

Building User Interfaces

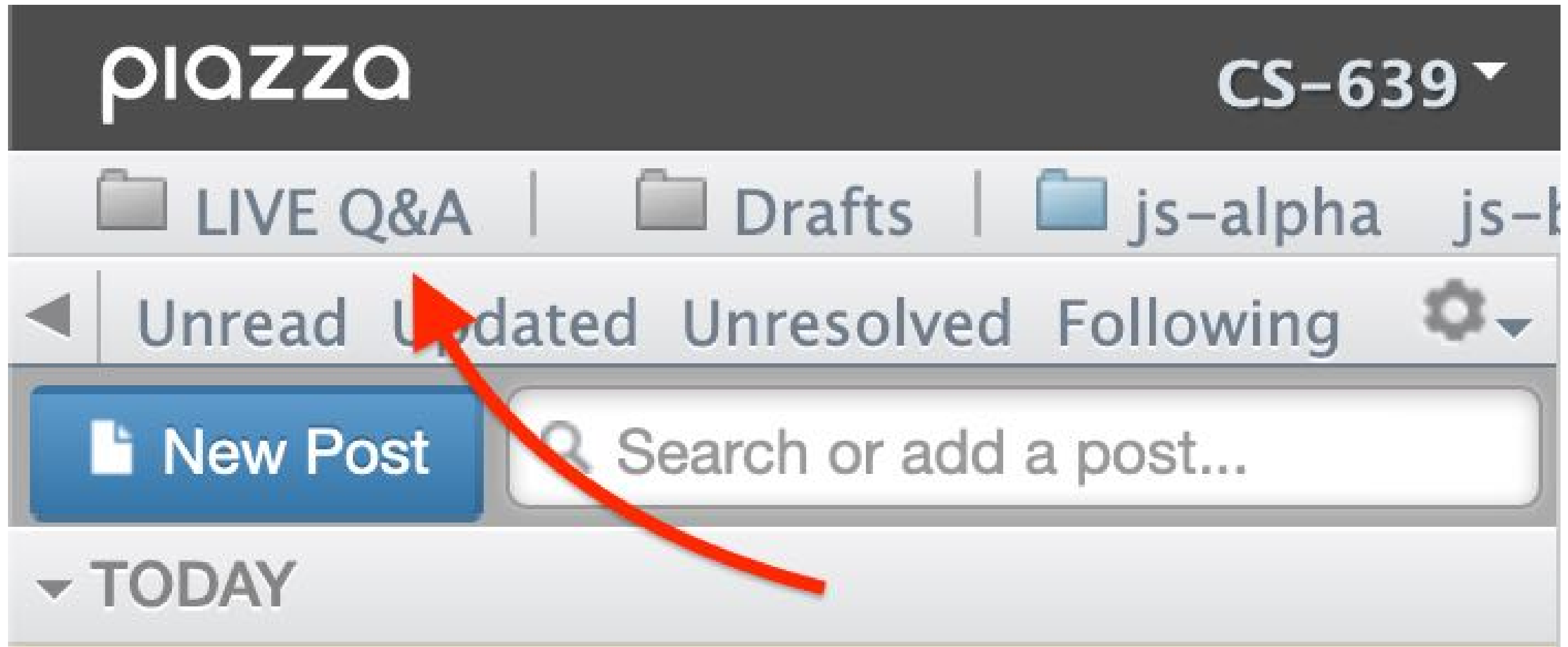
Designing **for Web & Desktop**

Professor Bilge Mutlu

What we will learn today?

- A brief history of user interfaces
- Platform-specific design
 - Designing for the desktop
 - Designing for the web

Live Q&A Reminder



Commentary on React

Problem: React components vs functional programming 🙅 will not scale!

Solution: Effective use functional and React components.

Ask "what is the code doing?"

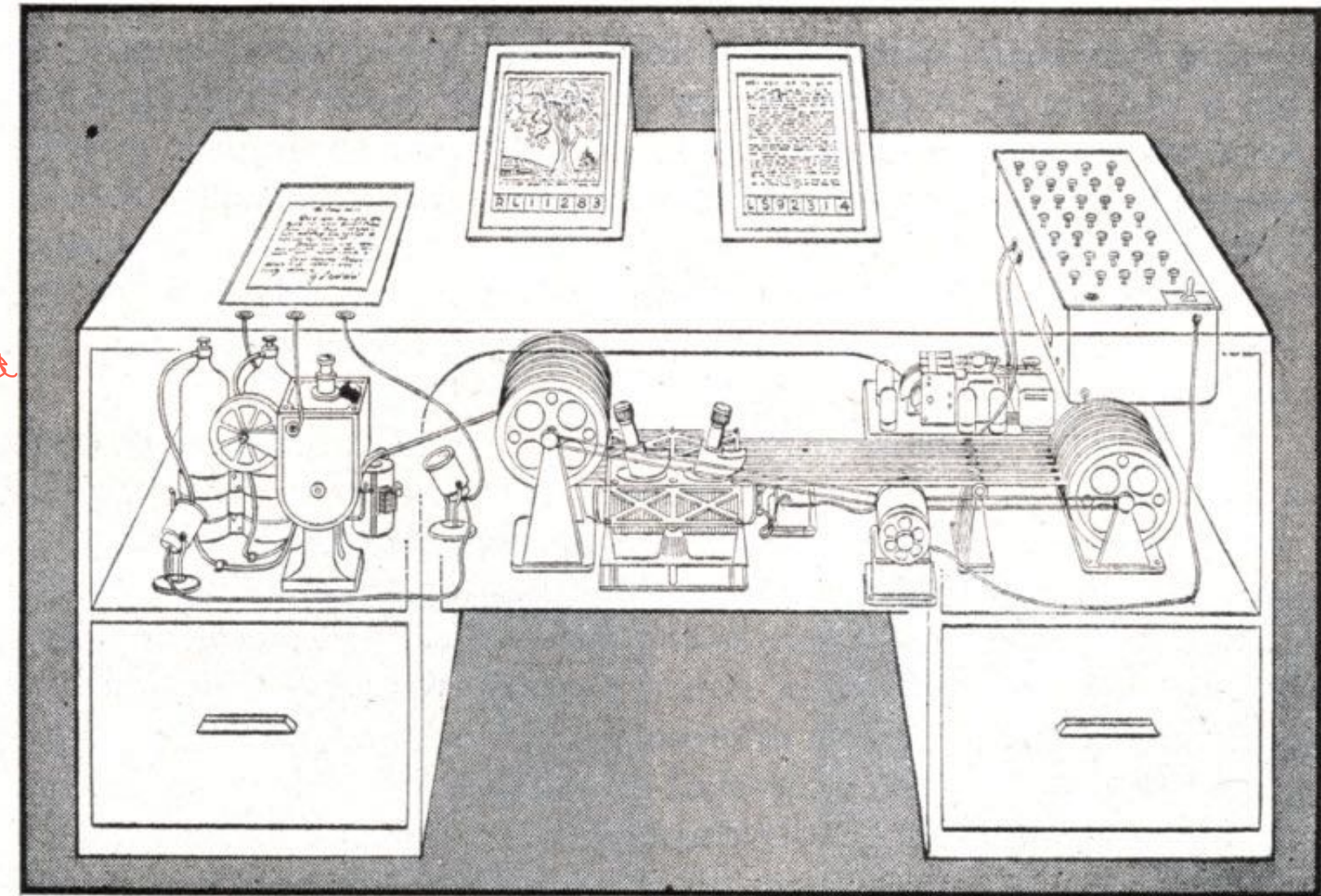
1. Creating reusable React elements ← class components
2. Computation, manipulating data, updating states ← functional components

Resources: Mosh Hamedani, ReactJS Hooks

A Brief History of User Interfaces

Milestone 1: Memex, 1945^{1 2 3}

A "proto-hypertext" system that connected documents using associated trails embedded into a desk, developed by Vannevar Bush.



MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

¹ Wikipedia: Memex

² The Atlantic: As We May Think

³ Image Source: Monoskop

Milestone 1, Continued^{4 5}

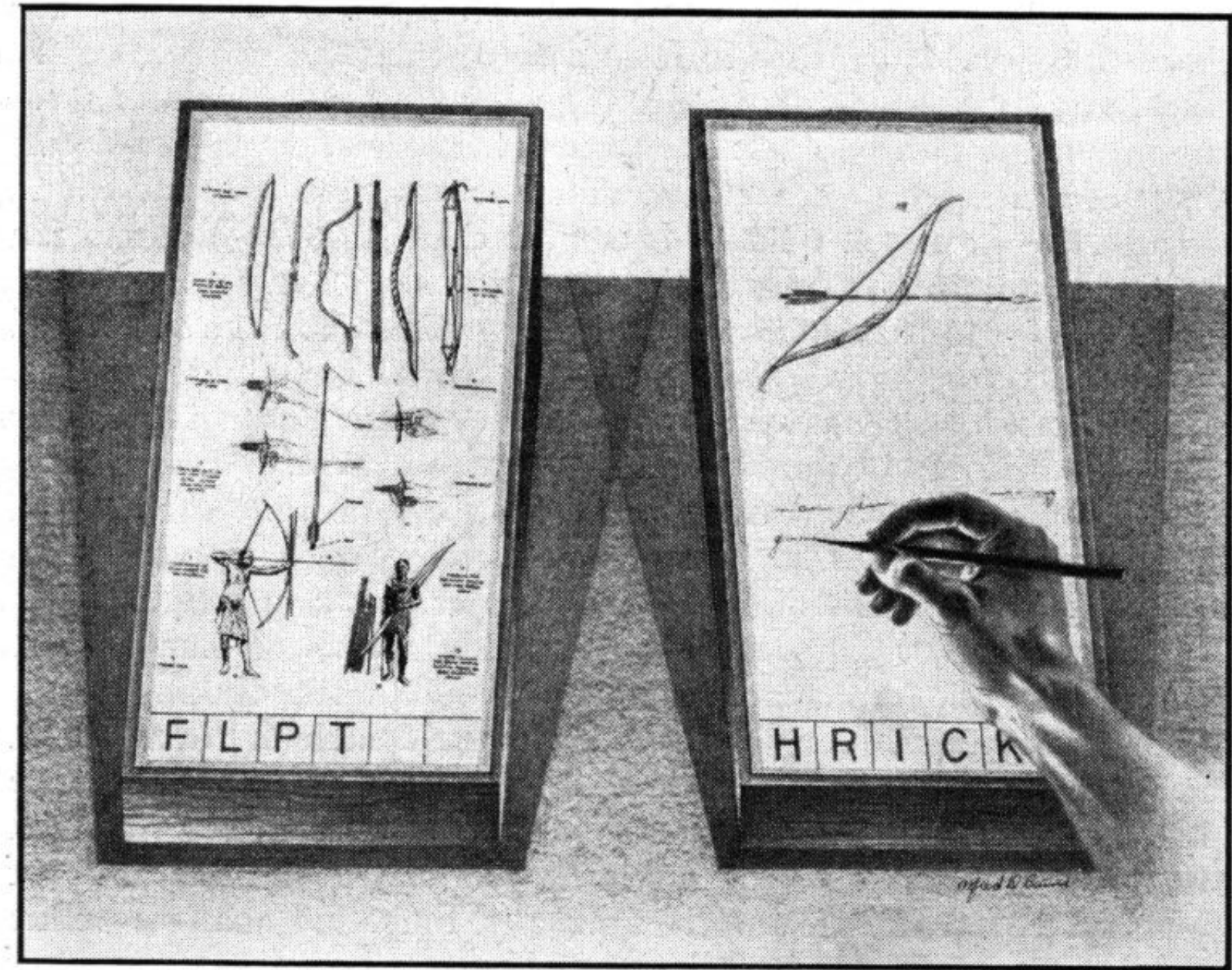
“Consider a future device ... in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory.”

— Vannevar Bush, 1945

precursor to the internet / hypertext

⁴ The Atlantic: As We May Think

⁵ Image Source: Monoskop



MEMEX IN USE is shown here. On one transparent screen the operator of the future writes notes and commentary dealing with reference material which is projected on the screen at left. Insertion of the proper code symbols at the bottom of right-hand screen will tie the new item to the earlier one after notes are photographed on supermicrofilm.

Milestone 2: Sketchpad, 1963^{6 7}

The first program to utilize a complete graphical user interface and that implemented object-oriented programming, non-procedural programming, constraints, pen input, etc. Sketchpad was developed by Ivan Sutherland.

⁶ Wikipedia: Sketchpad

⁷ Image source





force

to

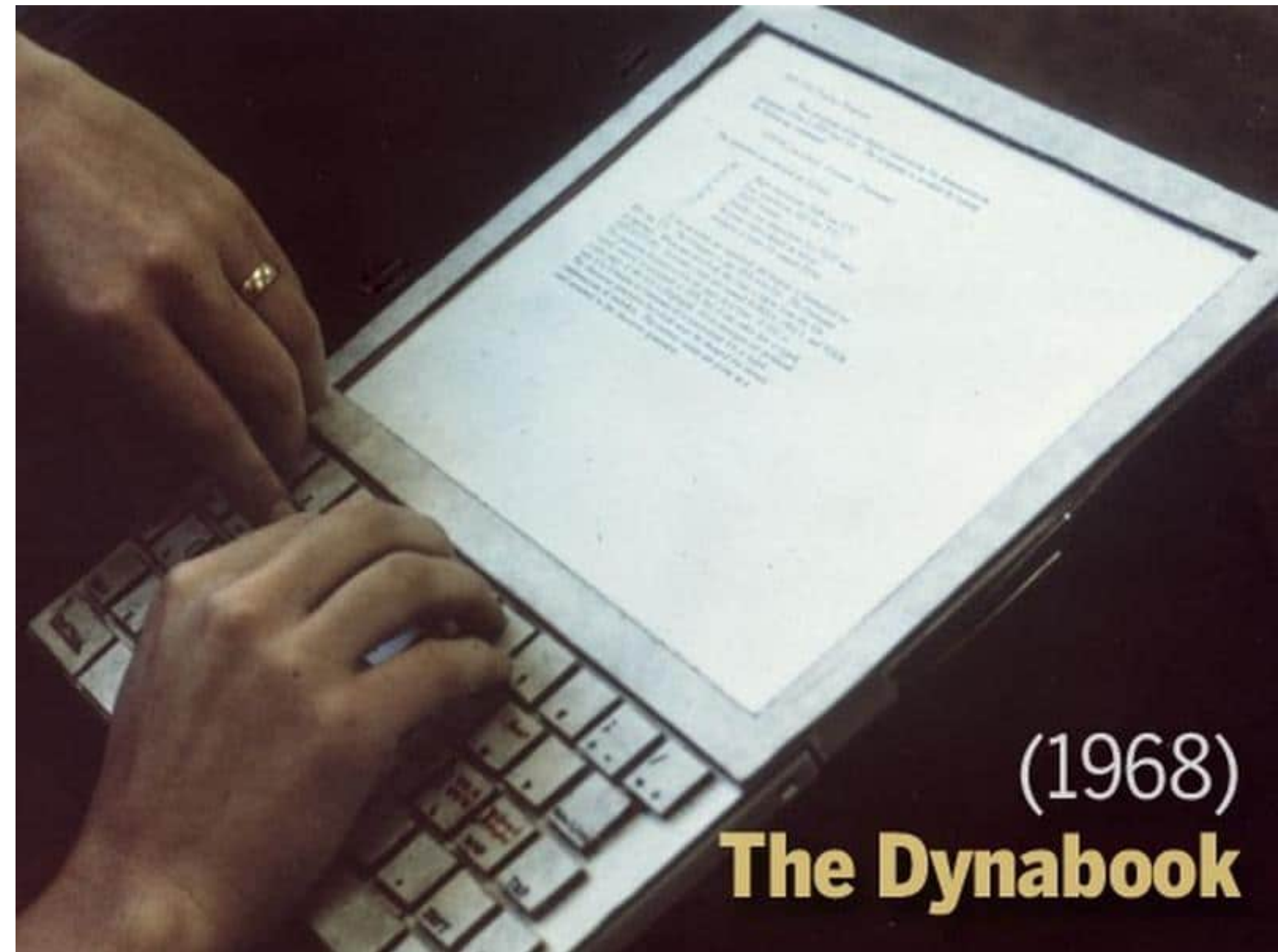
Milestone 3: Dynabook, 1968^{10 11}

A conceptual portable educational device for children (i.e., the first laptop/tablet computer) developed by Alan Kay.



¹⁰ Image sources: left, right

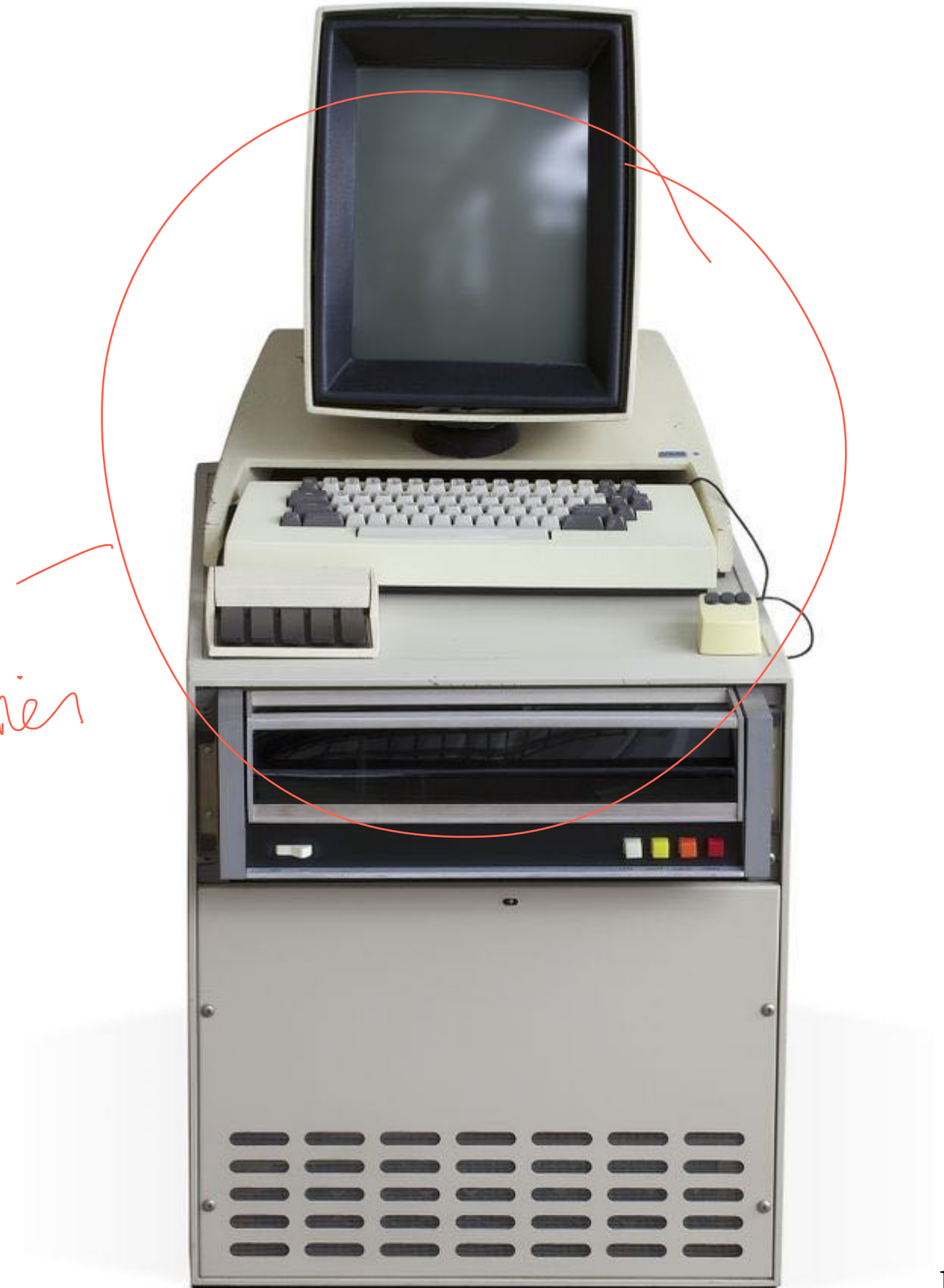
¹¹ A talk by Alan Kay on the history of Dynabook



Milestone 4: Xerox Alto, 1973¹² ¹³

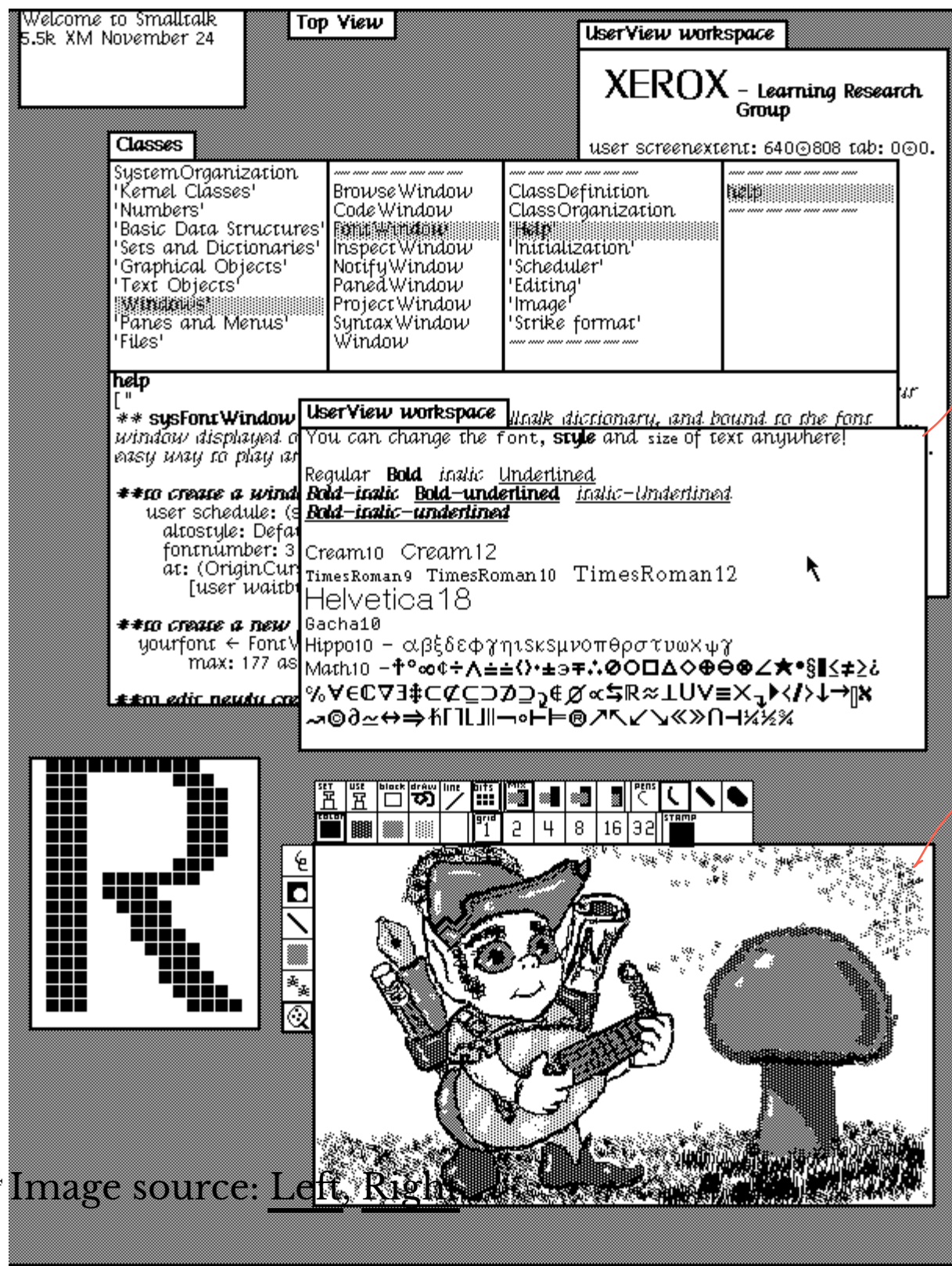
The first computer to support an OS based on a GUI that integrated the ideas developed for Dynabook. It was developed at the Xerox PARC (Palo Alto Research Center).

a
workstation

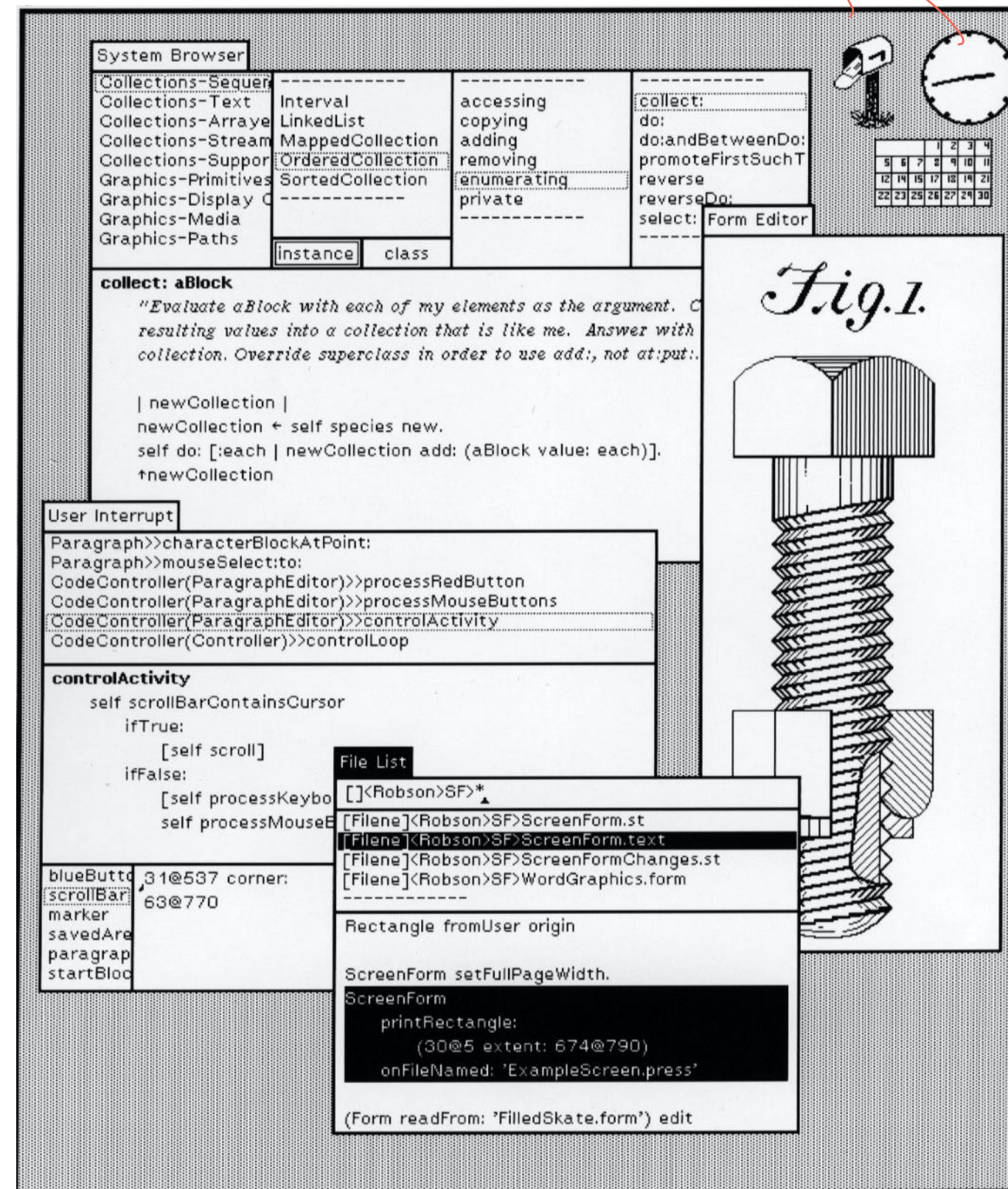


¹² Wikipedia: Dynabook

¹³ Image source



icons



Milestone 5: Xerox Star, 1981^{15 16 17}

First commercial system with a user interface that integrates today's technologies, including windows, icons, folders, mouse, etc.



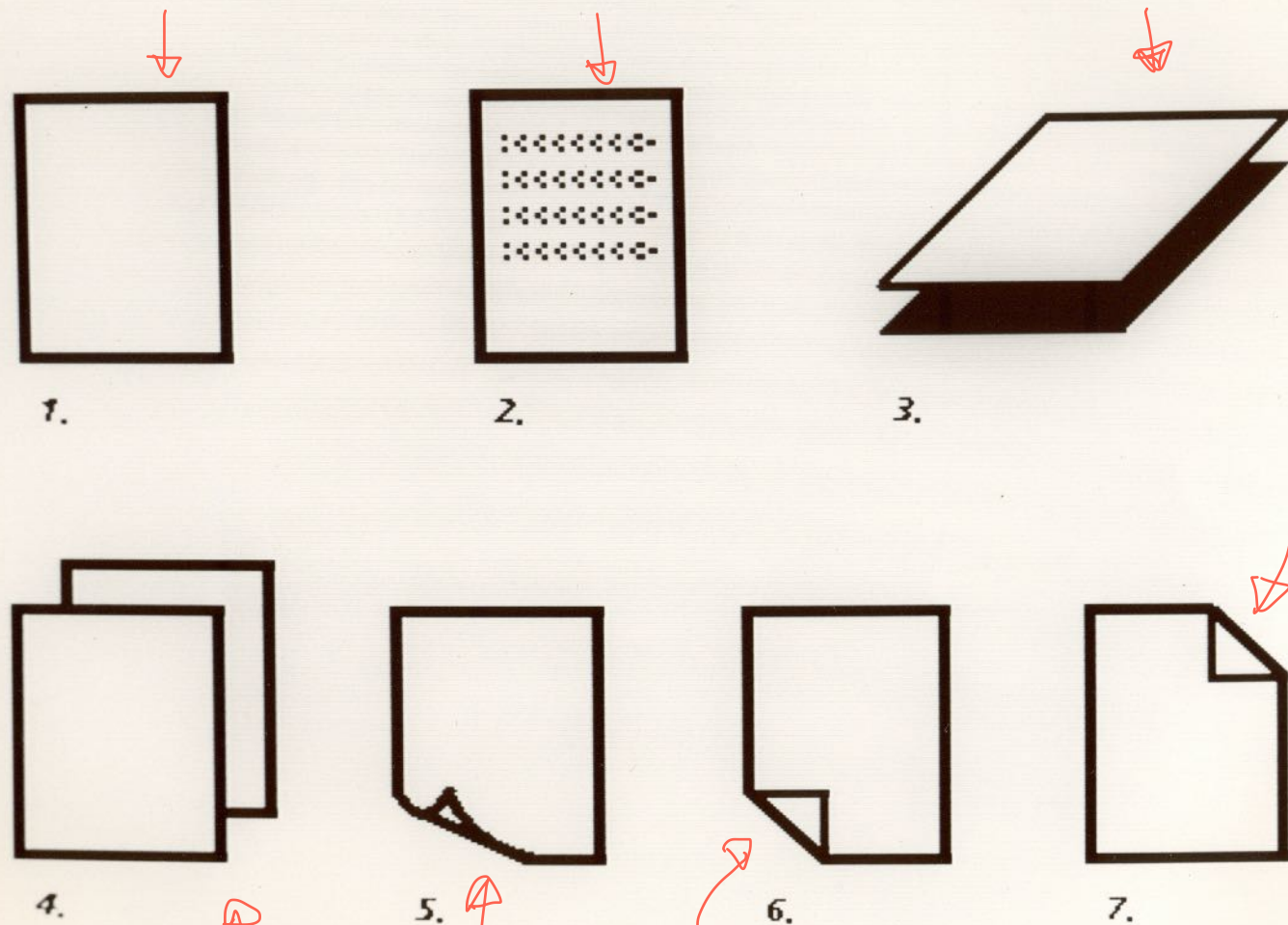
¹⁵ Wikipedia: [Xerox Star](#)

¹⁶ Videos of the Star Interface: [Part 1](#), [Part 2](#)

¹⁷ [Image source](#)

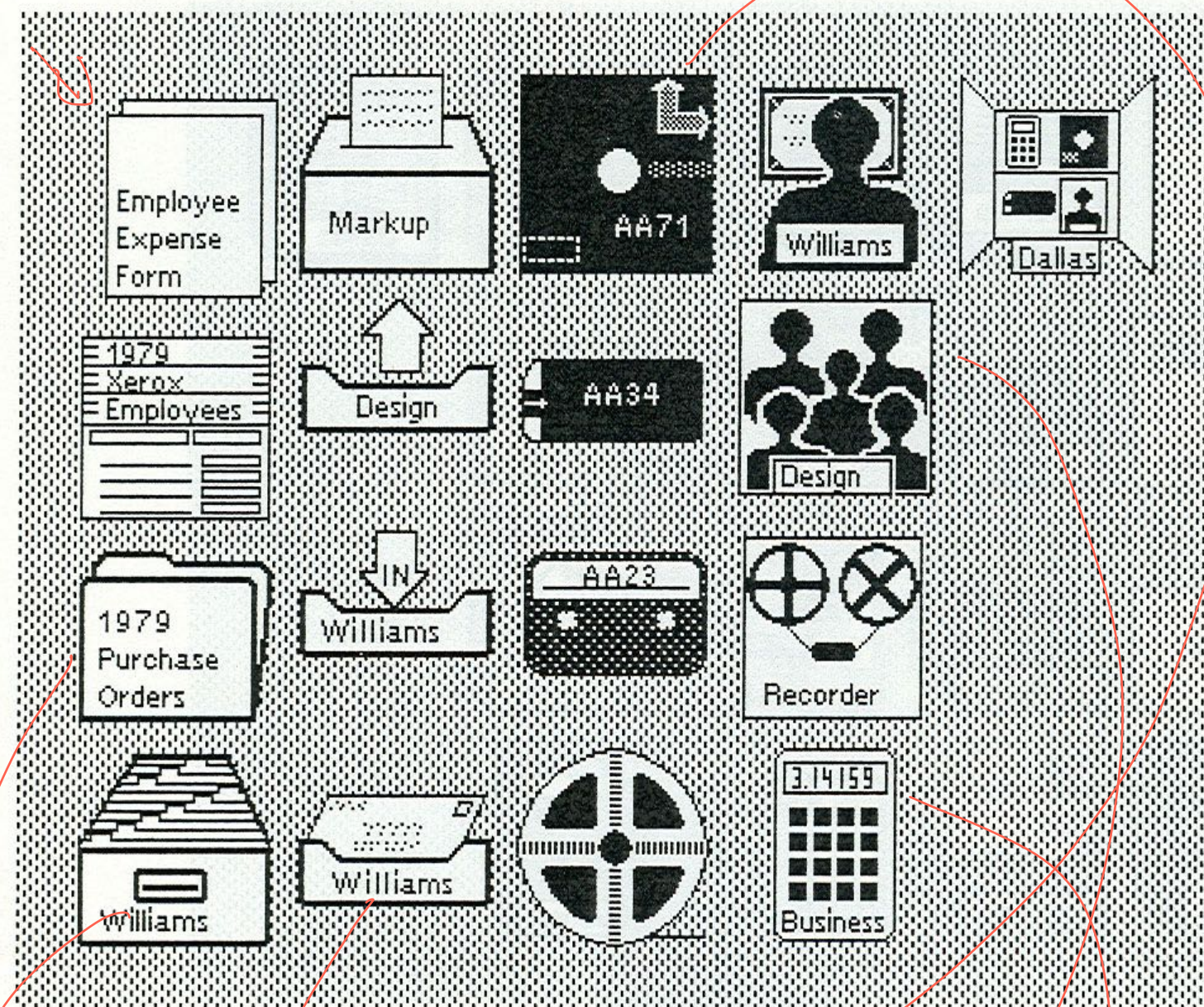


Evolution of "Document" Icon Shape



¹⁹ Image source: Left, Right

Figure 4.
Set 4 (Judd)



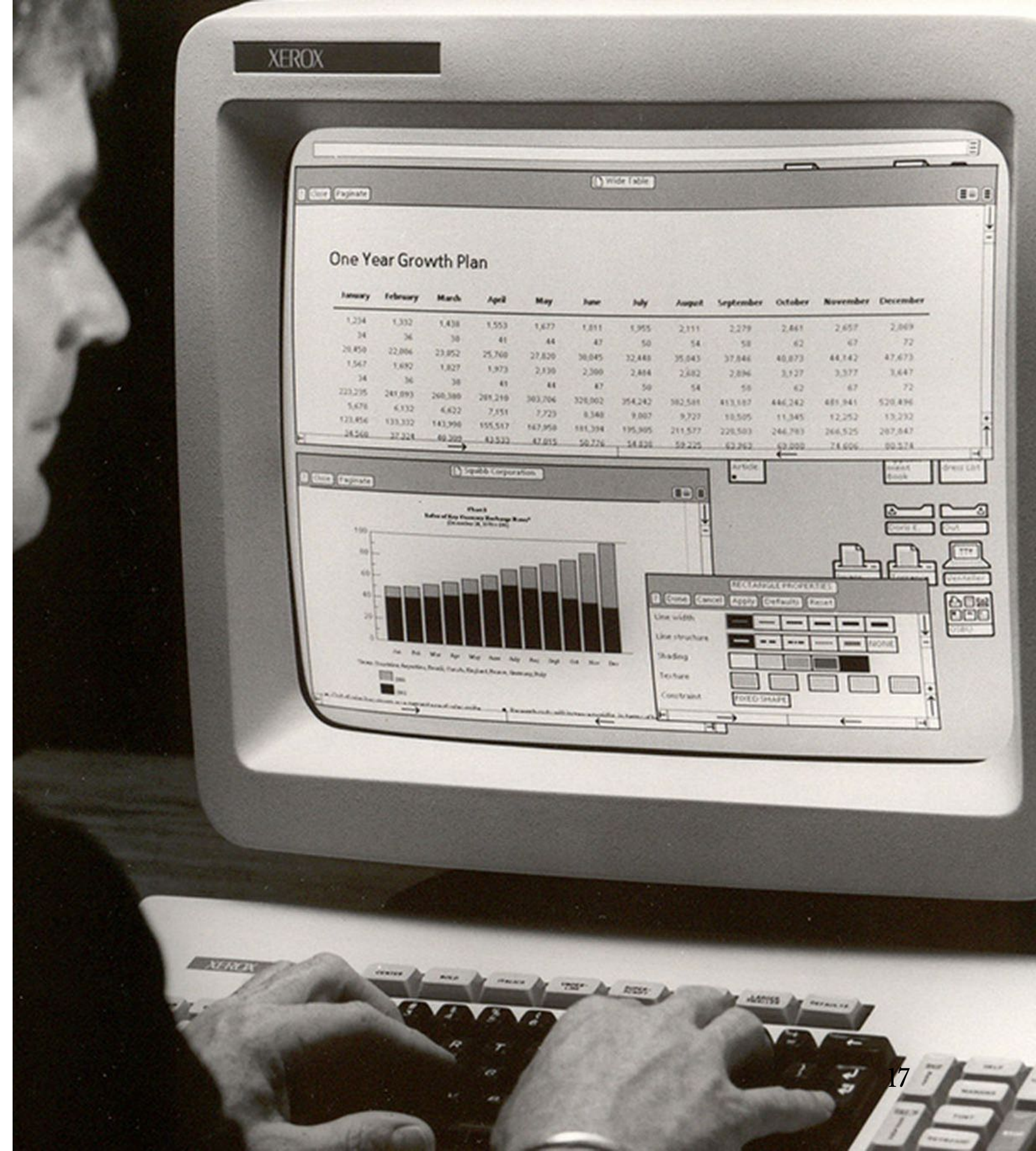
<u>document</u>	printer	<u>floppy disk</u>	user	directory
<u>record file</u>	out-basket	mag. card	<u>group</u>	
<u>folder</u>	in-basket	cassette	recorder	
<u>file drawer</u>	in-basket (with mail)	mag. tape	<u>calculator</u>	

Designing for the Desktop

The WIMP Paradigm²⁰

Definition: Windows, icons, menus, and pointer, or *WIMP*, is a design paradigm that current desktop interfaces follow that dates back to the Xerox Alto (1973).

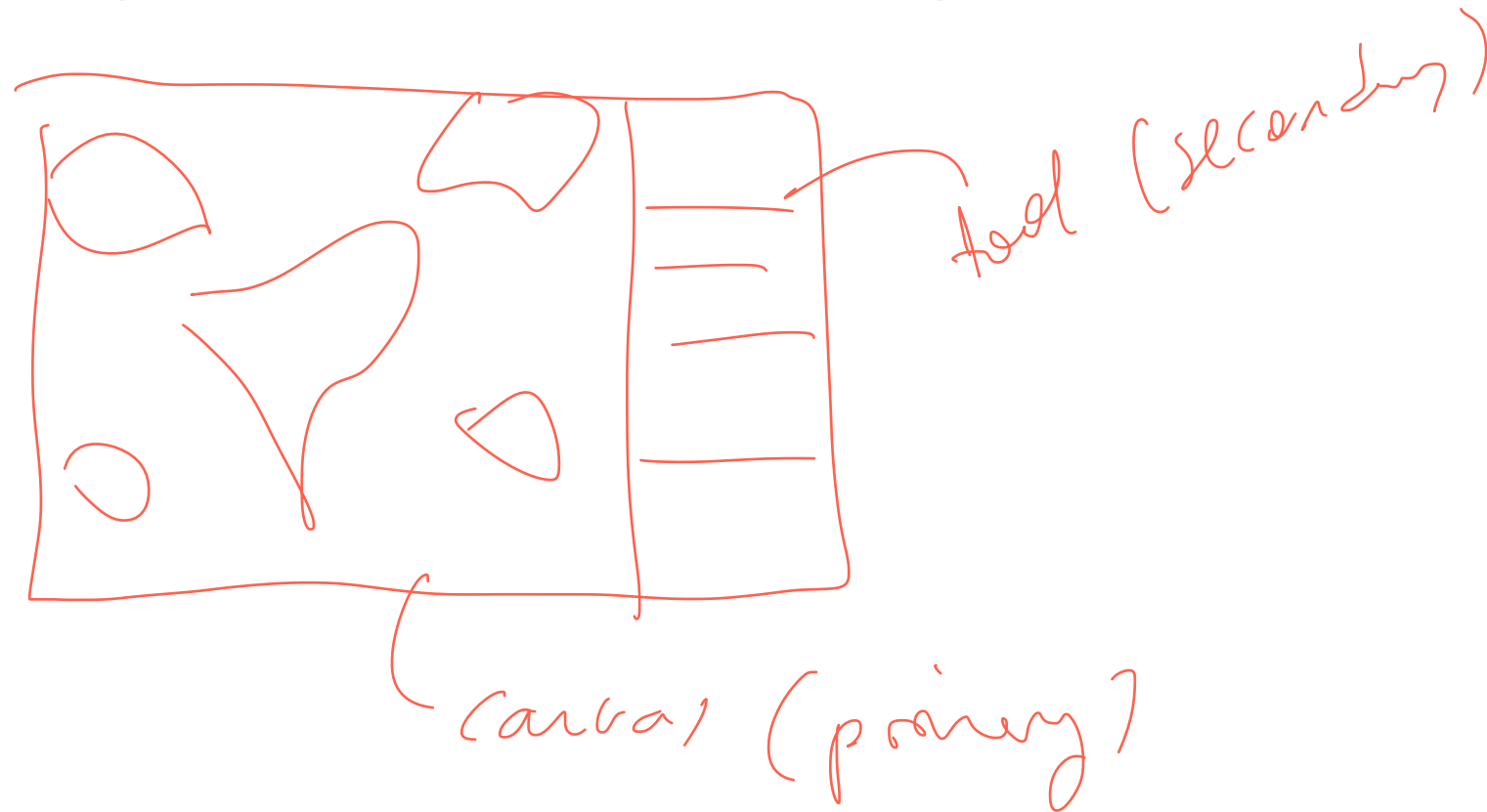
²⁰ Image source

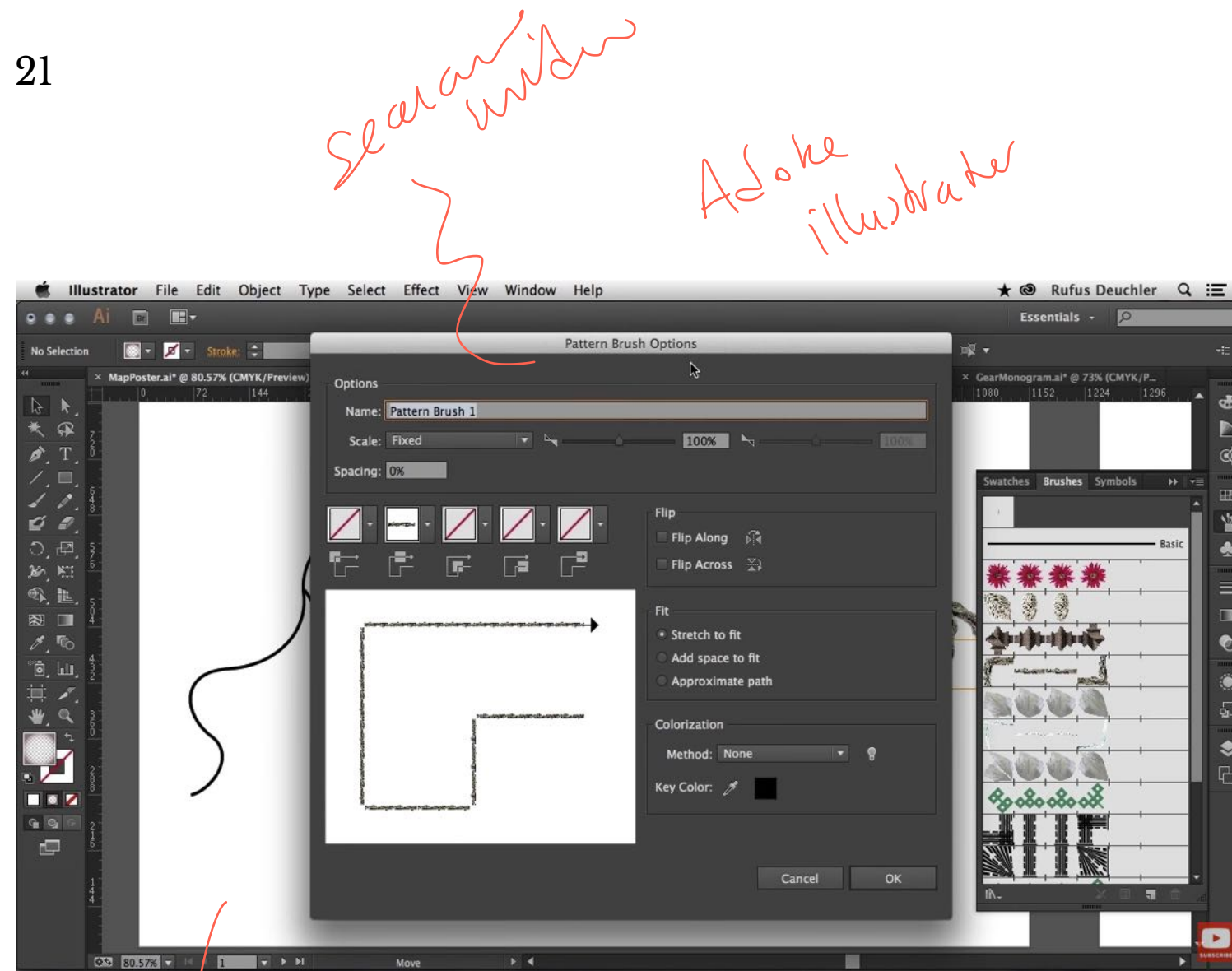


Elements of the WIMP Paradigm: *Windows*

Definition: Windows are resizable containers of individual applications.

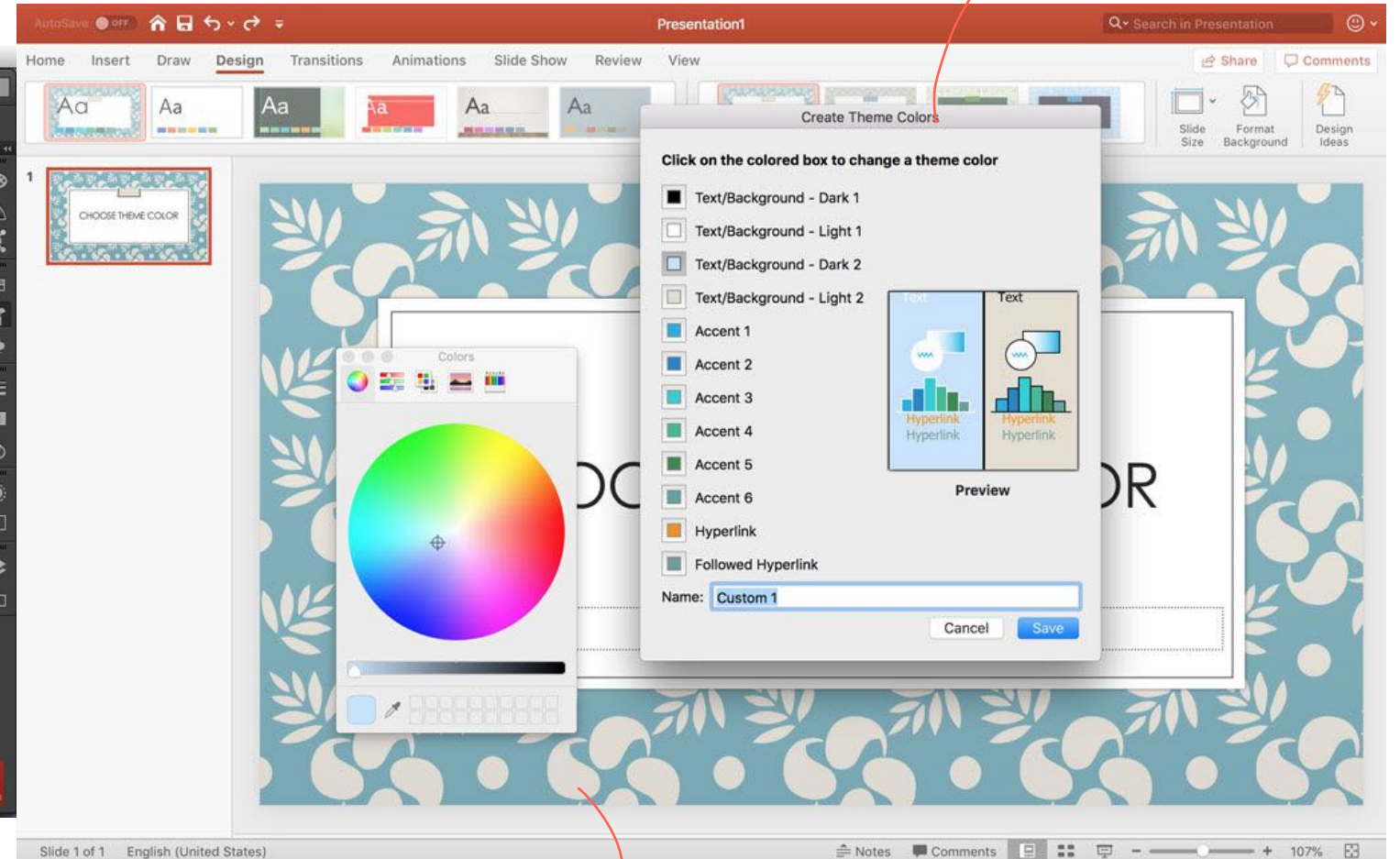
Primary windows contain elements for the main functionality of the application, such as a canvas. Secondary windows support main windows through modal panes, dialog boxes, etc.





canvas - primary window

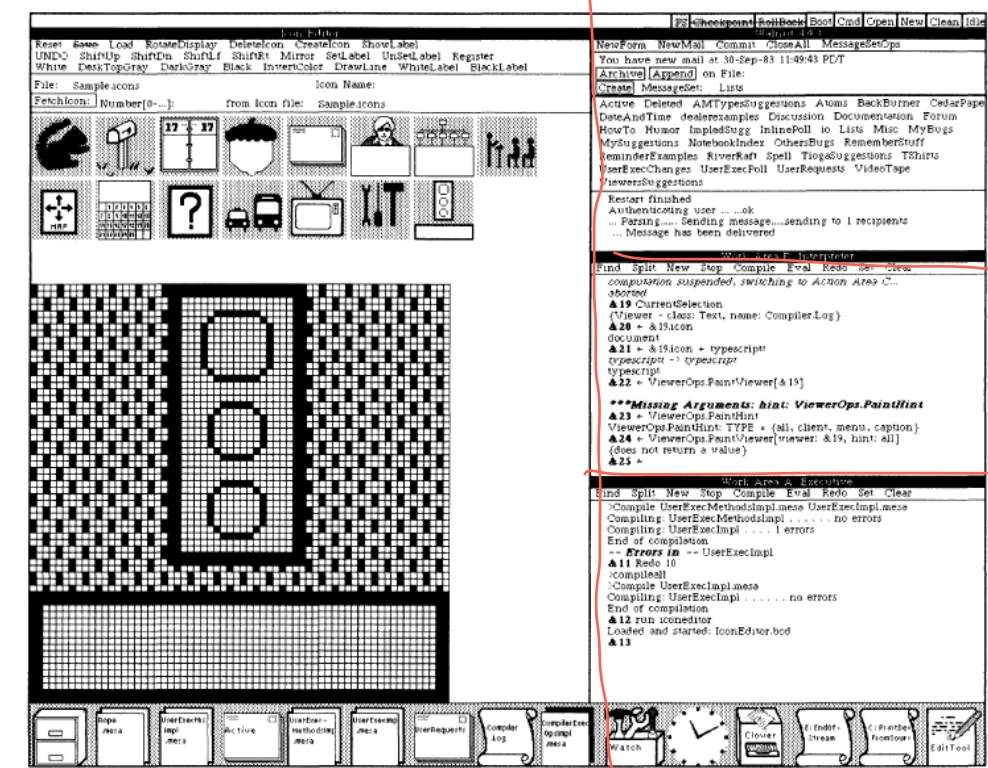
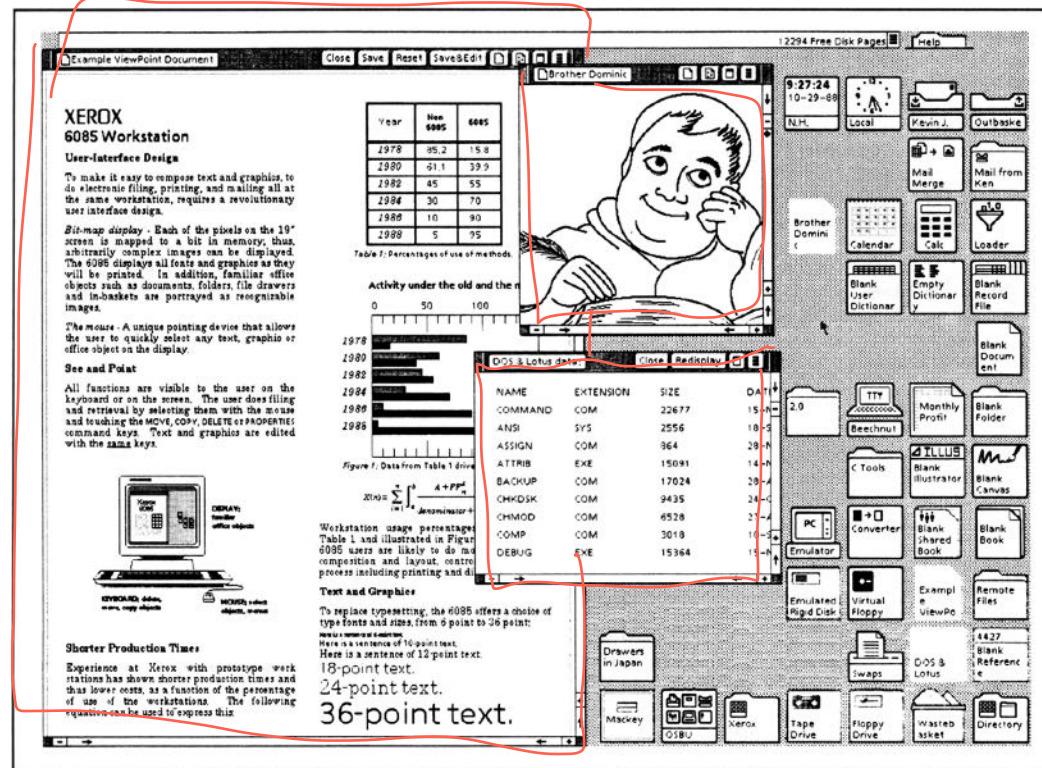
²¹ Image source: Left, Right



canvas - primary window

Window Organization²²

Definition: Windows can be organized in a way that overlaps several windows or tiles them across the screen.



²² Image source: Left, Right

overlapping



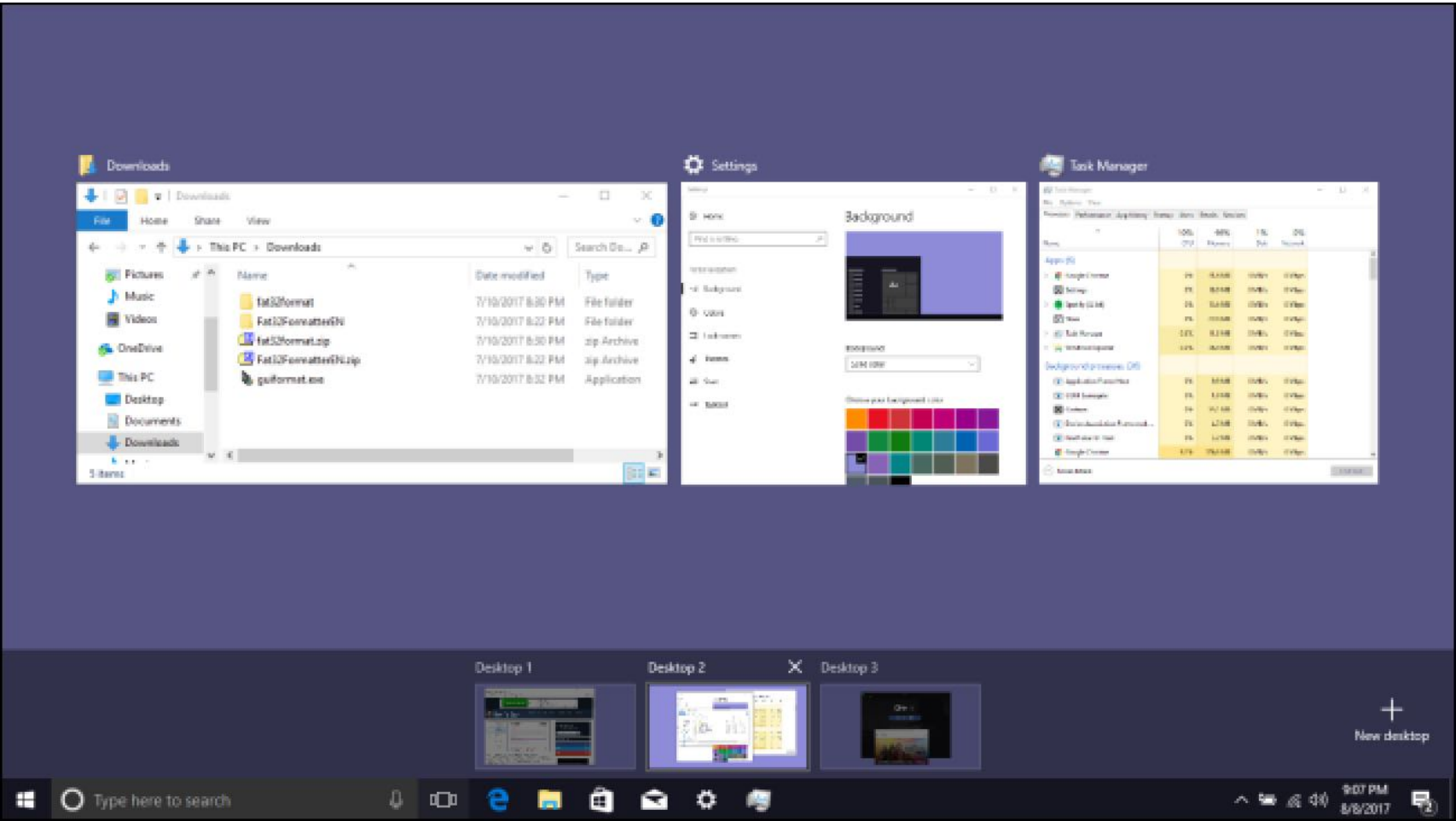
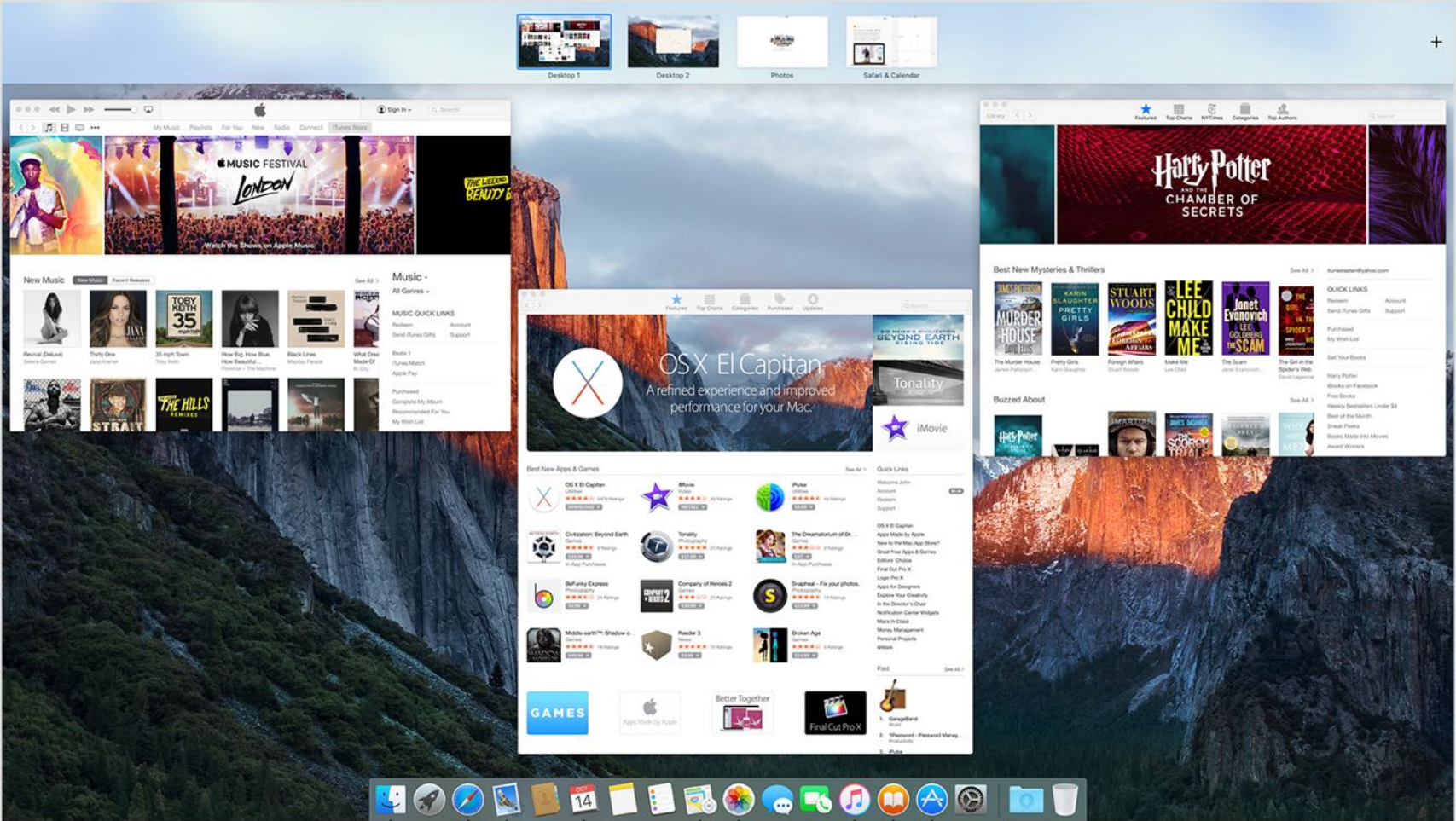
filed



²³ Image source: Left, Right

Mac OS

Windows

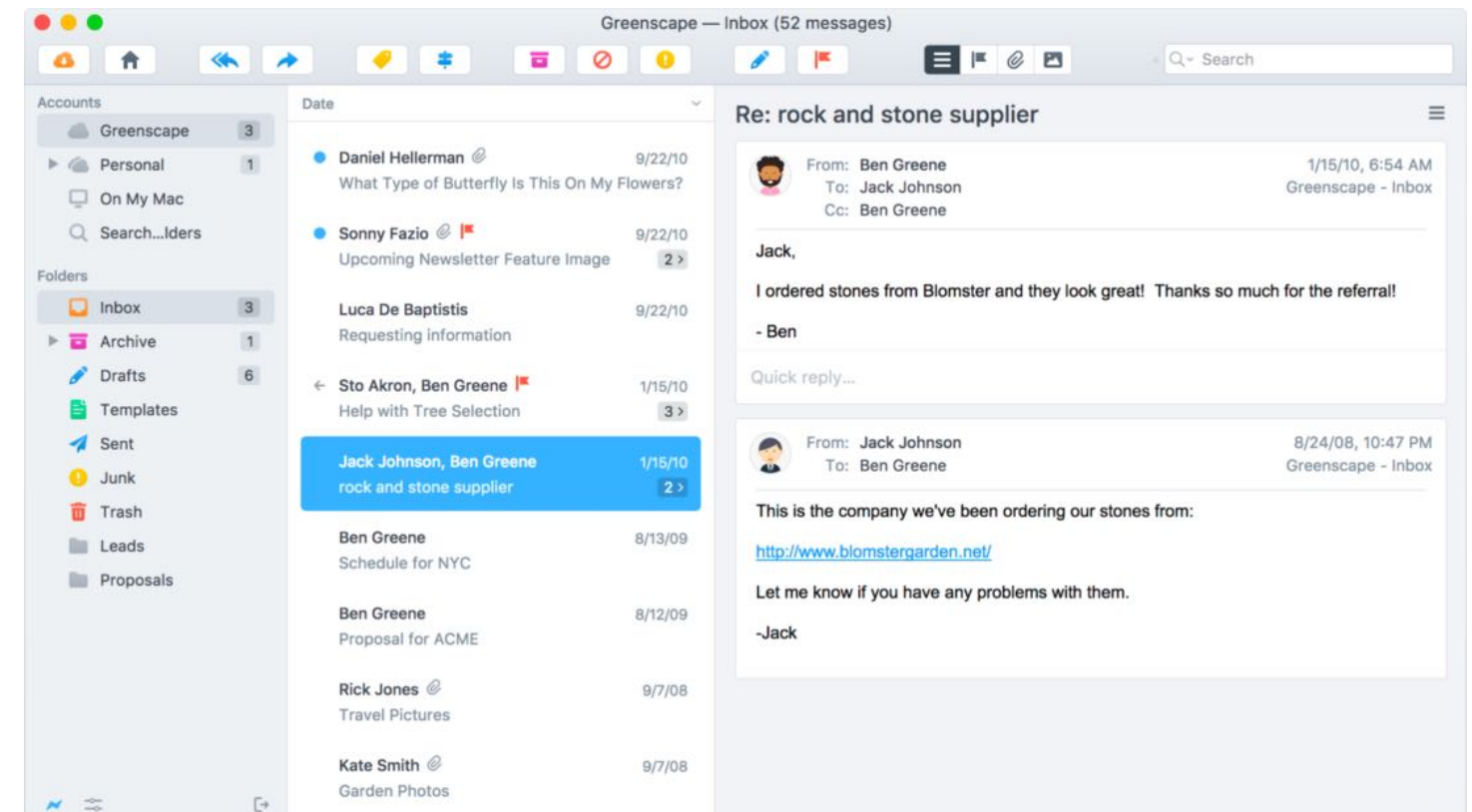
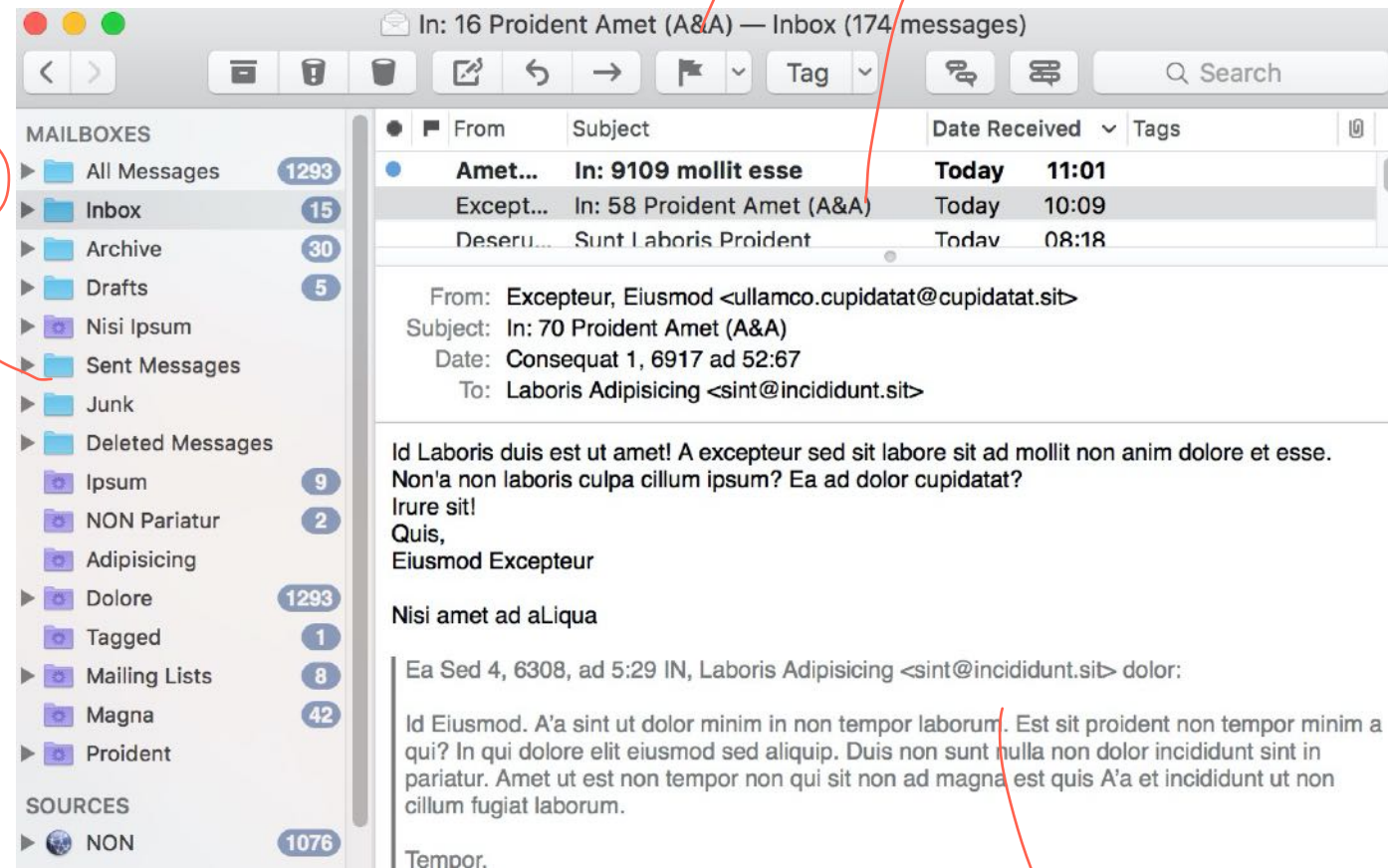


filed windows

²⁴ Image source: Left, Right

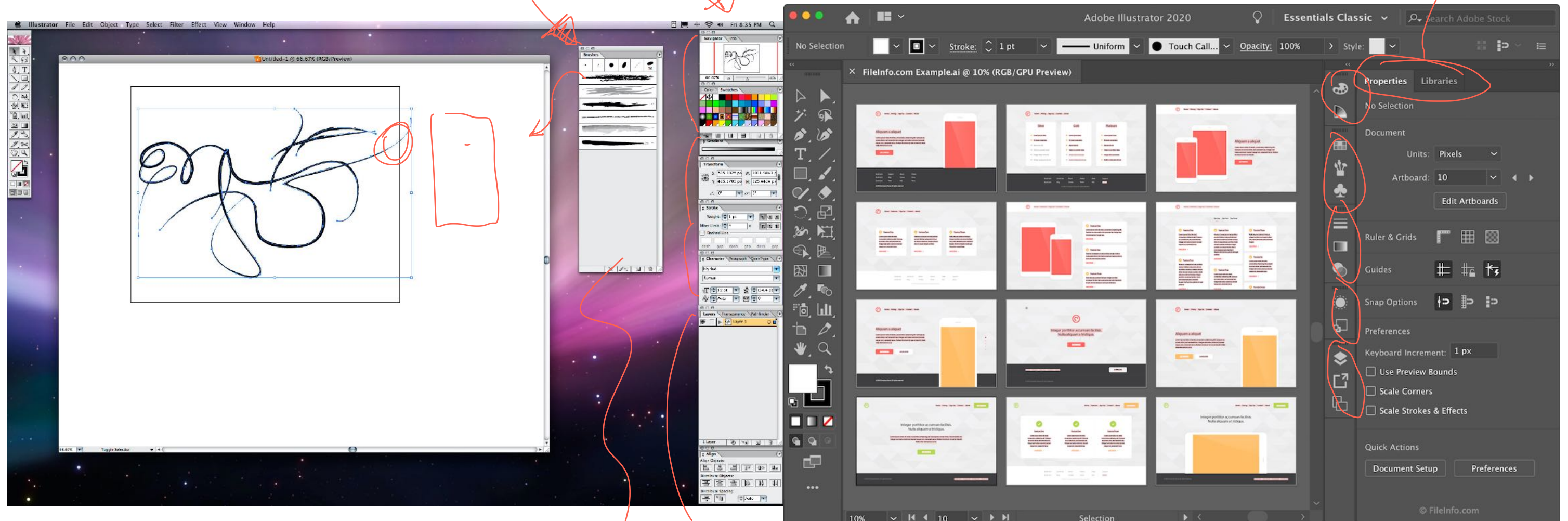
Window Structures²⁵

Windows bring together dedicated *panes* in different configurations.



²⁵ Image source: Left, Right

Secondary windows can be *docked*, *stacked*, and *floating*.²⁶



²⁶ Image source: Left, Right

Menus²⁷

Definition: Menus list all the functions of the an application. Menu lists serve educational and reference purposes.

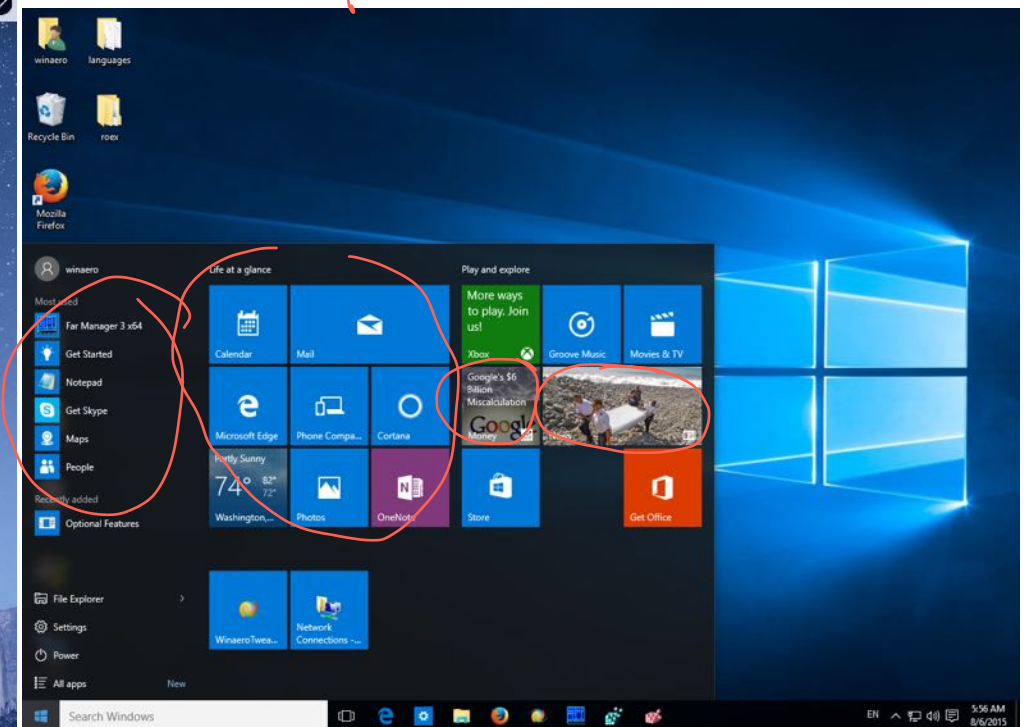
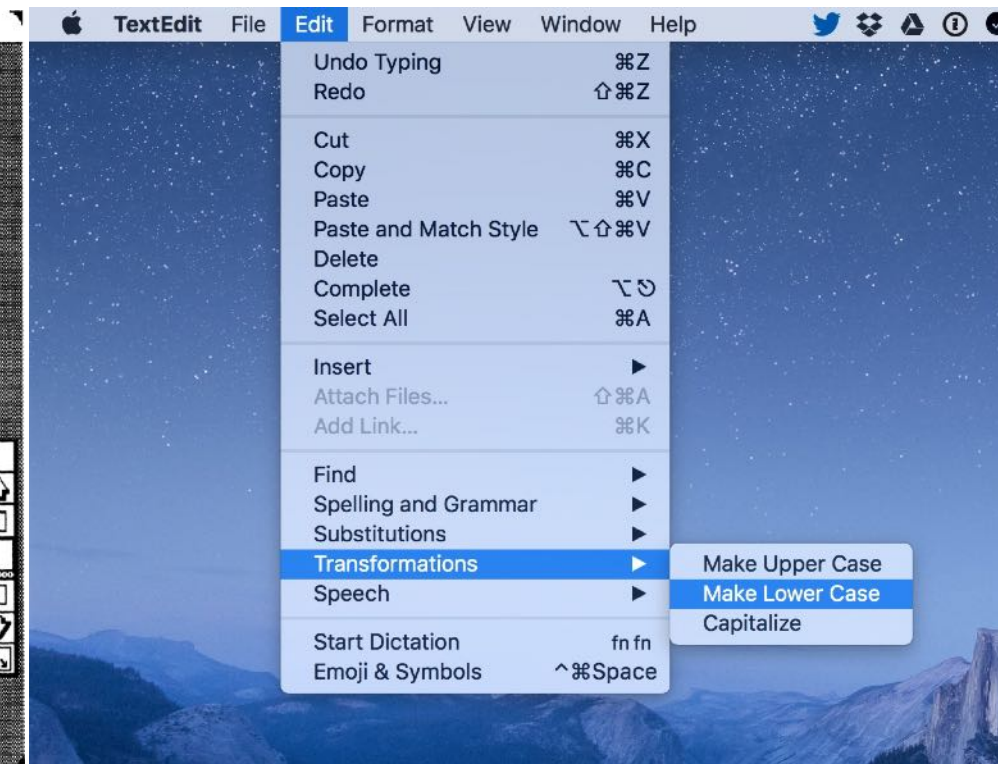
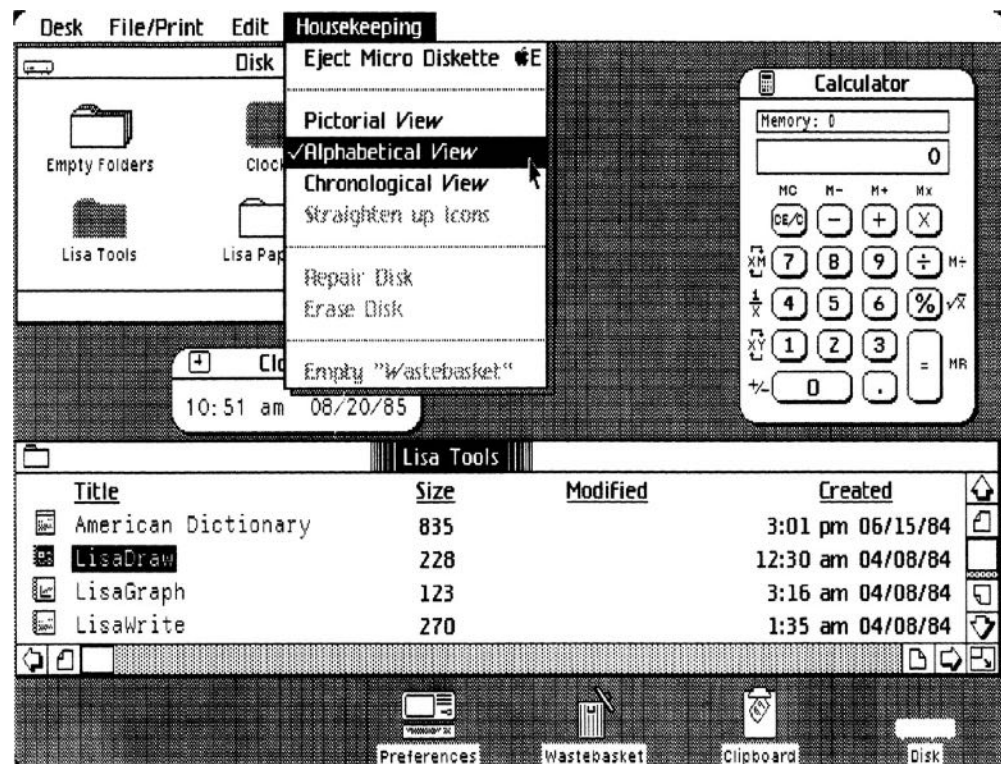
#1

historical

#2

today's

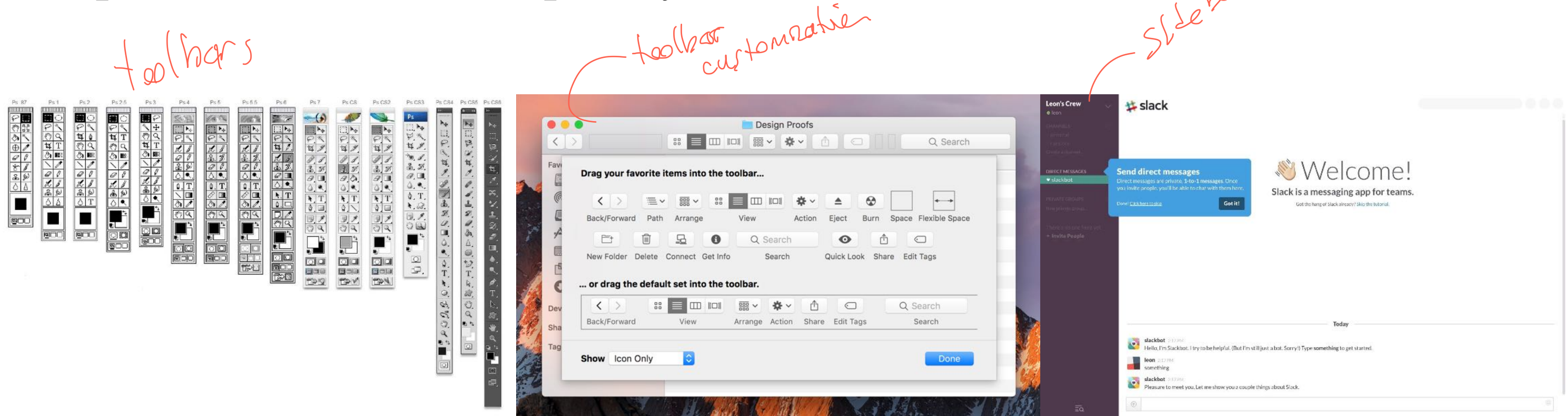
composite
menus



²⁷ Image source: Left, Center, Right

Toolbars, Palettes, Sidebars, & Tooltips²⁸

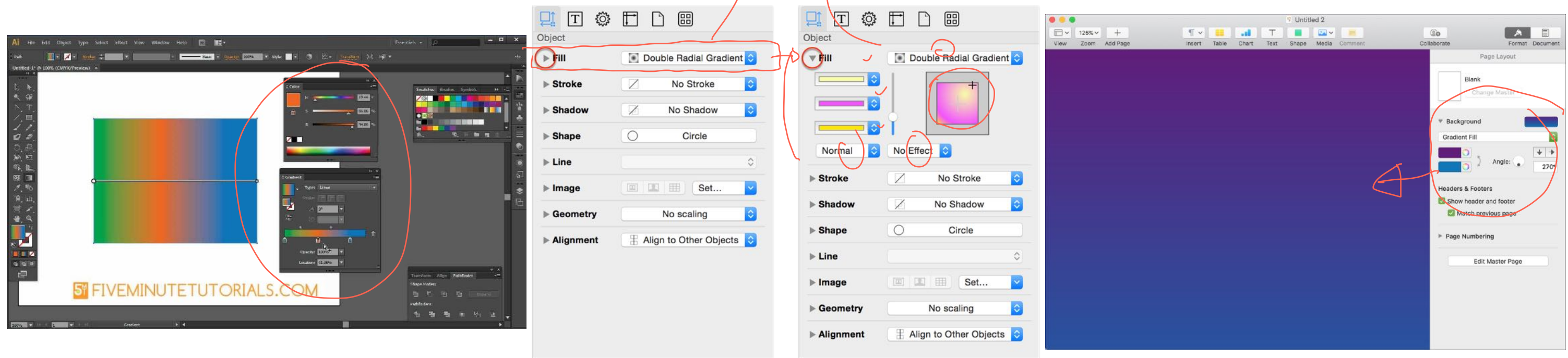
Definition: *Toolbars, palettes, sidebars, and tooltips* facilitate (visual and manipulation) access to frequently used functions.



²⁸ Image source: Left, Center, Right

Tool Palettes²⁹

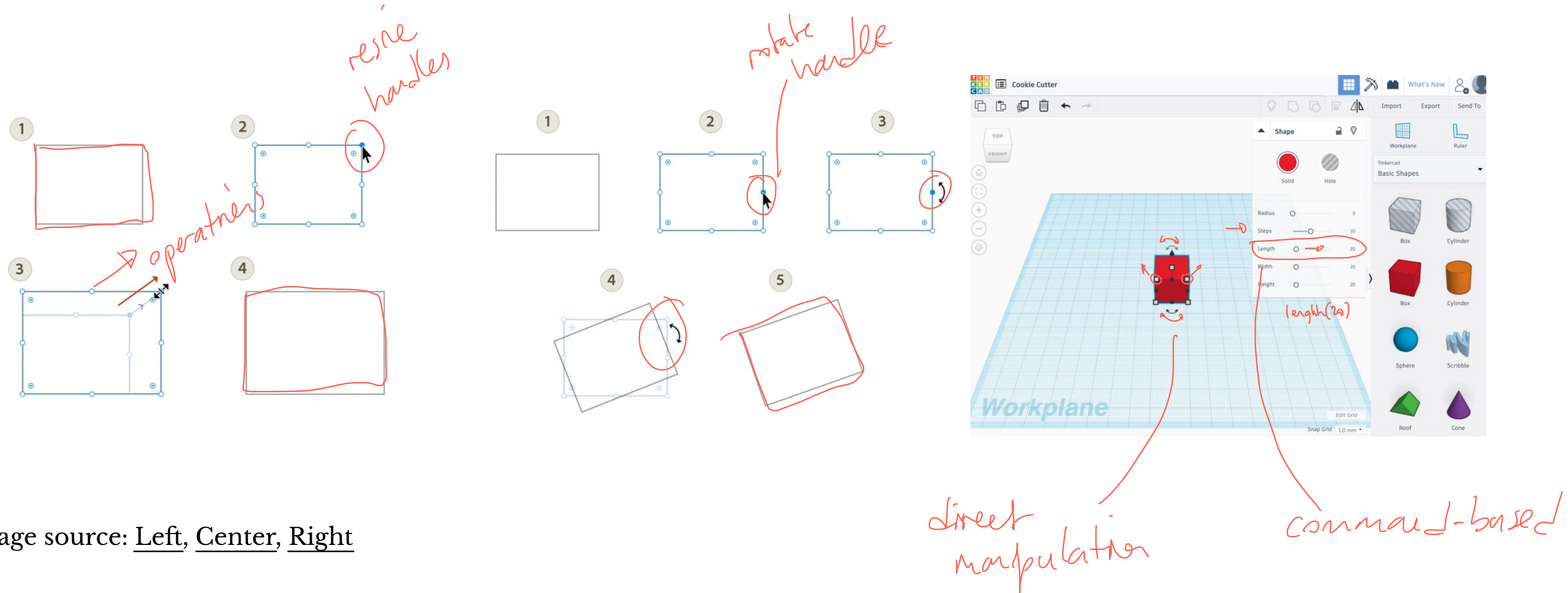
Definition: Tool palettes provide *advanced controls* for a particular function rather than frequently accessed functions.



²⁹ Image source: Left, Center, Right

Pointing³⁰

Definition: *Pointing* on an application canvas enables a range of advanced capabilities for direct manipulation.



³⁰ Image source: Left, Center, Right

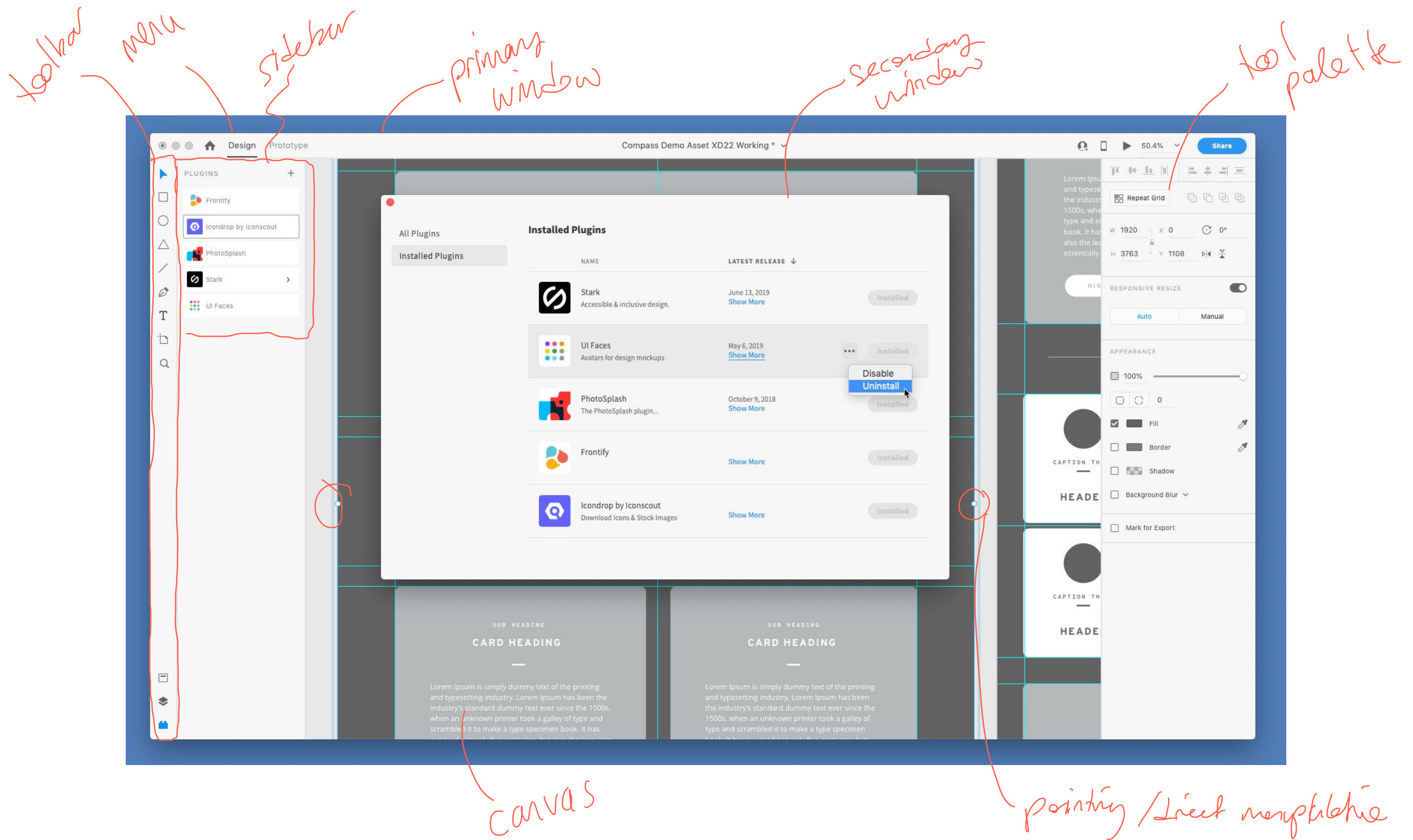
Quiz 1

Complete the Canvas quiz.



In-Class Activity 1: Desktop Application Deconstruction

Image Source



Designing for the Web

Desktop Applications vs. Websites

Desktop applications: Dynamic, persistent screens and supporting components that enable users to perform complex tasks.

Webpages: Interconnected pages with aids that help users navigate and access a large body of content.

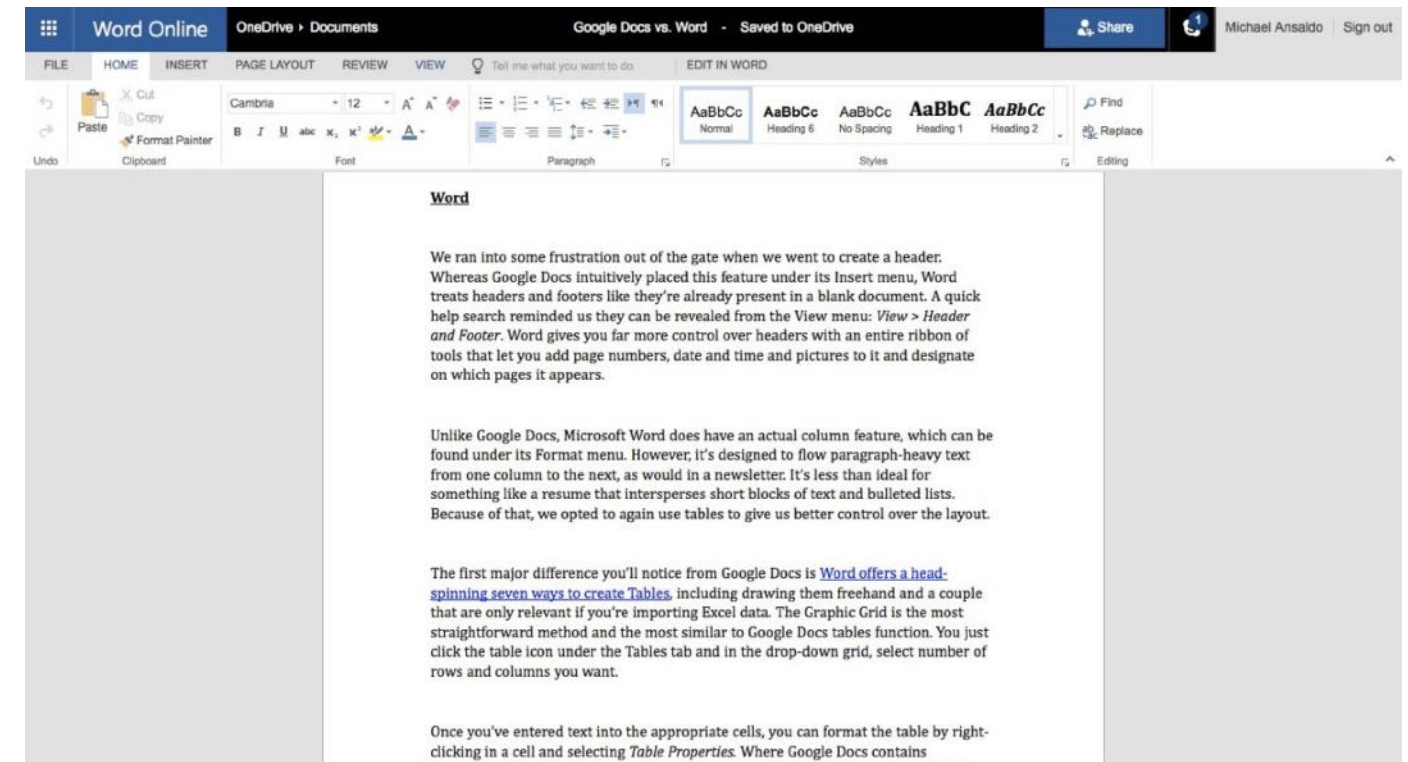
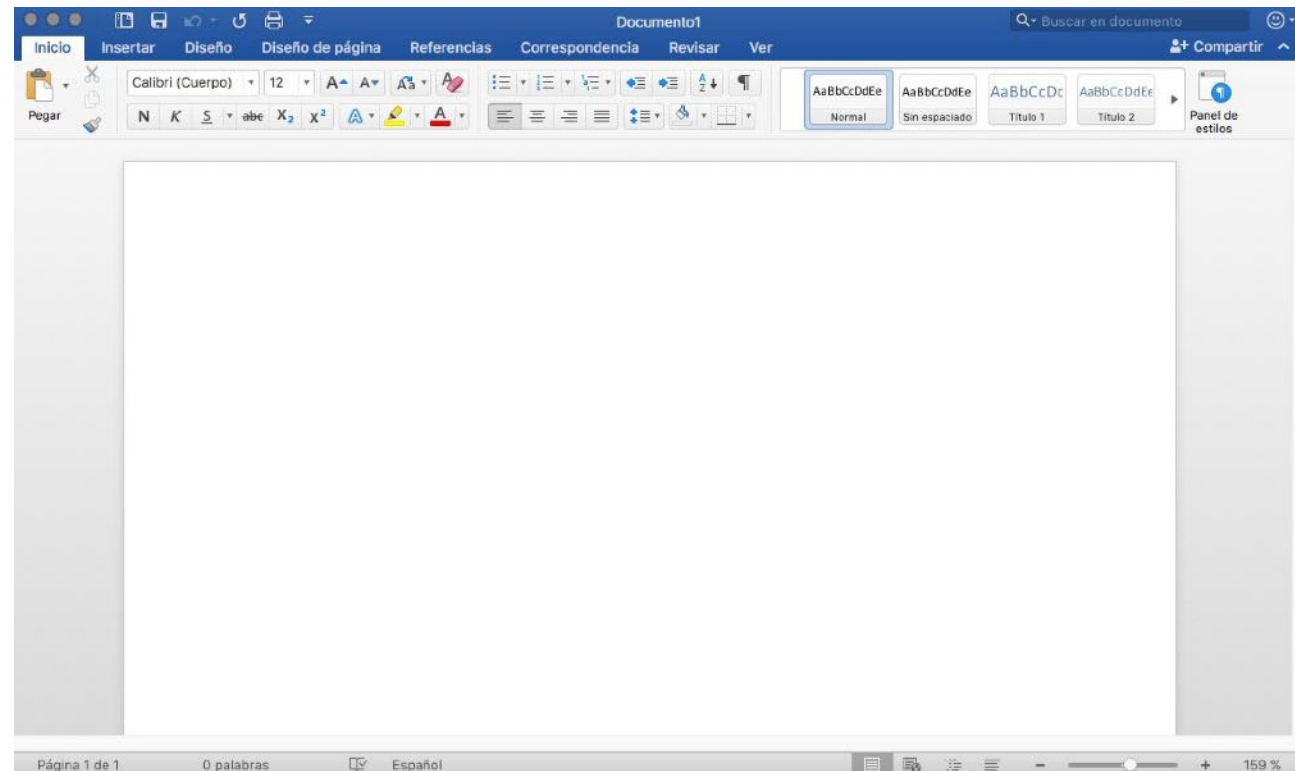
Also web applications

similar elements

different goals

Web Applications³¹

Definition: Single-page applications (SPAs) provide the functions of a desktop application on a webpage following the conventions of desktop applications.



³¹ Image source: Left, Right

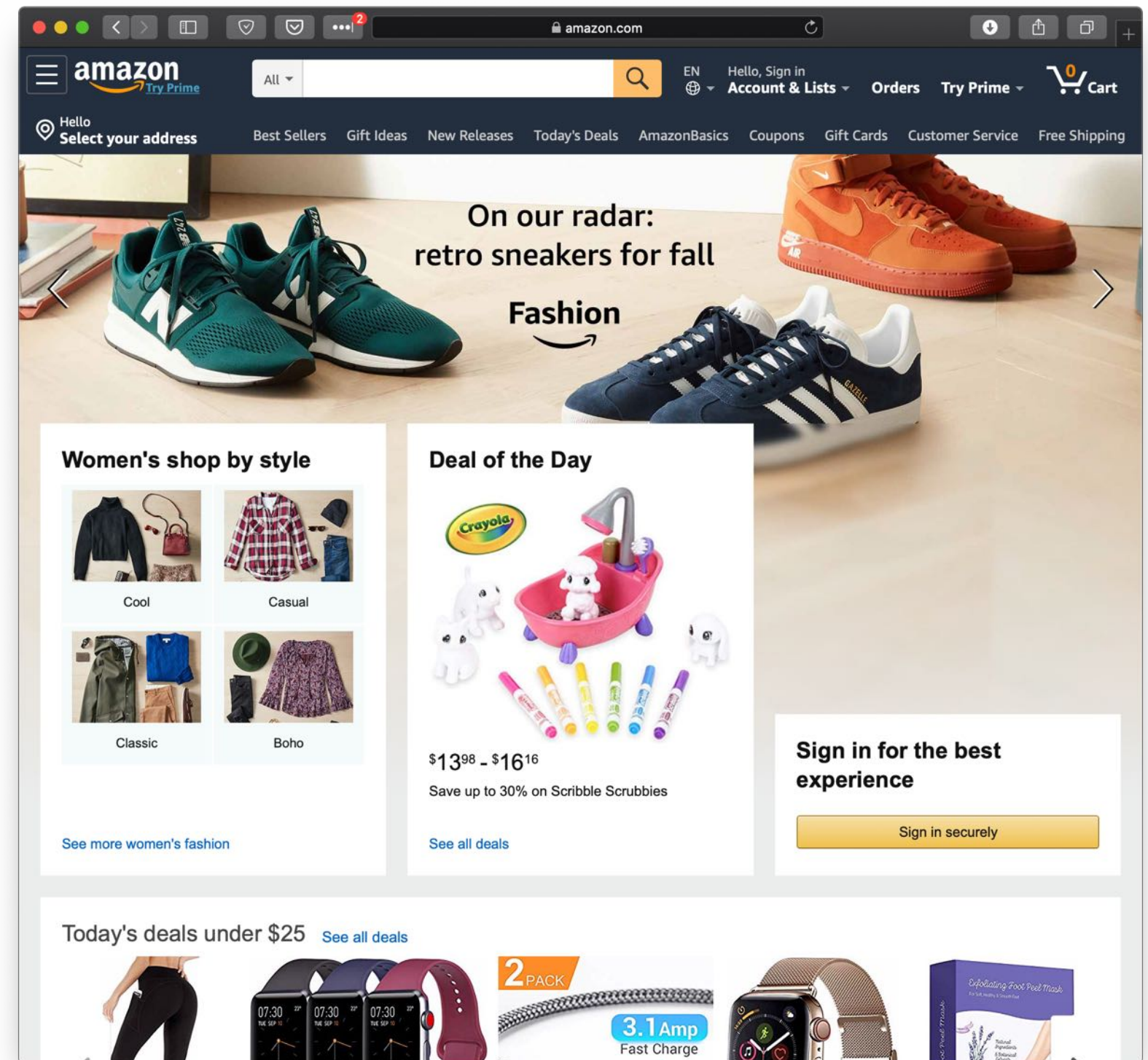
The Page

Since its inception, the *page*, has been the building block of web content.

If the web is made out of pages, how do we organize and help users navigate them?

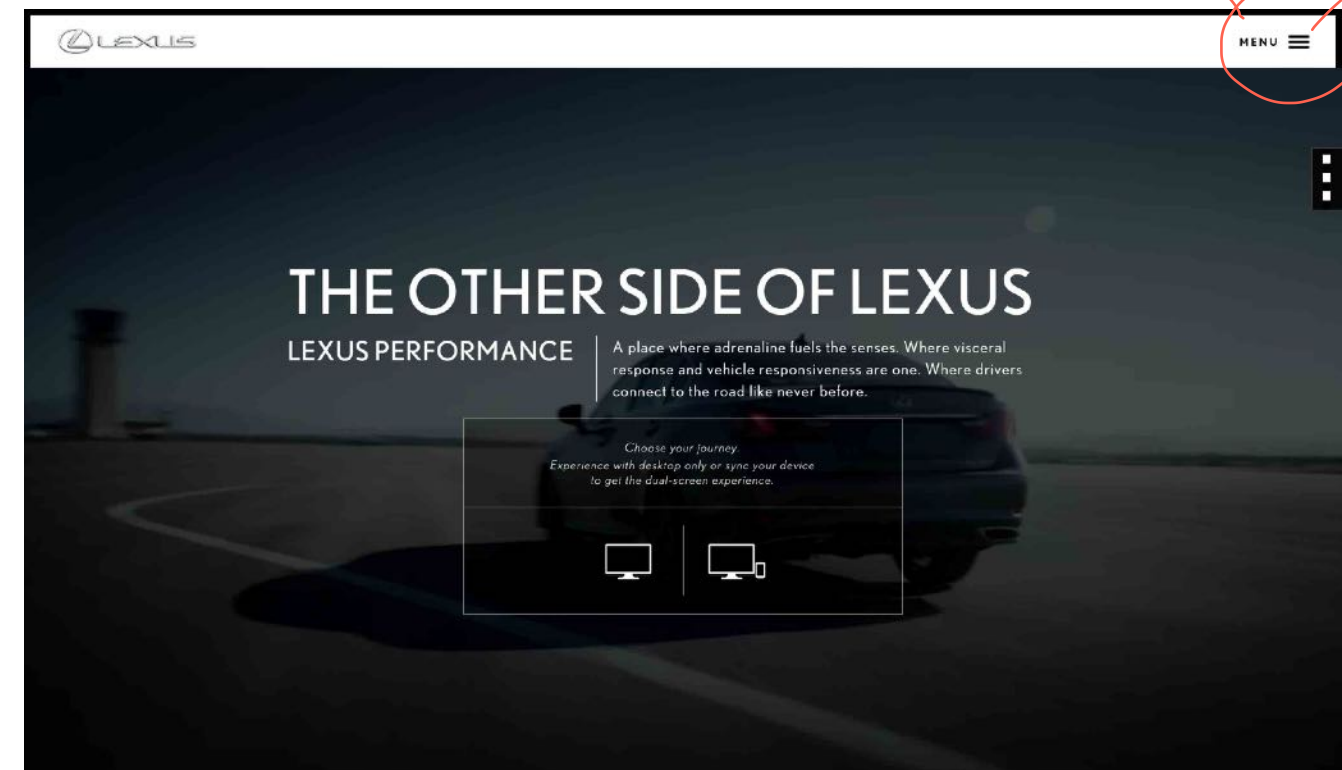
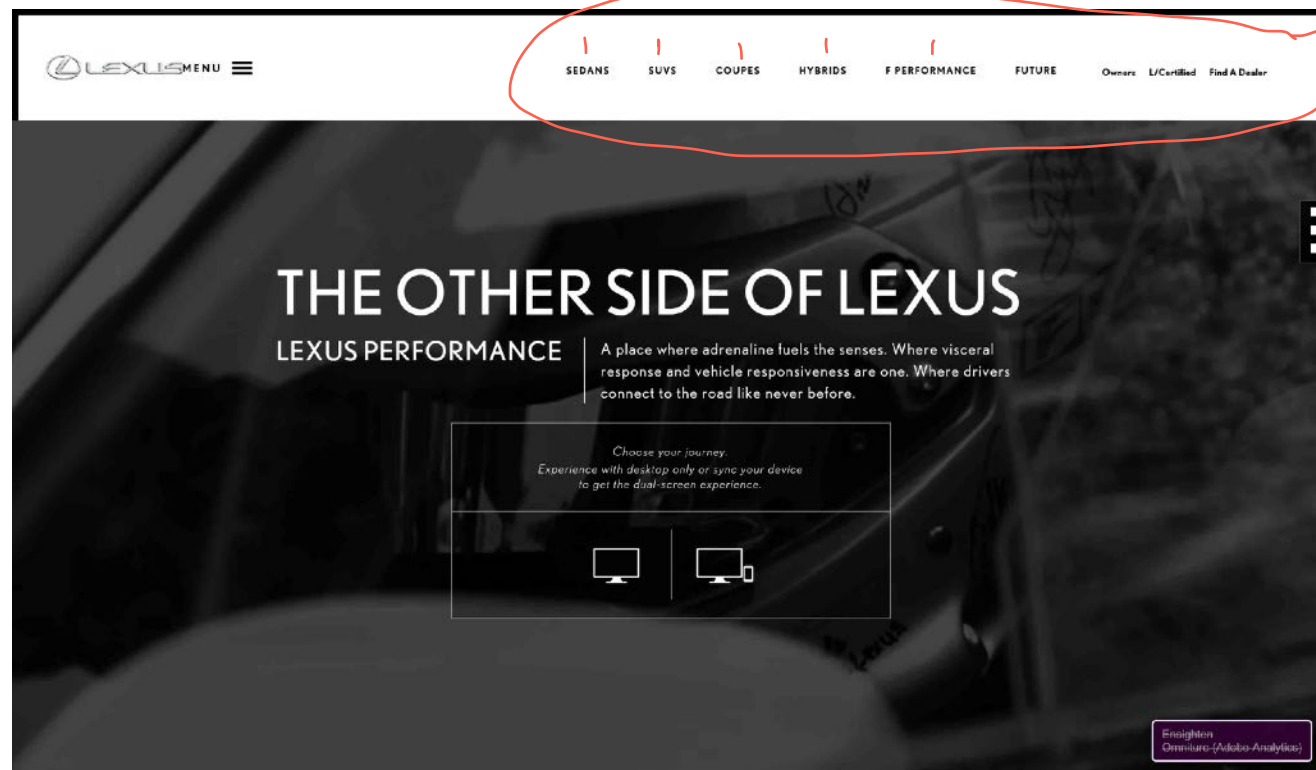
Using primary and secondary navigation aids.

pages w/ aids



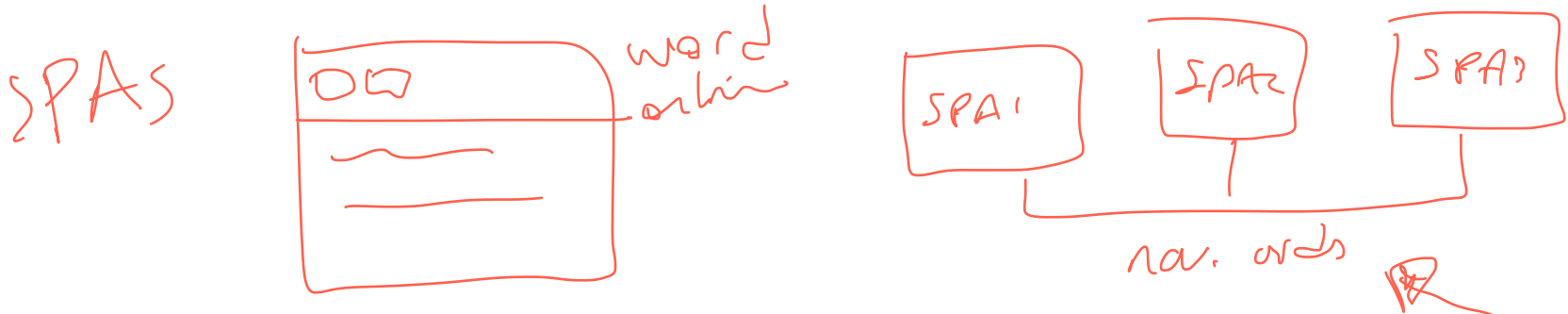
Primary Navigation Aids³²

Definition: Primary navigation aids take the form of menus/menubars and reflect the major areas or sections of a website.

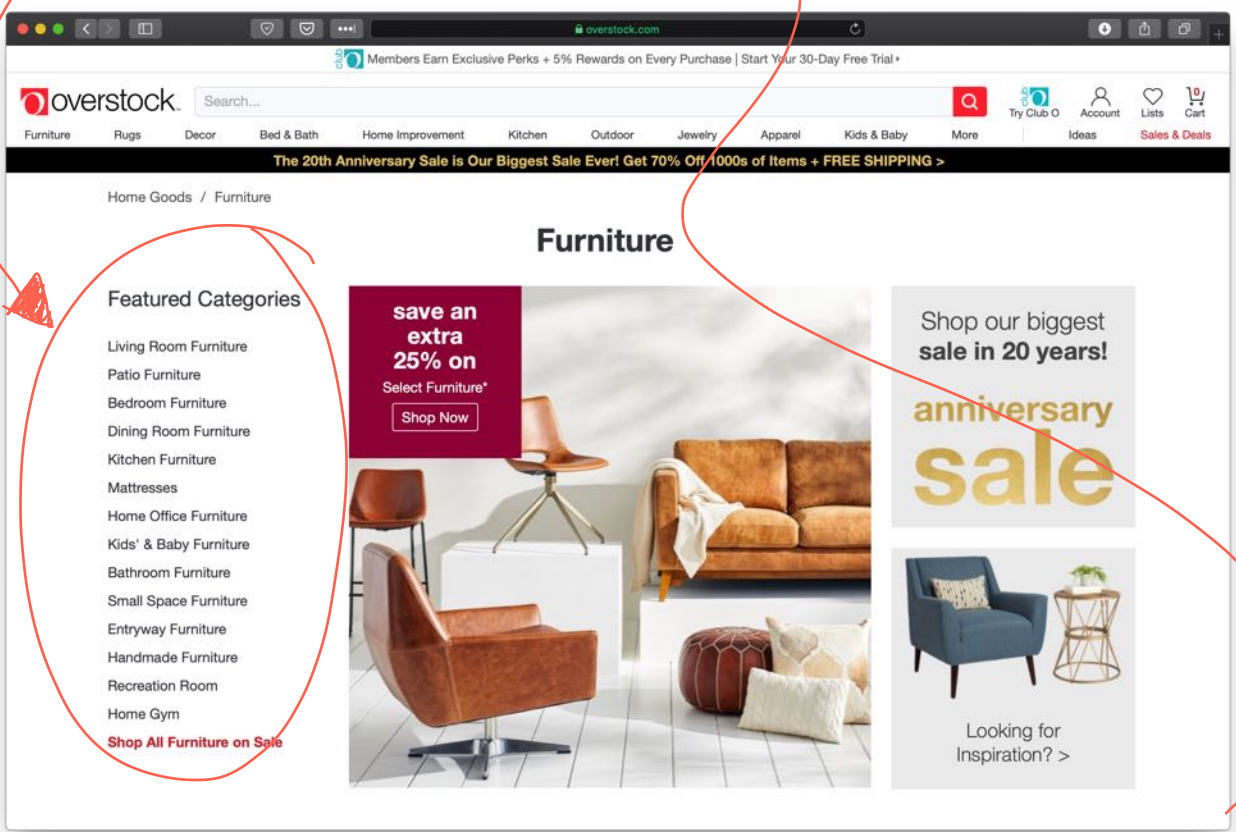
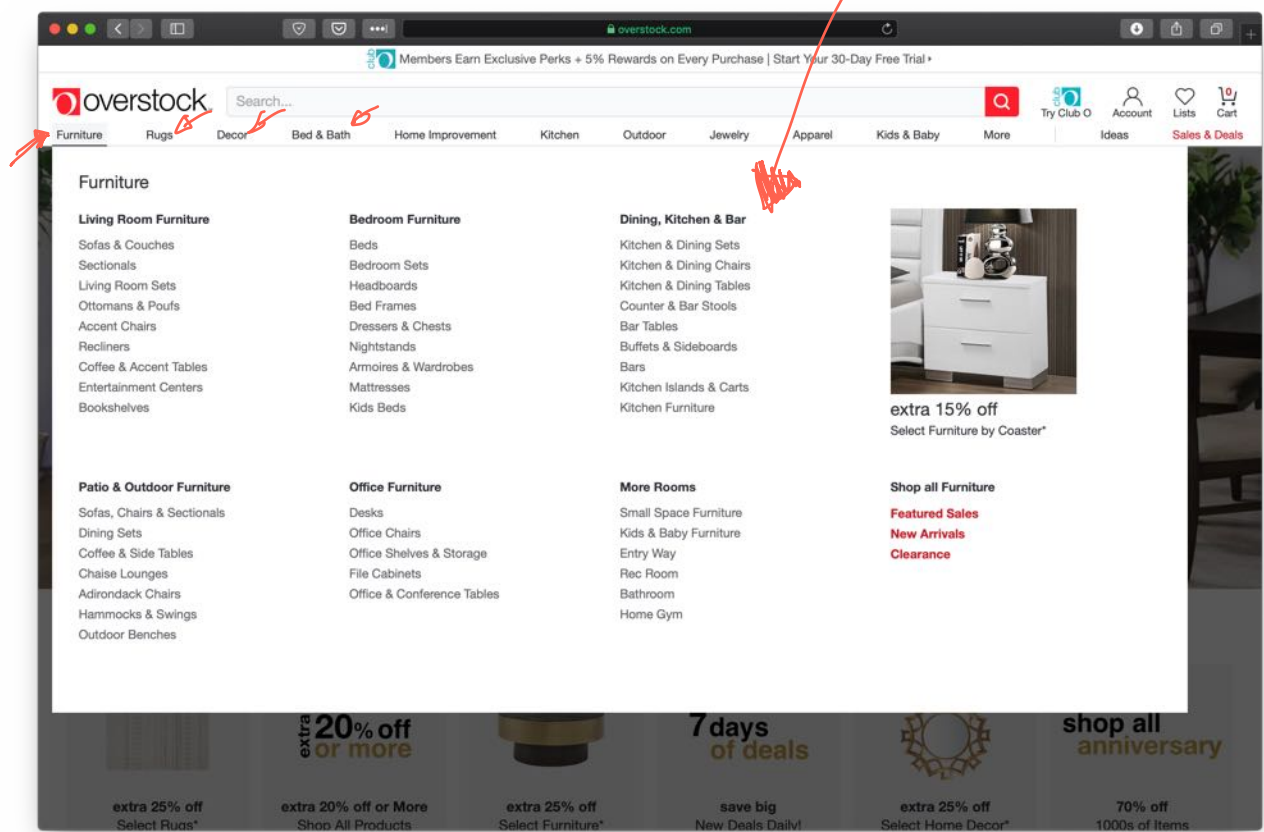


³² Image source: Left, Right

Secondary Navigation Aids

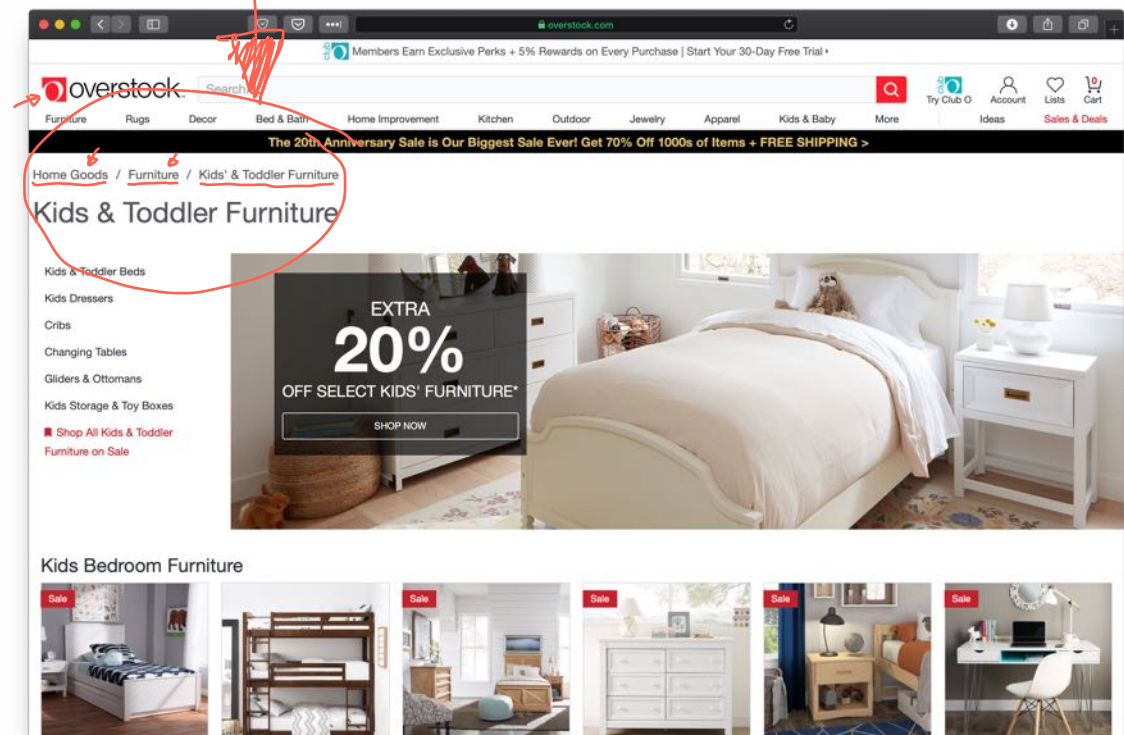
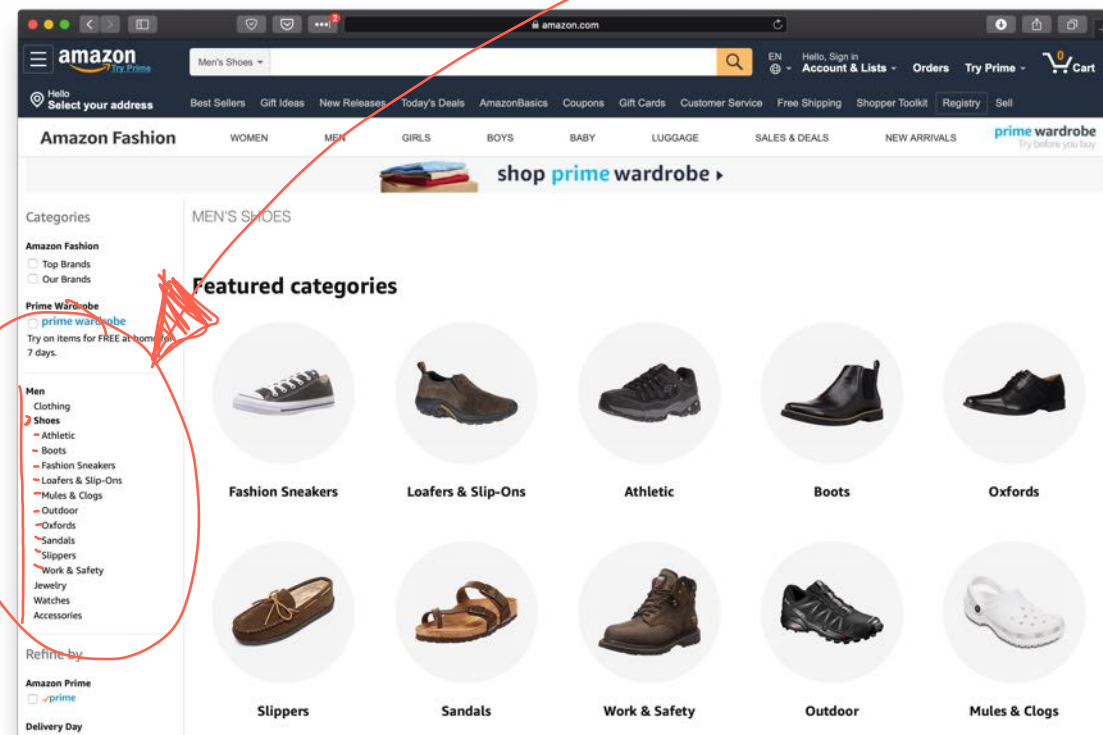


Definition: Secondary navigation aids provide comprehensive links to specific content on the site as *fat navigation*, *left-hand navigation*, *footer navigation*, etc.



How do we get home?

A key problem in complex sites is to get back to previous pages or other pages that are higher in the navigation hierarchy. Breadcrumbs and hierarchical lists are solutions to this problem.



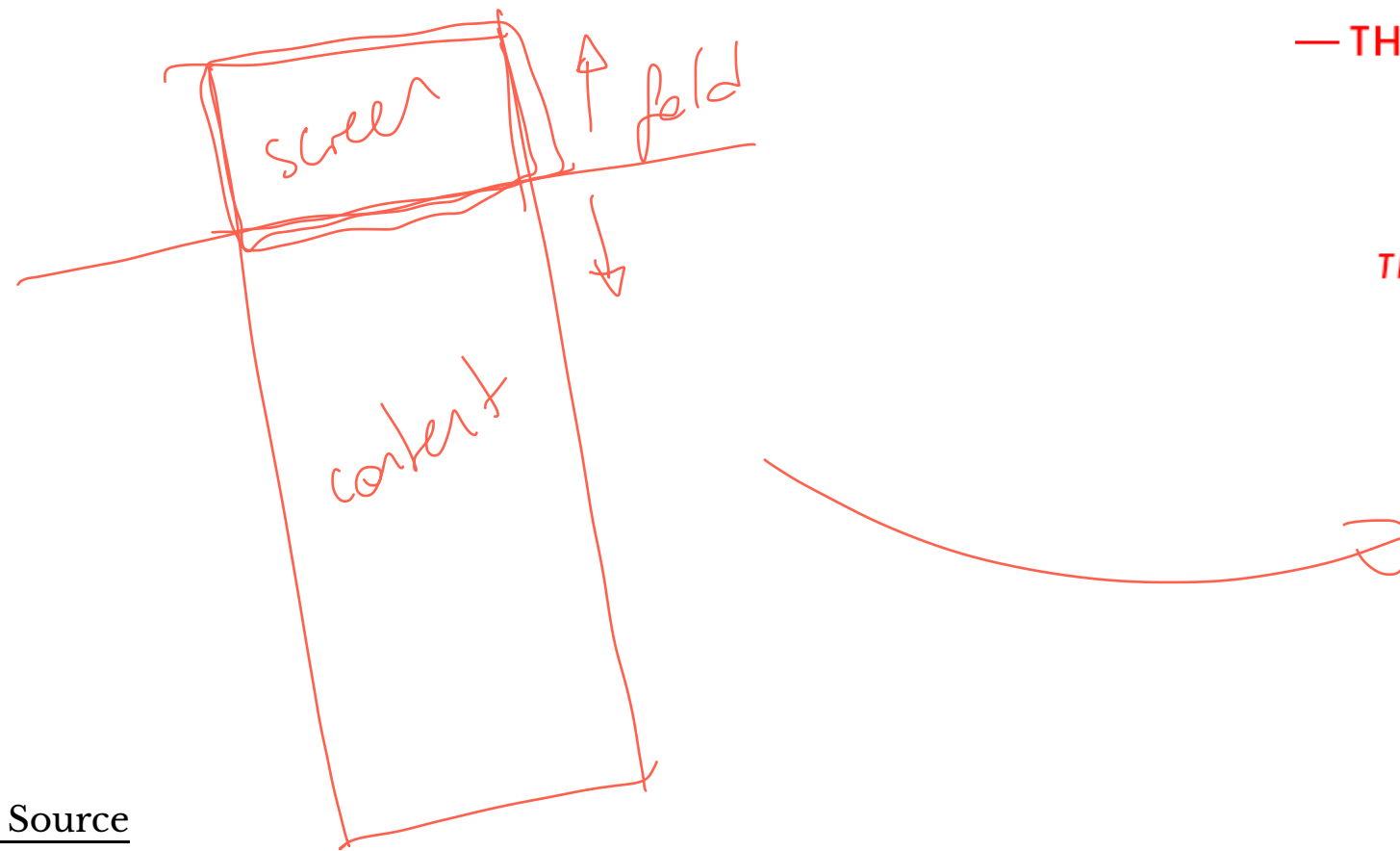
Quiz 2

Complete the Canvas quiz.



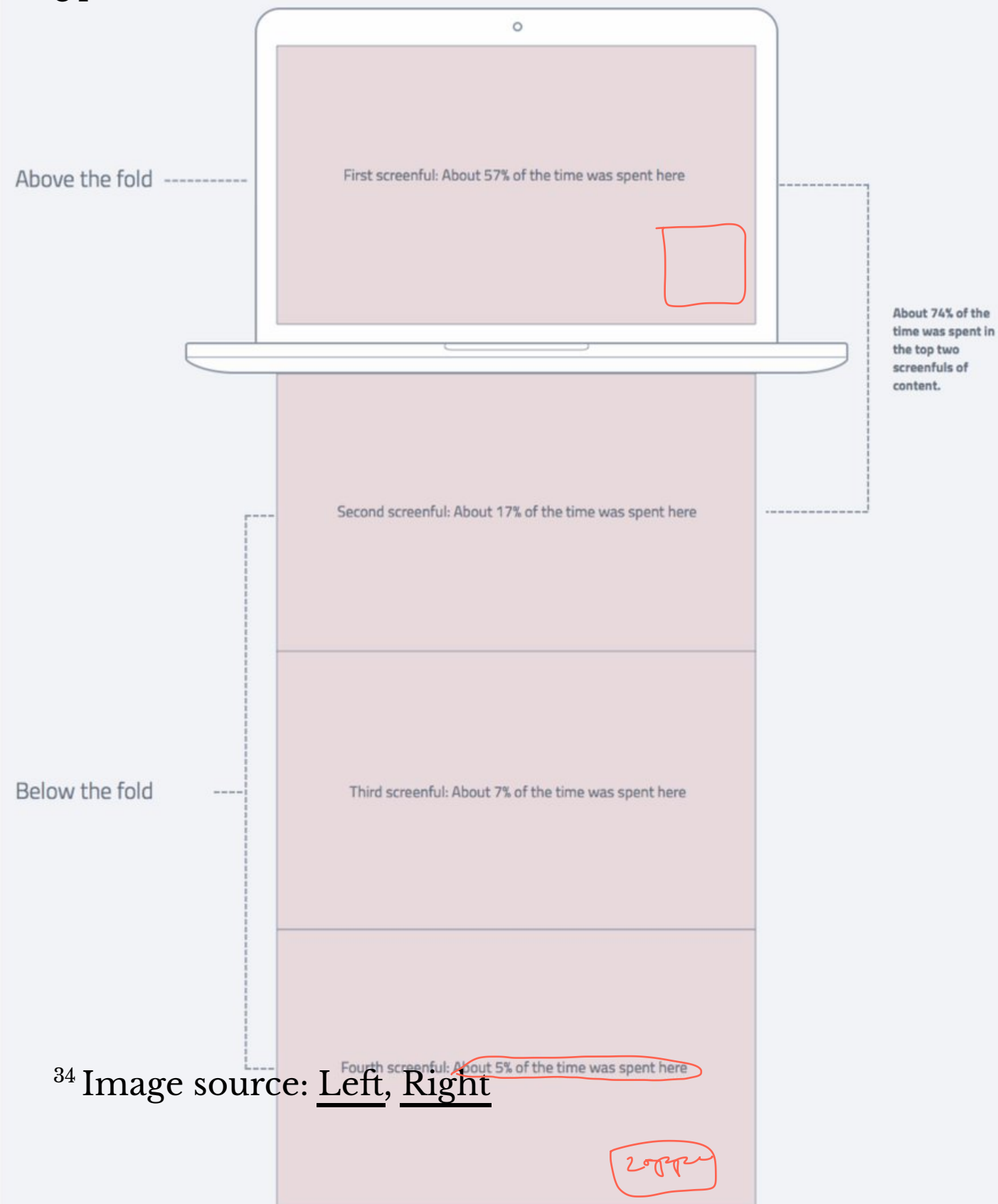
Organizing Page Content: The Fold³³

Definition: The *fold* is the dividing line between the area that is visible when a page first loads and the remainder of the page.



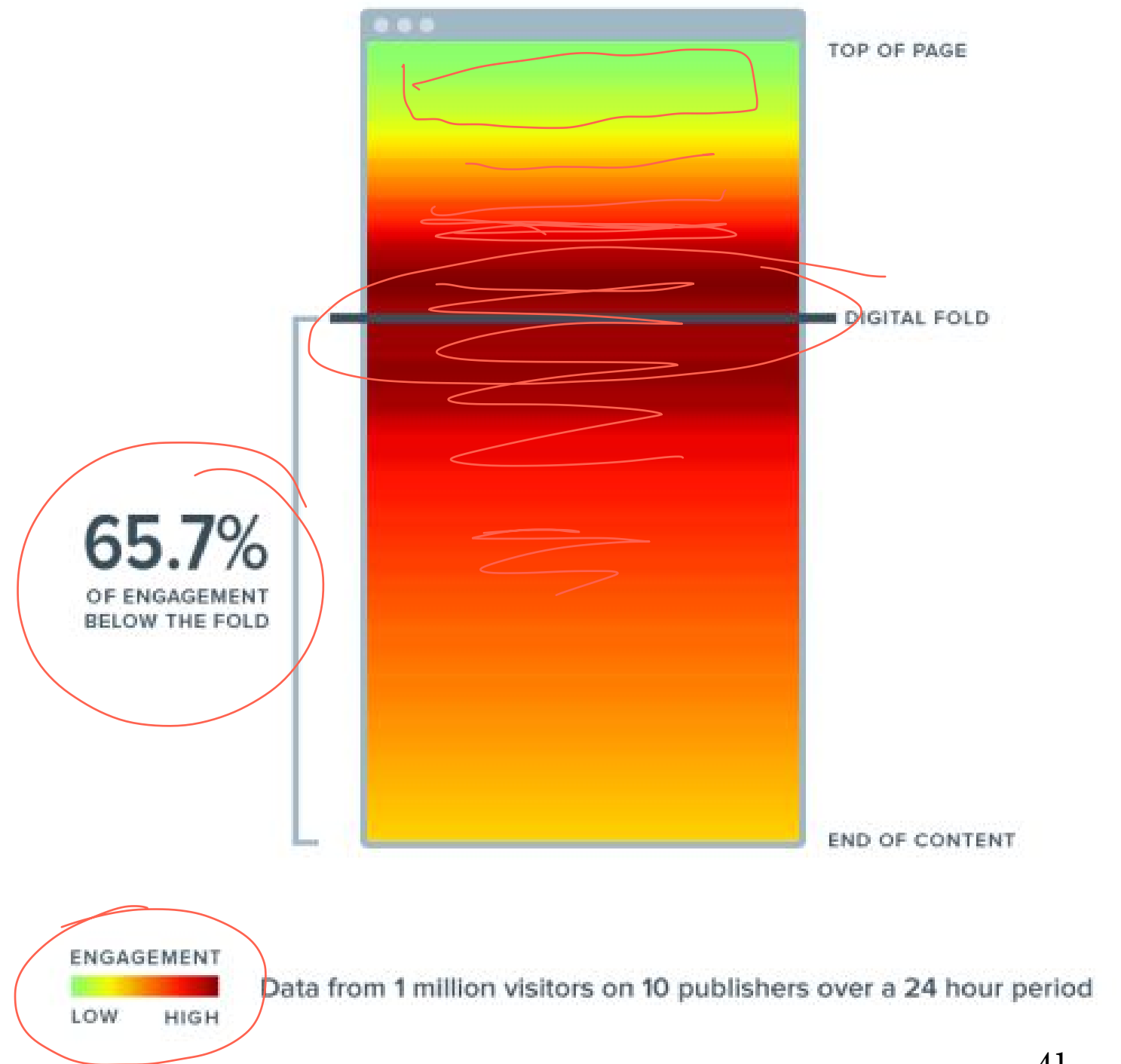
³³ Image Source





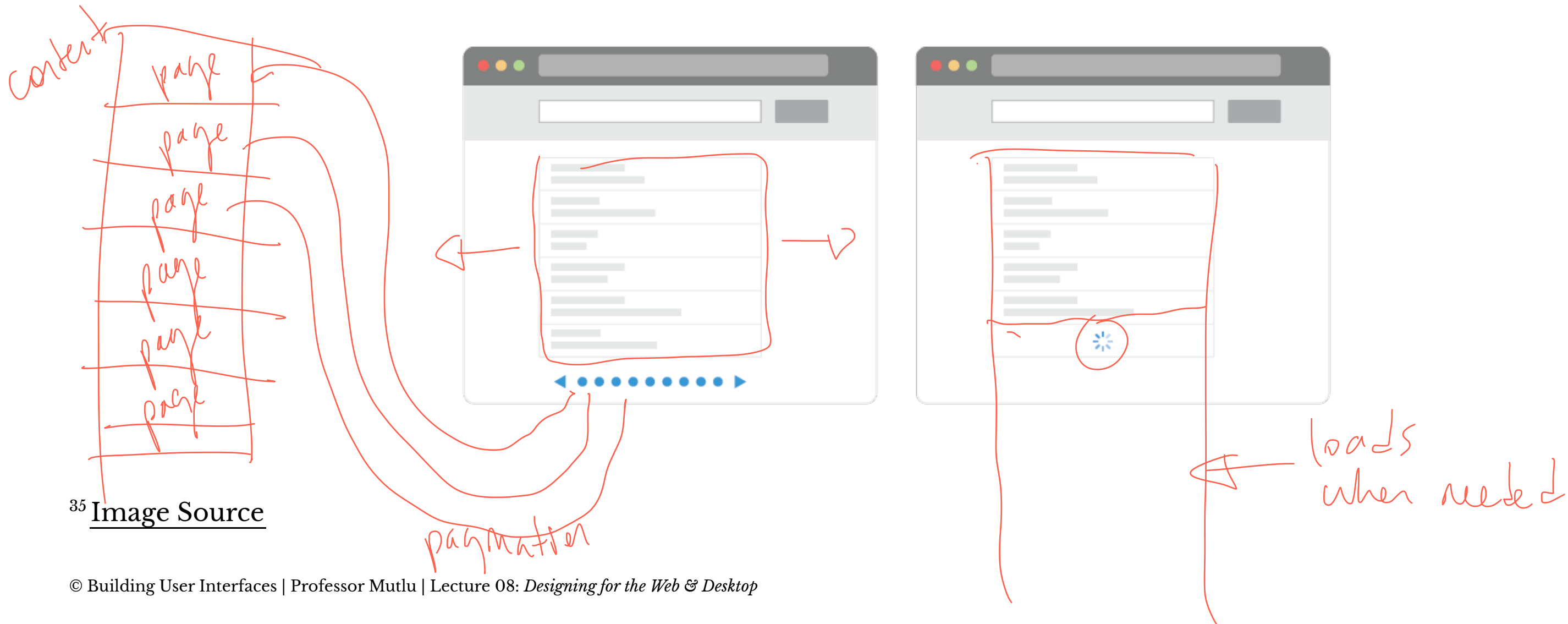
³⁴ Image source: Left, Right

WHERE WE SPEND TIME READING



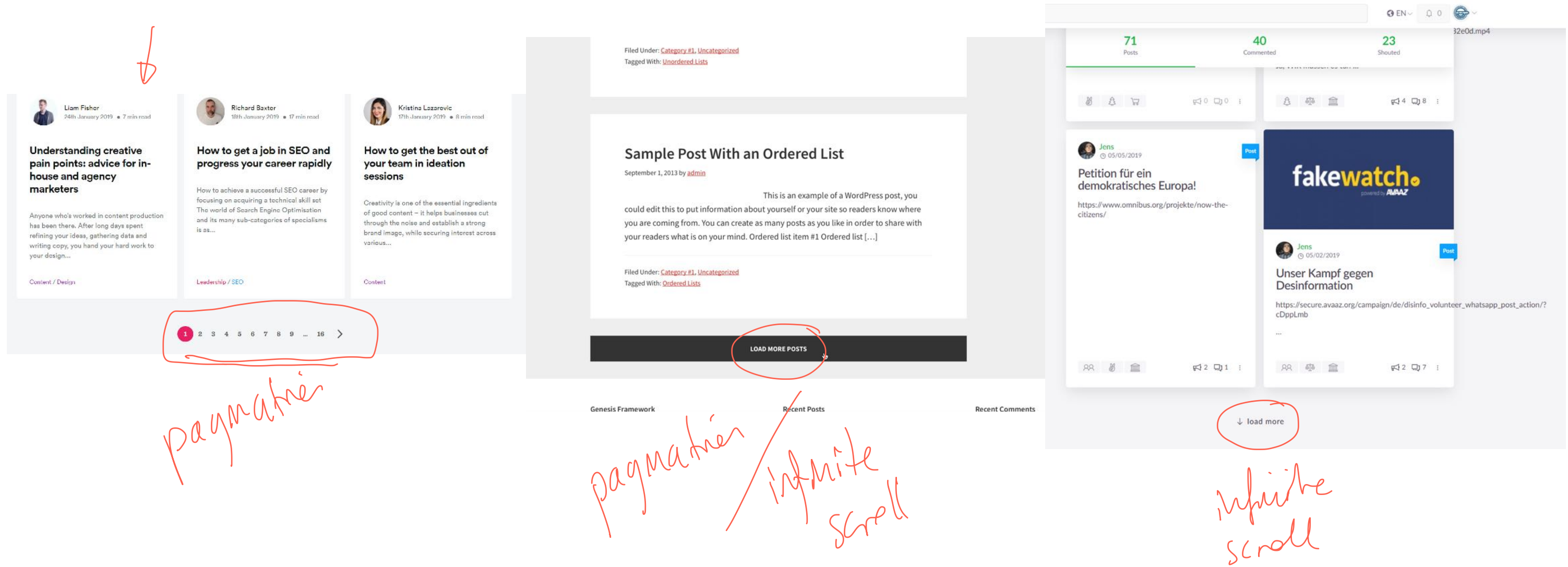
Organizing Page Content: Fitting It All in³⁵

Large volumes of content is either broken into discrete pages through *pagination* or incrementally loaded through *infinite scroll*.



³⁵ Image Source

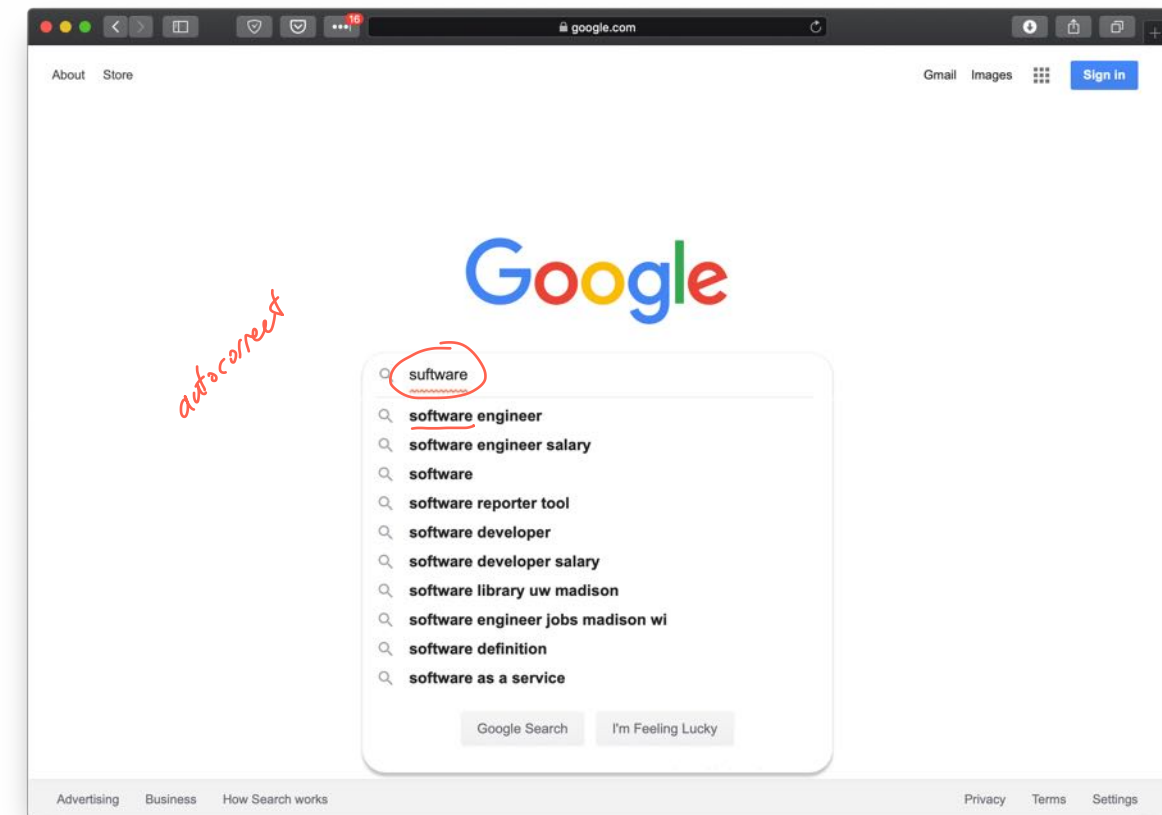
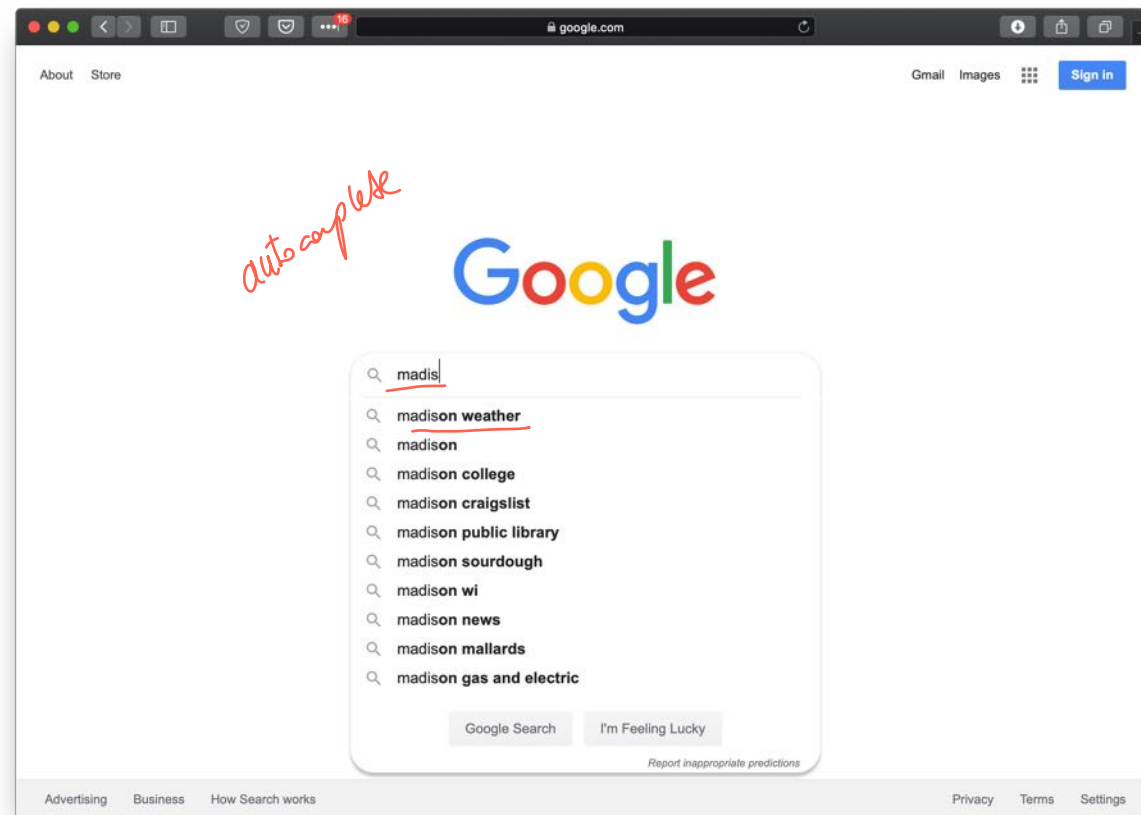
Examples of pagination and infinite scroll:³⁶



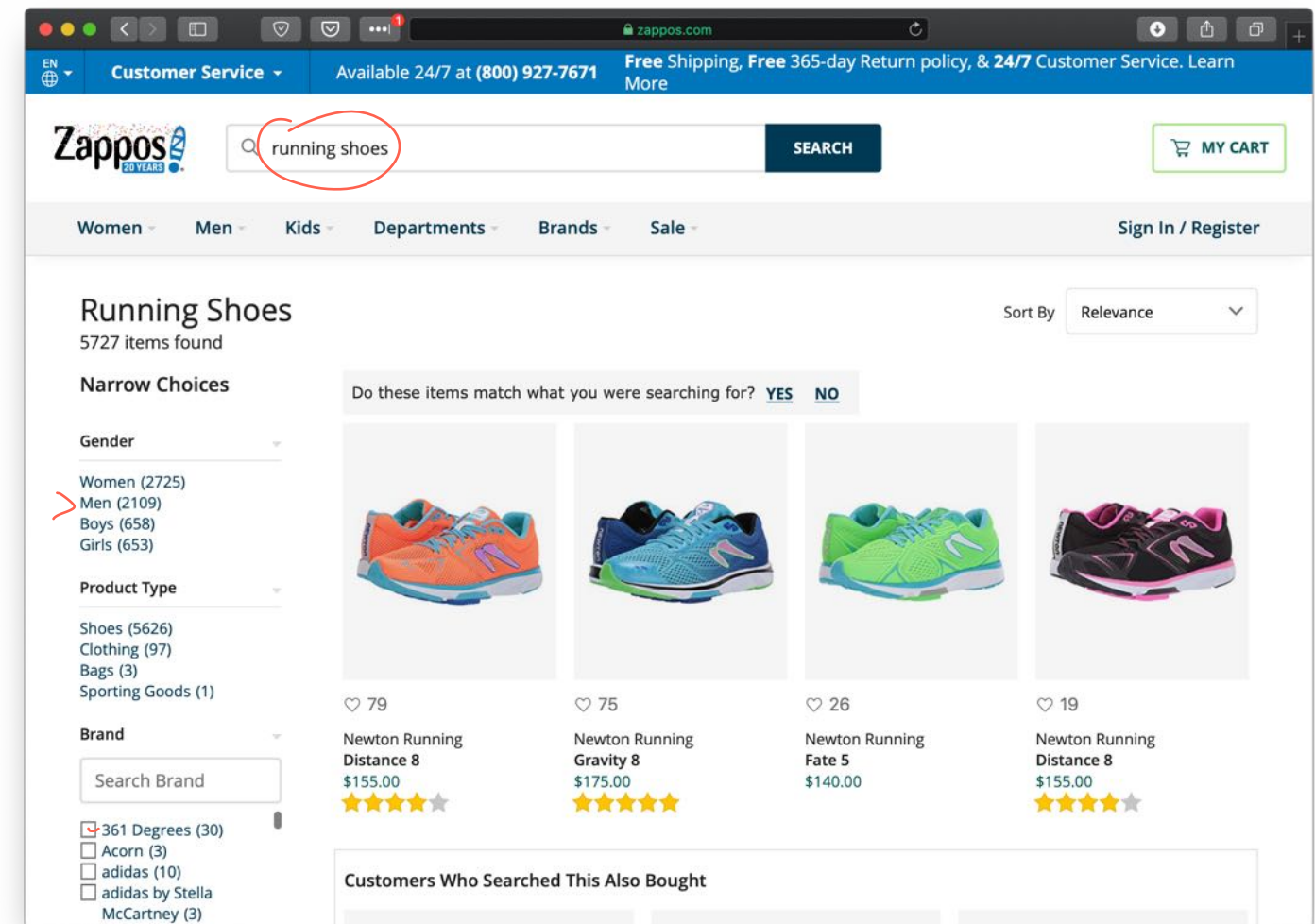
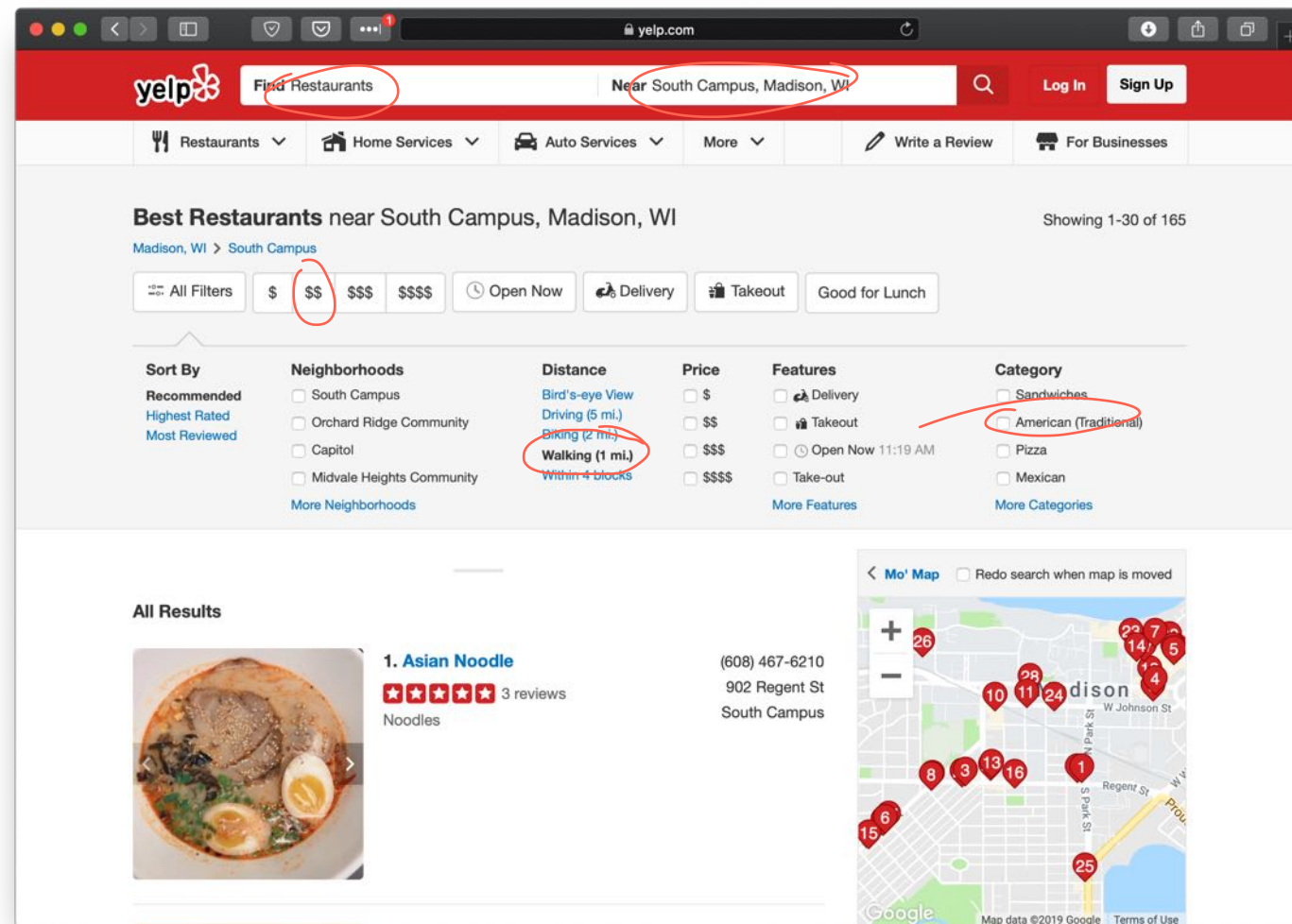
³⁶ Image source: Left, Center, Right

Search

Definition: Search, an alternative to page navigation, provides users with listings of content based on a search query.



Faceted search helps users narrow down a search once results are returned based on a simple query by providing functions to sort and filter the results.



Quiz 3

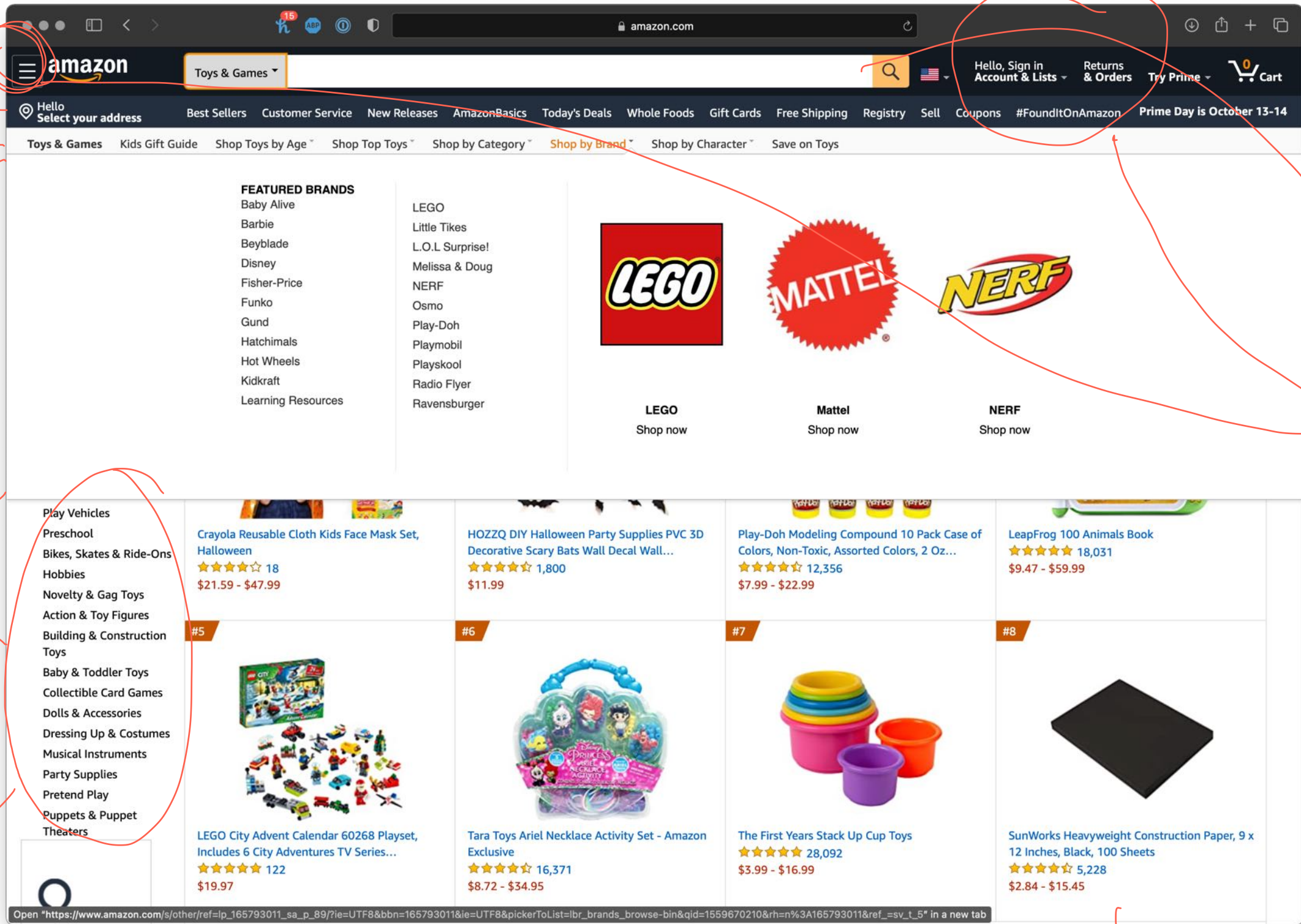
Complete the Canvas quiz.



In-Class Activity 2: Web Application Deconstruction

Image Source

primary nav
2nd level primary nav.
secondary fat navigator



search

fat navigator

sidebar
hierarchical list

faceted search

paginated

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- A brief history of user interfaces
- Platform-specific design
 - Designing for the desktop
 - Designing for the web