

Building User Interfaces

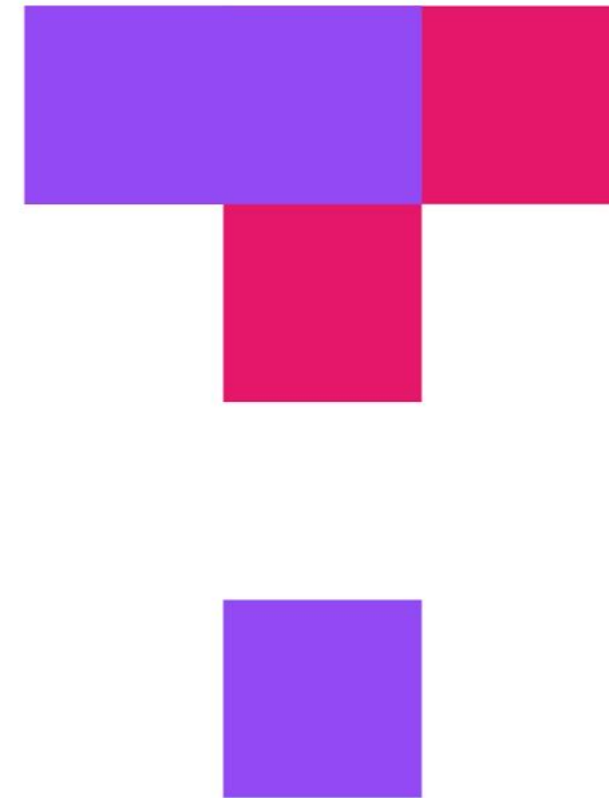
Design Paradigms in Interaction Design

Professor Bilge Mutlu

What we will learn today?

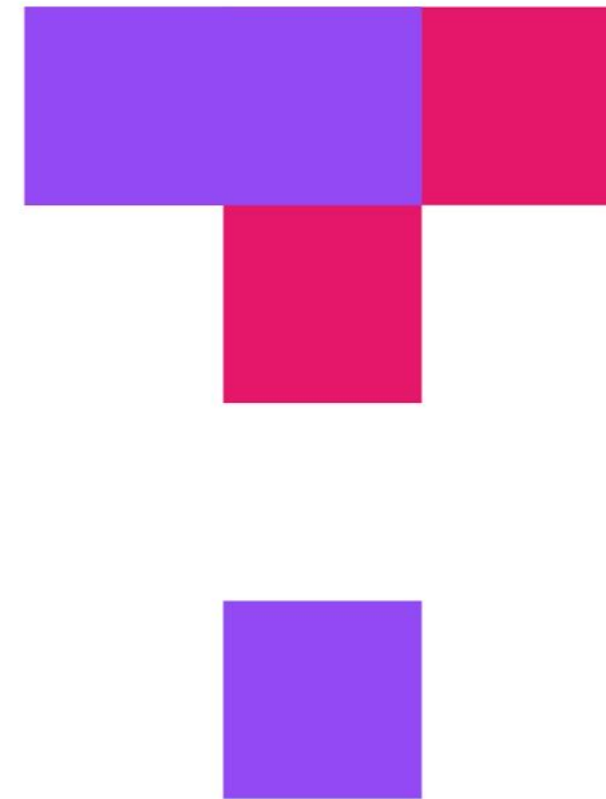
- >> What is interaction design?
- >> Design paradigms
- >> Design patterns & languages

TopHat Attendance



TOP HAT

TopHat Questions



TOP HAT

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 Design¹

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

5 DIMENSIONS OF INTERACTION DESIGN

ooo

Application Form

Please enter the description below:

>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec ut orci, dapibus et sagittis quis, ultricesper feugiat mauris. Donec tempus, diam ac congue rhoncus, nulla tortor venen-
dum, et hendrerit felis. Praesent id felis. Vestibulum ante ipsum primis in faucibus orci luctus et
aliquet erosque nibh. Curabitur malesuada elit, consetetur etiam quis, dignissim
consectetur elit.

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

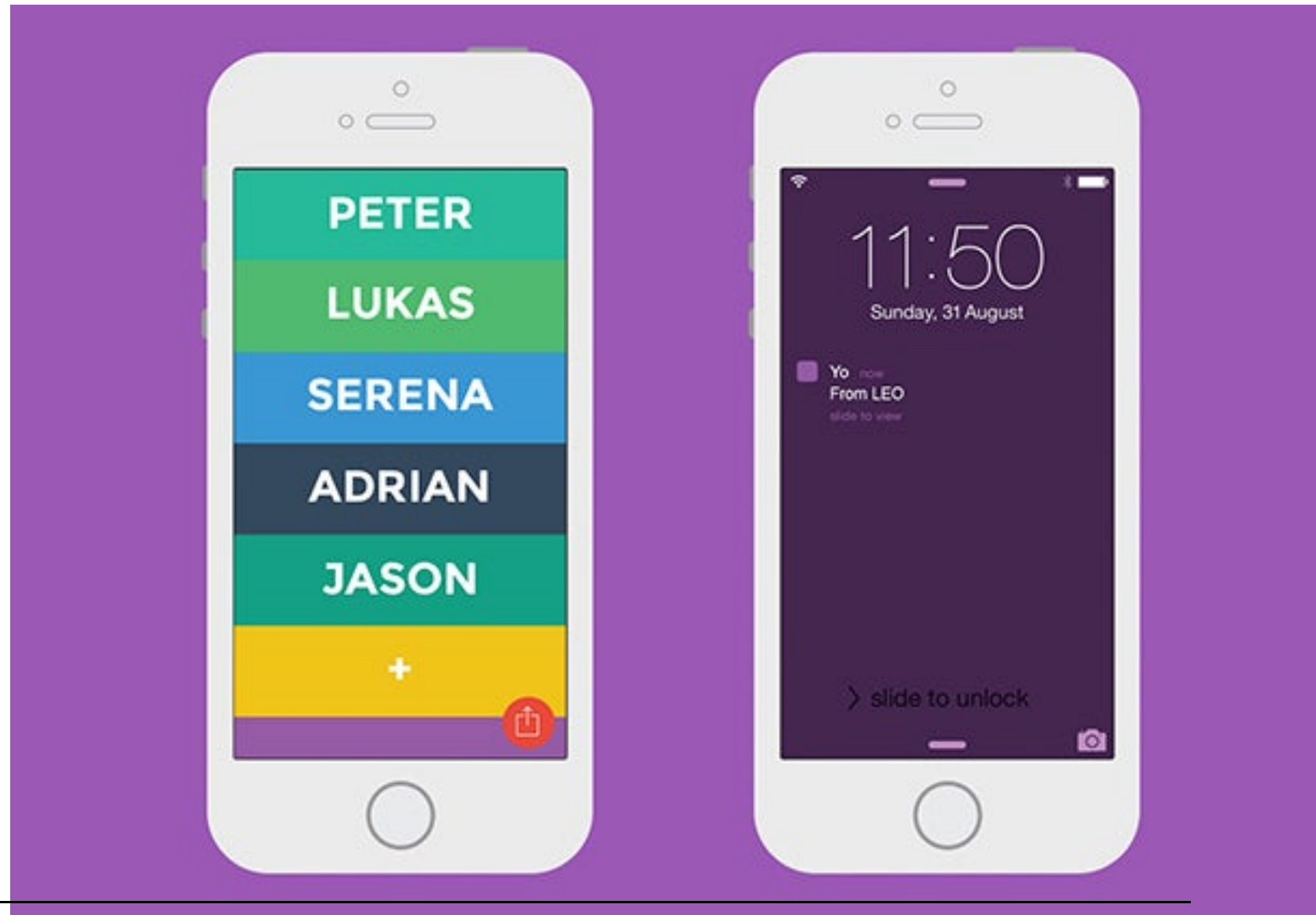
Pros:

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}



² Hardinge

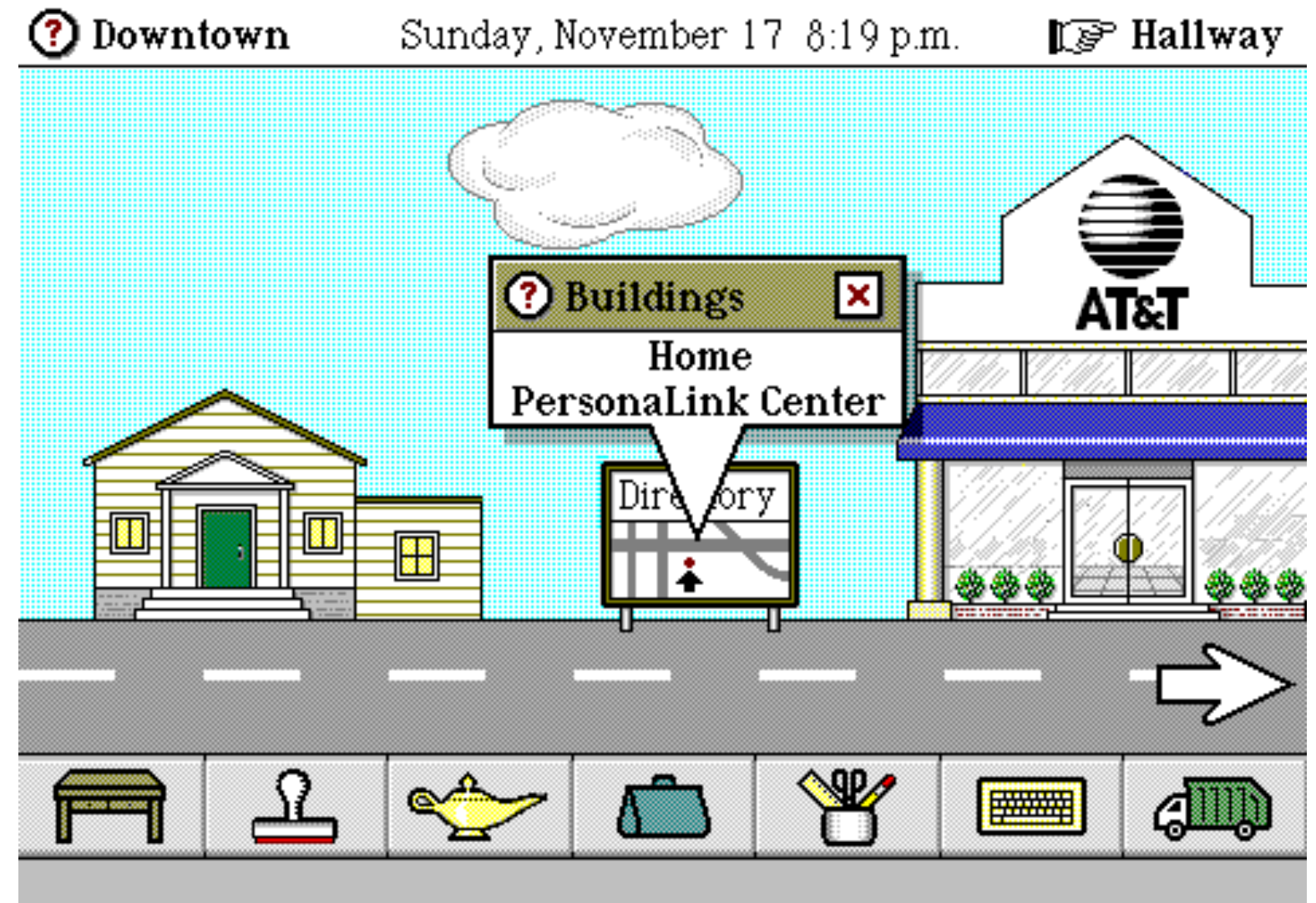
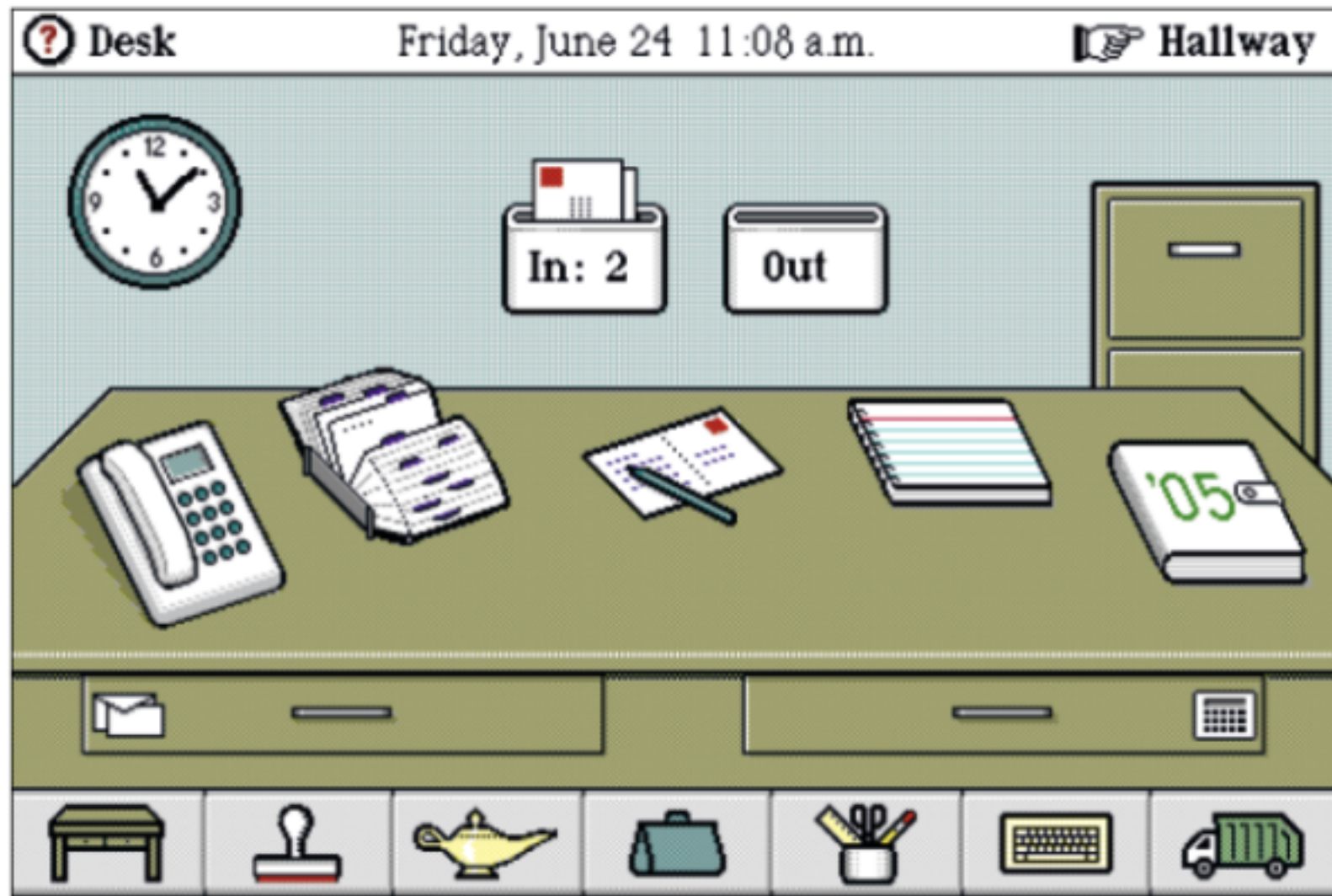
³ Entrepreneur Magazine

Metaphorical Design

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

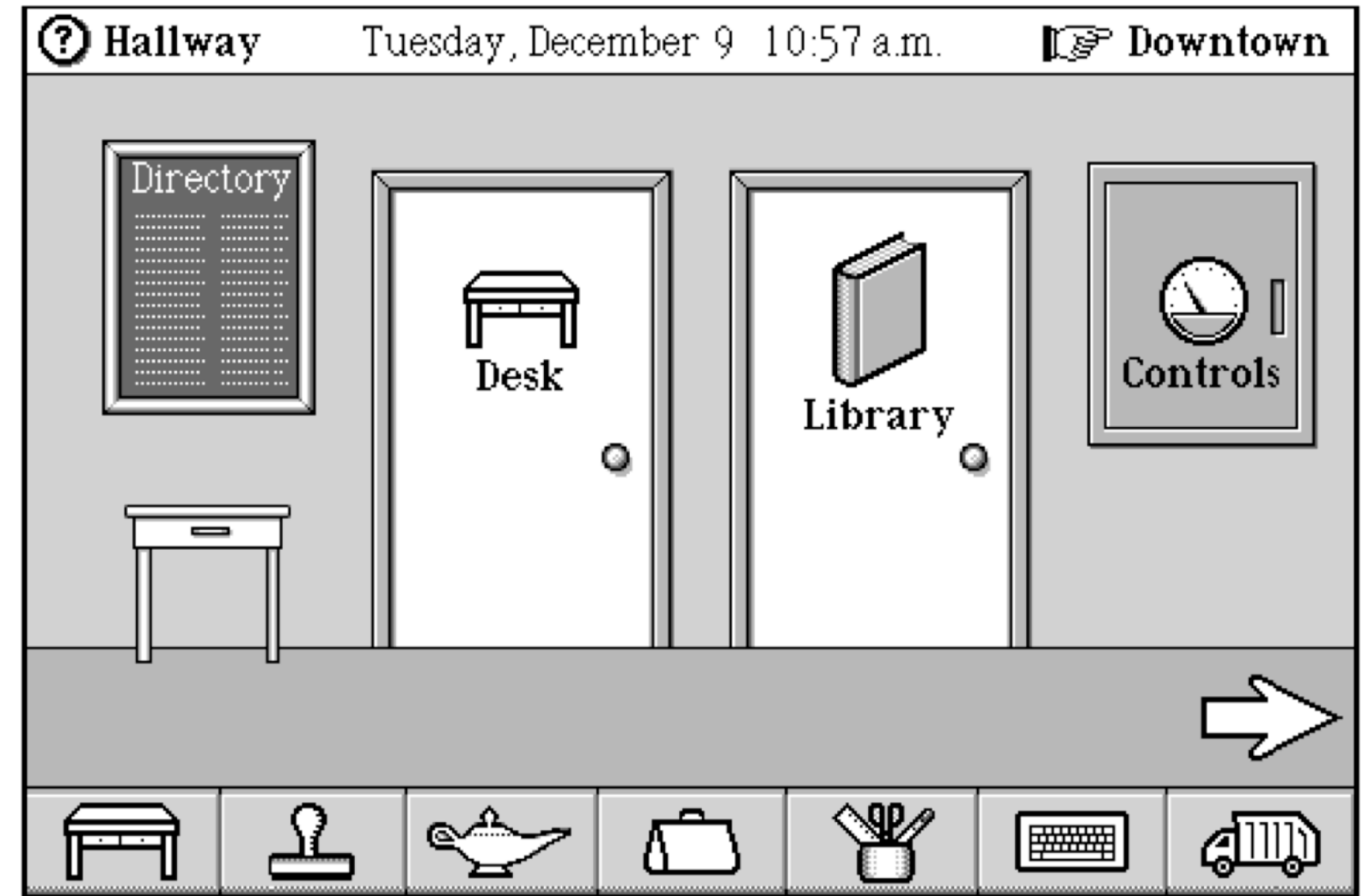
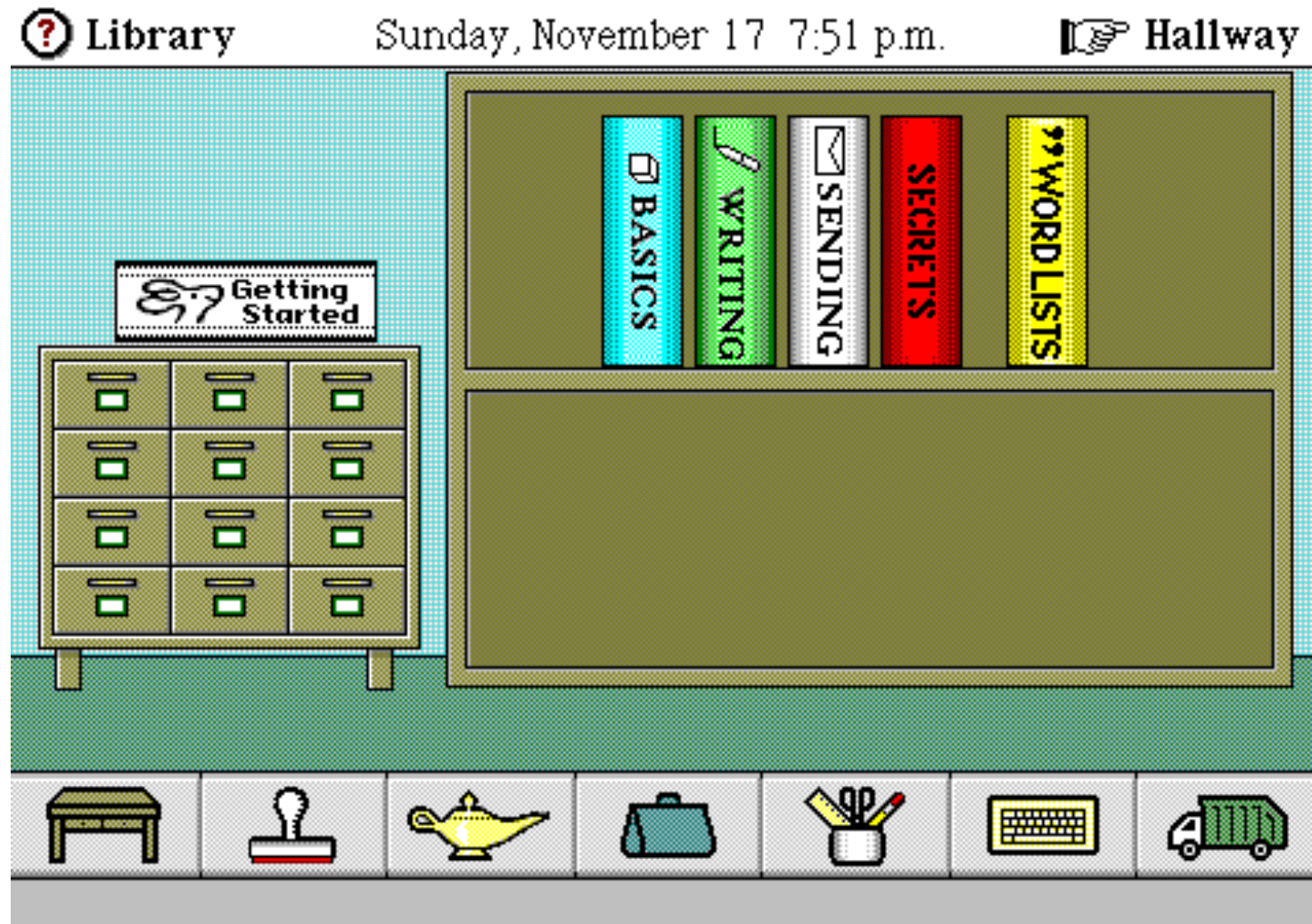
Metaphorical designs "jump-start" user mental models, rely on their existing knowledge of how things work in the real-world, and thus eliminate learning.

Source⁴



⁴ Wikipedia: [Magic Cap](#)

Source⁴⁵



⁴ Wikipedia: [Magic Cap](#)

⁵ NN Group: [The Anti-Mac Interface](#)

Source⁶

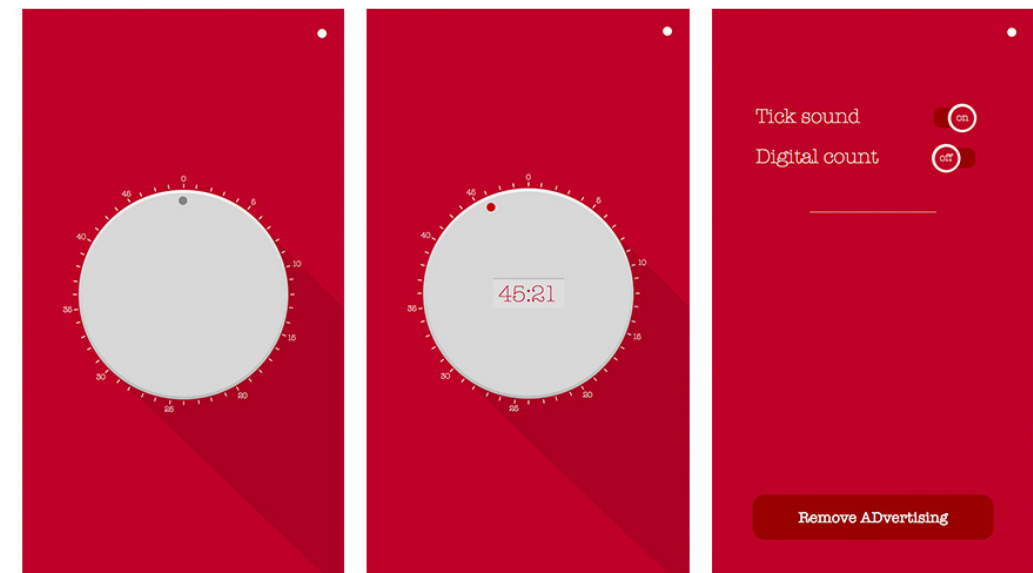
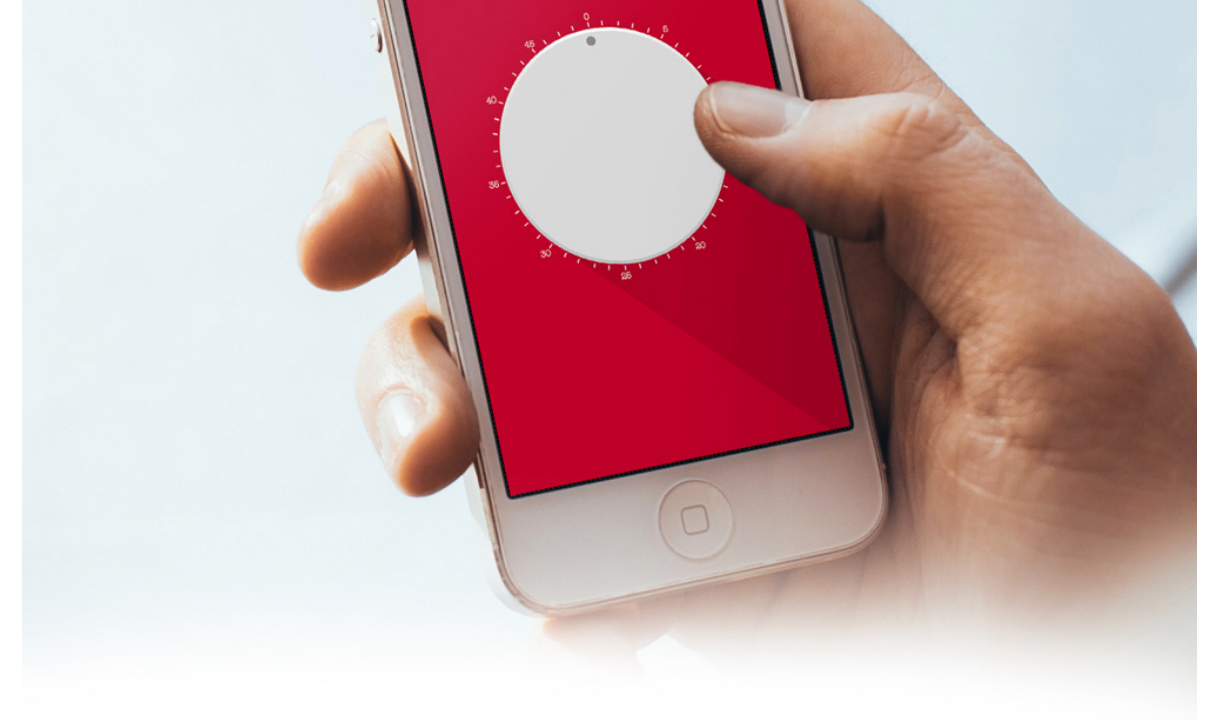


⁶UX Planet: Metaphorical Design

Source⁷



⁷ 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 Metaphor⁸

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.

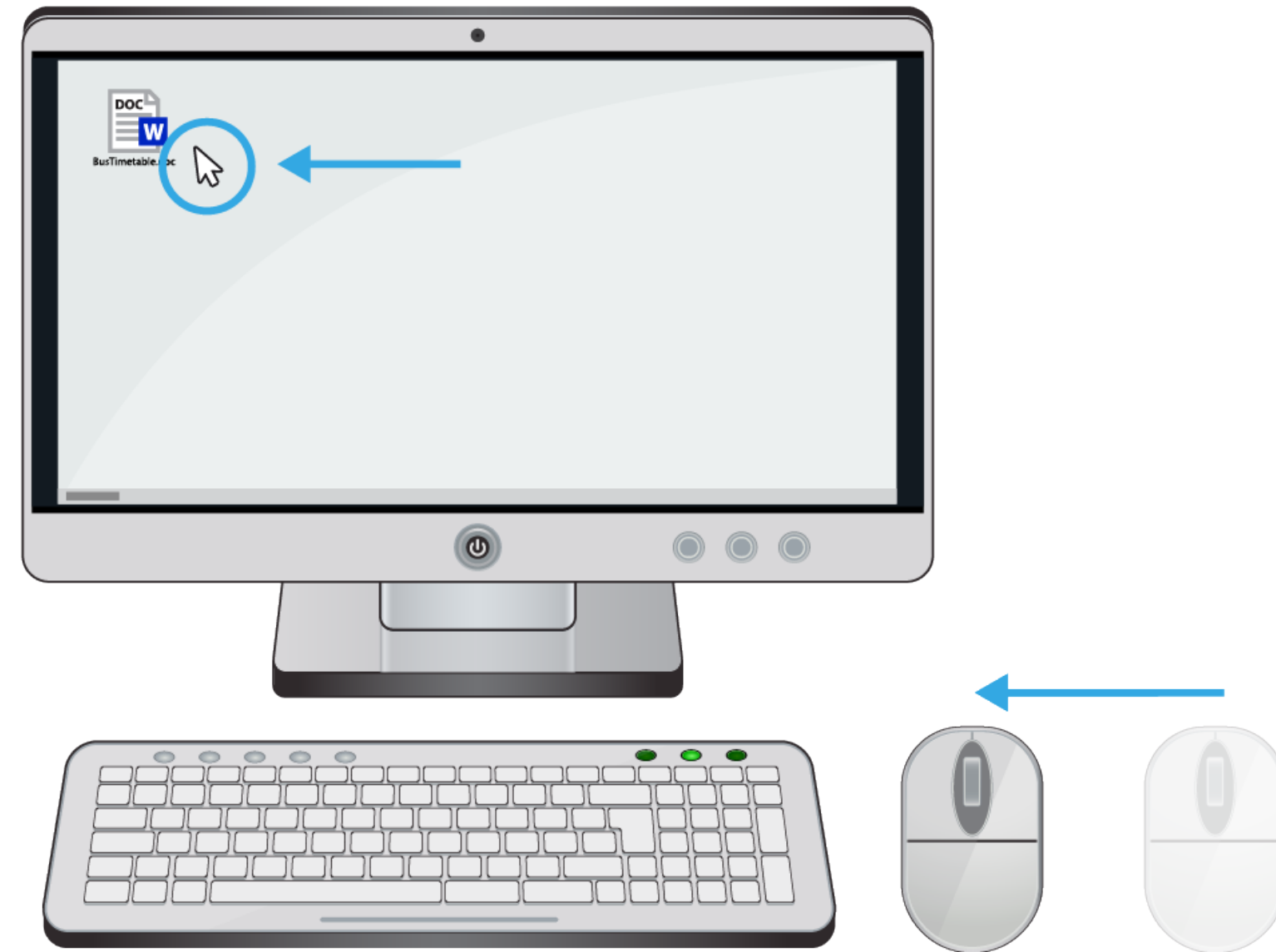
Cons: inability to scale; lack of familiar real-world system for entirely new capabilities; cultural differences; inability to adapt as capabilities evolve

⁸Cooper et al., 2014, About Face

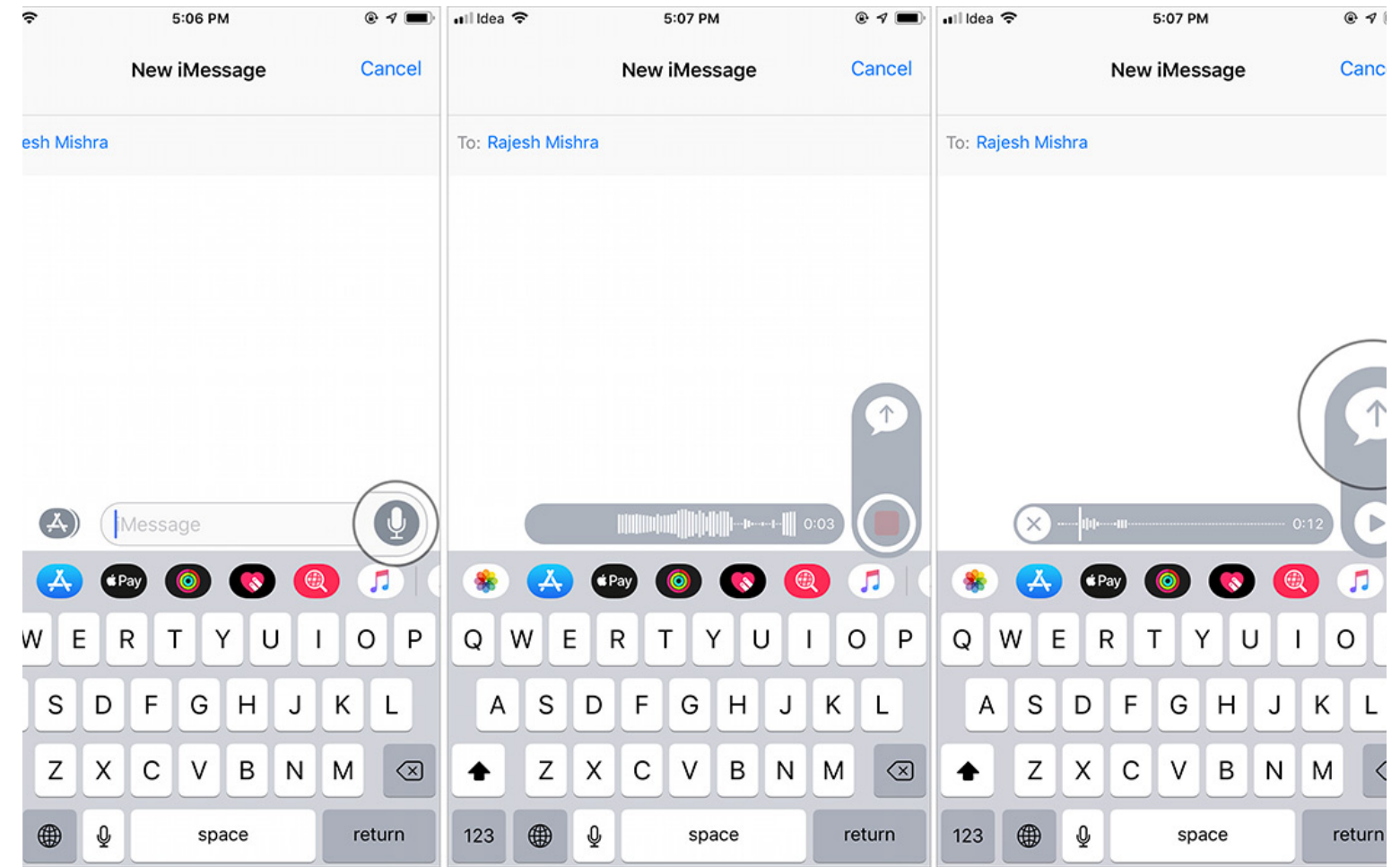
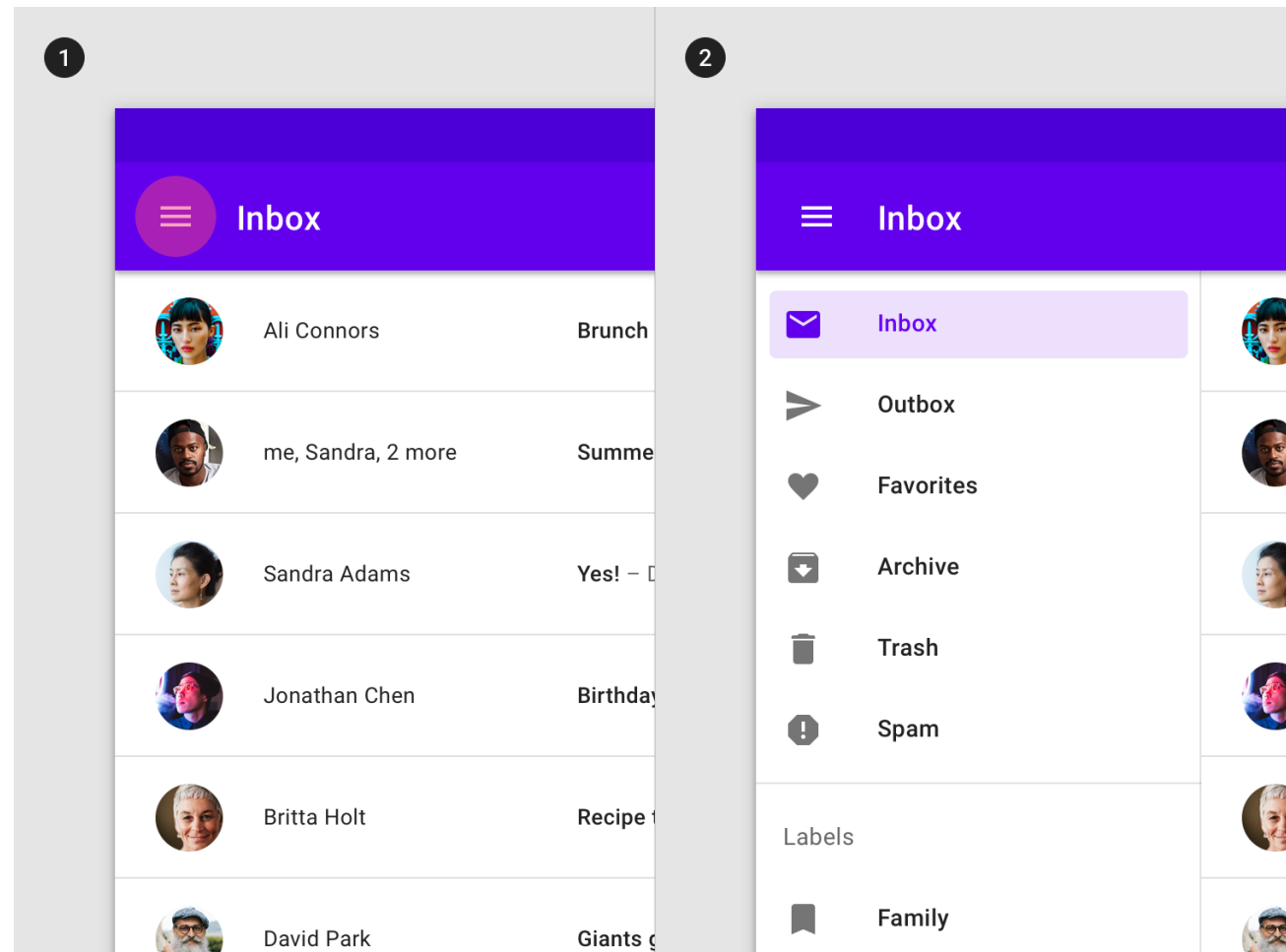
Idiomatic Design⁹

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.



⁹[Image Source](#)



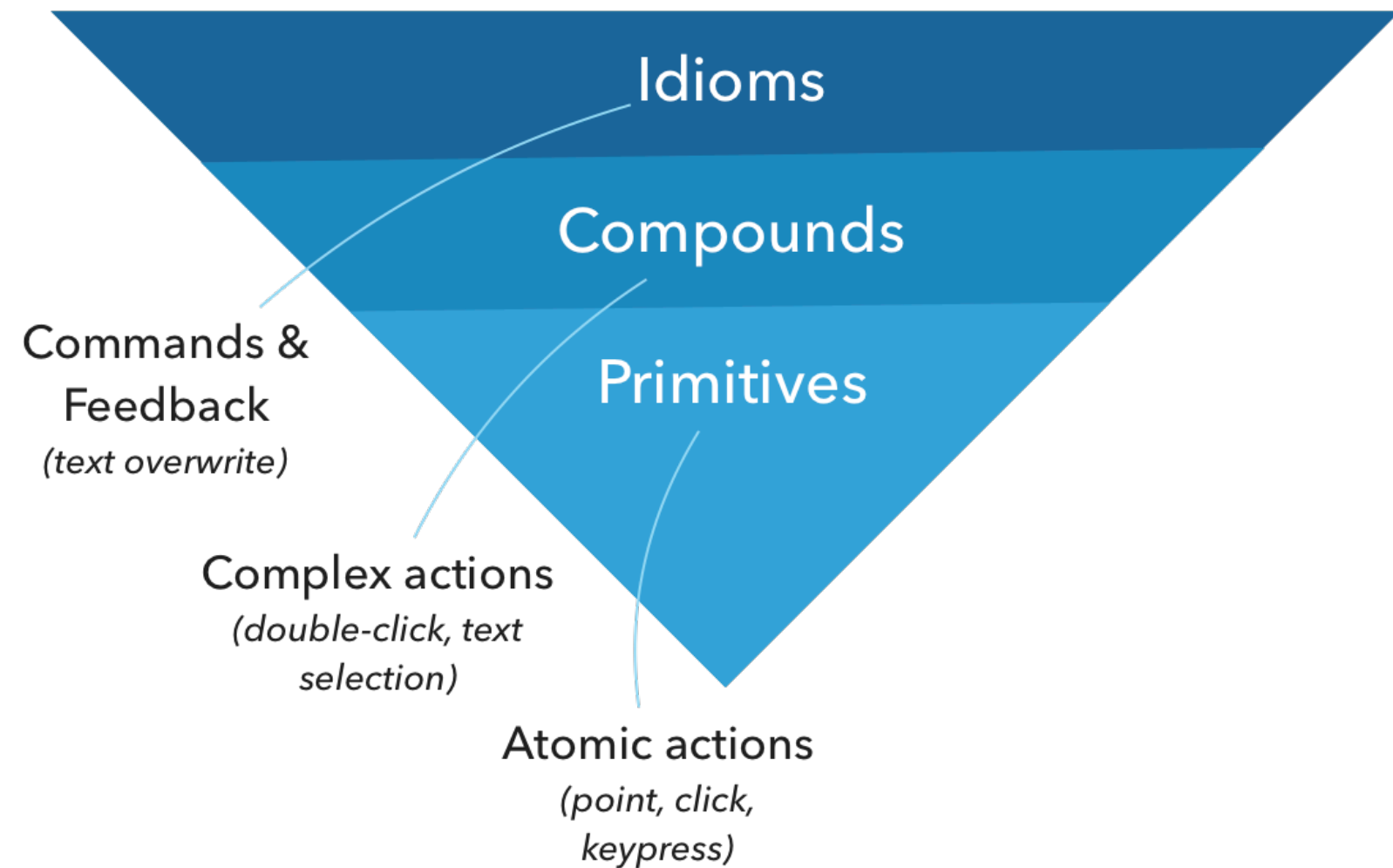
¹⁰ [Image Source](#)

¹¹ [Image Source](#)

Developing Idioms¹²

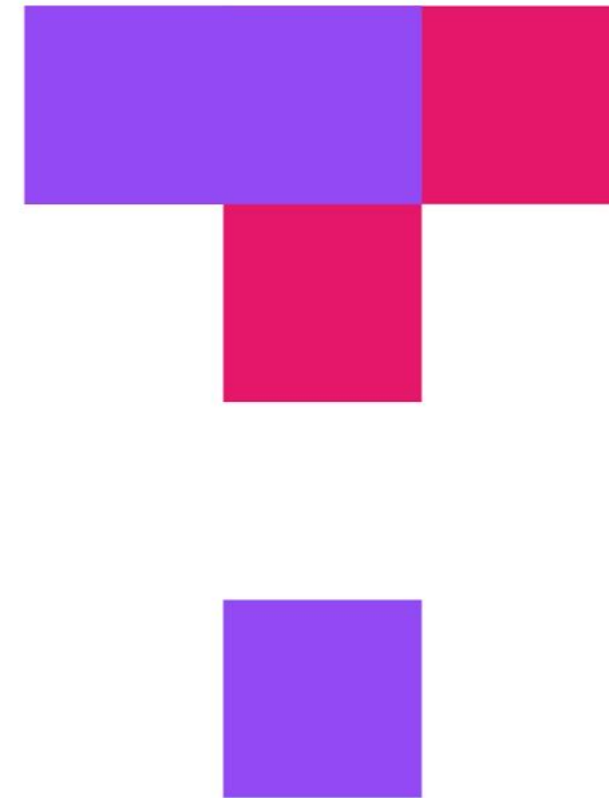
In designing idioms involve, three elements are established:

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



¹²Cooper et al., 2014, About Face

TopHat Quiz



TOP HAT

Hands-on Activity

Metaphorical and Idiomatic Design

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.

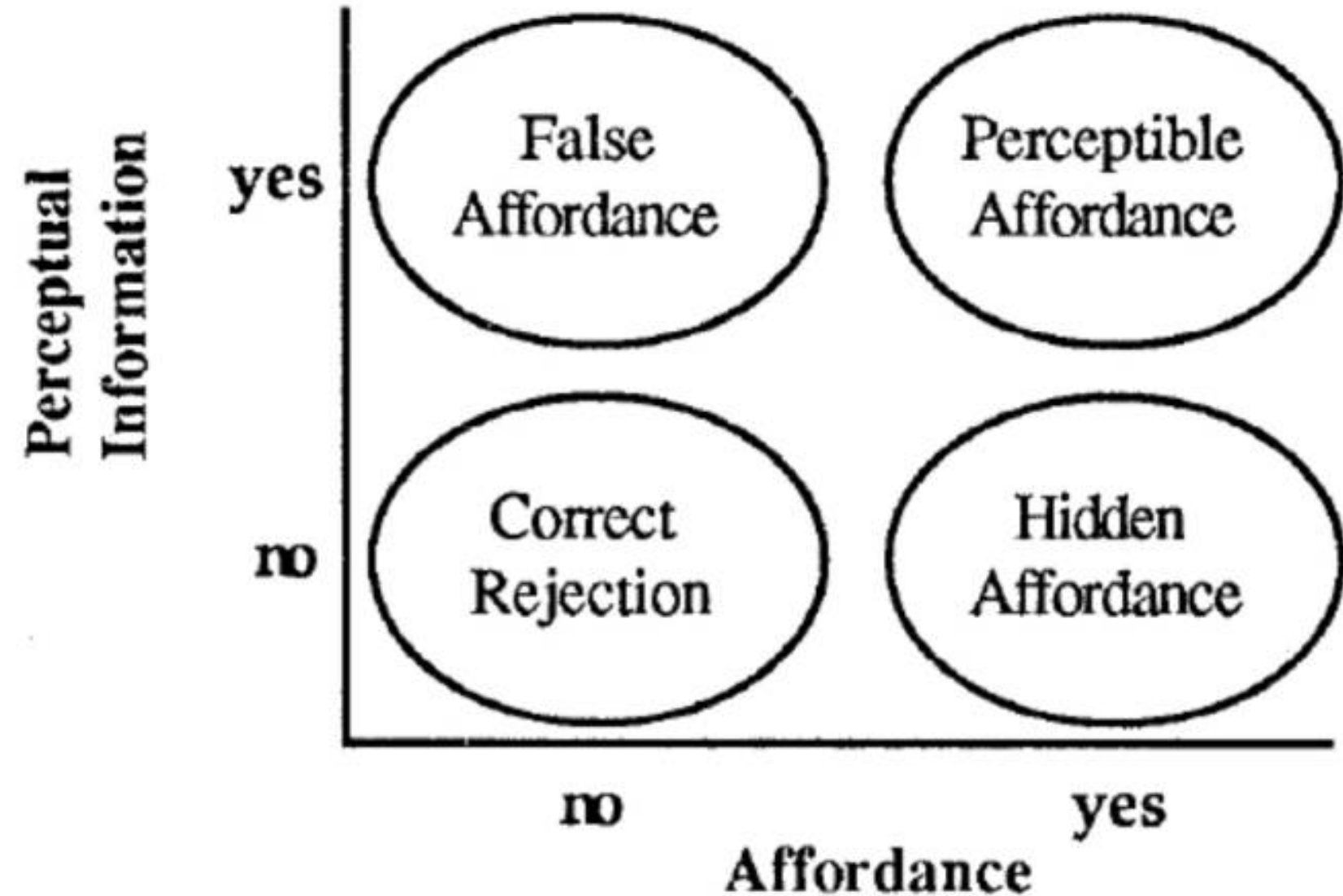
Theoretical Roots: James Gibson (1977, 1979) suggested that the human environment is structured in a way that communicates action possibilities through *affordances*.



Affordances in Design

Perceptible affordances enable users to intuitively recognize actions that are possible with interface elements.¹³

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

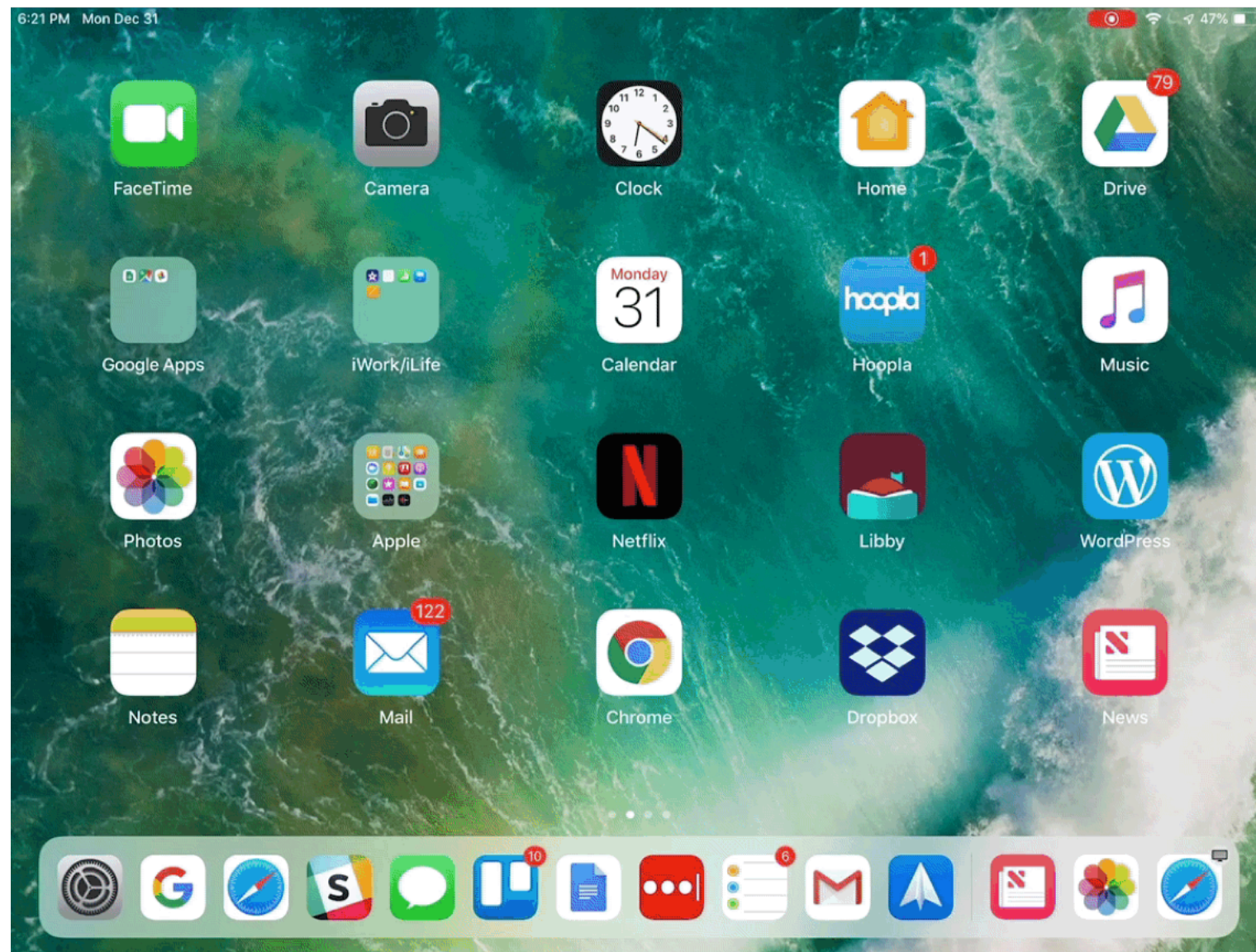


¹³Figure: Gaver, 1991, *Technology Affordances*

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

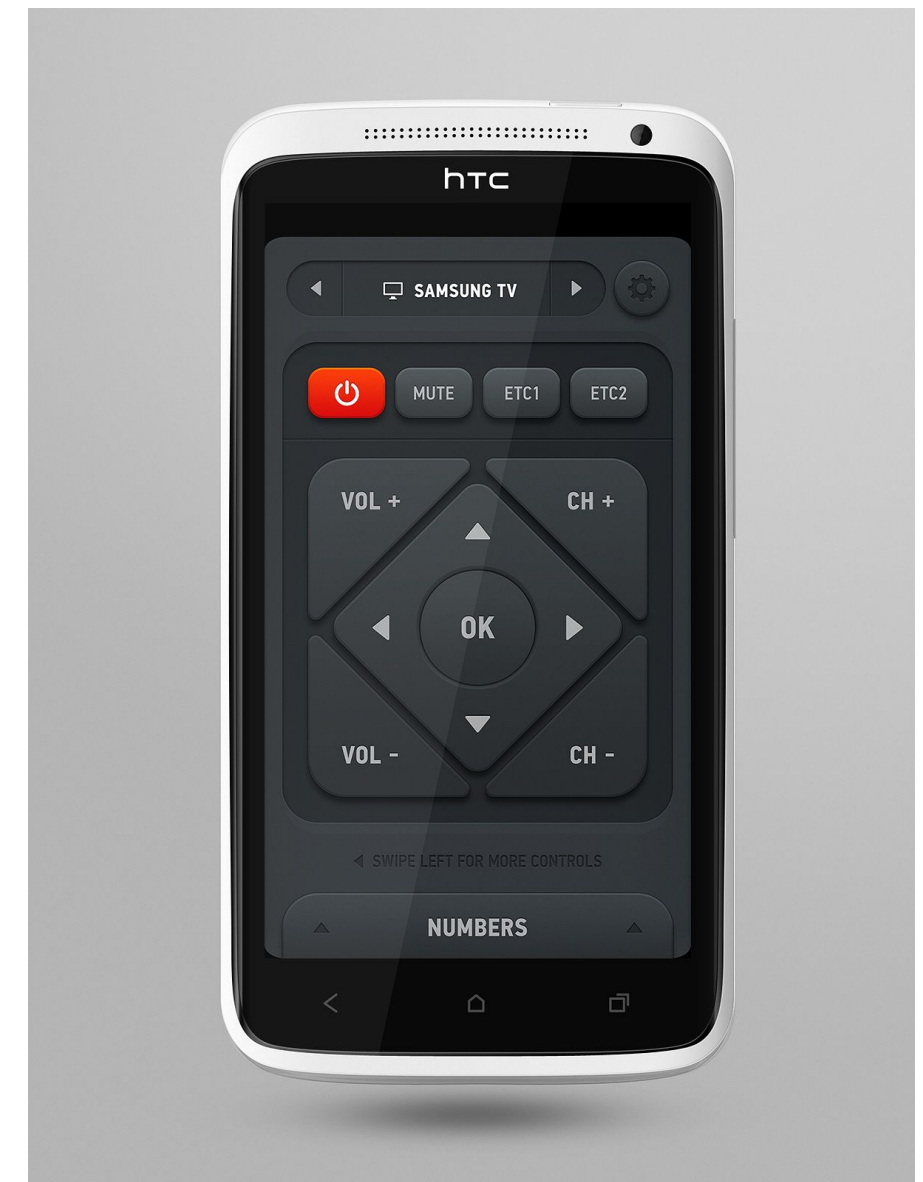
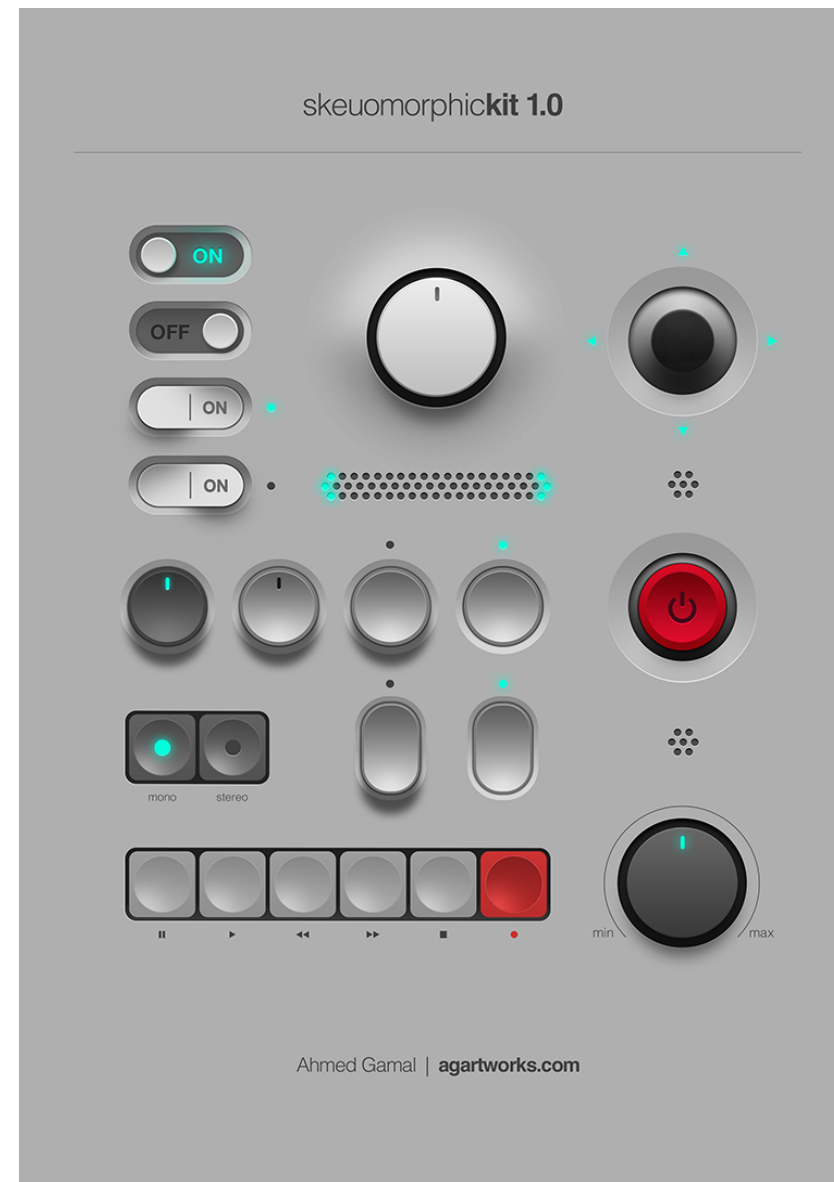
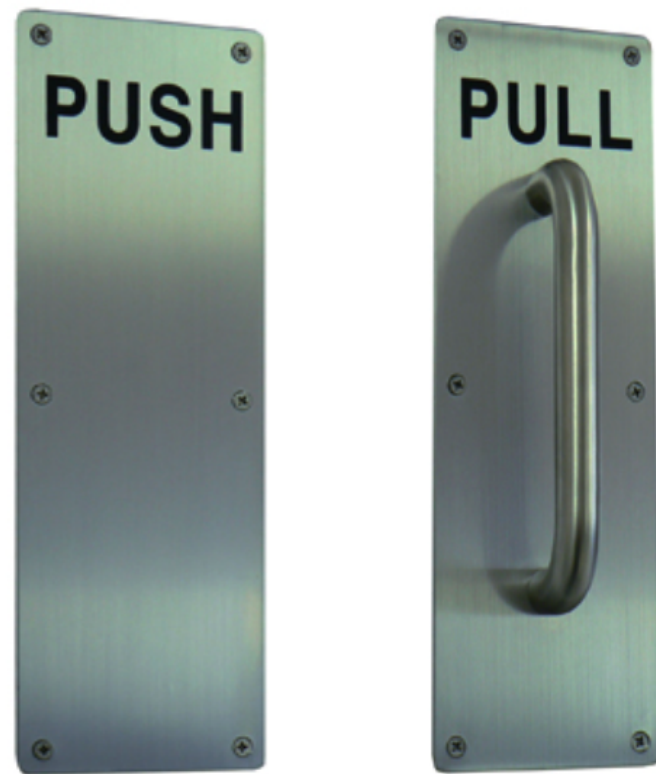


Hidden Affordance: There is no perceptual information, but there is (idiomatically designed) affordance.





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



Hands-on Activity

Affordances

Design Patterns & Languages

(More on them later)

Design Patterns

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

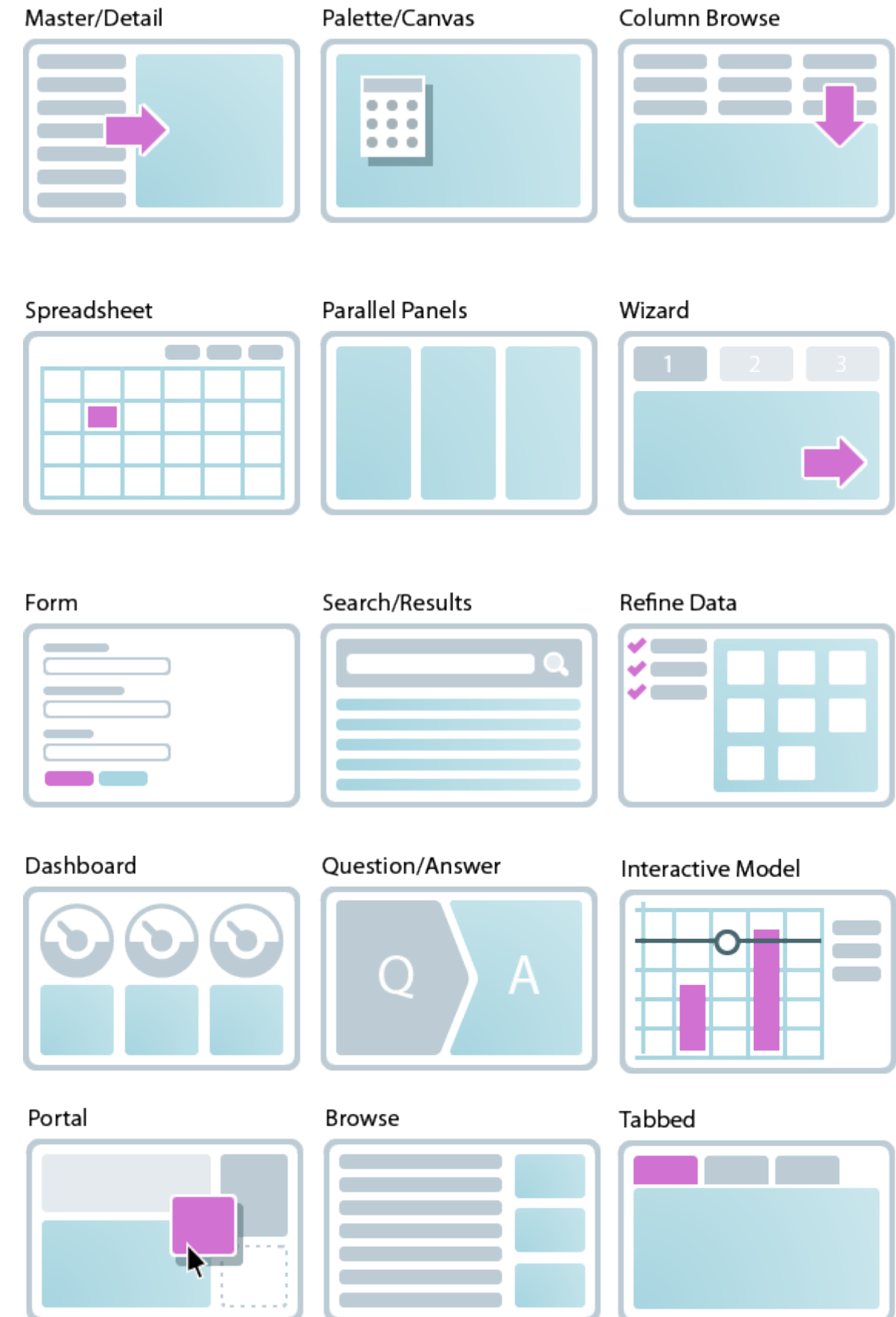
Originally developed by Christopher Alexander (1977; *A Pattern Language*) to address problems in architecture and city planning.¹⁴



¹⁴ [Smart Cities Dive](#)

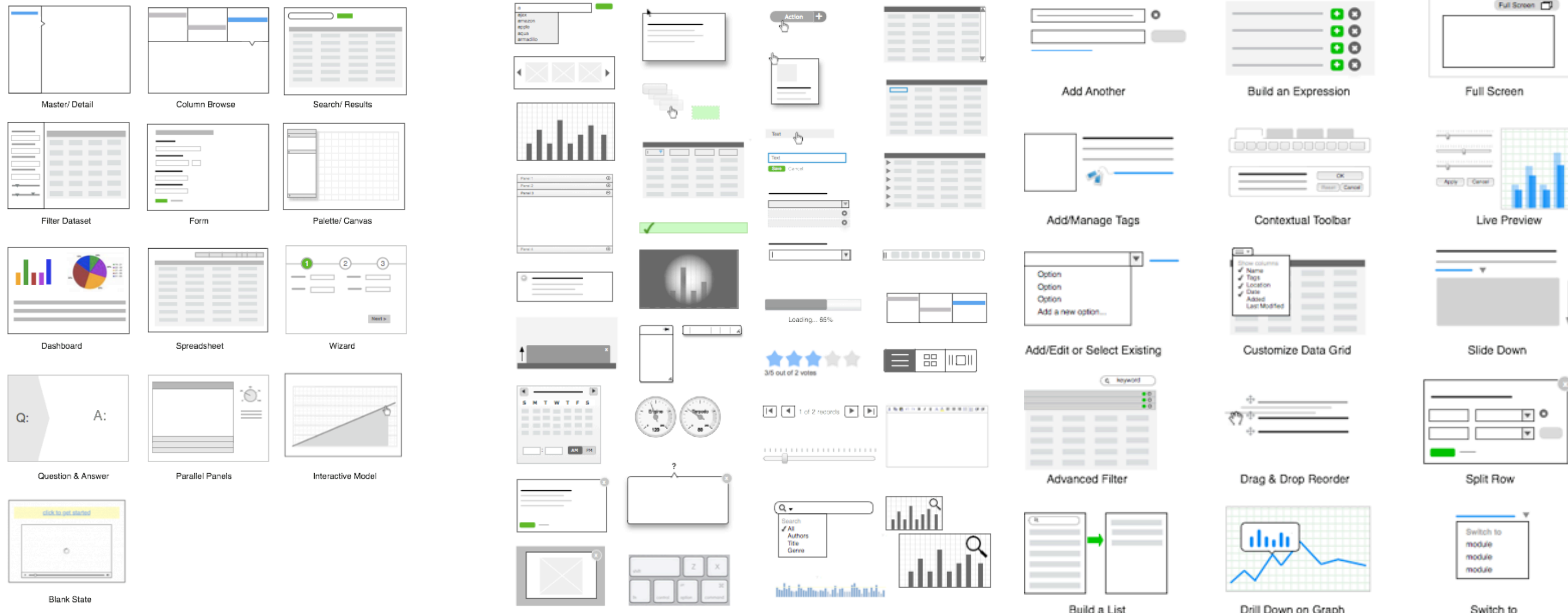
Design Patterns in UX

In the last decade, designers have also developed and refined patterns for overall structure and organization, components and controls.¹⁵



¹⁵Neil, 2010, 12 Standard Screen Patterns

Source¹⁶



¹⁶Neil, 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

Pros & Cons of Design Patterns, *Continued*

Cons:

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

Design Languages

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

Non-digital example: NASA Graphics Standard Manual.¹⁷

¹⁷NASA



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 1 1/2" (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).

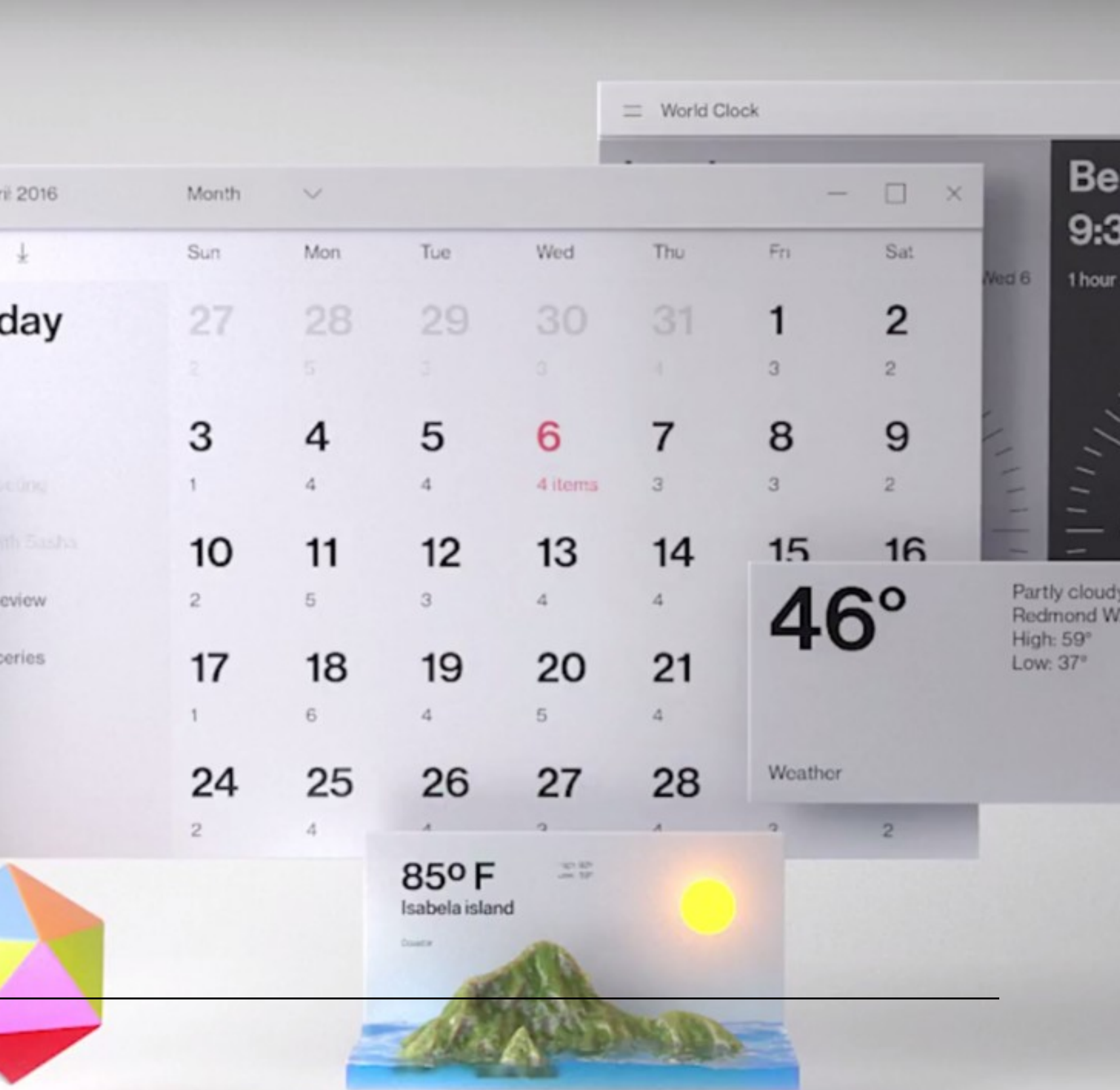
To distinguish emergency/security personnel (security guards, firemen, etc.) a distinctive NASA Red patch with a white border, white logotype and the installation identification in black is available. The name of the emergency/security service (i.e. Fire Department) appears in white centered within a smaller black patch that is positioned 3/8" (.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.



9.2



Source¹⁸¹⁹



¹⁸ Left: Google Material Design

¹⁹ Right: Microsoft Fluent Design System

What did we learn today?

- >> What is interaction design?
- >> Design paradigms
- >> Design patterns & languages