lack of familiar real-world system for entirely new capabilities; cultural differences; inability to adapt as capabilities evolve.

[9] Cooper et al., 2014, About Face

Idiomatic Design[10]

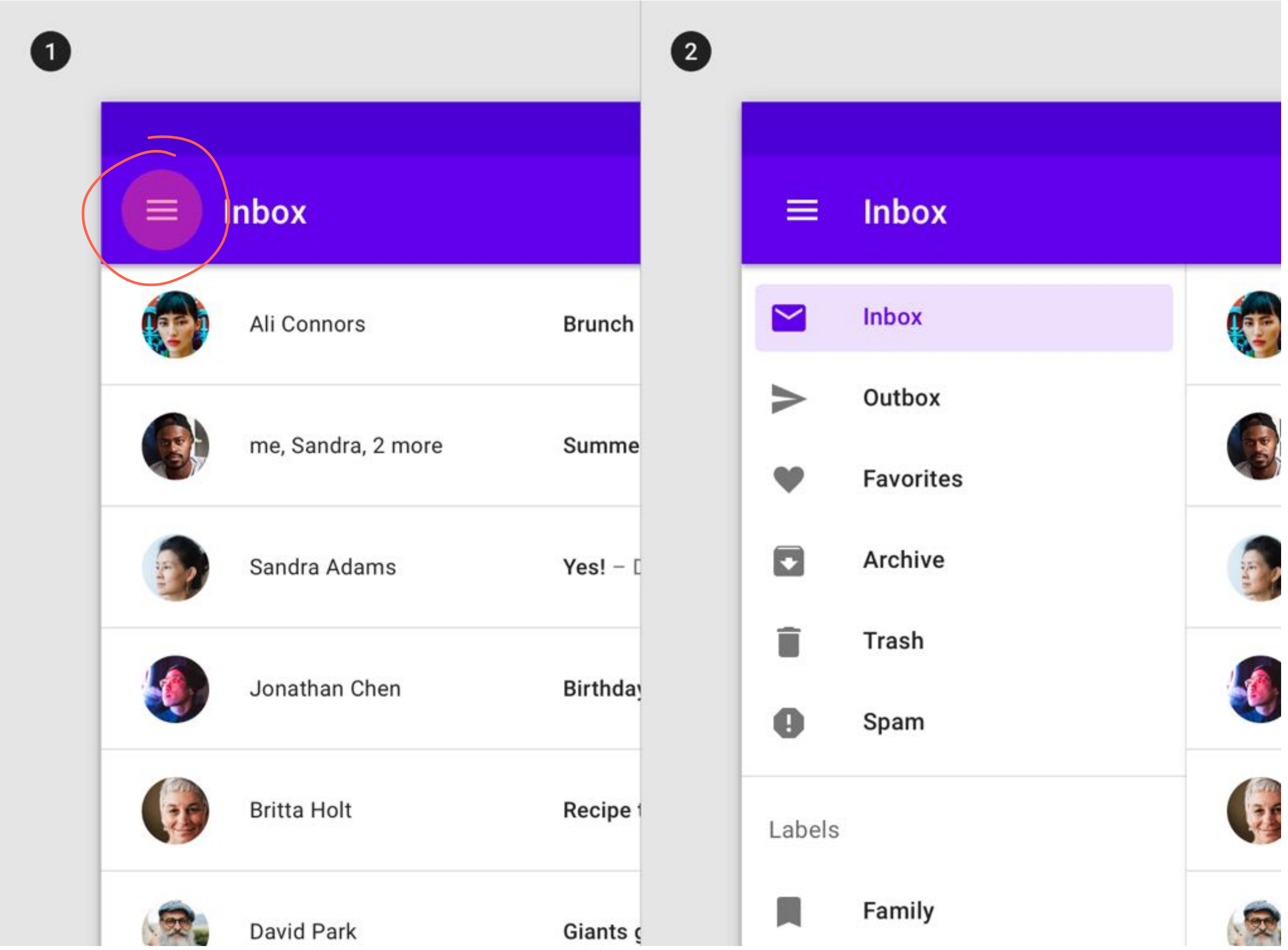
Definition: Building dedicated, highly expressive interaction capabilities that users must learn.

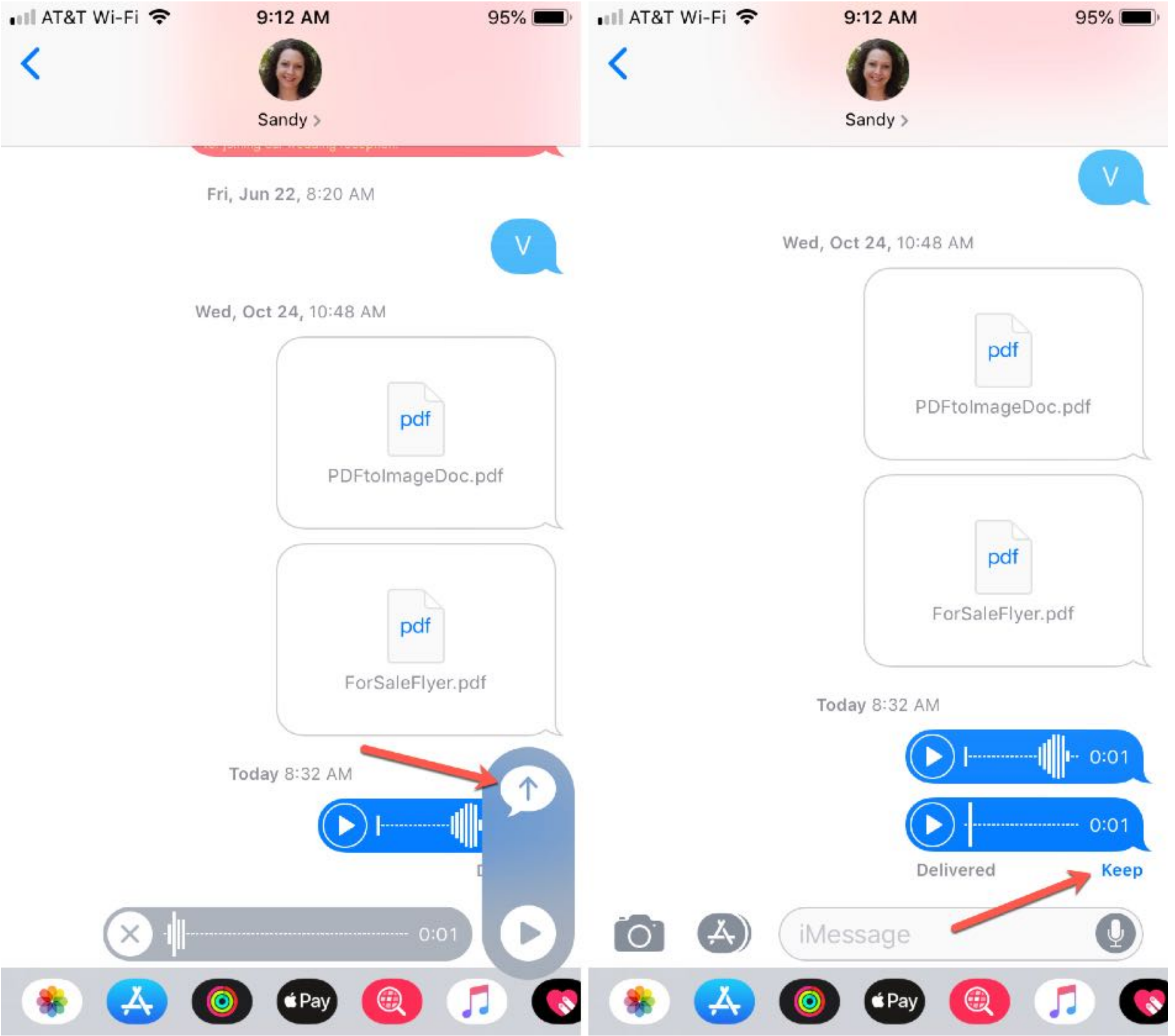
Mapping cursor movements on a screen to mouse movements is an extremely successful example.



[10] Image Source

[11][12]





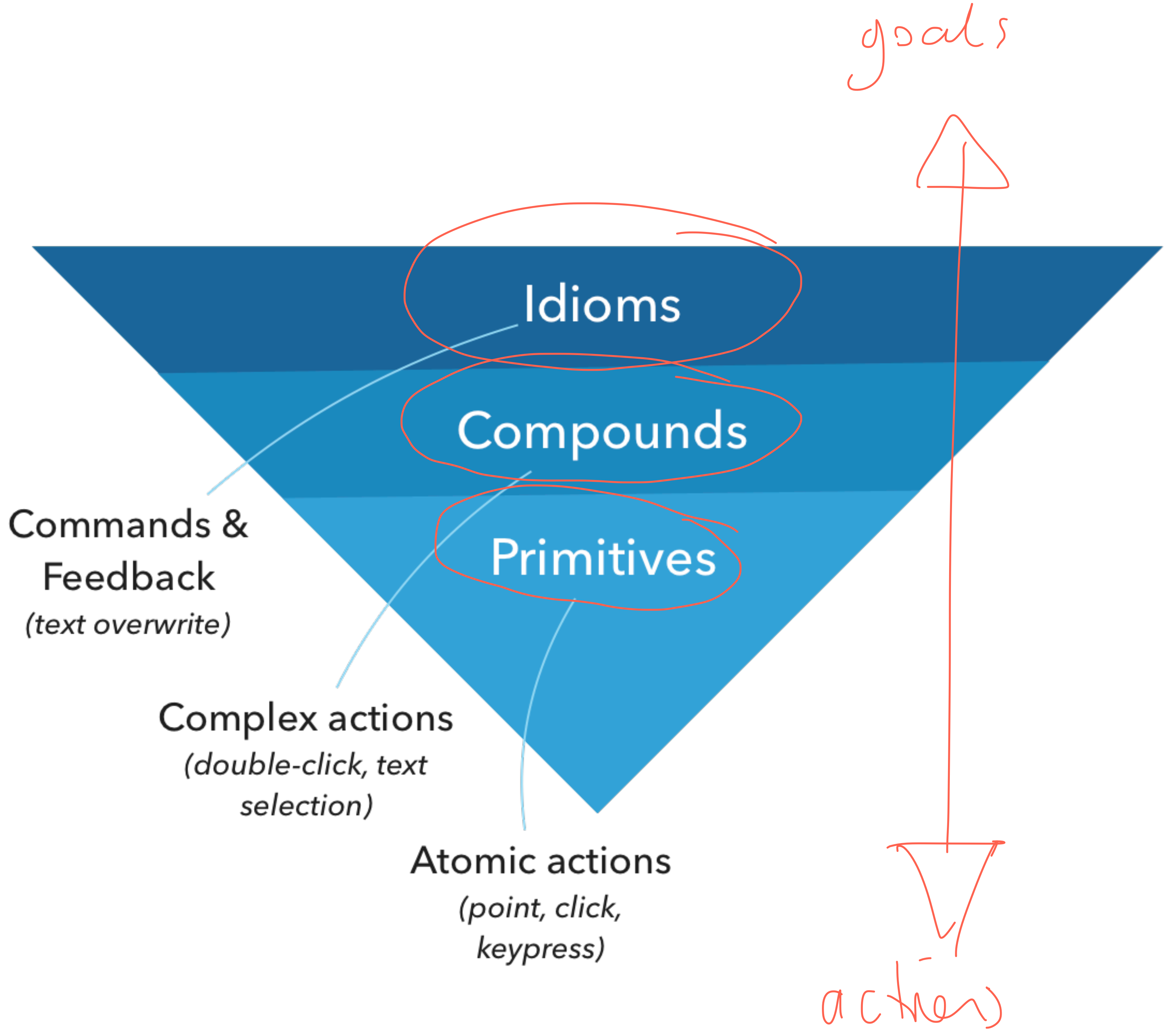
[11] Image Source

[12] Image Source

Developing Idioms[13]

In designing idioms involve, three elements are established:

1. **Primitives**: atomic actions, e.g., point, click
2. **Compounds**: complex actions, e.g., double-click
3. **Idioms**: higher-level elements, e.g., deleting text



[13] Cooper et al., 2014, About Face

Quiz 1

Complete the Canvas quiz.

Quiz 2

Complete the Canvas quiz.

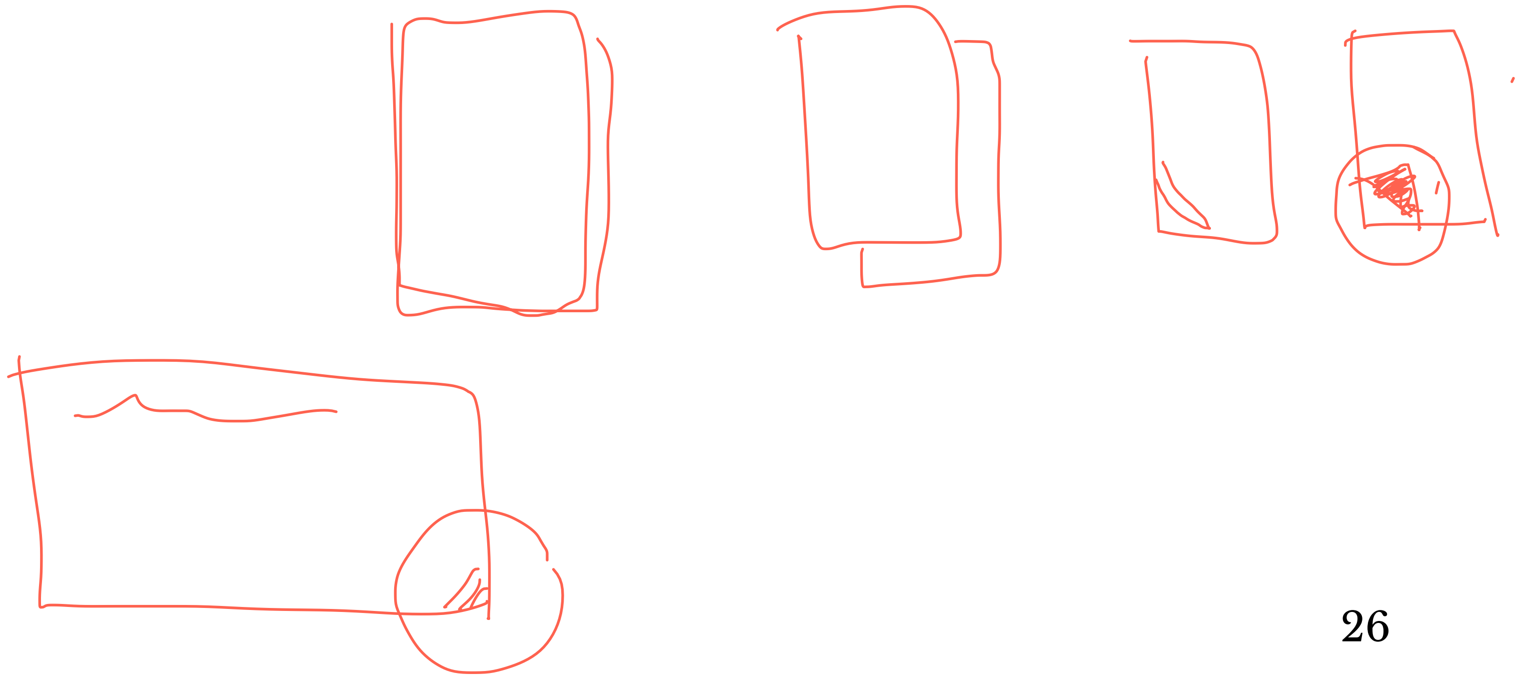
Affordances

Affordances

Definition: The perceived properties of a design element that give clues about how to interact with it. Designers have borrowed the concept from ecological psychology.

Theoretical Roots: James Gibson (1977, 1979) suggested that the human environment is structured in a way that communicates action possibilities through *affordances*.

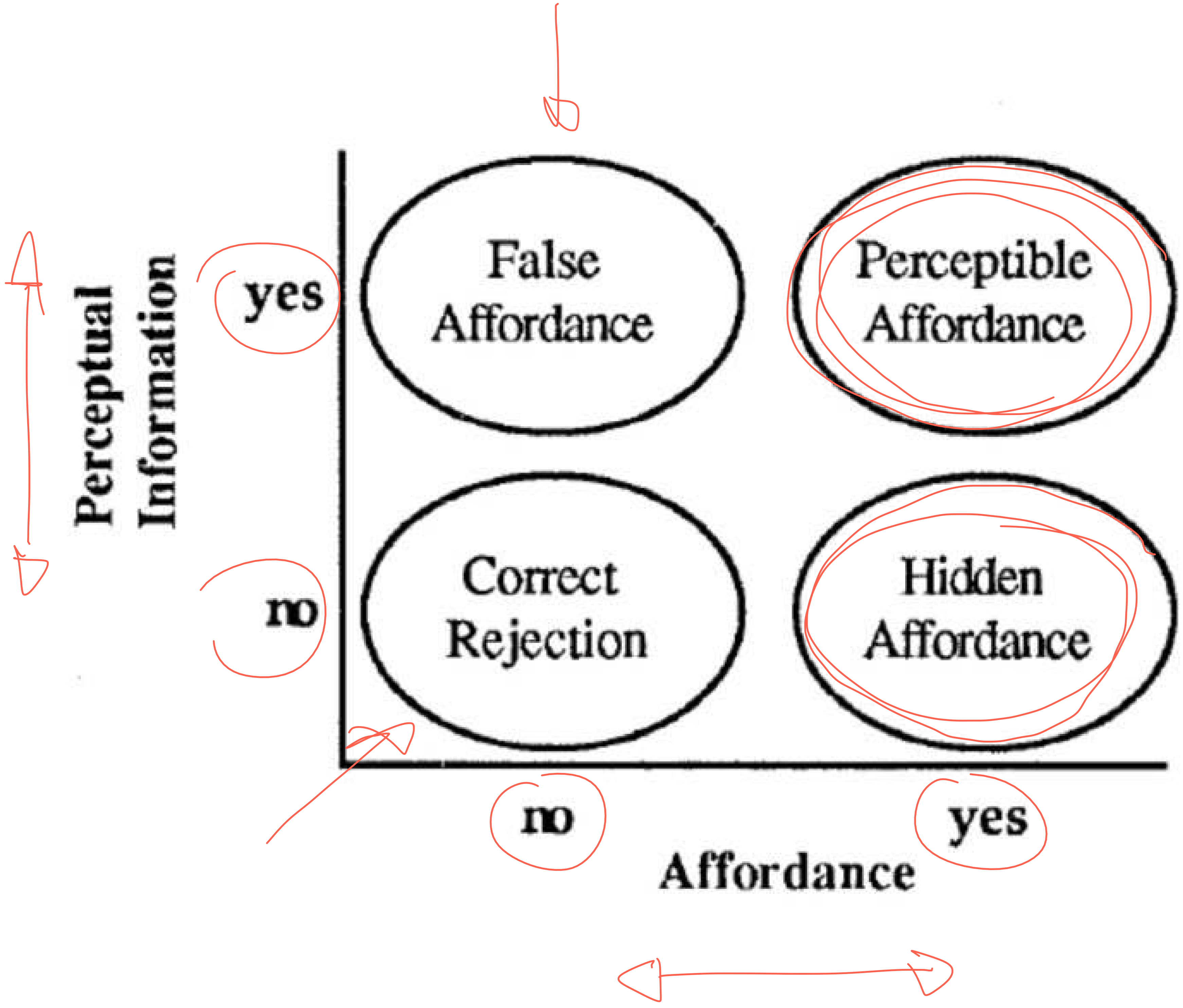
Which environment affords *walking*?



Affordances in Design

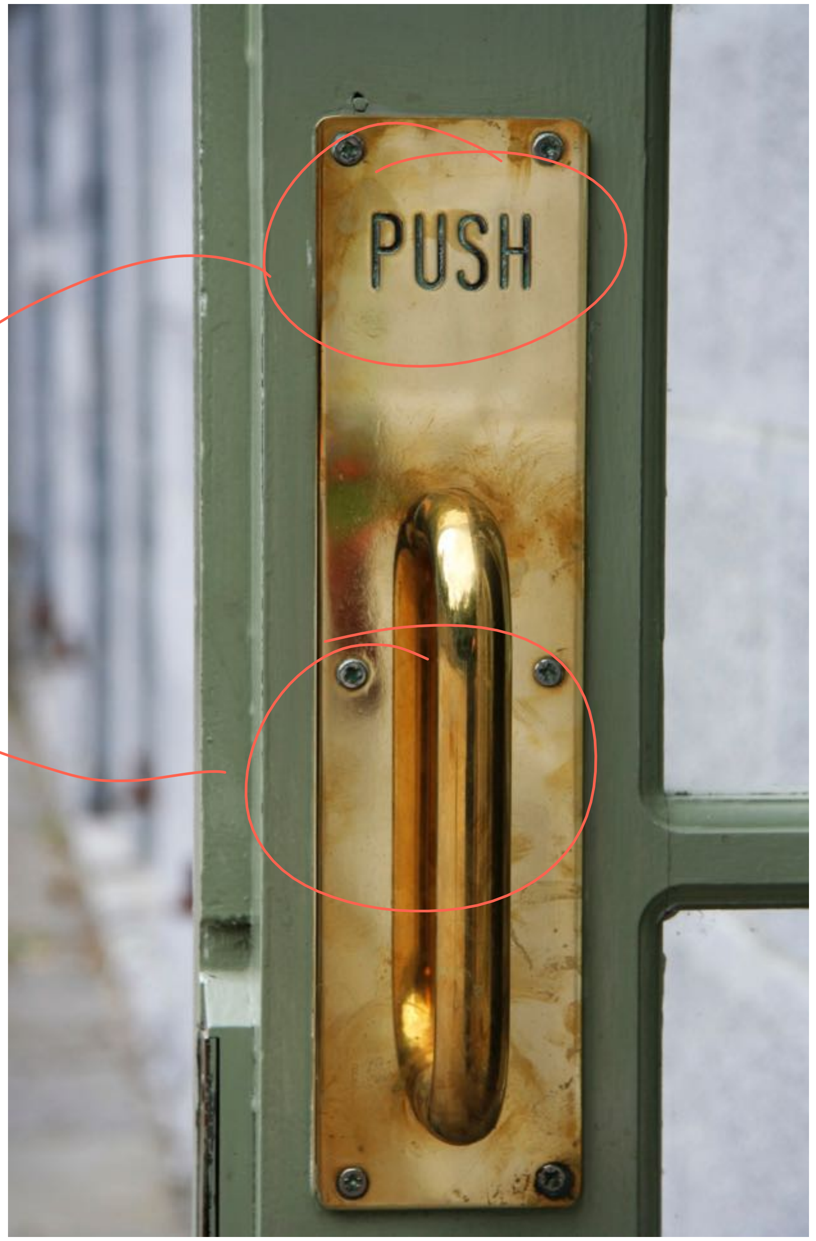
Perceptible affordances enable users to intuitively recognize actions that are possible with interface elements.[14]

Affordances can also be *hidden* and *false*.

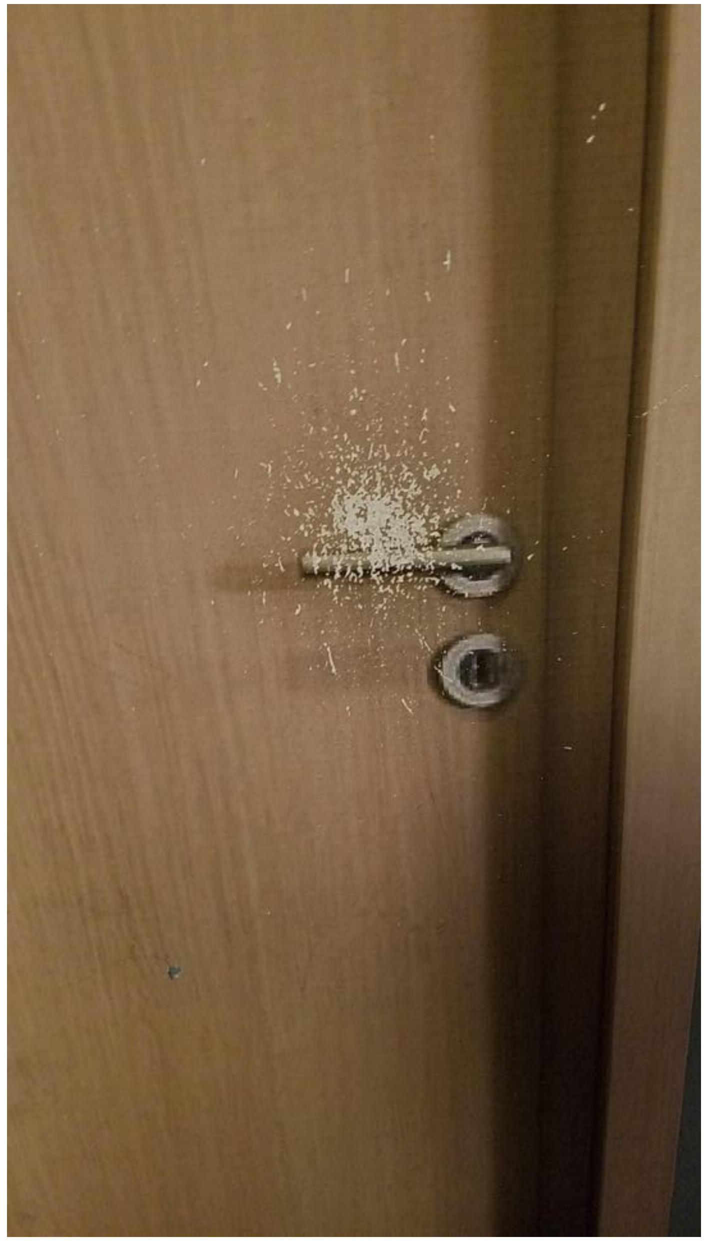


[14] Figure: Gaver, 1991, *Technology Affordances*

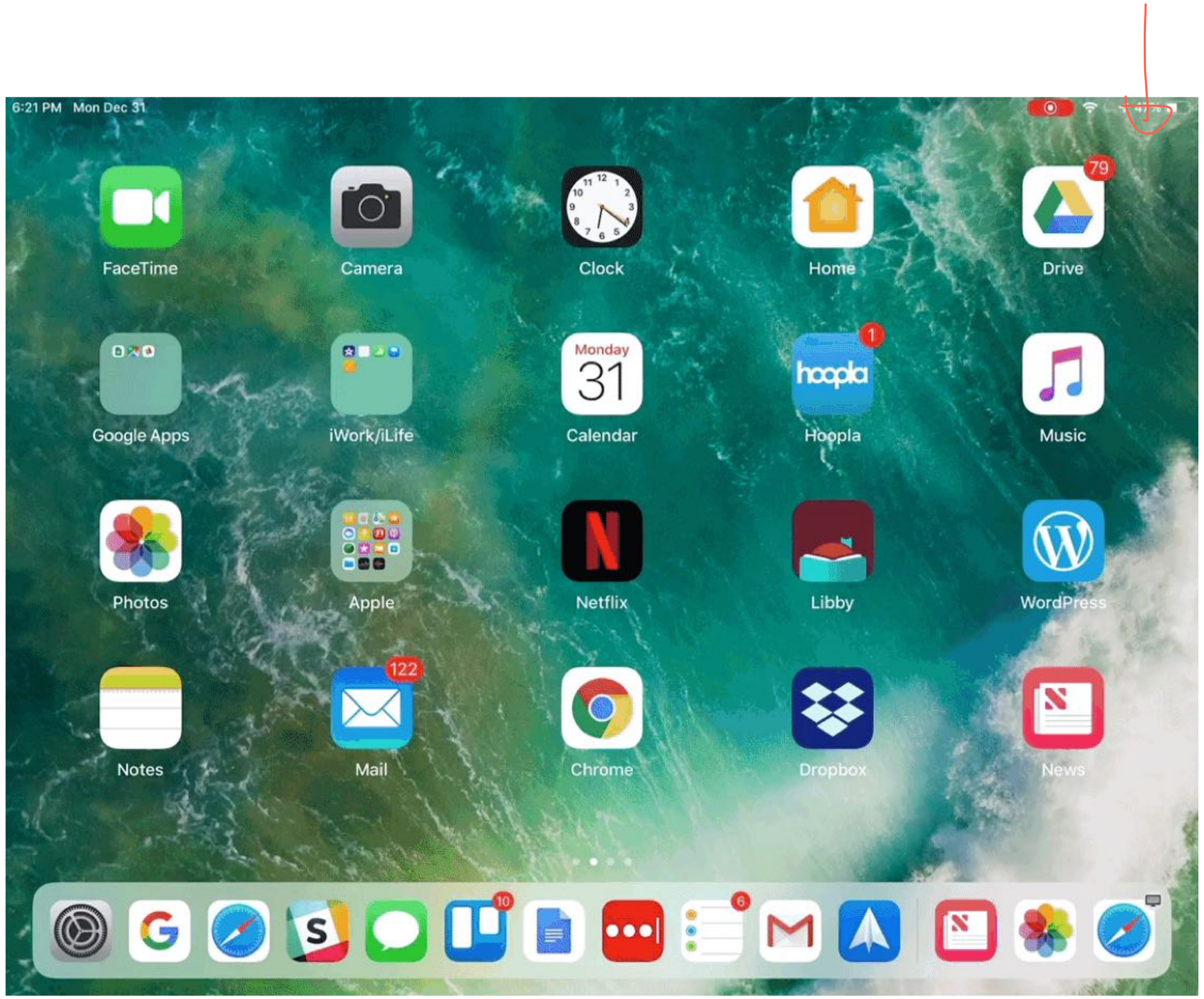
False Affordances: There is perceptual information, but no affordance or incorrect affordance.

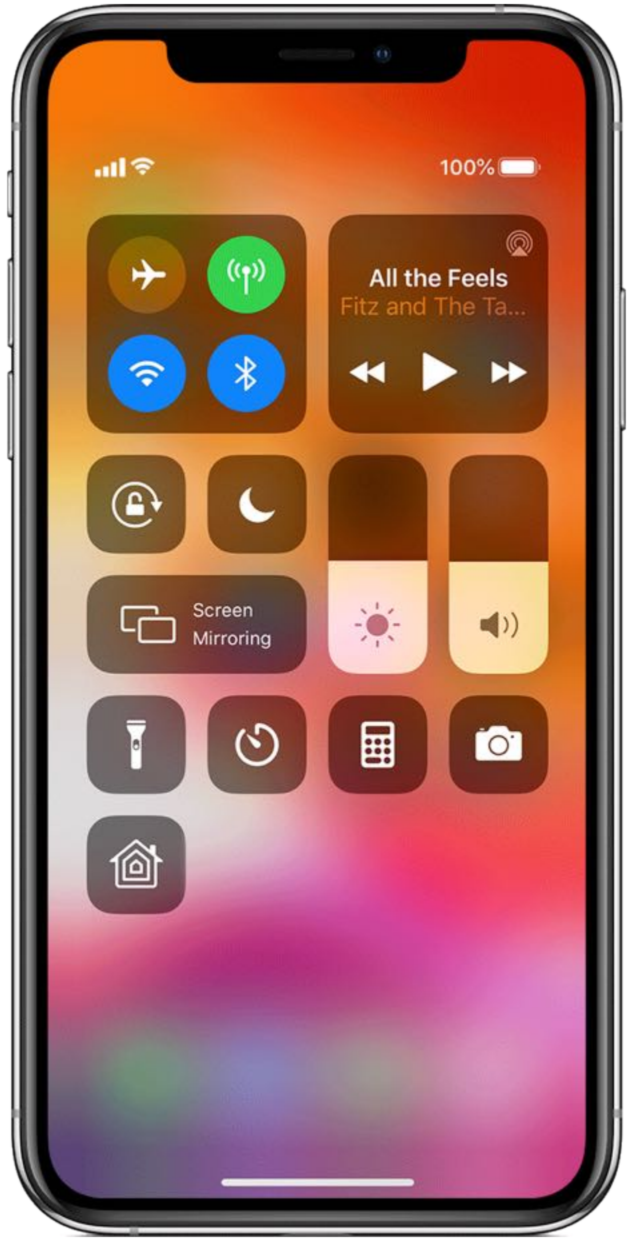


Inconsistency



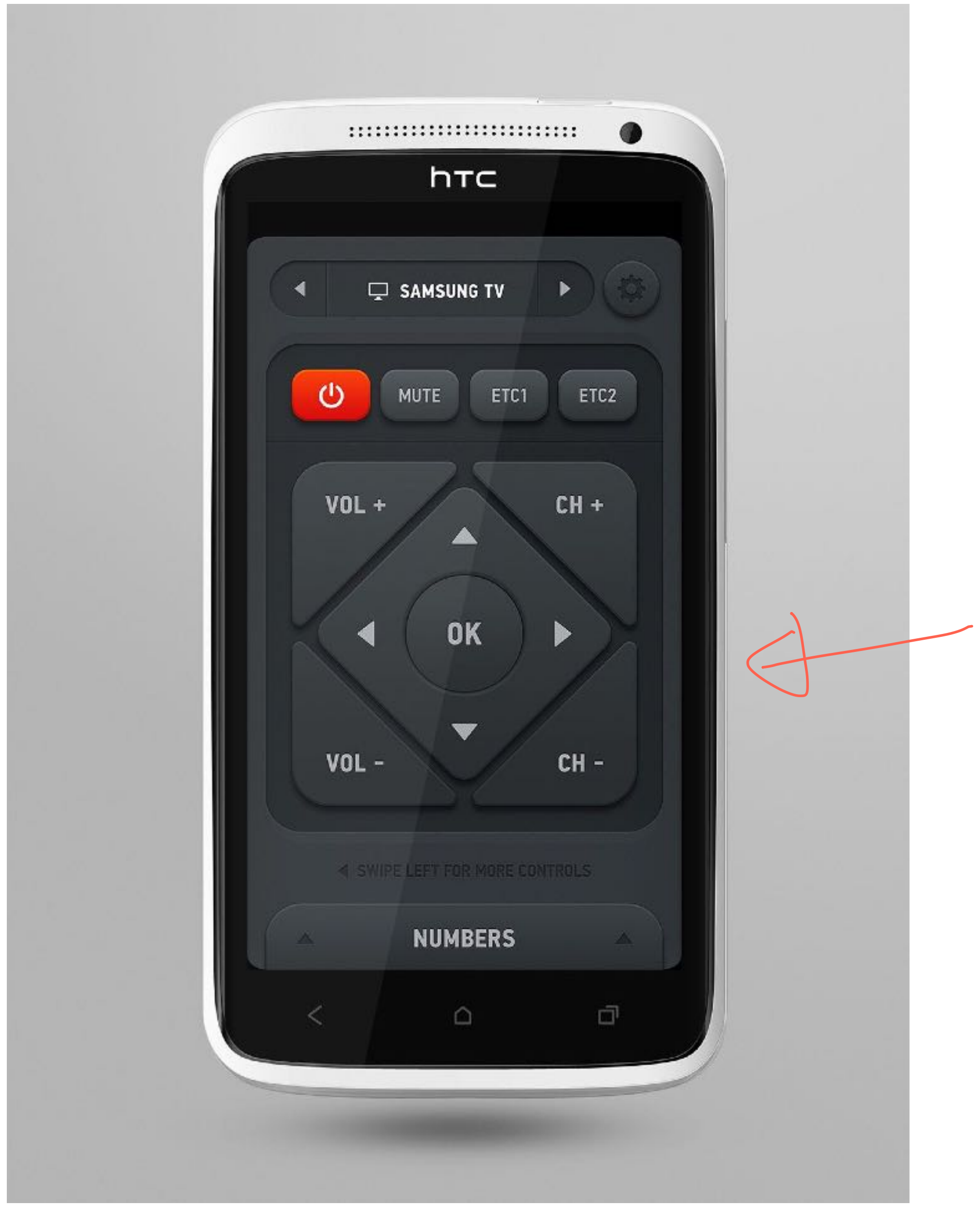
Hidden Affordance: There is no perceptual information, but there is (idiomatically designed) affordance.





Perceptible Affordances: The perceptual information and the affordance are both present.

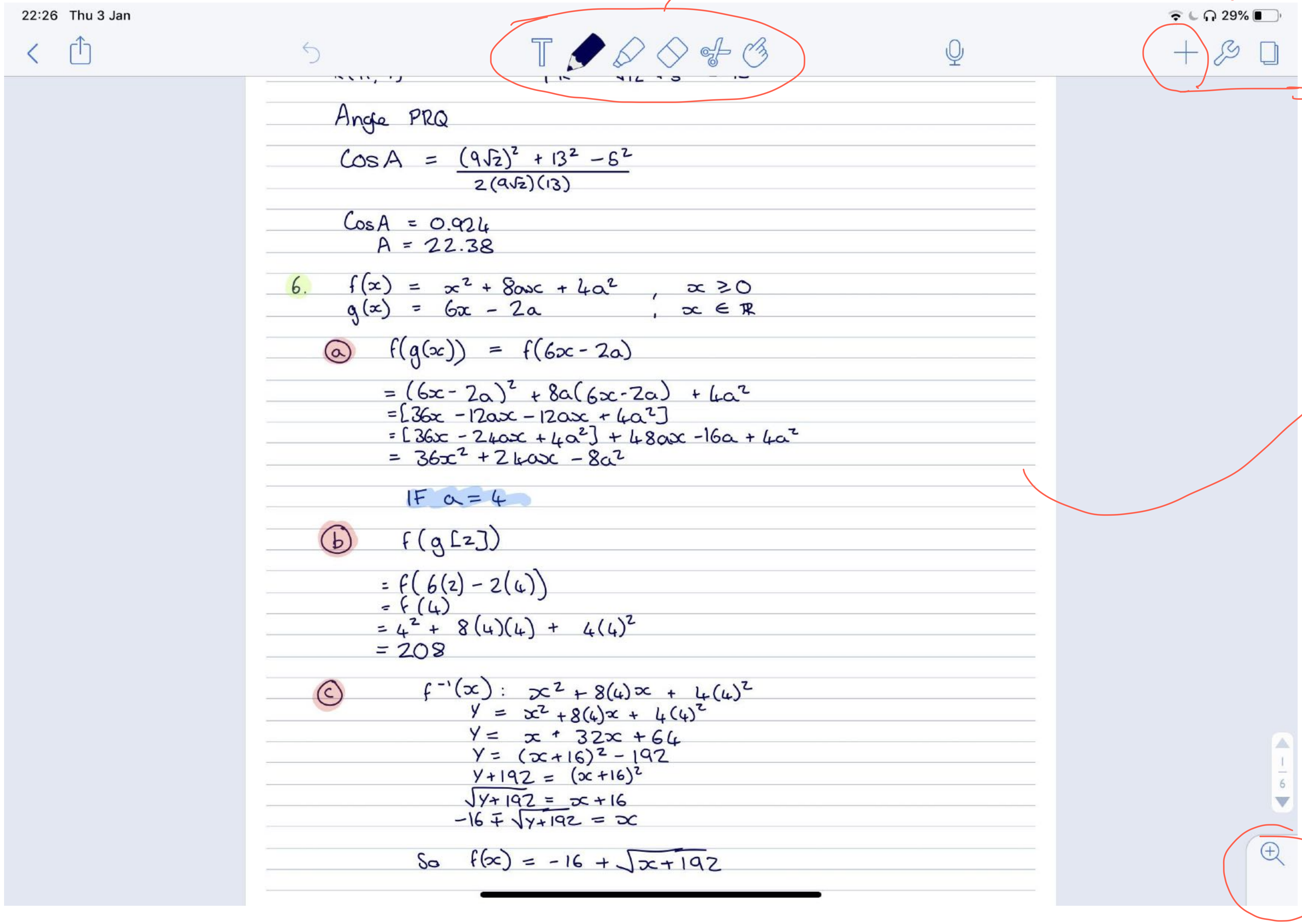
skeuomorphickit 1.0
ON
OFF
ON
ON
mono
stereo
min
max
Ahmed Gamal | agartworks.com



In-Class Activity

Metaphor & Affordance Deconstruction

toolbox metaphor / button affordance



Angle PRQ

$$\cos A = \frac{(9\sqrt{2})^2 + 13^2 - 6^2}{2(9\sqrt{2})(13)}$$

$\cos A = 0.924$
$A = 22.38$

6. $f(x) = x^2 + 8ax + 4a^2 \quad ; \quad x \geq 0$
$g(x) = 6x - 2a \quad ; \quad x \in \mathbb{R}$

ⓐ $f(g(x)) = f(6x - 2a)$

$= (6x - 2a)^2 + 8a(6x - 2a) + 4a^2$
$= [36x - 12ax - 12ax + 4a^2]$
$= [36x - 24ax + 4a^2] + 48ax - 16a + 4a^2$
$= 36x^2 + 24ax - 8a^2$

IF $a = 4$

ⓑ $f(g[2])$

$= f(6(2) - 2(4))$
$= f(4)$
$= 4^2 + 8(4)(4) + 4(4)^2$
$= 208$

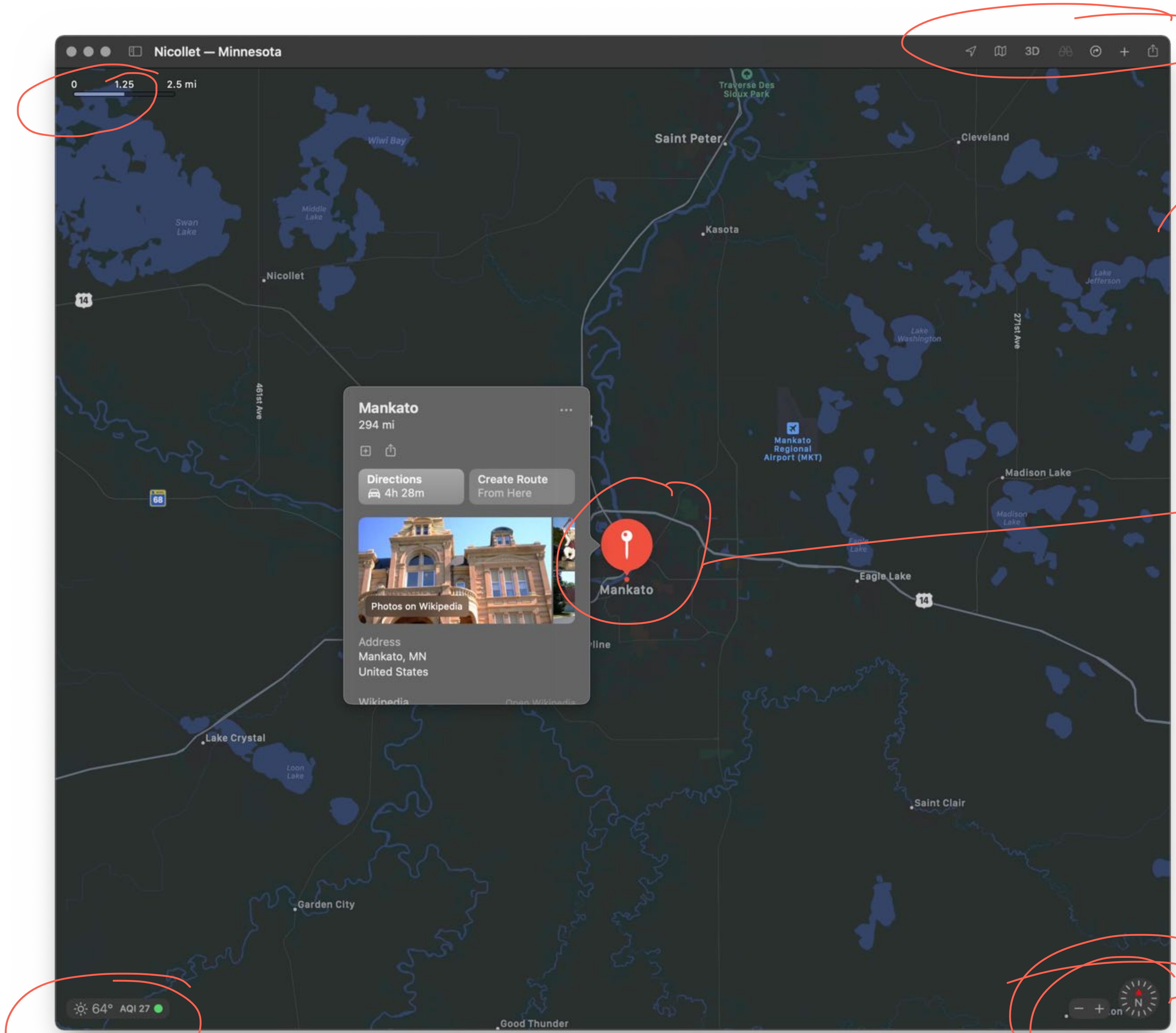
ⓒ $f^{-1}(x) : x^2 + 8(4)x + 4(4)^2$
$y = x^2 + 8(4)x + 4(4)^2$
$y = x + 32x + 64$
$y = (x + 16)^2 - 192$
$y + 192 = (x + 16)^2$
$\sqrt{y + 192} = x + 16$
$-16 \mp \sqrt{y + 192} = x$

So $f(x) = -16 + \sqrt{x + 192}$

affordance

metaphor of physical notebook

affordance for zooming



map metaphor (analogue)

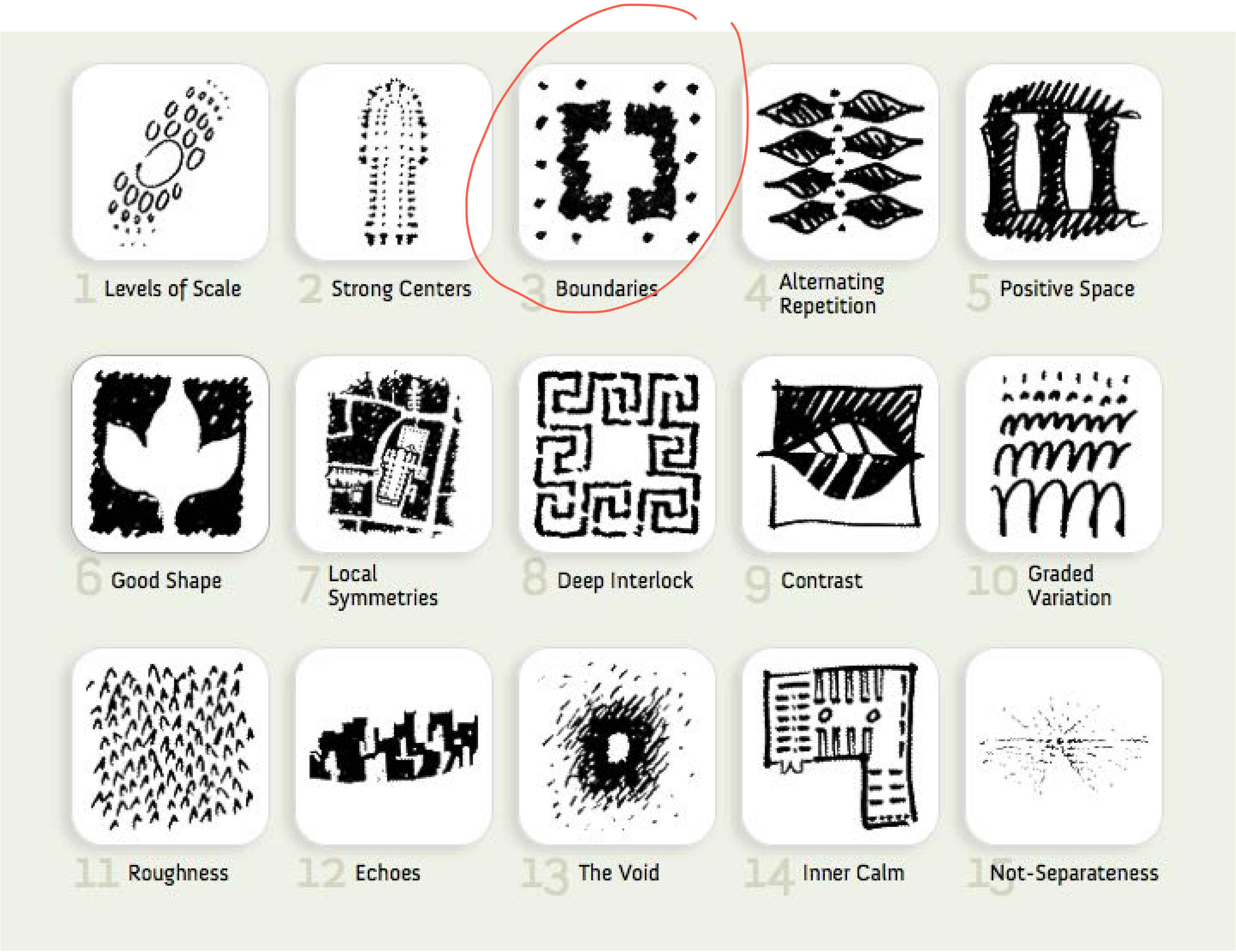
pin analogue

Design Patterns

Design Patterns

Definition: A design pattern is a general, reusable solution to a commonly occurring problem within a given context.

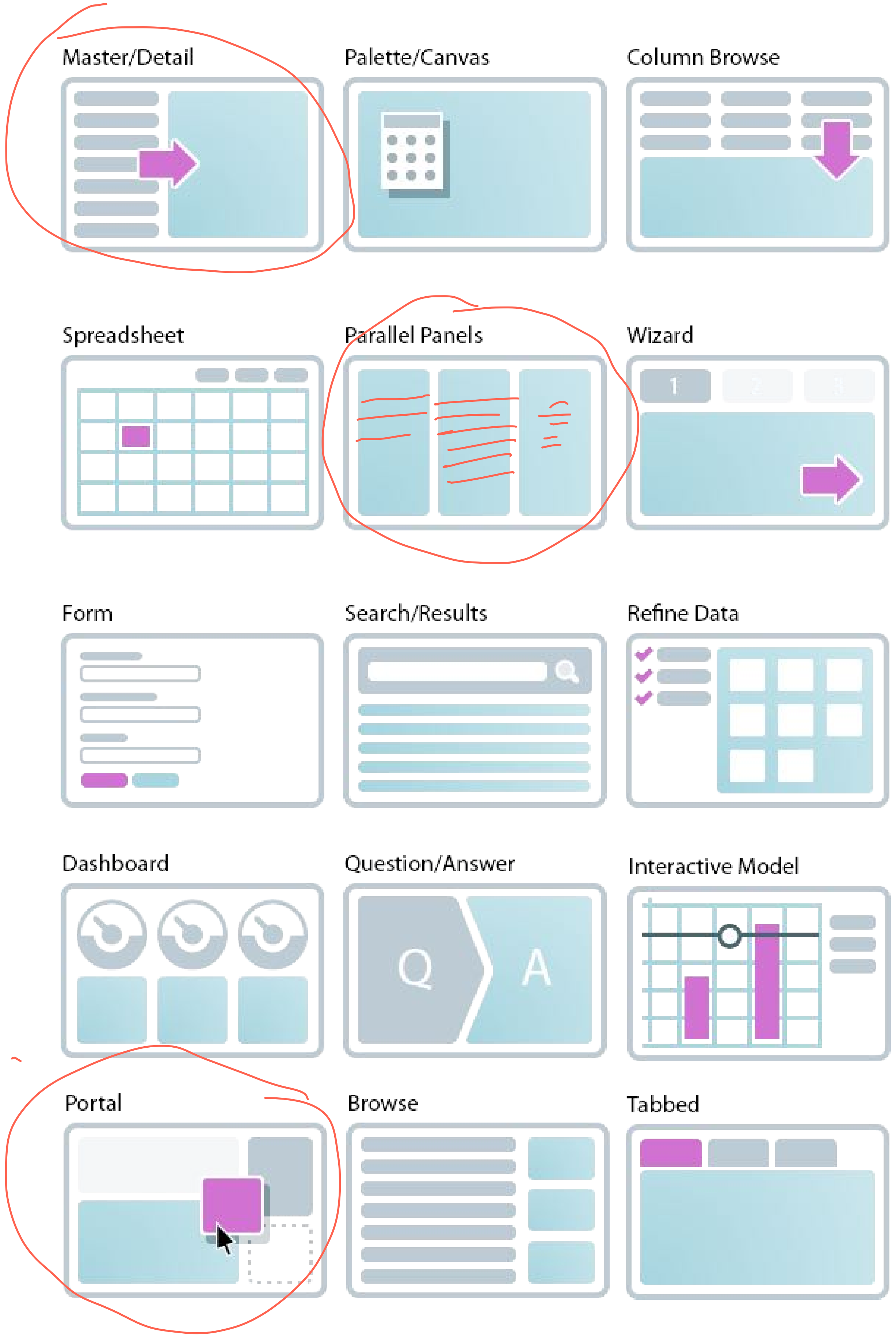
Originally developed by Christopher Alexander (1977; *A Pattern Language*) to address problems in architecture and city planning.[15]



[15] Smart Cities Dive

Design Patterns in UX

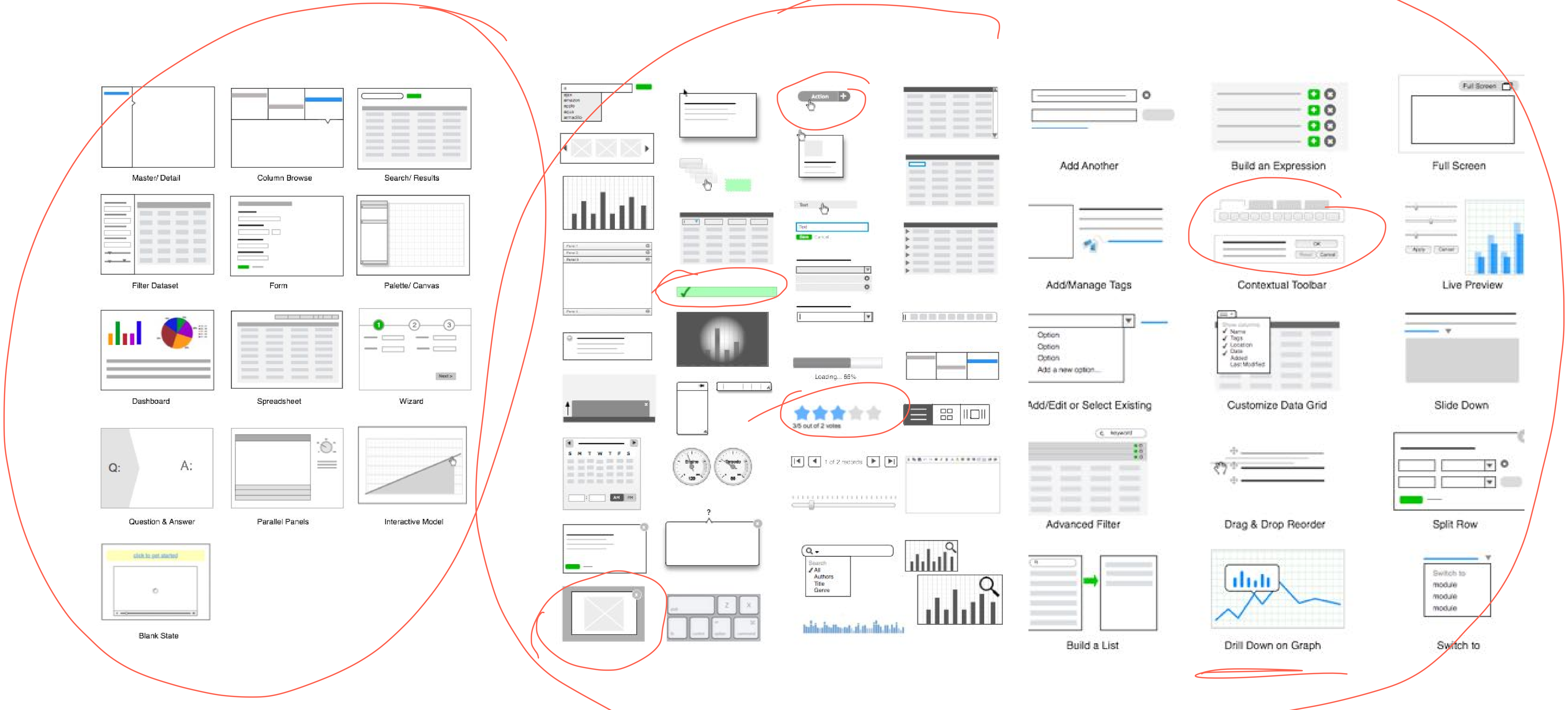
In the last decade, designers have also developed and refined patterns for overall structure and organization, components and controls.[16]



my.wisc.

[16] Neil, 2010, 12 Standard Screen Patterns

Source[17]



[17] Neil, 2010, 12 Standard Screen Patterns

Pros & Cons of Design Patterns

Pros:

1. Reducing design time and effort
2. Improving the quality of design solutions
3. Establishing familiarity across systems
4. Providing a baseline or state of the art

Cons:

1. Not every design problem will warrant a pattern
2. Patterns may not exist for new design spaces

Quiz 3

Complete the Canvas quiz.

Design Languages

The Problem with Patterns

Problem 1. Can I piece together different patterns to make a complete design? **No**, as this eclectic design would lack coherence.

Problem 2. How do I choose which pattern to use? Are patterns interchangeable? **No**, there has to be a *principle* to the selection of patterns.

Problem 3: Pattern languages help you create a design that is consistent vertically. How do we create a system that is consistent *horizontally*? I.e., how do we achieve visual and behavioral consistency in designs?

The solution: Design languages!

Enter Pattern Languages

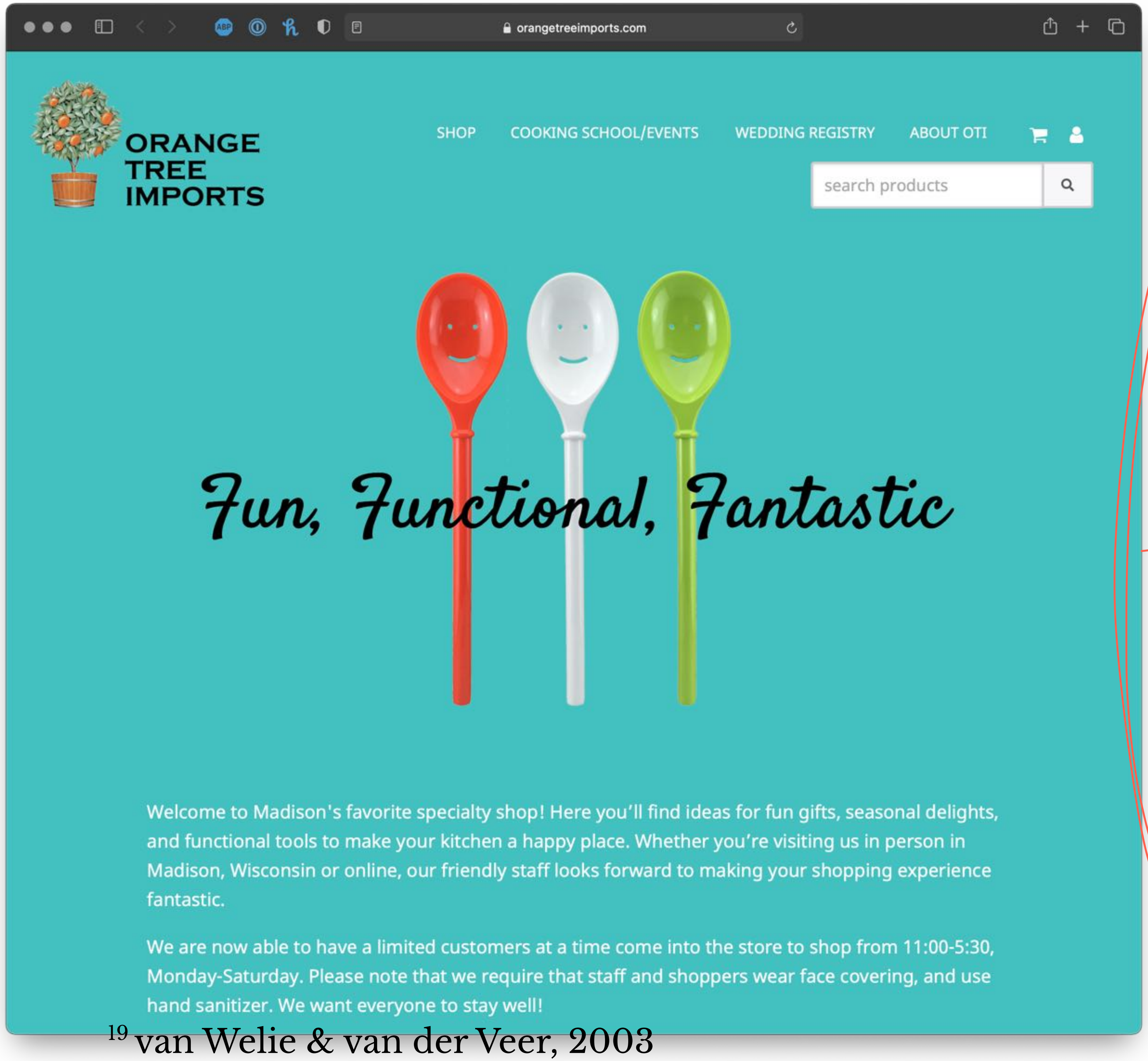
Define: A complete and hierarchical collection of patterns for a family of design problems.

Patterns are *words* (e.g., a component) that are connected with grammar rules to make *sentences* (e.g., a screen) and eventually *language* (e.g., user experience).[18]

The pattern language can be thought of as patterns being applied at different *levels*. Let's see an example.

[18] Kruschitz & Hitz, 2009

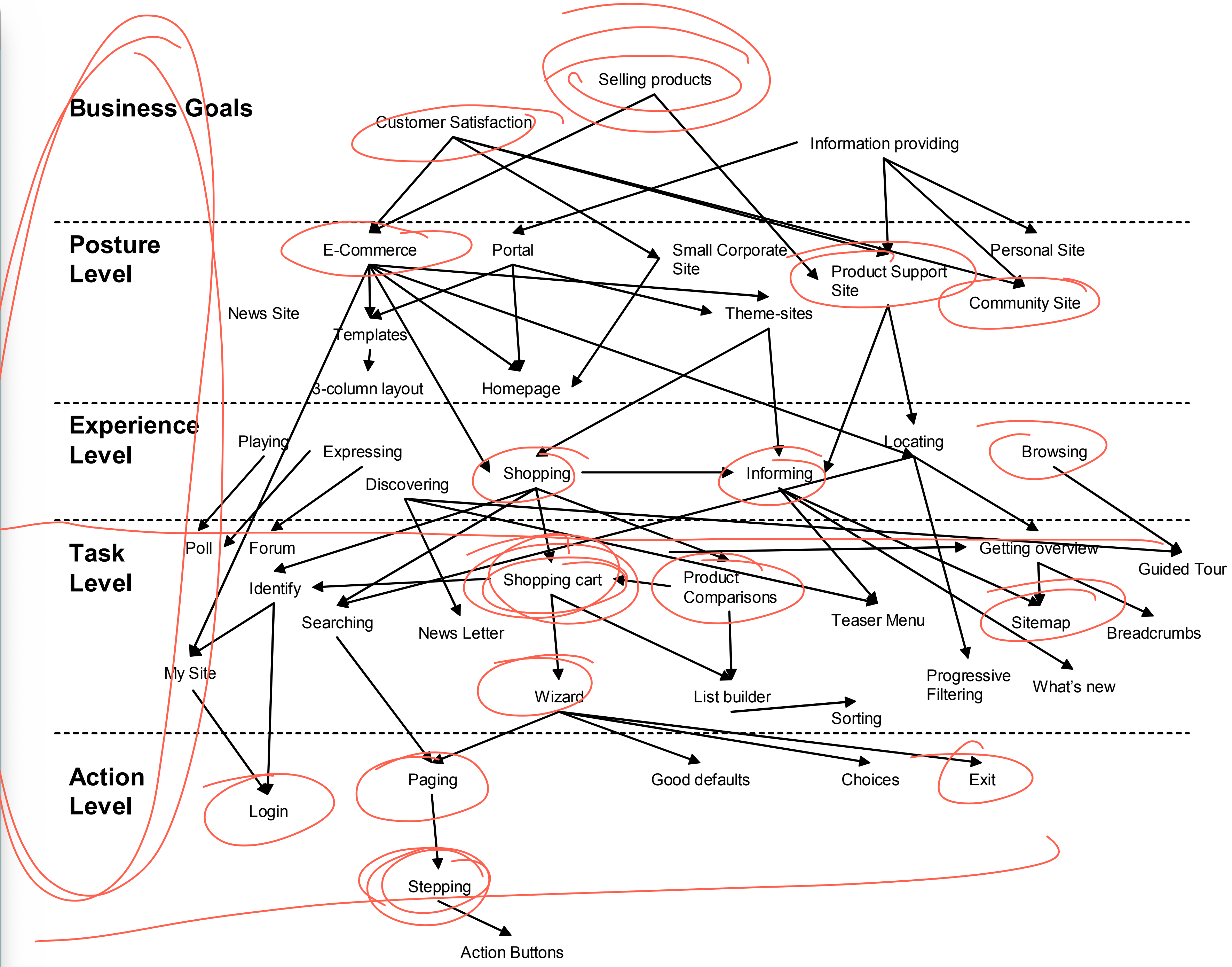
Source[19]



Fun, Functional, Fantastic

Welcome to Madison's favorite specialty shop! Here you'll find ideas for fun gifts, seasonal delights, and functional tools to make your kitchen a happy place. Whether you're visiting us in person in Madison, Wisconsin or online, our friendly staff looks forward to making your shopping experience fantastic.

We are now able to have a limited customers at a time come into the store to shop from 11:00-5:30, Monday-Saturday. Please note that we require that staff and shoppers wear face covering, and use hand sanitizer. We want everyone to stay well!



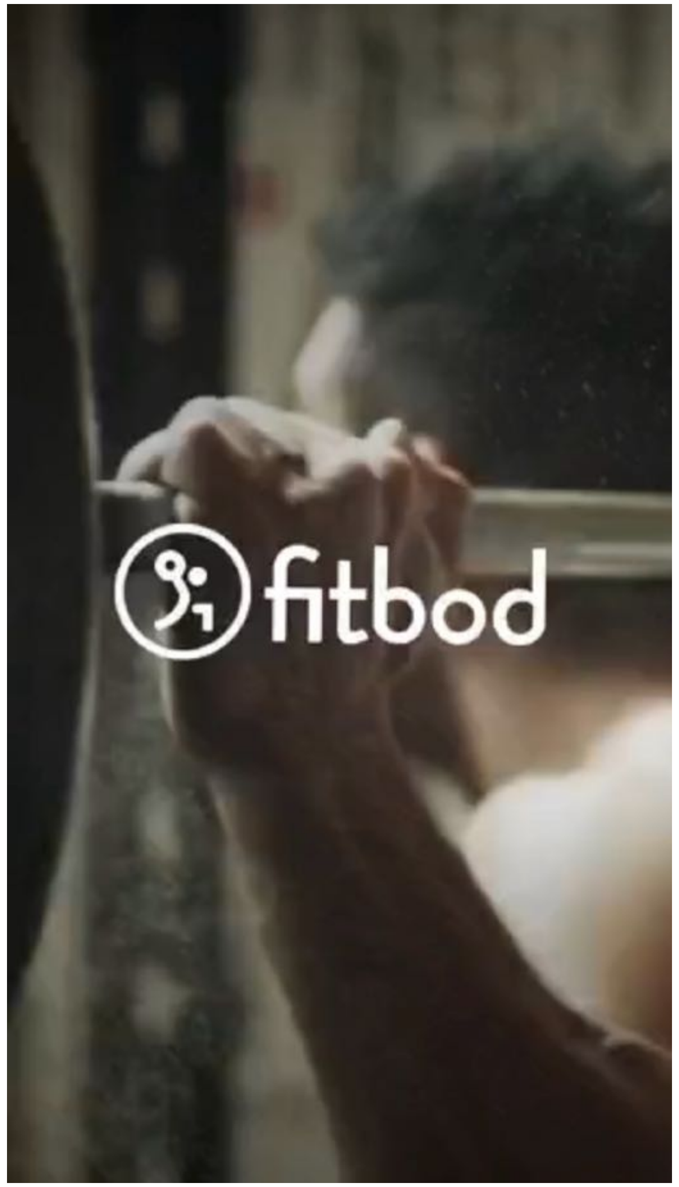
[19] van Welie & van der Veer, 2003

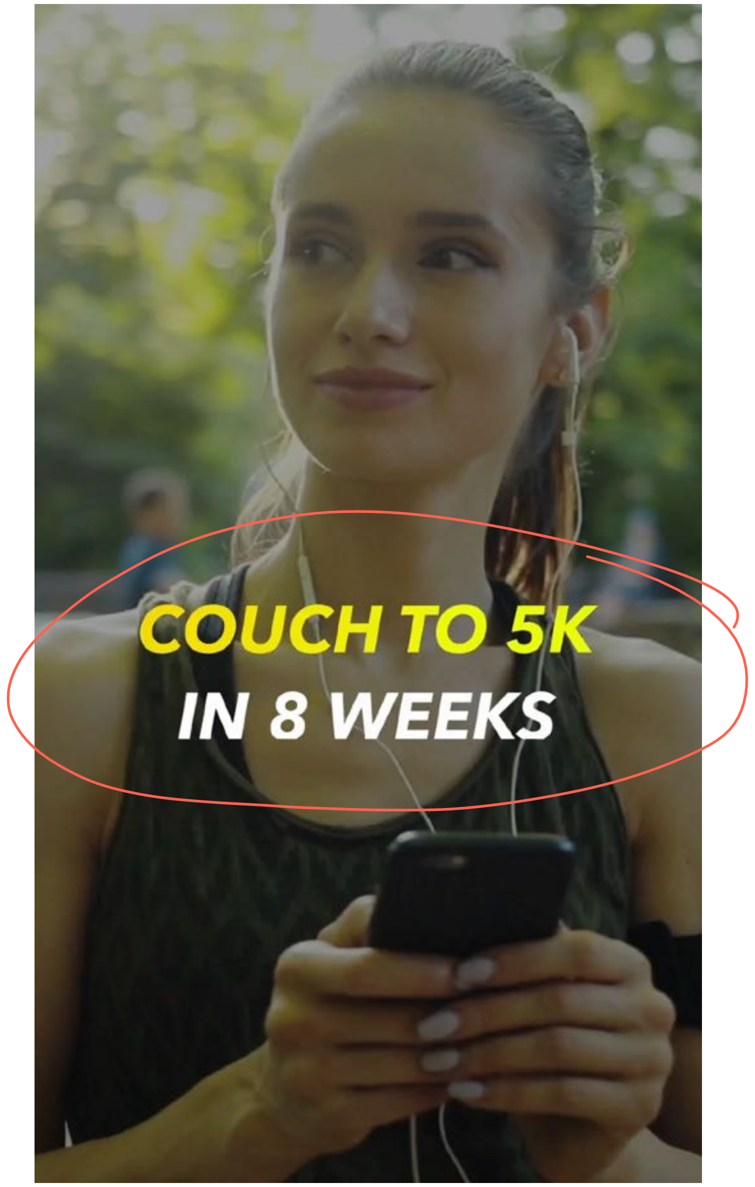
Business Goals

Definition: Conceptual design that captures the role that the design plays in user's life, i.e., the *mission* of the application, e.g., "helping users achieve fitness goals."

Source[20]

GET FIT & HEALTHY
WITH
myfitnesspal
From Weight Loss to Weightlifter: Christina's Postpartum Transformation
How a College Student's Weight-Loss Journey Led Her to a New Career
How Frank Dropped 8[illegible] and Found He Actually Running
Southerner Fought off 250 Pounds
Lauren's 30th Birthday Gift to Herself Was a Better Life



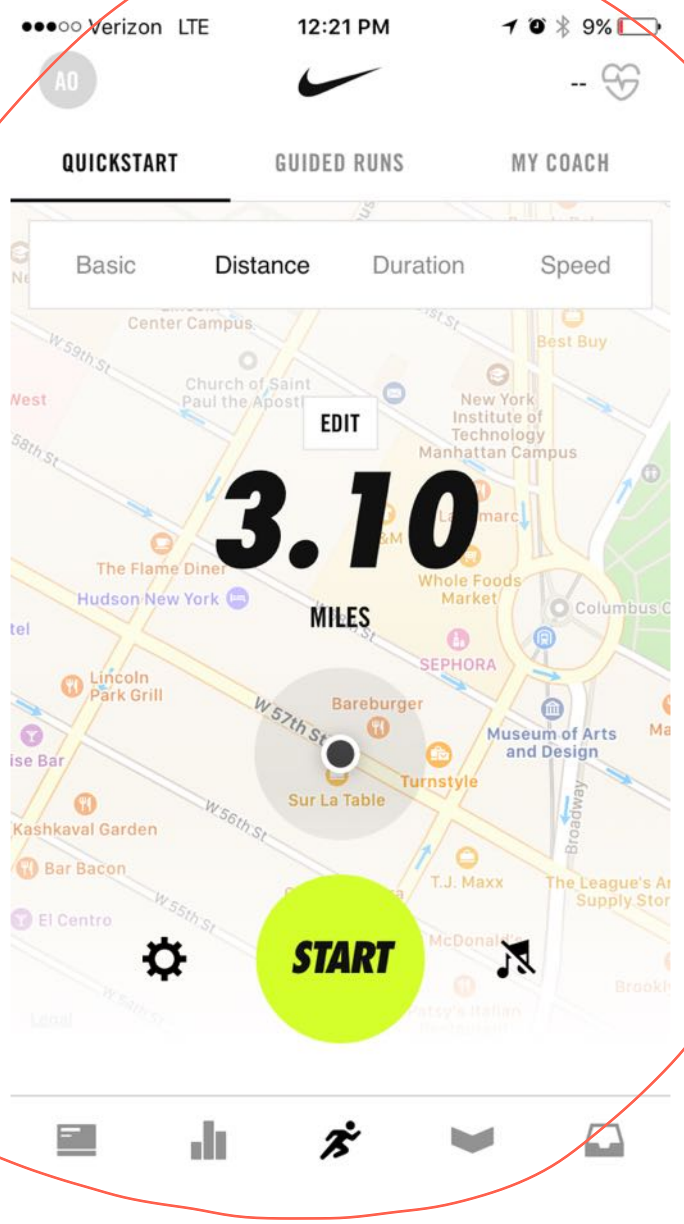


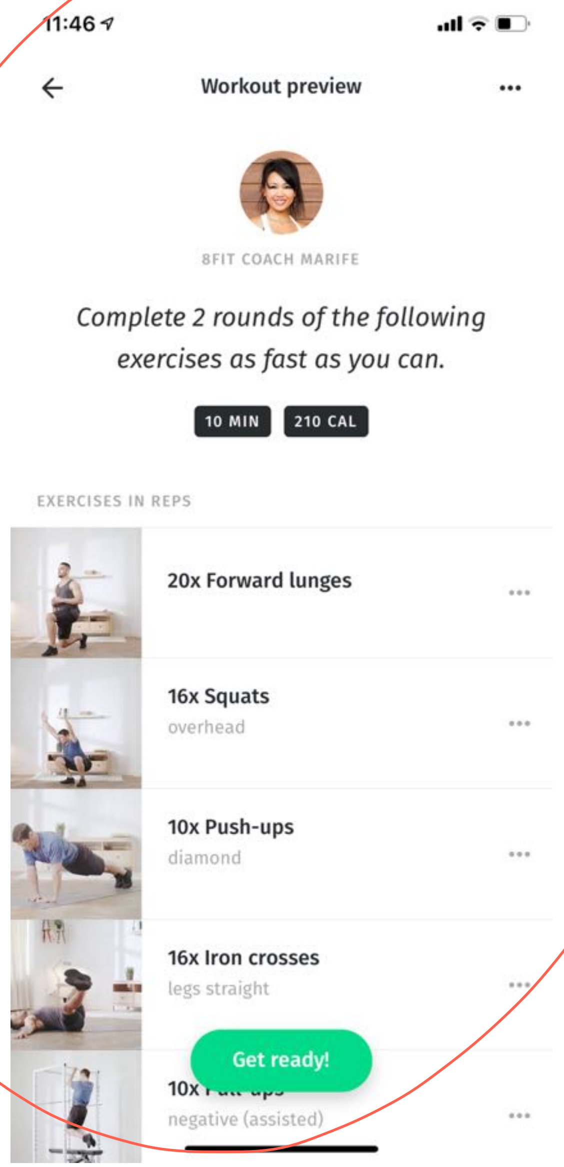
[20] Image source

Posture-Level Patterns

Definition: The *structure* that an application follows, i.e., what *type* of application it is, e.g., "a calorie tracking app," "a a step counter app," or "a life coaching app."

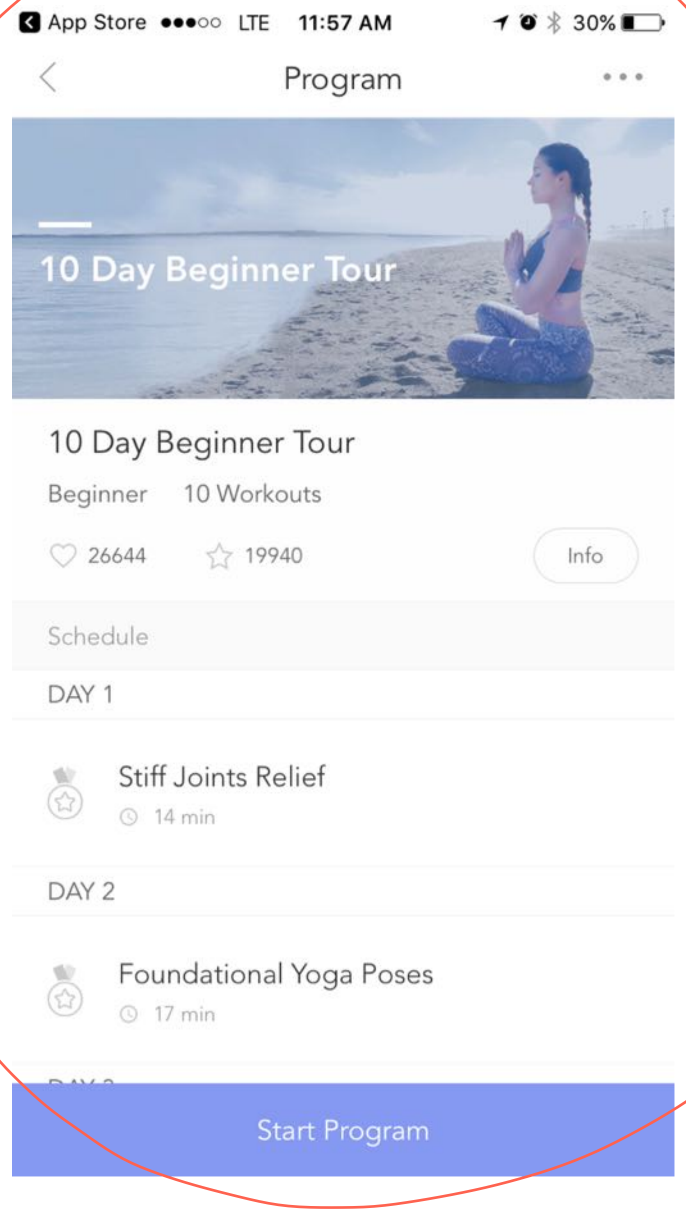
Source[21]





Complete 2 rounds of the following exercises as fast as you can.

- 20x Forward lunges
- 16x Squats overhead
- 10x Push-ups diamond
- 16x Iron crosses legs straight
- 10x Pull-ups negative (assisted)



10 Day Beginner Tour

Beginner 10 Workouts

Schedule

DAY 1

Stiff Joints Relief 14 min

DAY 2

Foundational Yoga Poses 17 min

[21] Source for images

Elements of a Posture-level Pattern

Once we determine the posture of an application, it gives us guidance on:

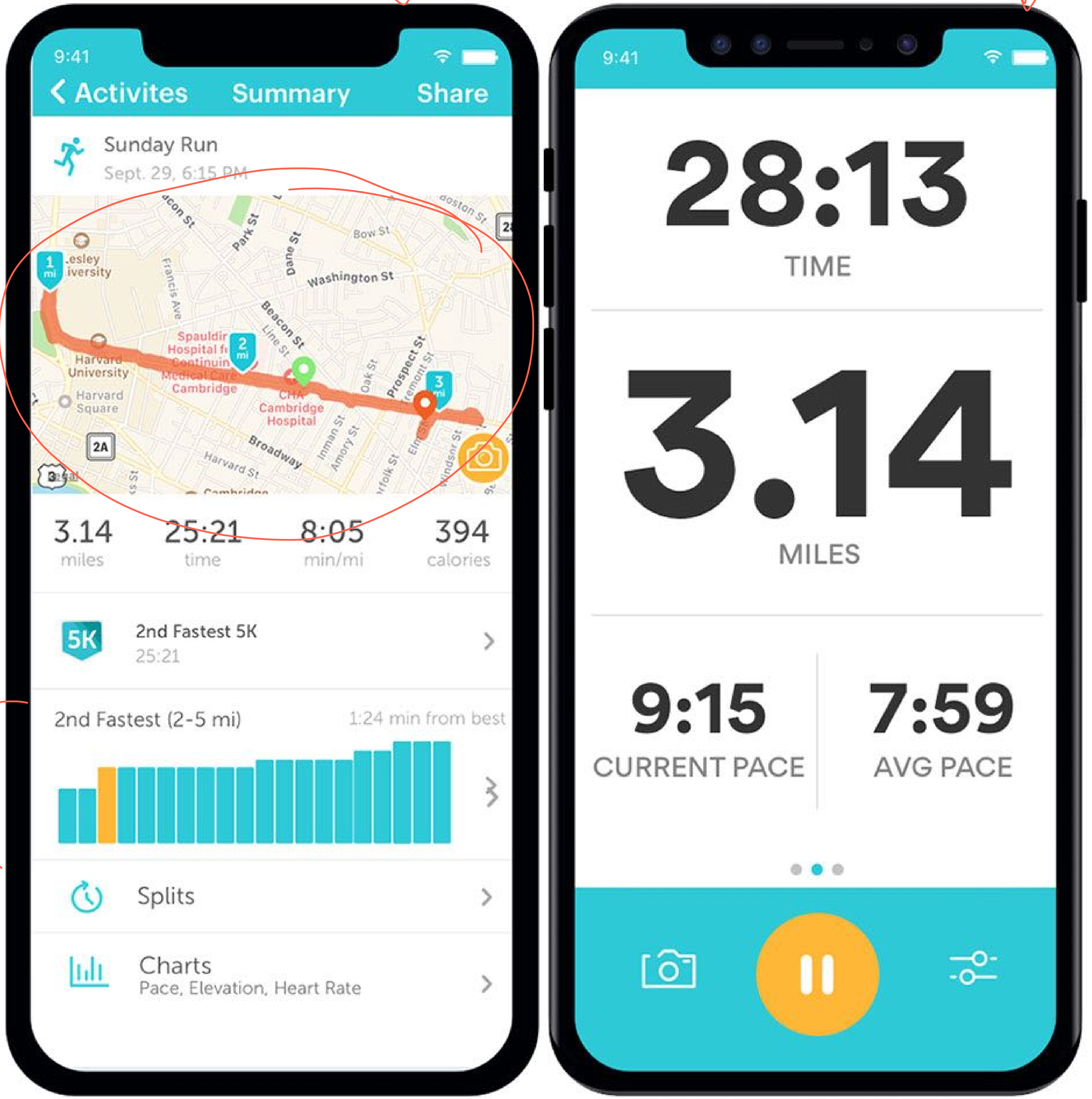
- Structure
- Components
- User experience
- Alternatives/competitors

Structure: Central canvas with supporting panels[22]

Components: Canvas, dashboard, score panel, data summary

UX: Measurement during the activity, review later

Competitors: Strava, RunKeeper



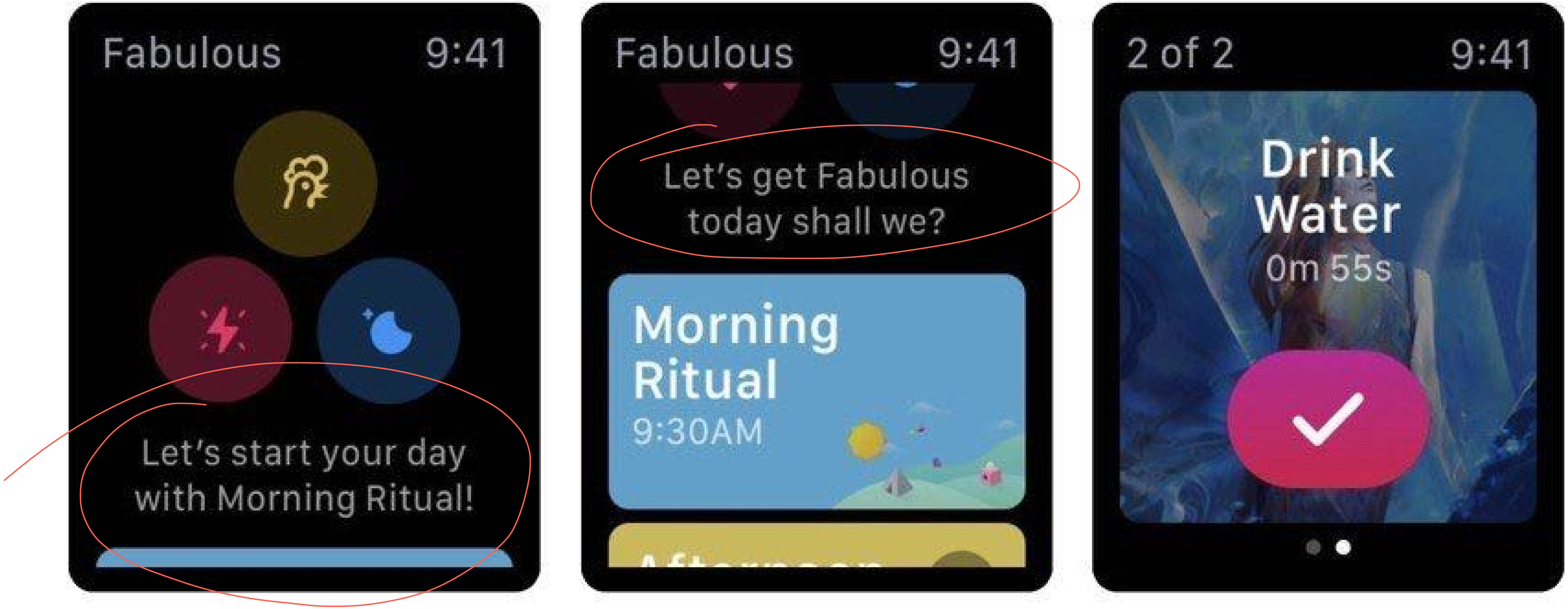
[22] Image source

Experience-Level Patterns

Definition: The *user goals* that make up the *user experience* that the application supports, e.g., activity tracking, coaching, and reviewing.

Experience-level patterns can also capture the *quality* of the user experience, e.g., *motivational* coaching.

Source[23]



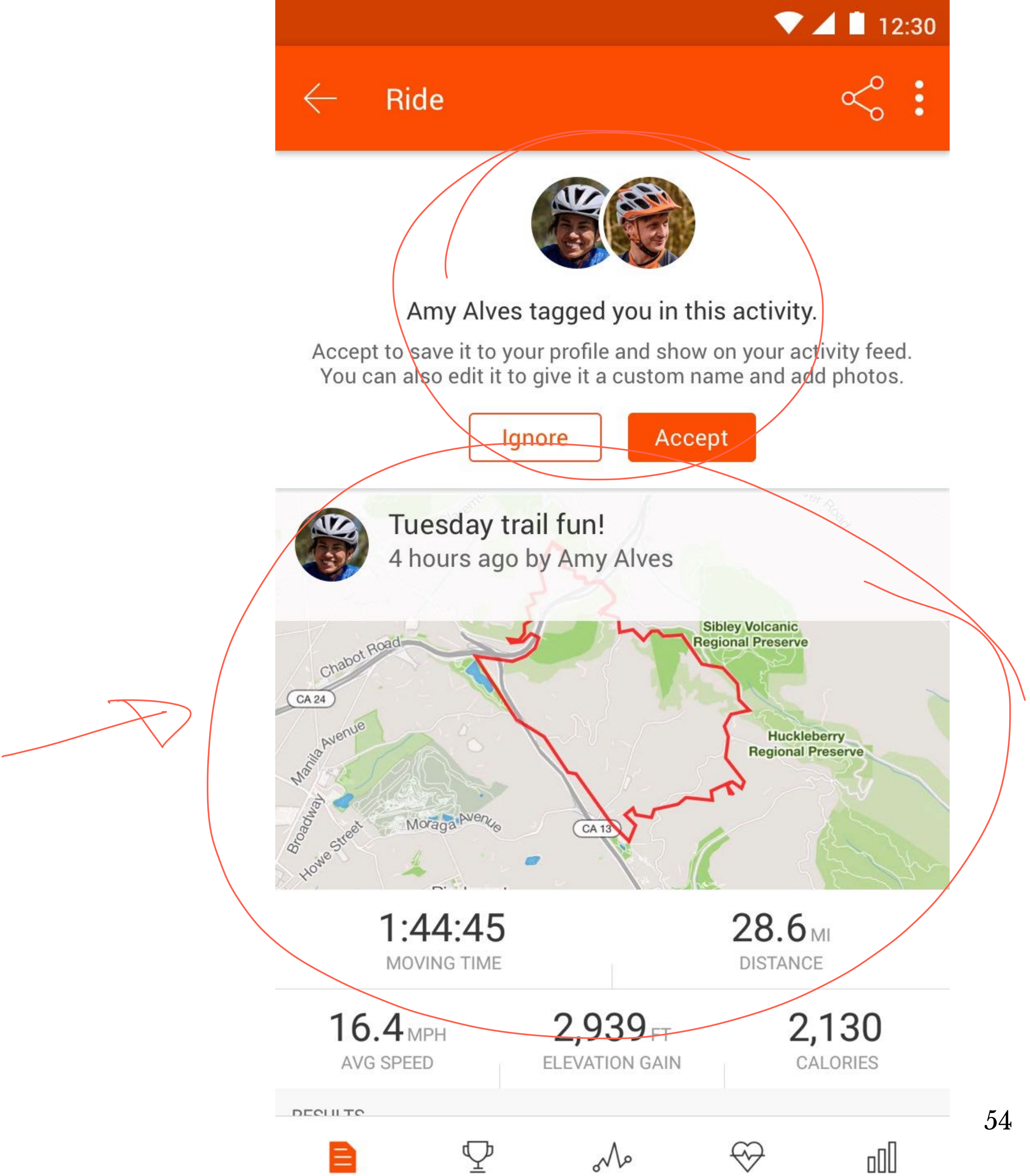
Let's start your day with Morning Ritual!

Let's get Fabulous today shall we?

[23] Image source

Elements of an Exprience-Level Pattern[24]

- Primary goals, e.g., activity tracking
- Secondary goals, e.g., community building



Amy Alves tagged you in this activity.

Accept to save it to your profile and show on your activity feed. You can also edit it to give it a custom name and add photos.

Tuesday trail fun!
4 hours ago by Amy Alves

1:44:45 MOVING TIME
28.6 MI DISTANCE
16.4 MPH AVG SPEED
2,939 FT ELEVATION GAIN
2,130 CALORIES

RESULTS

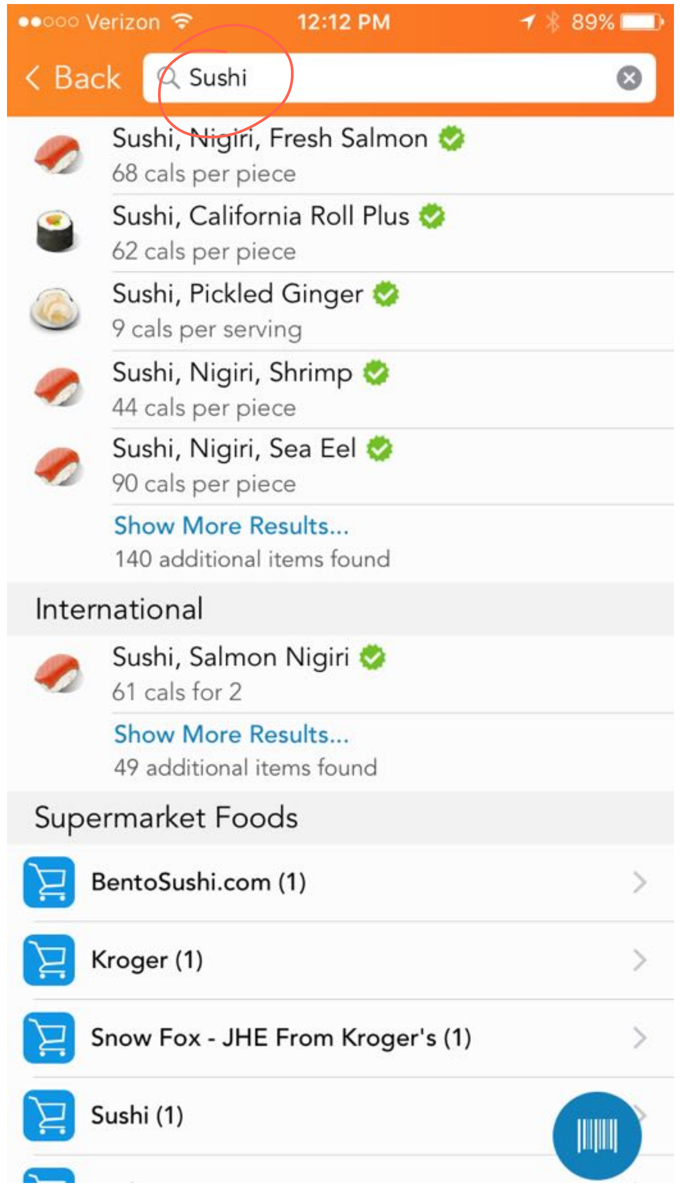
[24] Image source

Task-Level Patterns

Definition: Design solutions that help users accomplish sequences of actions that make up user tasks, e.g., logging a meal, capturing a run, or completing a workout.

Tasks point to specific application *components*. E.g., meal logging can be done through a "search-and-filter" component, activity tracking can be done through a "scoreboard" component.

Source[25]



●●○○○ Verizon 12:12 PM 89%

< Back Sushi

Sushi, Nigiri, Fresh Salmon ✓
68 cals per piece

Sushi, California Roll Plus ✓
62 cals per piece

Sushi, Pickled Ginger ✓
9 cals per serving

Sushi, Nigiri, Shrimp ✓
44 cals per piece

Sushi, Nigiri, Sea Eel ✓
90 cals per piece

Show More Results...
140 additional items found

International

Sushi, Salmon Nigiri ✓
61 cals for 2

Show More Results...
49 additional items found

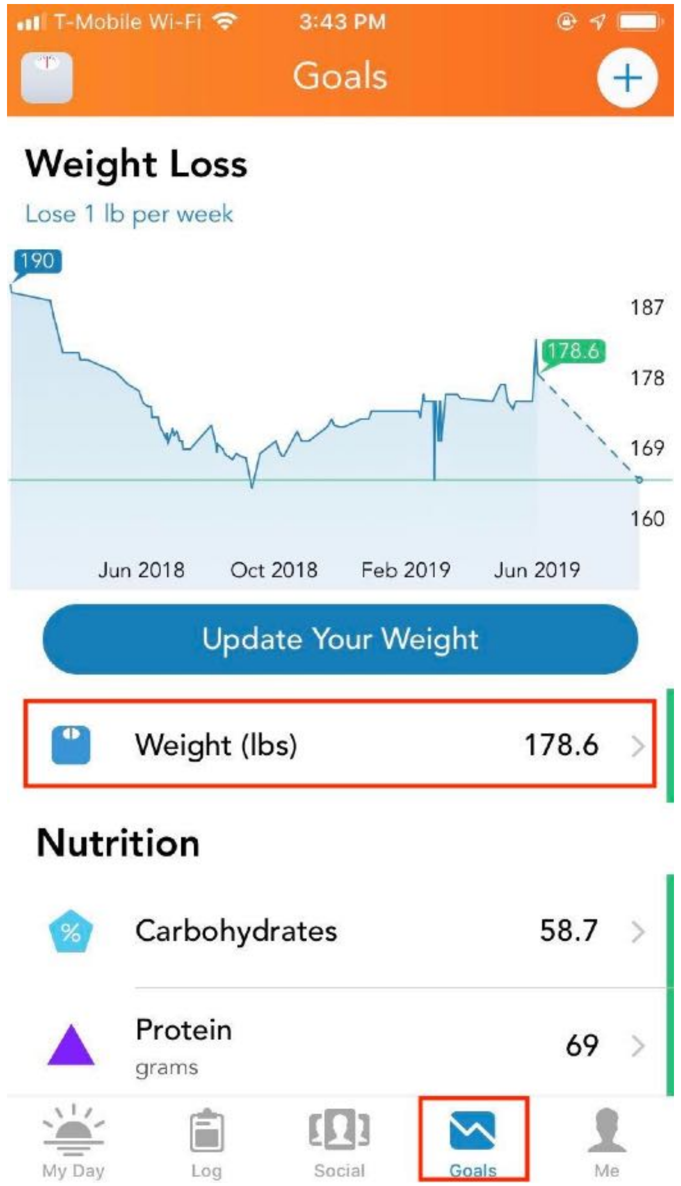
Supermarket Foods

BentoSushi.com (1) >

Kroger (1) >

Snow Fox - JHE From Kroger's (1) >

Sushi (1) >



T-Mobile Wi-Fi 3:43 PM

Goals +

Weight Loss
Lose 1 lb per week

Update Your Weight

Weight (lbs) 178.6 >

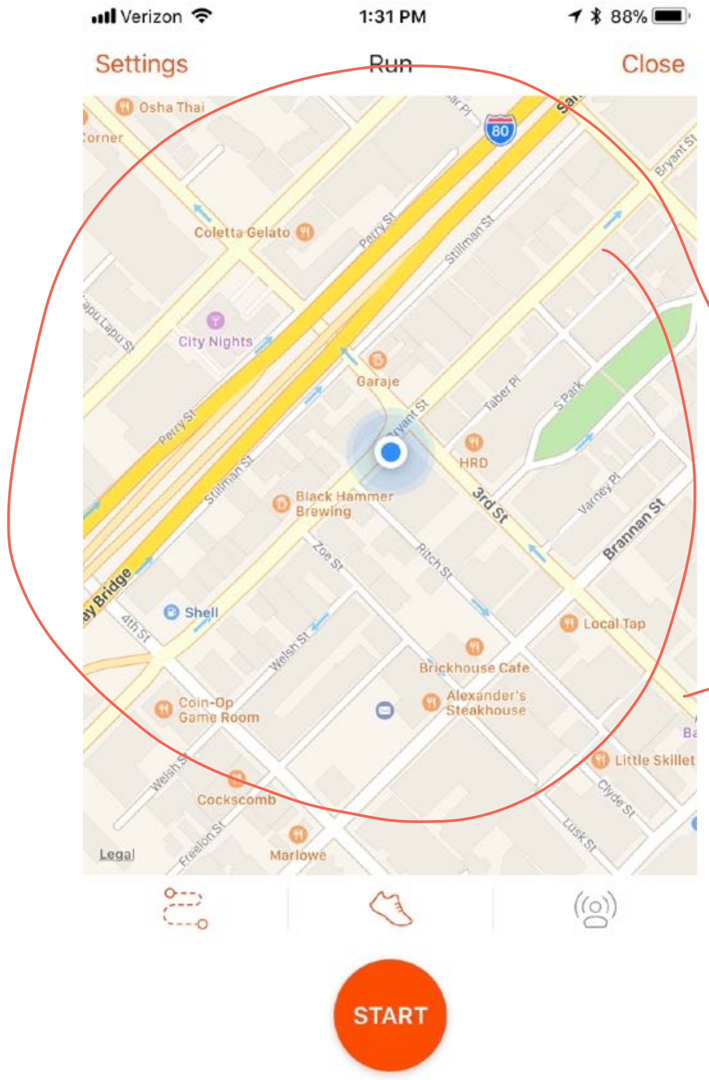
Nutrition

Carbohydrates 58.7 >

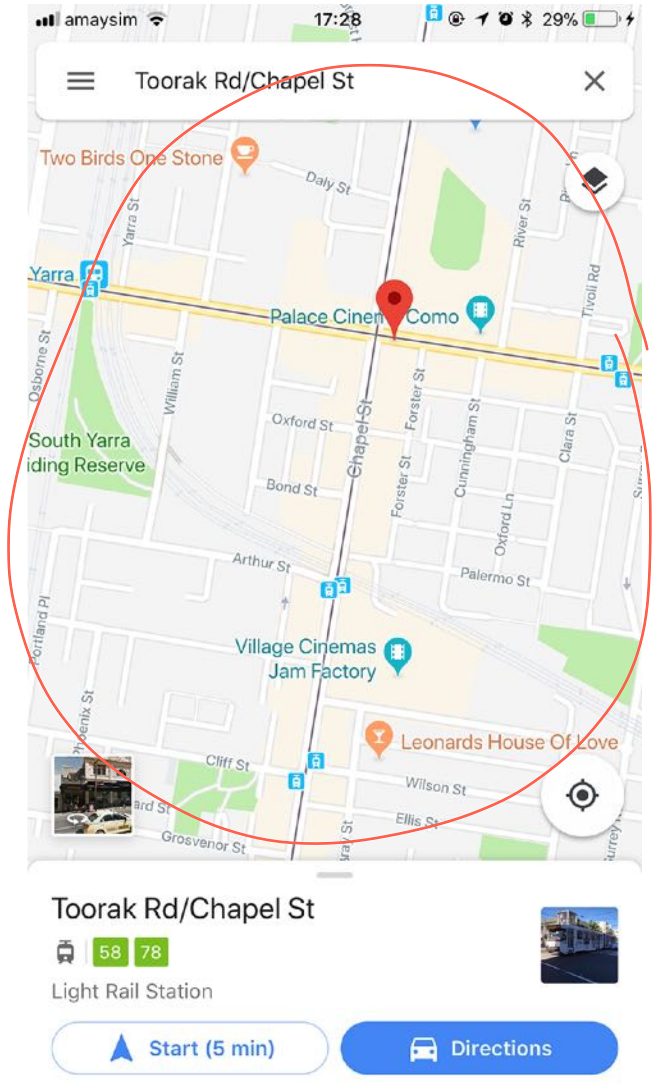
Protein
grams 69 >

[25] Image sources: left, right

Task-level patterns can be domain independent. Business goals and posture-level patterns set the context for these patterns.[26]



run tracking



maps

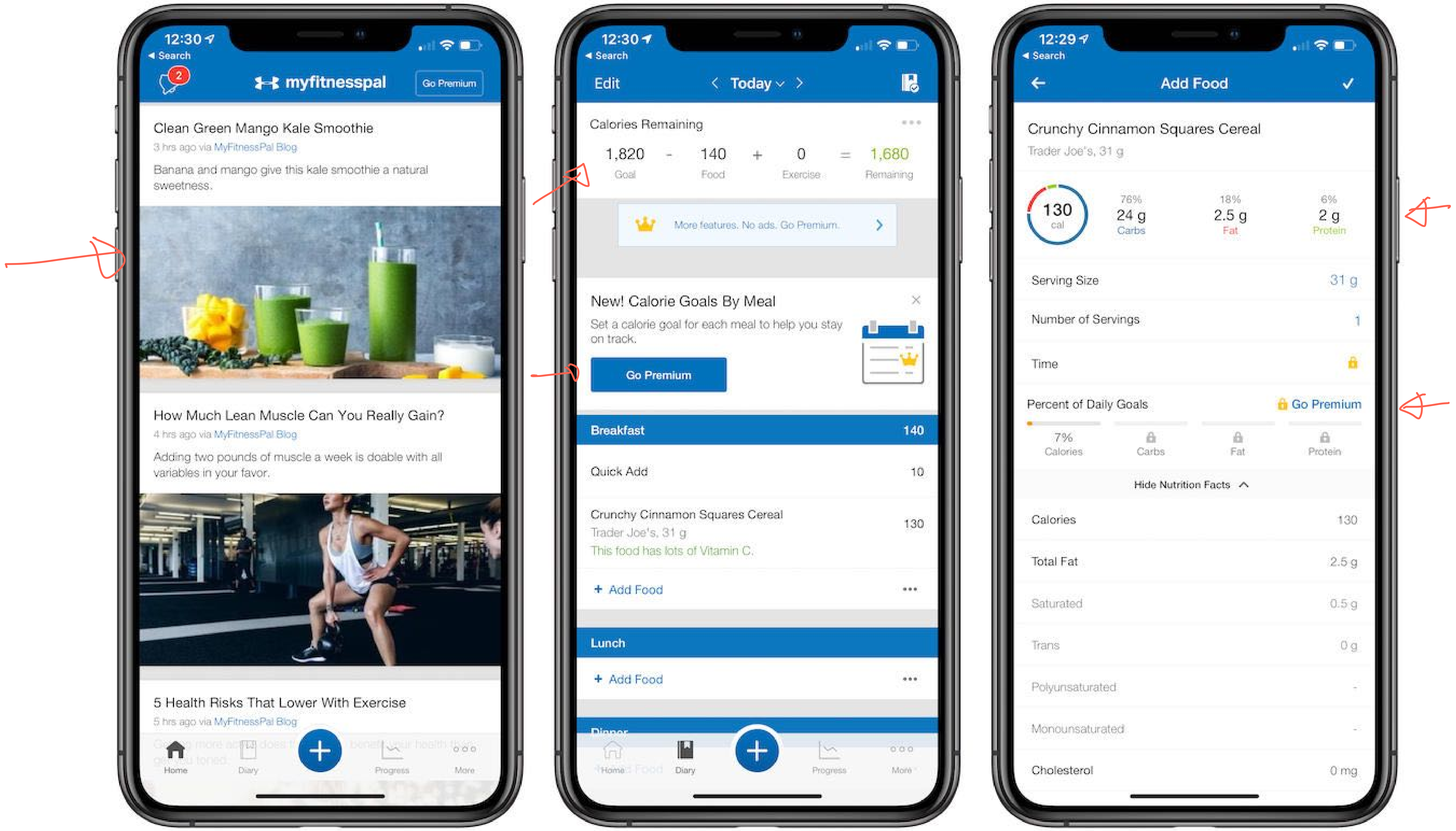
[26] Image sources: left, right

Action-Level Patterns

Definition: Design solutions that support the actions taken to complete the steps(s) of the user's task, e.g., a "start" button to initiate activity tracking, a selectable list entry for a food item.

Action-level patterns are the lowest level of building blocks for a design. They are often called *widgets* or *components* (as in React).

Action-level patterns for a *food tracking* app:[27]



Clean Green Mango Kale Smoothie
3 hrs ago via MyFitnessPal Blog
Banana and mango give this kale smoothie a natural sweetness.

How Much Lean Muscle Can You Really Gain?
4 hrs ago via MyFitnessPal Blog
Adding two pounds of muscle a week is doable with all variables in your favor.

5 Health Risks That Lower With Exercise
5 hrs ago via MyFitnessPal Blog

1,820	-	140	+	0	=	1,680
Goal		Food		Exercise		Remaining

More features. No ads. Go Premium.

New! Calorie Goals By Meal
Set a calorie goal for each meal to help you stay on track.

Breakfast	140
Quick Add	10
Crunchy Cinnamon Squares Cereal Trader Joe's, 31 g This food has lots of Vitamin C.	130
+ Add Food	•••
Lunch	
+ Add Food	•••
Dinner	

Crunchy Cinnamon Squares Cereal
Trader Joe's, 31 g

130 cal	76% 24 g Carbs	18% 2.5 g Fat	6% 2 g Protein

Serving Size	31 g
Number of Servings	1
Time	
Percent of Daily Goals	Go Premium

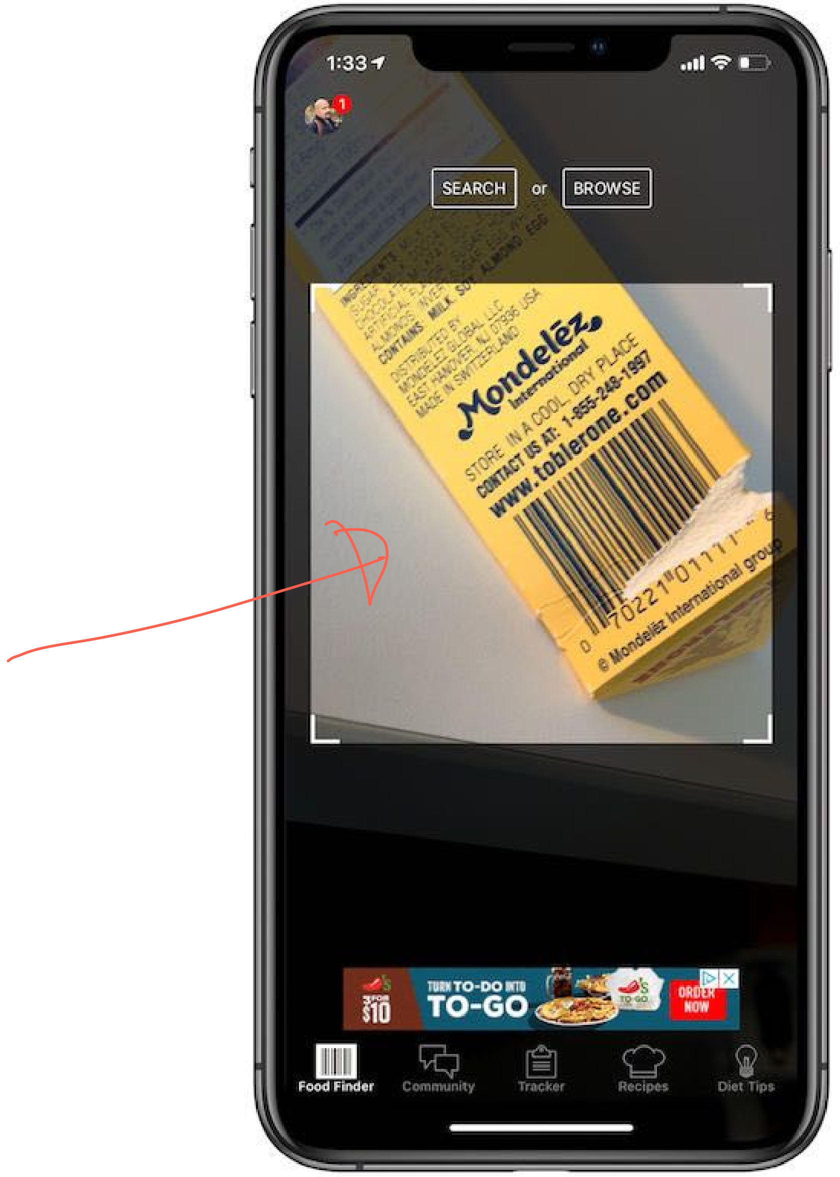
7% Calories	Carbs	Fat	Protein

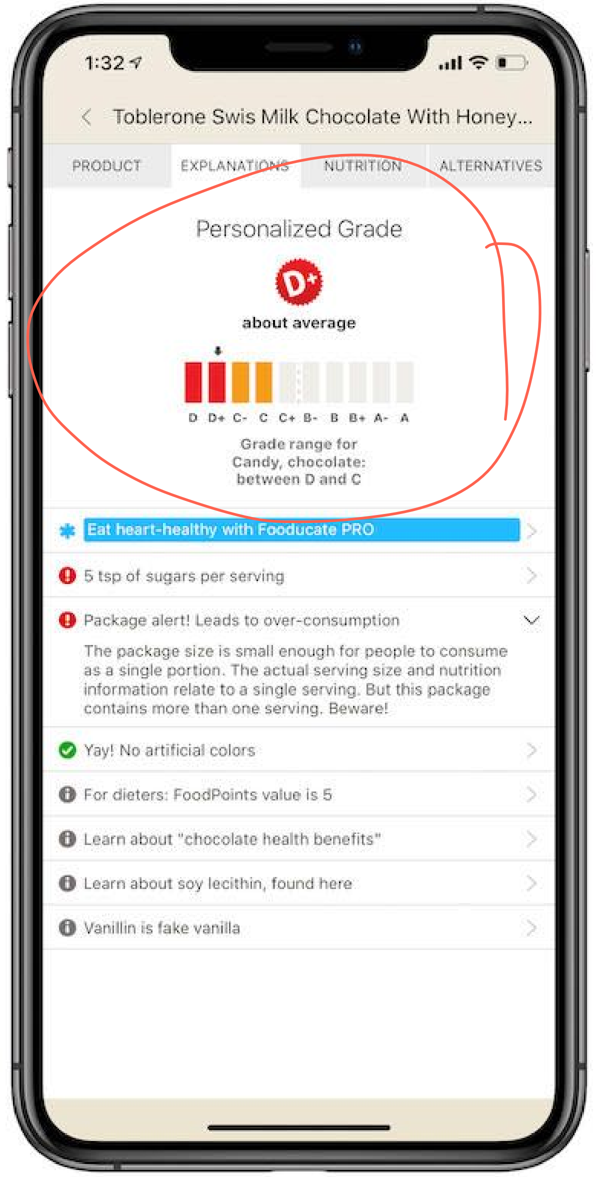
Hide Nutrition Facts

Calories	130
Total Fat	2.5 g
Saturated	0.5 g
Trans	0 g
Polyunsaturated	-
Monounsaturated	-
Cholesterol	0 mg

[27] Image source: My Fitness Pal

Action-level patterns for a *food education* app:[28]





1:32

Toblerone Swis Milk Chocolate With Honey...

PRODUCT | EXPLANATIONS | NUTRITION | ALTERNATIVES

Personalized Grade

D+

about average

D D+ C- C C+ B- B B+ A- A

Grade range for Candy, chocolate: between D and C

Eat heart-healthy with Fooducate PRO

5 tsp of sugars per serving

Package alert! Leads to over-consumption

The package size is small enough for people to consume as a single portion. The actual serving size and nutrition information relate to a single serving. But this package contains more than one serving. Beware!

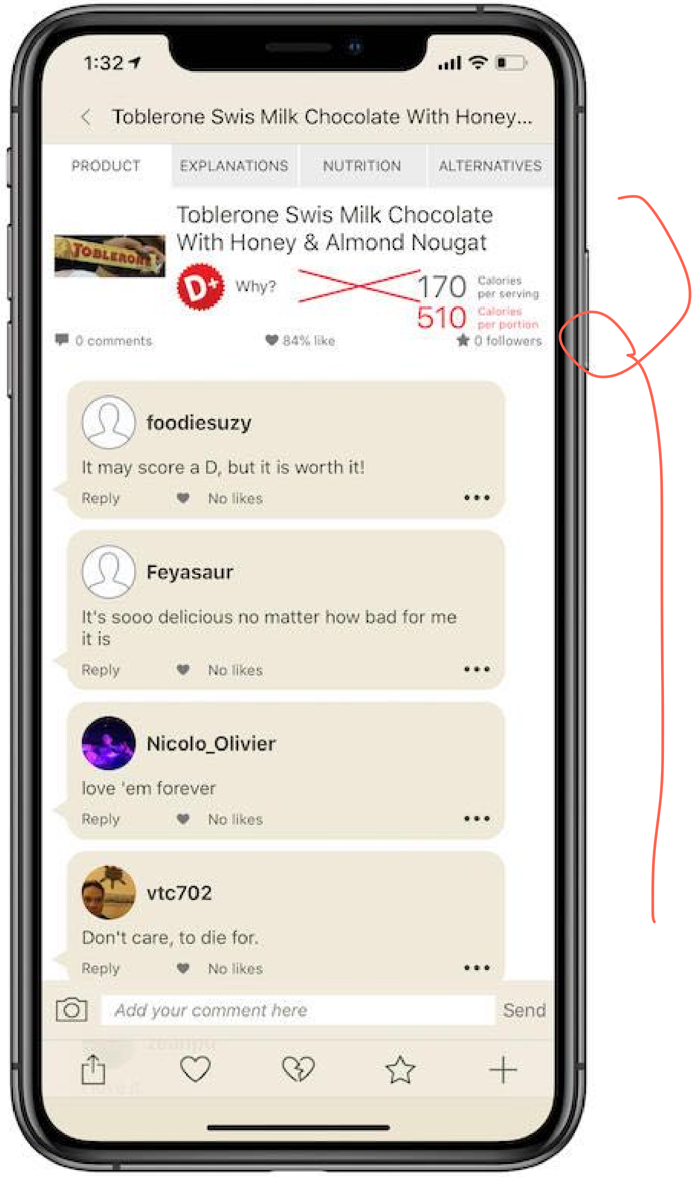
Yay! No artificial colors

For dieters: FoodPoints value is 5

Learn about "chocolate health benefits"

Learn about soy lecithin, found here

Vanillin is fake vanilla



1:32

Toblerone Swis Milk Chocolate With Honey...

PRODUCT | EXPLANATIONS | NUTRITION | ALTERNATIVES

Toblerone Swis Milk Chocolate With Honey & Almond Nougat

D+ Why? 170 Calories per serving 510 Calories per portion

0 comments 84% like 0 followers

foodiesuzy
It may score a D, but it is worth it!
Reply No likes

Feyasaur
It's sooo delicious no matter how bad for me it is
Reply No likes

Nicolo_Olivier
love 'em forever
Reply No likes

vtc702
Don't care, to die for.
Reply No likes

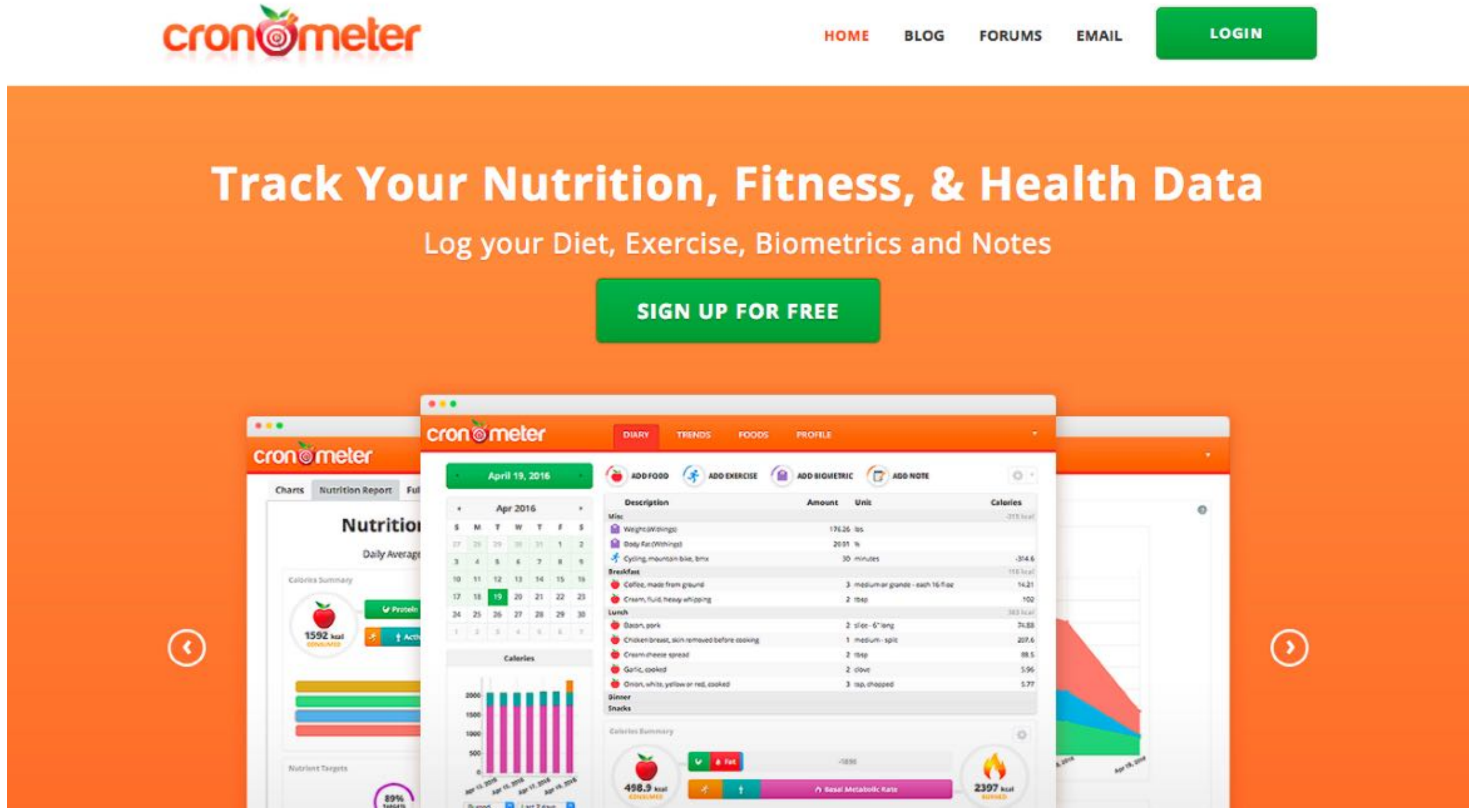
Add your comment here Send

[28] Image source: Fooducate

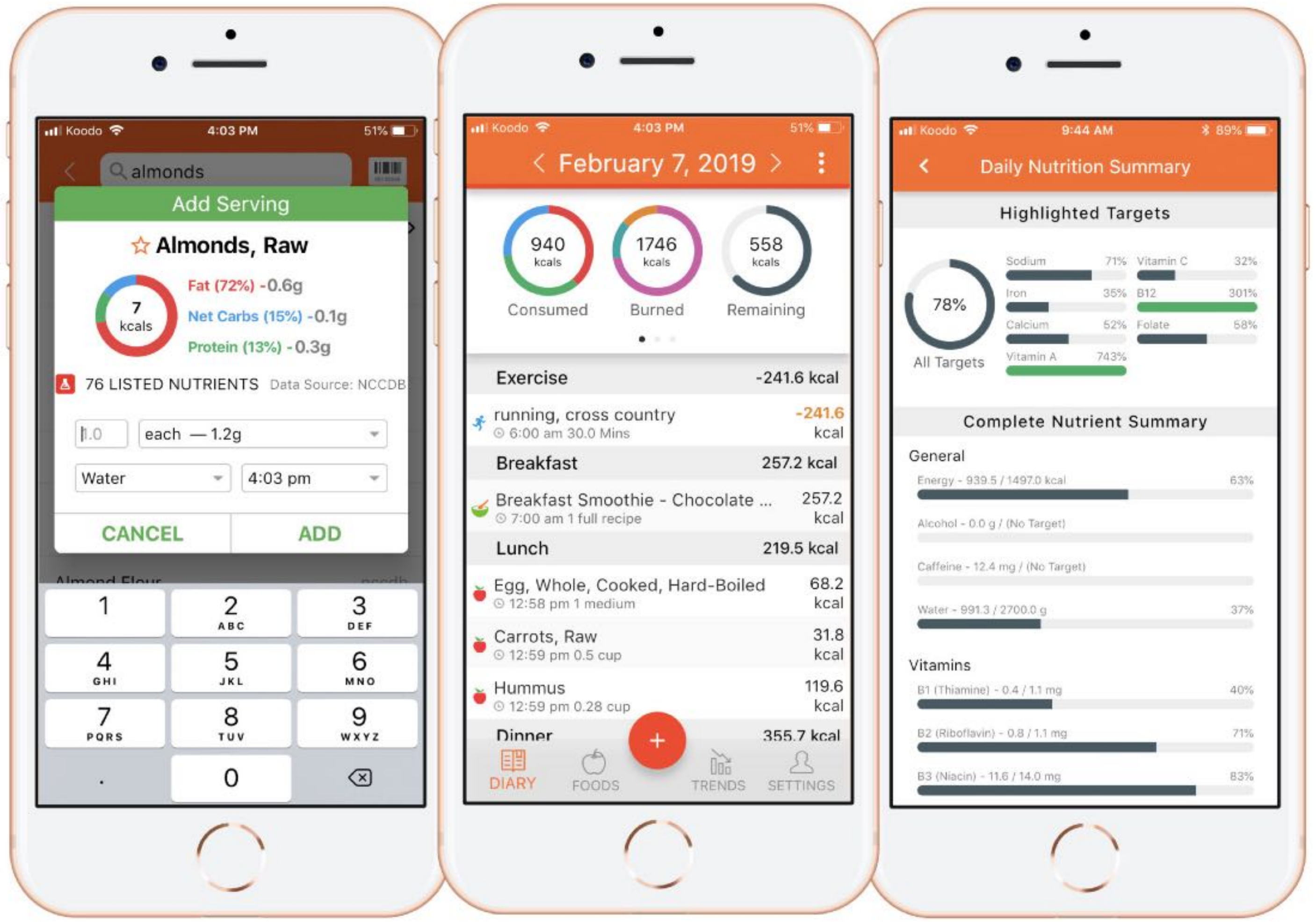
In-Class Activity

Pattern Language Deconstruction

Source[36]



cronometer
HOME
BLOG
FORUMS
EMAIL
LOGIN
Track Your Nutrition, Fitness, & Health Data
Log your Diet, Exercise, Biometrics and Notes
SIGN UP FOR FREE



Diary entry	Details	kcal
Exercise		-241.6 kcal
running, cross country	6:00 am 30.0 Mins	-241.6 kcal
Breakfast		257.2 kcal
Breakfast Smoothie - Chocolate ...	7:00 am 1 full recipe	257.2 kcal
Lunch		219.5 kcal
Egg, Whole, Cooked, Hard-Boiled	12:58 pm 1 medium	68.2 kcal
Carrots, Raw	12:59 pm 0.5 cup	31.8 kcal
Hummus	12:59 pm 0.28 cup	119.6 kcal
Dinner		355.7 kcal

Highlighted target	%
Sodium	71%
Vitamin C	32%
Iron	35%
B12	301%
Calcium	52%
Folate	58%
Vitamin A	743%

Nutrient	%
Energy - 939.5 / 1497.0 kcal	63%
Alcohol - 0.0 g / (No Target)	
Caffeine - 12.4 mg / (No Target)	
Water - 991.3 / 2700.0 g	37%
B1 (Thiamine) - 0.4 / 1.1 mg	40%
B2 (Riboflavin) - 0.8 / 1.1 mg	71%
B3 (Niacin) - 11.6 / 14.0 mg	83%

[36] Image sources: left, right

Business Goals

Mission of the application

catering to nutrition specs

Posture Level

"Type" of application

calorie tracking app

Experience Level

User goals

managing expectation

Task Level

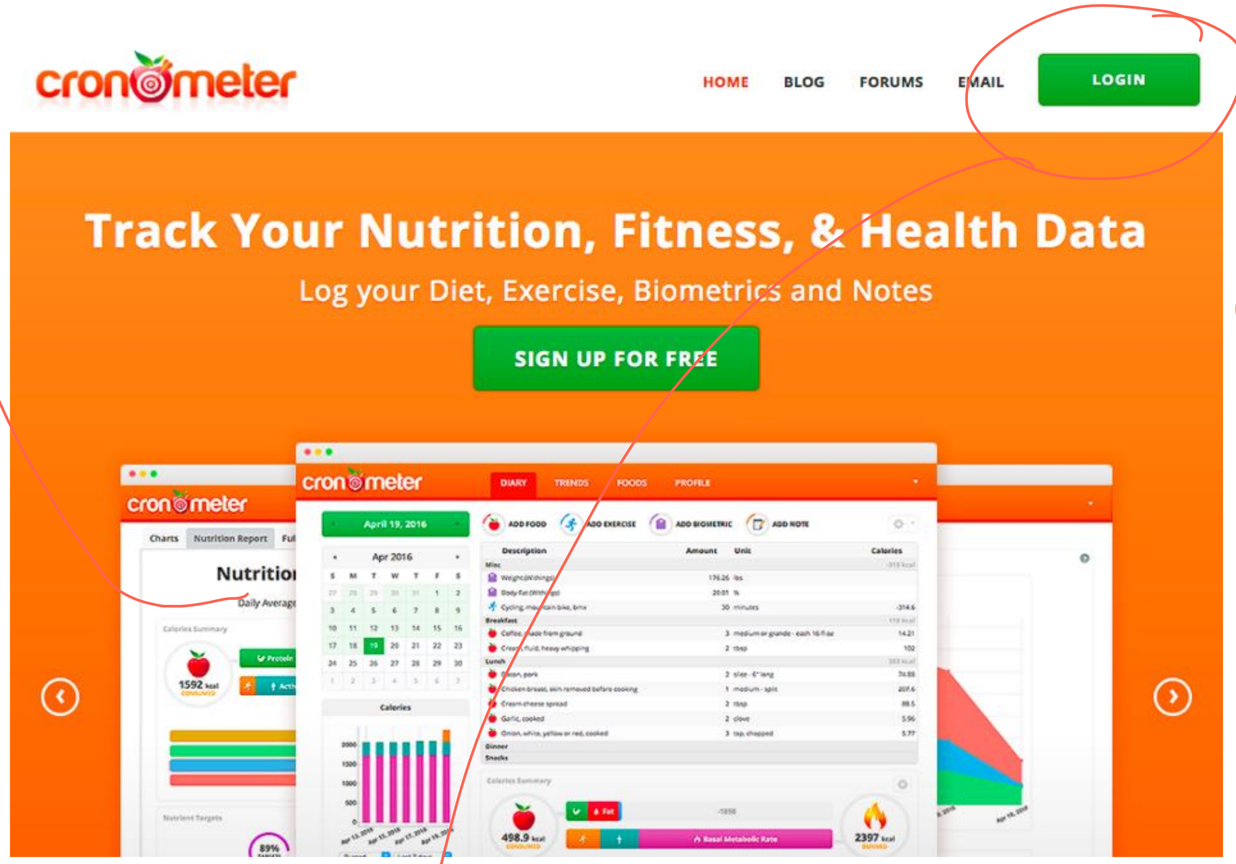
Task sequences

adding serving

Action Level

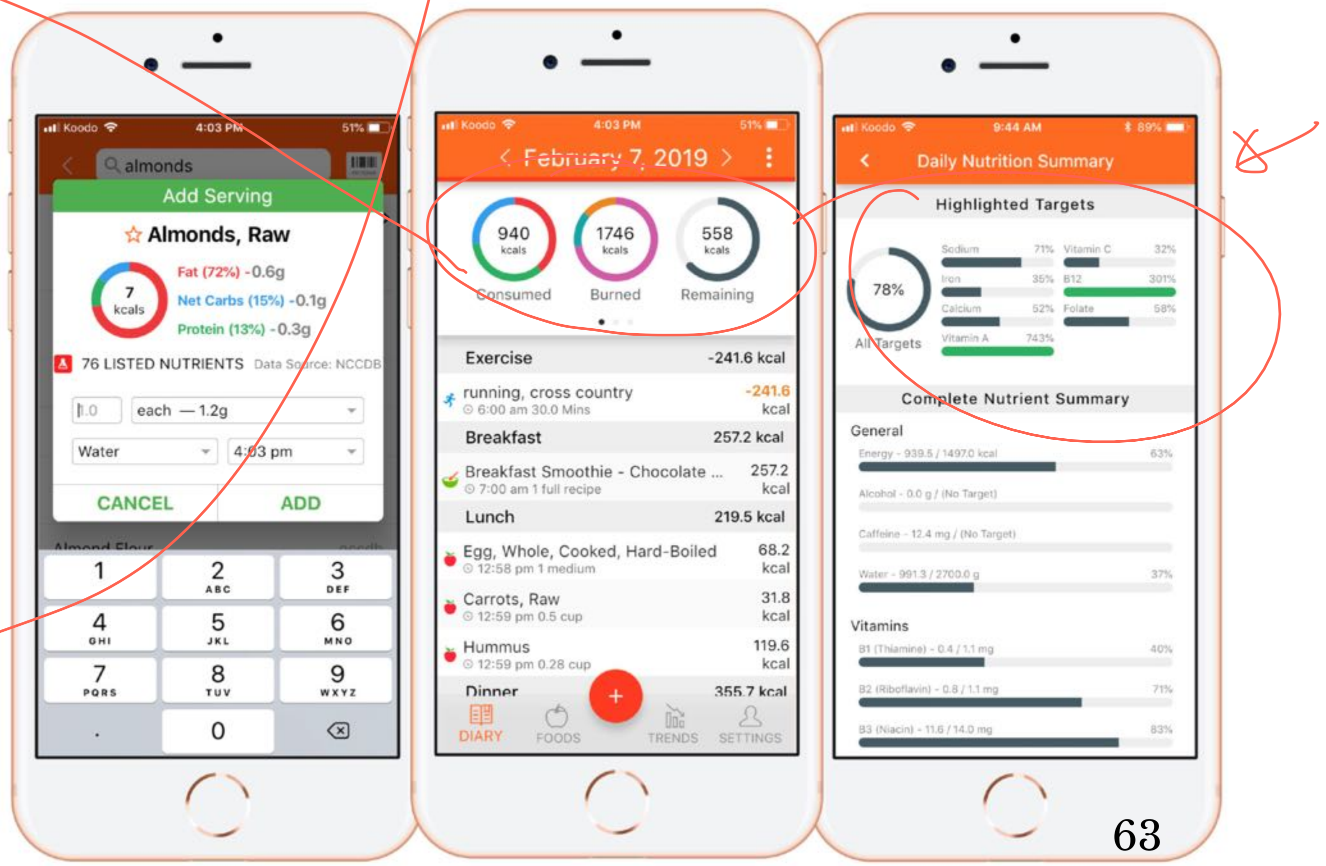
User actions

login



Track Your Nutrition, Fitness, & Health Data

Log your Diet, Exercise, Biometrics and Notes



Almonds, Raw

7 kcals

Fat (72%) - 0.6g

Net Carbs (15%) - 0.1g

Protein (13%) - 0.3g

76 LISTED NUTRIENTS Data Source: NCCDB

1.0 each — 1.2g

Water 4:03 pm

February 7, 2019

940 kcals	1746 kcals	558 kcals
Consumed	Burned	Remaining

Exercise	-241.6 kcal
running, cross country 6:00 am 30.0 Mins	-241.6 kcal
Breakfast	257.2 kcal
Breakfast Smoothie - Chocolate ... 7:00 am 1 full recipe	257.2 kcal
Lunch	219.5 kcal
Egg, Whole, Cooked, Hard-Boiled 12:58 pm 1 medium	68.2 kcal
Carrots, Raw 12:59 pm 0.5 cup	31.8 kcal
Hummus 12:59 pm 0.28 cup	119.6 kcal
Dinner	355.7 kcal

Daily Nutrition Summary

Highlighted Targets

78% All Targets

Sodium	71%	Vitamin C	32%
Iron	35%	B12	301%
Calcium	52%	Folate	58%
Vitamin A	743%		

Complete Nutrient Summary

General

Energy - 939.5 / 1497.0 kcal	63%
Alcohol - 0.0 g / (No Target)	
Caffeine - 12.4 mg / (No Target)	
Water - 991.3 / 2700.0 g	37%

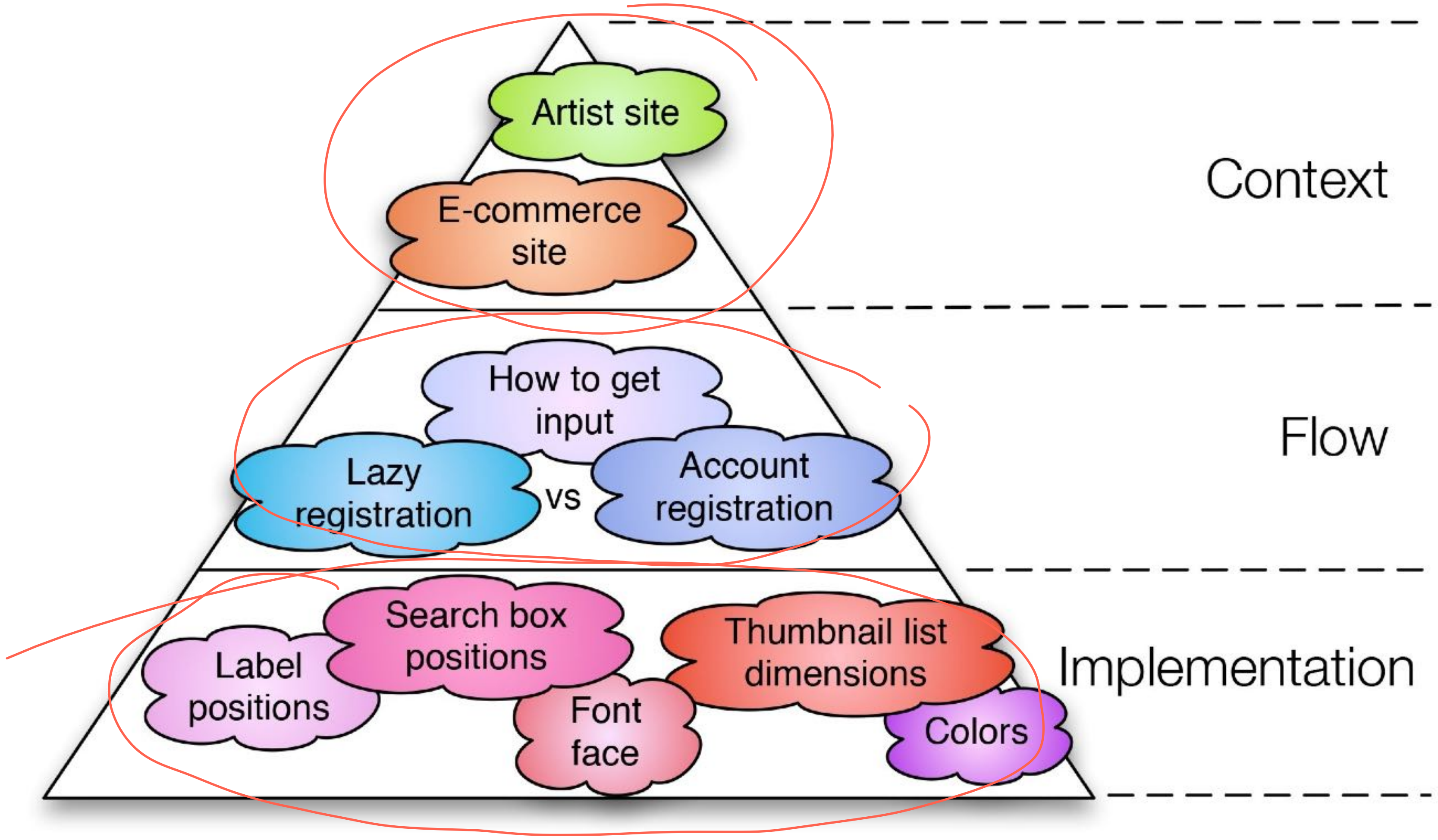
Vitamins

B1 (Thiamine) - 0.4 / 1.1 mg	40%
B2 (Riboflavin) - 0.8 / 1.1 mg	71%
B3 (Niacin) - 11.6 / 14.0 mg	83%

A Simplifed Model[29] [30]

Three-levels of patterns:

1. **Context:** Type of app
2. **Flow:** Components that support specific functions
3. **Implementation:** The visual/behavioral elements that implement the functions



[29] Anders Toxboe

[30] More on the three-levels of patterns by Jerry Cao

How do we use patterns?

Common practice: Patterns in the higher levels are defined informally, and the task- and action-level patterns are adopted through experimentation and trial and error.

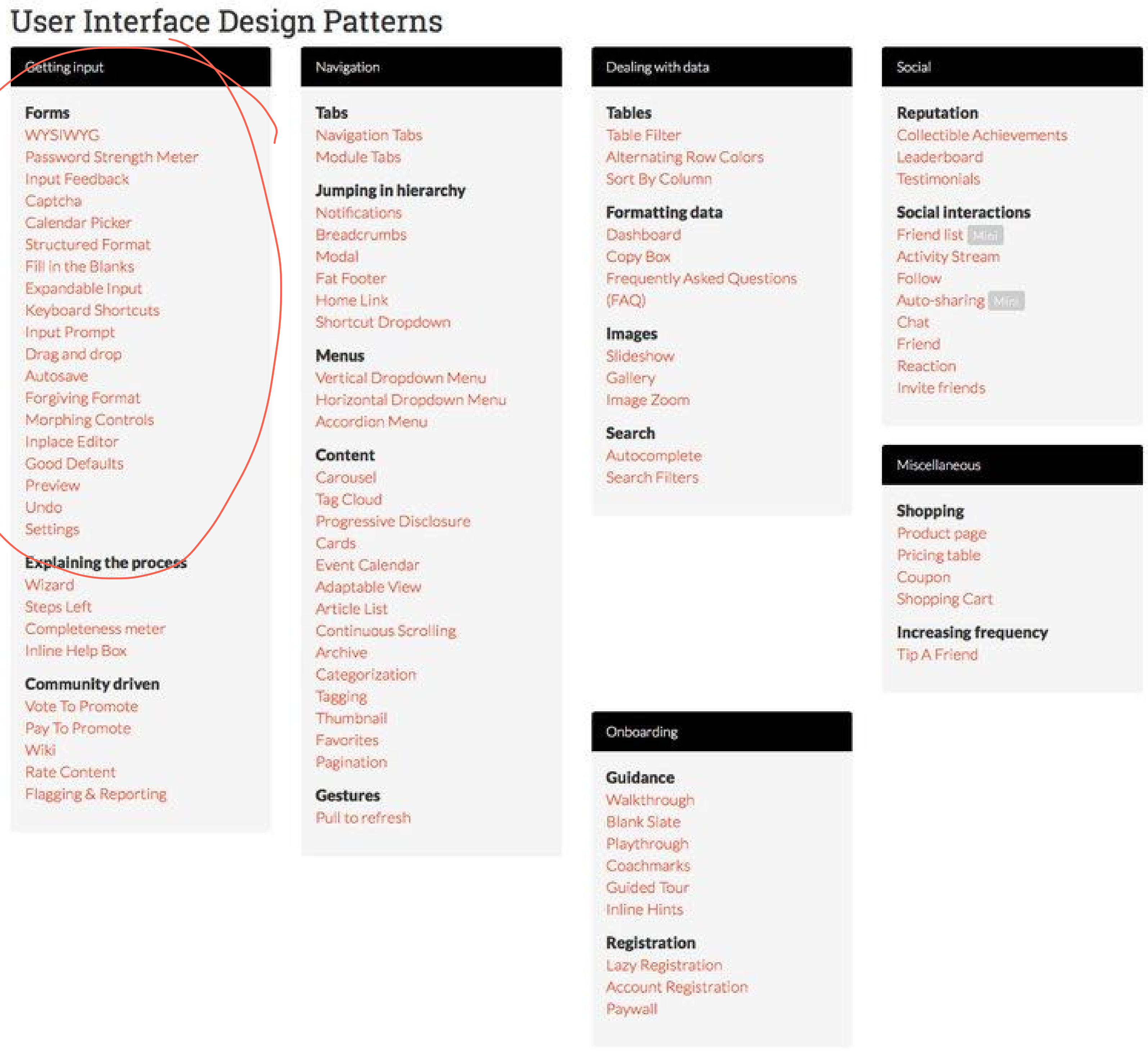
The problem: Ineffective (e.g., lack of coherence across different levels) and inefficient (wasted effort in experimentation).

The solution: Defining patterns top to bottom will "generate" the design when patterns are available across all levels.[31]

[31] van Welie & van der Veer, 2003

Where do we find patterns?[32]

Task- and action-level patterns are organized into catalogues/collections based on functional similarity.



User Interface Design Patterns

Getting input

Forms
WYSIWYG
Password Strength Meter
Input Feedback
Captcha
Calendar Picker
Structured Format
Fill in the Blanks
Expandable Input
Keyboard Shortcuts
Input Prompt
Drag and drop
Autosave
Forgiving Format
Morphing Controls
Inplace Editor
Good Defaults
Preview
Undo
Settings

Explaining the process
Wizard
Steps Left
Completeness meter
Inline Help Box

Community driven
Vote To Promote
Pay To Promote
Wiki
Rate Content
Flagging & Reporting

Navigation

Tabs
Navigation Tabs
Module Tabs

Jumping in hierarchy
Notifications
Breadcrumbs
Modal
Fat Footer
Home Link
Shortcut Dropdown

Menus
Vertical Dropdown Menu
Horizontal Dropdown Menu
Accordion Menu

Content
Carousel
Tag Cloud
Progressive Disclosure
Cards
Event Calendar
Adaptable View
Article List
Continuous Scrolling
Archive
Categorization
Tagging
Thumbnail
Favorites
Pagination

Gestures
Pull to refresh

Dealing with data

Tables
Table Filter
Alternating Row Colors
Sort By Column

Formatting data
Dashboard
Copy Box
Frequently Asked Questions (FAQ)

Images
Slideshow
Gallery
Image Zoom

Search
Autocomplete
Search Filters

Onboarding

Guidance
Walkthrough
Blank Slate
Playthrough
Coachmarks
Guided Tour
Inline Hints

Registration
Lazy Registration
Account Registration
Paywall

Social

Reputation
Collectible Achievements
Leaderboard
Testimonials

Social interactions
Friend list Mini
Activity Stream
Follow
Auto-sharing Mini
Chat
Friend
Reaction
Invite friends

Miscellaneous

Shopping
Product page
Pricing table
Coupon
Shopping Cart

Increasing frequency
Tip A Friend

[32] Image source

Online Pattern Libraries

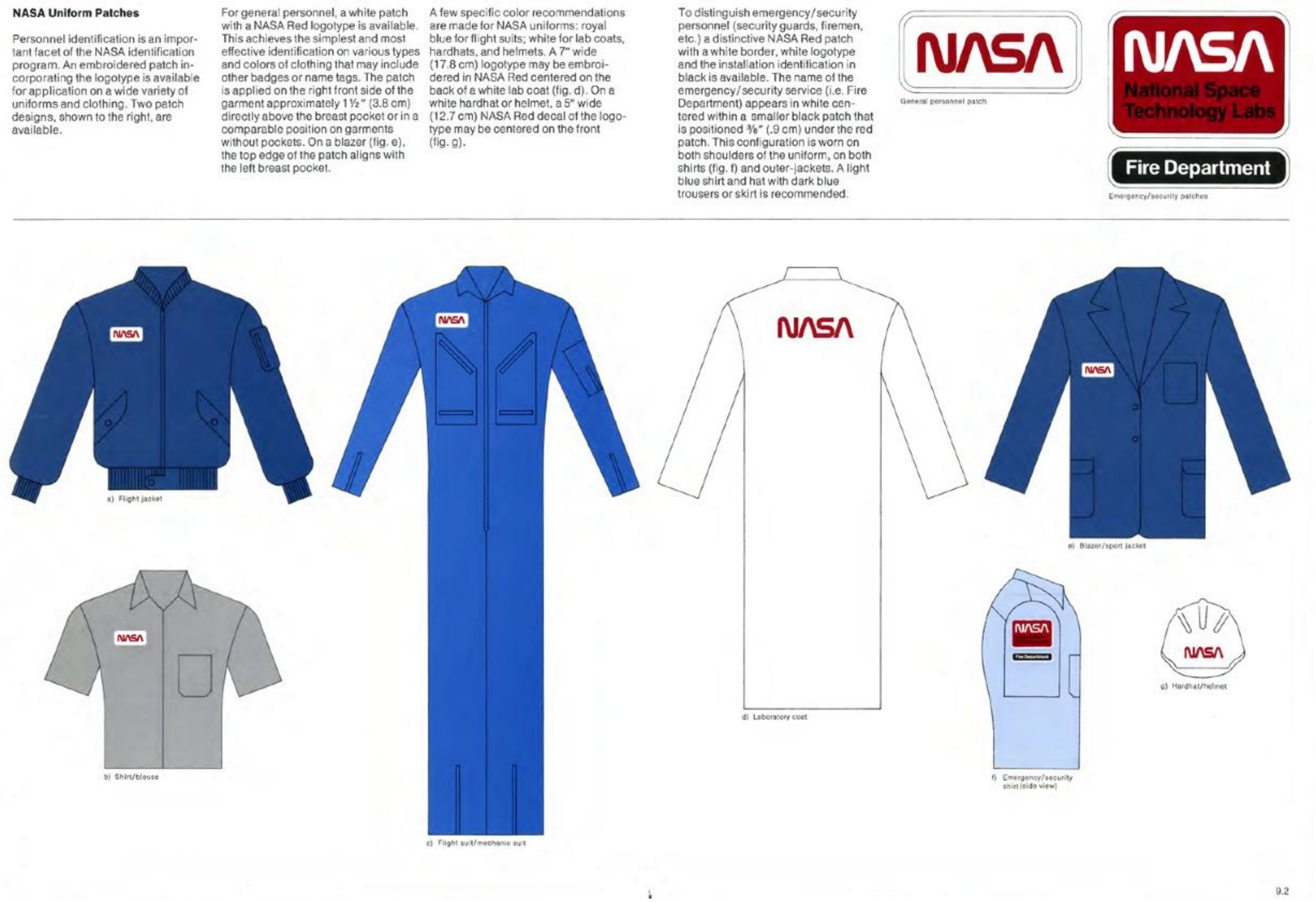
- UIPatterns.io
- UI-Patterns
- Mobbin
- UI Garage
- Welie

Design Style Guides

Definition: A vocabulary of design elements that are repeatedly applied to interaction design problems. These are task- and action-level interface components that follow a consistent look and feel in appearance and behavior.

Non-digital example: NASA Graphics Standard Manual.[33]

[33] NASA



NASA Uniform Patches

Personnel identification is an important facet of the NASA identification program. An embroidered patch incorporating the logotype is available for application on a wide variety of uniforms and clothing. Two patch designs, shown to the right, are available.

For general personnel, a white patch with a NASA Red logotype is available. This achieves the simplest and most effective identification on various types and colors of clothing that may include other badges or name tags. The patch is applied on the right front side of the garment approximately 1½" (3.8 cm) directly above the breast pocket or in a comparable position on garments without pockets. On a blazer (fig. e), the top edge of the patch aligns with the left breast pocket.

A few specific color recommendations are made for NASA uniforms: royal blue for flight suits; white for lab coats, hardhats, and helmets. A 7" wide (17.8 cm) logotype may be embroidered in NASA Red centered on the back of a white lab coat (fig. d). On a white hardhat or helmet, a 5" wide (12.7 cm) NASA Red decal of the logotype may be centered on the front (fig. g).

To distinguish emergency/security personnel (security guards, firemen, etc.) a distinctive NASA Red patch with a white border, white logotype and the installation identification in black is available. The name of the emergency/security service (i.e. Fire Department) appears in white centered within a smaller black patch that is positioned ⅜" (.9 cm) under the red patch. This configuration is worn on both shoulders of the uniform, on both shirts (fig. f) and outer-jackets. A light blue shirt and hat with dark blue trousers or skirt is recommended.

NASA

General personnel patch

NASA
National Space
Technology Labs

Fire Department

Emergency/security patches

a) Flight jacket

b) Shirt/blouse

c) Flight suit/mechanic suit

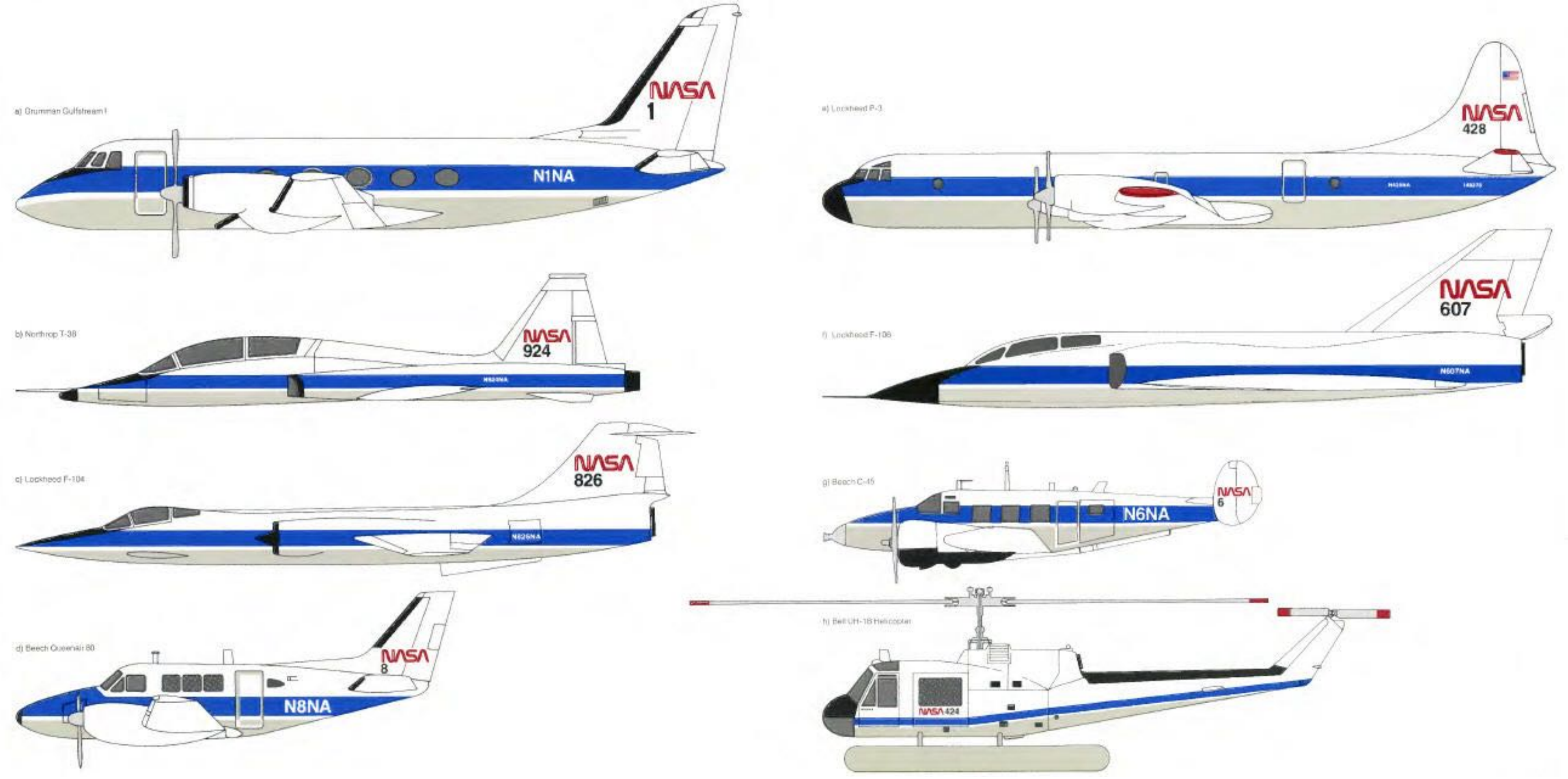
d) Laboratory coat

e) Blazer/sport jacket

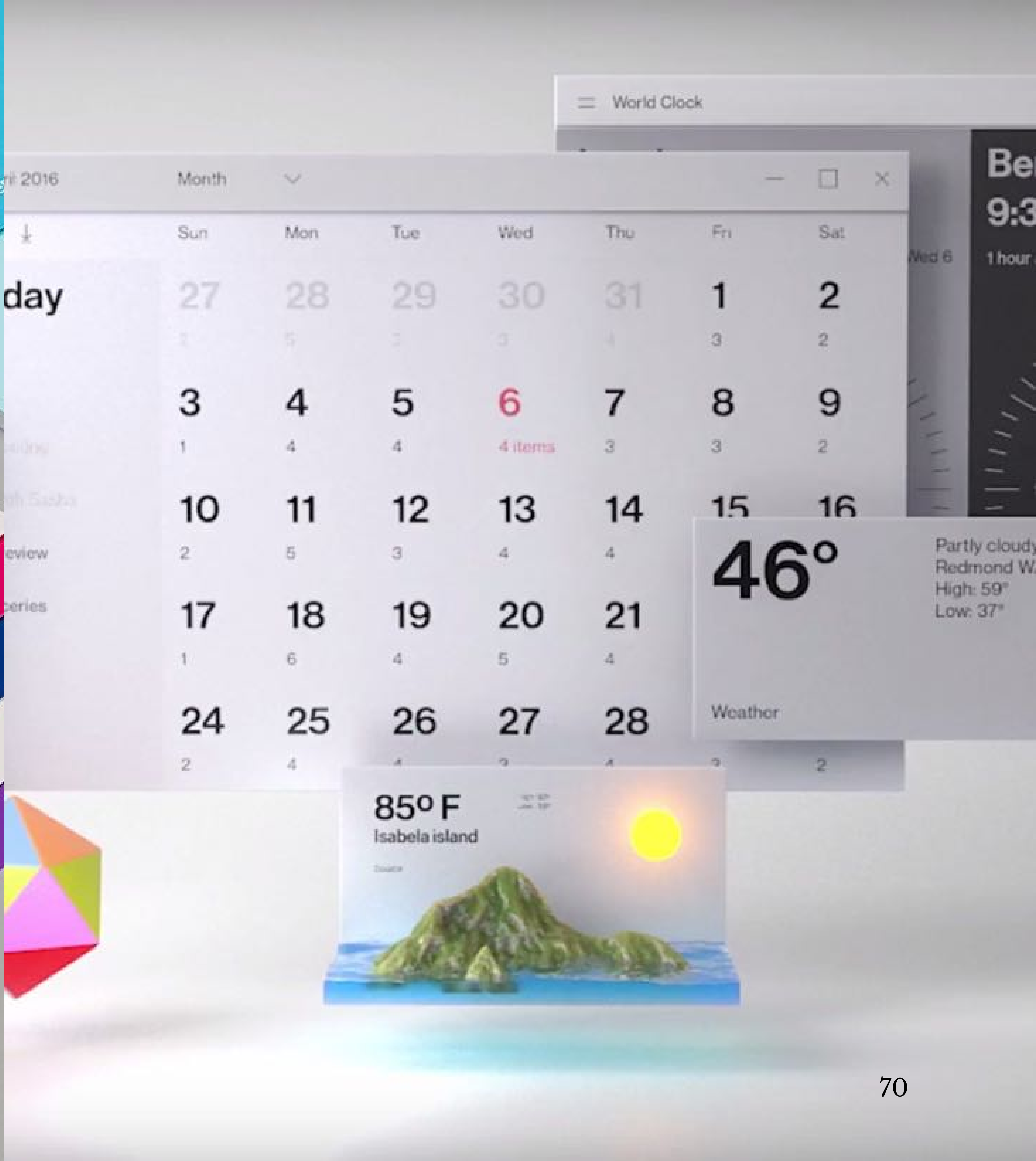
f) Emergency/security shirt (side view)

g) Hardhat/helmet

9.2

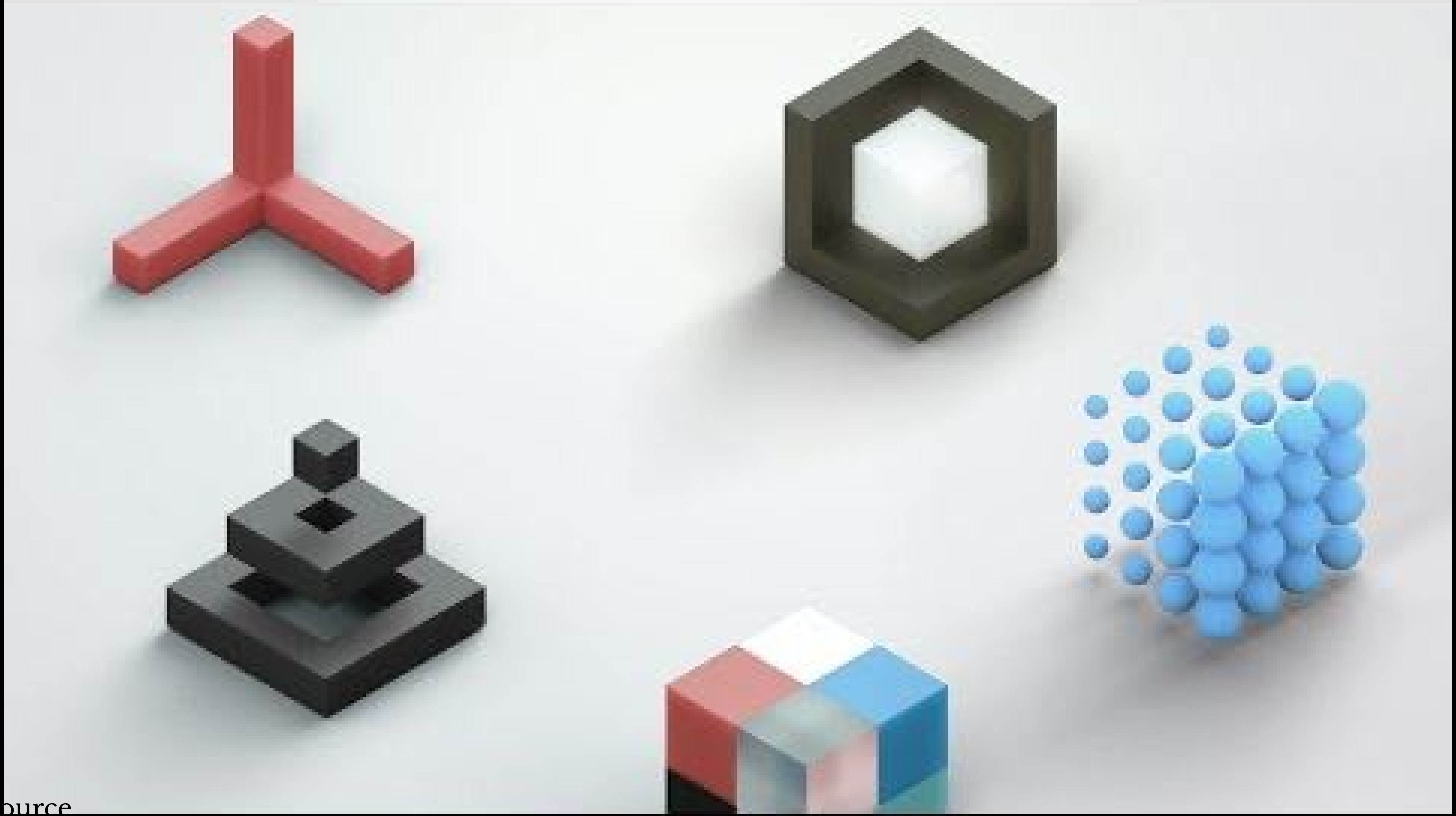


Source[34][35]



[34] *Left:* Google Material Design

[35] *Right:* Microsoft Fluent Design System



ource

Commonly Used Design Style Guides[20]

- Material Design
- Fluent Design System
- Materialize
- Ant Design
- Grommet
- Flat Remix

[20] Image source

Case Studies of Design Language Use

- Material studies examples
- Fluent design case studies

What did we learn today?

- Design paradigms
- Design patterns
- Design languages