Building User Interfaces

Design Paradigms in Interaction Design

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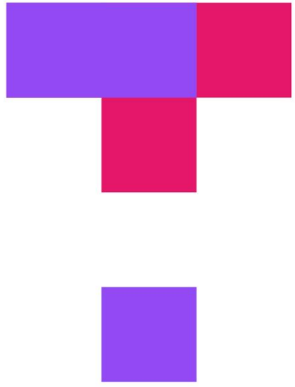
What we will learn today?

- What is interaction design?
- Design paradigms + History
- Design patterns & languages ← Week dedicated to this later

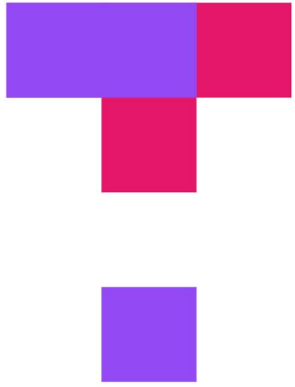
Types of Design:
Graphics
Product
Interaction → Computers are interacted with! ⇒ System Behavior

TopHat Attendance



TOP HAT

TopHat Questions



TOP HAT

What is interaction design?

Interaction Design

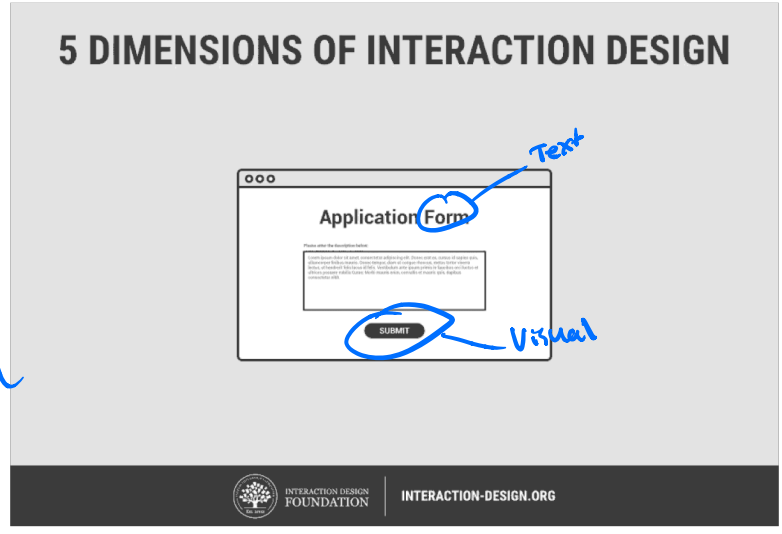
Definition: Defining behaviors for a system that engages the full spectrum of its user's perception, cognition, and movements.

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 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 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:

transparent

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

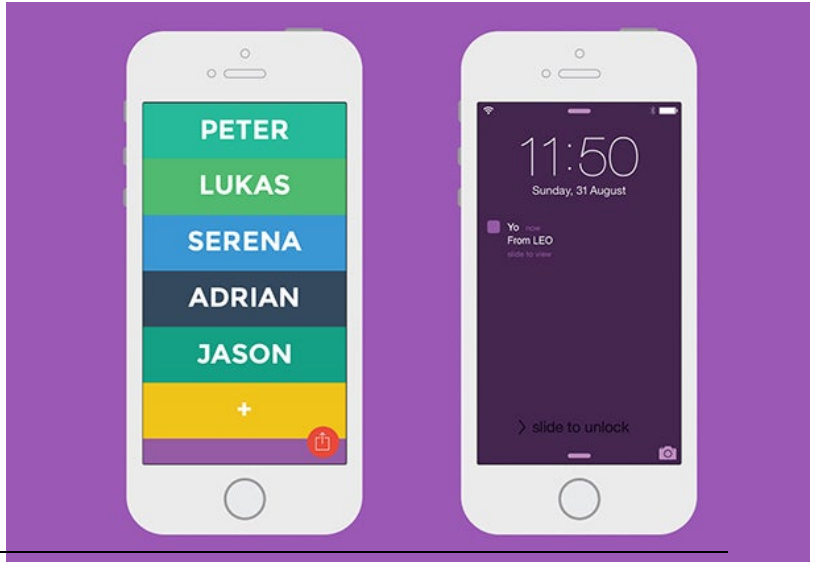
Cons:

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

Shows the system, and systems are complex

Source[2] [3]

implementation-centric designs



[2] Hardinge

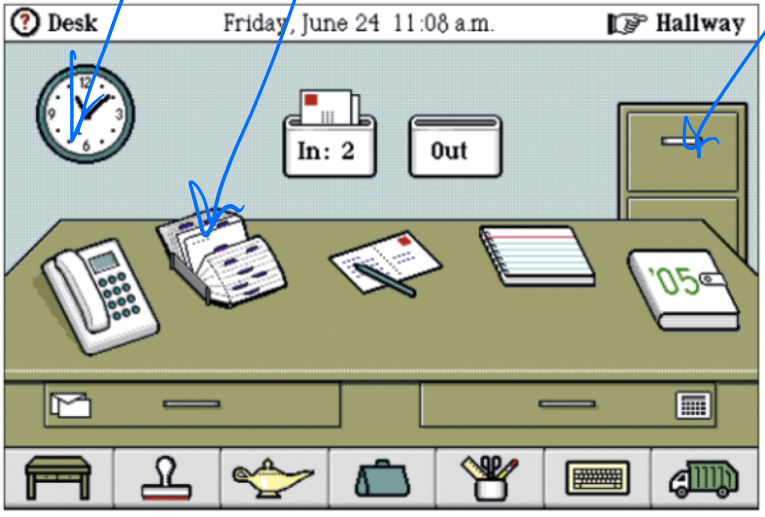
[3] Entrepreneur Magazine

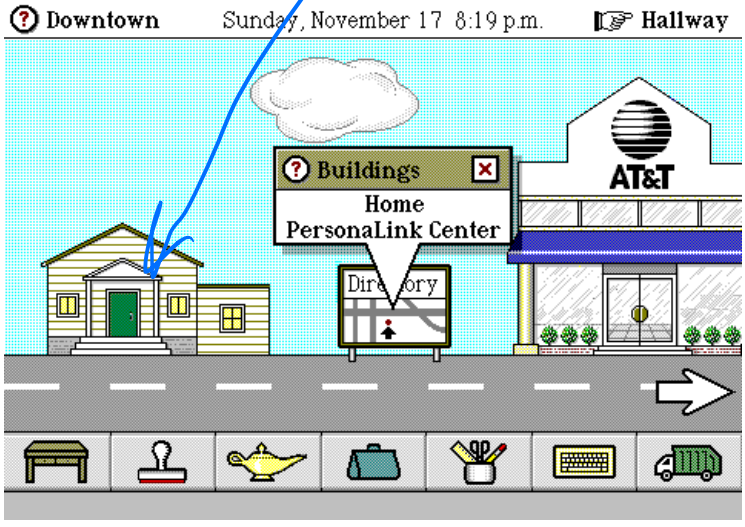
Metaphorical Design

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.

Source[4]

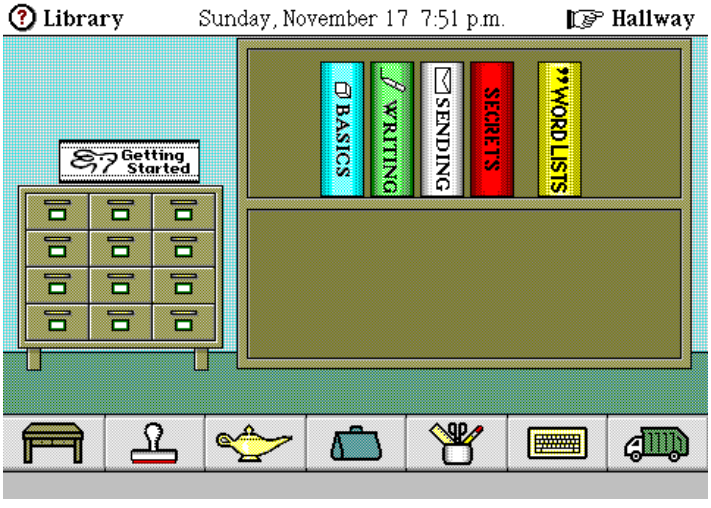


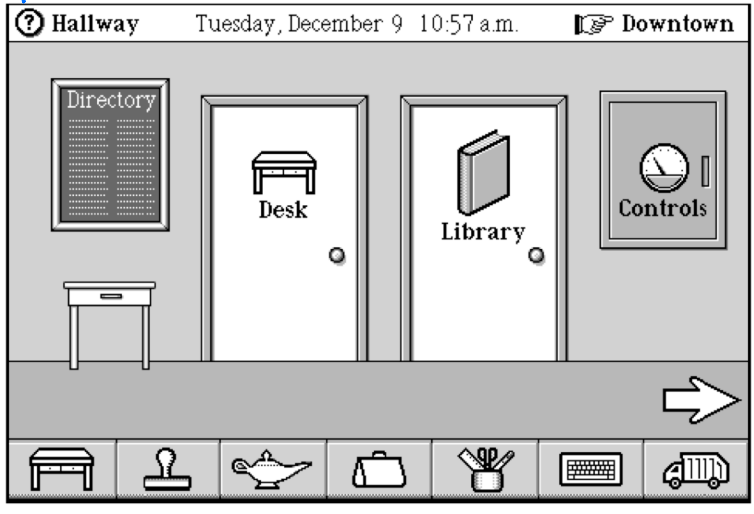


[4] Wikipedia: Magic Cap

Source[45]

Digital Town Metaphor





[4] Wikipedia: Magic Cap

[5] NN Group: The Anti-Mac Interface

Source[6]

Bookshelf metapho-

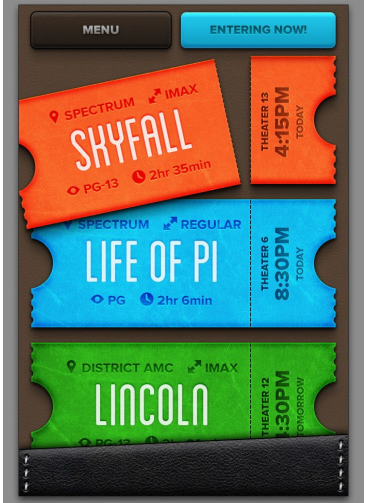
[6] UX Planet: Metaphorical Design

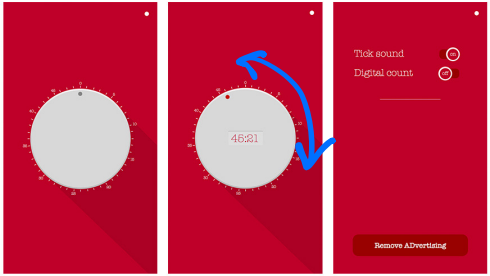
Source[7]

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 Metaphor[8]

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

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

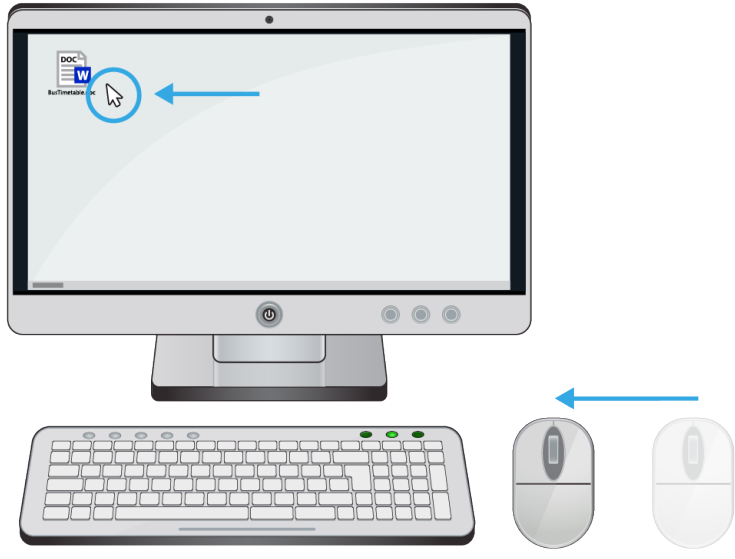
Most designs are not global metaphors

Idiomatic Design[9]

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

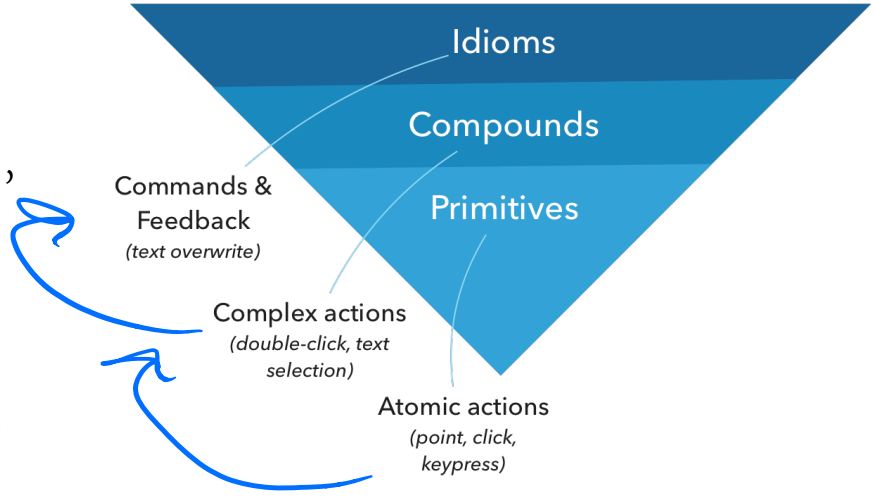


[9] Image Source

Developing Idioms[10]

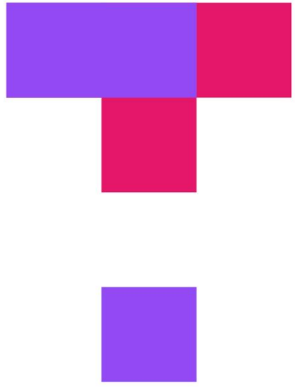
In designing idioms involve, three elements are established:

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



[10] Cooper 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.

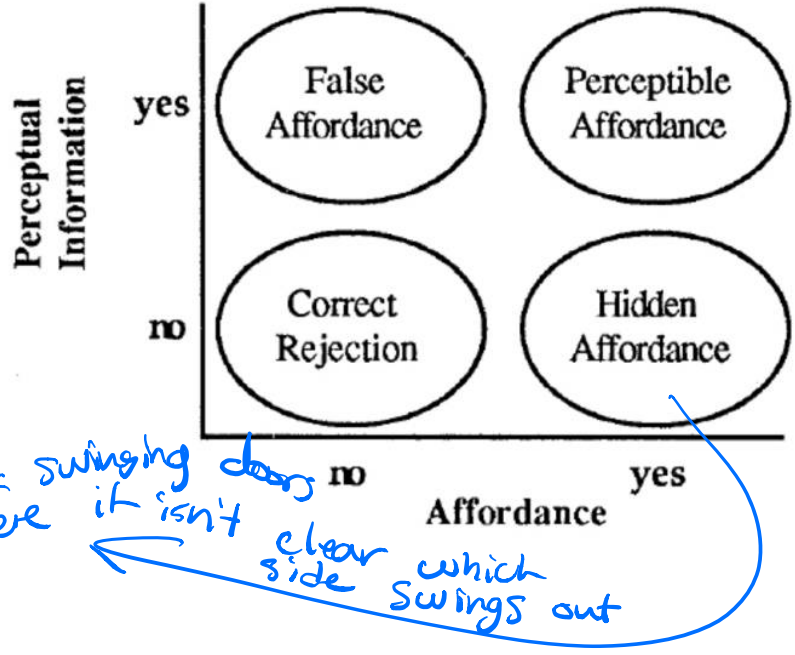
Theoretical Roots: James Gibson (1977, 1979) suggested that the human environment is structured in a way that communicates action possibilities through *affordances*.


which one invites you to walk?
to climb?

Affordances in Design

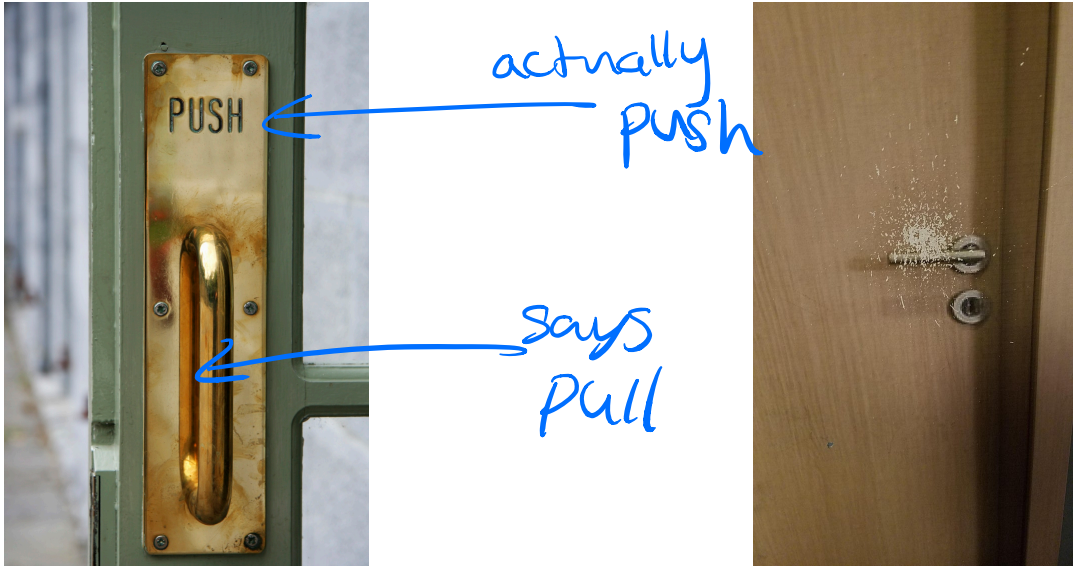
Perceptible affordances enable users to intuitively recognize actions that are possible with interface elements.[11]

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

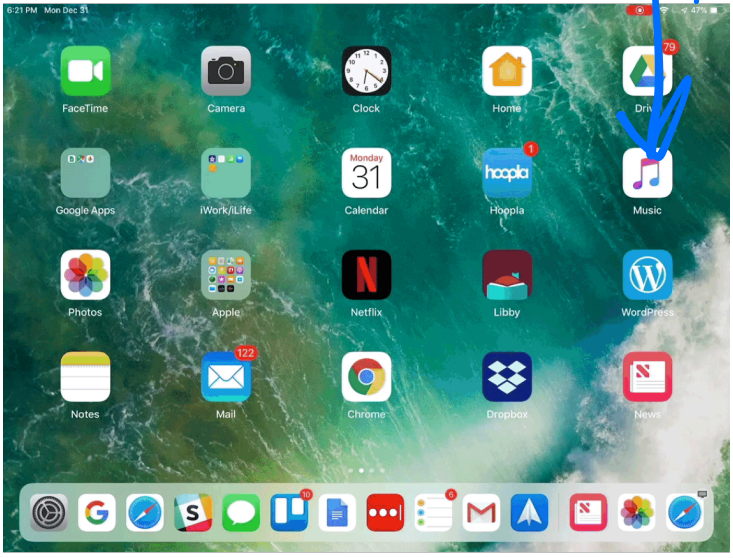


[11] Figure: Gaver, 1991, *Technology Affordances*

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

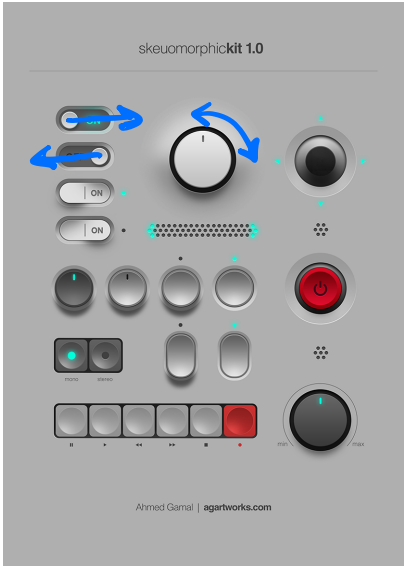


Hidden Affordance: There is no perceptual information, but there is (idiomatically designed) affordance.



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.

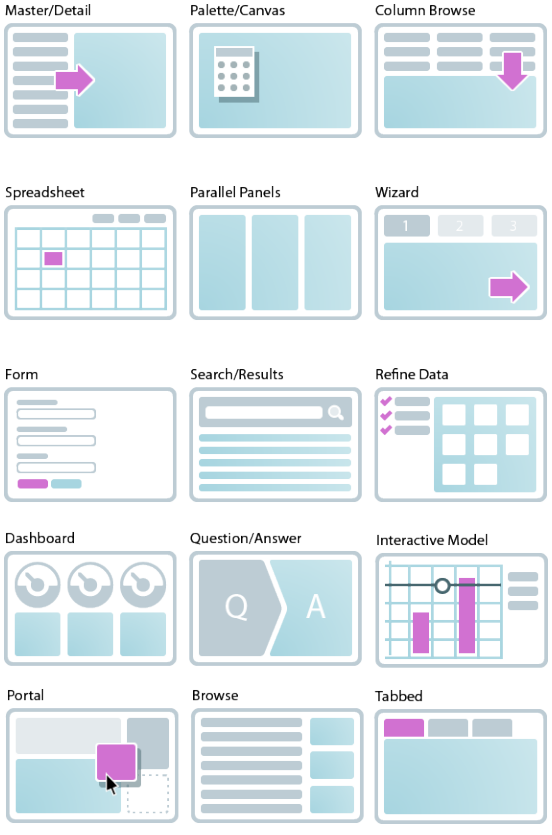
Originally developed by Christopher Alexander (1977; *A Pattern Language*) to address problems in architecture and city planning.[12]

[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



[13] Neil, 2010, 12 Standard Screen Patterns

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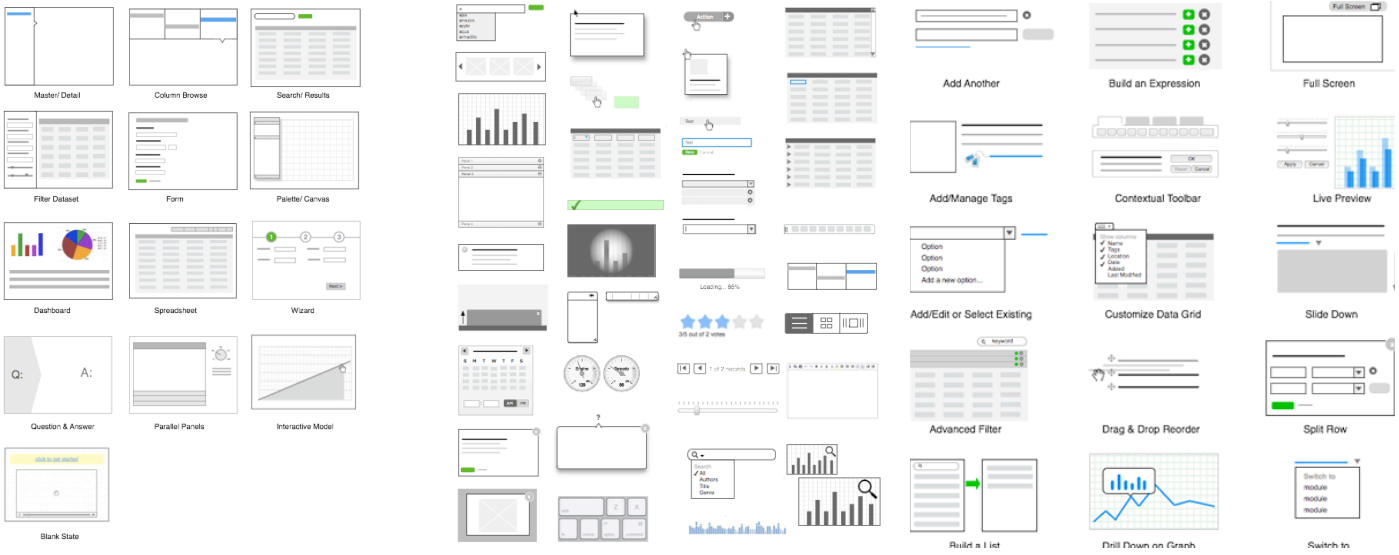
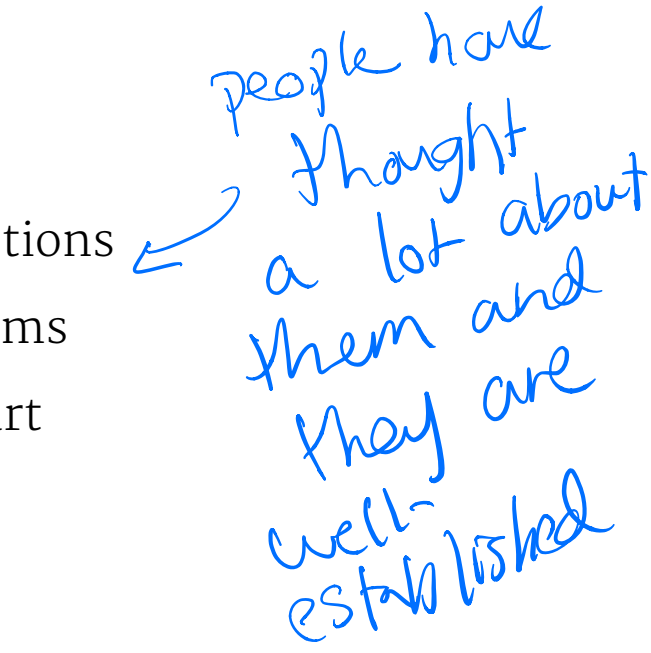


[13] Neil, 2010, 12 Standard Screen Patterns

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



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

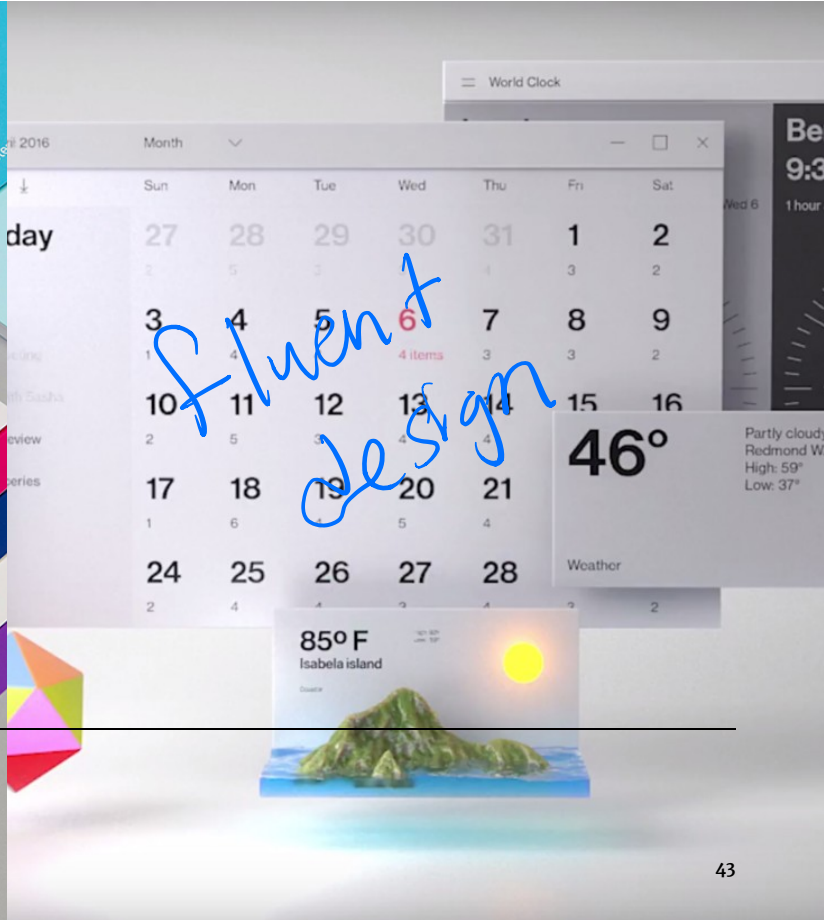
Definition: A vocabulary of design elements that are repeatedly applied to interaction design problems.

Non-digital example: NASA Graphics Standard Manual.[14]

[14] NASA

UW Madison has one too!

Source[15][16]



[15] *Left:* Google Material Design

[16] *Right:* Microsoft Fluent Design System

What did we learn today?

» What is interaction design?

» Design paradigms

» Design patterns & languages