Building User Interfaces

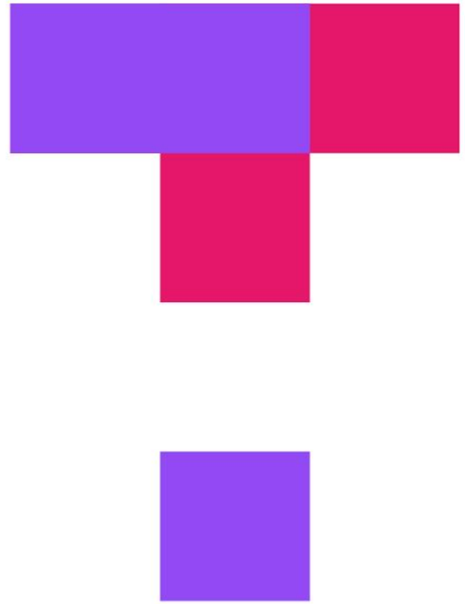
Design Patterns and Design Languages

Professor Bilge Mutlu

What we will learn today?

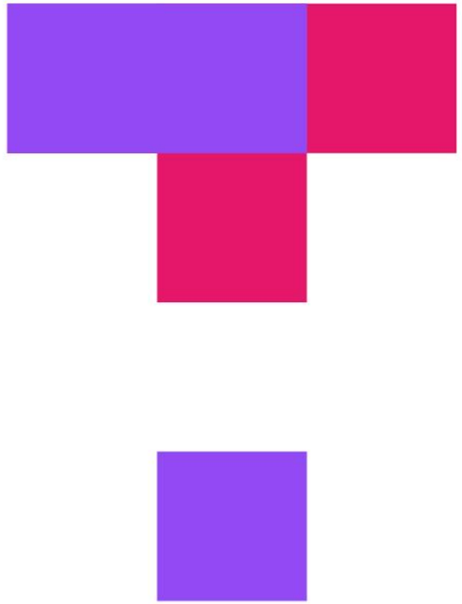
- Design Patterns
- Design Languages
- Assignment Preview

TopHat Attendance



TOP HAT

TopHat Questions



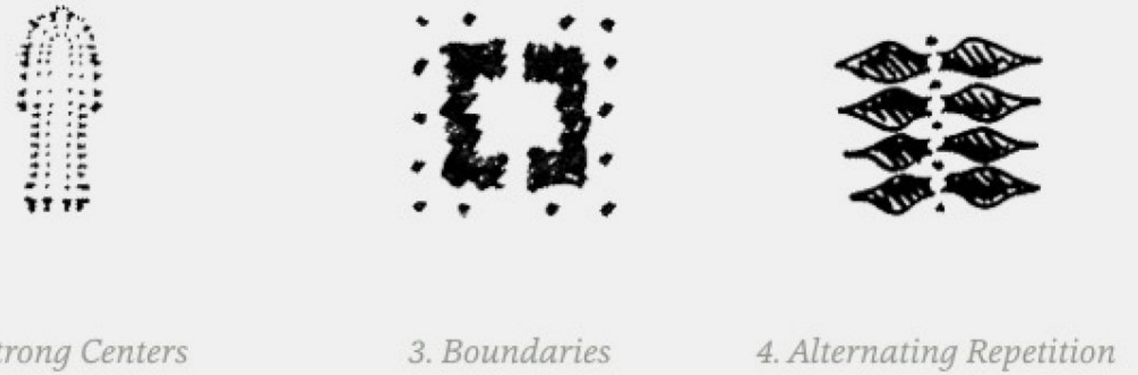
TOP HAT

Design Patterns

Recap: Design Patterns

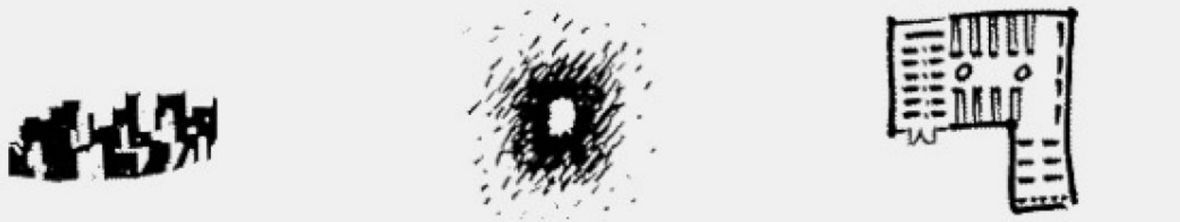
Definition: A design pattern is a general, reusable solution to a commonly occurring problem within a given context.

Originally developed by Christopher Alexander (1977; *A Pattern Language*) to address problems in architecture and city planning.[1]



2. Strong Centers *3. Boundaries* *4. Alternating Repetition*

7. Local Symmetries *8. Deep Interlock* *9. Contrast*

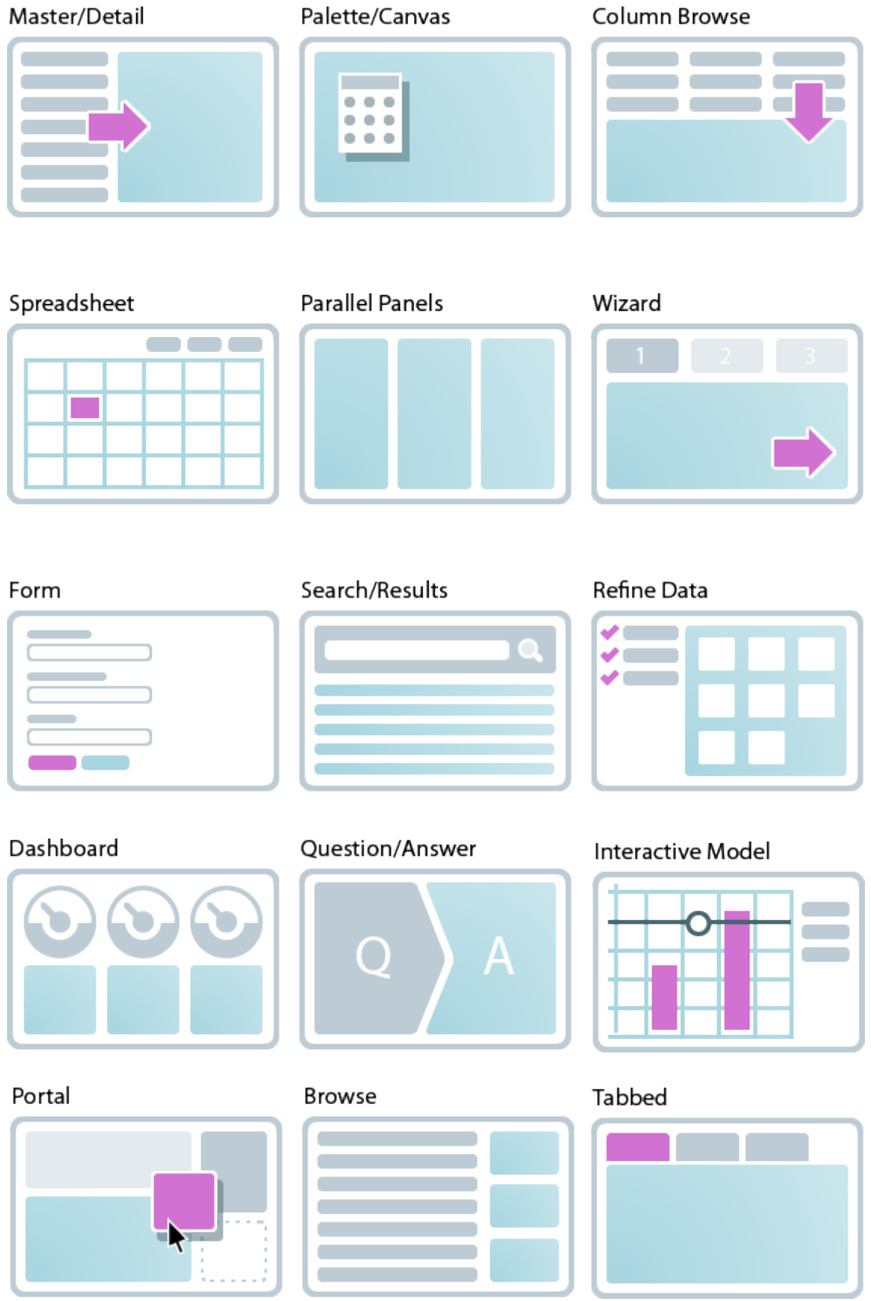


12. Echoes *13. The Void* *14. Inner calm*

[1] Smart Cities Dive

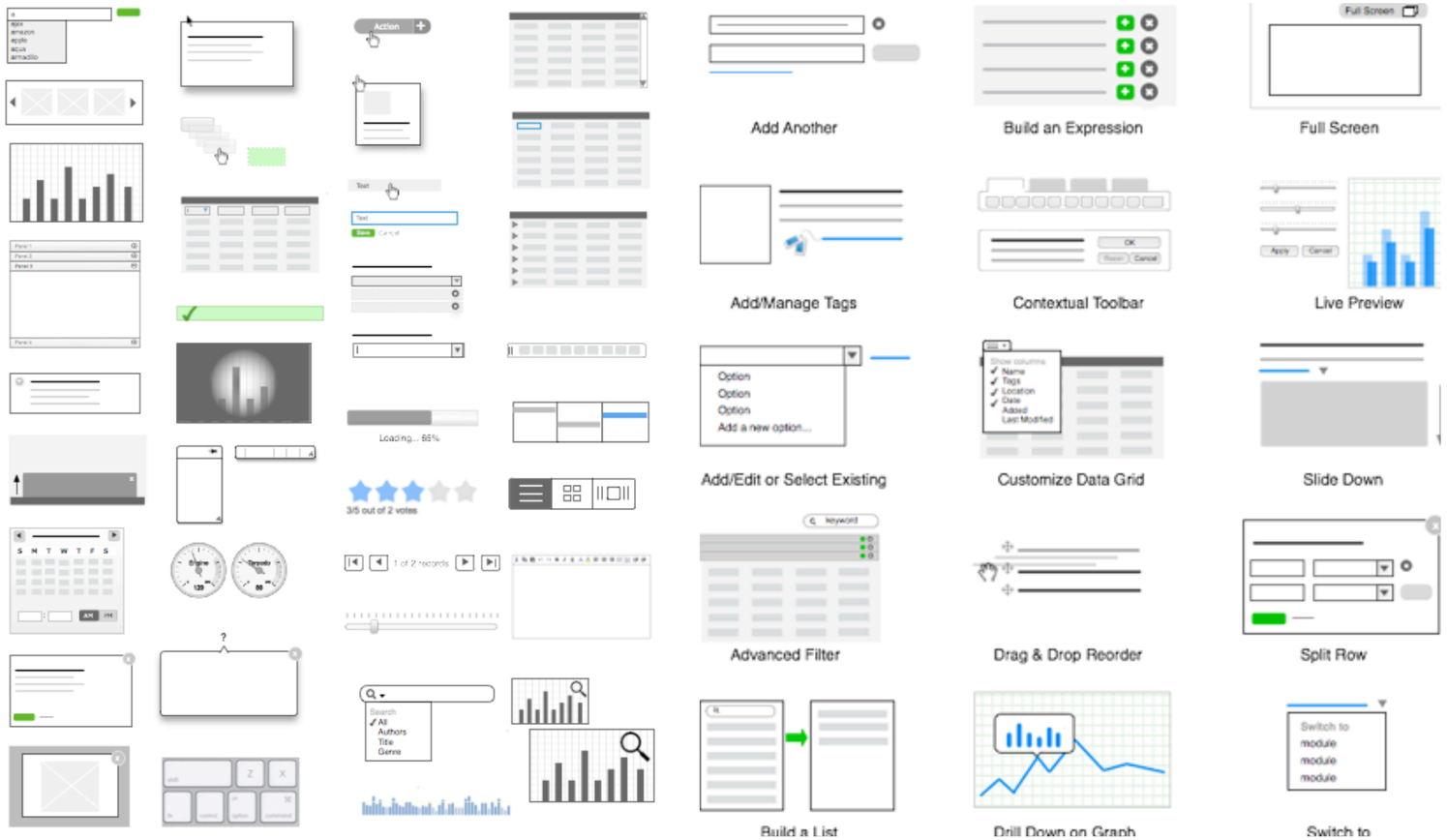
Recap: Design Patterns in UX

In the last decade, designers have also developed and refined patterns for overall structure and organization, components and controls.[2]



[2] Neil, 2010, 12 Standard Screen Patterns

Source[3]



[3] Neil, 2010, 12 Standard Screen Patterns

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.

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).[4]

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

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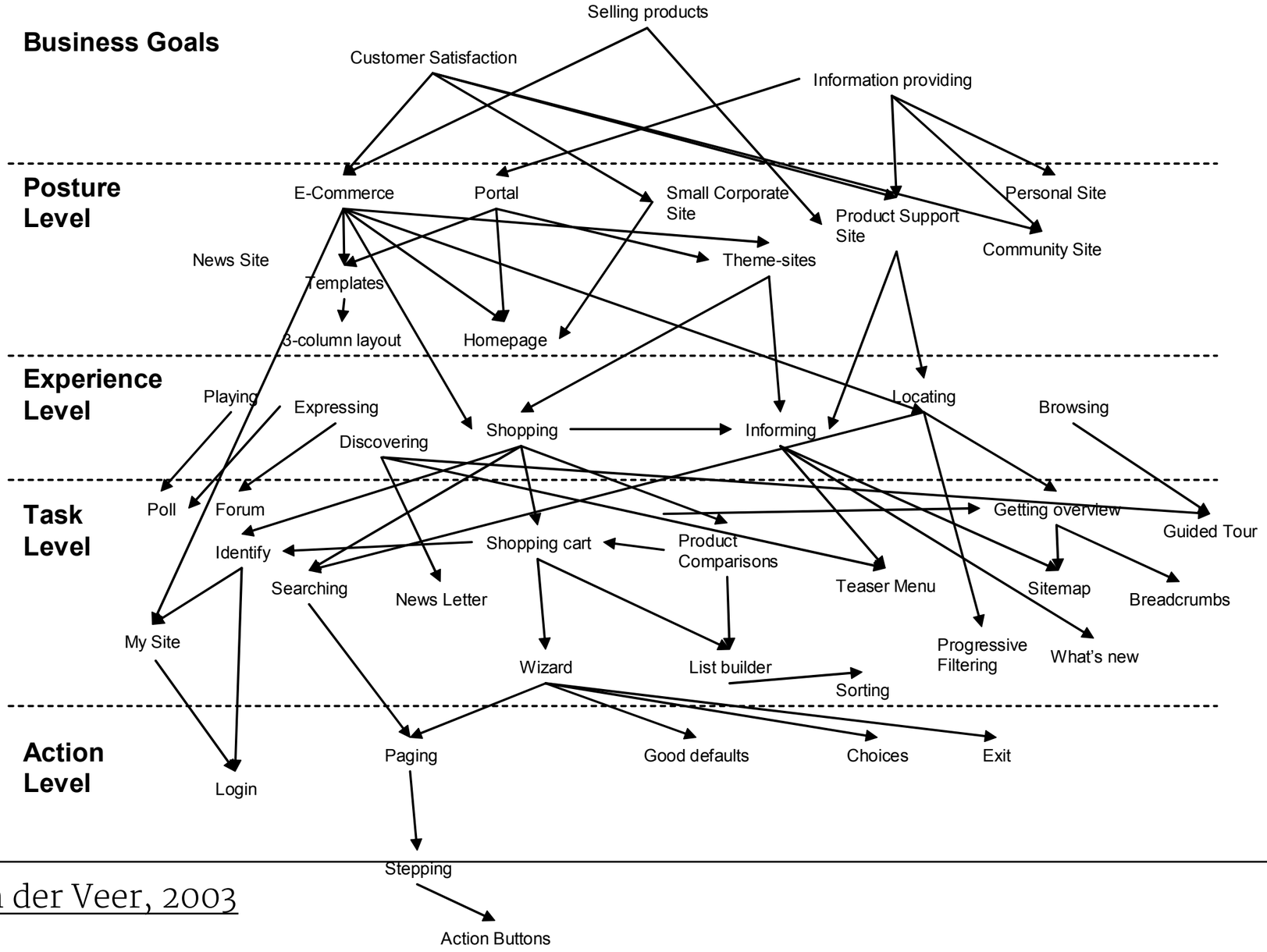
[4] Kruschitz & Hitz, 2009

Source[5]

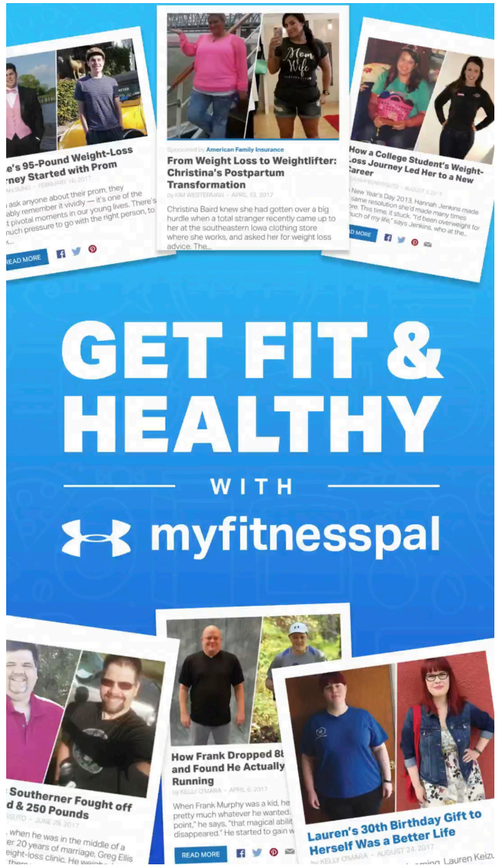


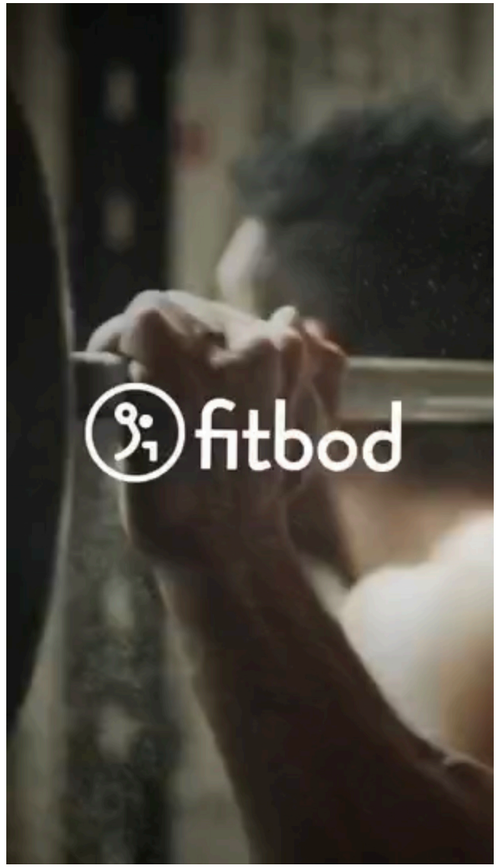
[5] van Welie & van der Veer, 2003

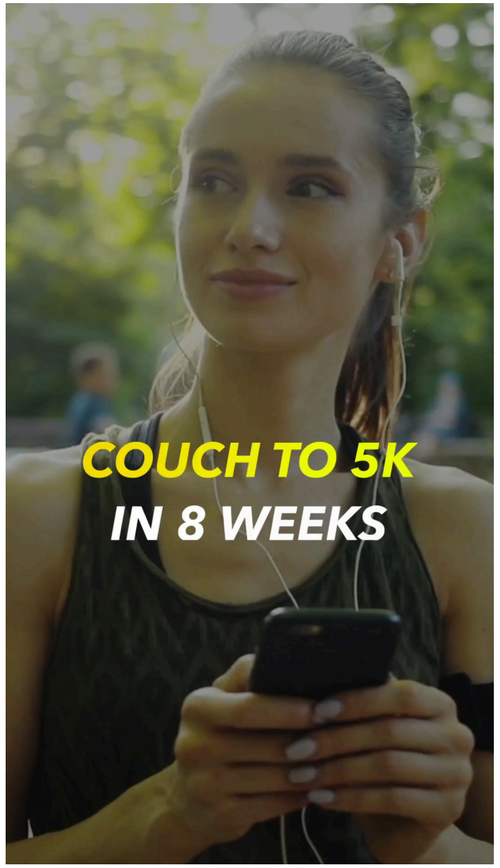
Business Goals

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[6]





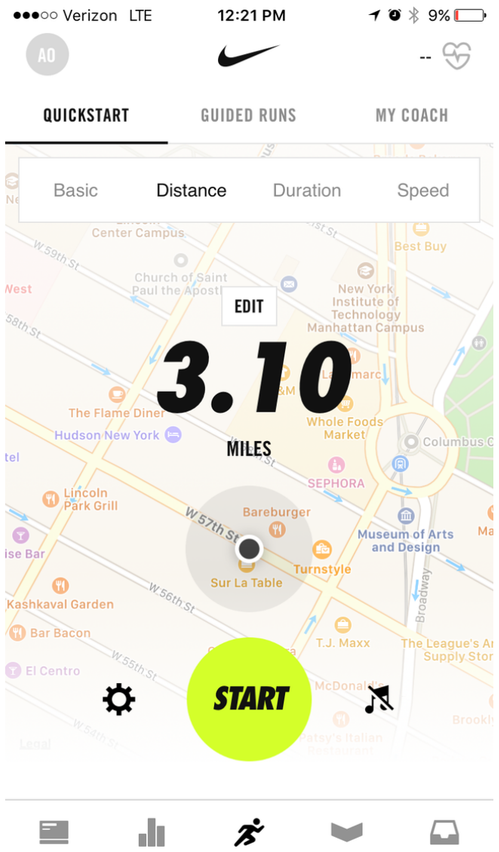


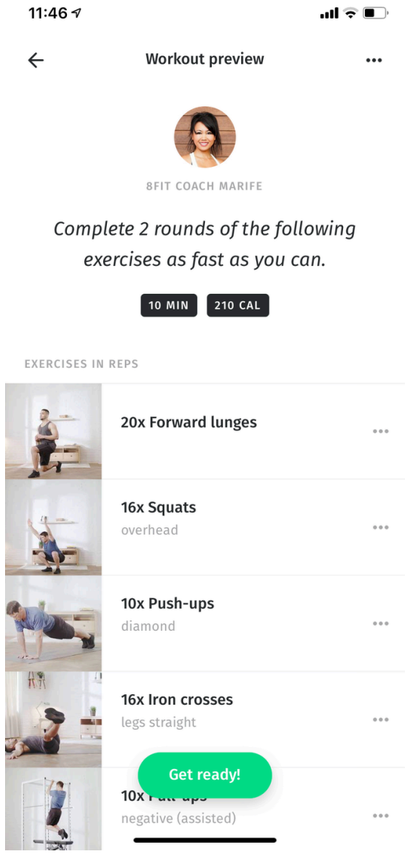
[6] Image sources (iOS App Store): *myfitnesspal*, *fitbod*, *5K runner*

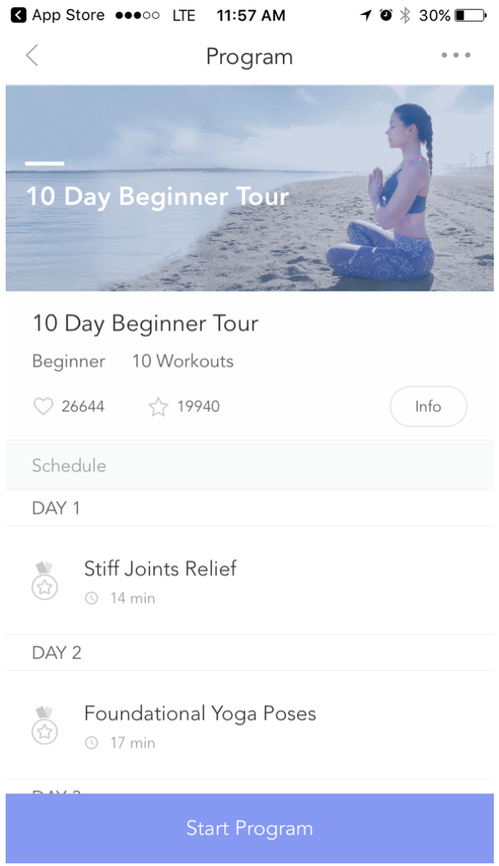
Posture-Level Patterns

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[7]







[7] 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

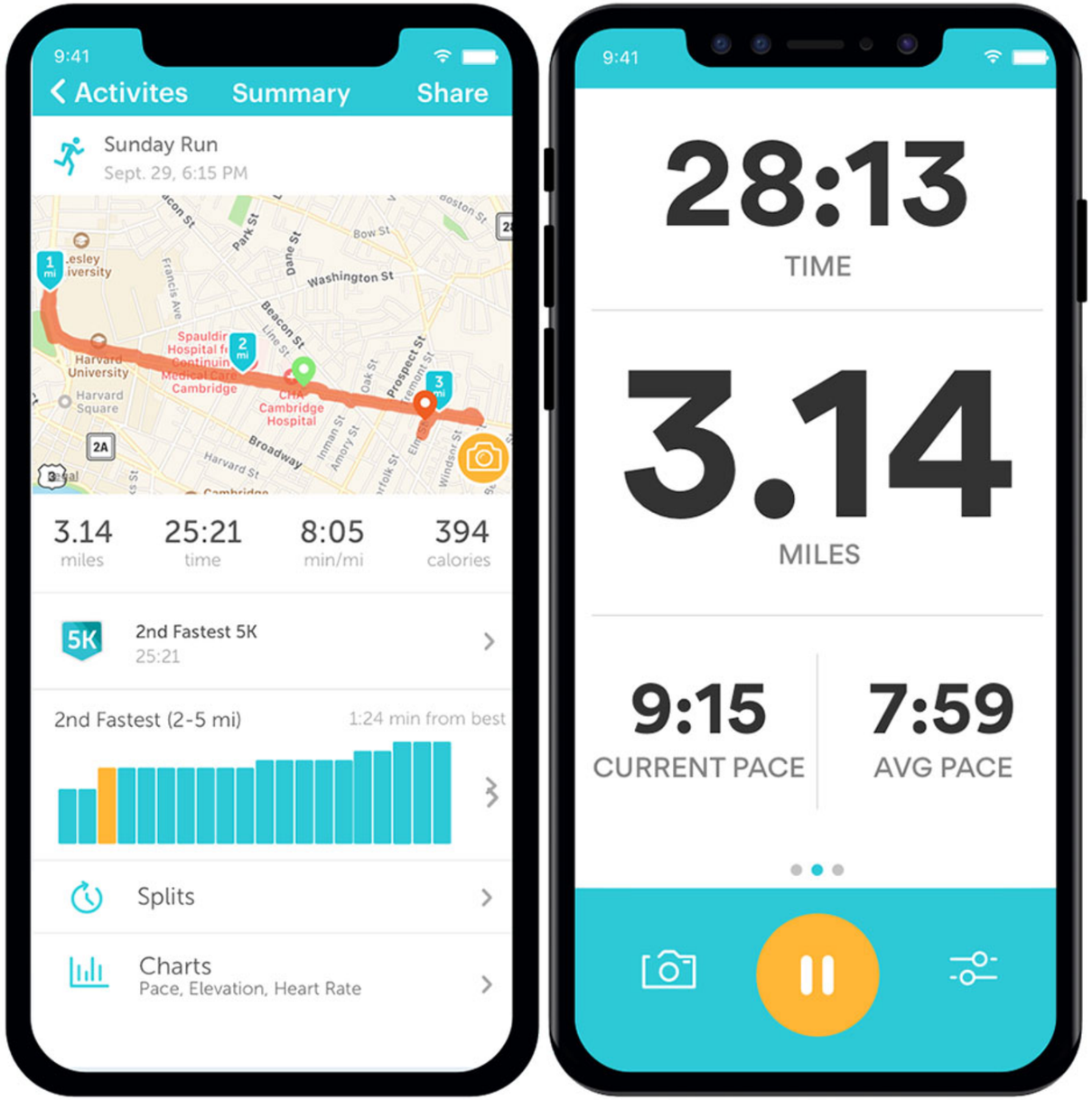
» Alternatives/competitors

Structure: Central canvas with supporting panels[8]

Components: Canvas, dashboard, score panel, data summary

UX: Measurement during the activity, review later

Competitors: Strava, RunKeeper



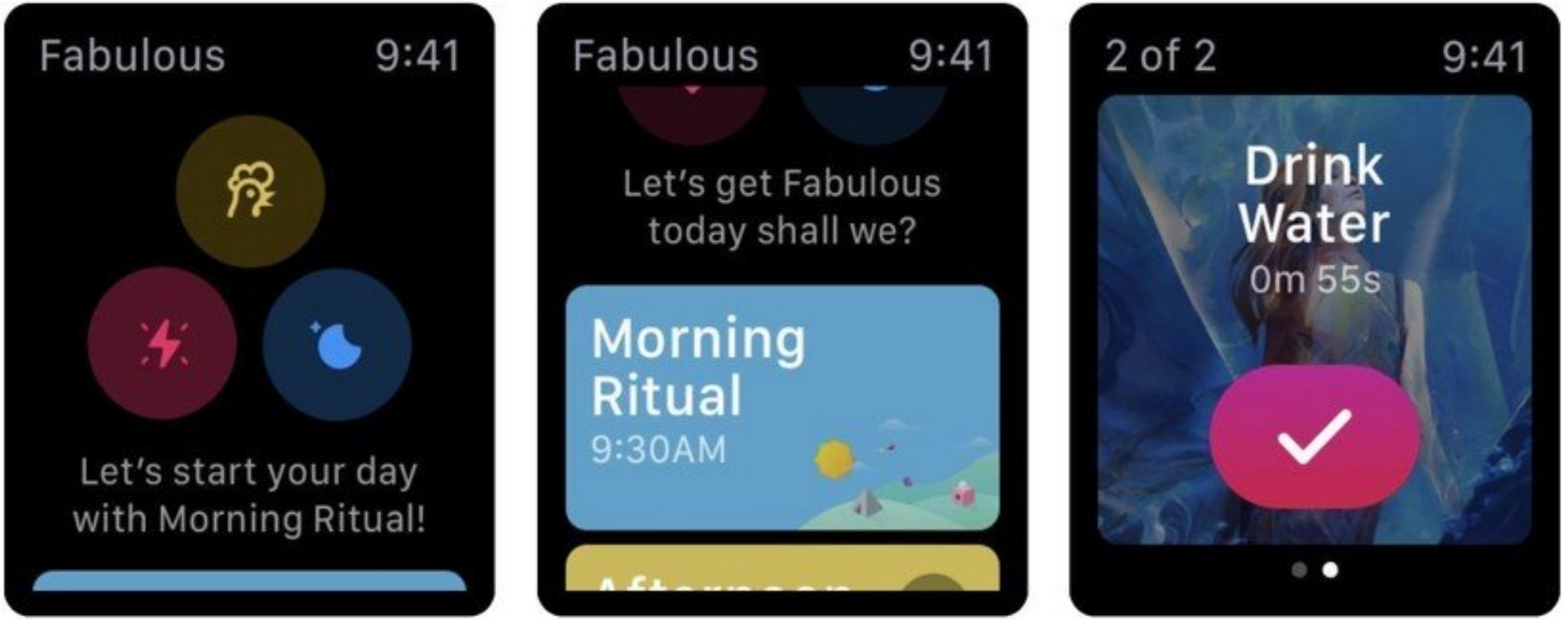
[8] Image source

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[9]

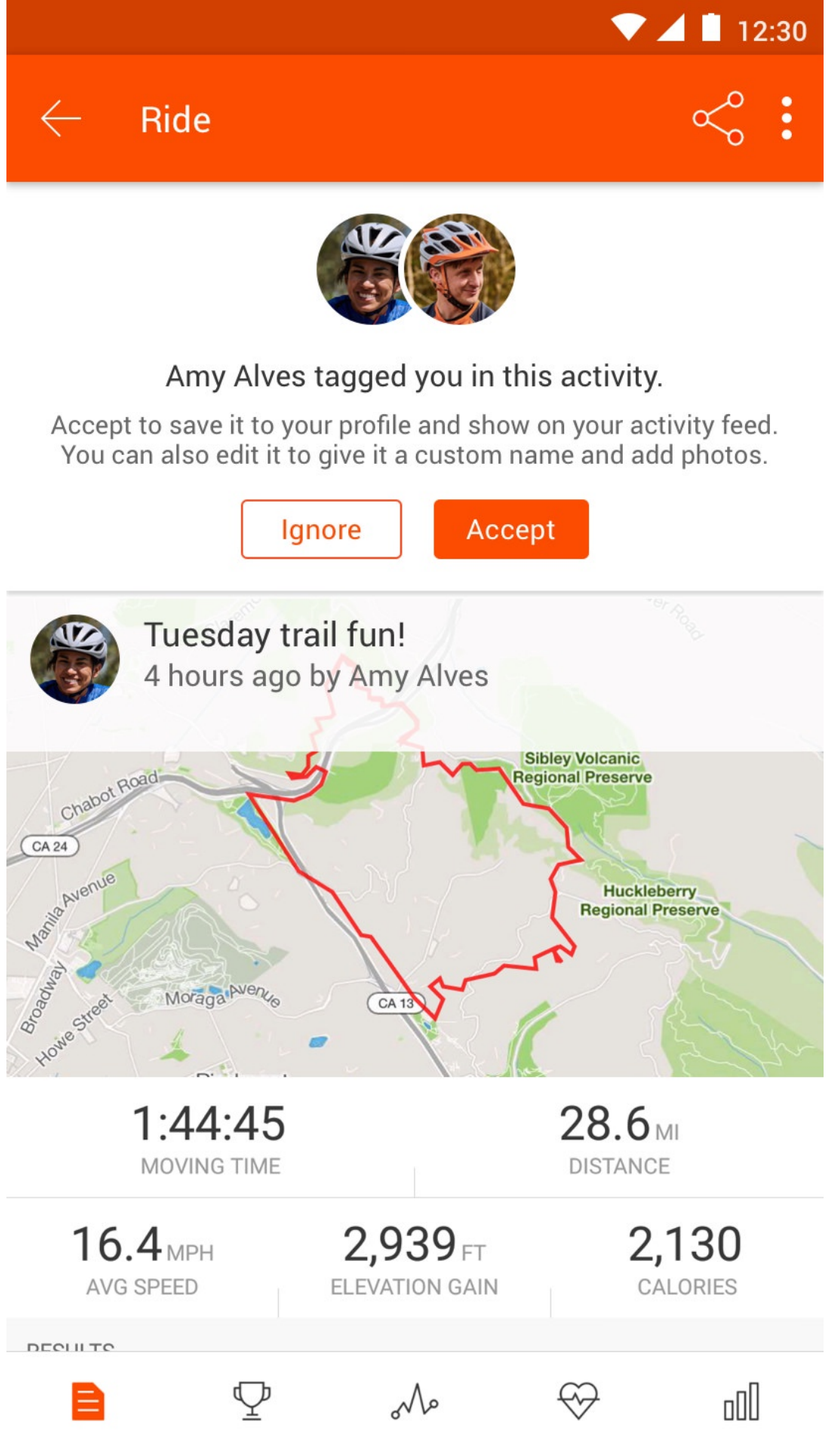


[9] Image source

Elements of an Exprience-Level Pattern[10]

» Primary goals, e.g., activity tracking

» Secondary goals, e.g., community building



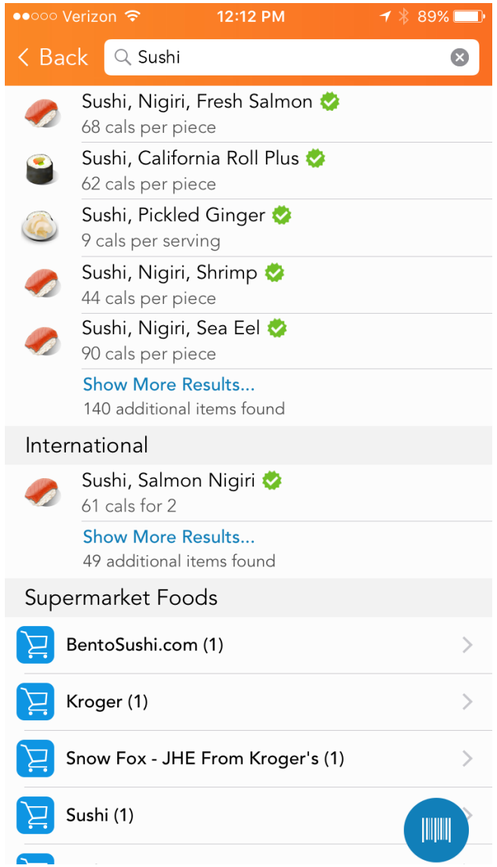
[10] Image source

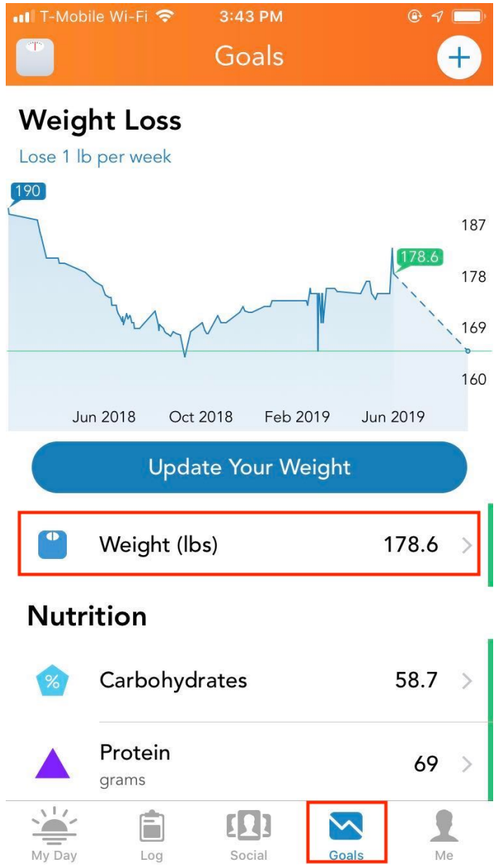
Task-Level Patterns

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.

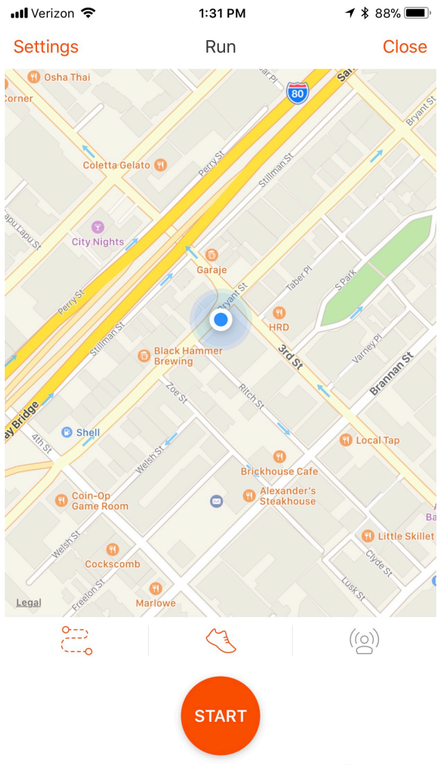
Source[11]

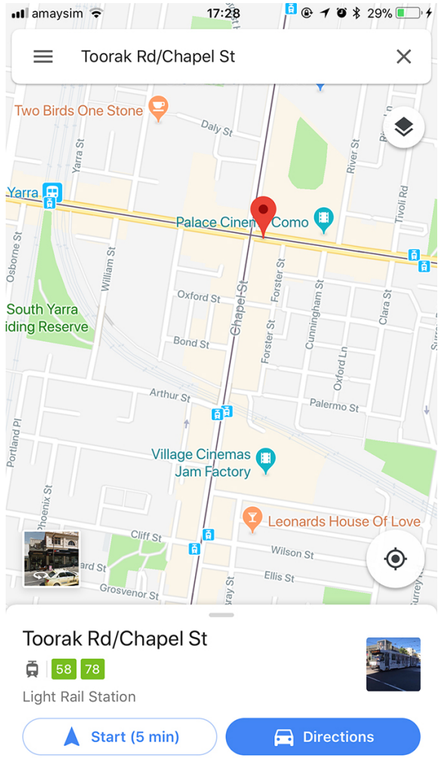




[11] Image sources: left, right

Task-level patterns can be domain independent. Business goals and posture-level patterns set the context for these patterns.[12]





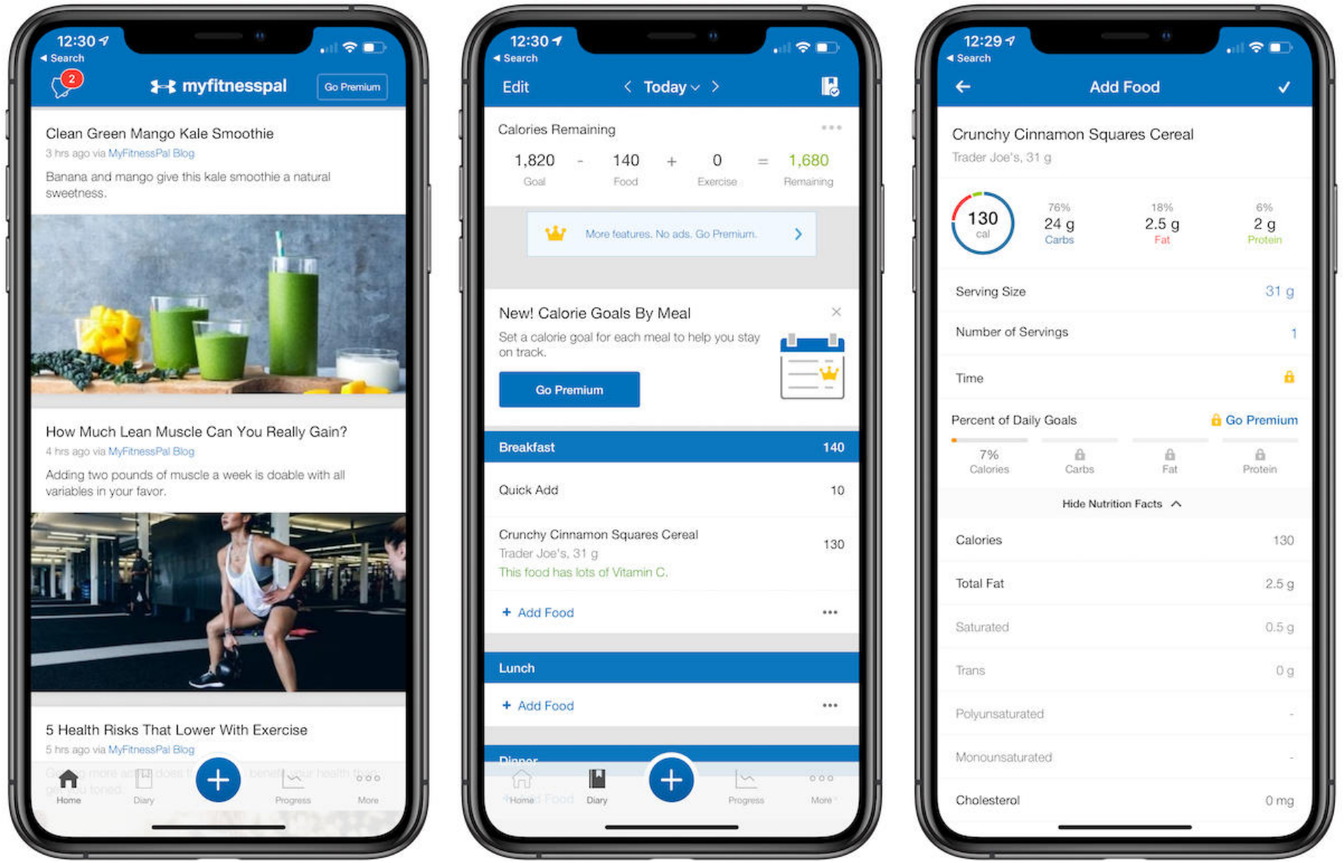
[12] Image sources: left, right

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.

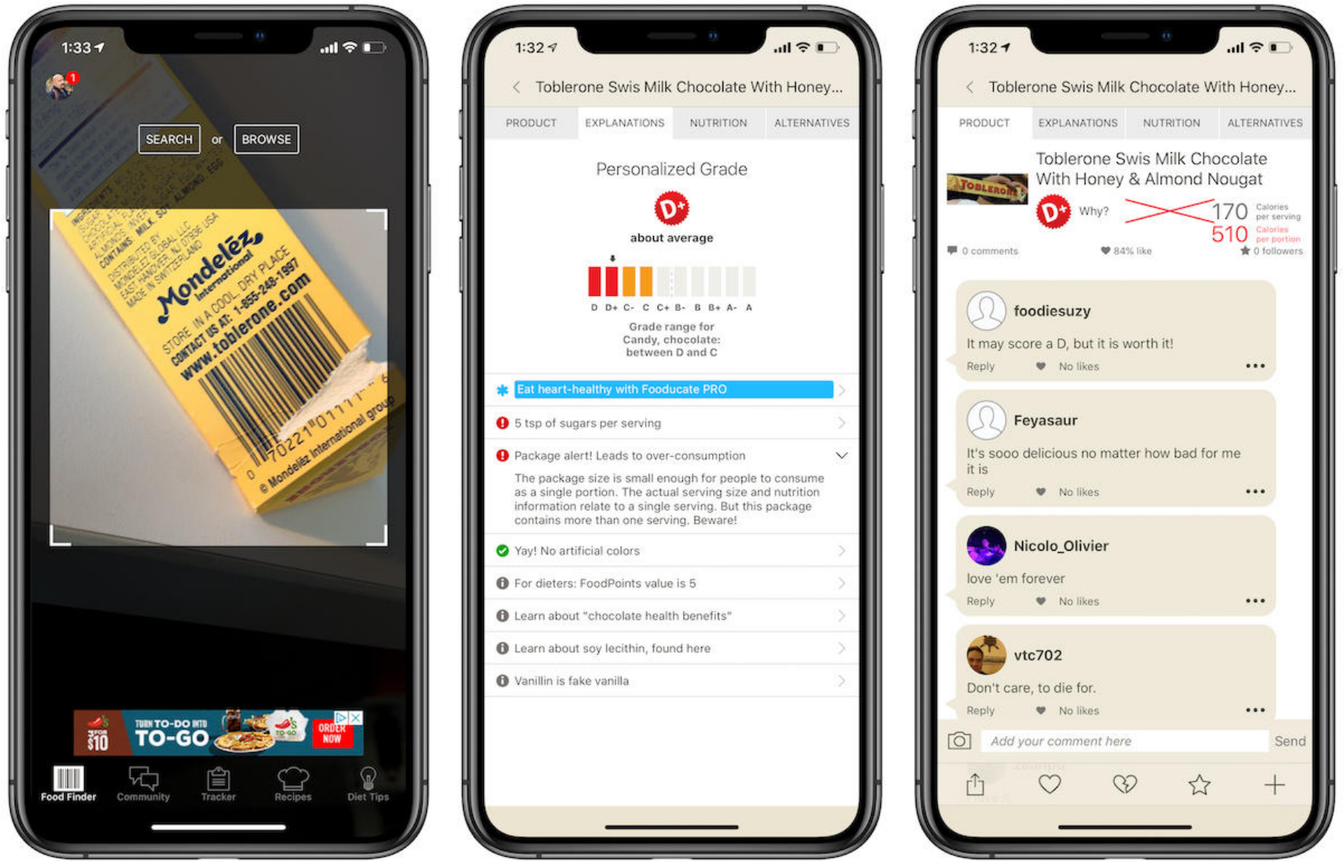
Action-level patterns are the lowest level of building blocks for a design. They are often called *widgets* or *components* (as in React).

Action-level patterns for a *food tracking* app:[13]



[13] Image source: My Fitness Pal

Action-level patterns for a *food education* app:[14]

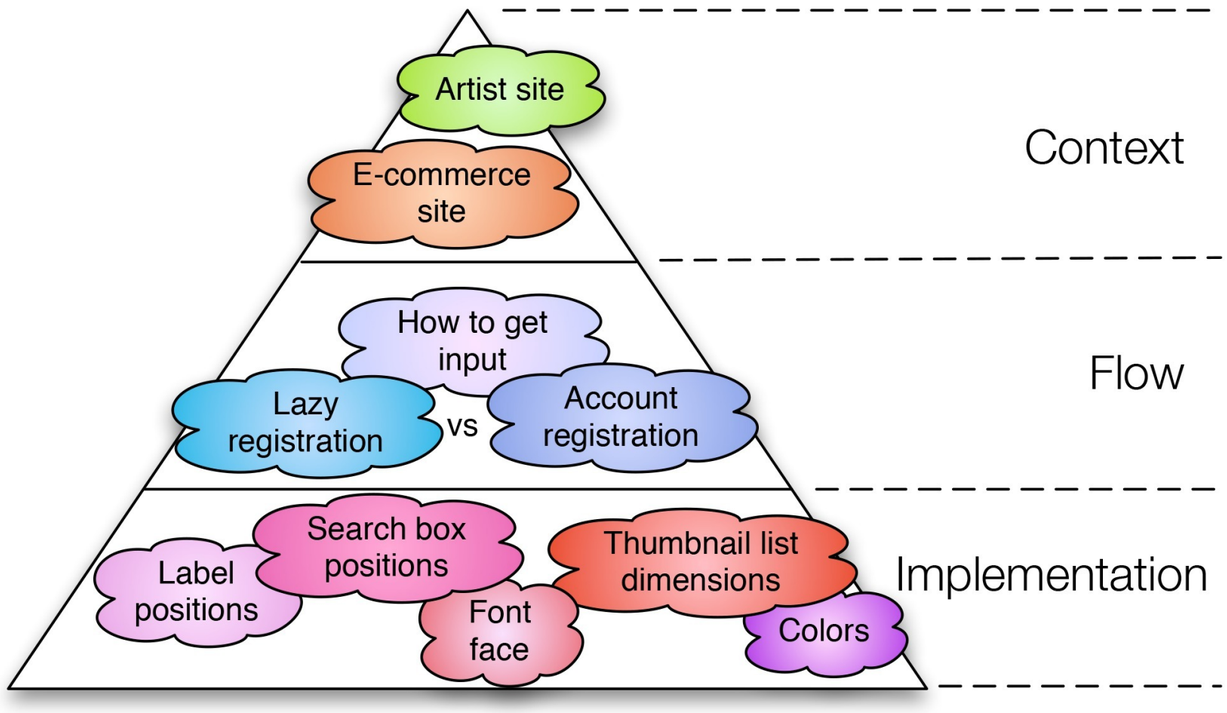


[14] Image source: Fooducate

A Simplifed Model[15] [16]

Three-levels of patterns:

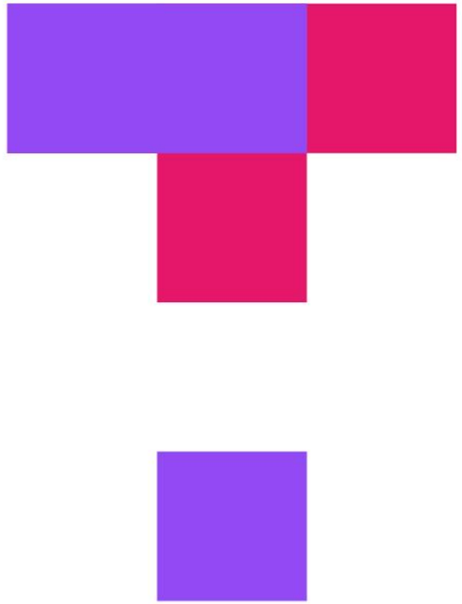
1. **Context:** Type of app
2. **Flow:** Components that support specific functions
3. **Implementation:** The visual/ behavioral elements that implement the functions



[15] Anders Toxboe

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

TopHat Quiz



TOP HAT

How do we use pattern languages?

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.[5]

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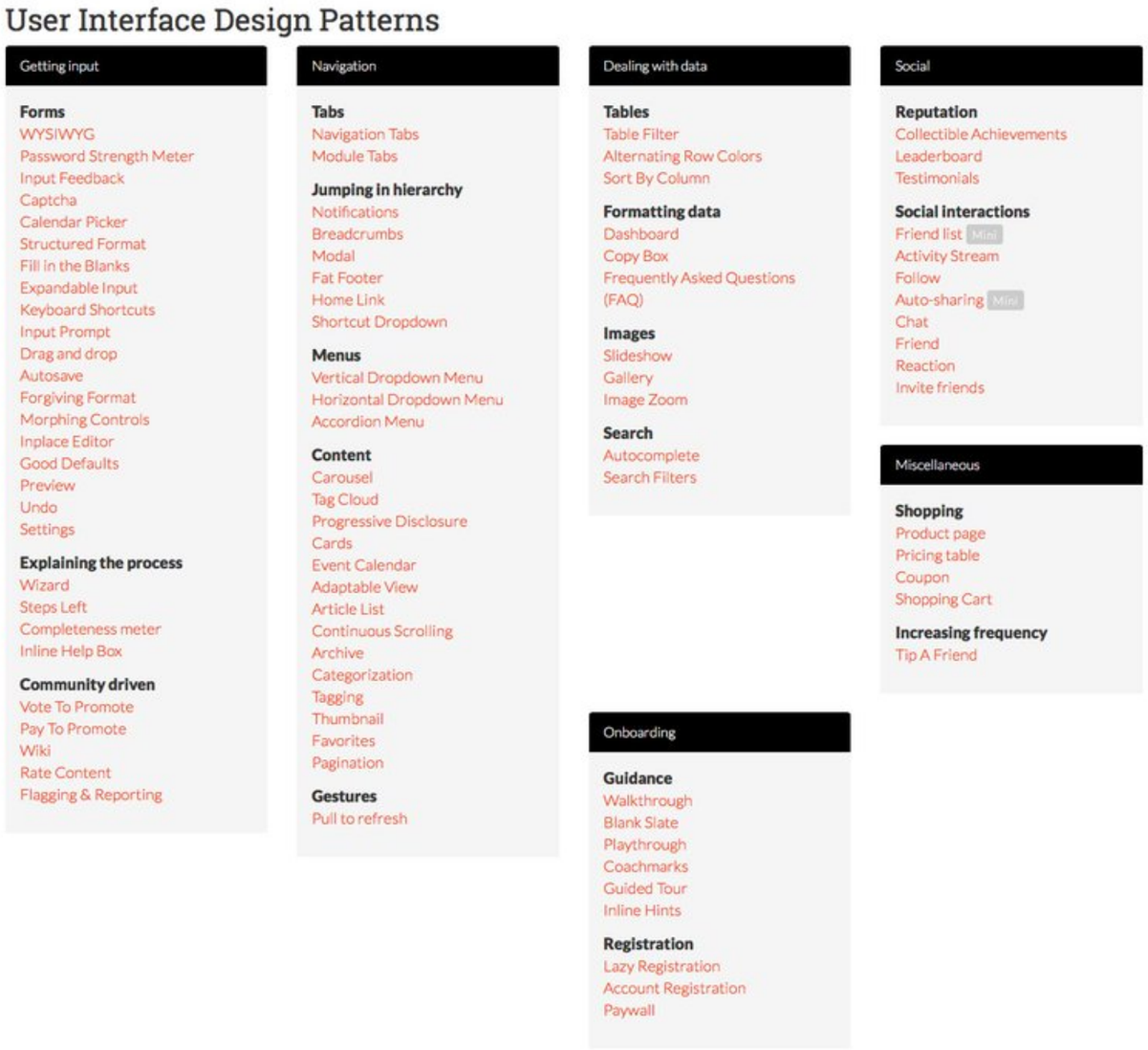
[5] van Welie & van der Veer, 2003

Where do we find patterns?[17]

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



[17] Image source

Online Pattern Libraries

» UIPatterns.io

» UI-Patterns

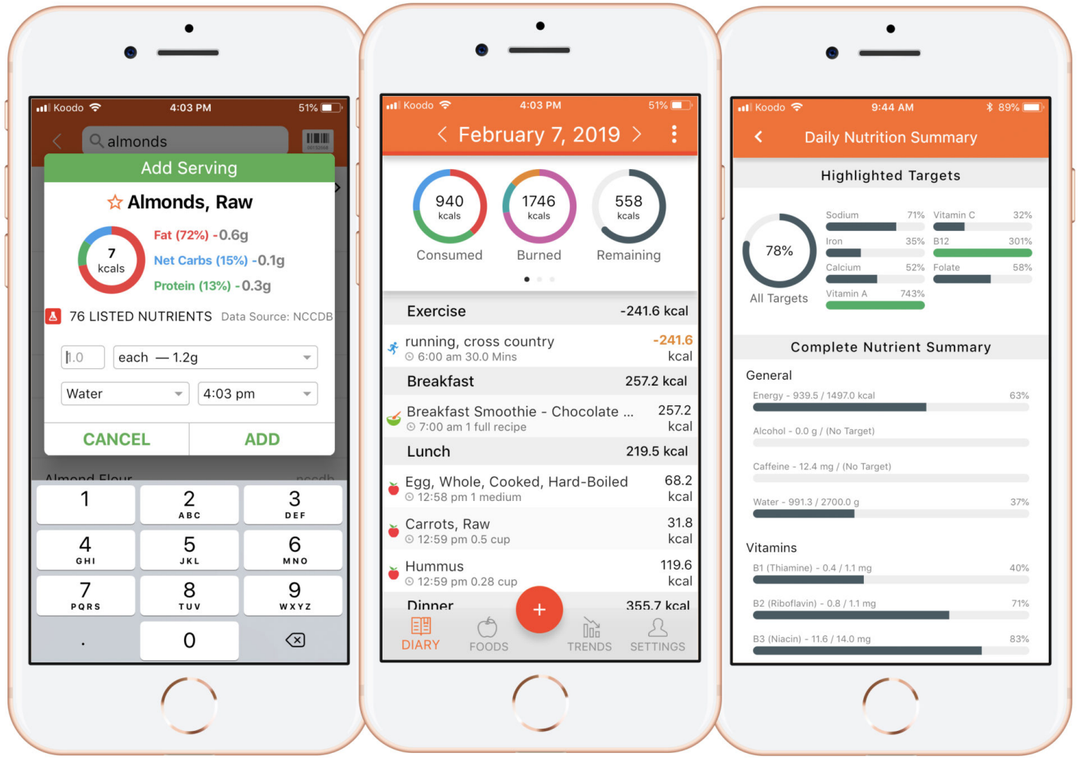
» Mobbin

» UI Garage

» Welie

In-Class Activity

Source[18]



[18] Image sources: left, right

Business Goals

Mission of the application

Posture Level

“Type” of application

Experience Level

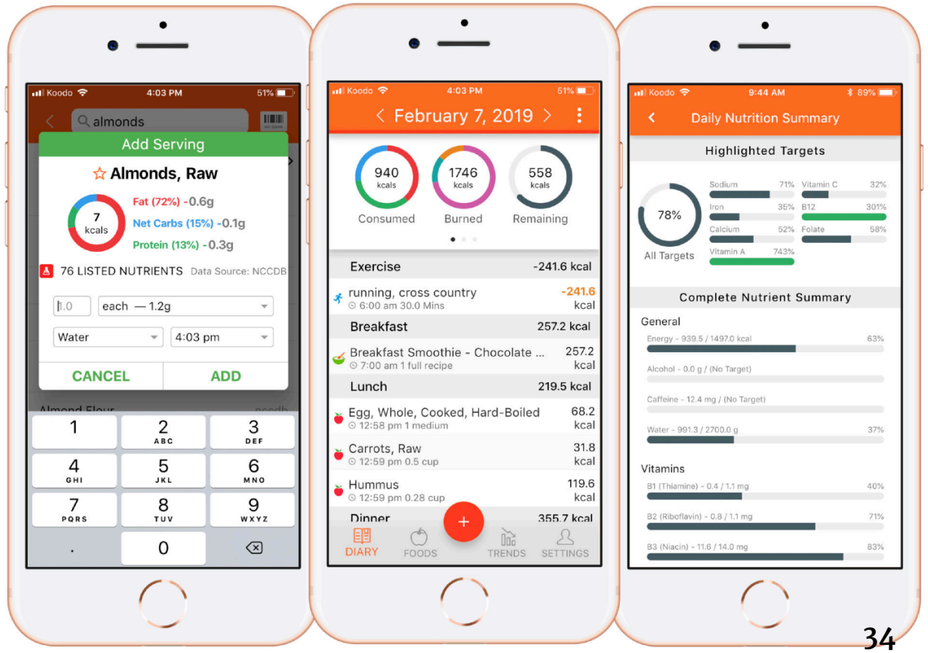
User goals

Task Level

Task sequences

Action Level

User actions



Design Languages

The problem: 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!

Recap: Design Languages

Definition: A vocabulary of design elements that are repeatedly applied to interaction design problems.

Non-digital example: NASA Graphics Standard Manual.[19]

[19] NASA

Source[19]

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 ¾" (.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.

General personnel patch

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

[19] NASA

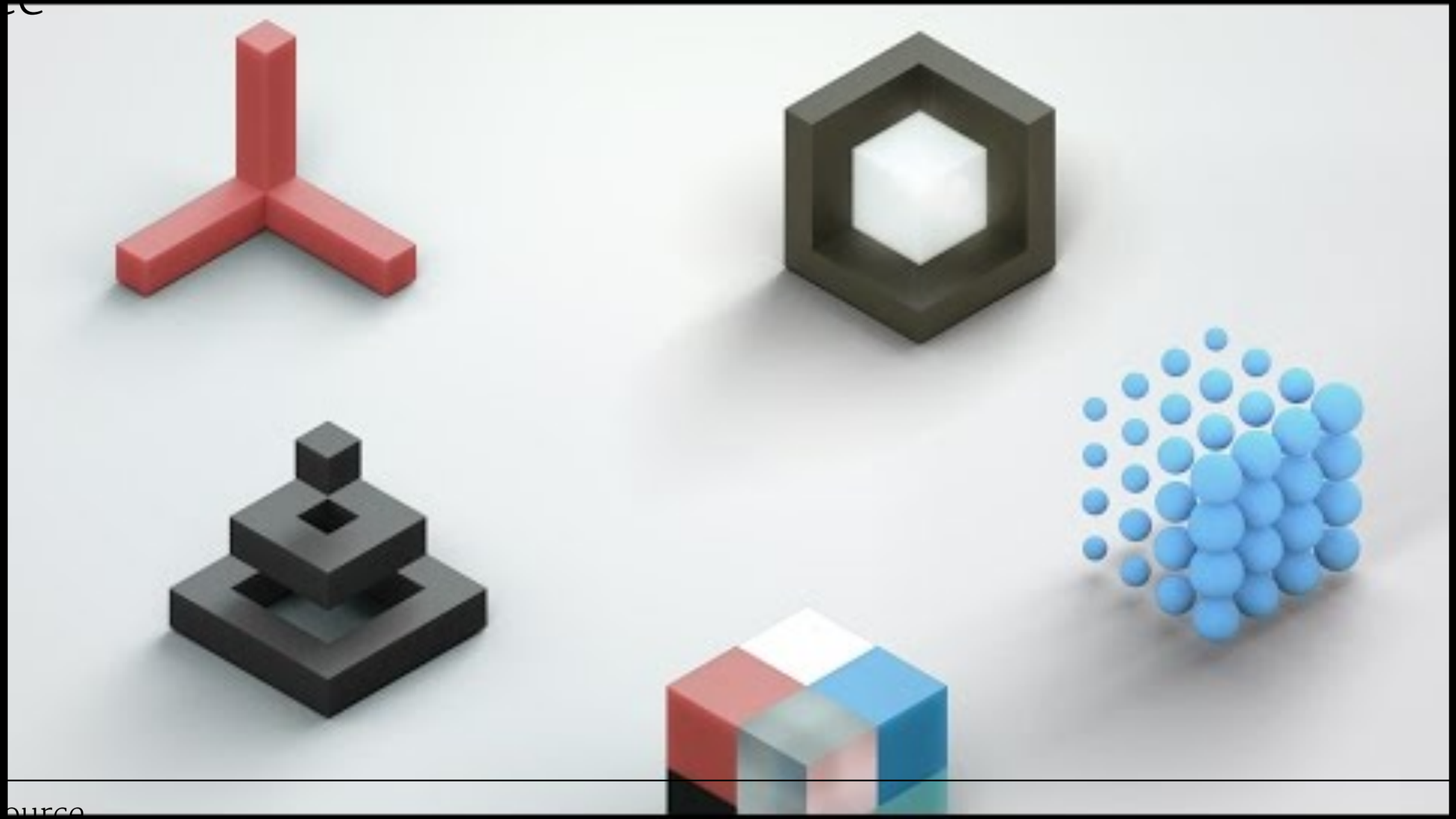
UX Design Languages

Definition: Task- and action-level interface components that follow a consistent look and feel in appearance and behavior.

Commonly Used Design Languages[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

Assignment Preview

Design Assignment 07: Design Patterns

The assignment will help us generate design ideas for the React Native module deliverable: a *mobile fitness/calorie-tracking* application. In a two-part assignment, you will:

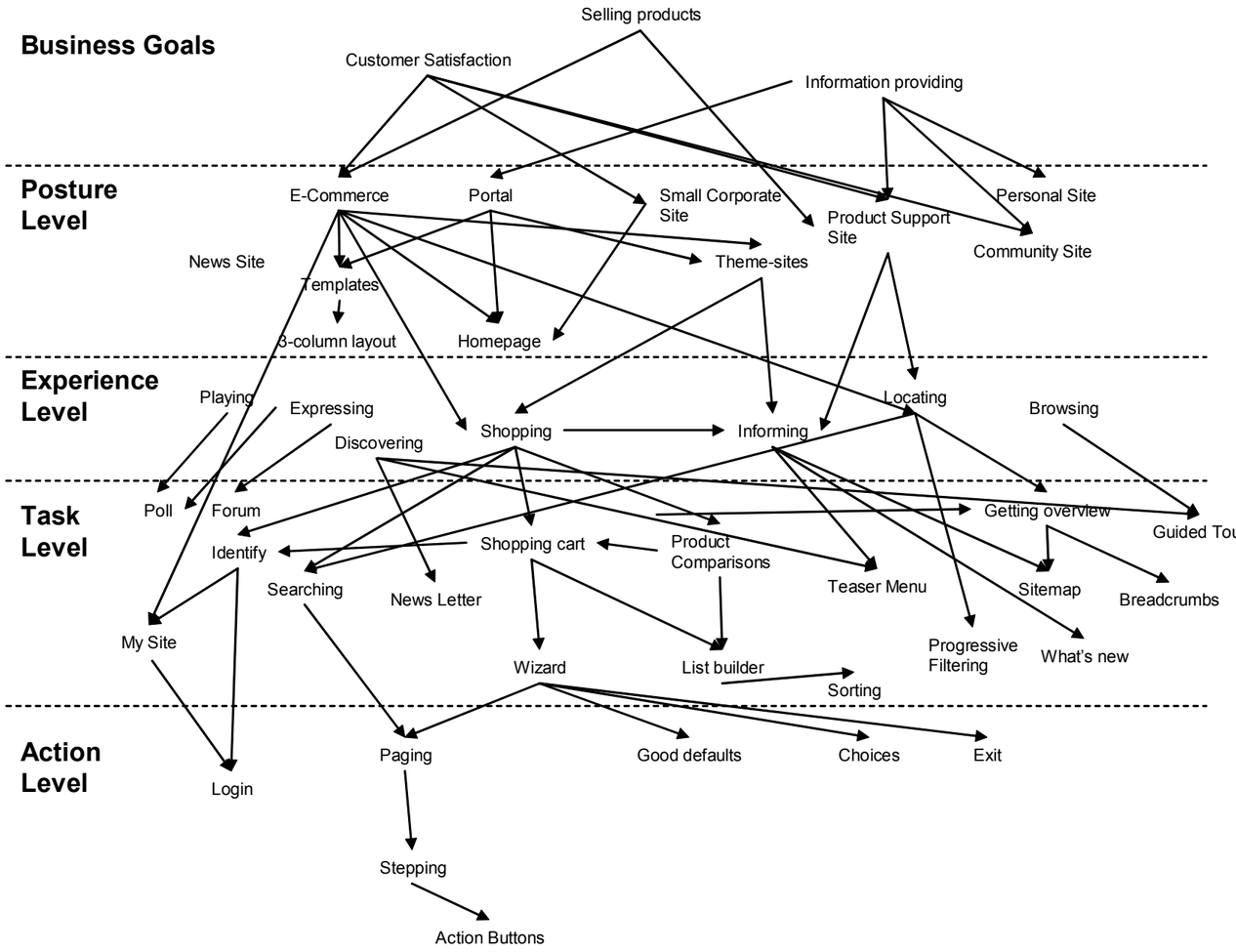
Step 1. Analyze the design patterns in an existing application

Step 2. Generate a design for a new application

Step 1. Analyze an existing design

» Analyze the application for all levels of design patterns, from top to bottom.[5]

» Analyze screen designs for task- and action-level patterns.

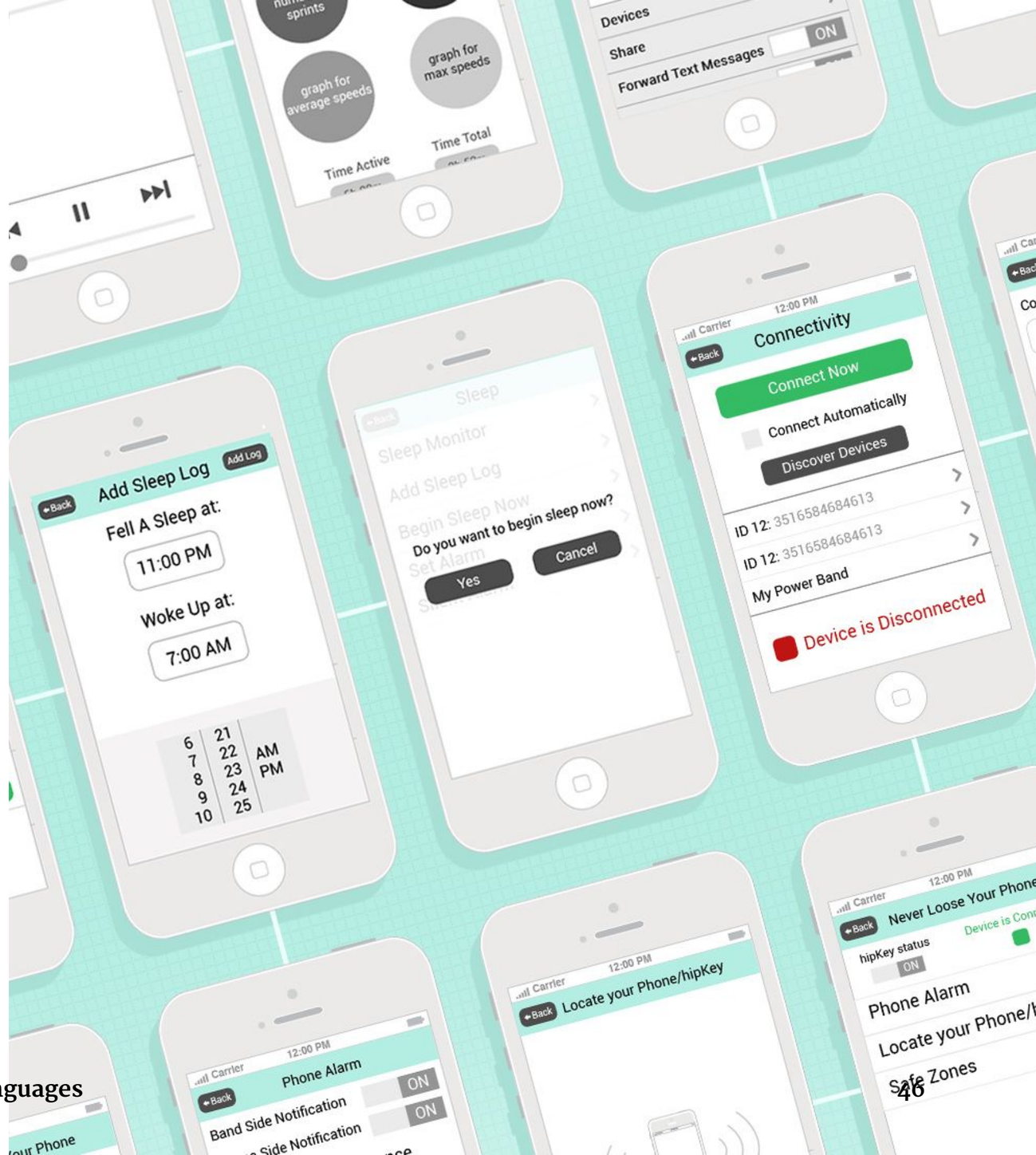


[5] van Welie & van der Veer, 2003

Step 2. Generate a new design[22]

» Using the pattern language analysis approach, make design decisions at all levels of your application, from top to bottom.

» Visualize your decisions at the task- and action-levels by creating wireframes.



[22] Image source

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