

Building User Interfaces

Designing **for Web & Desktop**

Professor Yuhang Zhao

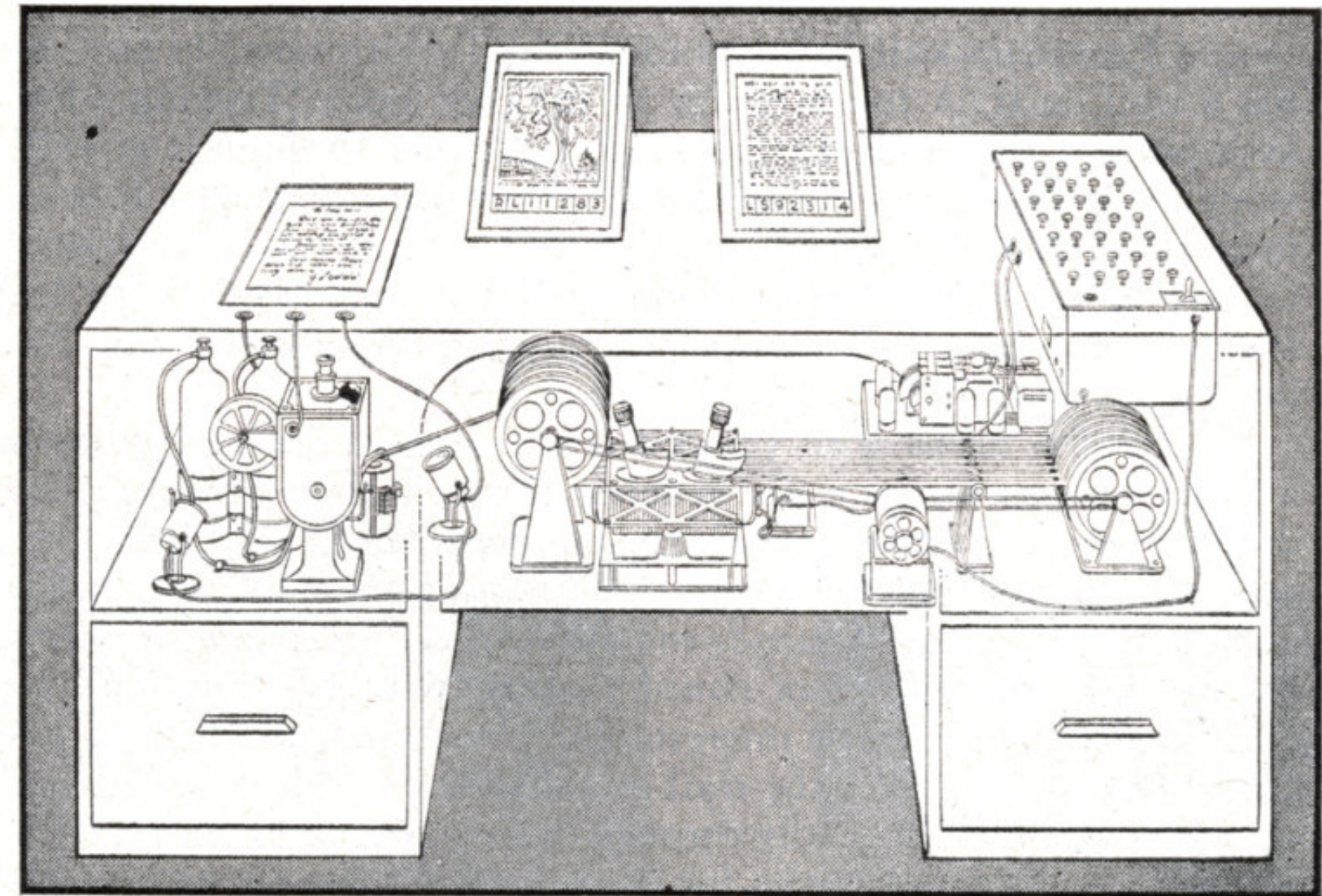
What we will learn today?

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

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.

¹Wikipedia: [Memex](#)

²[The Atlantic: As We May Think](#)

³Image Source: [Monoskop](#)

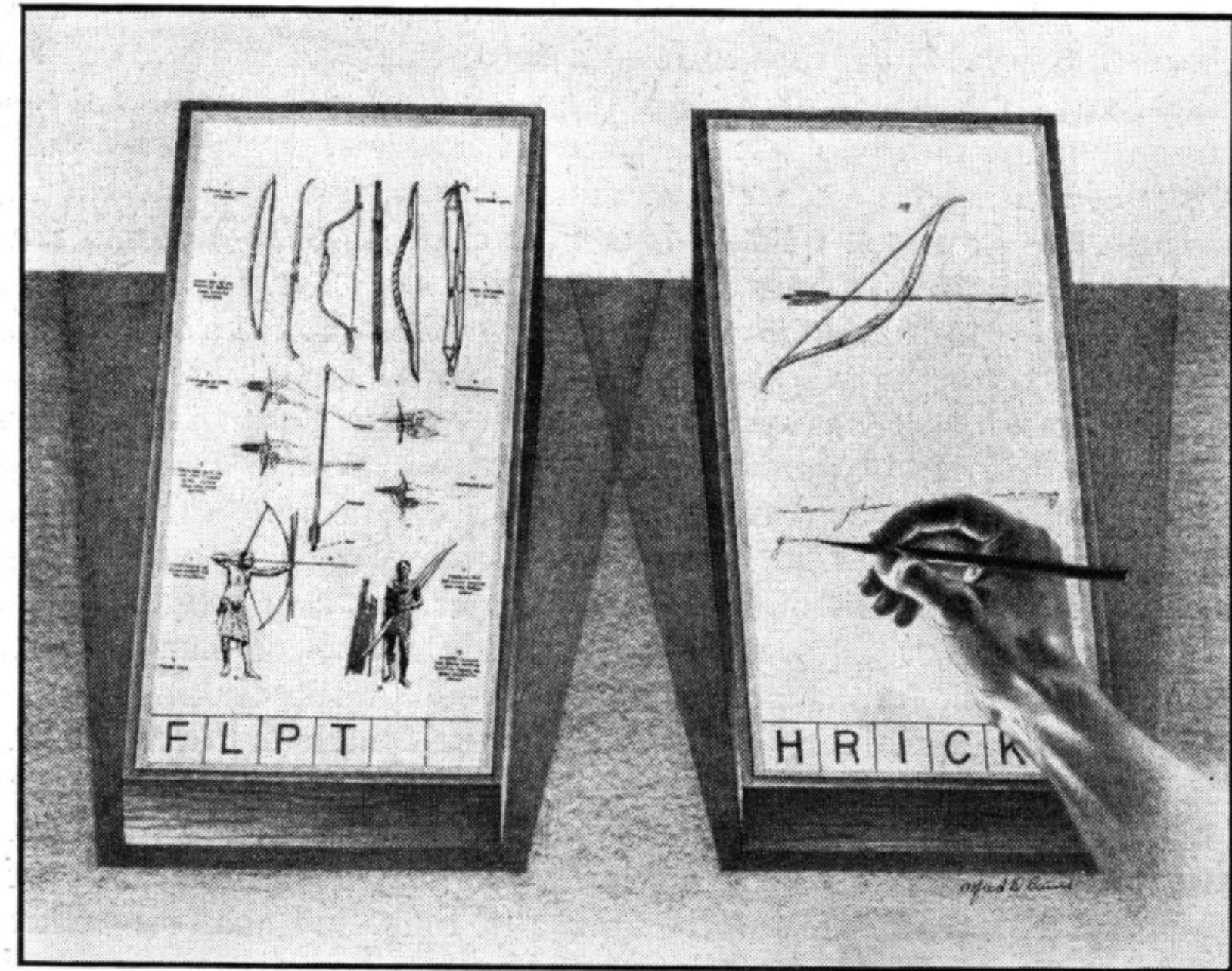
Milestone 1, Continued⁴ ⁵

“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

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](#)



Source

GO



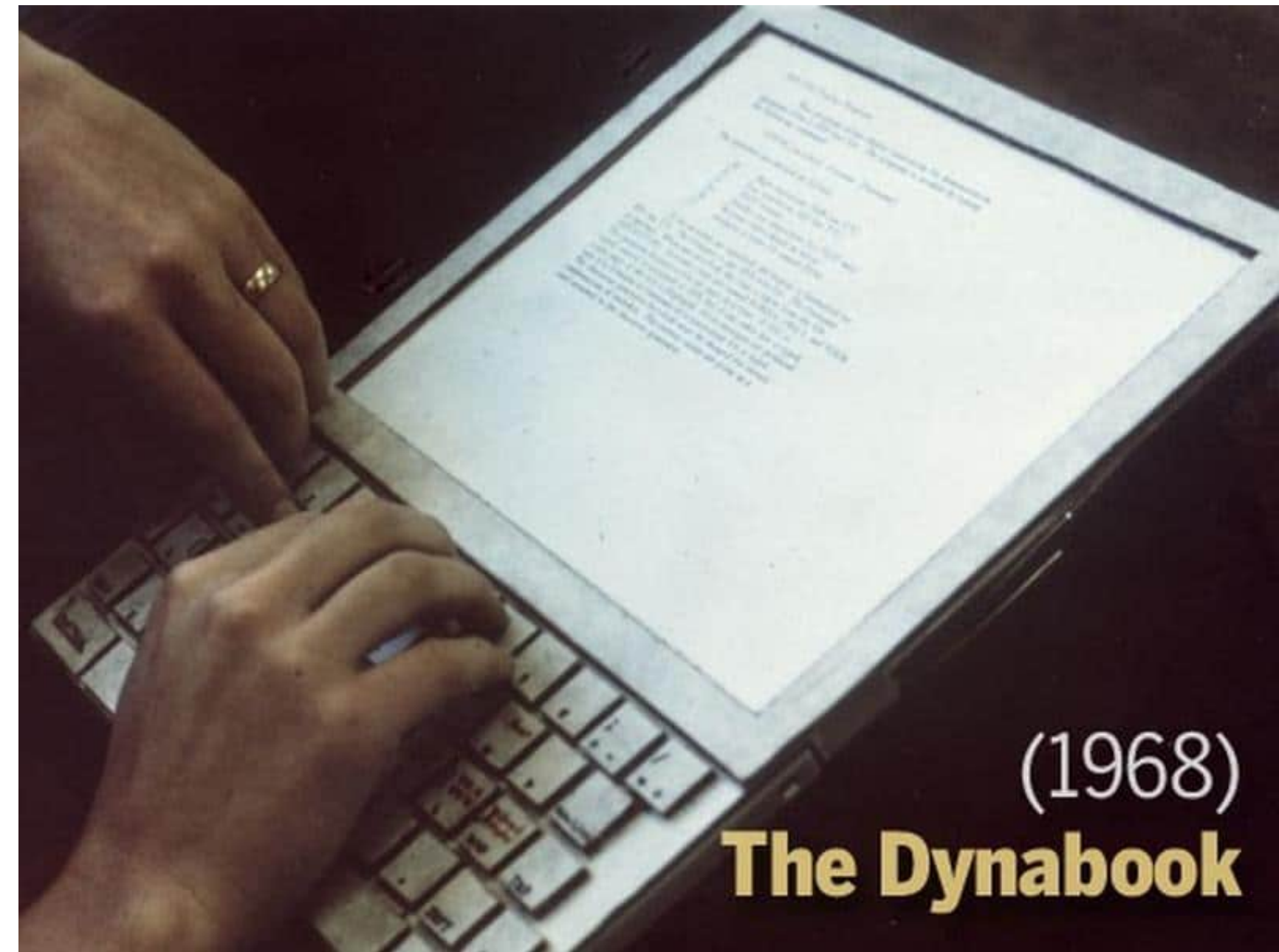
Milestone 3: Dynabook, 1968^{10 11}

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, 1973^{12 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).



¹² [Wikipedia: Dynabook](#)

¹³ [Image source](#)

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](#)

12294 Free Disk Pages | Help

Example viewPoint Document

Close Save Reset Save&Edit

XEROX 6085 Workstation

User-Interface Design

To make it easy to compose text and graphics, to do electronic filing, printing, and mailing all at the same workstation, requires a revolutionary user interface design.

Bit-map display - Each of the pixels on the 19" screen is mapped to a bit in memory, thus, arbitrarily complex images can be displayed. The 6085 displays all fonts and graphics as they will be printed. In addition, familiar office objects such as documents, folders, file drawers and in-baskets are portrayed as recognizable images.

The mouse - A unique pointing device that allows the user to quickly select any text, graphic or office object on the display.

See and Point

All functions are visible to the user on the keyboard or on the screen. The user does filing and retrieval by selecting them with the mouse and touching the MOVE, COPY, DELETE or PROPERTIES command keys. Text and graphics are edited with the same keys.

Shorter Production Times

Experience at Xerox with prototype work stations has shown shorter production times and thus lower costs, as a function of the percentage of use of the workstations. The following equation can be used to express this:

$$X = \frac{A + PP}{1 + P}$$

where X is the percentage of use of the workstation, A is the number of pages per hour, P is the percentage of use of the workstation, and PP is the percentage of use of the workstation.

Table 7: Percentages of Use of the Tools

Year	Mon 6085	6085
1978	85.2	15.8
1980	41.1	39.9
1982	45	55
1984	30	70
1986	10	90
1988	5	95

Figure 7: Data from Table 1 drive

Activity under the old and the new

Workstation usage percentages Table 1 and illustrated in Figure 6085 users are likely to do no composition and layout, control process including printing and display.

Text and Graphics

To replace typesetting, the 6085 offers a choice of type fonts and sizes, from 6 point to 36 point:

Here is a sentence of 16 point text.
 Here is a sentence of 12 point text.
 18-point text.
 24-point text.
 36-point text.

Brother Domini

9:27:24
10-29-88

N.H. Local Kevin J. Outbaske

Mail Merge Mail from Ken

Calendar Calc Loader

Blank User Dictionary Empty Dictionary Blank Record File

Blank Document

2.0 Beechnut Monthly Profit Blank Folder

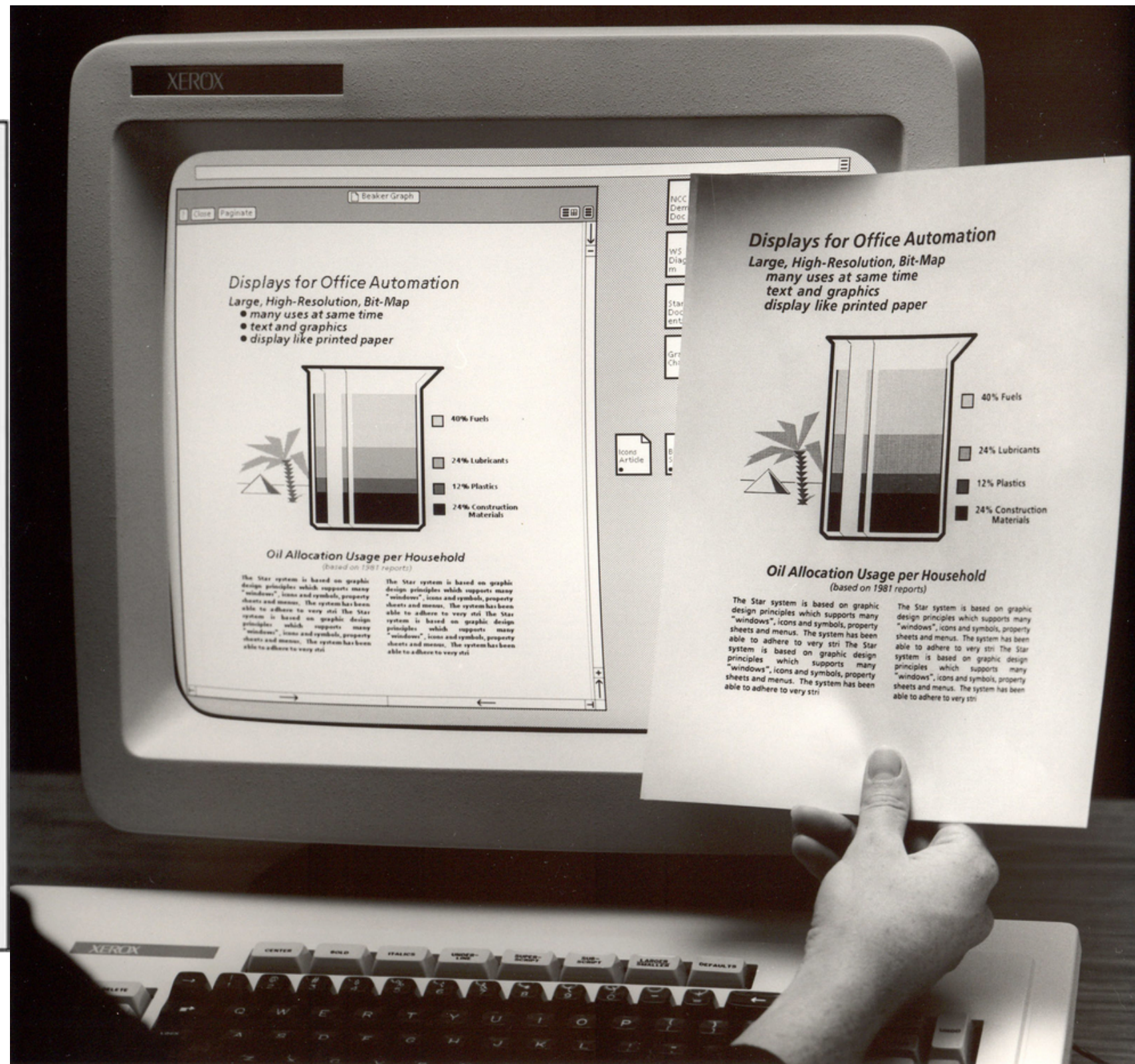
C Tools Blank Illustratr Blank Canvas

PC Converter Blank Shared Book Blank Book

Emulator Virtual Floppy Example ViewPo Remote Files

Emulated Rigid Disk Swaps C-O-S & Lotus 4427 Blank Reference

Drawers in Japan Mackey OSBU Xerox Tape Drive Floppy Drive Wastebasket Directory



18 Image source: Left, Right

Evolution of "Document" Icon Shape

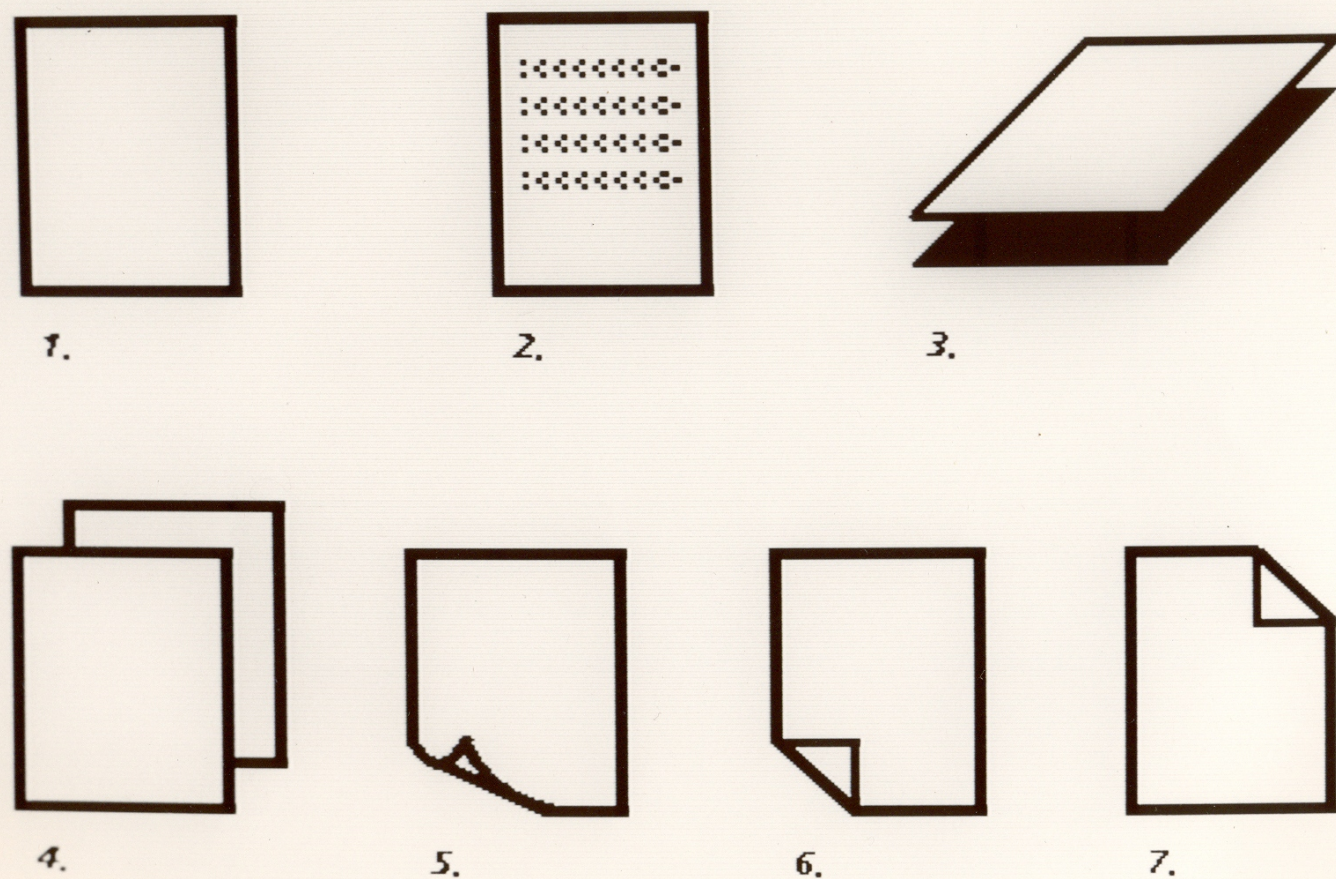
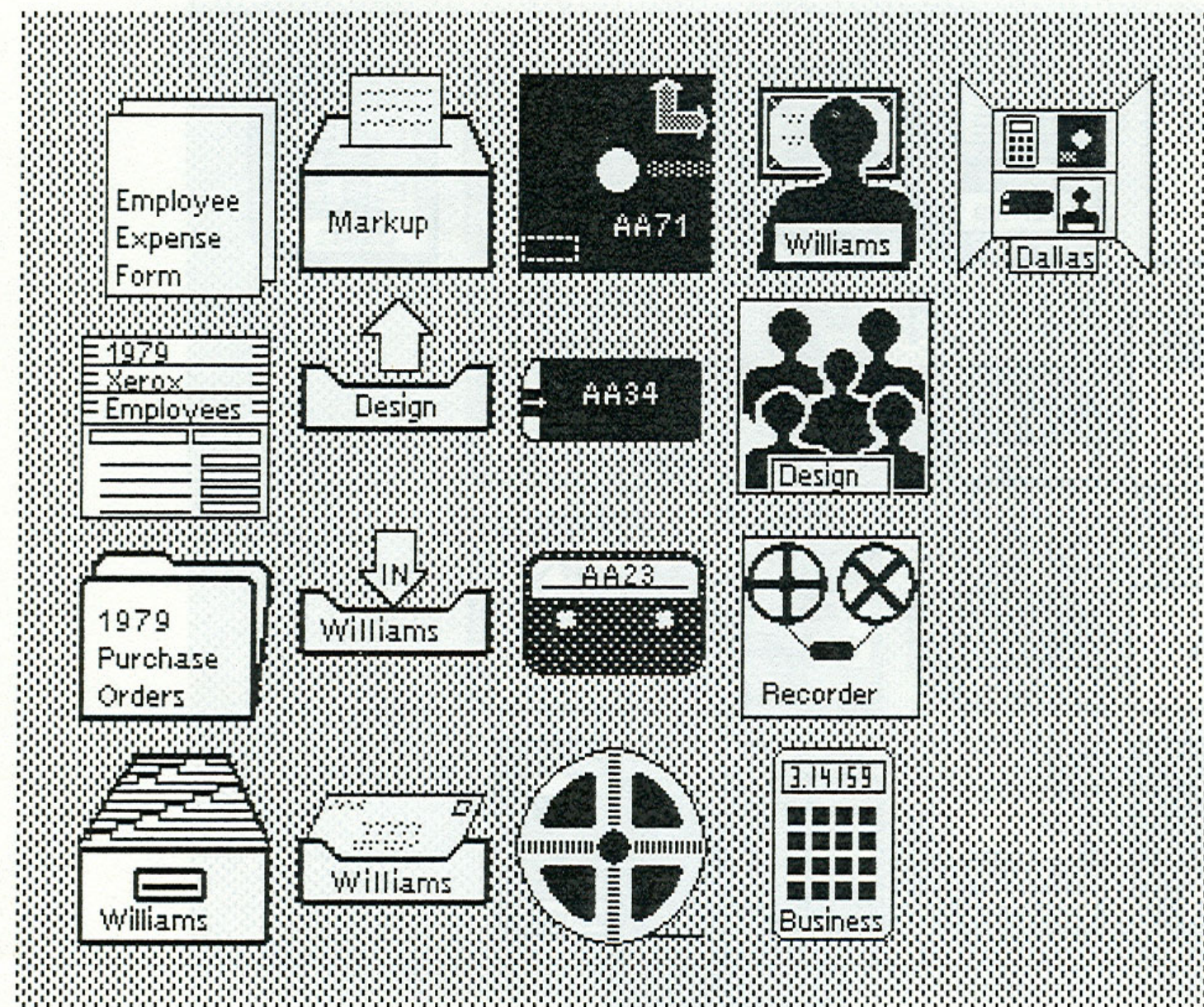


Figure 4.
Set 4 (Judd)



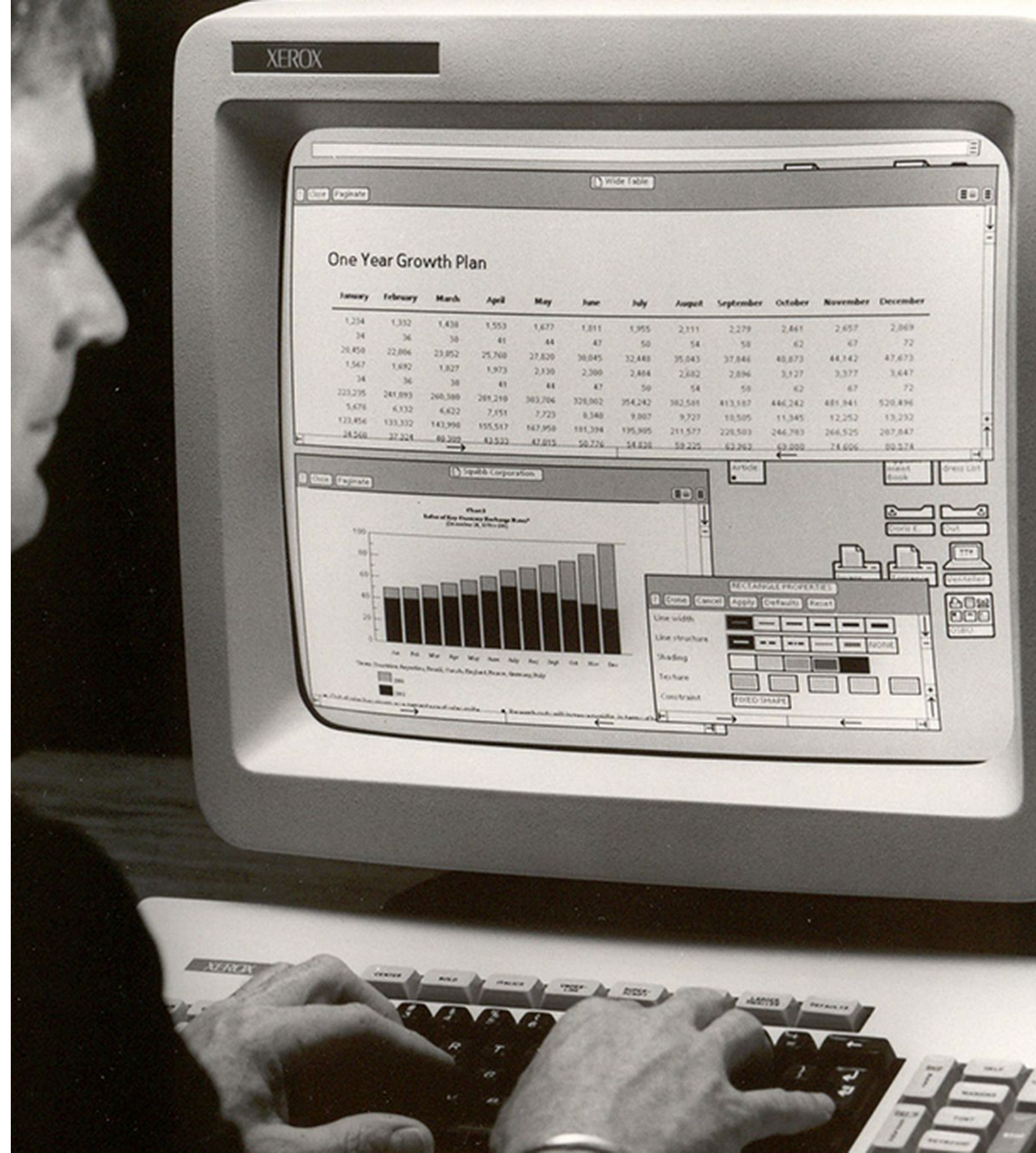
- | | | | | |
|-------------|-----------------------|-------------|------------|-----------|
| document | printer | floppy disk | user | directory |
| record file | out-basket | mag. card | group | |
| folder | in-basket | cassette | recorder | |
| file drawer | in-basket (with mail) | mag. tape | calculator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

¹⁹ Image source: Left, Right

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).

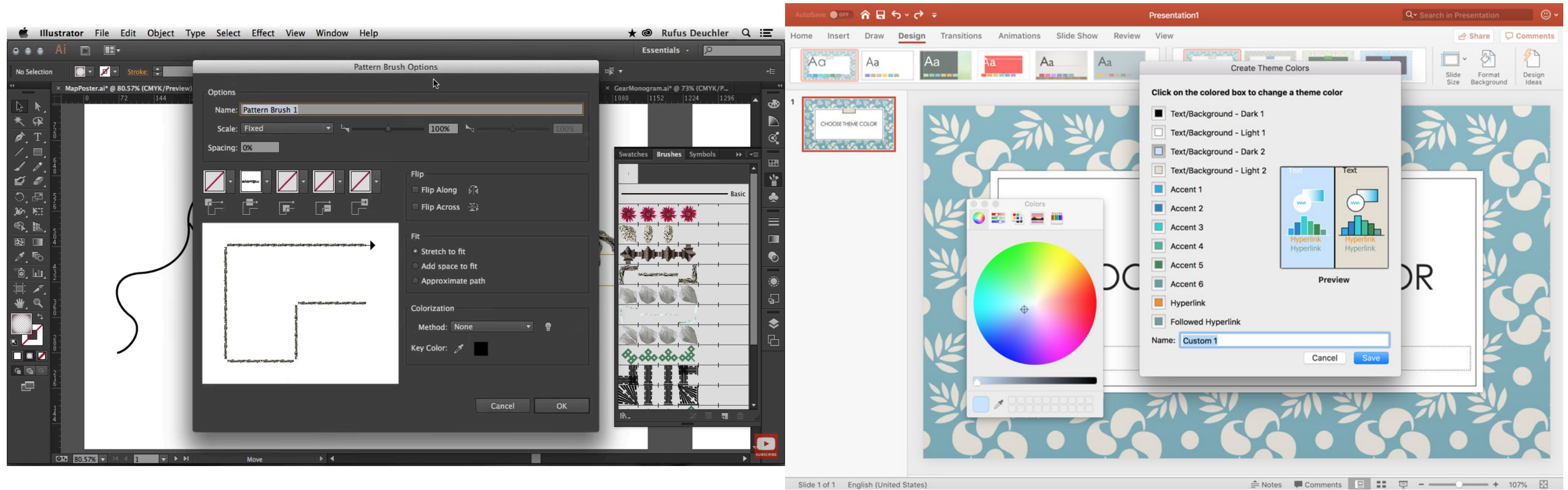


²⁰ [Image source](#)

Elements of the WIMP Paradigm: *Windows*

Definition: Windows are resizable containers of individual applications.

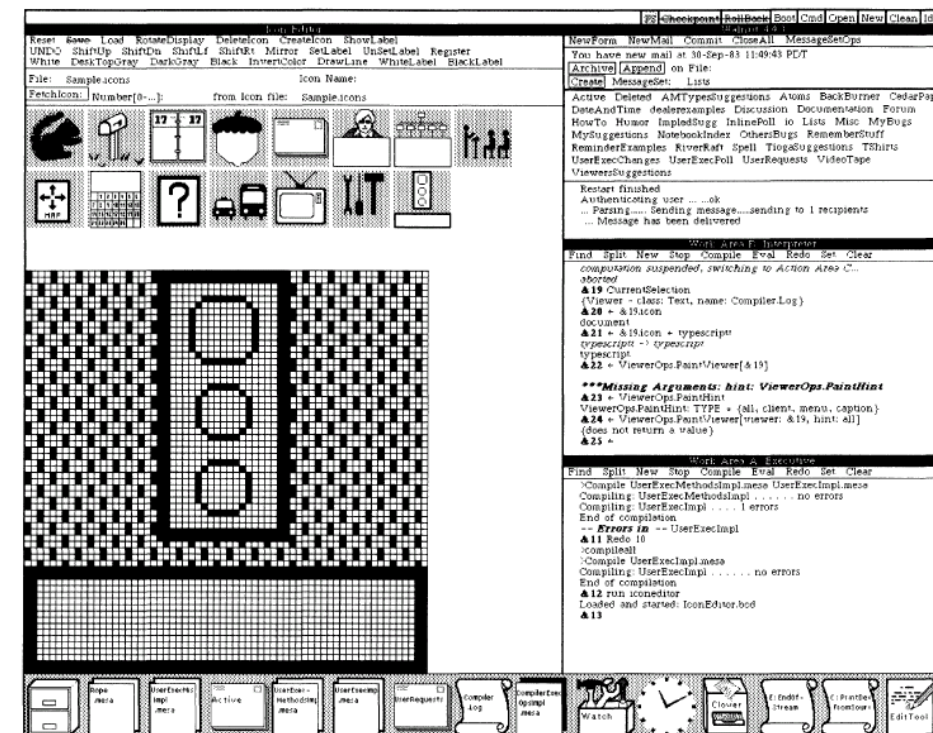
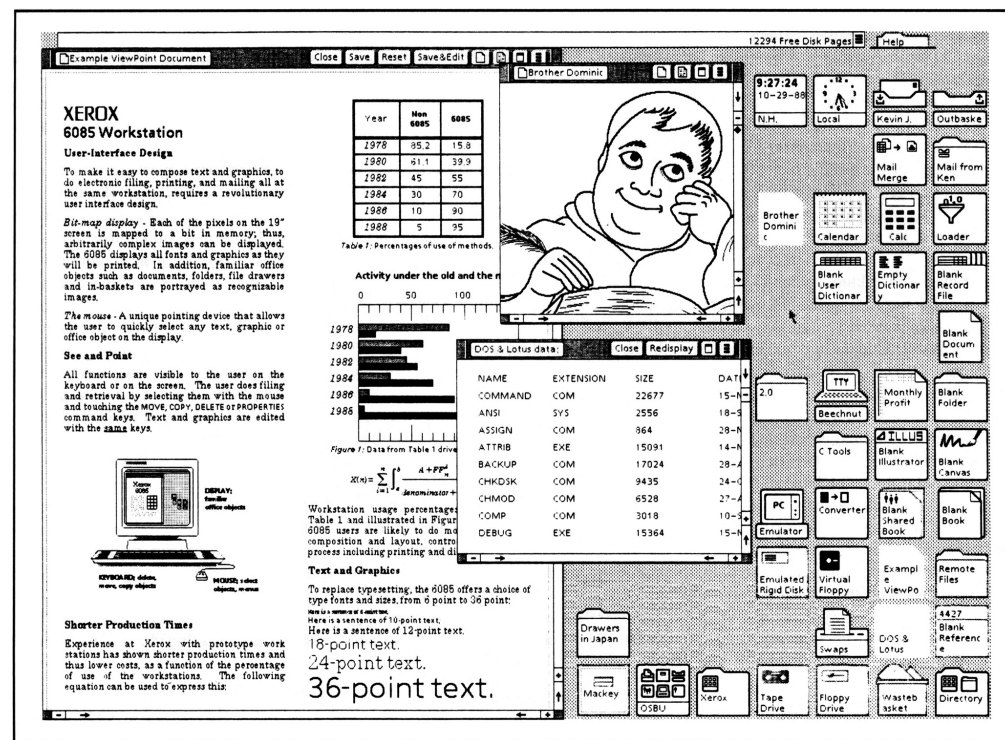
Primary windows contain elements for the main functionality of the application, such as a canvas. *Secondary* windows support main windows through modal panes, dialog boxes, etc.



21 Image source: Left, Right

Window Organization²²

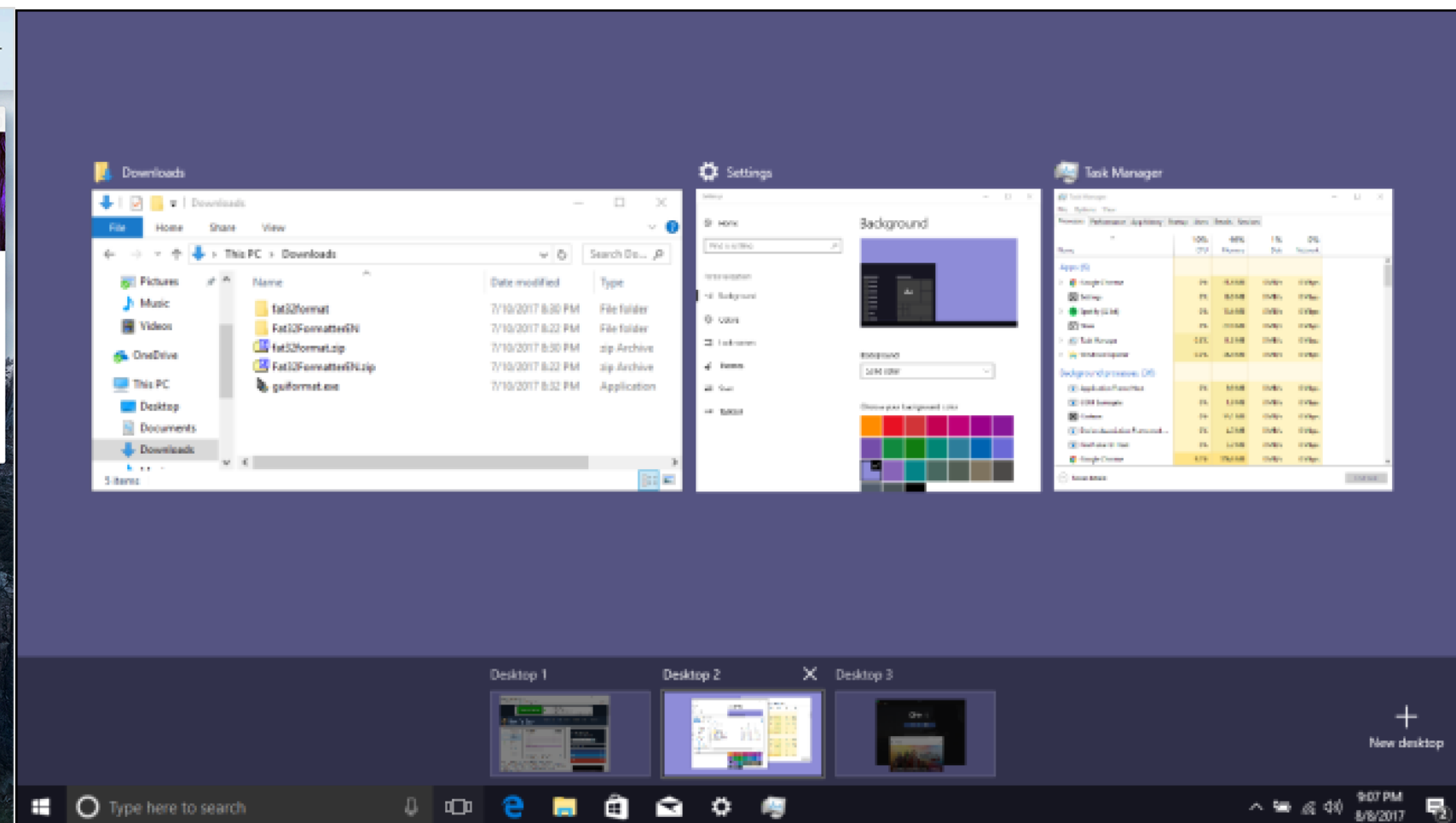
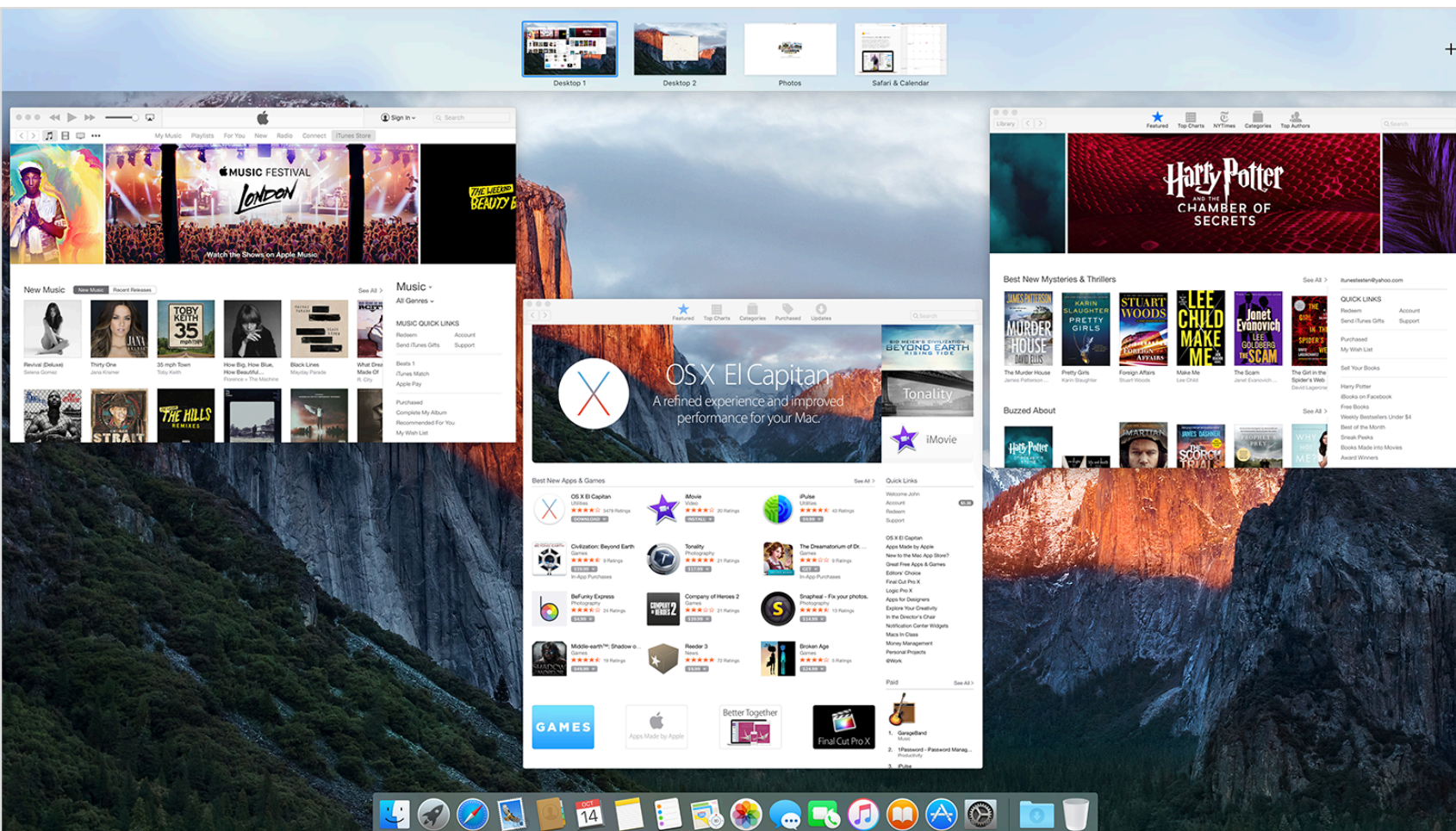
Definition: Windows can be organized in a way that overlaps several windows or tiles them across the screen.



²² Image source: Left, Right



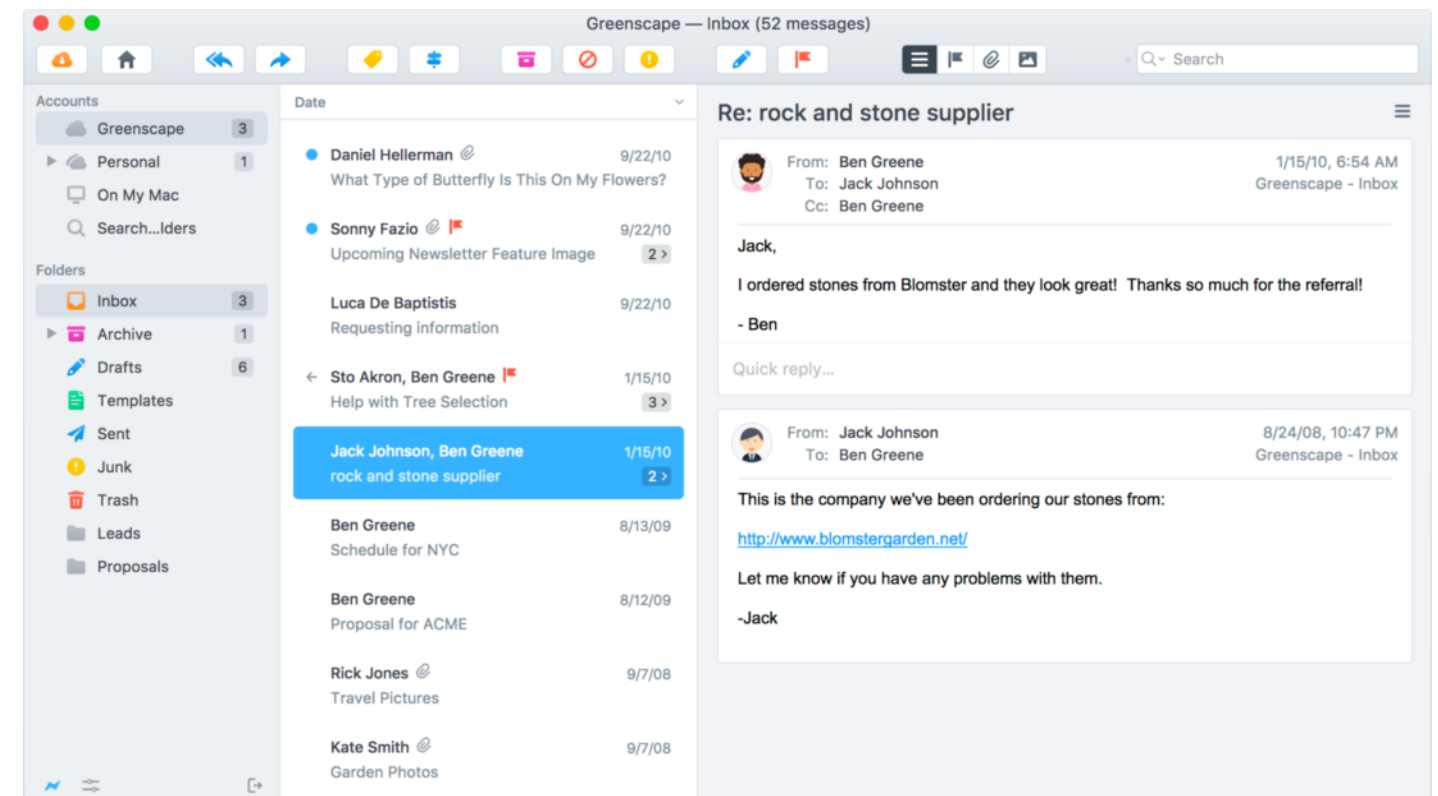
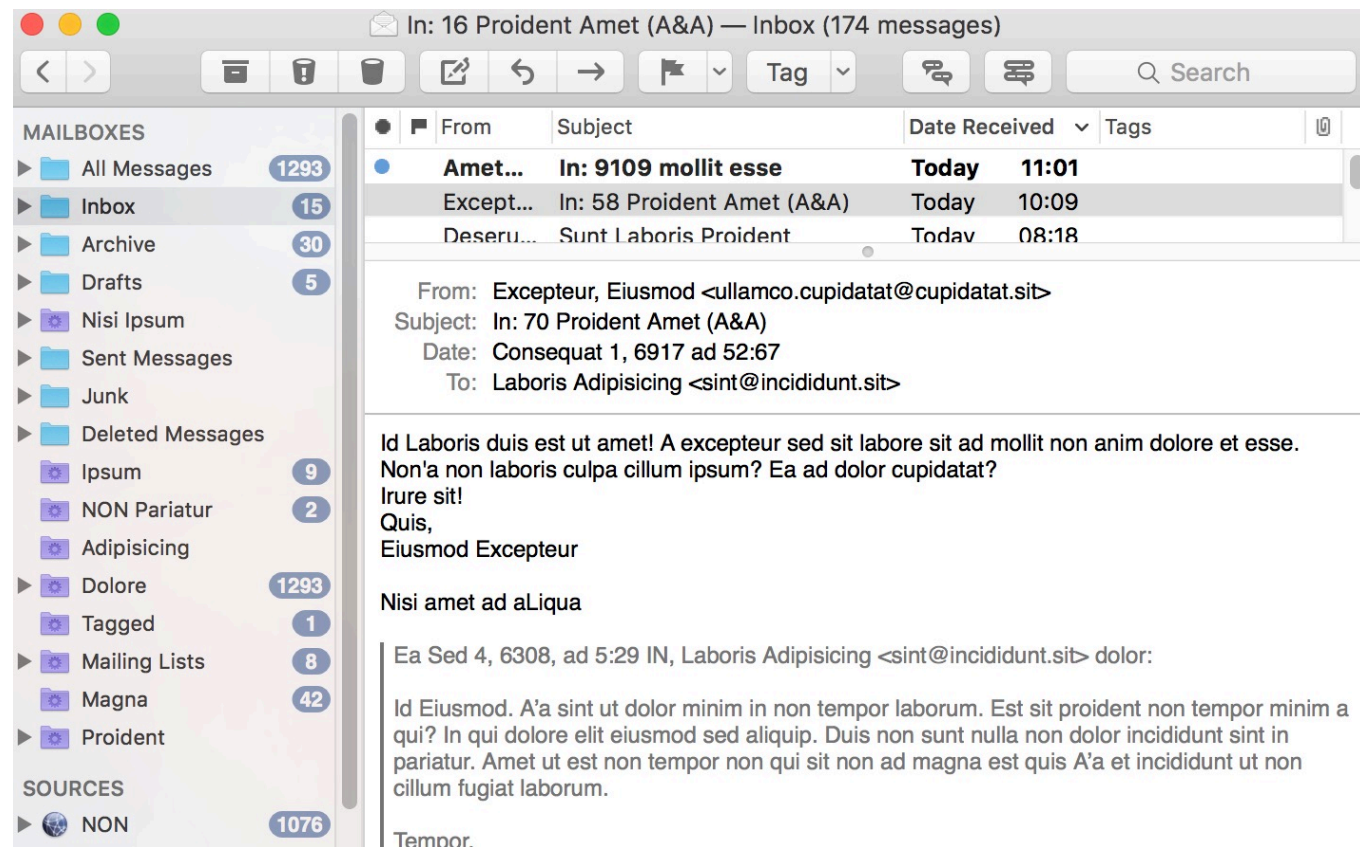
²³ Image source: Left, Right



²⁴ Image source: Left, Right

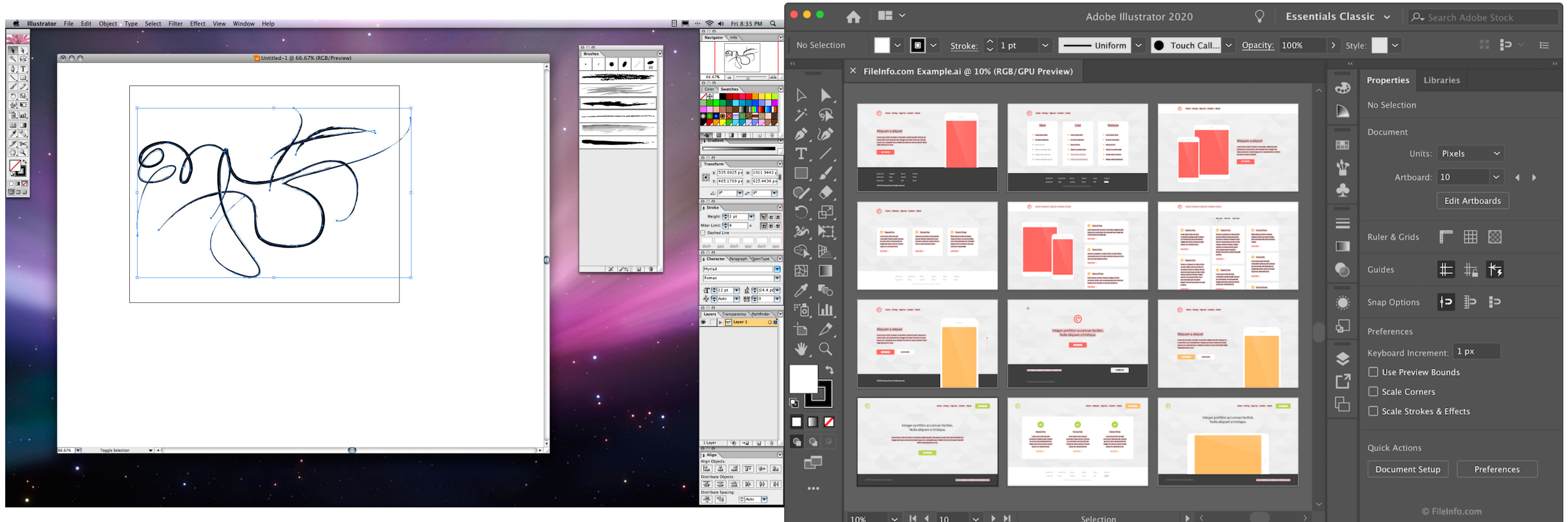
Window Structures²⁵

Windows bring together dedicated *panes* in different configurations.



²⁵ Image source: Left, Right

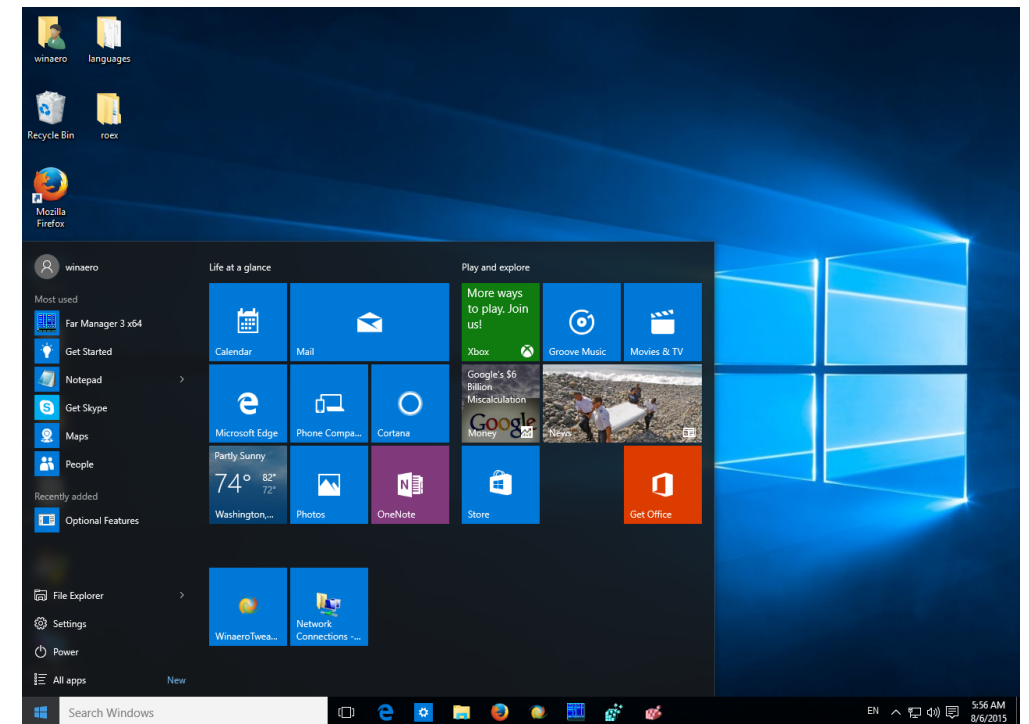
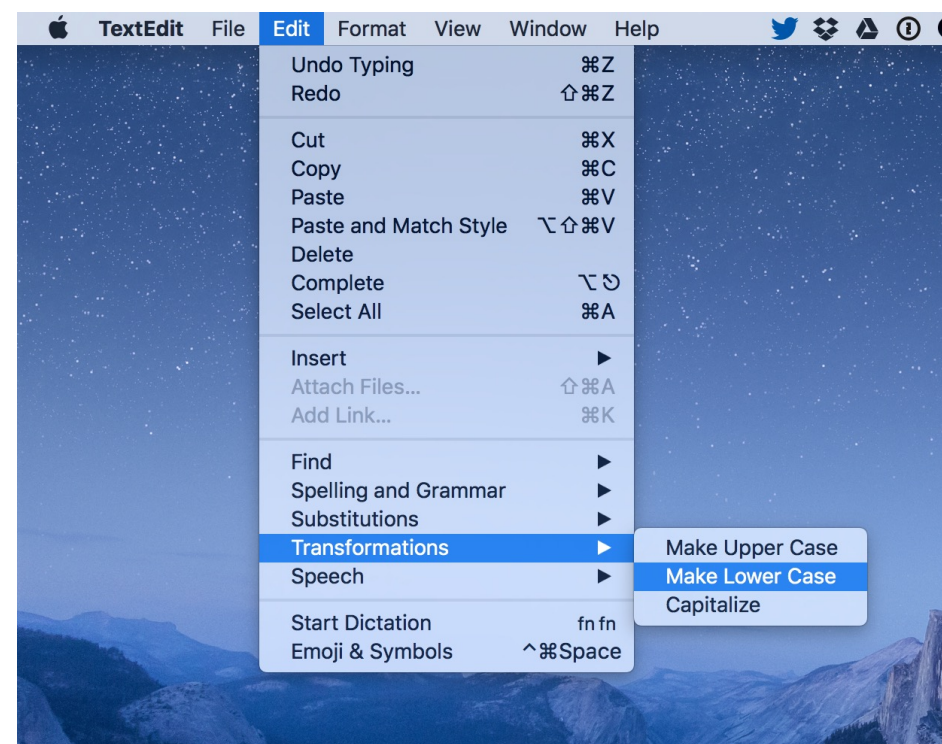
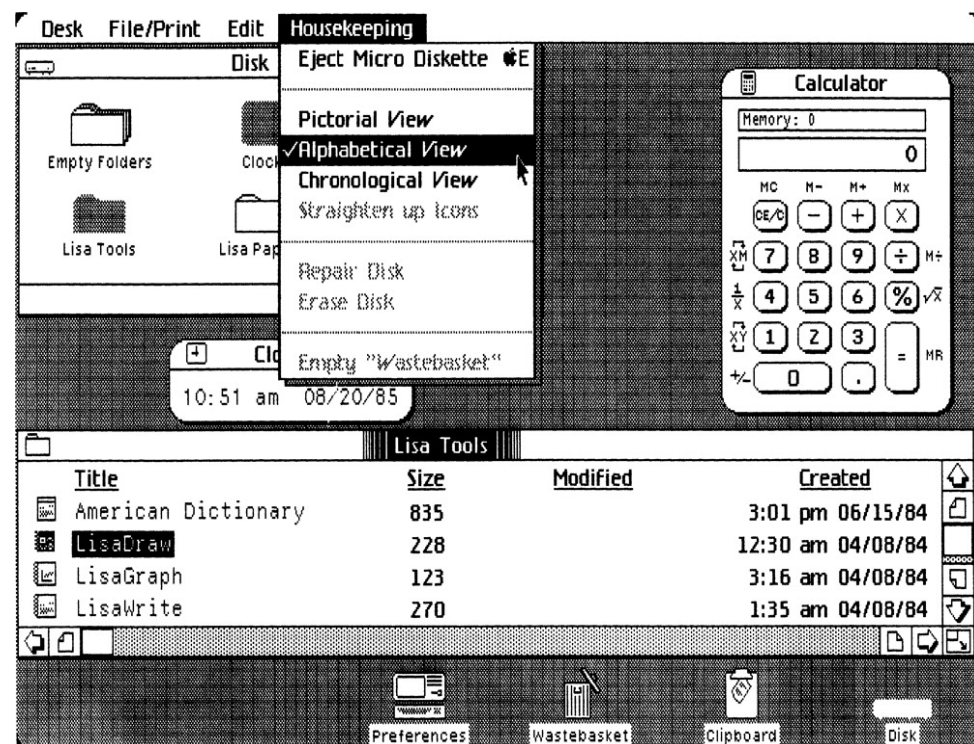
Secondary windows can be *docked*, *stacked*, and *floating*.²⁶



²⁶ Image source: Left, Right

Menus²⁷

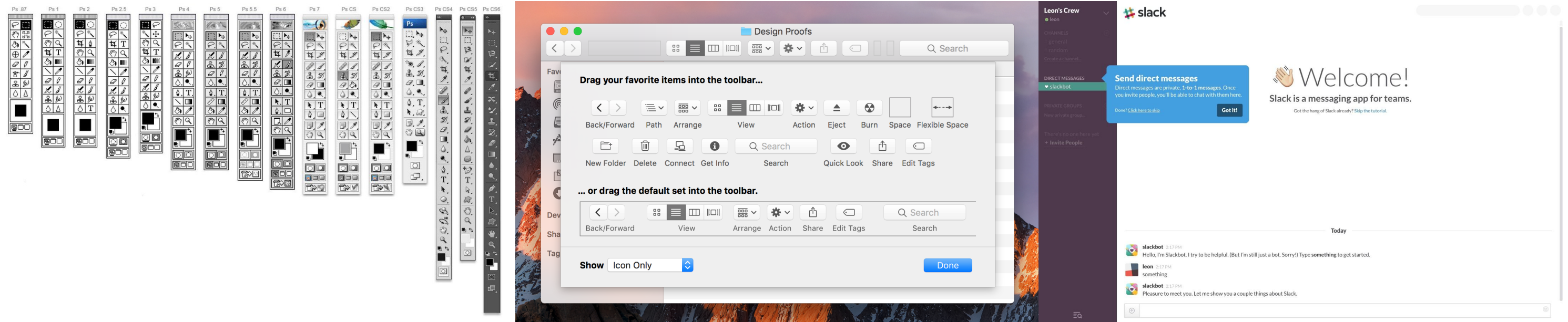
Definition: Menus list all the functions of the an application. Menu lists serve *educational* and *reference* purposes.



²⁷ Image source: Left, Center, Right

Toolbars, Palettes, Sidebars, & Tooltips²⁸

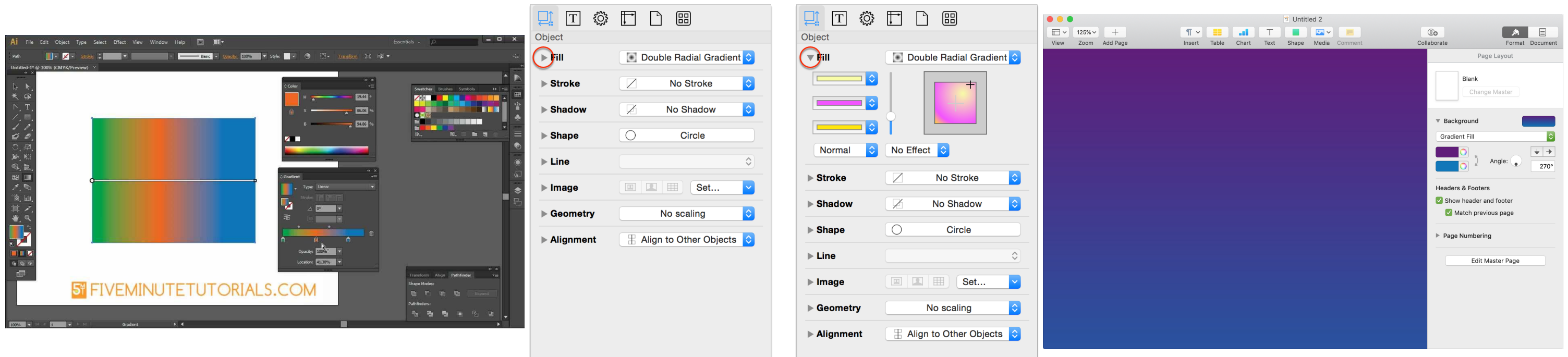
Definition: *Toolbars, palettes, sidebars, and tooltips* facilitate (visual and manipulation) access to frequently used functions.



²⁸ Image source: Left, Center, Right

Tool Palettes²⁹

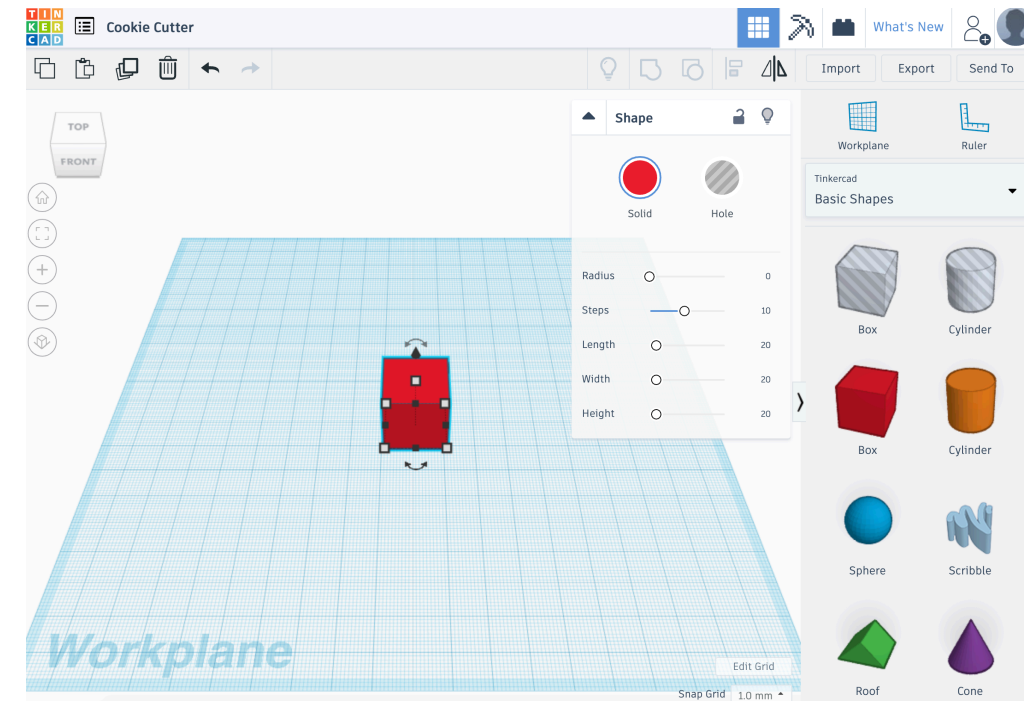
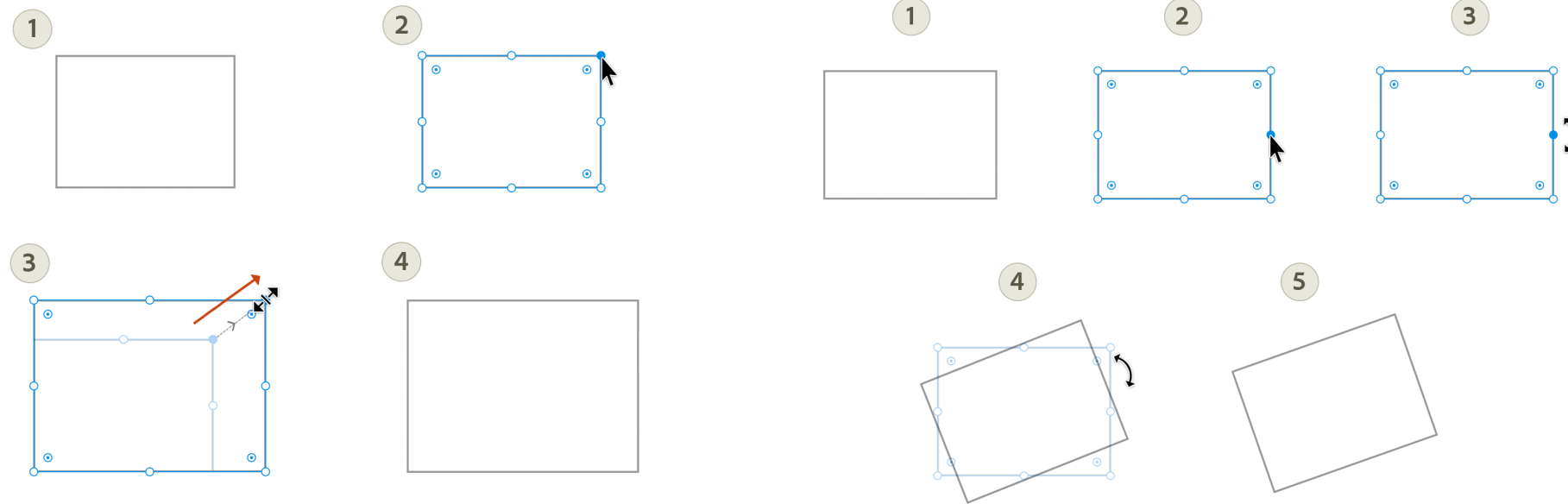
Definition: Tool palettes provide *advanced controls* for a particular function rather than frequently accessed functions.



²⁹ Image source: Left, Center, Right

Pointing³⁰

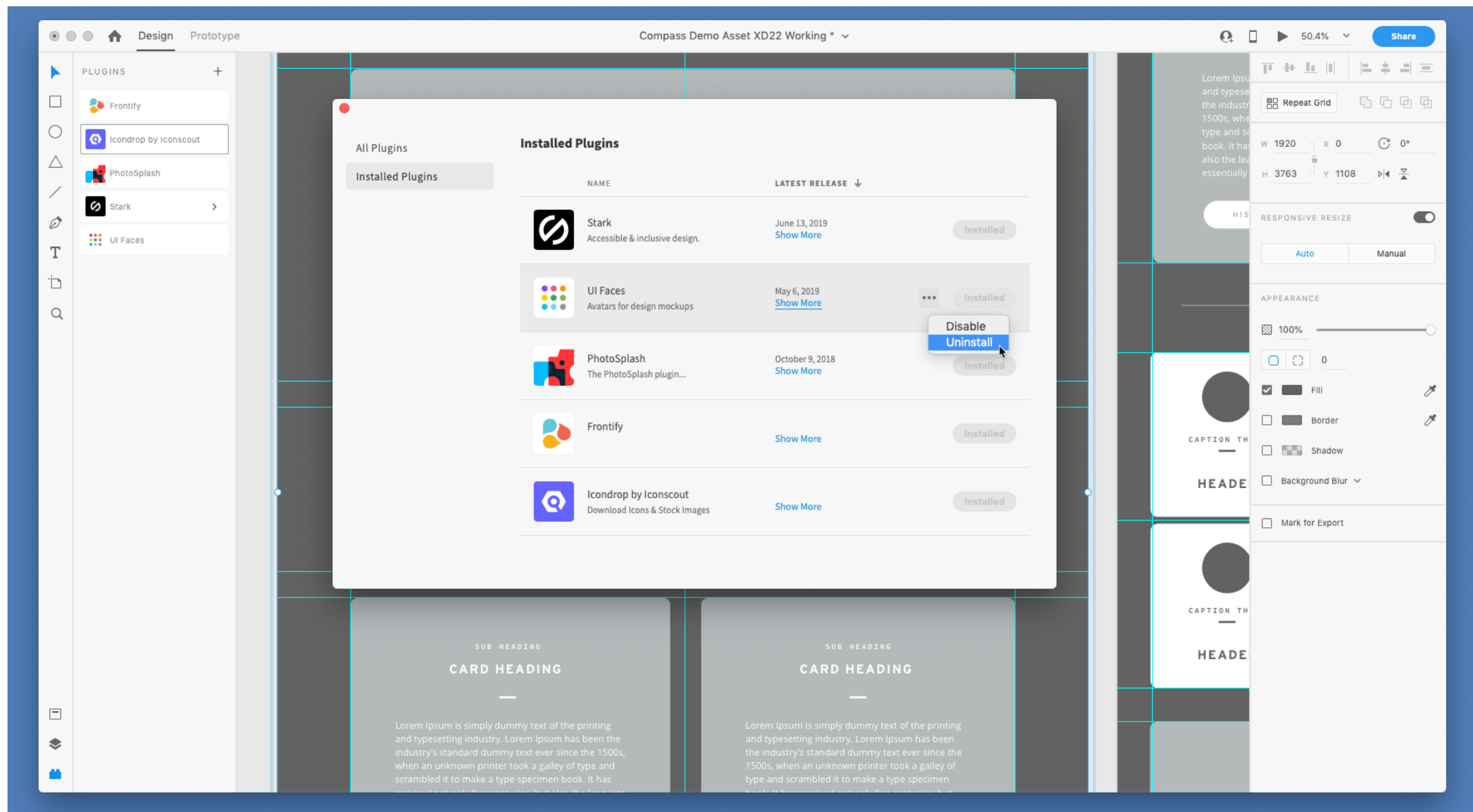
Definition: *Pointing* on an application canvas enables a range of advanced capabilities for *direct manipulation*.



³⁰ Image source: Left, Center, Right

In-Class Activity 1: Desktop Application Deconstruction

Image Source



Link to Google Drawings

Designing for the Web

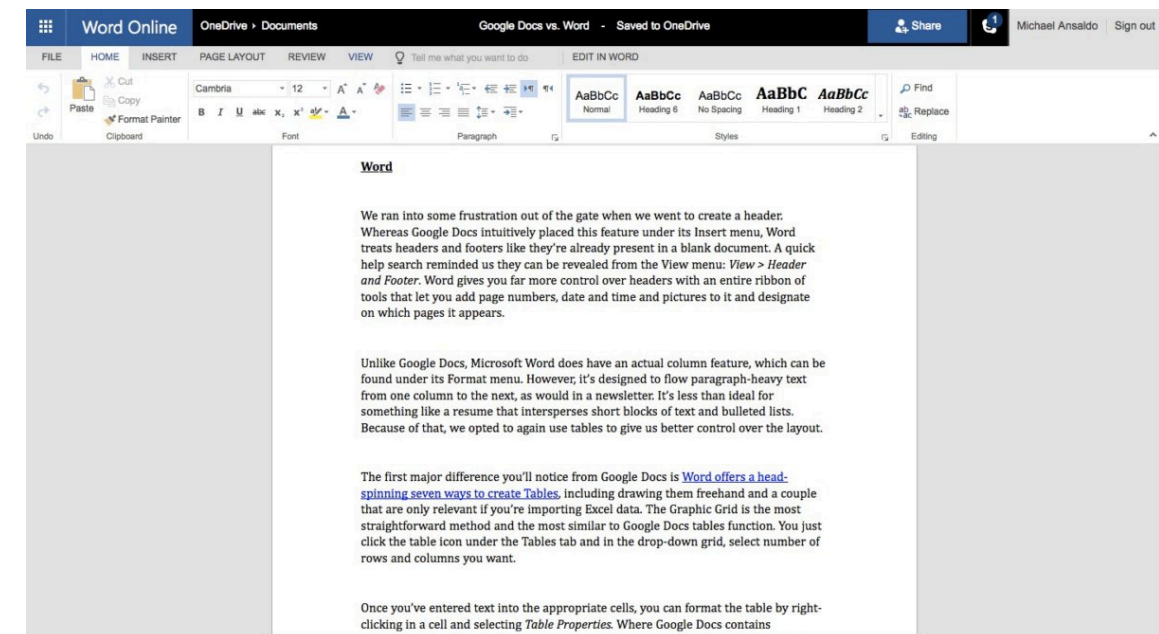
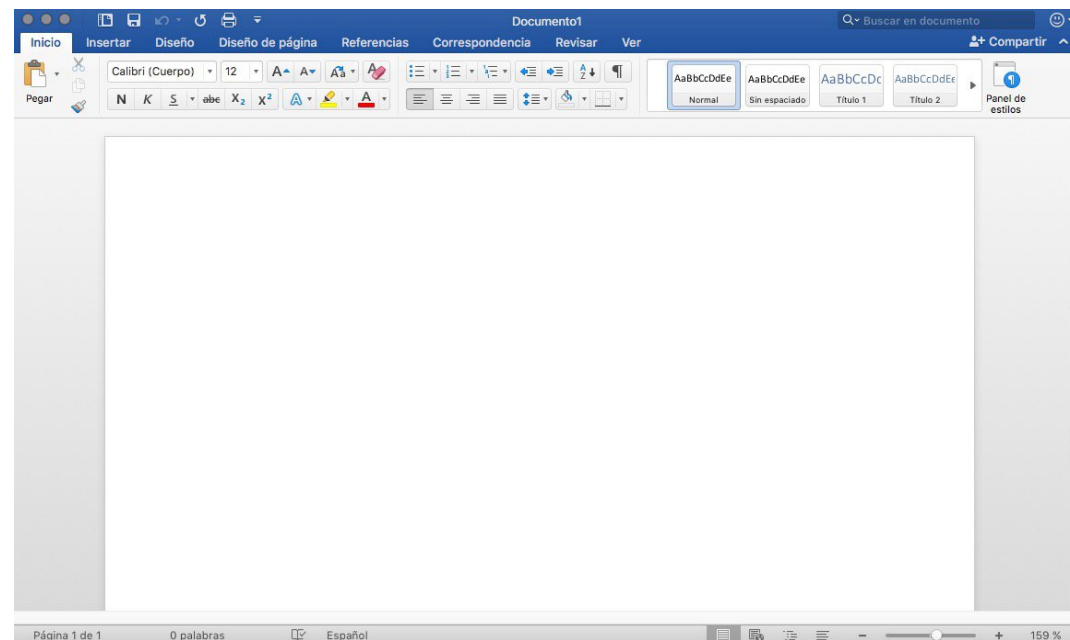
Desktop Applications vs. Websites

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.

Web Applications³¹

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



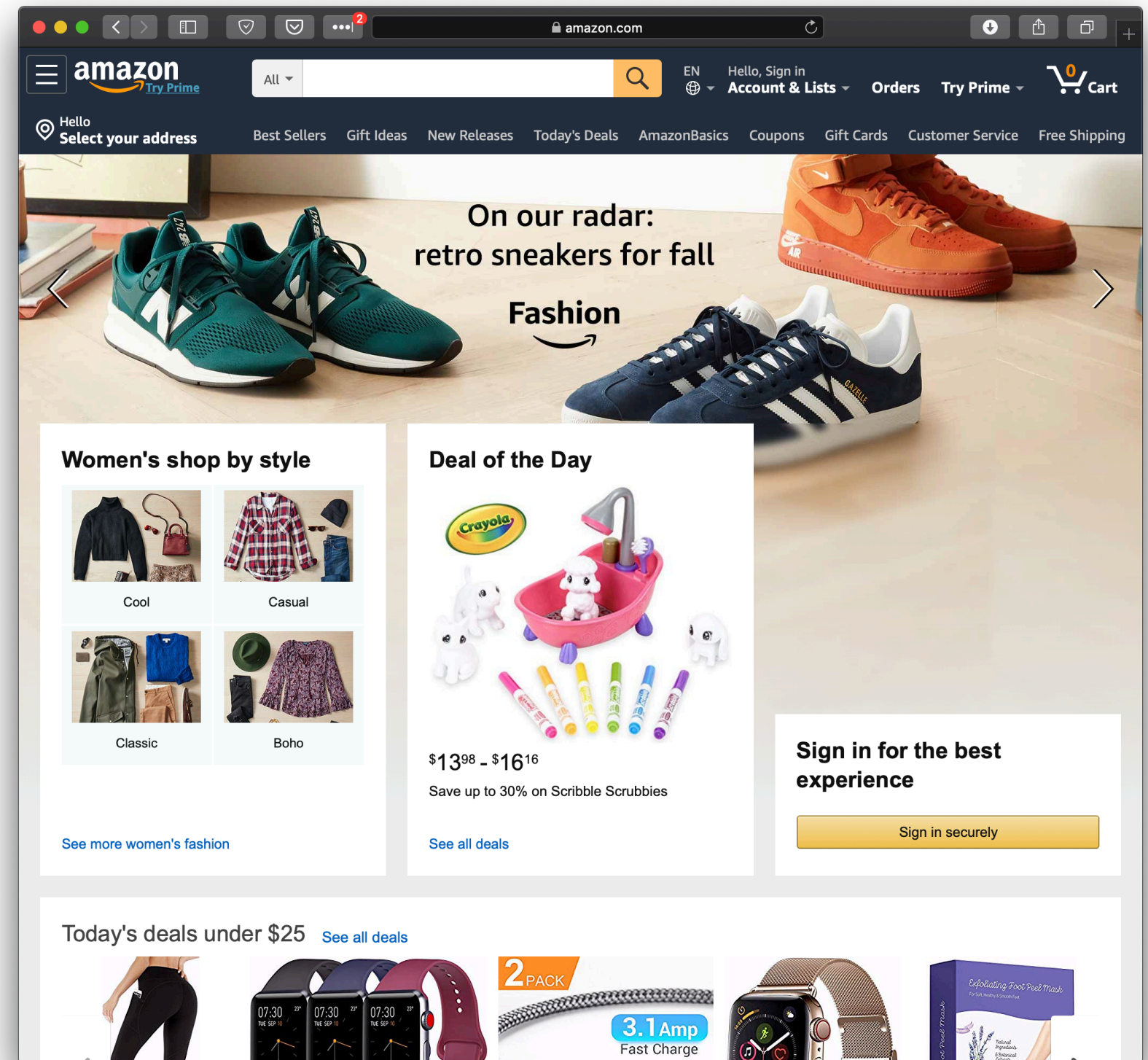
³¹ Image source: Left, Right

The Page

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

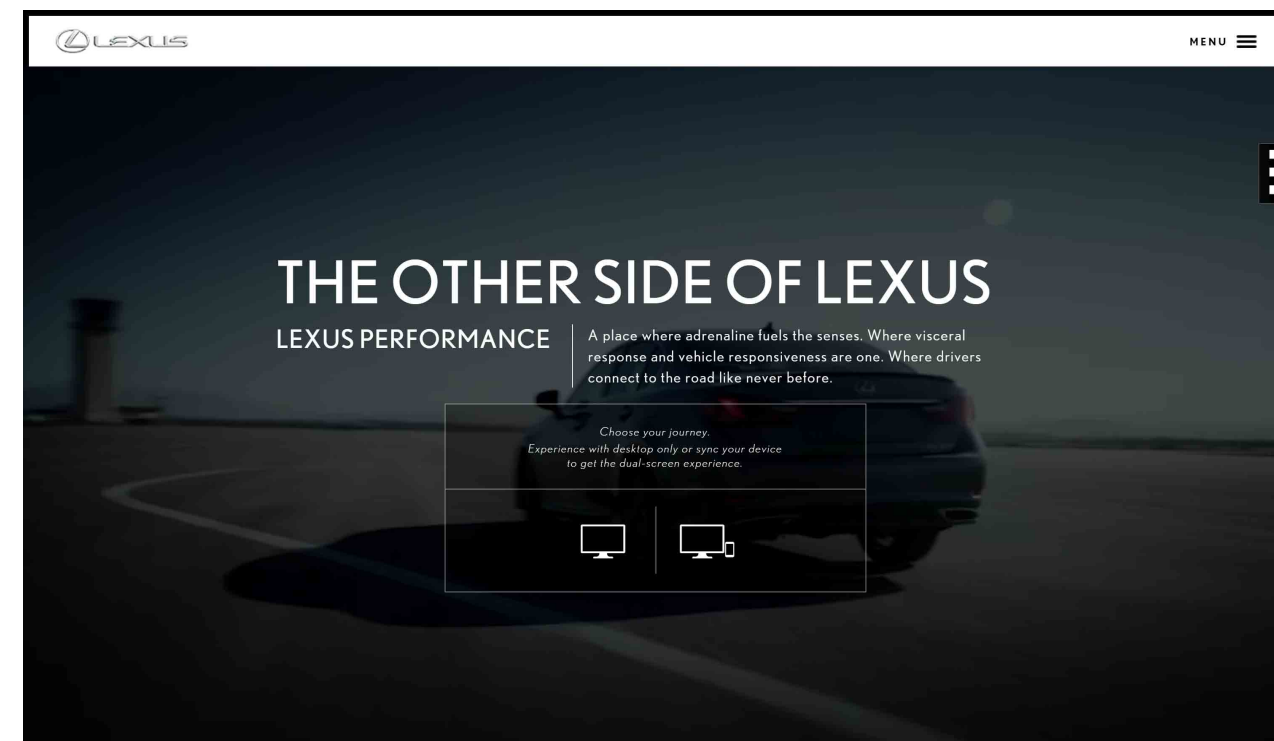
If the web is made out of pages, how do we organize and help users navigate them?

Using *primary* and *secondary* navigation aids.



Primary Navigation Aids³²

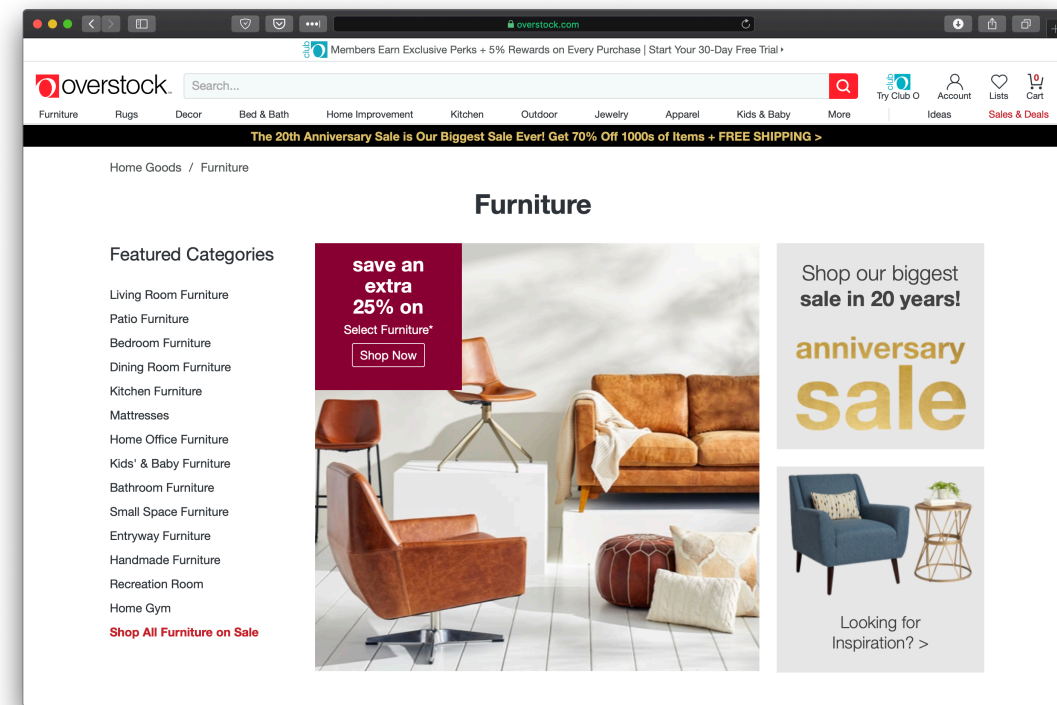
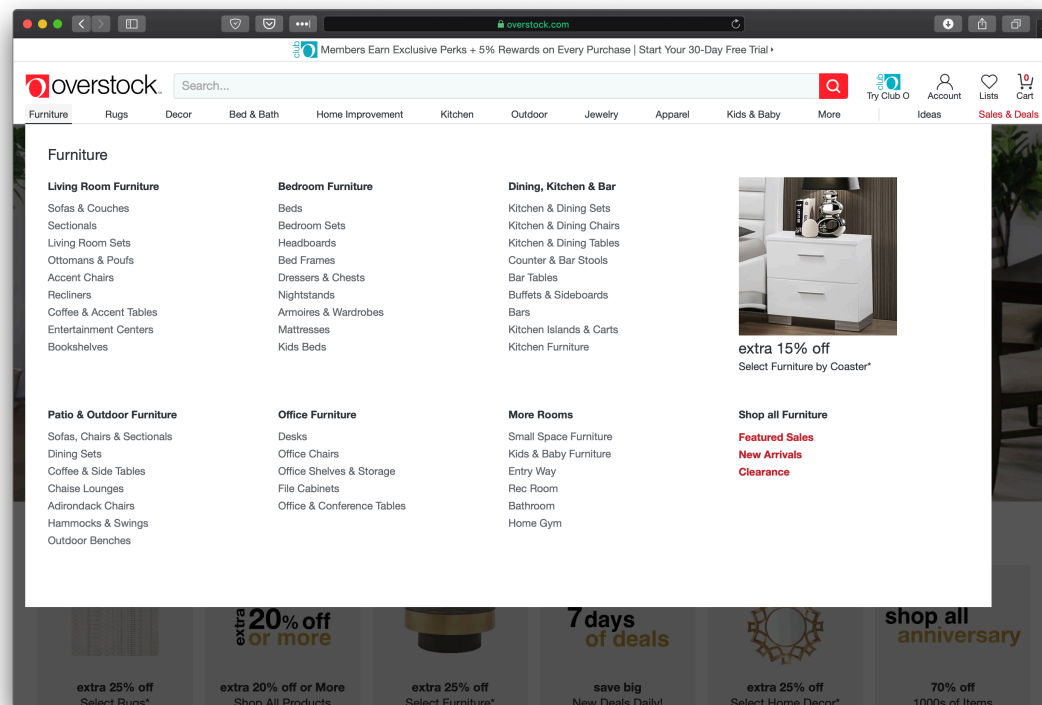
Definition: Primary navigation aids take the form of menus/menubars and reflect the major areas or sections of a website.



³² Image source: [Left](#), [Right](#)

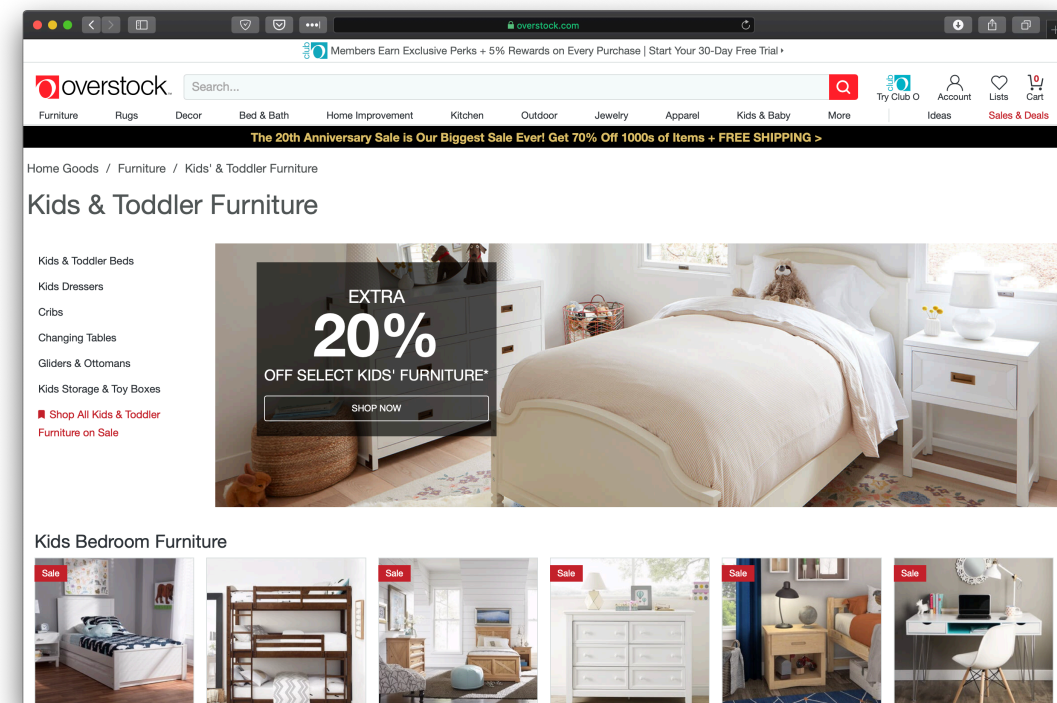
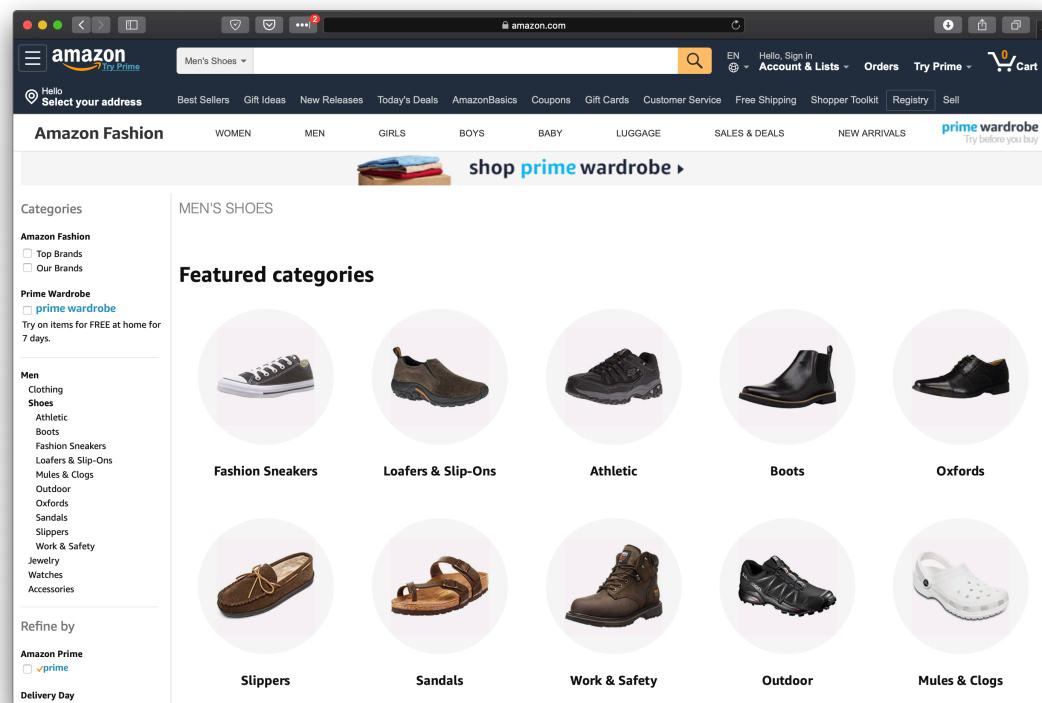
Secondary Navigation Aids

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



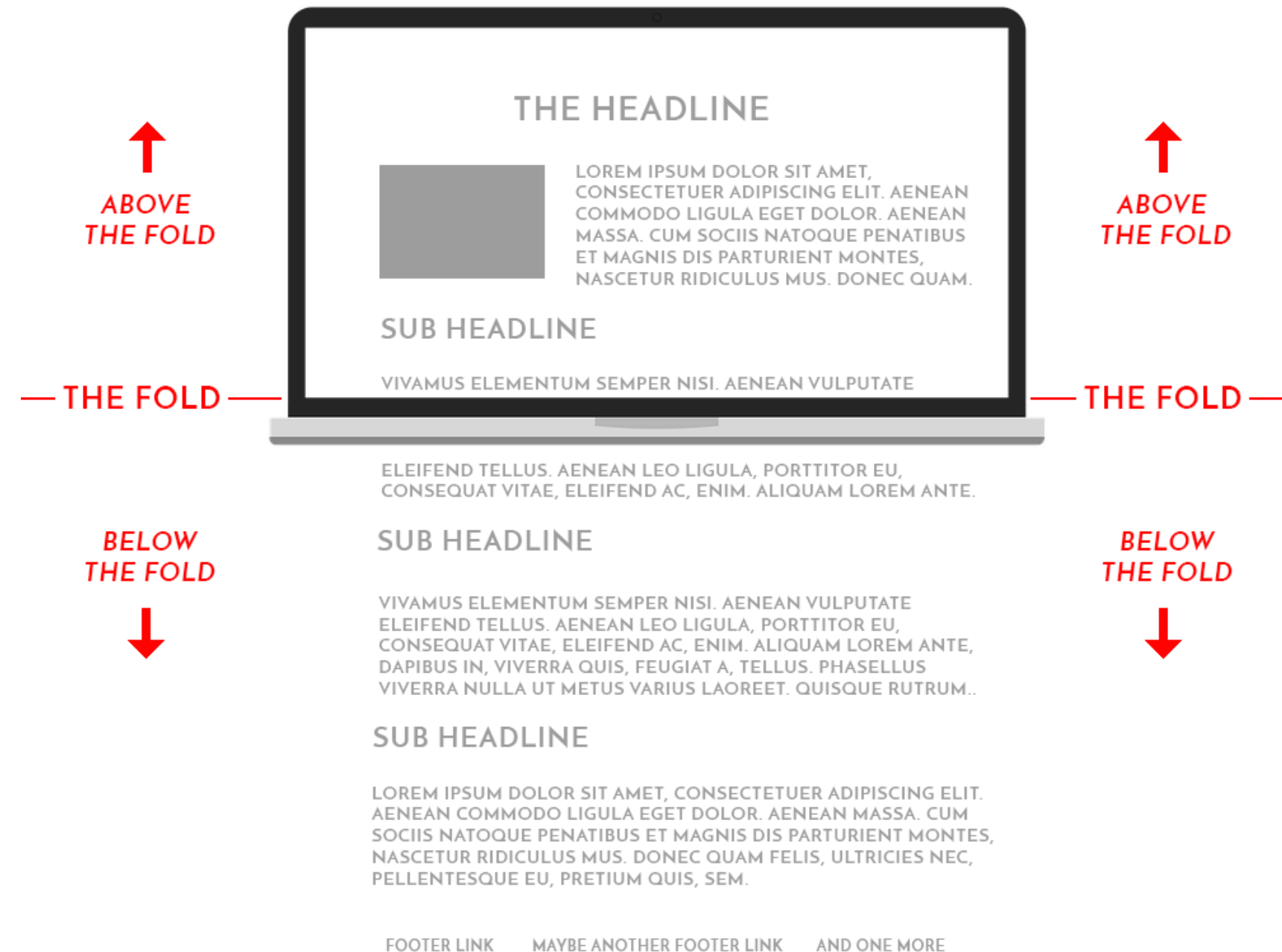
How do we get home?

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.

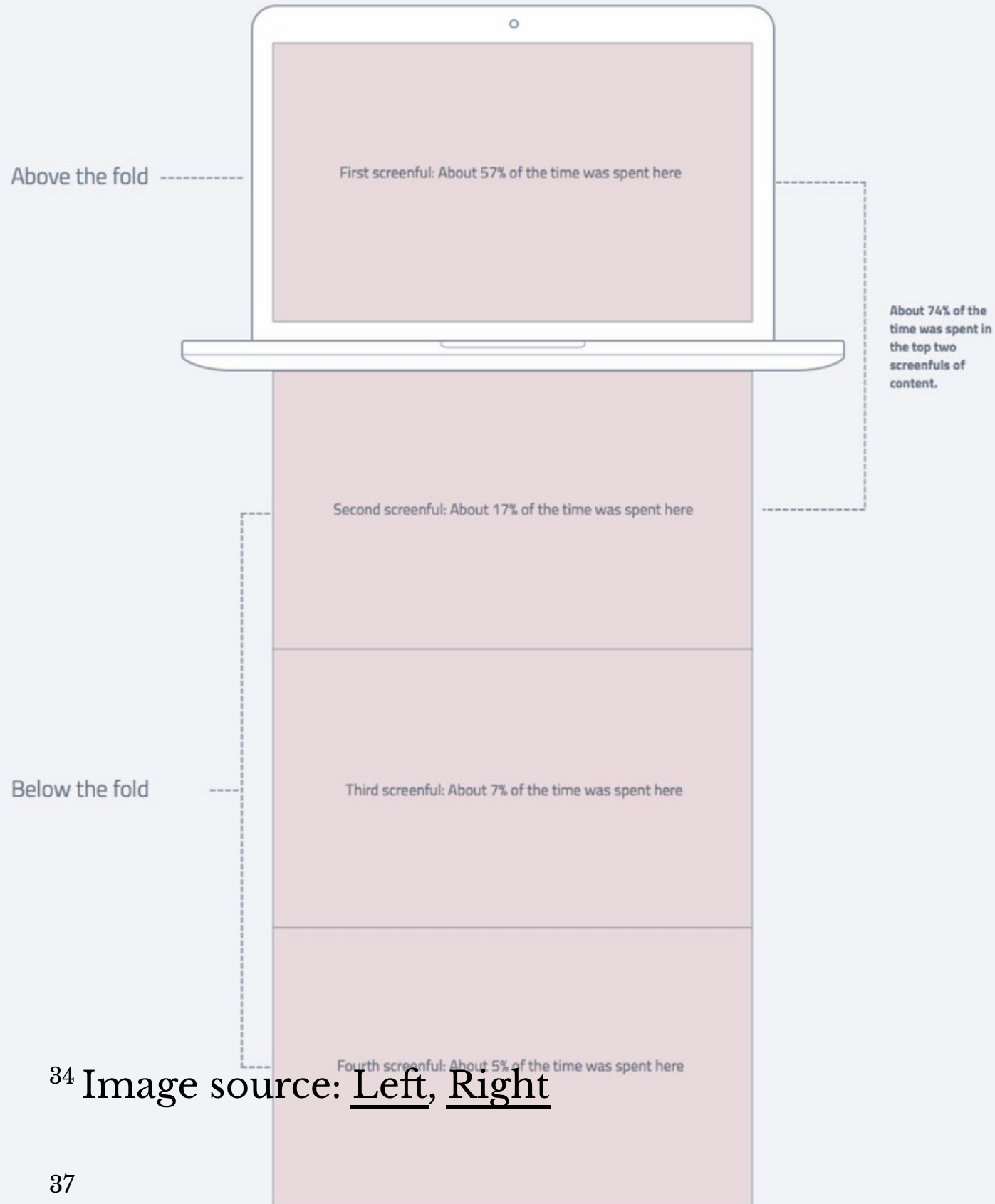


Organizing Page Content: The Fold³³

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

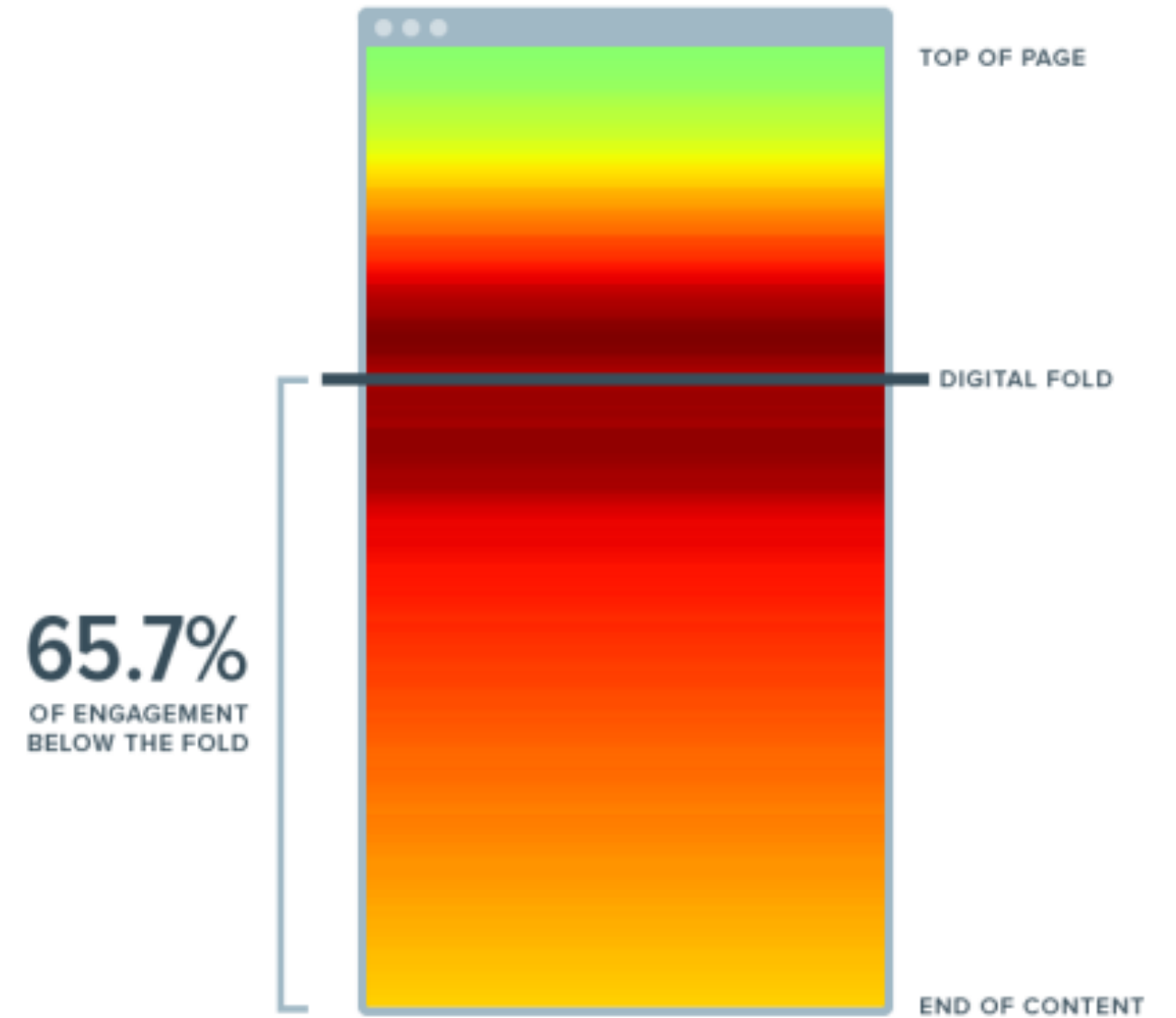


³³ Image Source



34 Image source: Left, Right

WHERE WE SPEND TIME READING



ENGAGEMENT

LOW HIGH

Data from 1 million visitors on 10 publishers over a 24 hour period

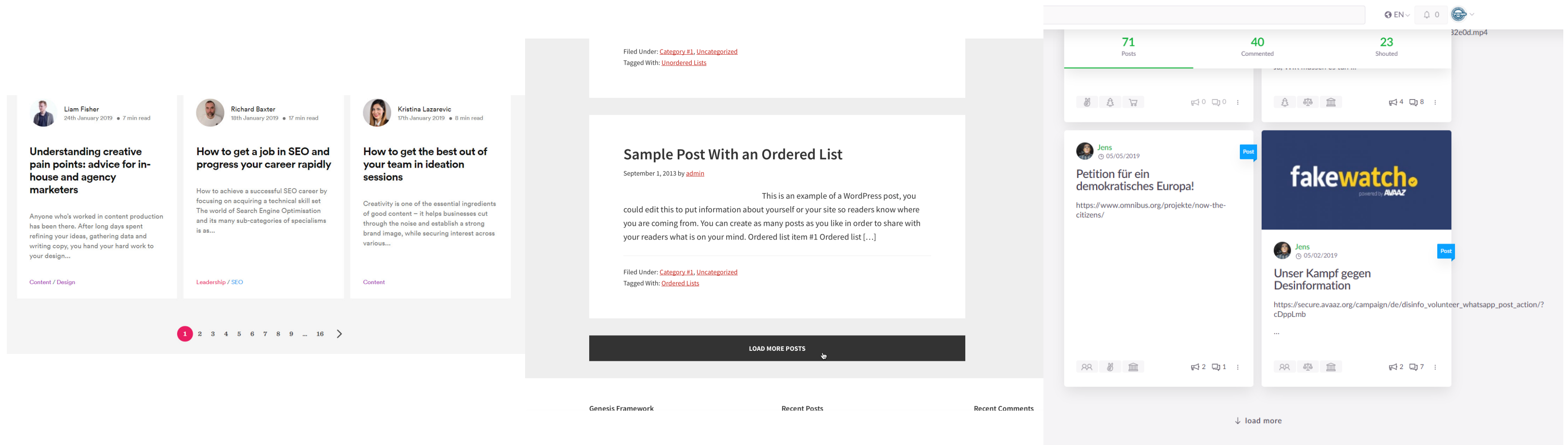
Organizing Page Content: Fitting It All in³⁵

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



³⁵ Image Source

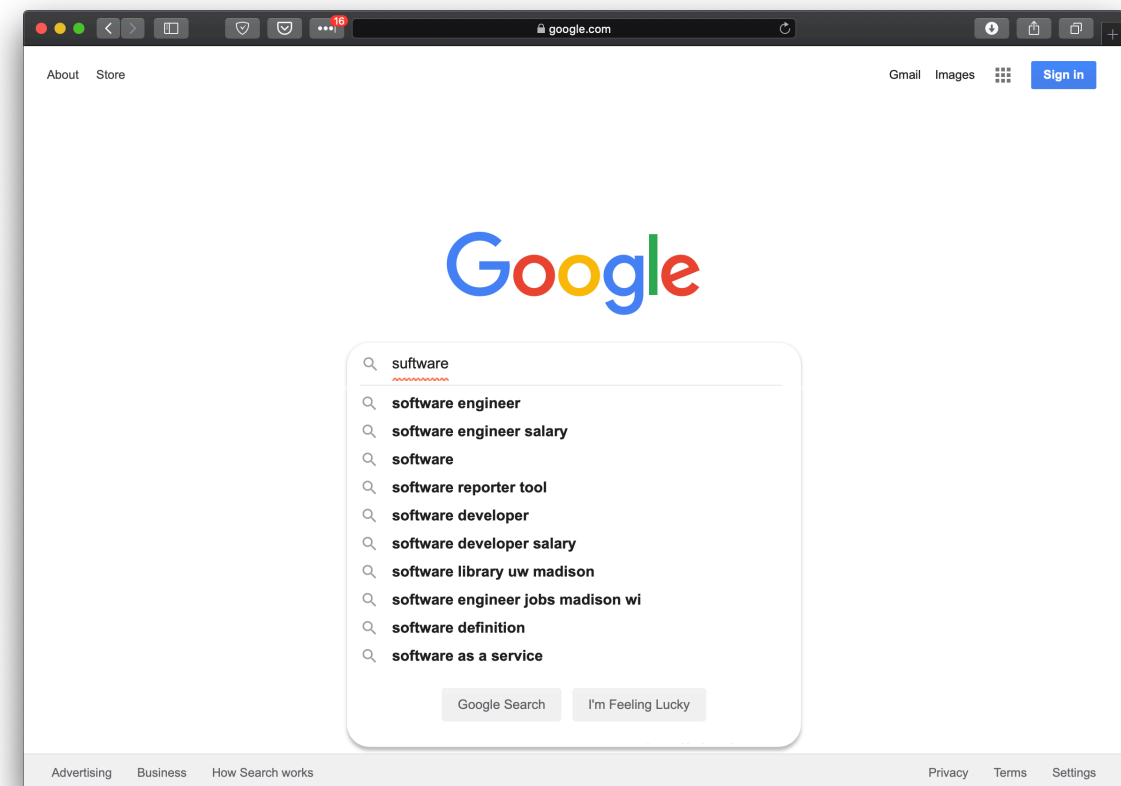
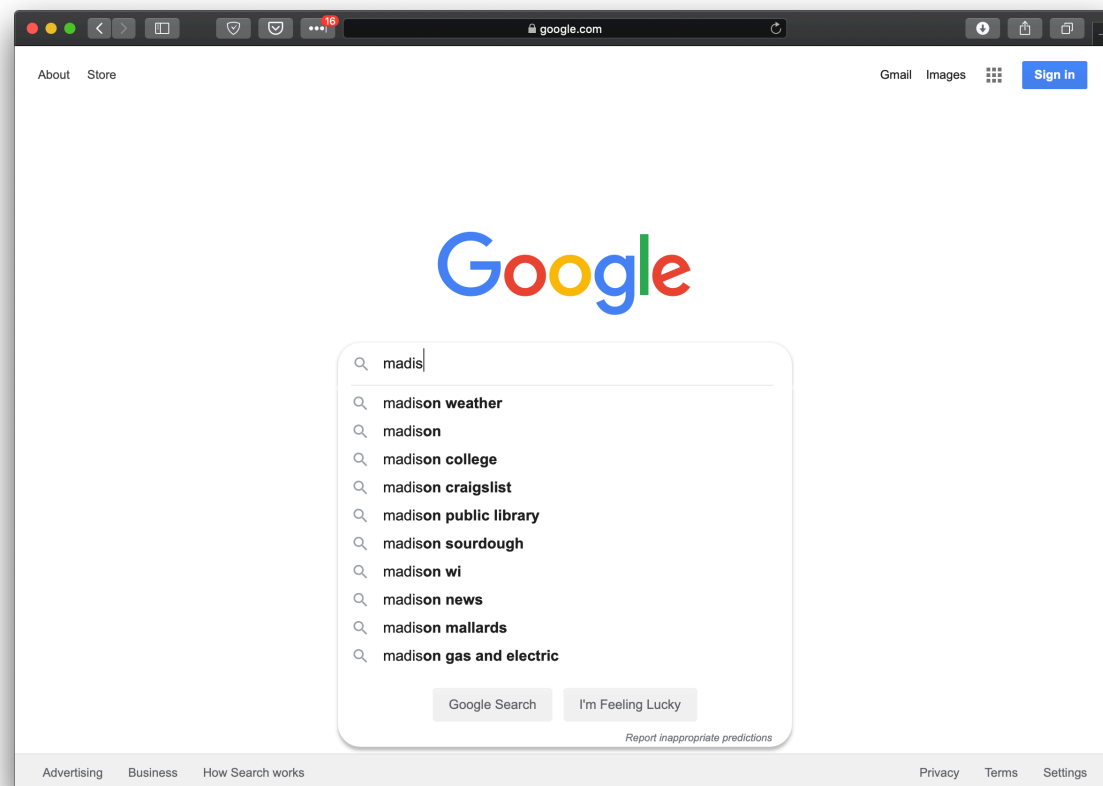
Examples of pagination and infinite scroll:³⁶



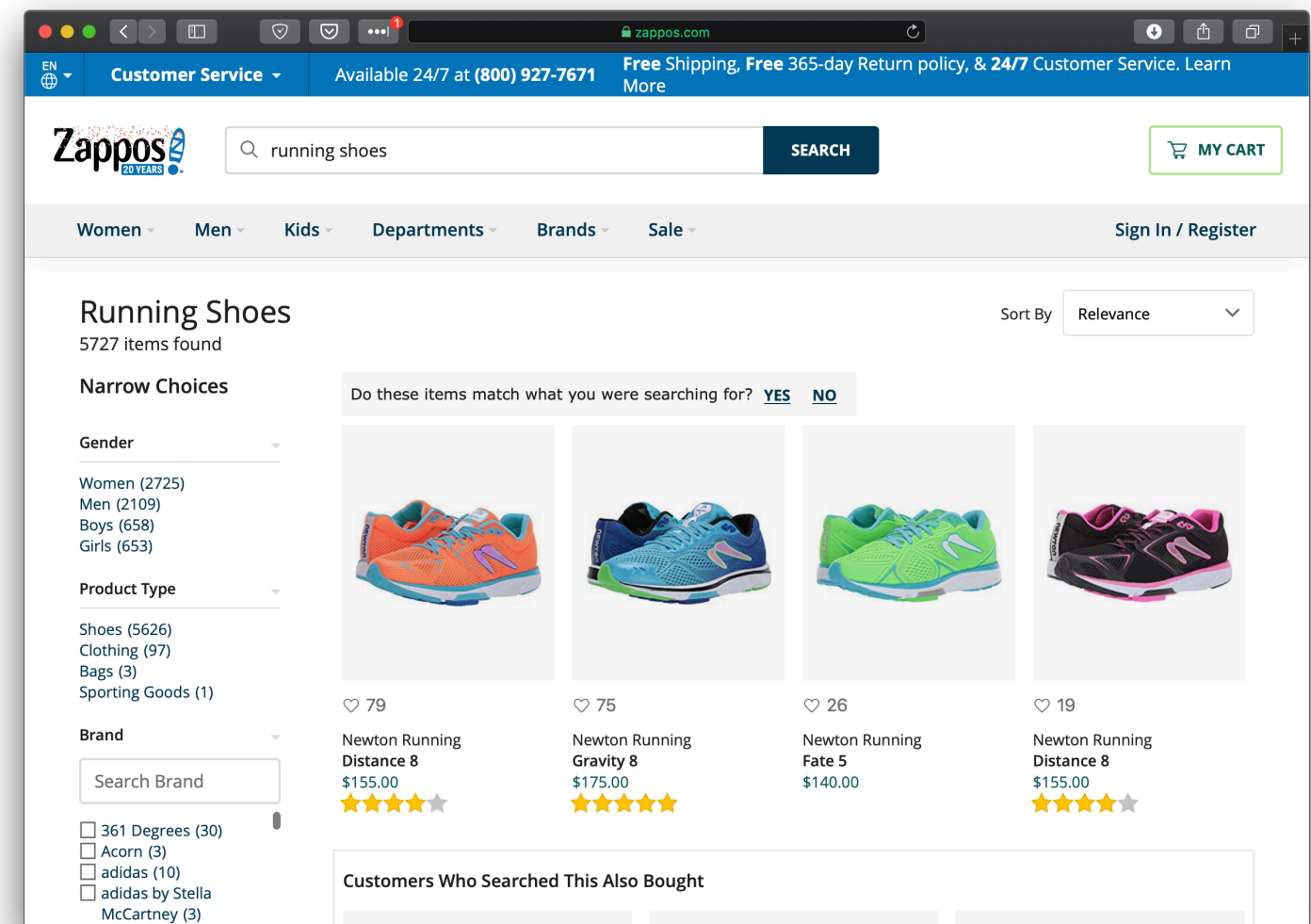
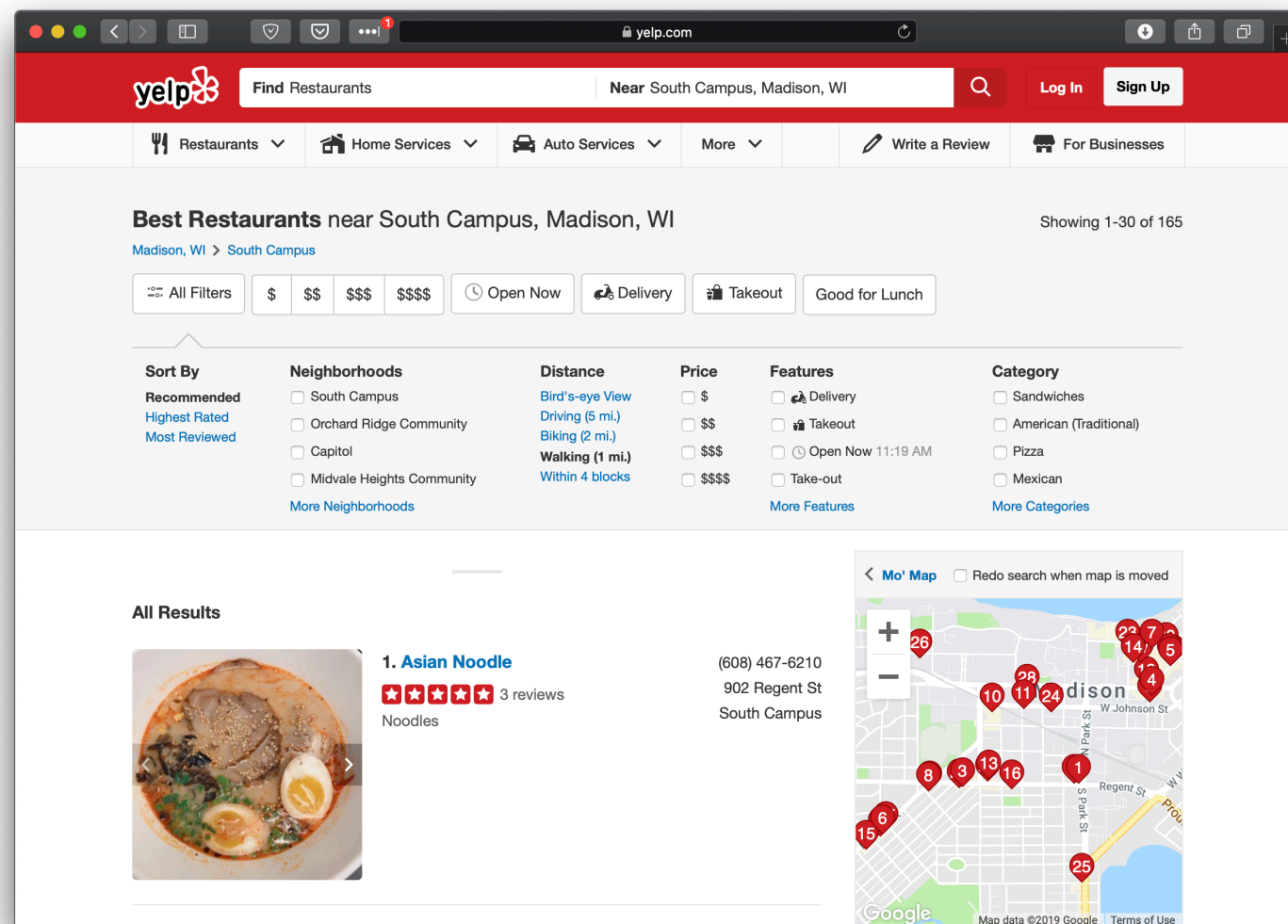
³⁶ Image source: Left, Center, Right

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.



In-Class Activity 2: Web Application Deconstruction


Image Source

[Hello](#) [Select your address](#)
[Best Sellers](#)
[Customer Service](#)
[New Releases](#)
[AmazonBasics](#)
[Today's Deals](#)
[Whole Foods](#)
[Gift Cards](#)
[Free Shipping](#)
[Registry](#)
[Sell](#)
[Coupons](#)
[#FoundItOnAmazon](#)
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 Hatchimals
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[Crayola Reusable Cloth Kids Face Mask Set, Halloween](#)
 ★★★★★☆ 18
 \$21.59 - \$47.99




[HOZZQ DIY Halloween Party Supplies PVC 3D Decorative Scary Bats Wall Decal Wall...](#)
 ★★★★★☆ 1,800
 \$11.99




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[LeapFrog 100 Animals Book](#)
 ★★★★★☆ 18,031
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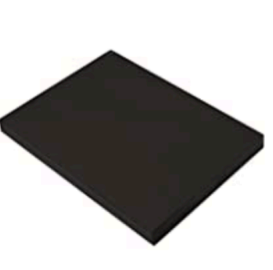
[LEGO City Advent Calendar 60268 Playset, Includes 6 City Adventures TV Series...](#)
 ★★★★★☆ 122



[Tara Toys Ariel Necklace Activity Set - Amazon Exclusive](#)
 ★★★★★☆ 16,371



[The First Years Stack Up Cup Toys](#)
 ★★★★★☆ 28,092
 \$3.99 - \$16.99



[SunWorks Heavyweight Construction Paper, 9 x 12 Inches, Black, 100 Sheets](#)
 ★★★★★☆ 5,228

Link to Google Drawings

What we learned today?

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