

Building User Interfaces

Designing

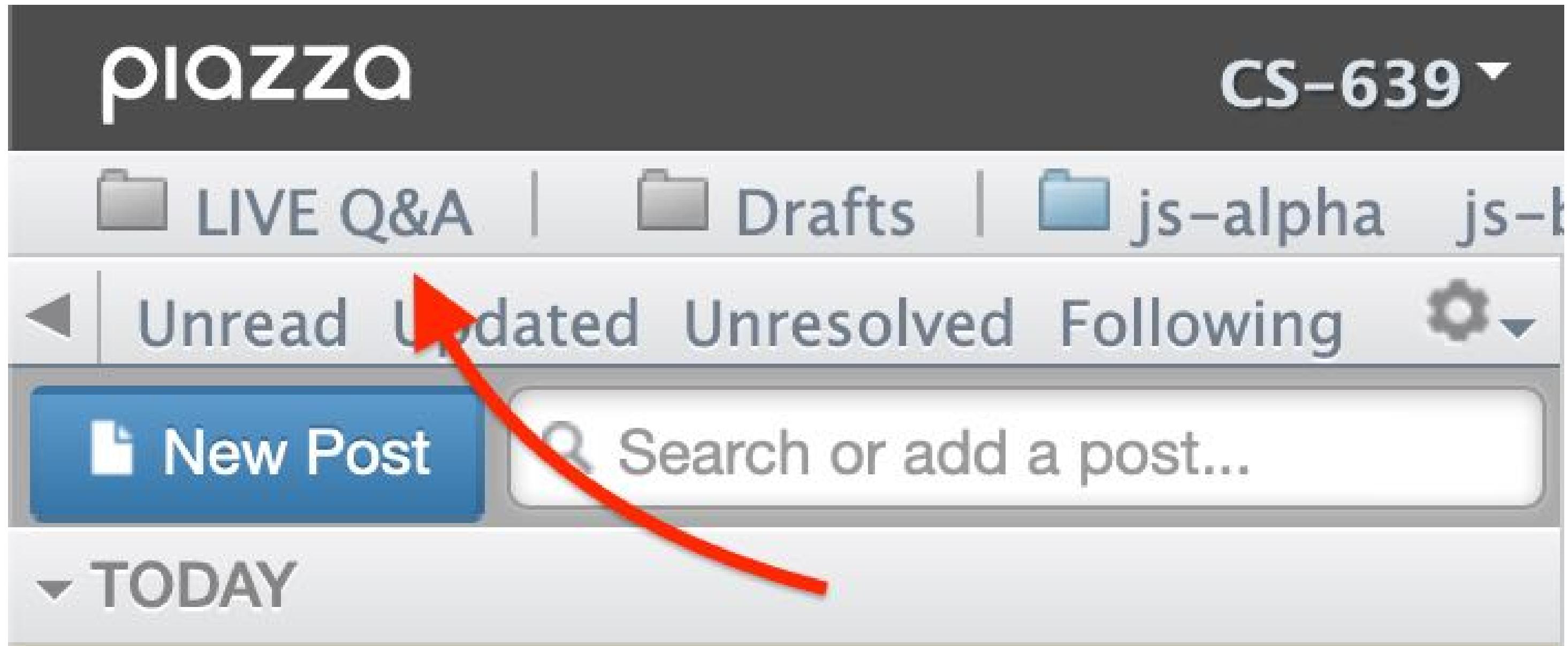
for Web & Desktop

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?"

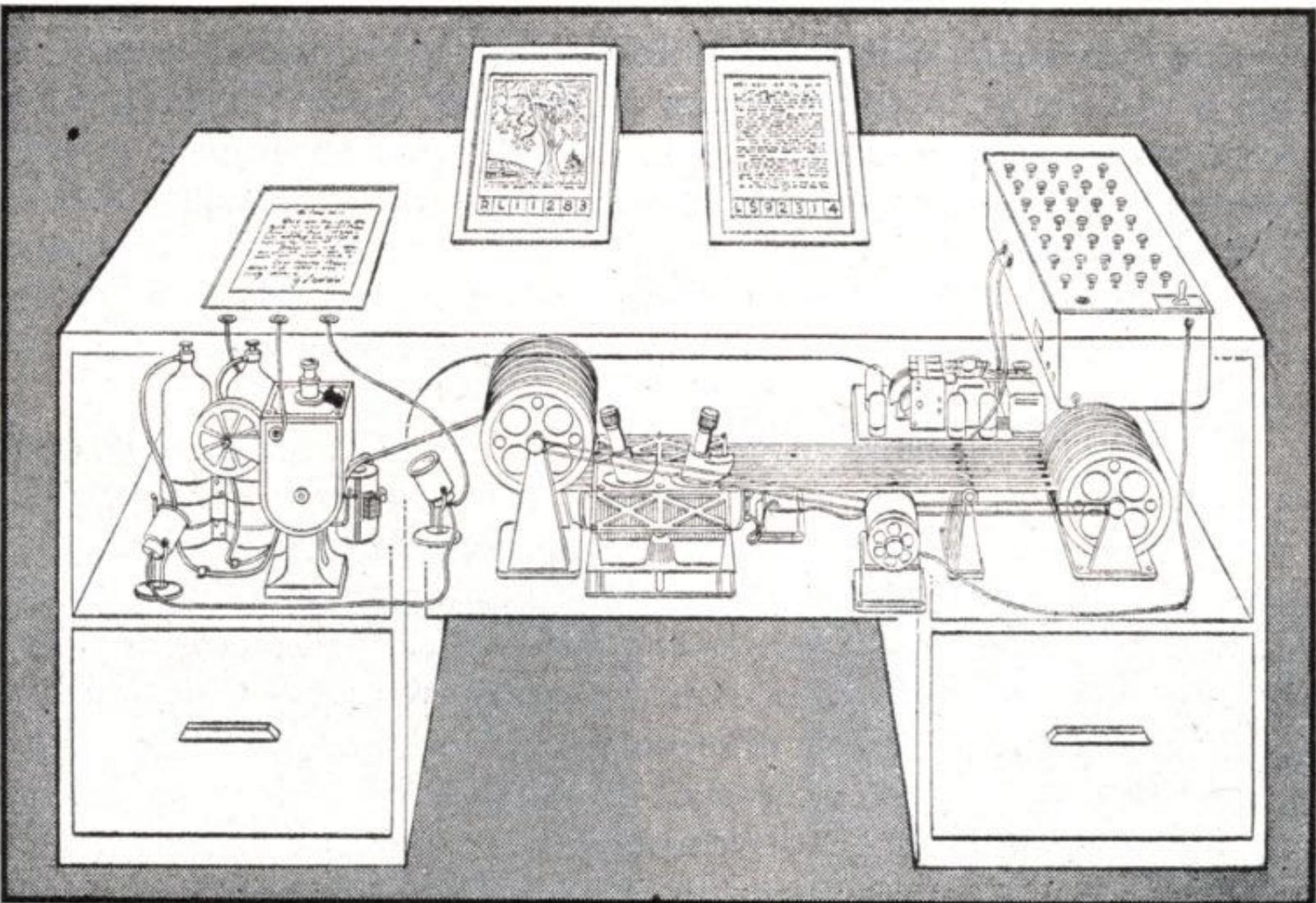
1. Creating reusable React elements ← class components
2. Computation, manipulating data, updating states ← functional components

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 supermicro-film 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](#)

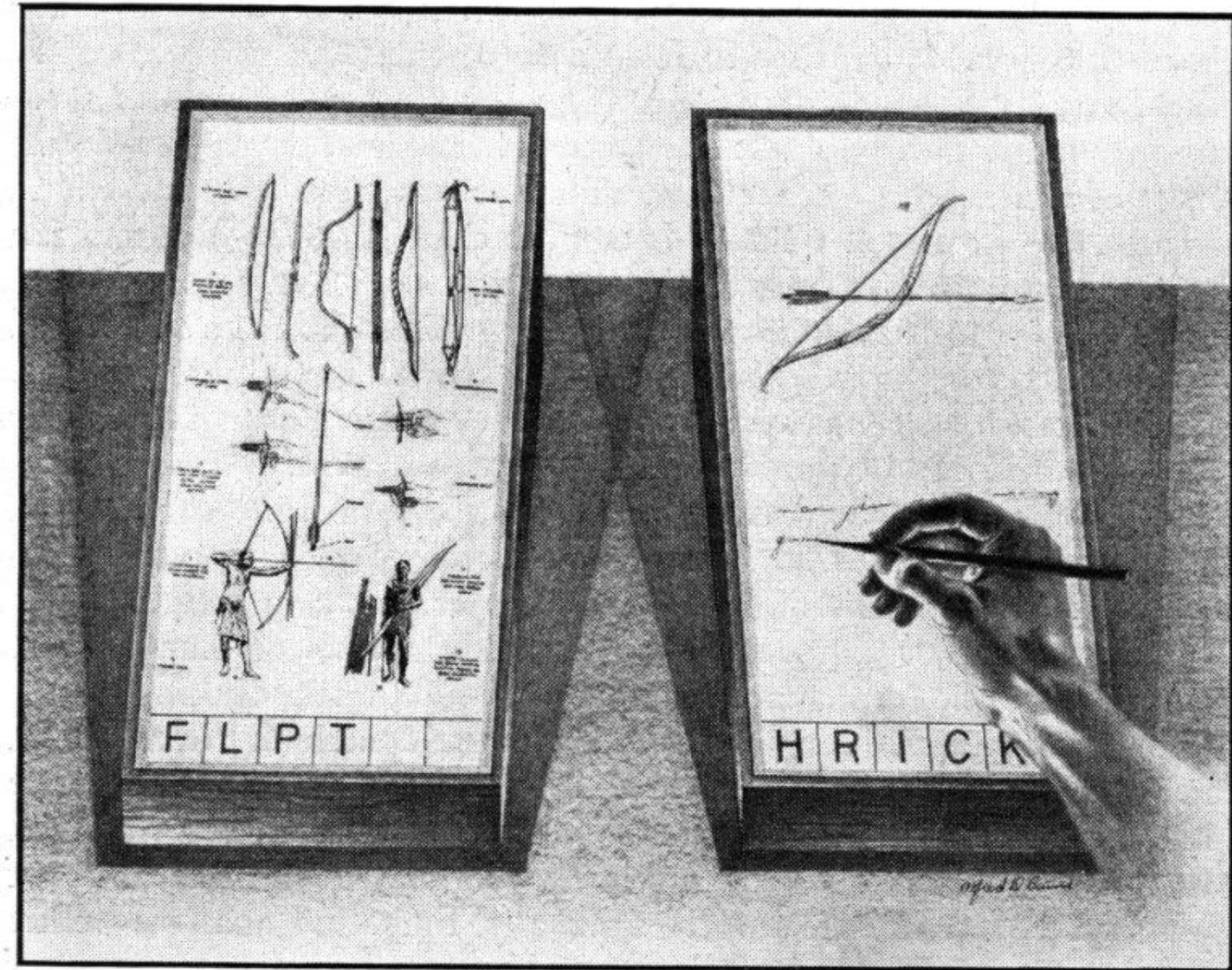
² [The Atlantic: As We May Think](#)

³ Image Source: [Monoskop](#)

Milestone 1, 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



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.

⁴ The Atlantic: As We May Think

⁵ Image Source: [Monoskop](#)

Milestone 2: Sketchpad, 1963⁶ 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](#)

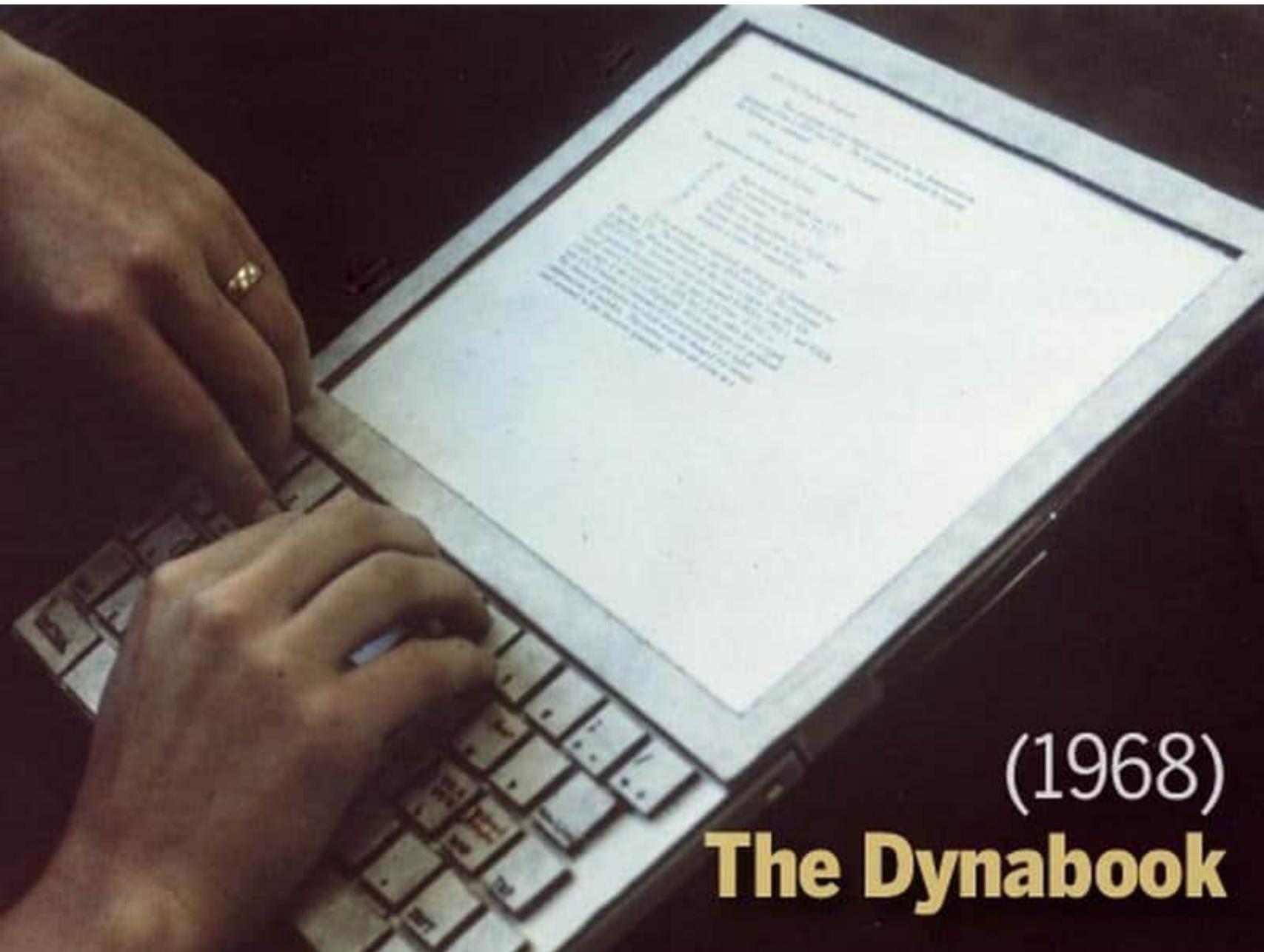
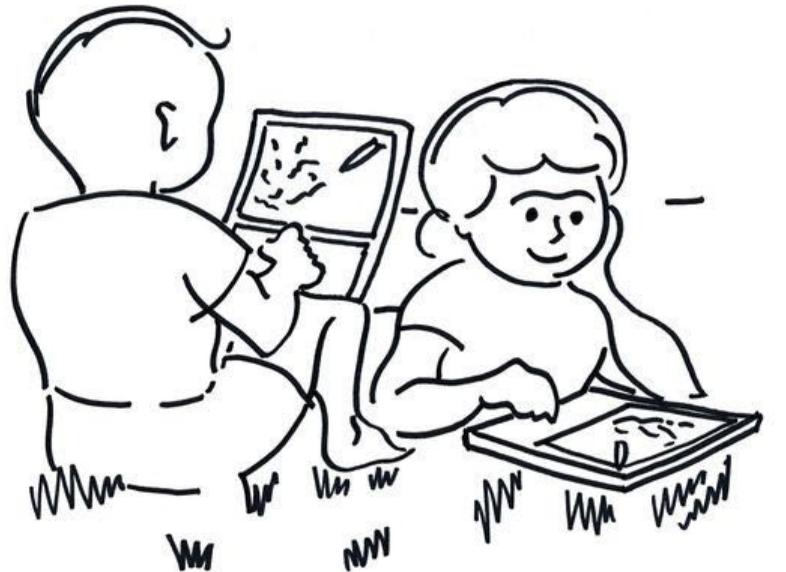


urce

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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](#)

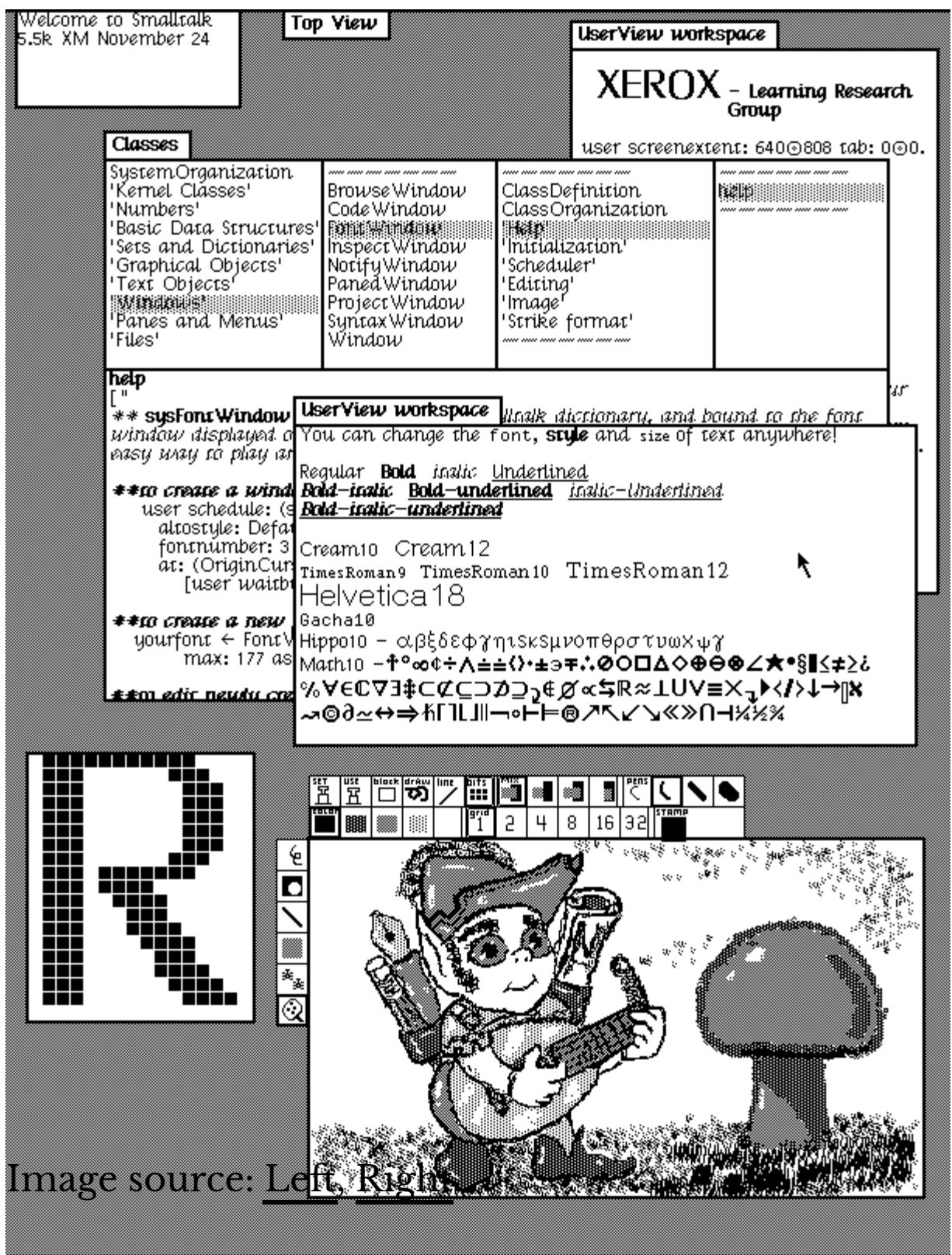
Milestone 4: Xerox Alto, 1973^{12 13}

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).

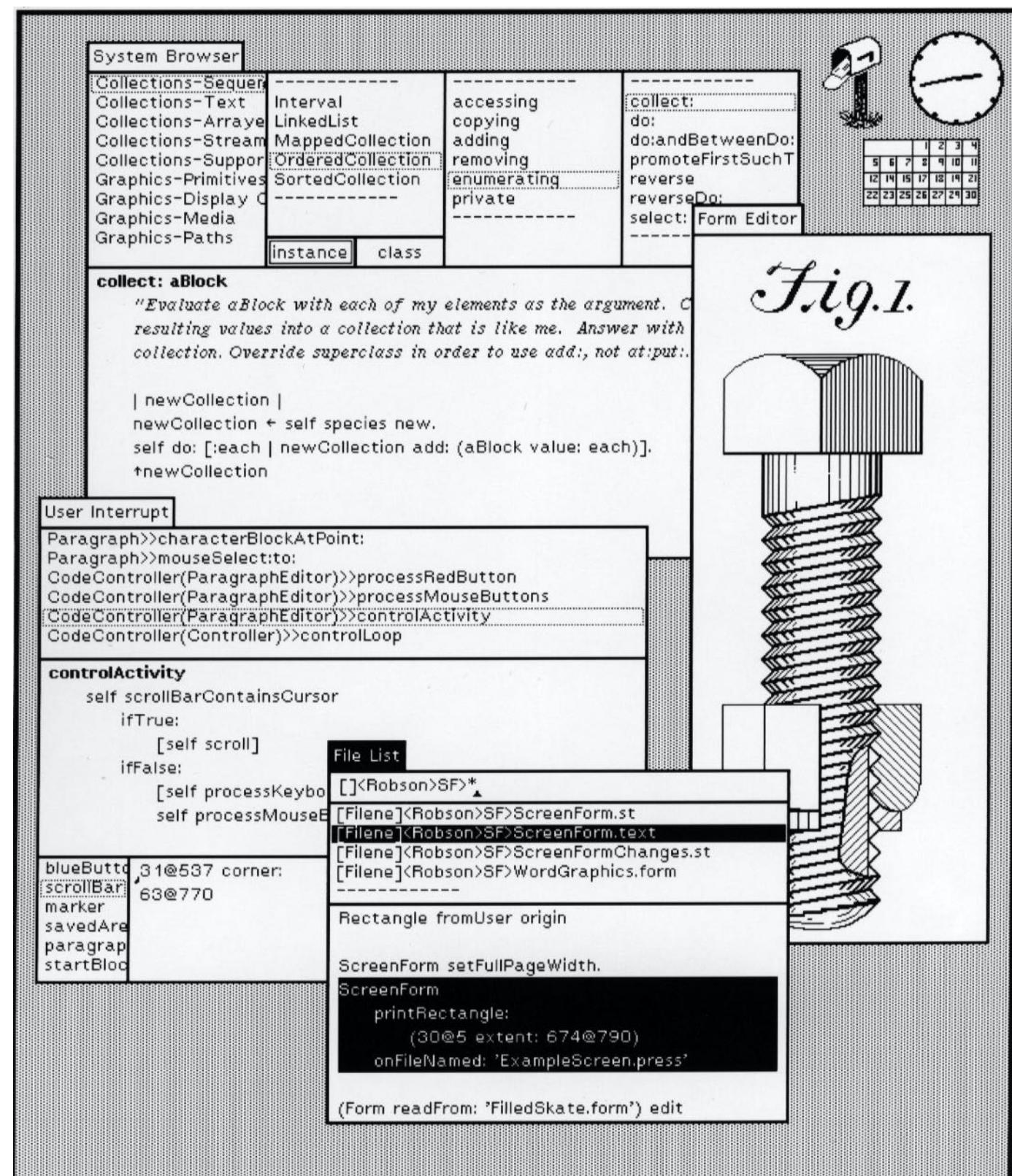


¹² [Wikipedia: Dynabook](#)

¹³ [Image source](#)



¹⁴ Image source: Left, Right



Milestone 5: Xerox Star, 1981¹⁵ ¹⁶ ¹⁷

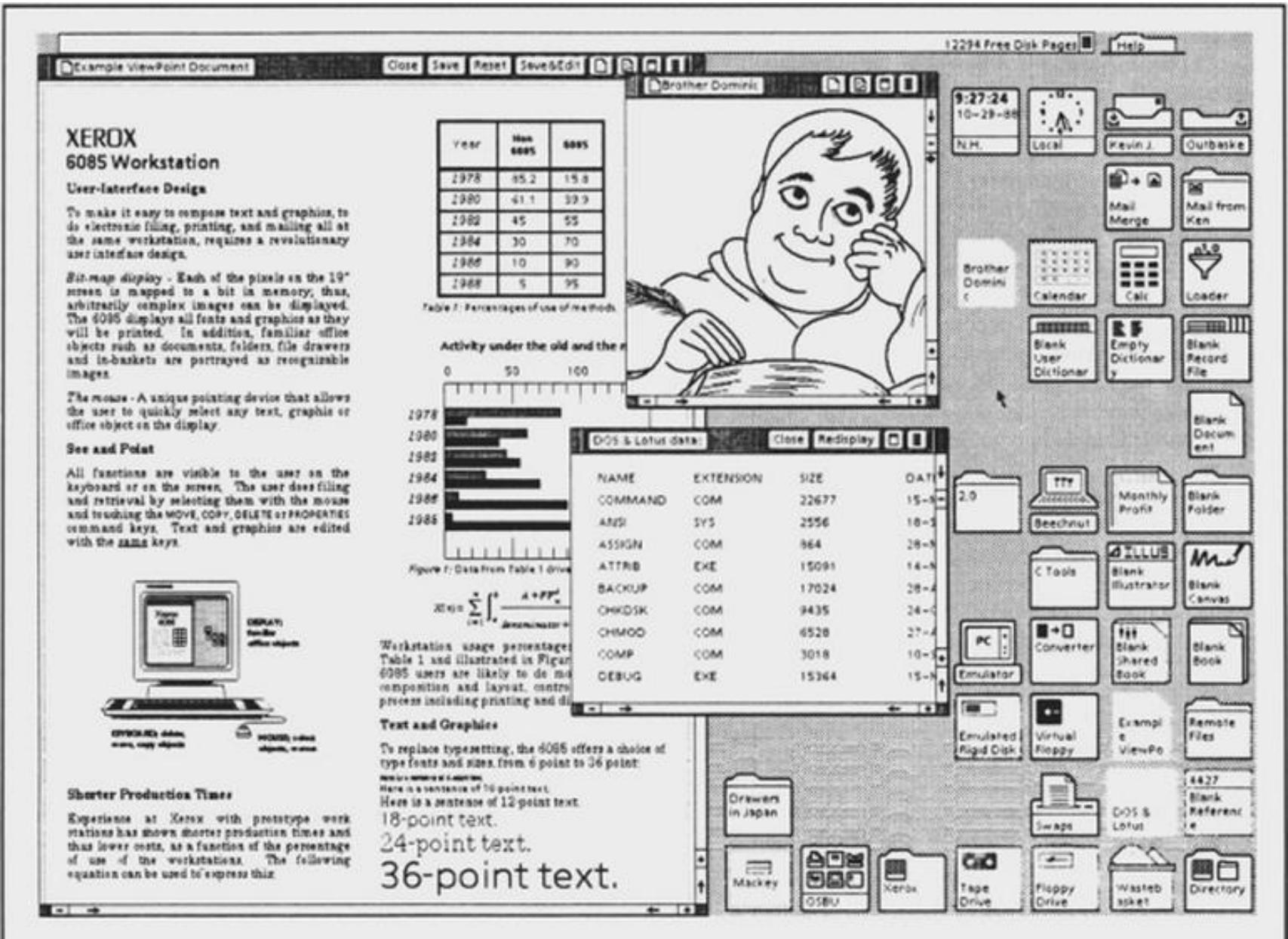
First commercial system with a user interface that integrates today's technologies, including windows, icons, folders, mouse, etc.



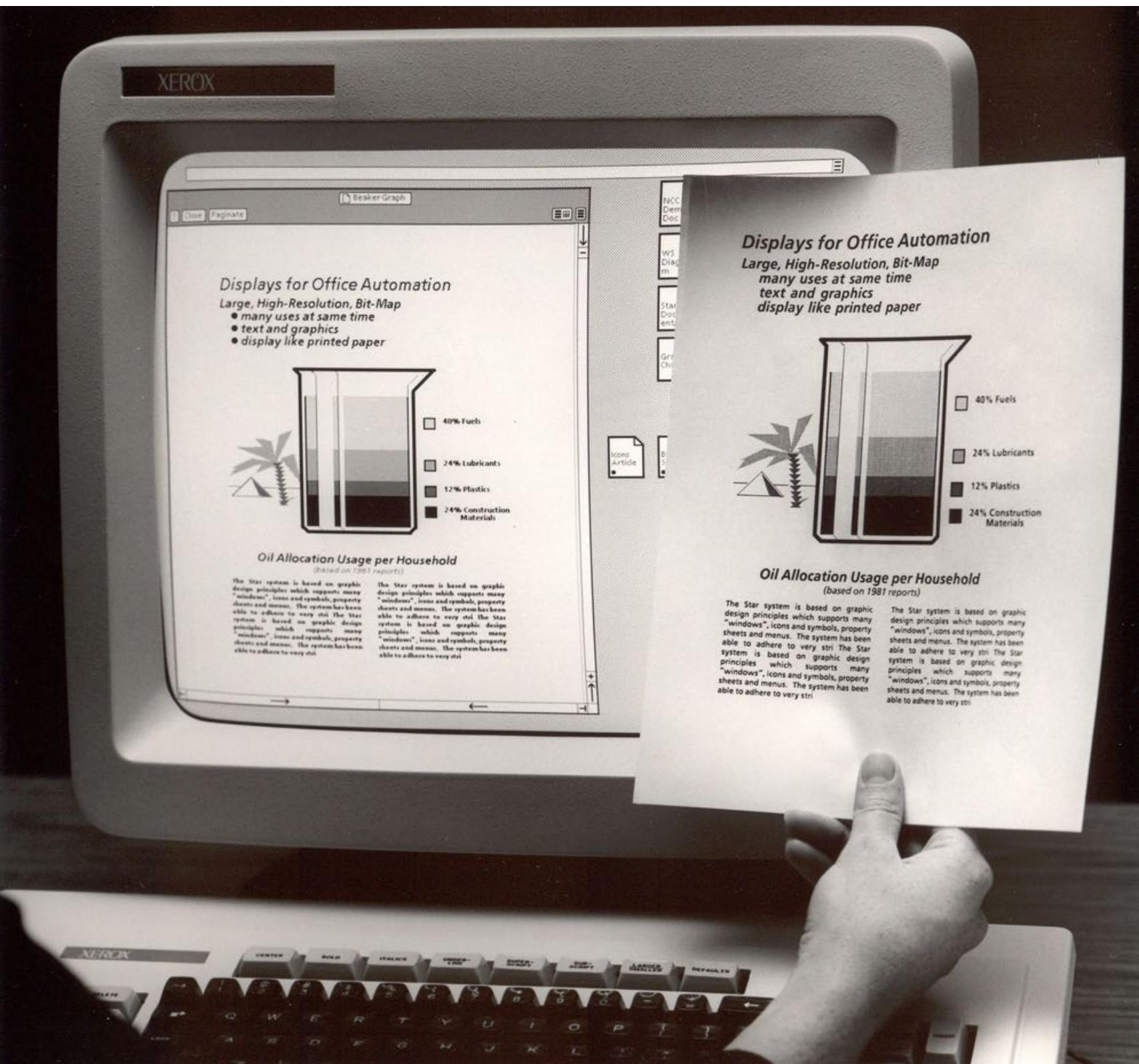
¹⁵ Wikipedia: [Xerox Star](#)

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

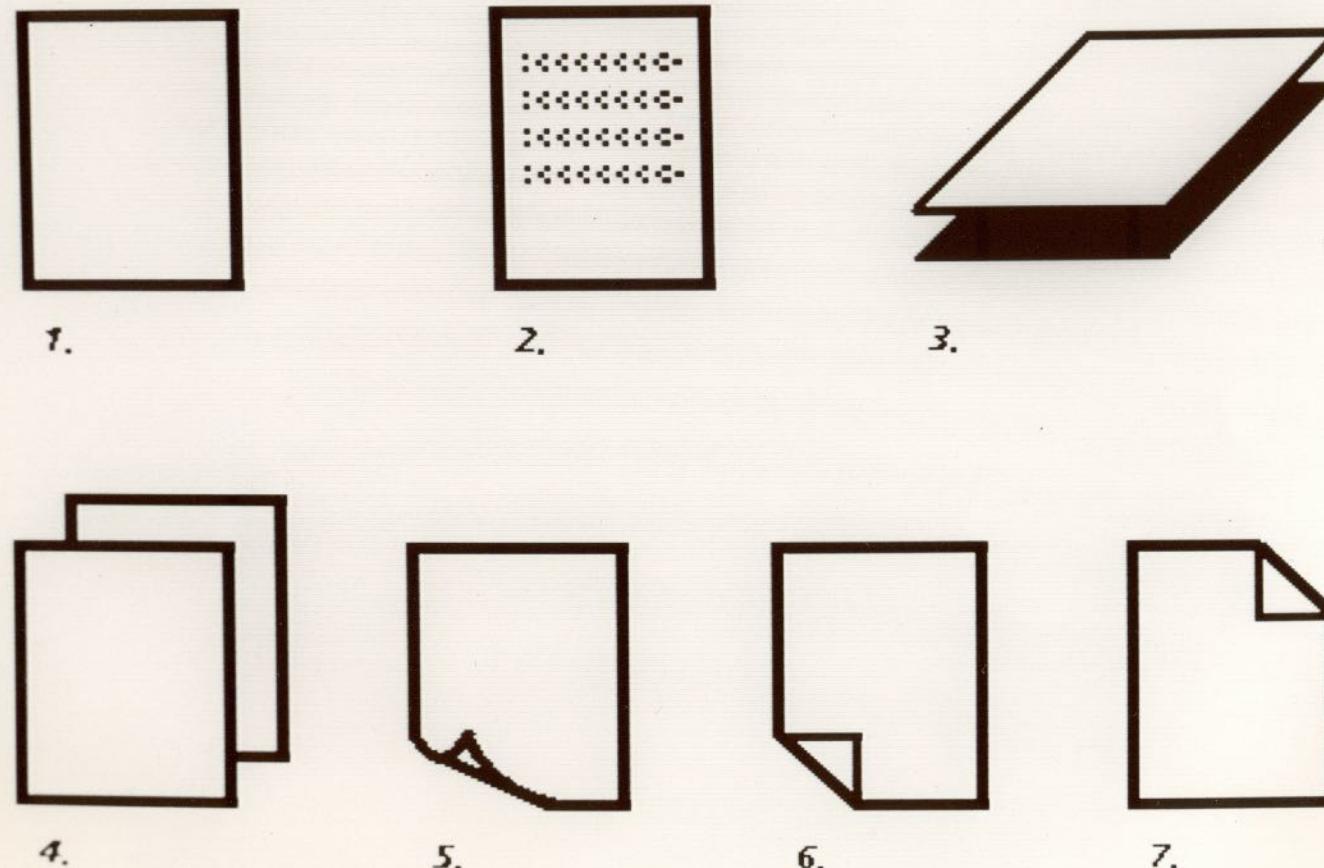
¹⁷ [Image source](#)



¹⁸ Image source: Left, Right

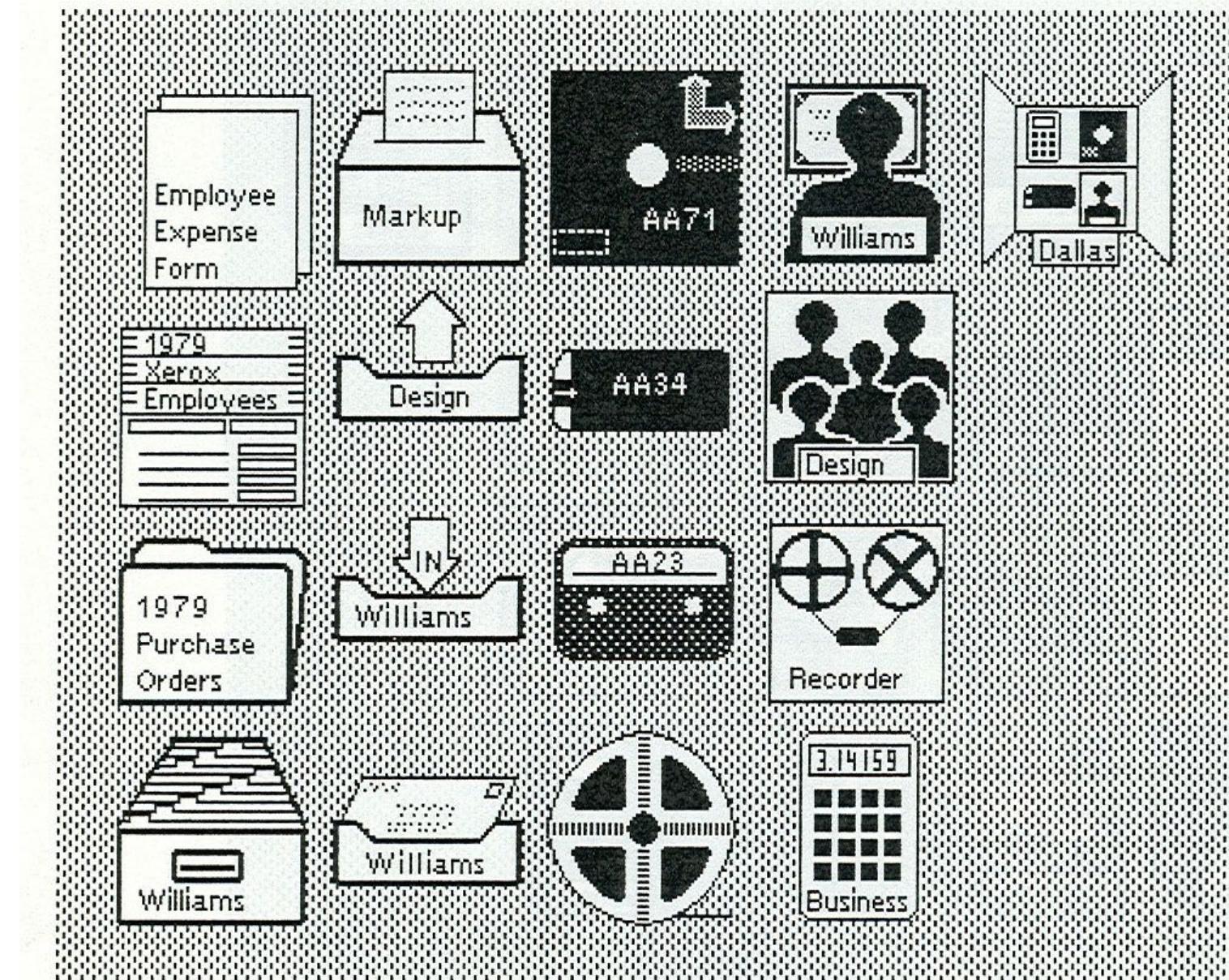


Evolution of "Document" icon Shape



¹⁹ Image source: [Left](#), [Right](#)

Figure 4.
Set 4 (Judd)

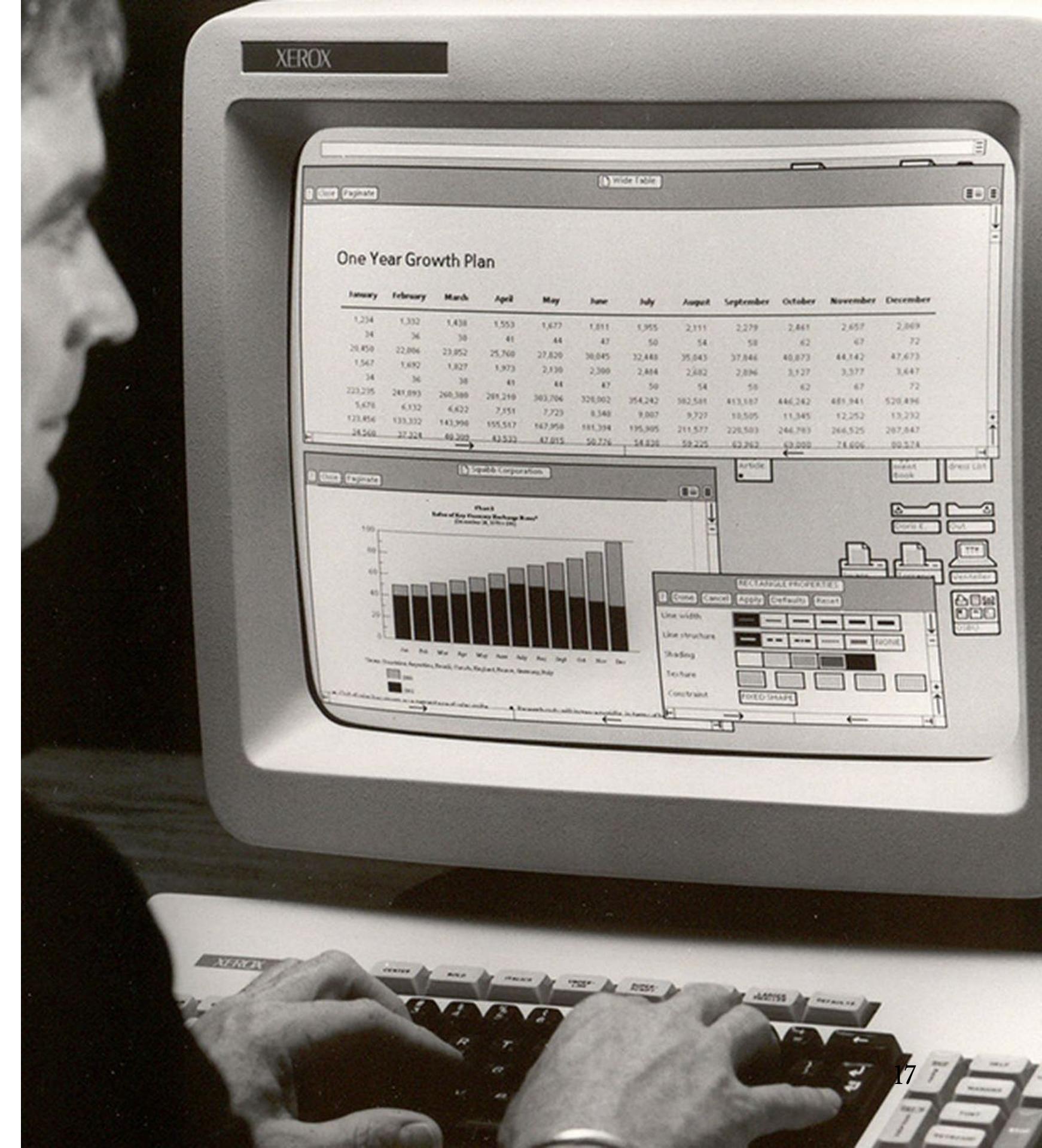


document	printer	floppy disk	user	directory
record file	out-basket	mag. card	group	
folder	in-basket	cassette	recorder	
file drawer	in-basket (with mail)	mag. tape	calculator	

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).

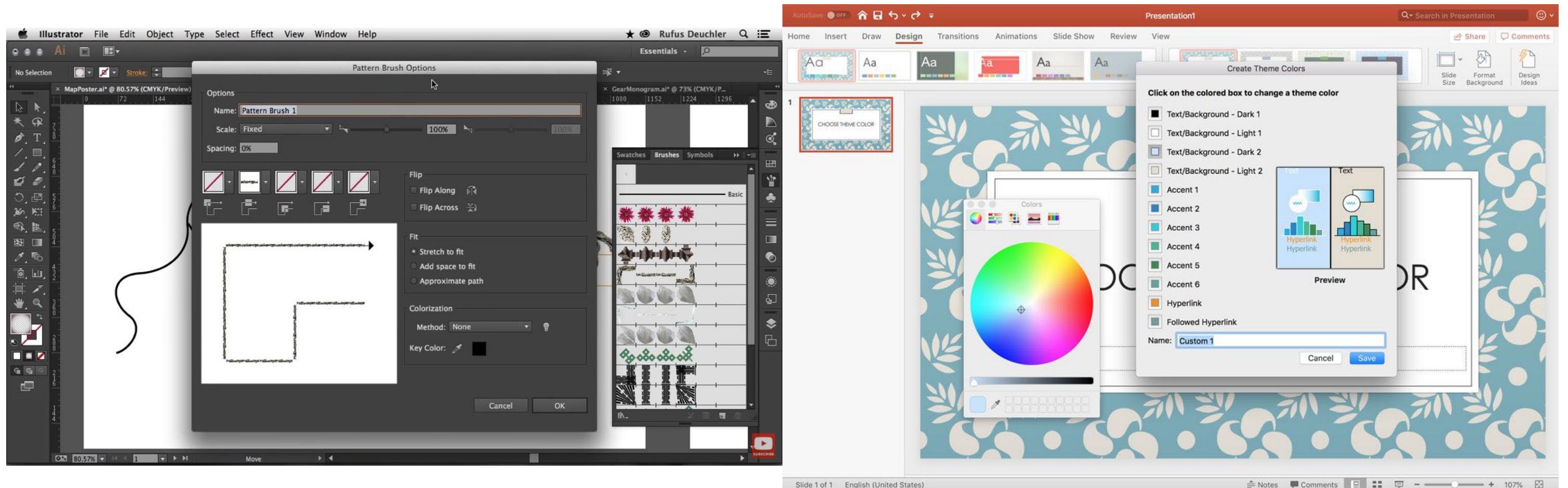


²⁰ [Image source](#)

Elements of the WIMP Paradigm: Windows

Definition: Windows are resizable containers of individual applications.

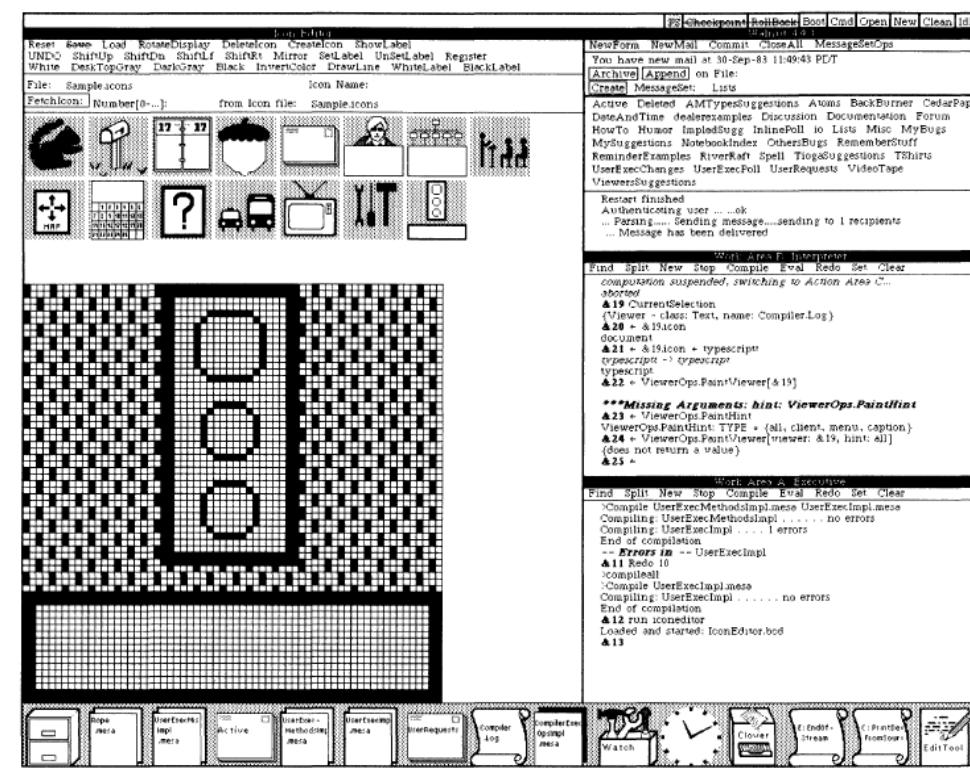
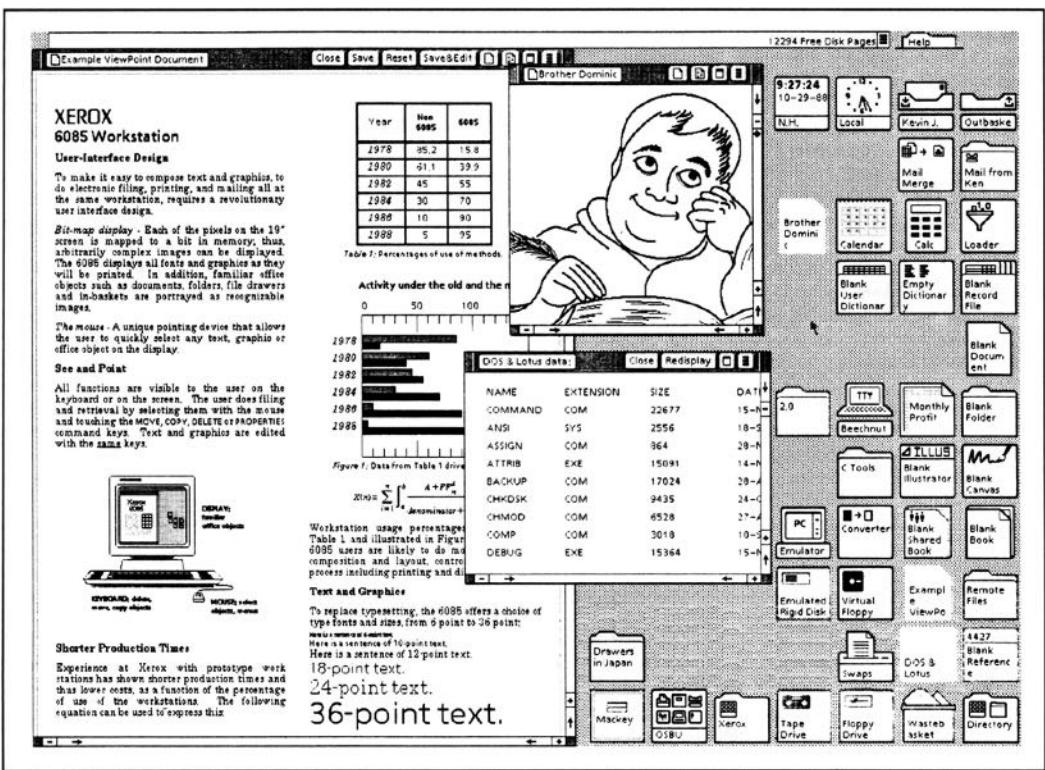
Primary windows contain elements for the main functionality of the application, such as a canvas. *Secondary* windows support main windows through modal panes, dialog boxes, etc.



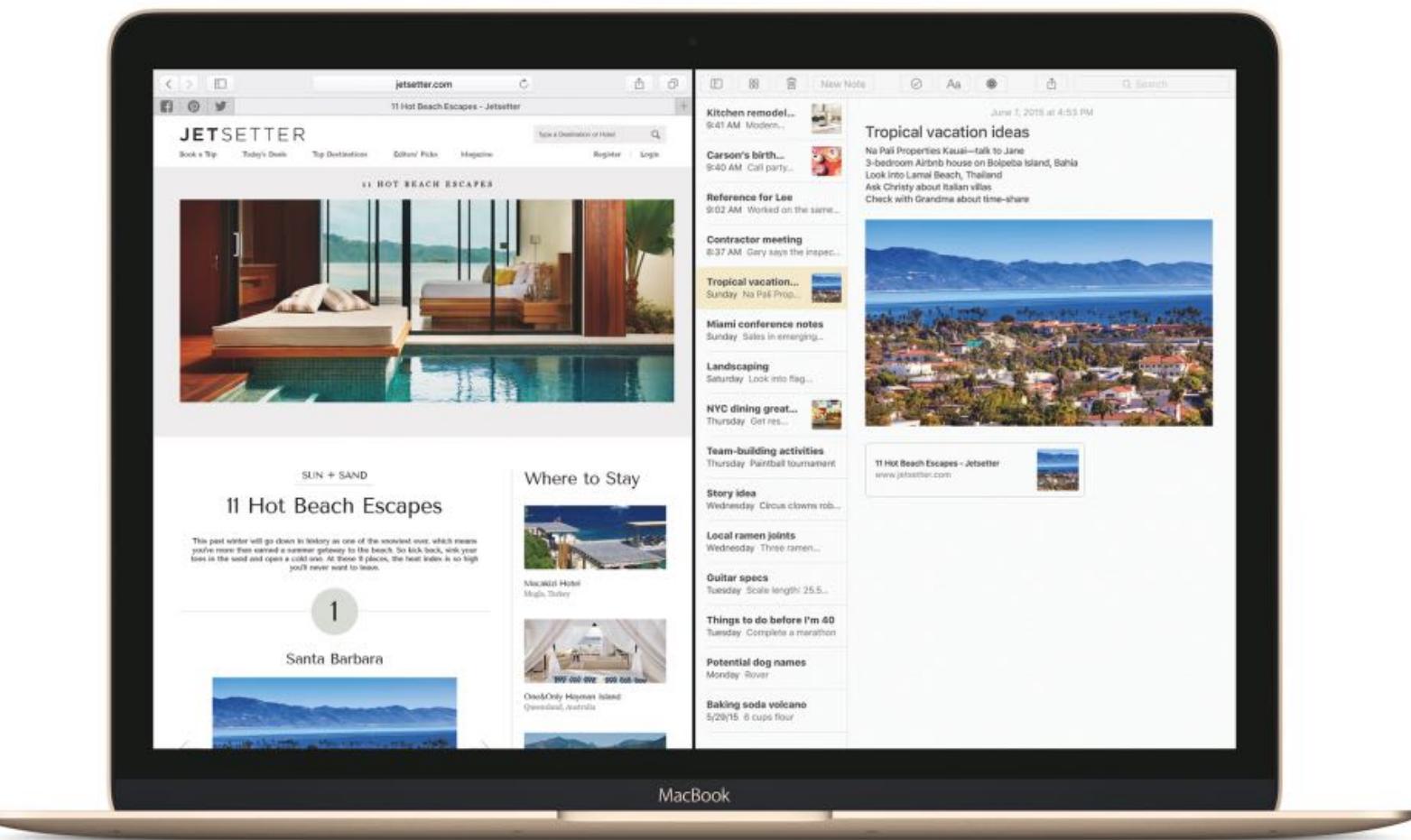
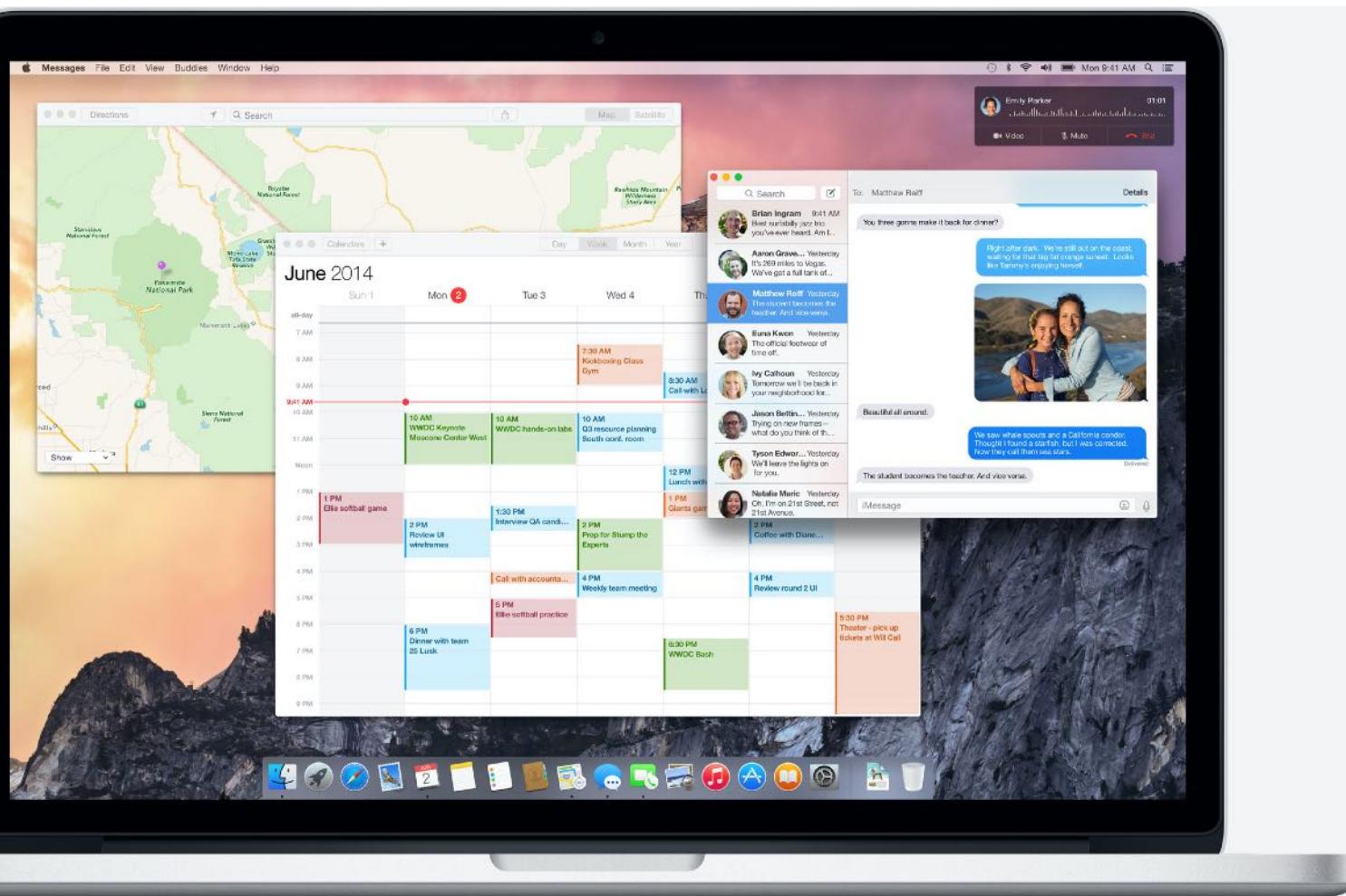
²¹ Image source: [Left](#), [Right](#)

Window Organization²²

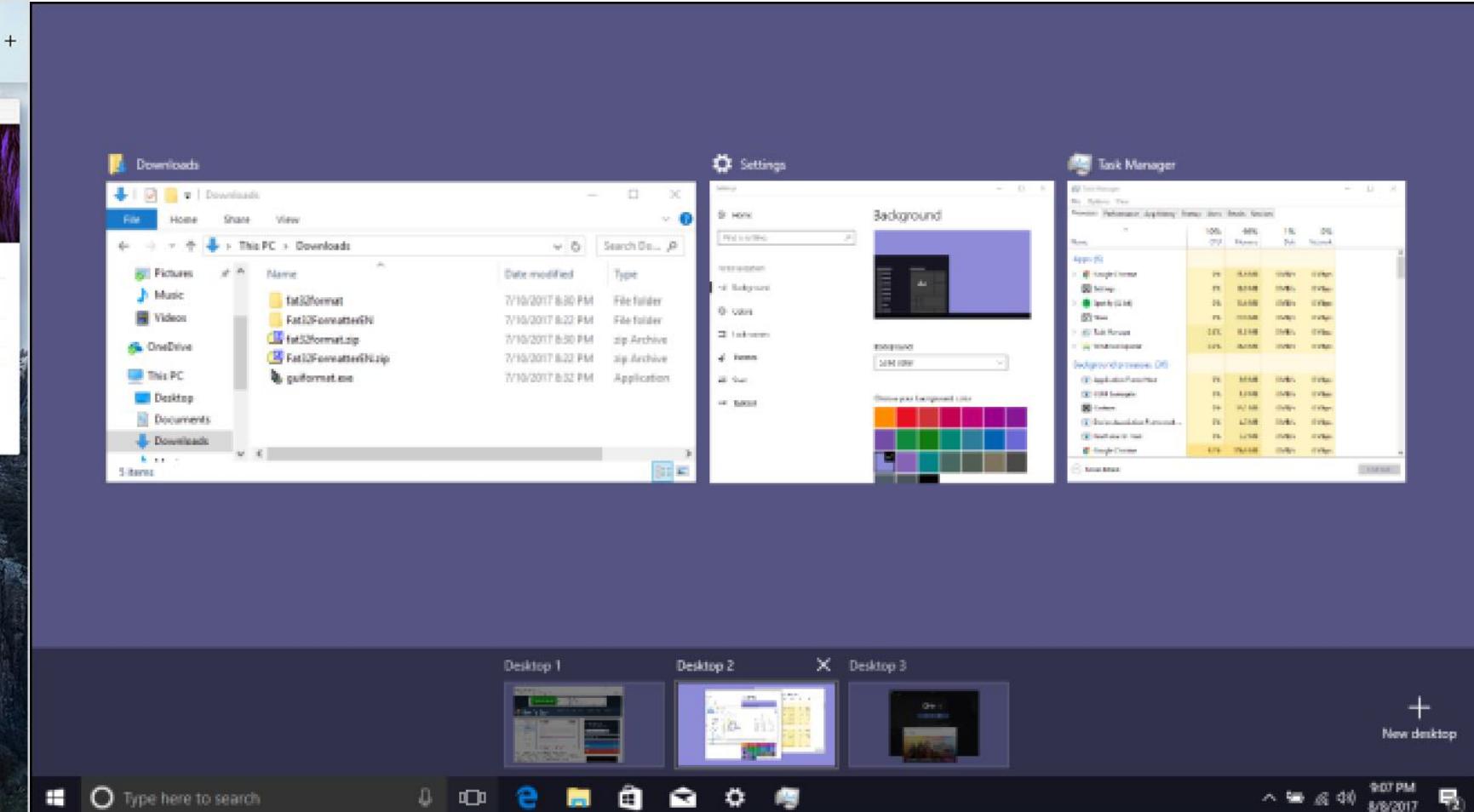
Definition: Windows can be organized in a way that overlaps several windows or tiles them across the screen.



²² Image source: [Left](#), [Right](#)



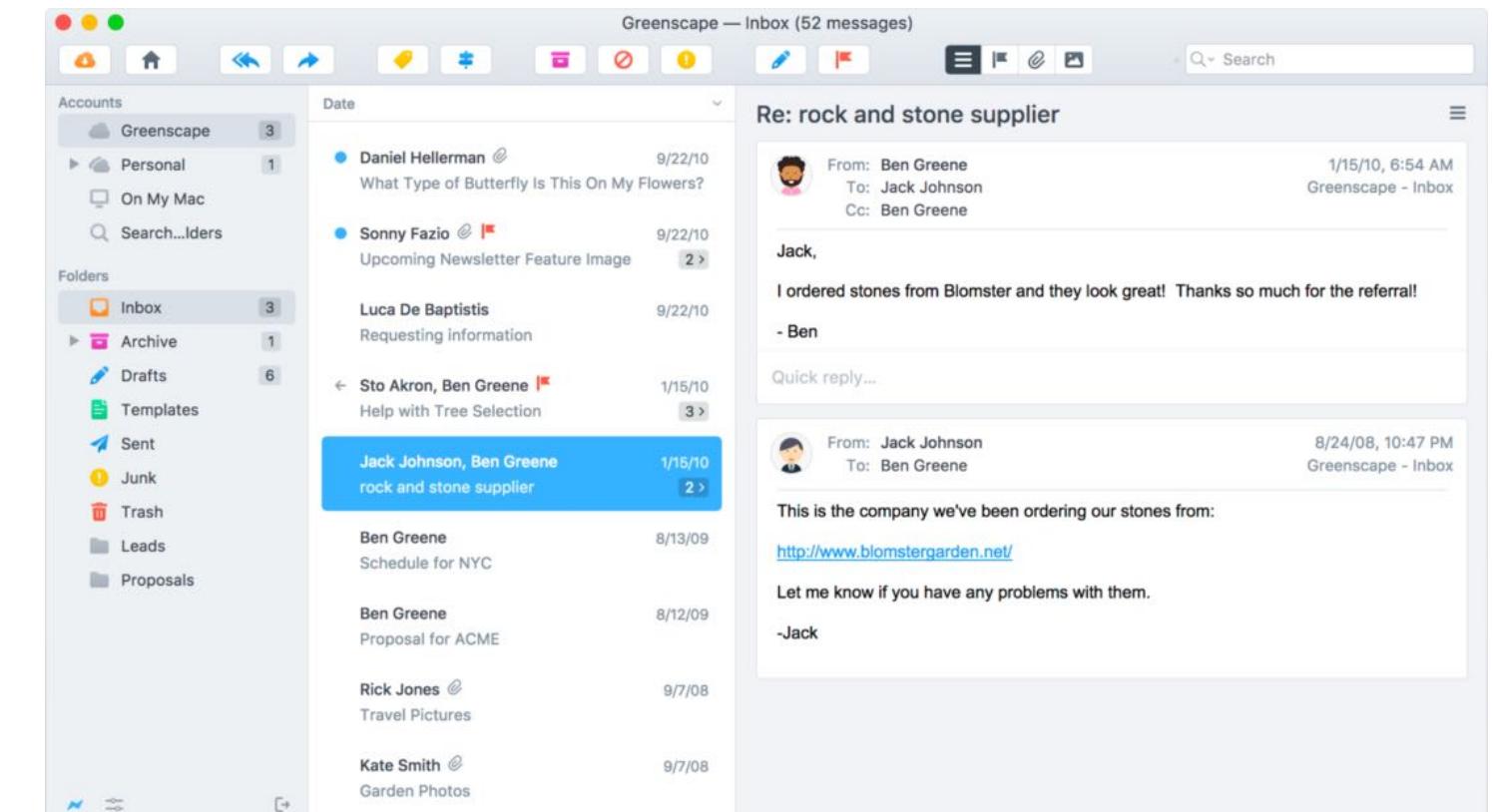
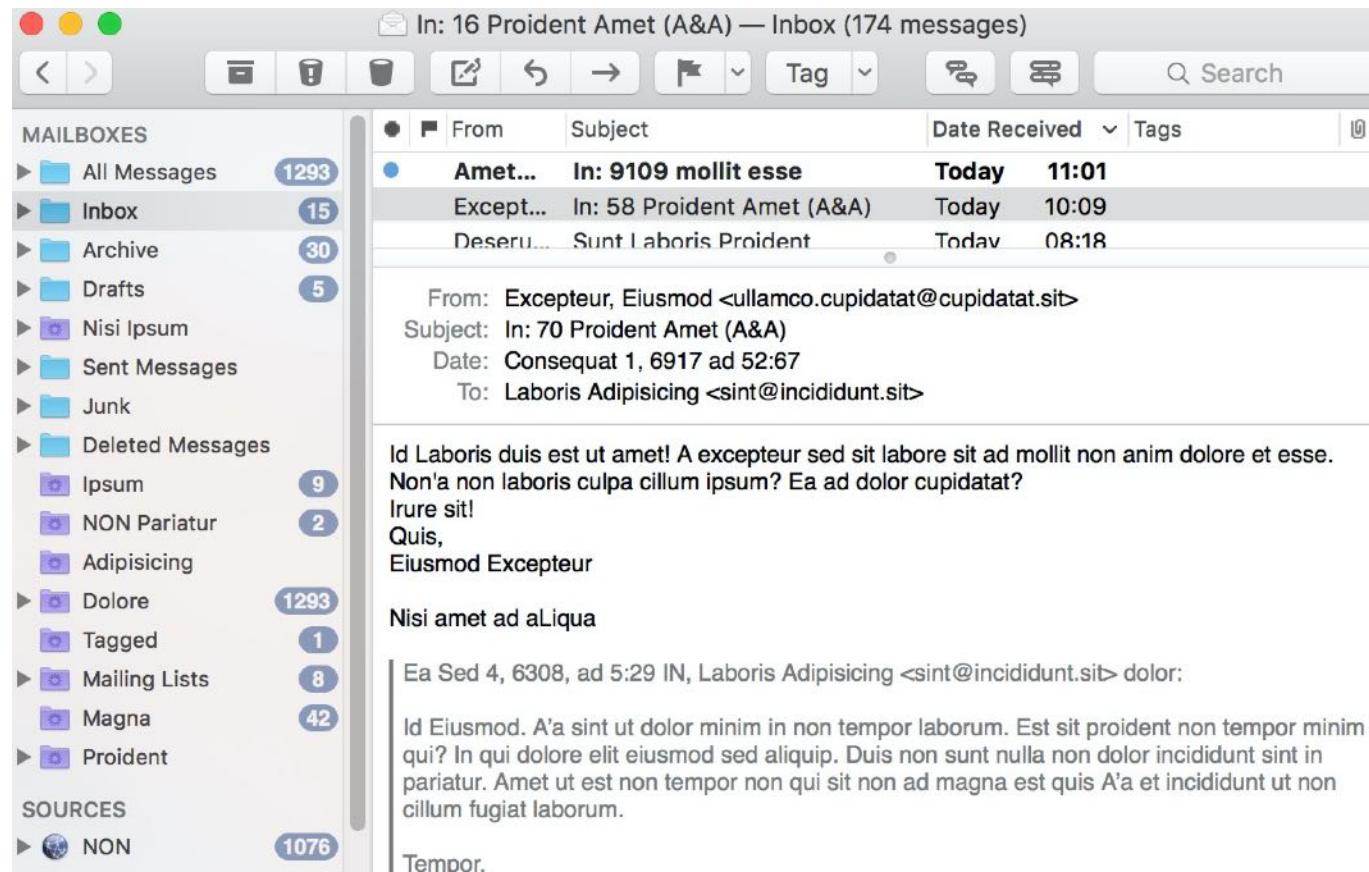
²³ Image source: [Left](#), [Right](#)



²⁴ Image source: [Left](#), [Right](#)

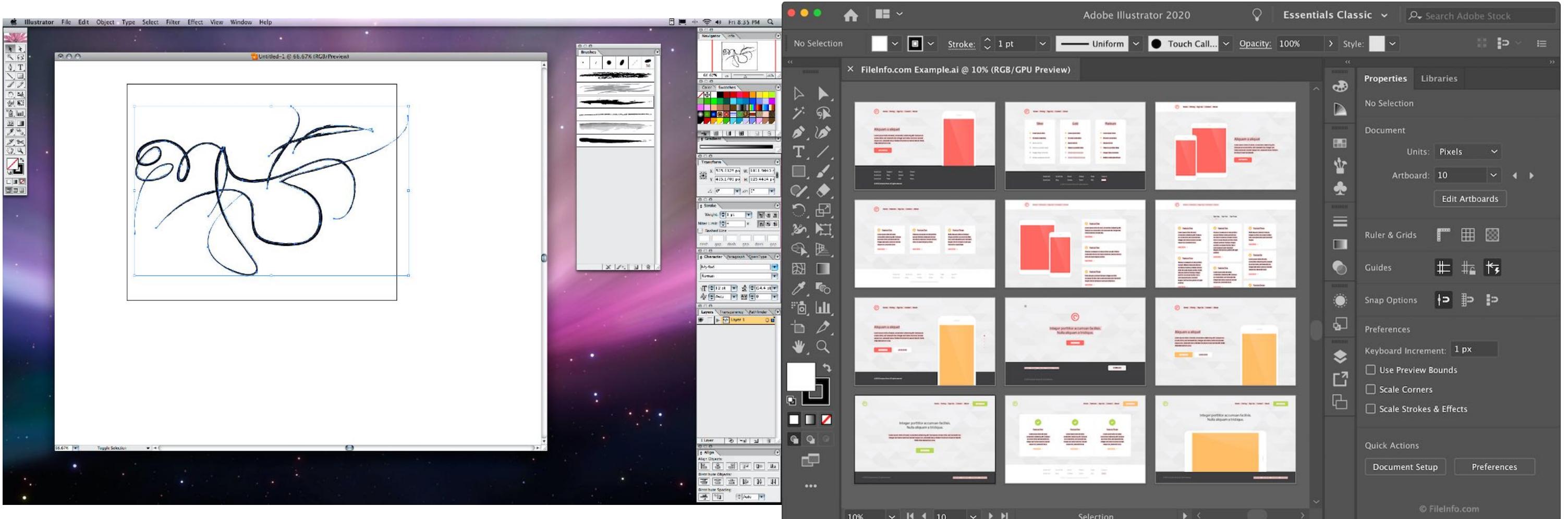
Window Structures²⁵

Windows bring together dedicated *panes* in different configurations.



²⁵ Image source: [Left](#), [Right](#)

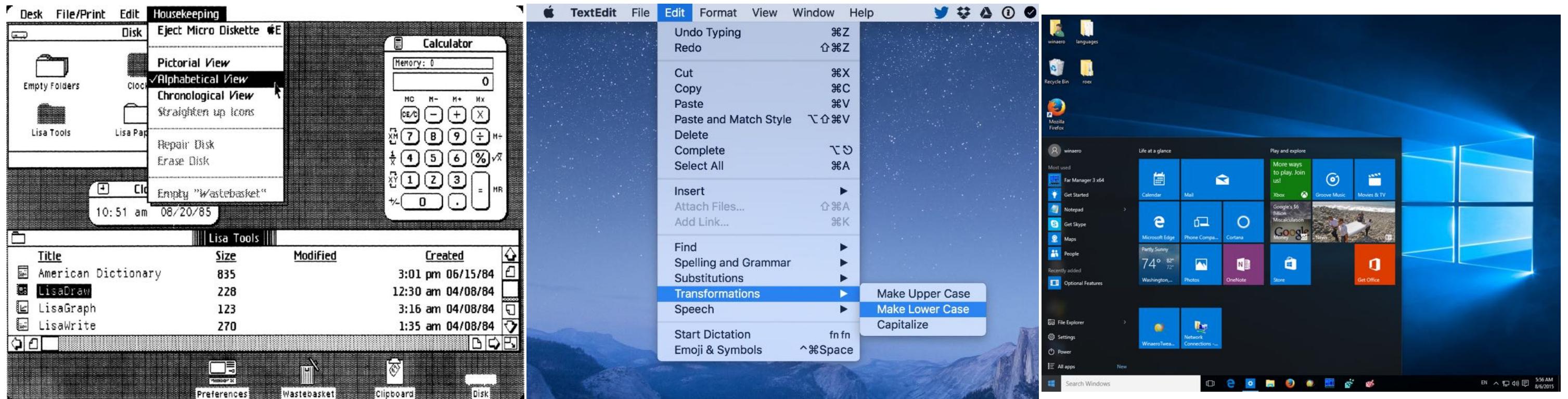
Secondary windows can be *docked*, *stacked*, and *floating*.²⁶



²⁶ Image source: [Left](#), [Right](#)

Menus²⁷

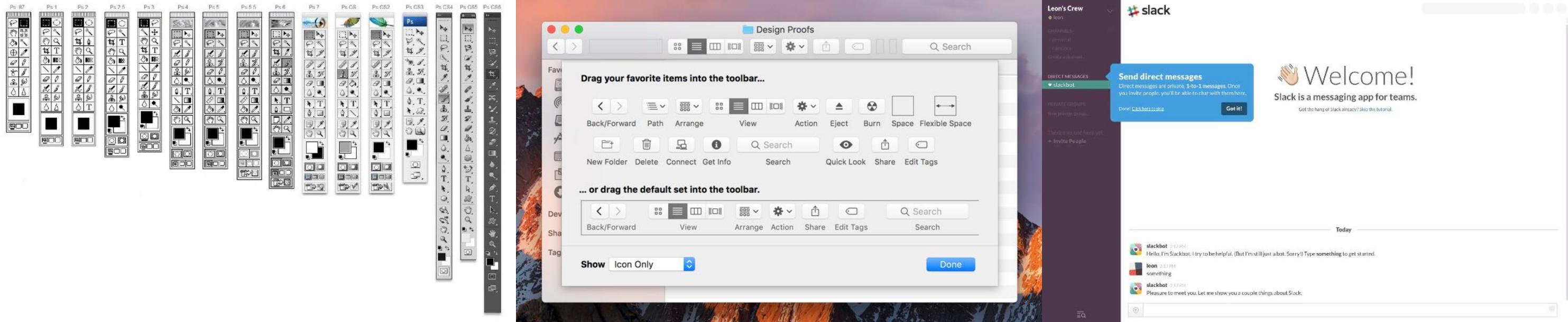
Definition: Menus list all the functions of the an application. Menu lists serve *educational* and *reference* purposes.



²⁷ Image source: [Left](#), [Center](#), [Right](#)

Toolbars, Palettes, Sidebars, & Tooltips²⁸

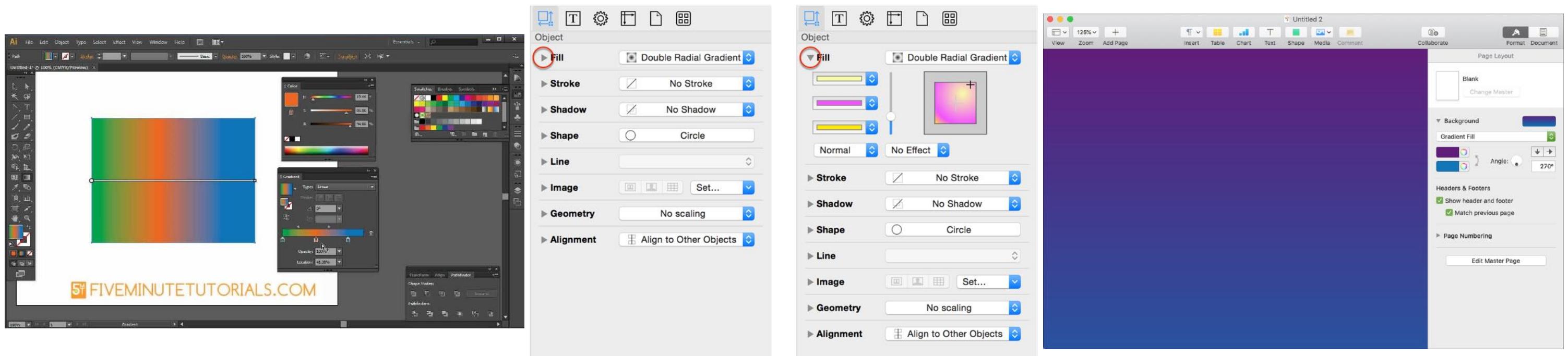
Definition: *Toolbars, palettes, sidebars, and tooltips* facilitate (visual and manipulation) access to frequently used functions.



²⁸ Image source: [Left](#), [Center](#), [Right](#)

Tool Palettes²⁹

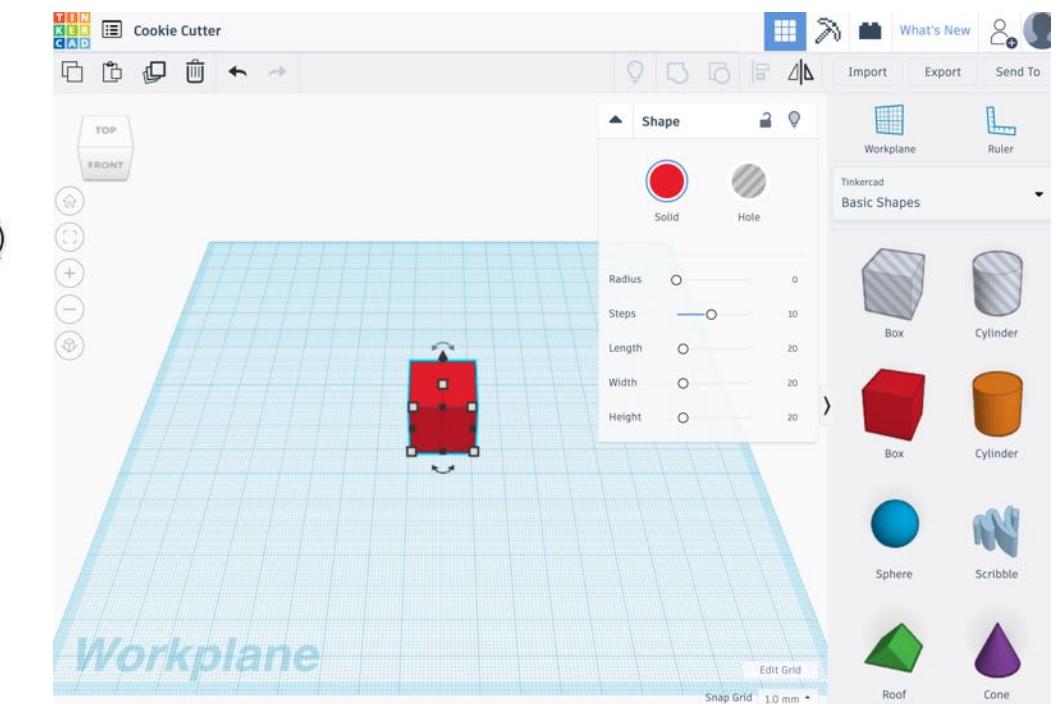
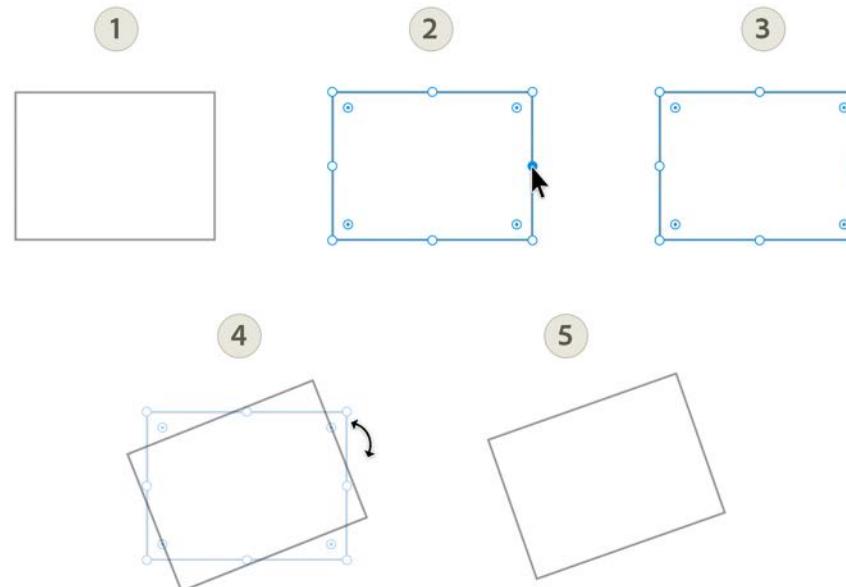
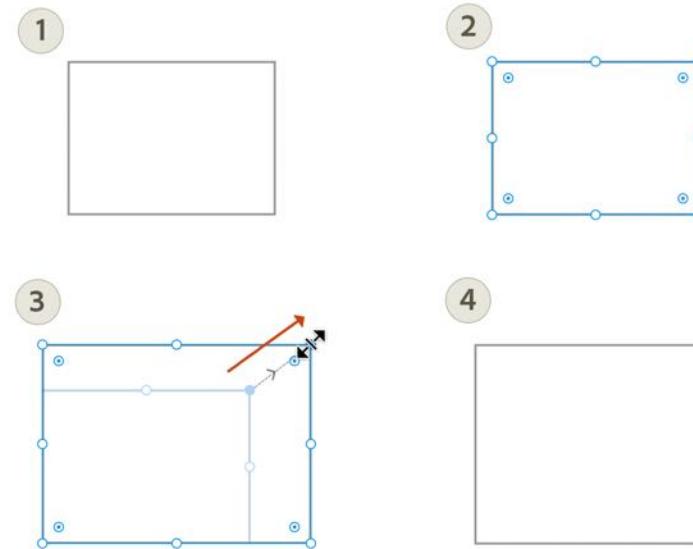
Definition: Tool palettes provide *advanced controls* for a particular function rather than frequently accessed functions.



²⁹ Image source: [Left](#), [Center](#), [Right](#)

Pointing³⁰

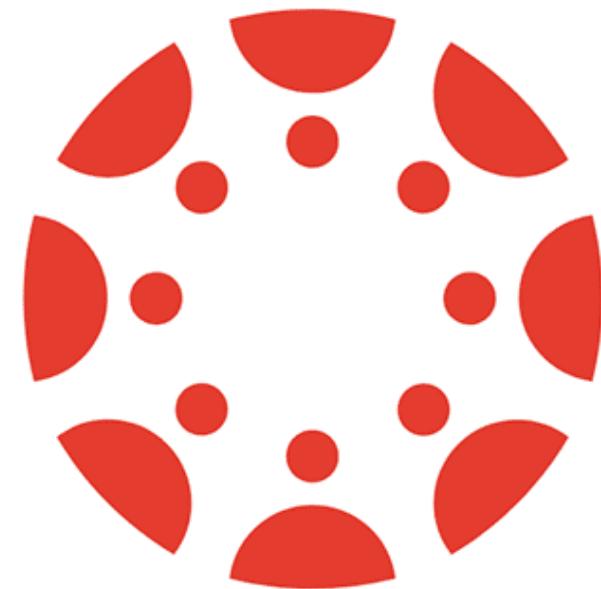
Definition: *Pointing* on an application canvas enables a range of advanced capabilities for *direct manipulation*.



³⁰ Image source: [Left](#), [Center](#), [Right](#)

Quiz 1

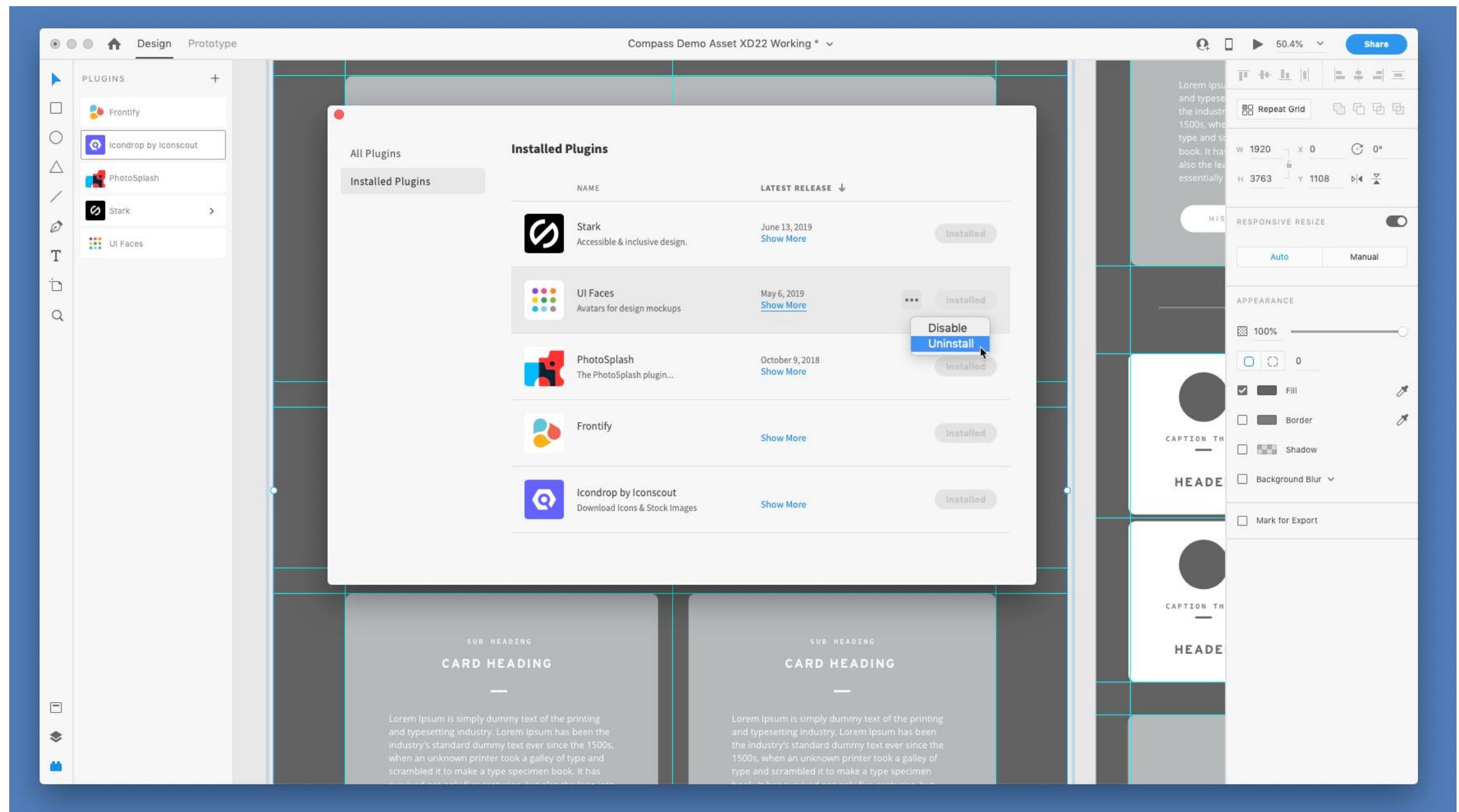
Complete the Canvas quiz.



canvas

In-Class Activity 1: Desktop Application Deconstruction

Image Source



Designing for the Web

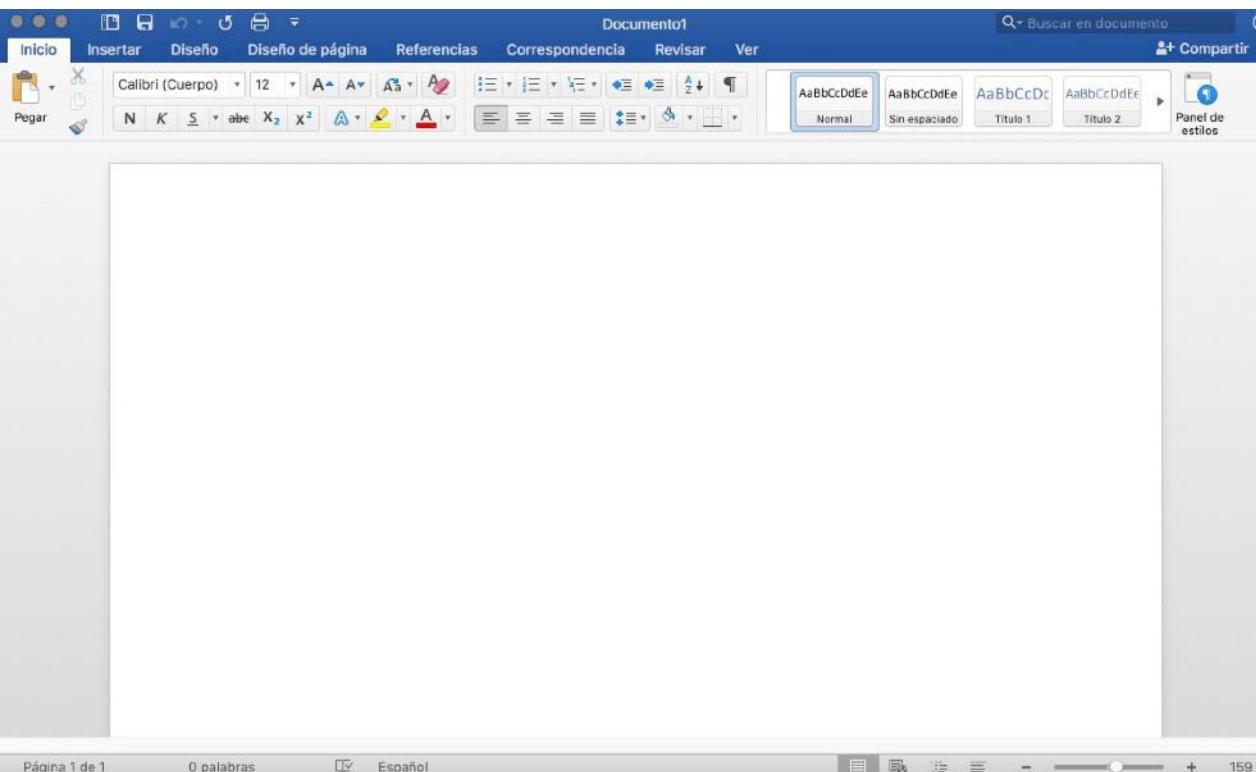
Desktop Applications vs. Websites

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.

Web Applications³¹

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

A screenshot of the Google Docs Word Online interface. The top navigation bar includes FILE, HOME, INSERT, PAGE LAYOUT, REVIEW, and VIEW. The main content area displays a document titled 'Word'. The text in the document reads: 'We ran into some frustration out of the gate when we went to create a header. Whereas Google Docs intuitively placed this feature under its Insert menu, Word treats headers and footers like they're already present in a blank document. A quick help search reminded us they can be revealed from the View menu: View > Header and Footer. Word gives you far more control over headers with an entire ribbon of tools that let you add page numbers, date and time and pictures to it and designate on which pages it appears.' Below this, another paragraph continues: 'Unlike Google Docs, Microsoft Word does have an actual column feature, which can be found under its Format menu. However, it's designed to flow paragraph-heavy text from one column to the next, as would in a newsletter. It's less than ideal for something like a resume that intersperses short blocks of text and bulleted lists. Because of that, we opted to again use tables to give us better control over the layout.' At the bottom, there is a note: 'The first major difference you'll notice from Google Docs is [Word offers a head-spinning seven ways to create Tables](#), including drawing them freehand and a couple that are only relevant if you're importing Excel data. The Graphic Grid is the most straightforward method and the most similar to Google Docs tables function. You just click the table icon under the Tables tab and in the drop-down grid, select number of rows and columns you want.'

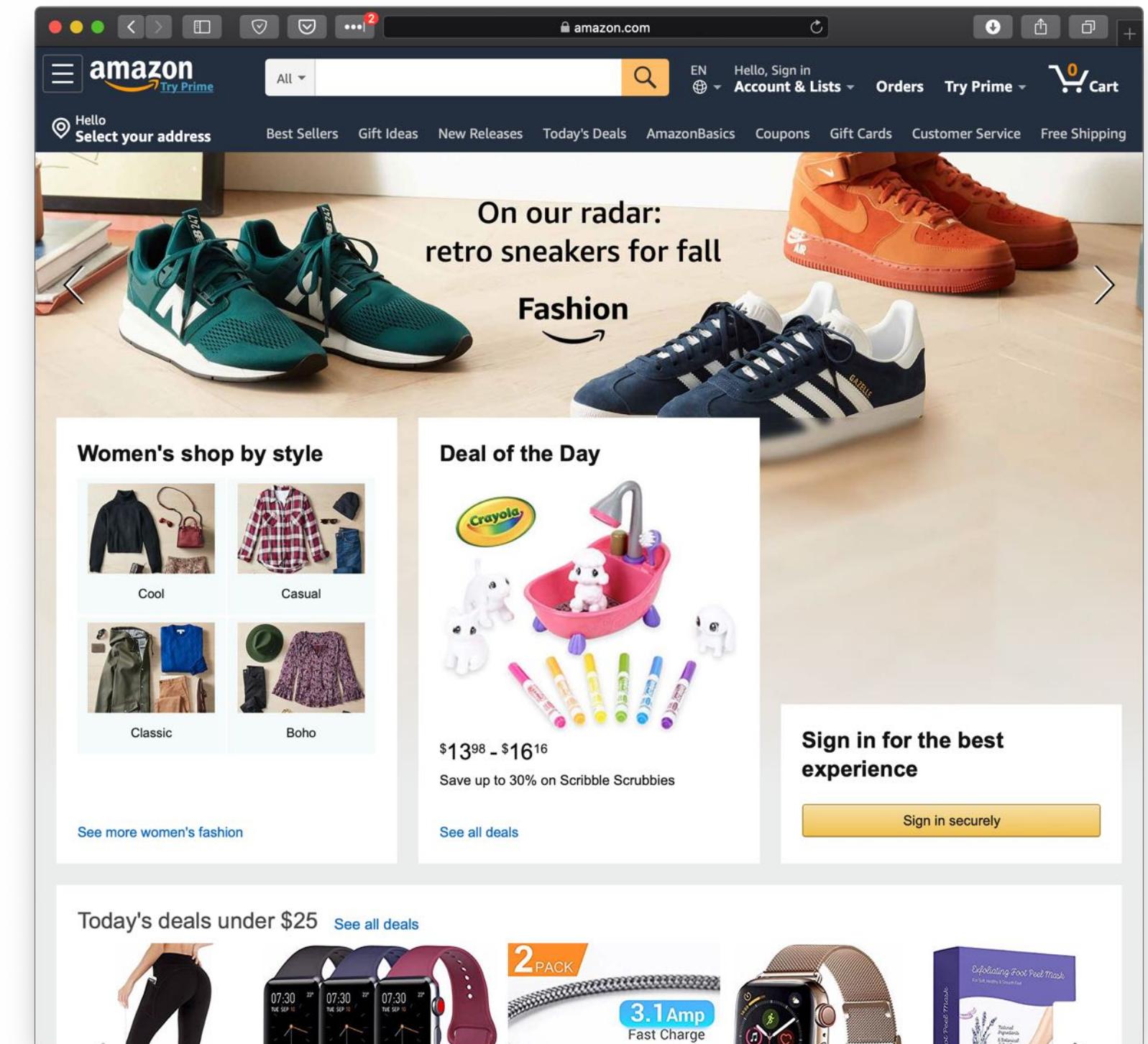
³¹ Image source: [Left](#), [Right](#)

The Page

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

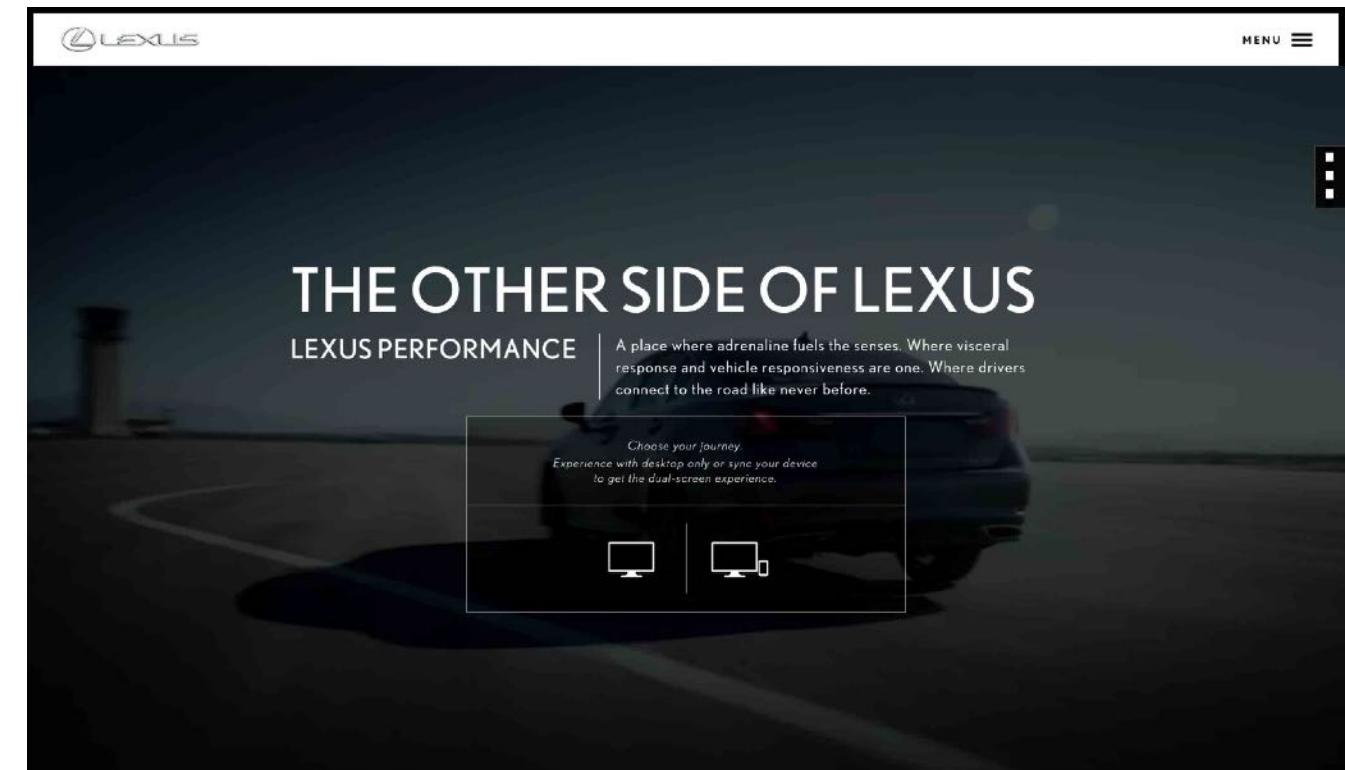
If the web is made out of pages, how do we organize and help users navigate them?

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.

The screenshot shows the Overstock.com homepage with a focus on the Furniture category. The left sidebar contains a hierarchical navigation tree under 'Furniture'. Top-level categories include Living Room Furniture, Bedroom Furniture, Dining, Kitchen & Bar, Patio & Outdoor Furniture, Office Furniture, and More Rooms. Each category has a list of sub-items. To the right of the sidebar, there are product thumbnails and promotional banners for discounts like 'extra 15% off Select Furniture by Coaster*' and 'extra 20% off or more Select Rugs*'. At the bottom, there are several promotional banners for deals like '7 days of deals', 'shop all anniversary', and discounts for Rugs, Furniture, and Home Decor.

The screenshot shows the Overstock.com homepage with a simplified navigation menu. The main menu items are Furniture, Rugs, Decor, Bed & Bath, Home Improvement, Kitchen, Outdoor, Jewelry, Apparel, Kids & Baby, More, Ideas, and Sales & Deals. A prominent black banner at the top announces 'The 20th Anniversary Sale Is Our Biggest Sale Ever! Get 70% Off 1000s of Items + FREE SHIPPING >'. Below the banner, the Furniture category is selected, showing a grid of furniture products. To the right, there's a 'Featured Categories' sidebar with links to various furniture types. A large promotional image for the anniversary sale features a brown sofa and chairs, with text offering an extra 25% off select furniture. Another sidebar on the right encourages users to 'Shop our biggest sale in 20 years!' and 'anniversary sale'.

How do we get home?

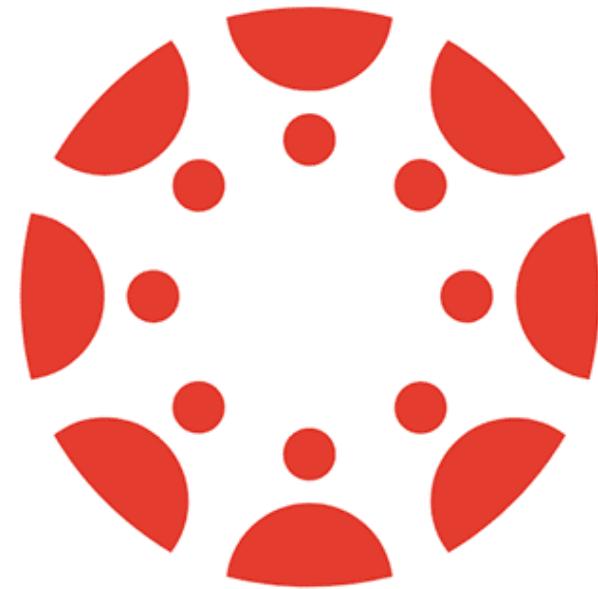
A key problem in complex sites is to get back to previous pages or other pages that are higher in the navigation hierarchy. *Breadcrumbs* and *hierarchical lists* are solutions to this problem.

This screenshot shows the Amazon Fashion Men's Shoes page. At the top, there's a navigation bar with links like Best Sellers, Gift Ideas, New Releases, Today's Deals, AmazonBasics, Coupons, Gift Cards, Customer Service, Free Shipping, Shopper Toolkit, Registry, Sell, and a Cart icon. Below the navigation bar, there are links for Amazon Fashion (WOMEN, MEN, GIRLS, BOYS, BABY), LUGGAGE, SALES & DEALS, and NEW ARRIVALS. A "prime wardrobe" button is also present. On the left, there's a sidebar with categories like Men's Clothing, Shoes, and Accessories, and a "Refine by" section for Amazon Prime and Delivery Day. The main content area features a "MEN'S SHOES" heading and a "Featured categories" section with five categories: Fashion Sneakers, Loafers & Slip-Ons, Athletic, Boots, and Oxfords. Below this, there are five more categories: Slippers, Sandals, Work & Safety, Outdoor, and Mules & Clogs, each with a small image of a shoe.

This screenshot shows the Overstock Kids & Toddler Furniture page. At the top, there's a navigation bar with links for Furniture, Rugs, Decor, Bed & Bath, Home Improvement, Kitchen, Outdoor, Jewelry, Apparel, Kids & Baby, More, Try Club, Account, Lists, and Cart. A banner at the top says "The 20th Anniversary Sale is Our Biggest Sale Ever! Get 70% Off 1000s of Items + FREE SHIPPING >". Below the banner, the page title is "Kids & Toddler Furniture". There's a sidebar with categories like Kids & Toddler Beds, Cribs, Changing Tables, Gliders & Ottomans, Kids Storage & Toy Boxes, and a link to "Shop All Kids & Toddler Furniture on Sale". The main content area features a large image of a child's bedroom with a bed, dresser, and nightstand, and a promotional overlay that says "EXTRA 20% OFF SELECT KIDS' FURNITURE*" with a "SHOP NOW" button. Below this, there are several smaller images of different types of kids' furniture, including a bunk bed, a dresser, and a desk.

Quiz 2

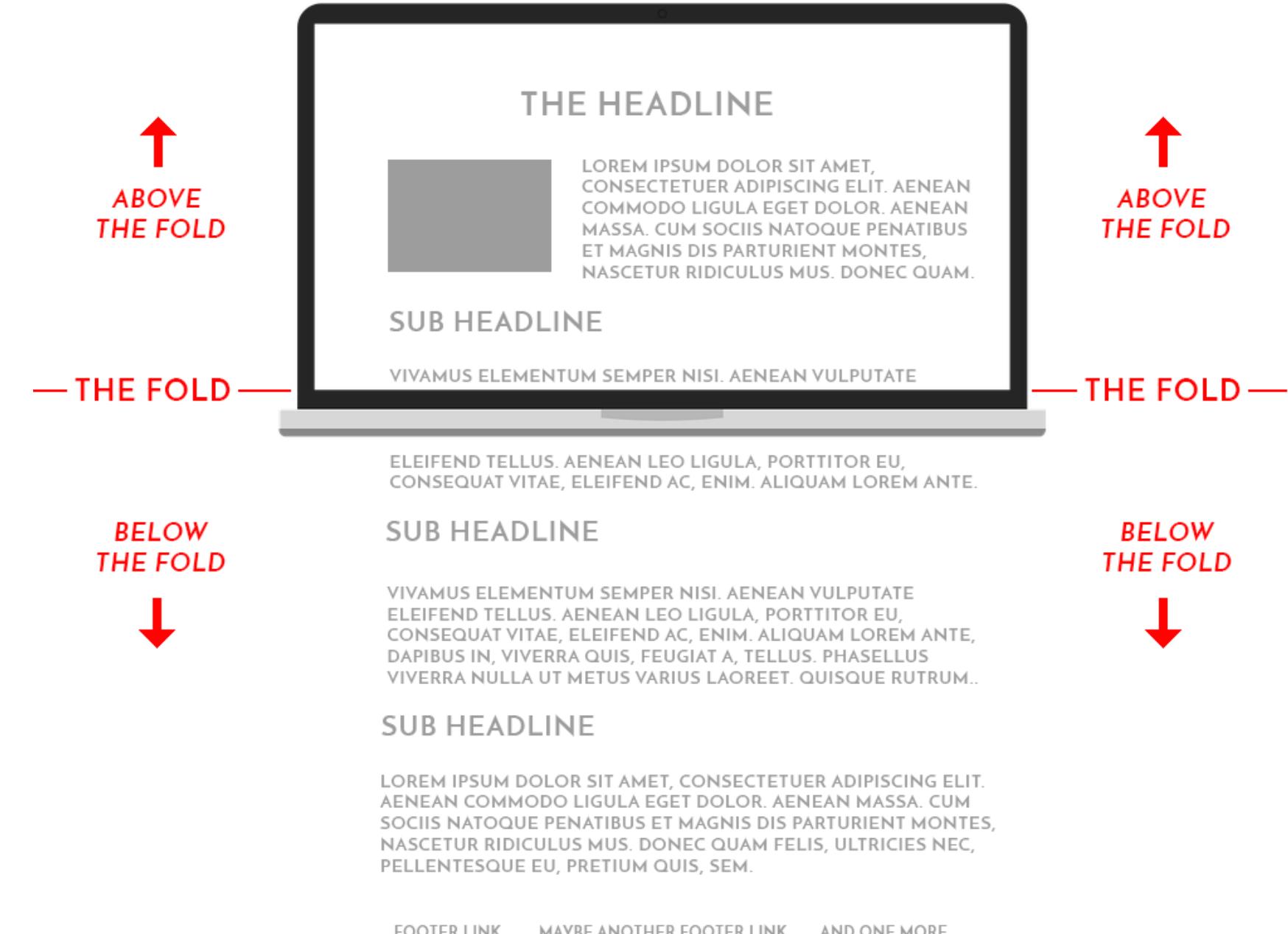
Complete the Canvas quiz.



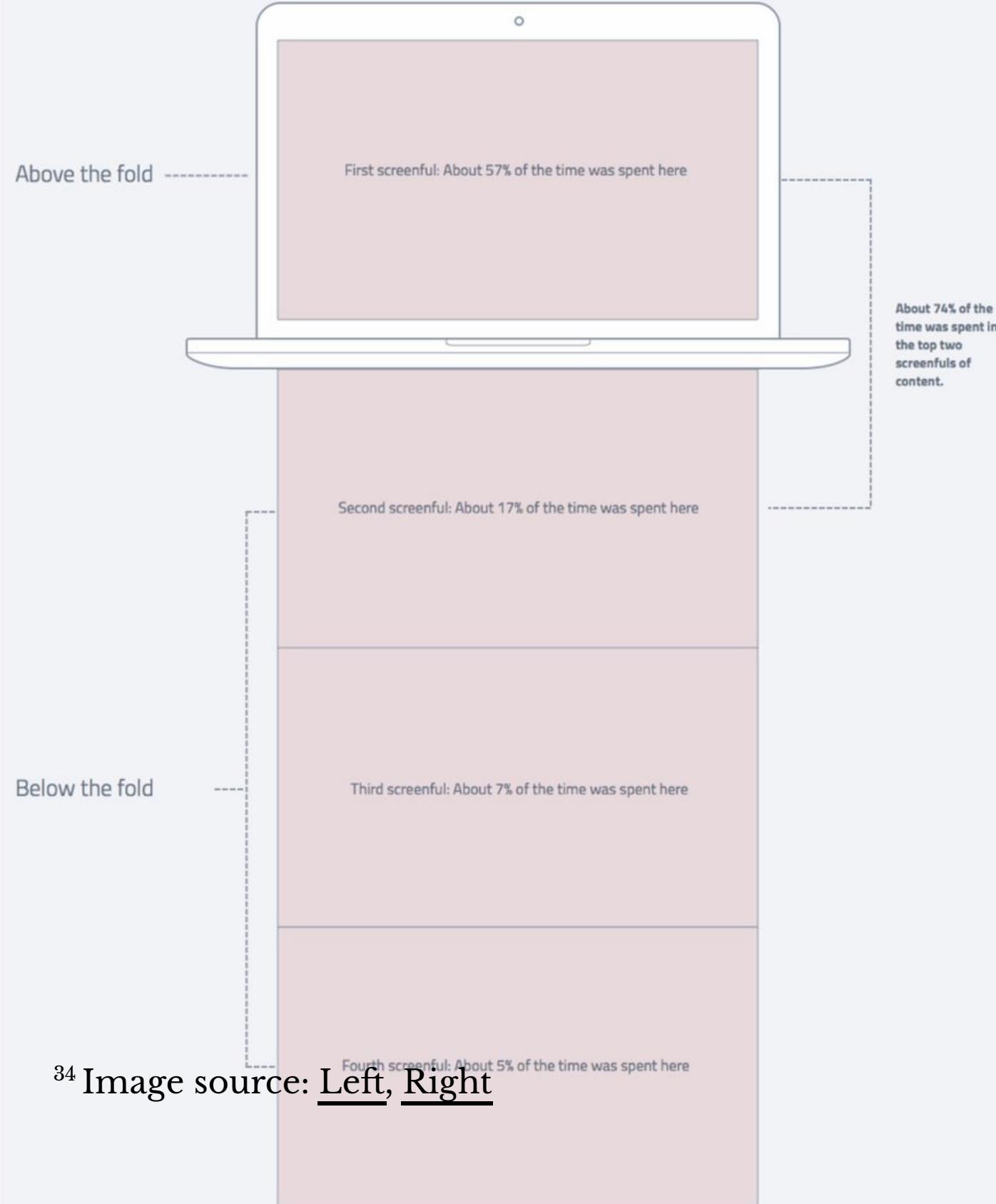
canvas

Organizing Page Content: The Fold³³

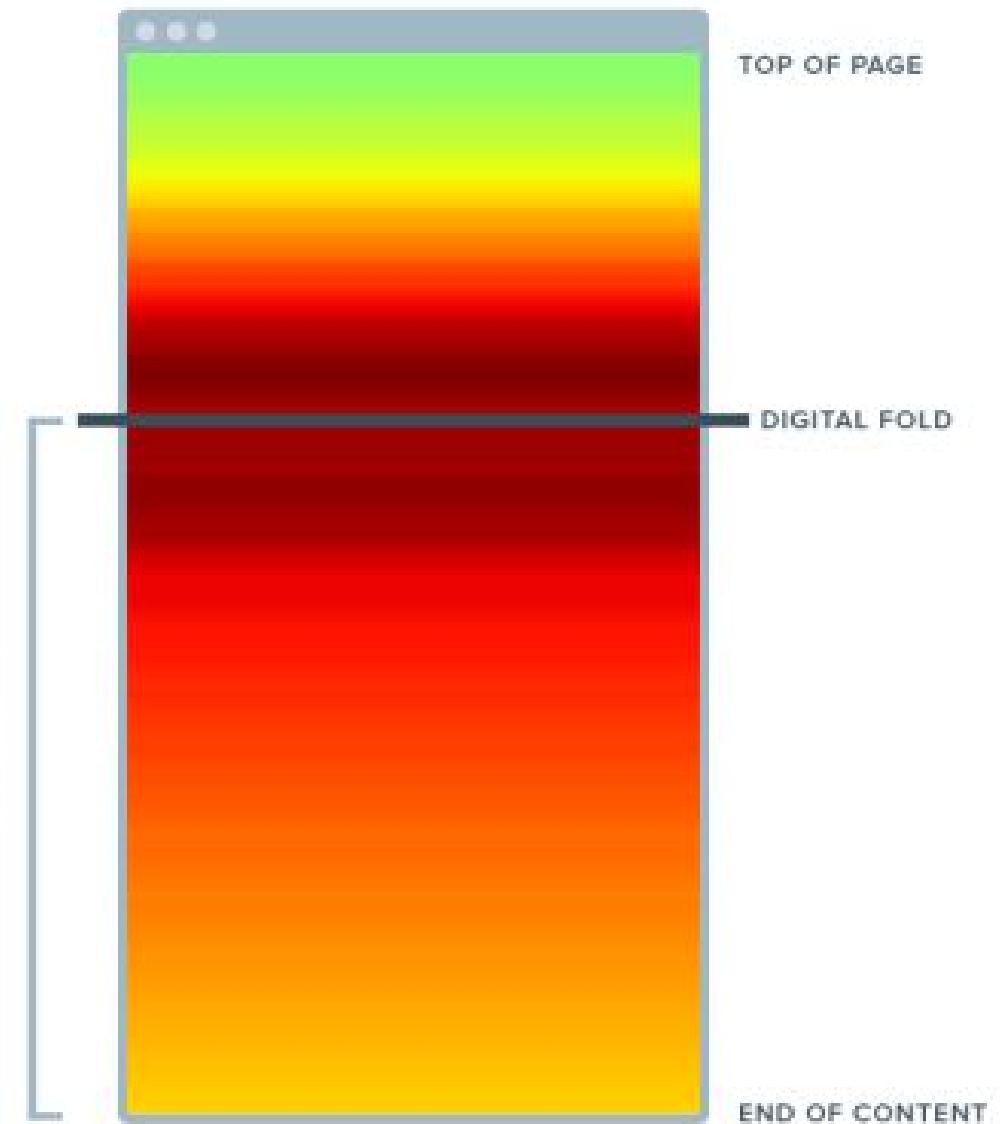
Definition: The *fold* is the dividing line between the area that is visible when a page first loads and the remainder of the page.



³³ [Image Source](#)



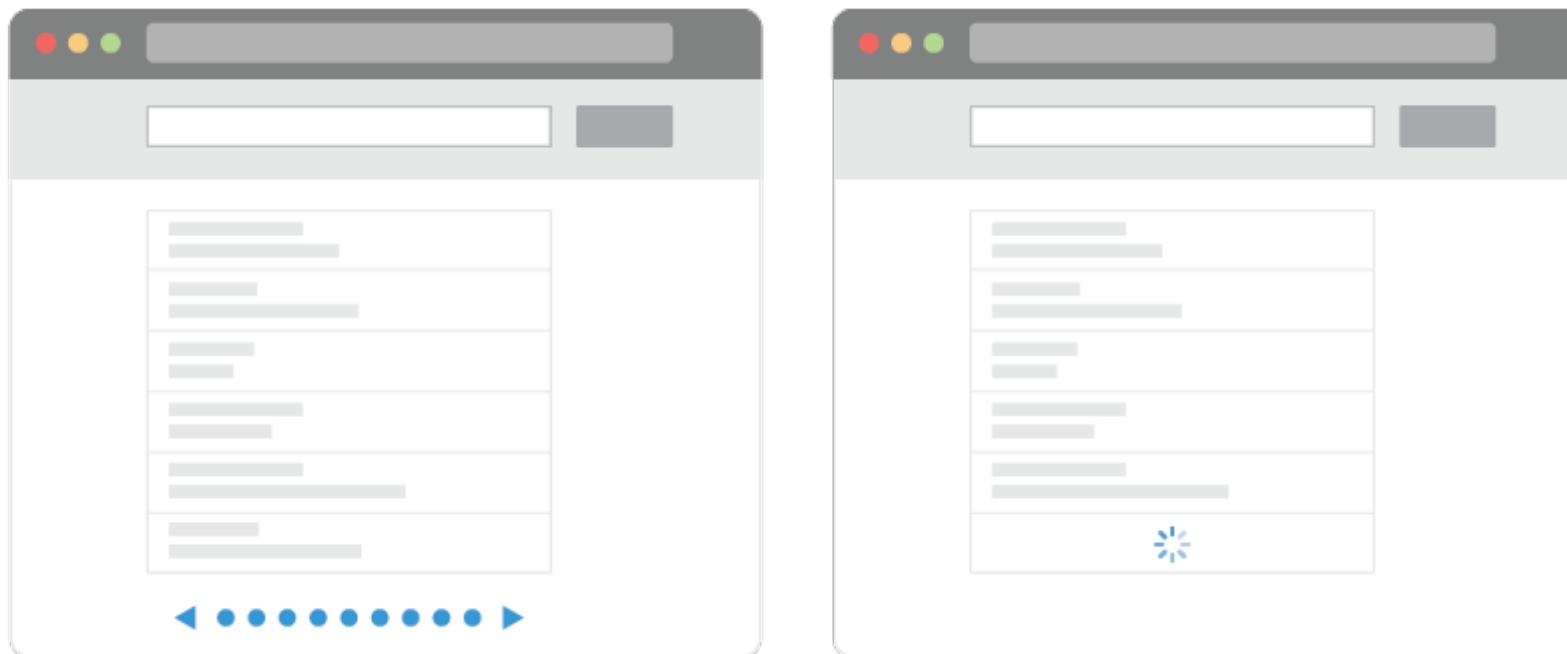
WHERE WE SPEND TIME READING



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

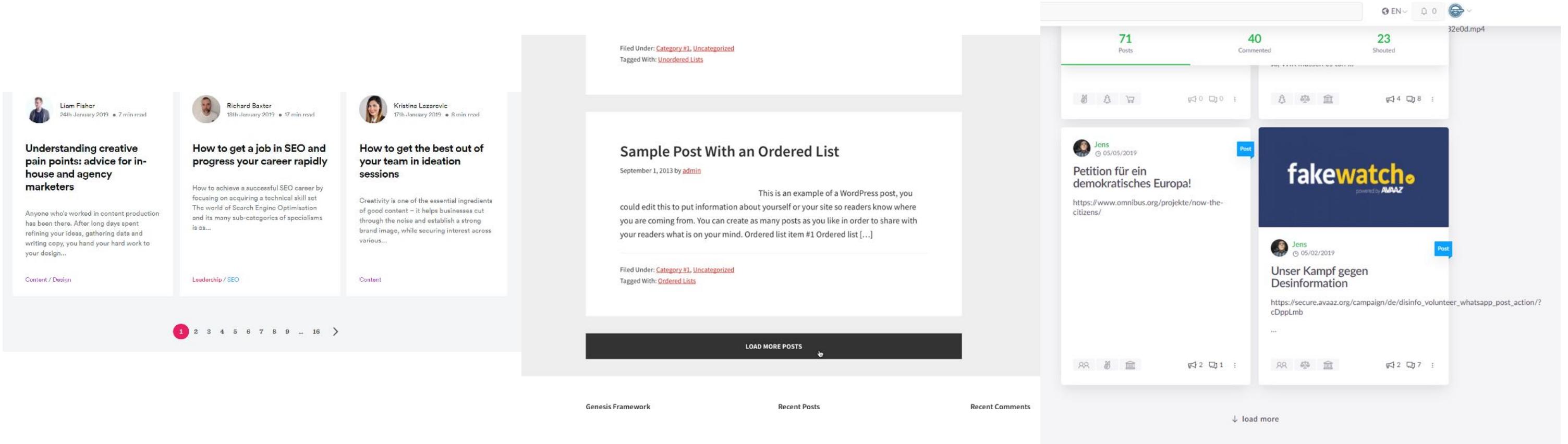
Organizing Page Content: Fitting It All in³⁵

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



³⁵ [Image Source](#)

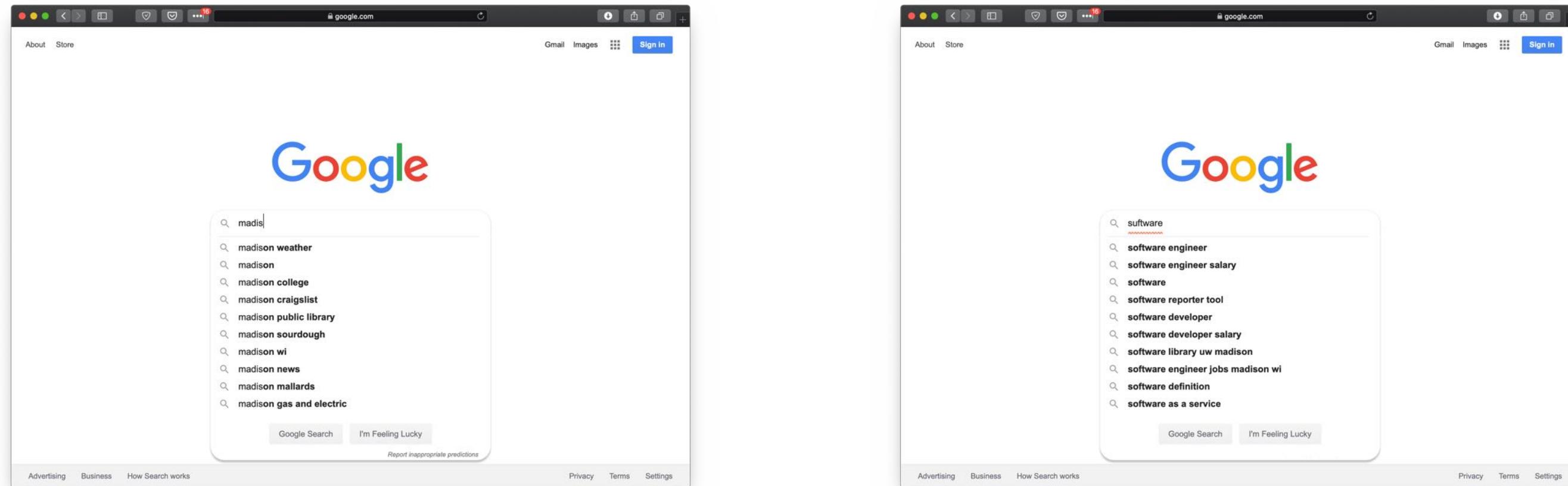
Examples of pagination and infinite scroll:³⁶



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.

The screenshot shows the Yelp website interface. At the top, there's a red header with the Yelp logo, a search bar containing "Near South Campus, Madison, WI", and navigation links for "Log In" and "Sign Up". Below the header, a navigation bar includes links for "Restaurants", "Home Services", "Auto Services", "More", "Write a Review", and "For Businesses".

The main content area is titled "Best Restaurants near South Campus, Madison, WI" and displays "Showing 1-30 of 165" results. It features a map of Madison, WI, with numbered pins indicating restaurant locations. To the left of the map is a sidebar with filtering options:

- Sort By:** Recommended, Highest Rated, Most Reviewed.
- Neighborhoods:** South Campus, Orchard Ridge Community, Capitol, Midvale Heights Community, More Neighborhoods.
- Distance:** Bird's-eye View, Driving (5 mi.), Biking (2 mi.), Walking (1 mi.), Within 4 blocks.
- Price:** \$, \$\$, \$\$\$, \$\$\$\$.
- Features:** Delivery, Takeout, Open Now 11:19 AM.
- Category:** Sandwiches, American (Traditional), Pizza, Mexican.

Below the sidebar, there's a section for "All Results" featuring a photo of a bowl of ramen and a listing for "1. Asian Noodle".

The screenshot shows the Zappos website interface. At the top, there's a blue header with the Zappos logo, a search bar containing "running shoes", and a "SEARCH" button. The header also includes links for "Customer Service", "Available 24/7 at (800) 927-7671", "Free Shipping, Free 365-day Return policy, & 24/7 Customer Service. Learn More", and "MY CART".

The main content area is titled "Running Shoes" and displays "5727 items found". It features a grid of four running shoe models with their names and star ratings below them:

- Newton Running Distance 8: 4.5 stars, \$155.00.
- Newton Running Gravity 8: 5 stars, \$175.00.
- Newton Running Fate 5: 4 stars, \$140.00.
- Newton Running Distance 8: 4.5 stars, \$155.00.

To the left of the shoe grid, there are narrow choice filters for "Gender" (Women, Men, Boys, Girls), "Product Type" (Shoes, Clothing, Bags, Sporting Goods), and "Brand" (Search Brand, 361 Degrees, Acorn, adidas, adidas by Stella McCartney). There's also a section for "Customers Who Searched This Also Bought".

Quiz 3

Complete the Canvas quiz.



canvas

In-Class Activity 2: Web Application Deconstruction

Image Source

amazon.com

15 ABP ⓘ 🔒

Hello, Sign in Account & Lists Returns & Orders Try Prime Cart 0

Amazon Basics Prime Day is October 13-14

Best Sellers Customer Service New Releases AmazonBasics Today's Deals Whole Foods Gift Cards Free Shipping Registry Sell Coupons #FoundItOnAmazon Prime Day is October 13-14

Toys & Games Kids Gift Guide Shop Toys by Age Shop Top Toys Shop by Category Shop by Brand Shop by Character Save on Toys

FEATURED BRANDS

Baby Alive	LEGO
Barbie	Little Tikes
Beyblade	L.O.L Surprise!
Disney	Melissa & Doug
Fisher-Price	NERF
Funko	Osmo
Gund	Play-Doh
Hatchimals	Playmobil
Hot Wheels	Playskool
Kidkraft	Radio Flyer
Learning Resources	Ravensburger

LEGO Shop now **Mattel** Shop now **NERF** Shop now

Play Vehicles

Preschool

Bikes, Skates & Ride-Ons

Hobbies

Novelty & Gag Toys

Action & Toy Figures

Building & Construction Toys

Baby & Toddler Toys

Collectible Card Games

Dolls & Accessories

Dressing Up & Costumes

Musical Instruments

Party Supplies

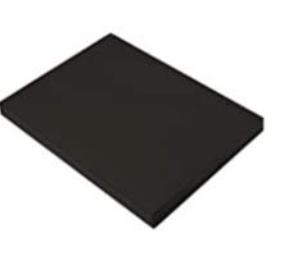
Pretend Play

Puppets & Puppet Theaters

#5  LEGO City Advent Calendar 60268 Playset, Includes 6 City Adventures TV Series... ★★★★★ 122 \$19.97

#6  Tara Toys Ariel Necklace Activity Set - Amazon Exclusive ★★★★★ 16,371 \$8.72 - \$34.95

#7  The First Years Stack Up Cup Toys ★★★★★ 28,092 \$3.99 - \$16.99

#8  SunWorks Heavyweight Construction Paper, 9 x 12 Inches, Black, 100 Sheets ★★★★★ 5,228 \$2.84 - \$15.45

HOZZQ DIY Halloween Party Supplies PVC 3D Decorative Scary Bats Wall Decal Wall... ★★★★★ 1,800 \$11.99

Play-Doh Modeling Compound 10 Pack Case of Colors, Non-Toxic, Assorted Colors, 2 Oz... ★★★★★ 12,356 \$7.99 - \$22.99

LeapFrog 100 Animals Book ★★★★★ 18,031 \$9.47 - \$59.99

Open "https://www.amazon.com/s/other/ref=lp_165793011_sa_p_89?ie=UTF8&bbn=165793011&ie=UTF8&pickerToList=lbr_brands_browse-bin&qid=1559670210&rh=n%3A165793011&ref_=sv_t_5" in a new tab

What we learned today?

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