

Building User Interfaces

Design Paradigms in Interaction Design

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What we will learn today?

>> What is interaction design?

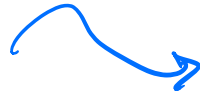
>> Design paradigms *+ History*

>> Design patterns & languages *←*

Week dedicated to this later

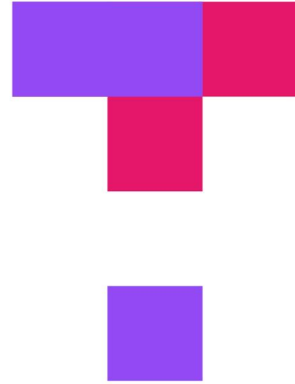
Types of Design:

*Graphics
Product
Interaction*



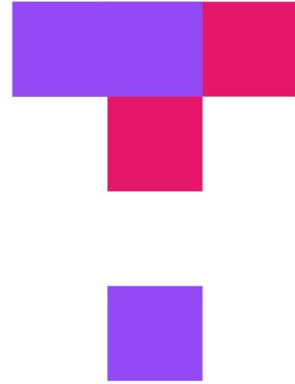
*Computers are interacted with!
⇒ system Behavior*

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.

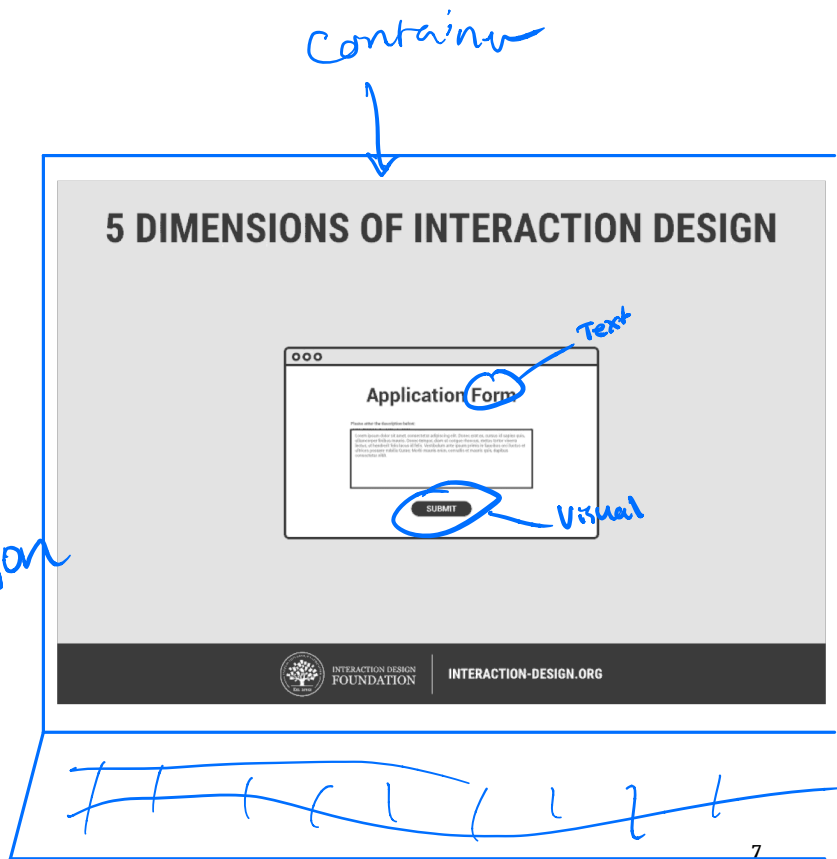
Differs from visual design in its closer and more complex relationship to user behavior and context.

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 ← *could be animation*
5. **5D**: Behavior

¹Interaction 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.

ex1 direct control of a robot's joints

ex2 light switch

expert interfaces
tend to be this
way

Pros & Cons of Implementation-centric Design

Pros:

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

transparent

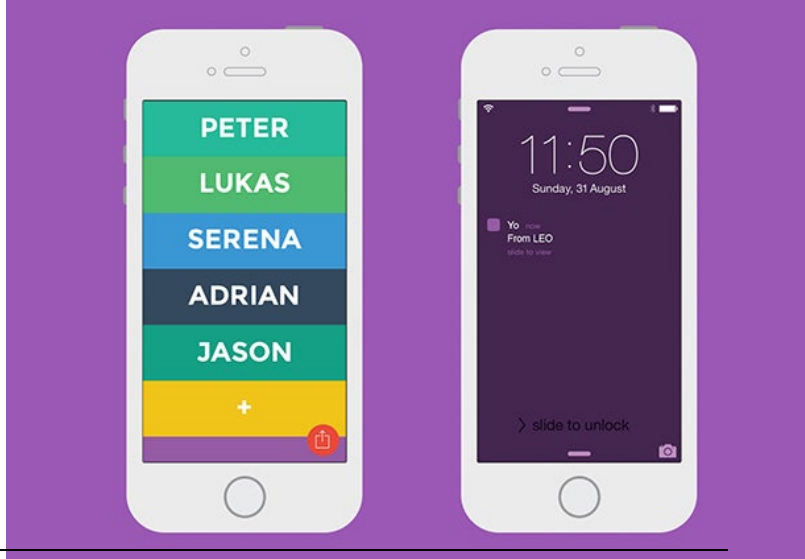
Cons:

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

Shows the system, and systems are complex

Source^{2 3}

implementation - centric designs



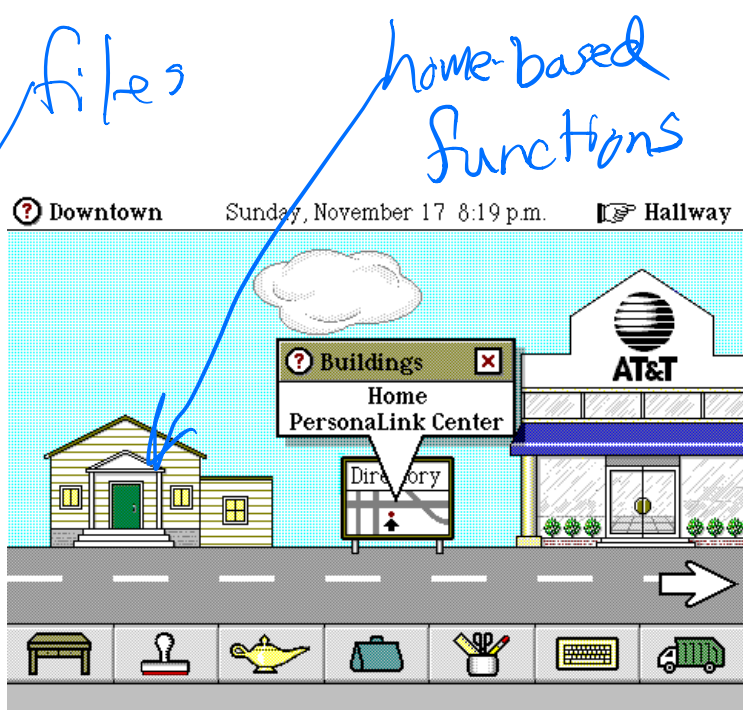
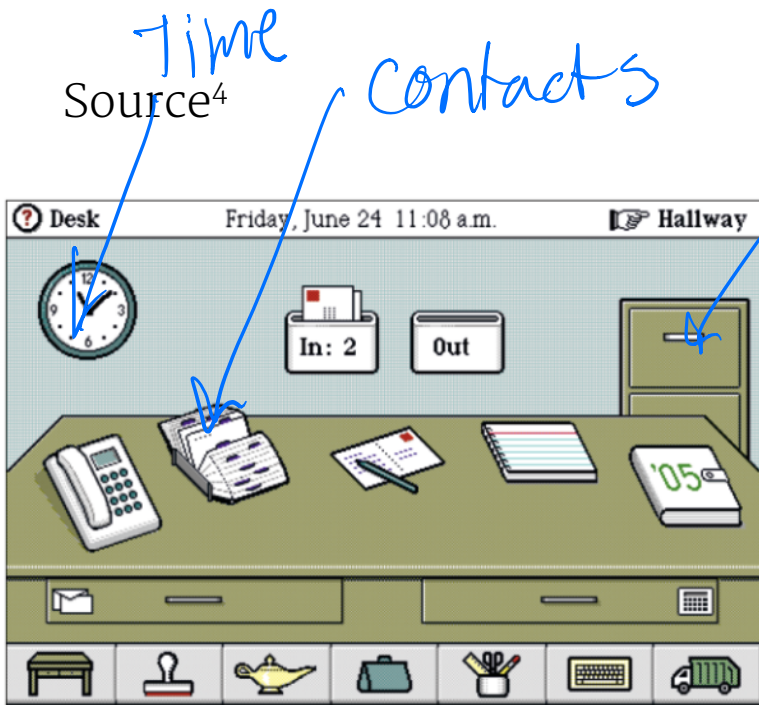
²Hardinge

³Entrepreneur Magazine

Metaphorical Design

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

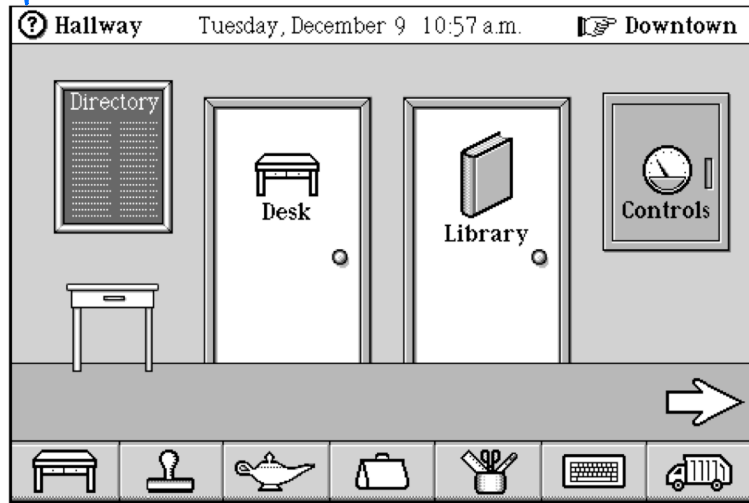
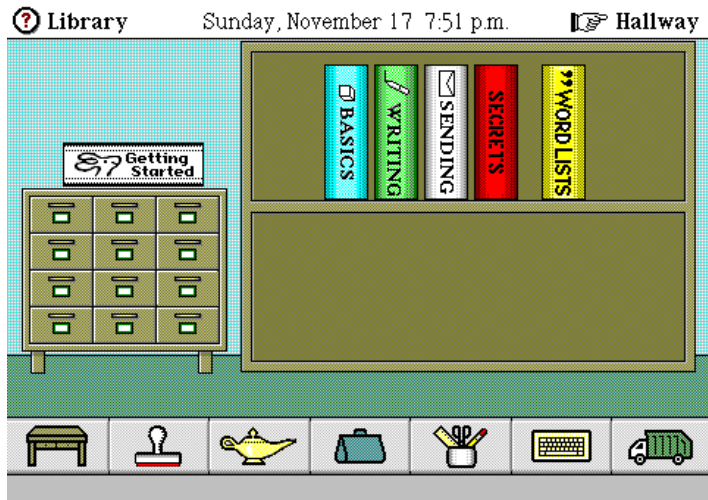
Metaphorical designs "jump-start" user mental models, rely on their existing knowledge of how things work in the real-world, and thus eliminate learning.



⁴Wikipedia: [Magic Cap](#)

Source⁴⁵

Digital Town Metaphor

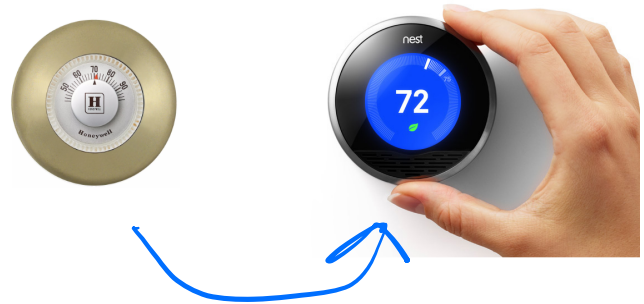


⁴ Wikipedia: [Magic Cap](#)

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

Source⁶

Bookshelf metaphor



⁶UX Planet: Metaphorical Design

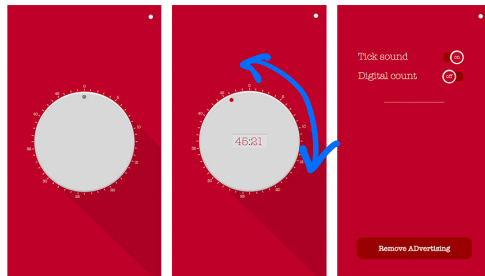
Source⁷

*digital
implementation
- based design*



⁷ Apple App Store: [76 Synthesizer](#)

also a metaphor



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

Magic Cap
is an example

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

can get obtuse and cumbersome
with lots of functionality

⁸Cooper et al., 2014, About Face

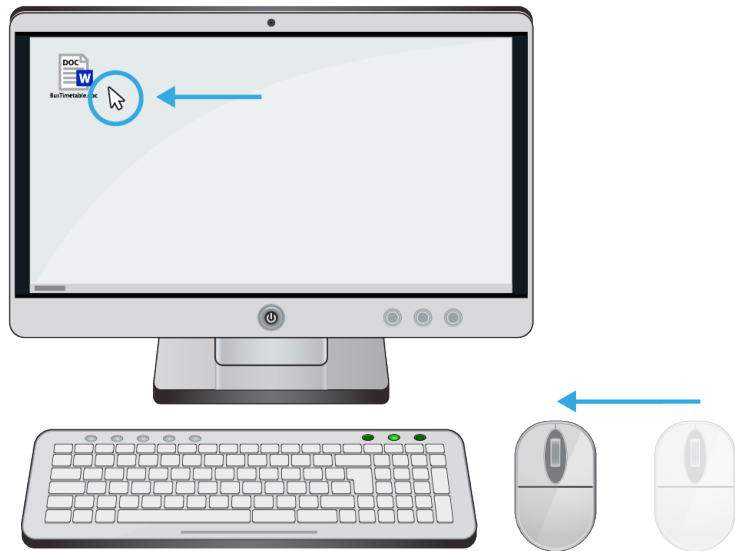
Most designs are not
global metaphors

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.

* people learn how to use a mouse

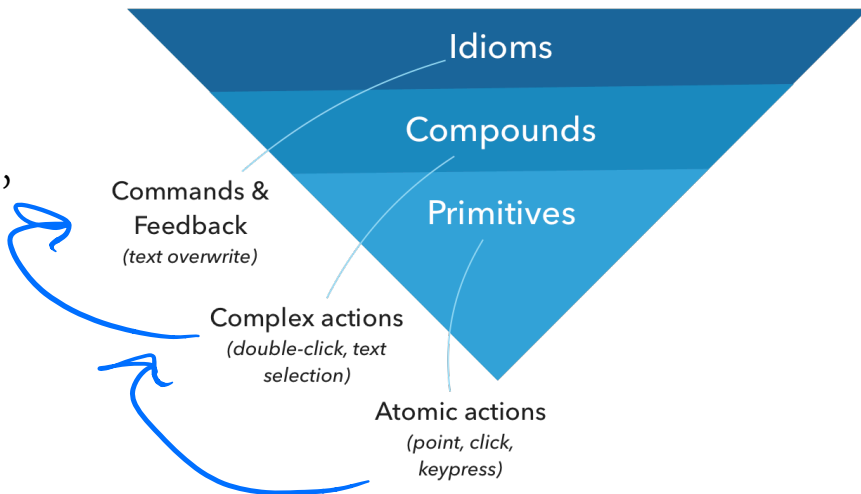


⁹ [Image Source](#)

Developing Idioms¹⁰

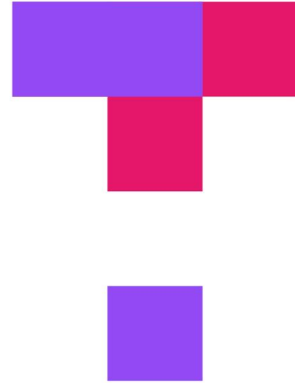
In designing idioms involve, three elements are established:

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



¹⁰Cooper et al., 2014, About Face

TopHat Quiz



TOP HAT

Hands-on Activity

Metaphorical and Idiomatic Design

Comparing Apple Books vs Kindle

Affordances

Affordances

← Really important idea!

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*.

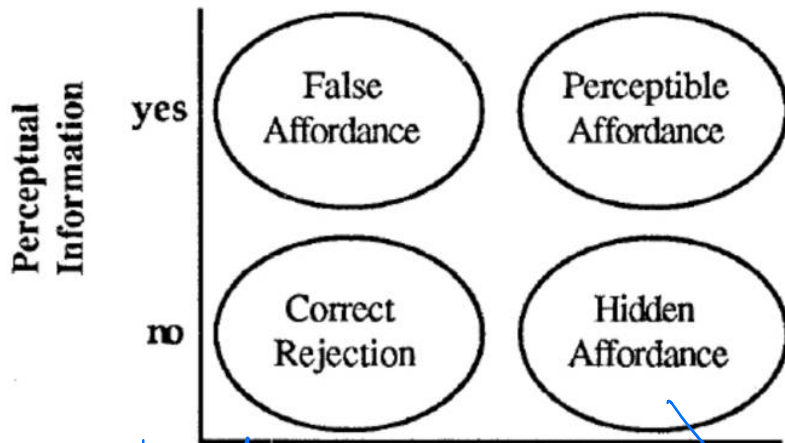
Which one invites you to walk?
to climb?



Affordances in Design

Perceptible affordances enable users to intuitively recognize actions that are possible with interface elements.¹¹

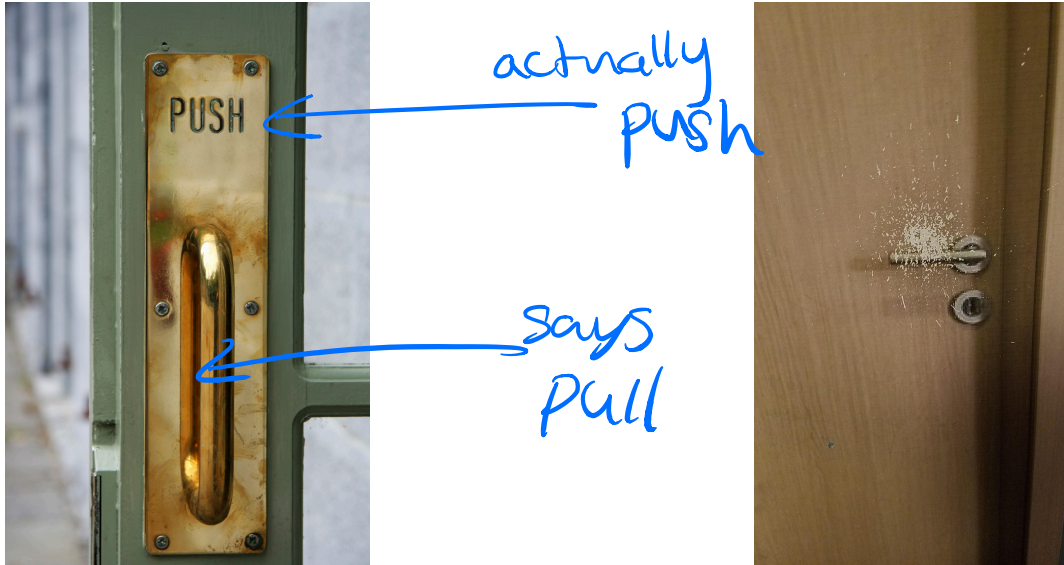
Affordances can also be *hidden* and *false*.



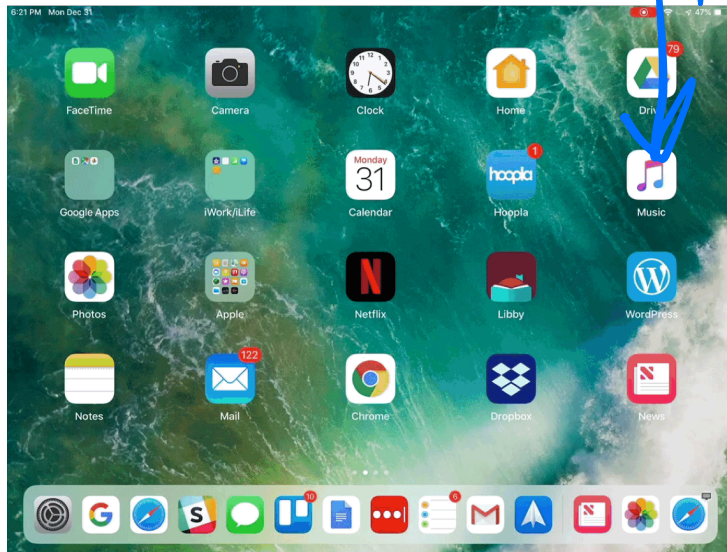
Think swinging door where it isn't clear which side swings out

¹¹ Figure: 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.

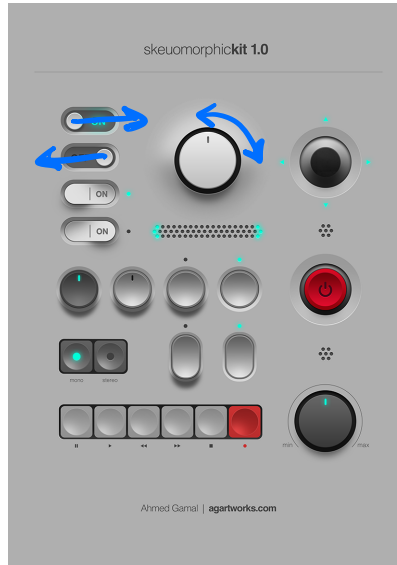
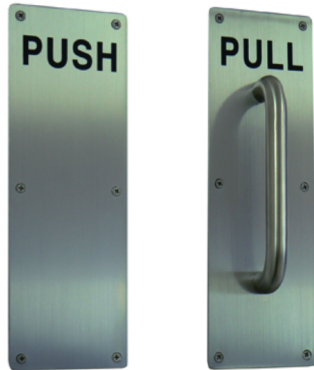


*pulls down
Control
center*





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.¹²

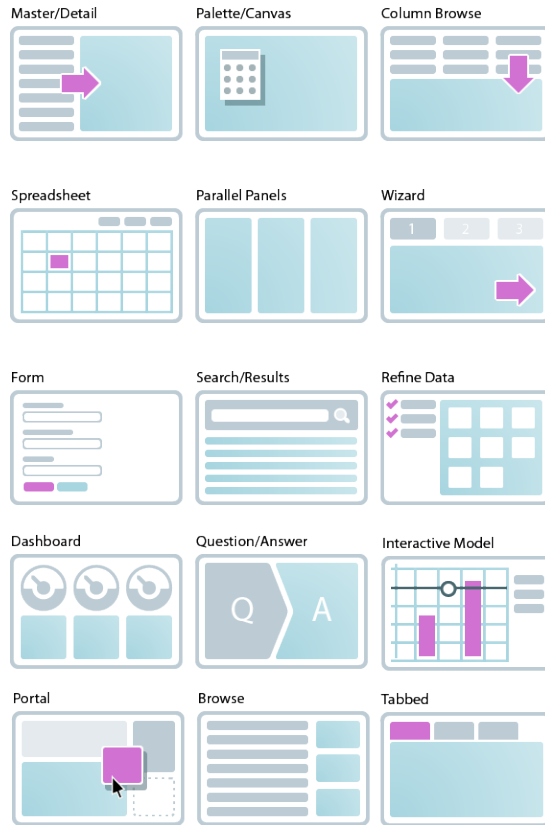


¹² Smart Cities Dive

Design Patterns in UX

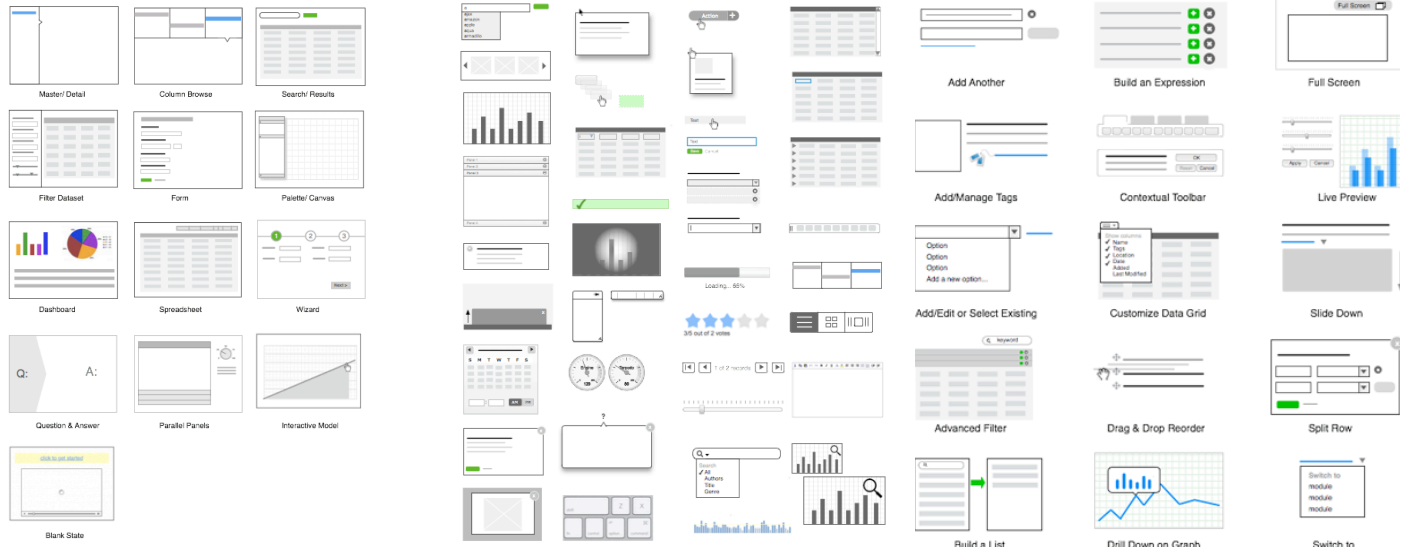
In the last decade, designers have also developed and refined patterns for overall structure and organization, components and controls.¹³

transferred into UX



¹³Neil, 2010, 12 Standard Screen Patterns

Source¹³



¹³Neil, 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

people have thought a lot about them and they are well-established

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.¹⁴



¹⁴NASA

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 sleeve (fig. 4), 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, headbands, and helmets. A 7" wide (17.8 cm) logotype may be embroidered in black is available. The name of the emergency/security division (i.e. Fire Department) appears in white centered within a smaller black patch that is positioned 3/4" (3.8 cm) under the red patch. This configuration is worn on both shoulders of the uniform, on both shorts, ties, and outer-panels. A light blue shirt and hat with dark blue trousers or skirt is recommended.



General personnel patch



Fire Department



UW Madison has one too!

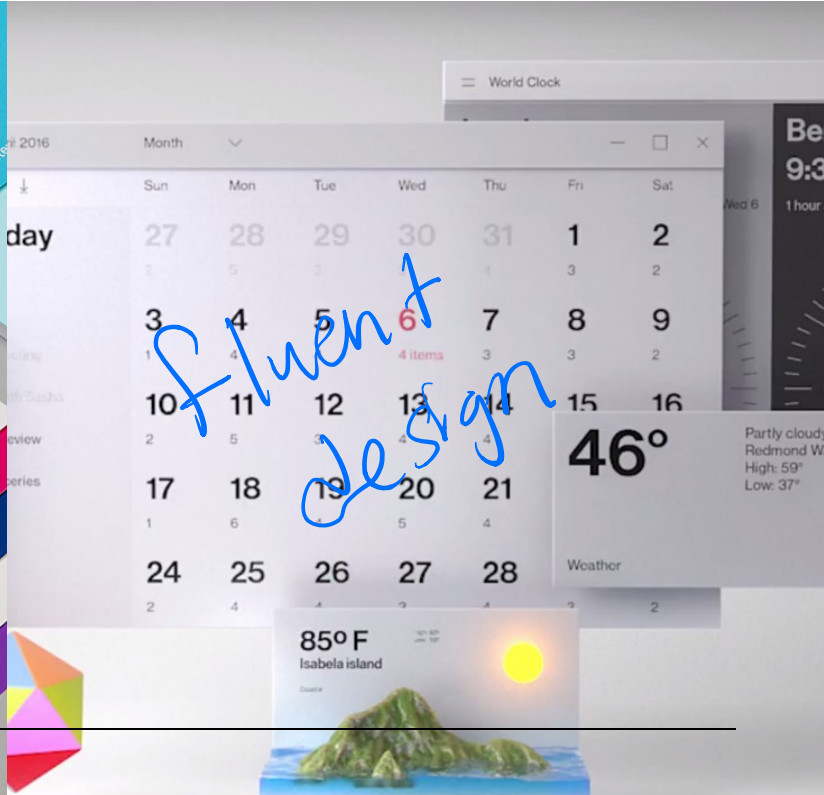
Source¹⁵¹⁶

Material.io



¹⁵Left: Google Material Design

¹⁶Right: Microsoft Fluent Design System



What did we learn today?

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