

# Building User Interfaces

# Designing

## for Web & Desktop

Professor Yuhang Zhao

Adapted from Prof. Mutlu's slides

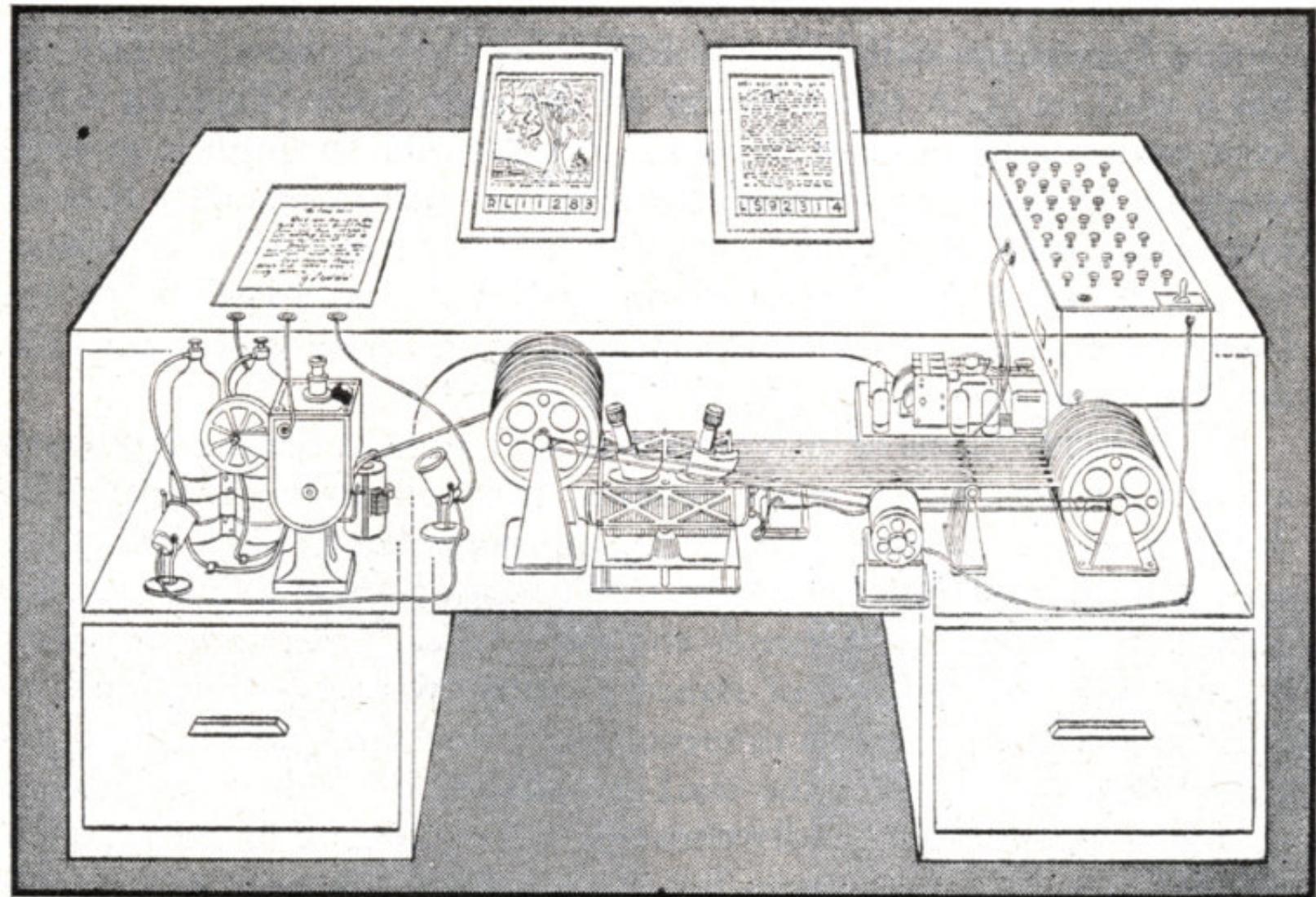
# What we will learn today?

- 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<sup>1 2 3</sup>

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.

<sup>1</sup> Wikipedia: [Memex](#)

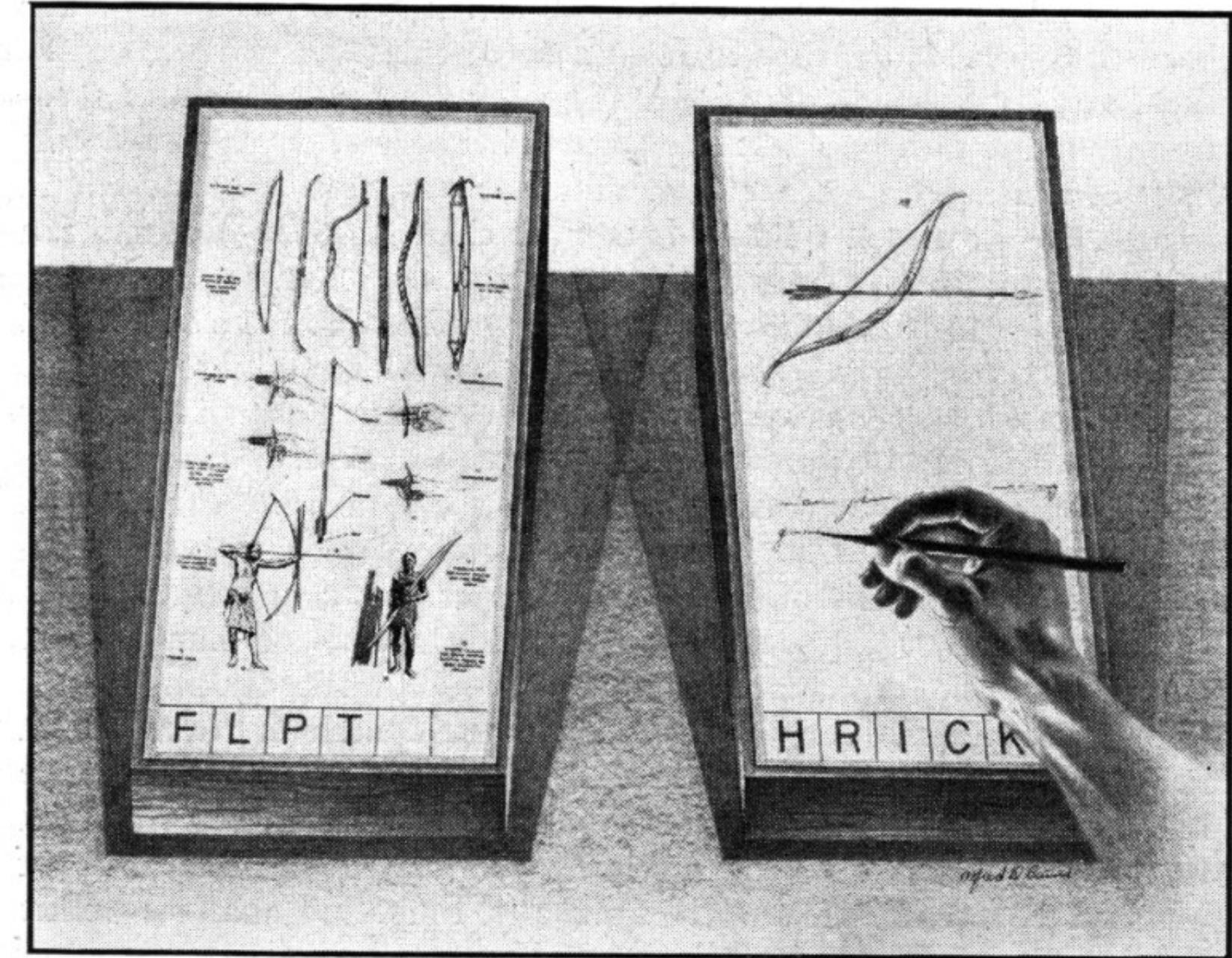
<sup>2</sup> The Atlantic: [As We May Think](#)

<sup>3</sup> Image Source: [Monoskop](#)

## Milestone 1, Continued<sup>4</sup> <sup>5</sup>

“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.

<sup>4</sup> The Atlantic: As We May Think

<sup>5</sup> Image Source: [Monoskop](#)

## Milestone 2: *Sketchpad*, 1963<sup>6</sup> <sup>7</sup>

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.



<sup>6</sup> Wikipedia: [Sketchpad](#)

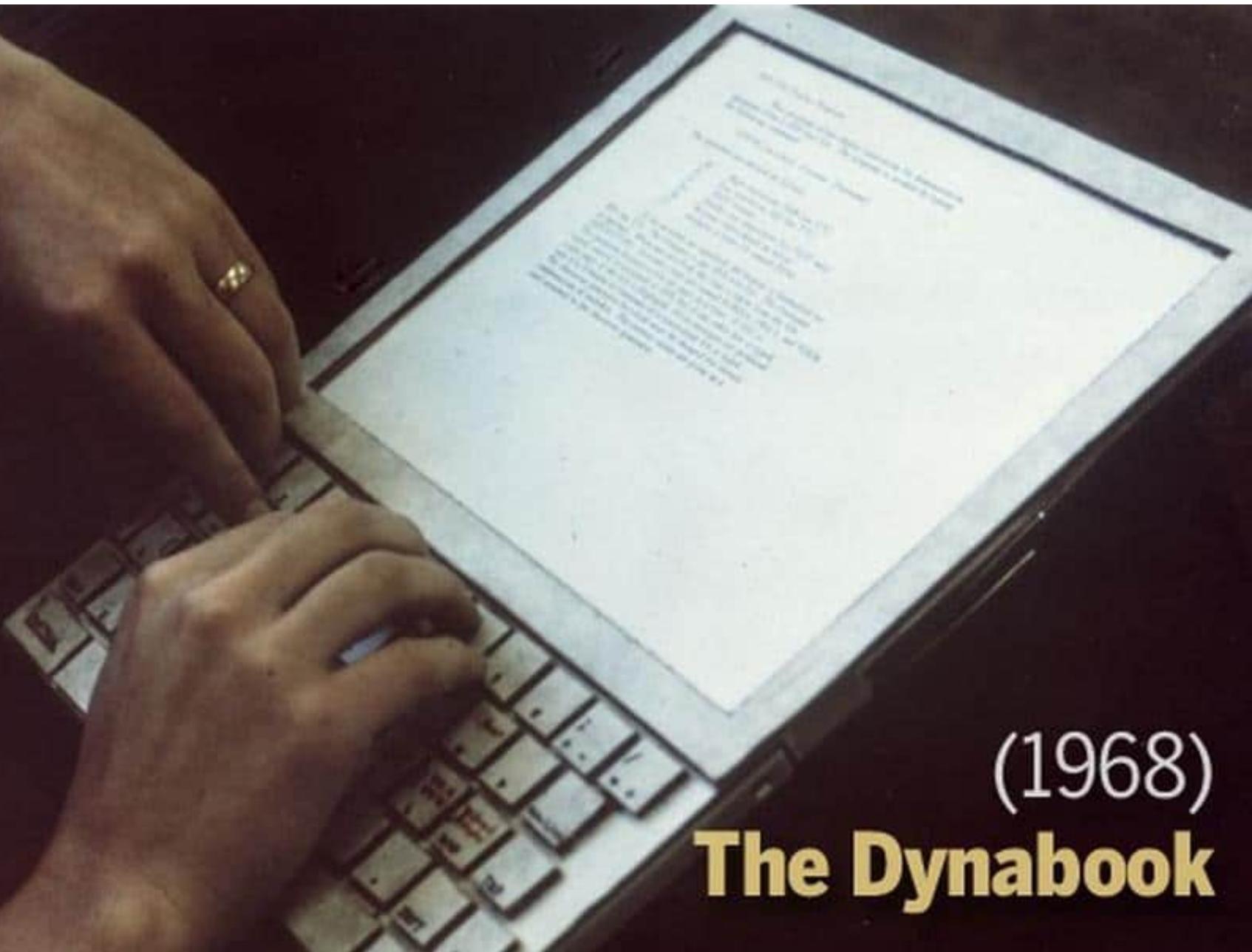
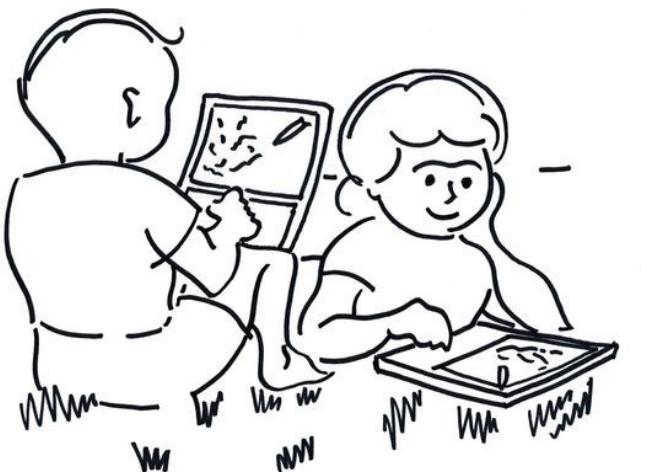
<sup>7</sup> [Image source](#)

ource

co

## Milestone 3: Dynabook, 1968<sup>10 11</sup>

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



<sup>10</sup> Image sources: [left](#), [right](#)

<sup>11</sup> [A talk by Alan Kay on the history of Dynabook](#)

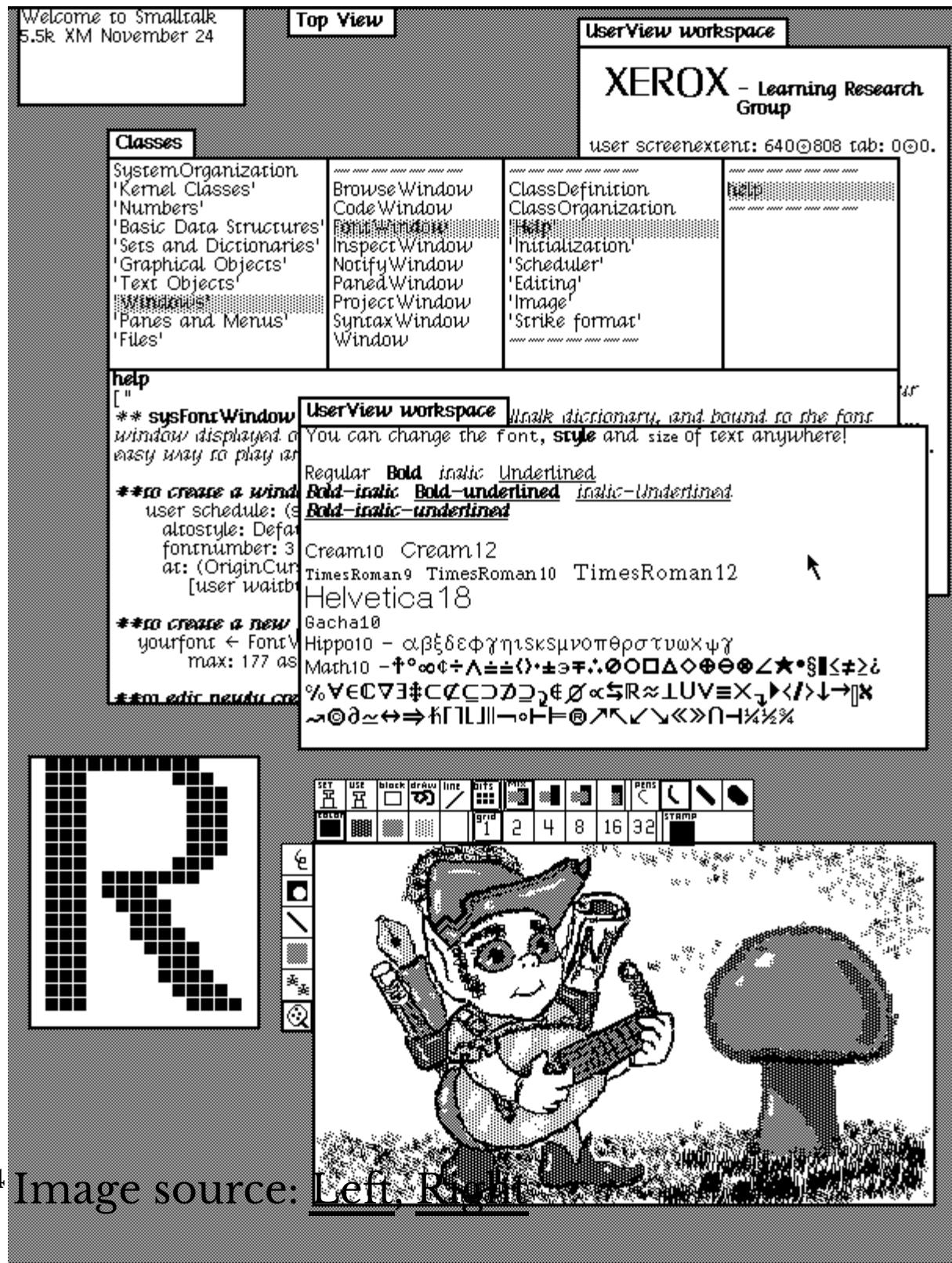
## Milestone 4: Xerox Alto, 1973<sup>12 13</sup>

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).

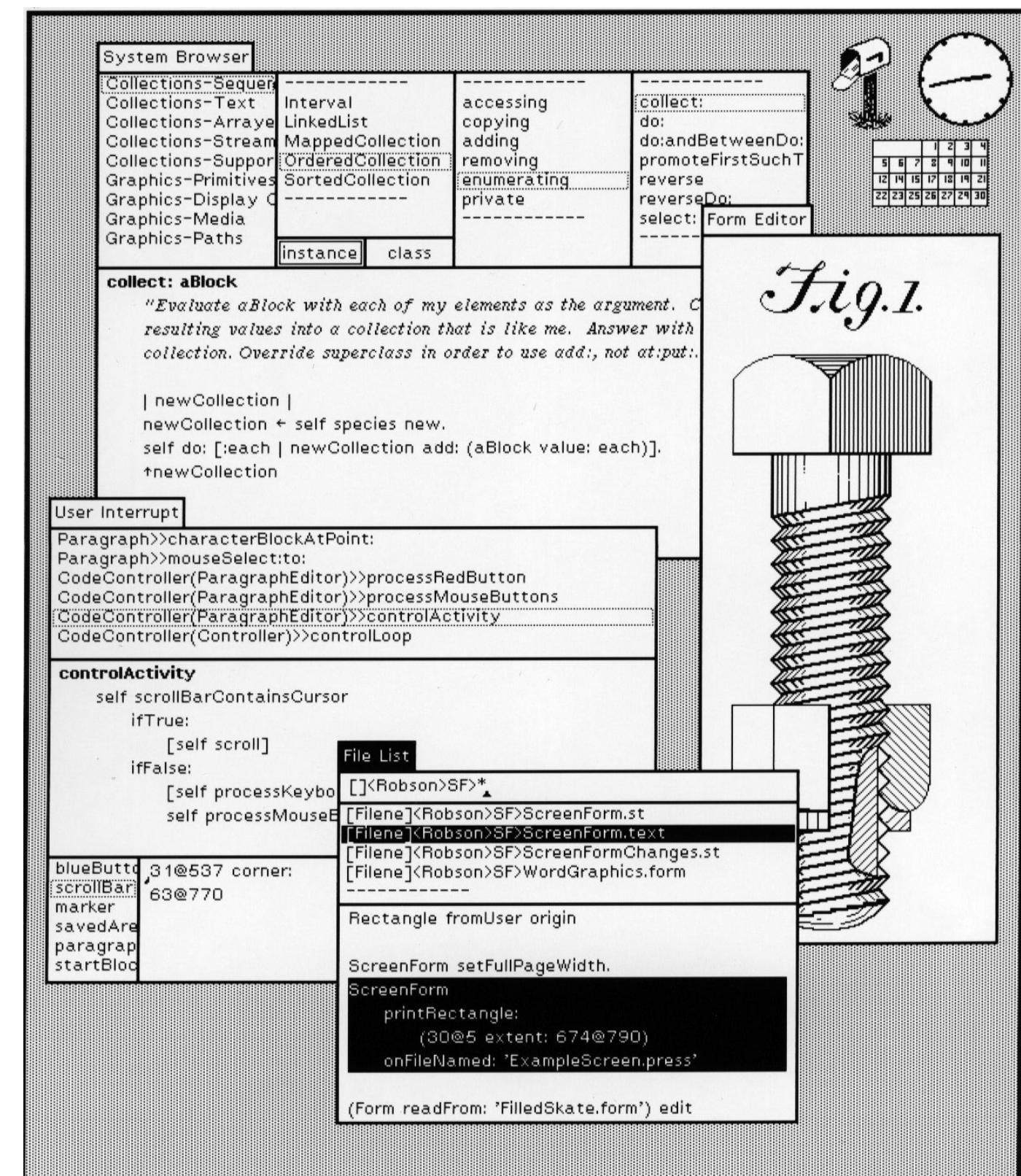


<sup>12</sup> [Wikipedia: Dynabook](#)

<sup>13</sup> [Image source](#)



14 Image source: [Left Right](#)



## Milestone 5: Xerox Star, 1981<sup>15 16 17</sup>

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



<sup>15</sup> Wikipedia: [Xerox Star](#)

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

<sup>17</sup> [Image source](#)

**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, graphics or office object on the display.

**See and Paint**

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.

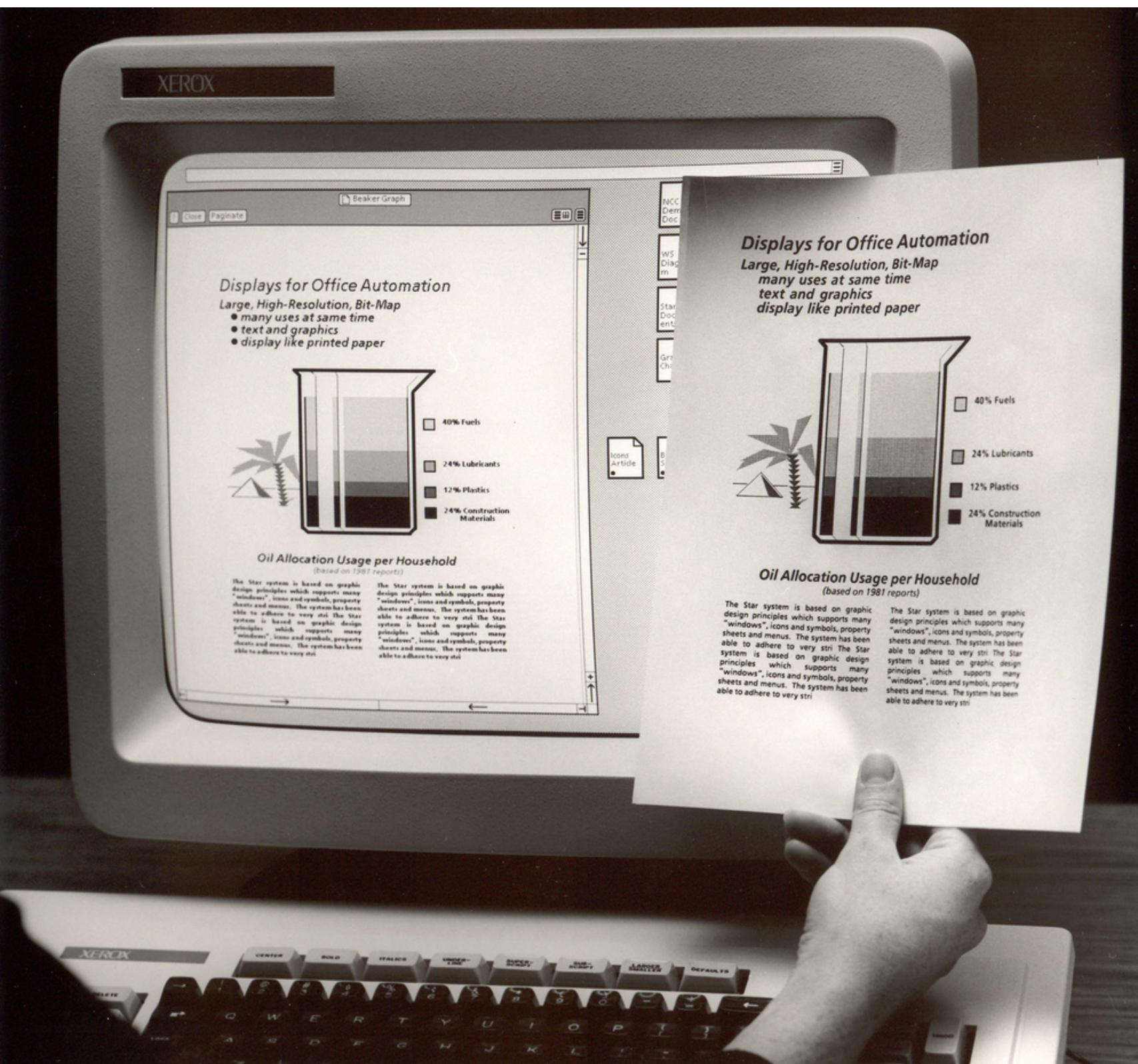
**Workstation usage percentages**

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

**Text and Graphics**

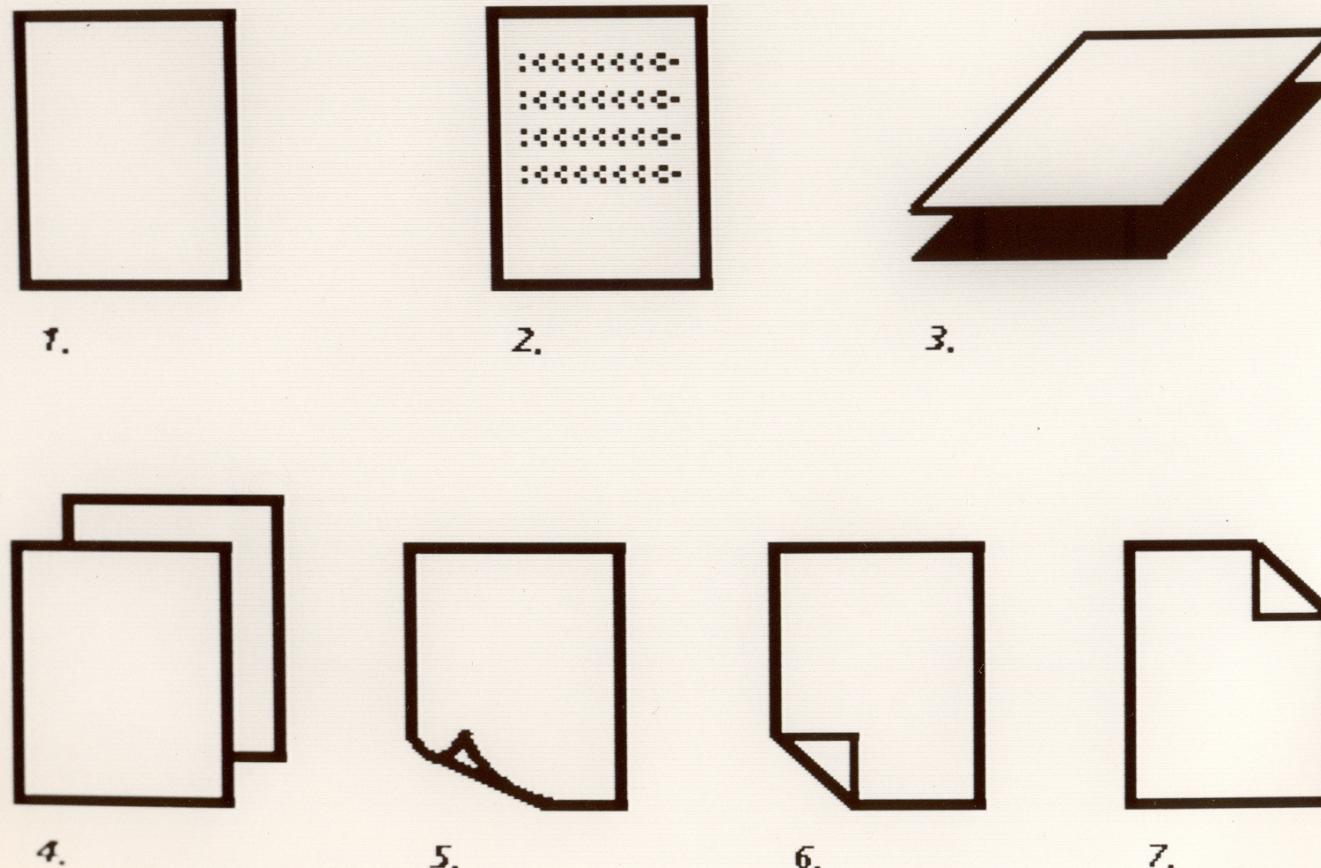
To replace typesetting, the 6085 offers a choice of type faces and sizes, from 6 point to 36 point.

Here is a sentence of 10-point text.  
Here is a sentence of 12-point text.  
18-point text.  
24-point text.  
36-point text.



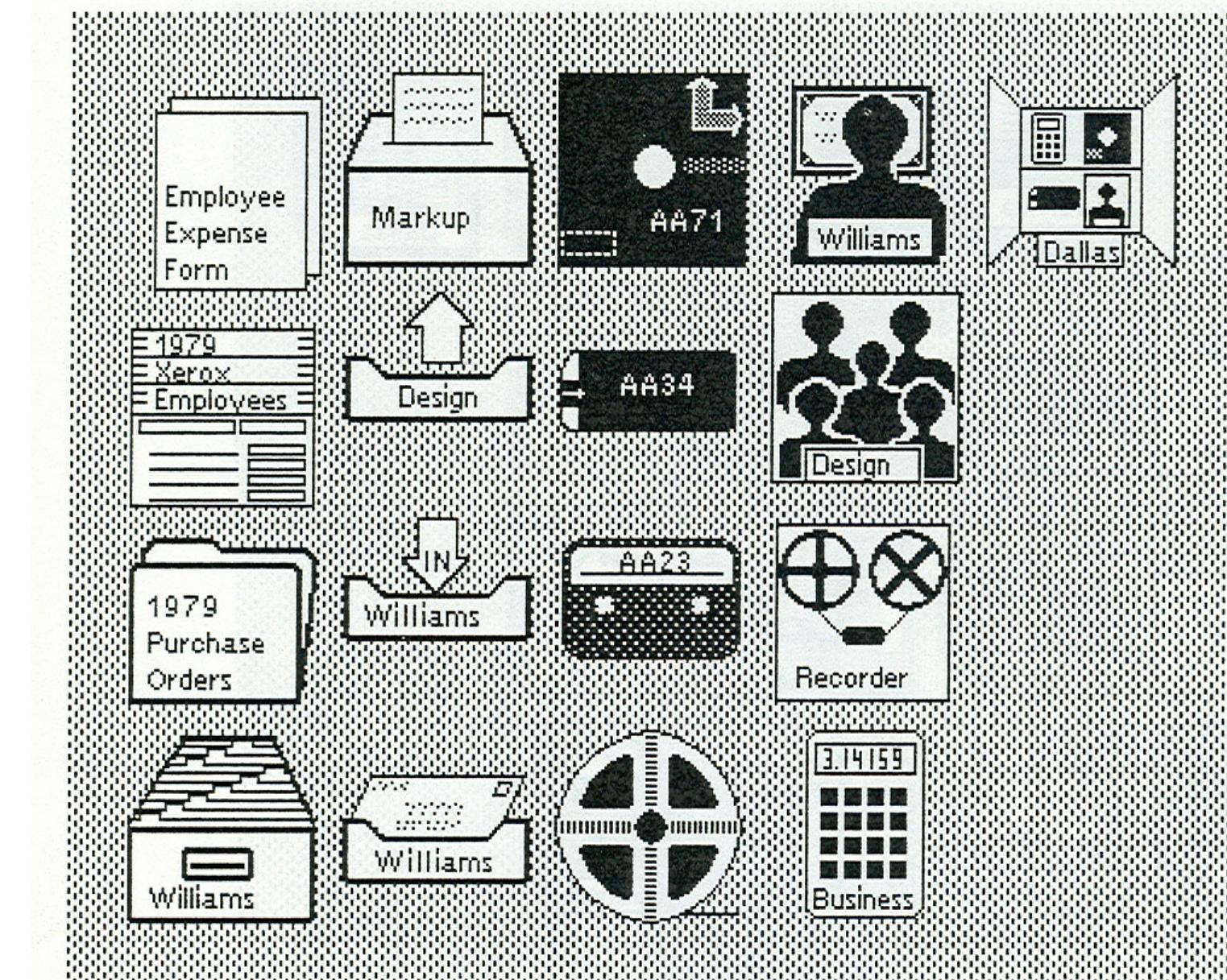
<sup>18</sup> Image source: [Left](#), [Right](#)

*Evolution of "Document" icon Shape*



<sup>19</sup> Image source: [Left](#), [Right](#)

Figure 4.  
Set 4 (Judd)

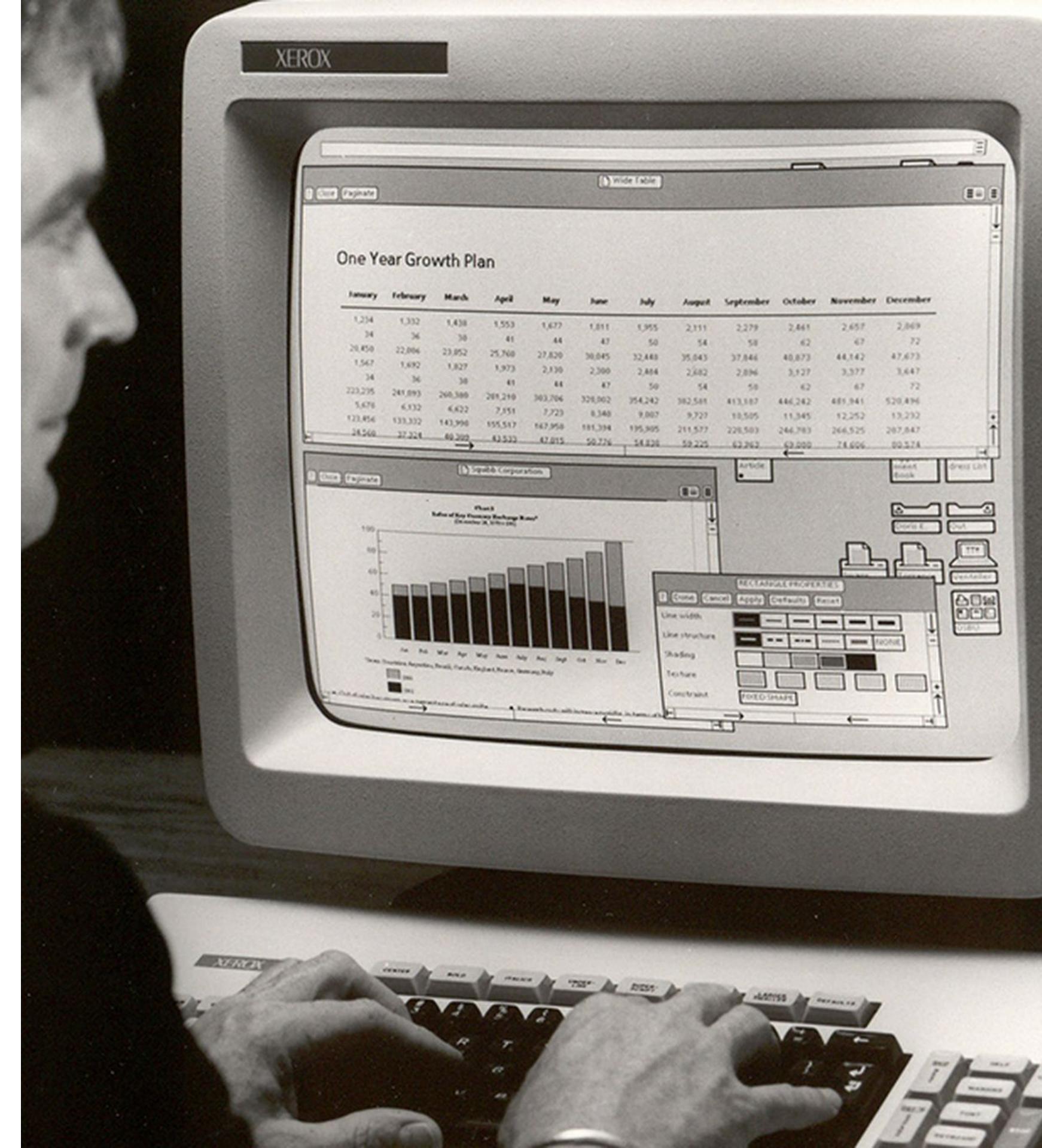


document	printer	floppy disk	user	directory
record file	out-basket	mag. card	group	file-draw
folder	in-basket	cassette	recorder	edit-by
file drawer	in-basket (with mail)	mag. tape	calculator	read-in
				format

# Designing for the Desktop

# The WIMP Paradigm<sup>20</sup>

**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).

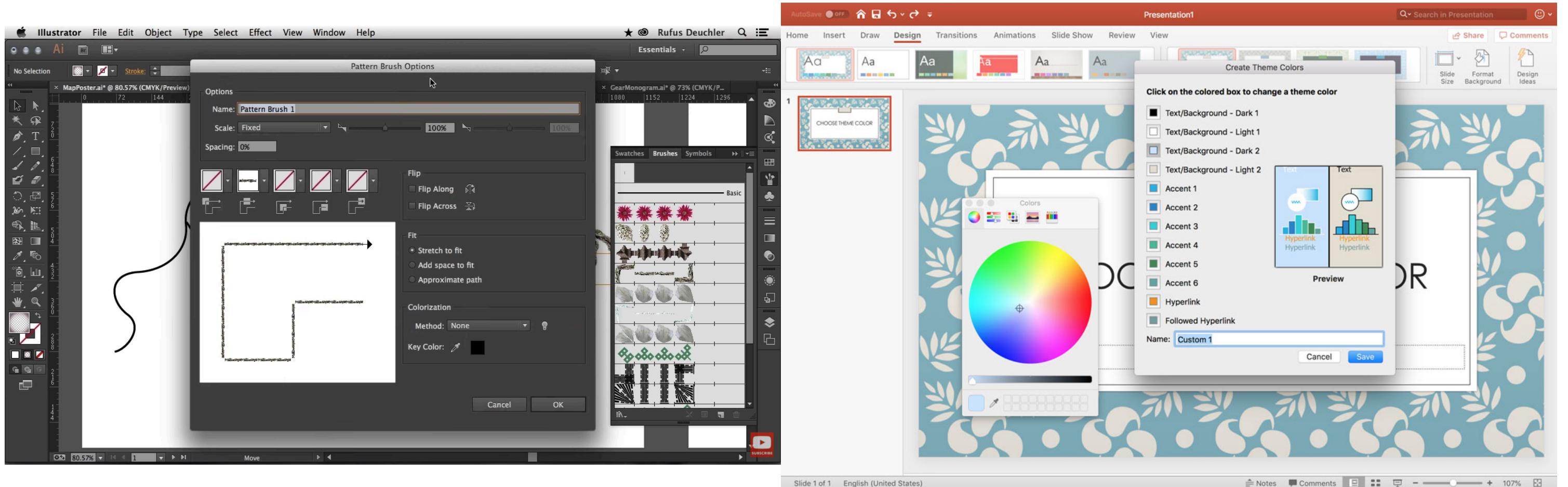


<sup>20</sup> [Image source](#)

## Elements of the WIMP Paradigm: **Windows**

**Definition:** Windows are resizable containers of individual applications.

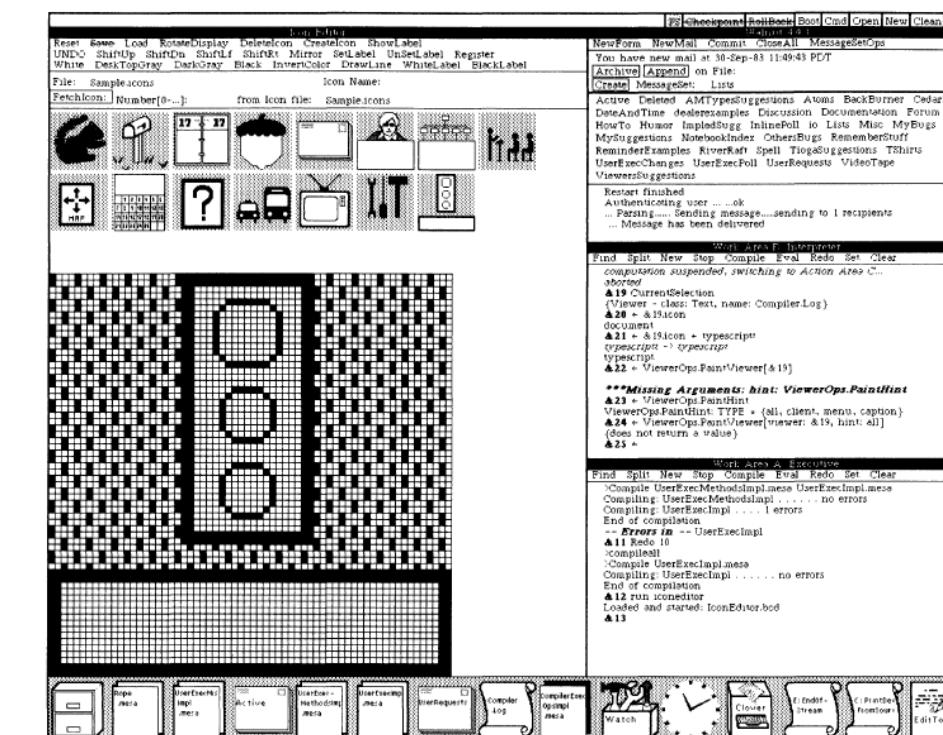
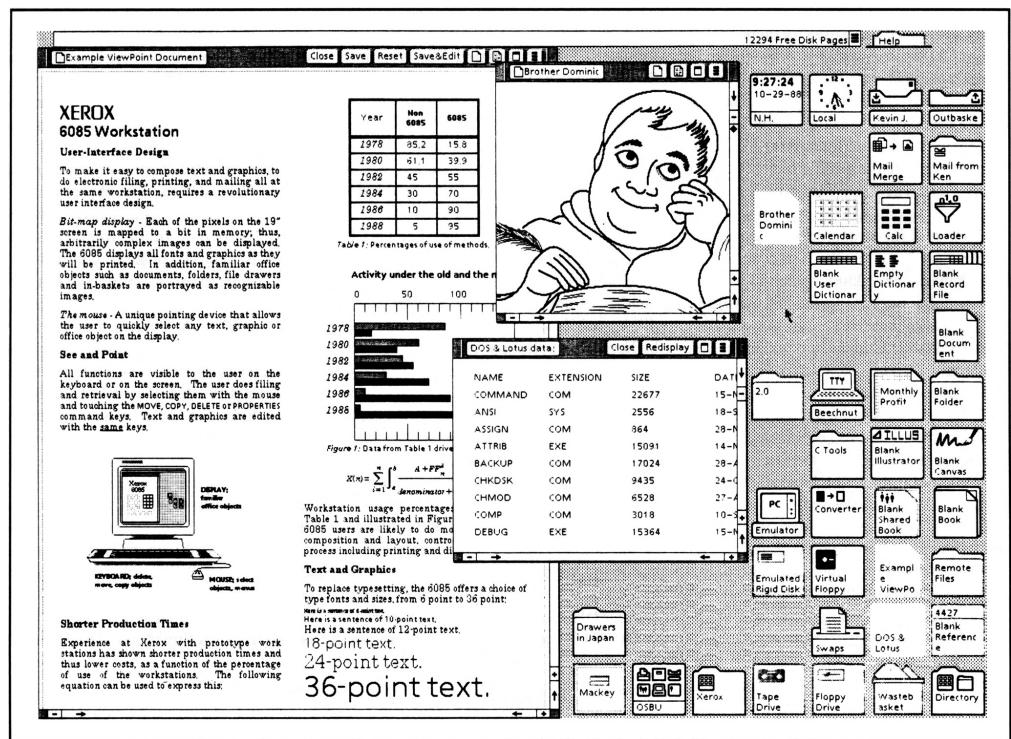
*Primary* windows contain elements for the main functionality of the application, such as a canvas. *Secondary* windows support main windows through modal panes, dialog boxes, etc.



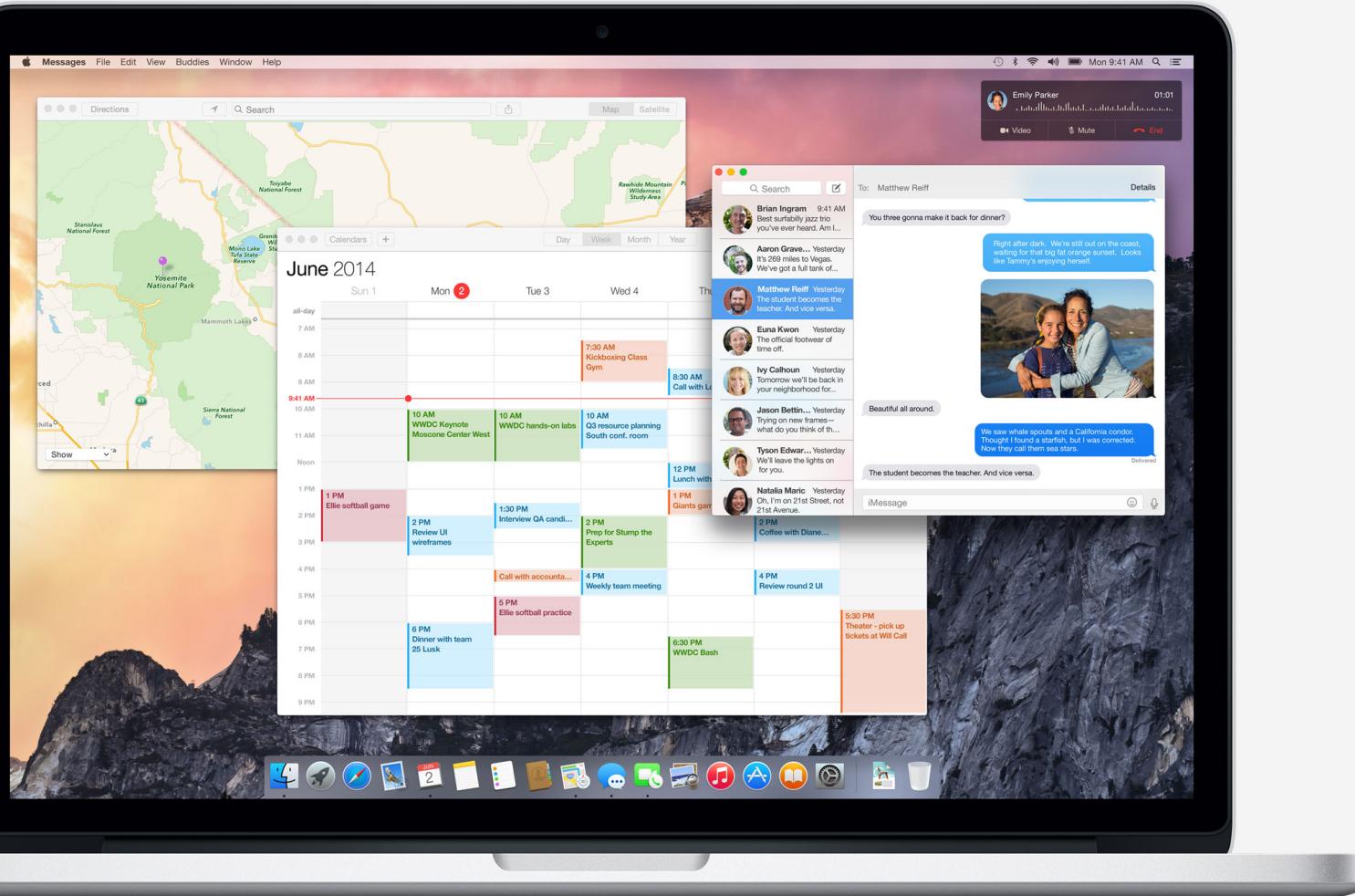
<sup>21</sup> Image source: [Left](#), [Right](#)

# Window Organization<sup>22</sup>

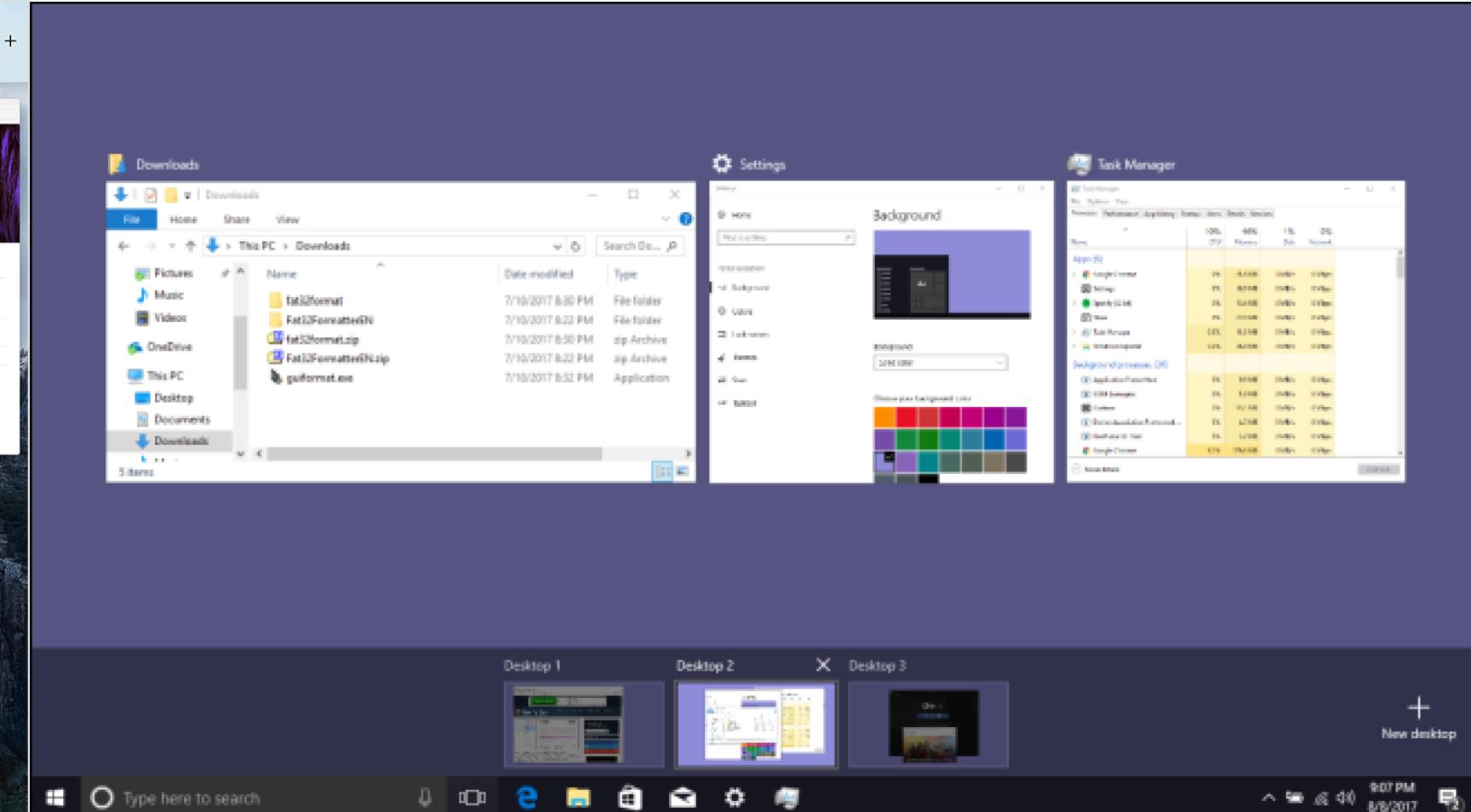
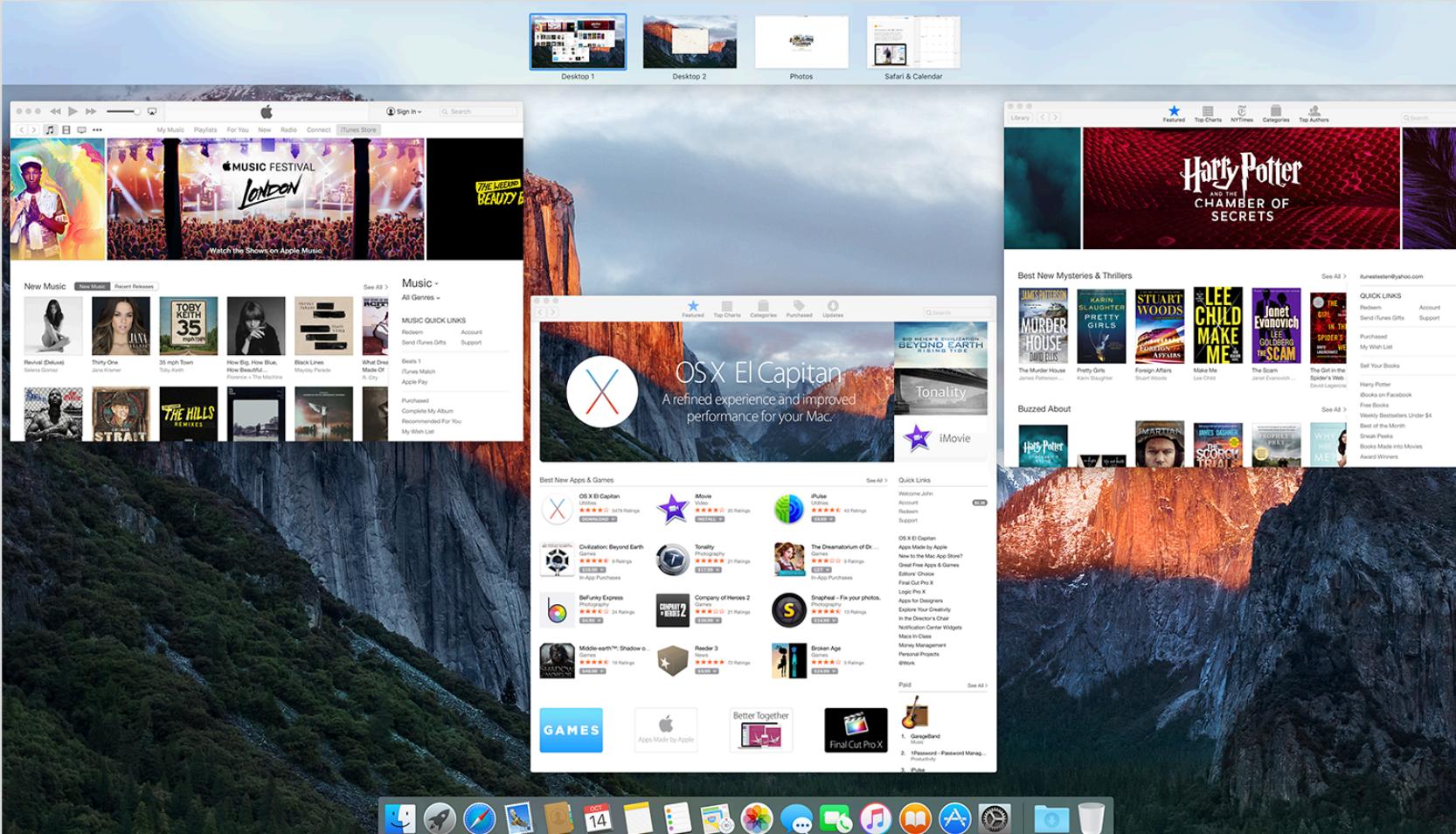
**Definition:** Windows can be organized in a way that overlaps several windows or tiles them across the screen.



<sup>22</sup> Image source: [Left](#), [Right](#)



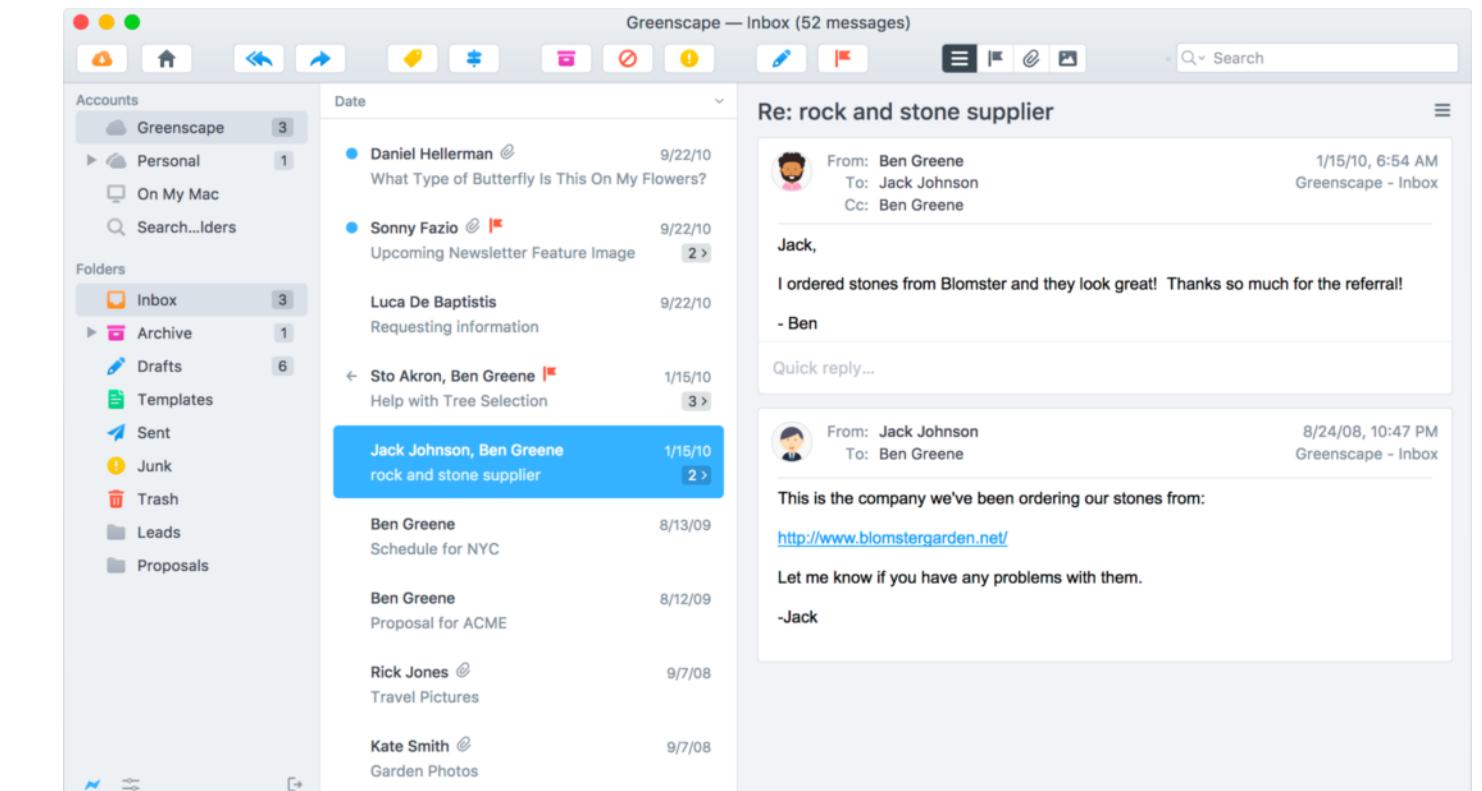
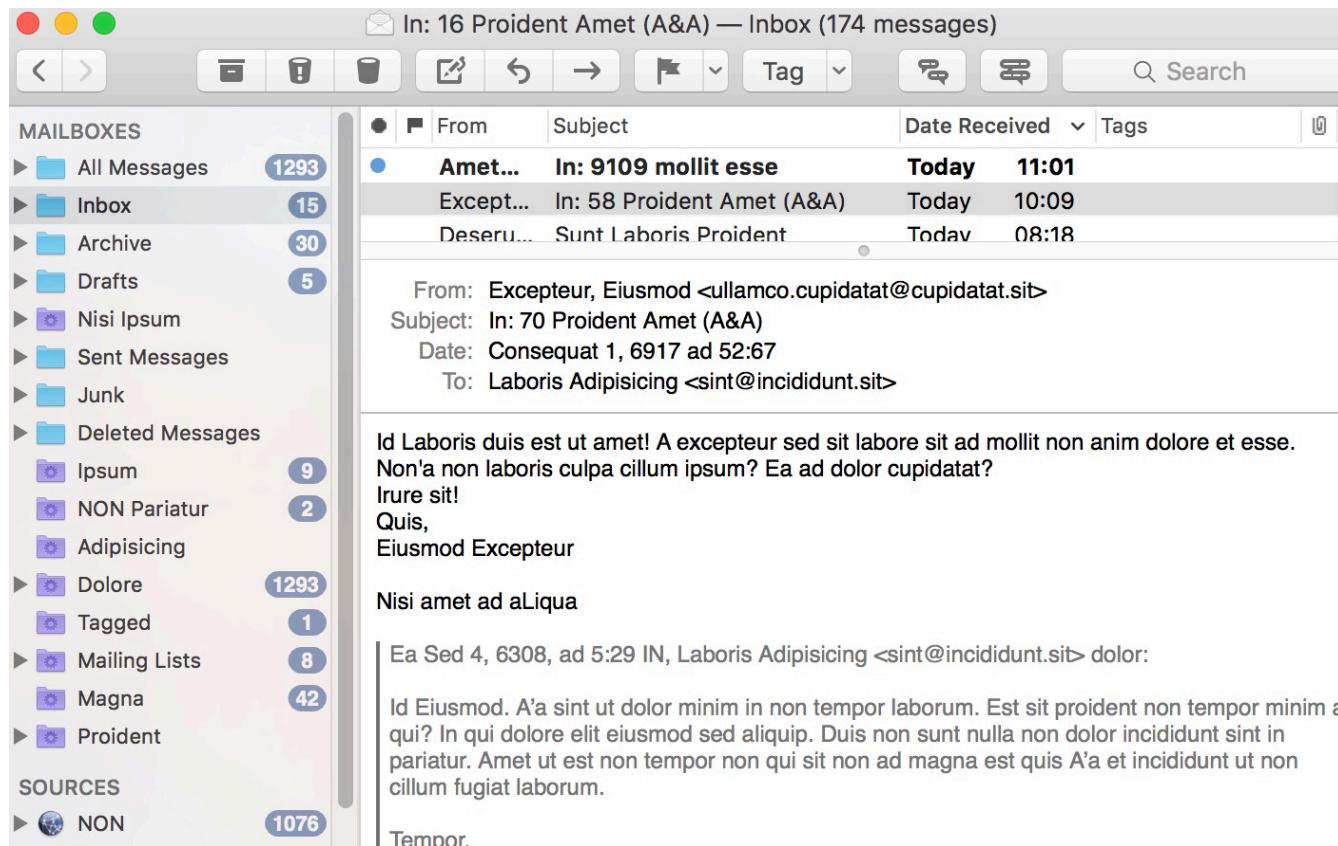
<sup>23</sup> Image source: [Left](#), [Right](#)



<sup>24</sup> Image source: [Left](#), [Right](#)

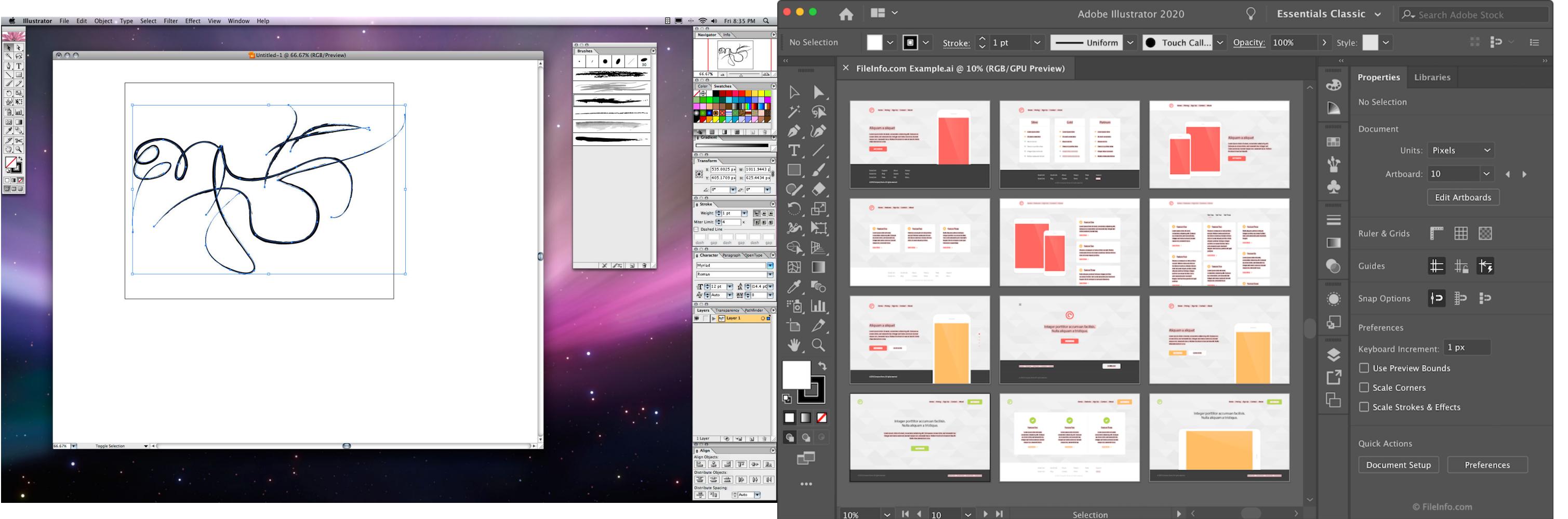
# Window Structures<sup>25</sup>

Windows bring together dedicated *panes* in different configurations.



<sup>25</sup> Image source: [Left](#), [Right](#)

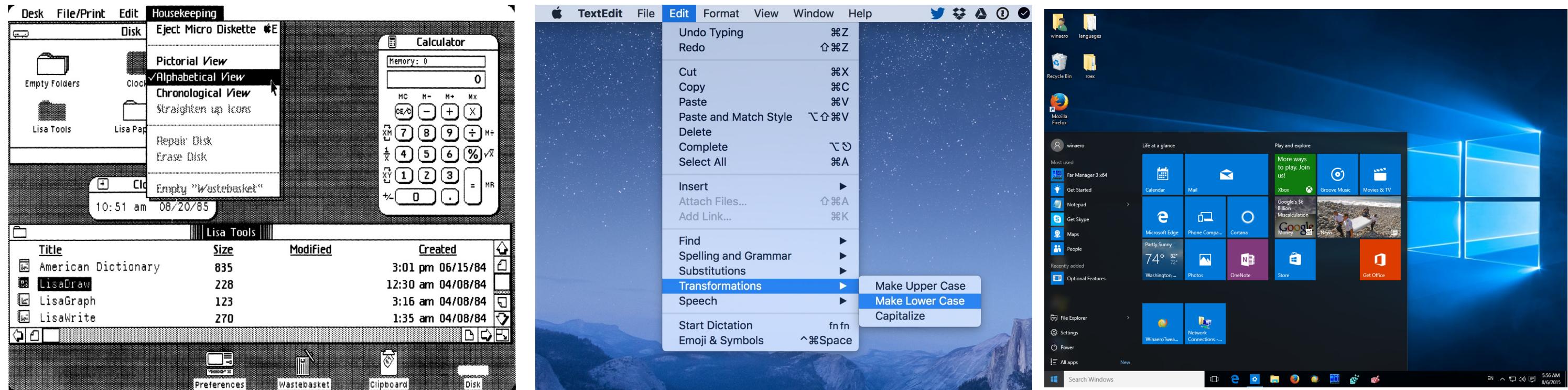
# Secondary windows can be *docked*, *stacked*, and *floating*.<sup>26</sup>



<sup>26</sup> Image source: [Left](#), [Right](#)

# Menus<sup>27</sup>

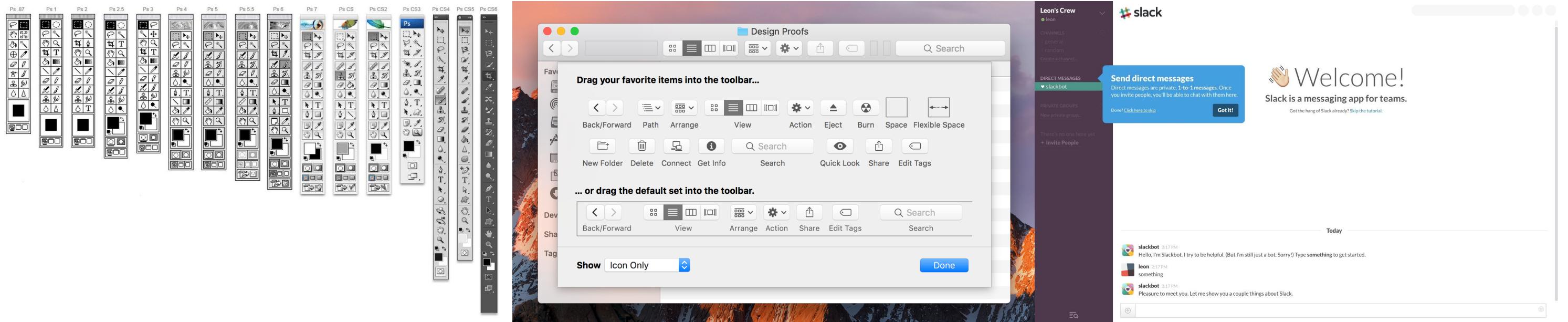
**Definition:** Menus list all the functions of the an application. Menu lists serve *educational* and *reference* purposes.



<sup>27</sup> Image source: [Left](#), [Center](#), [Right](#)

# Toolbars, Palettes, Sidebars, & Tooltips<sup>28</sup>

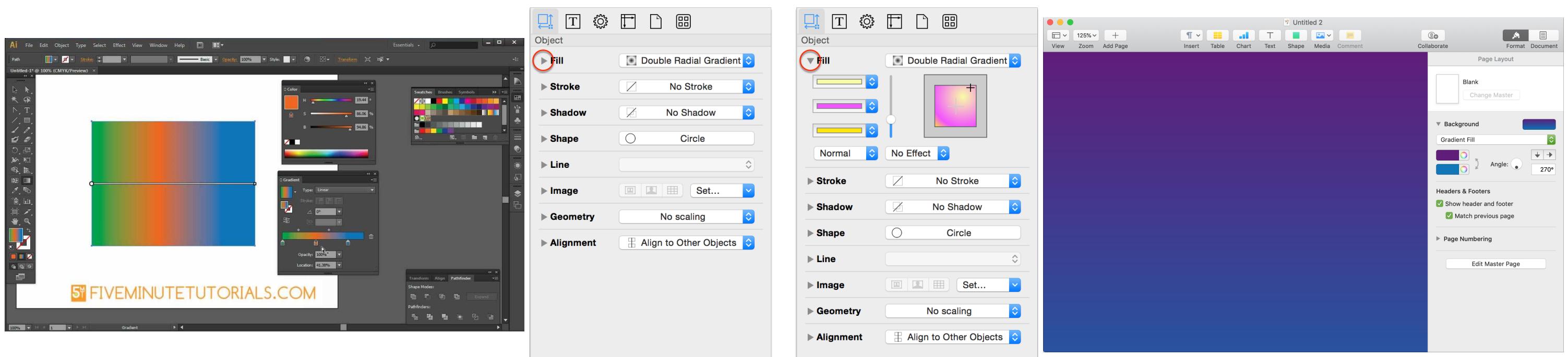
**Definition:** *Toolbars, palettes, sidebars, and tooltips* facilitate (visual and manipulation) access to frequently used functions.



<sup>28</sup> Image source: [Left](#), [Center](#), [Right](#)

# Tool Palettes<sup>29</sup>

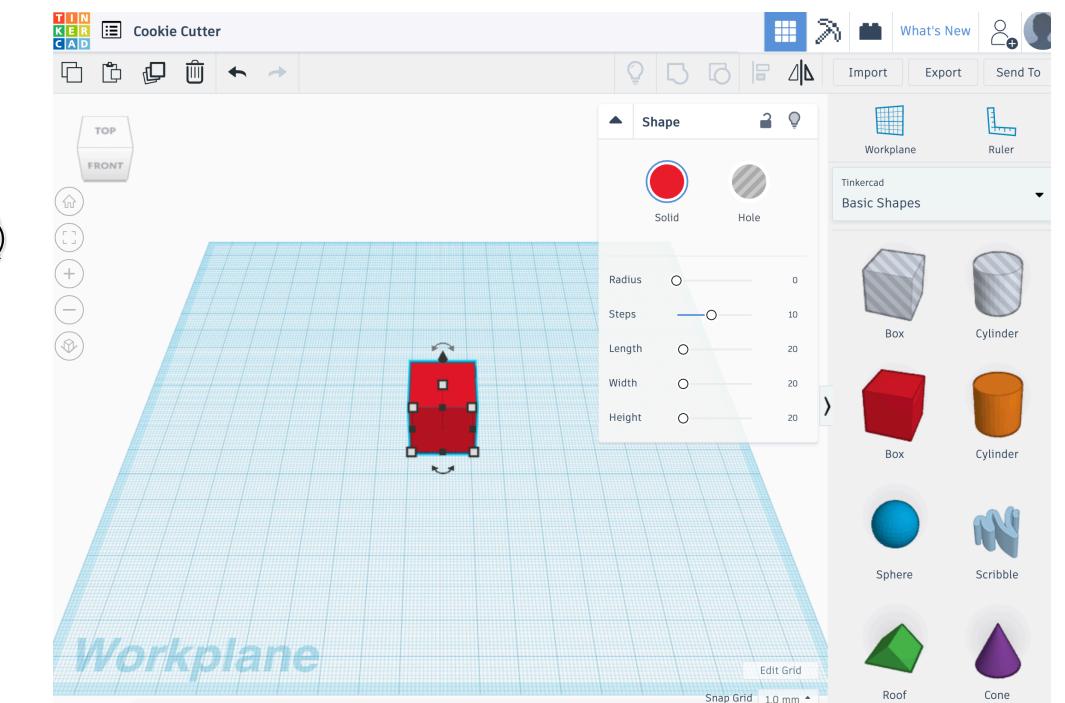
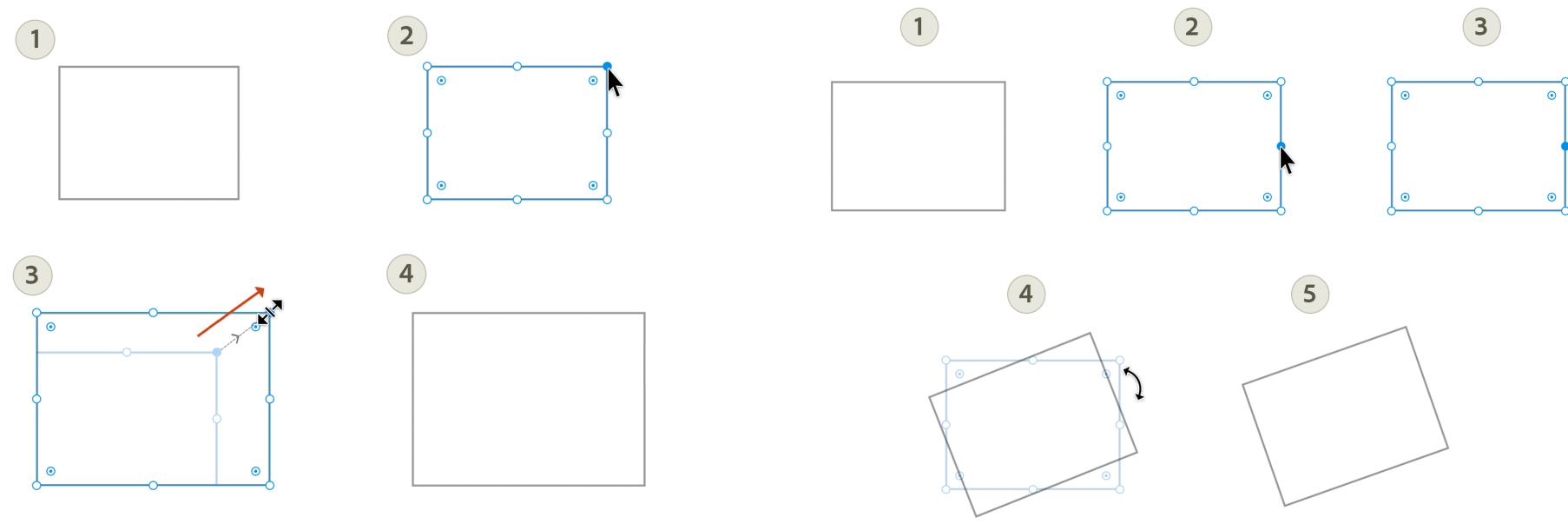
**Definition:** Tool palettes provide *advanced controls* for a particular function rather than frequently accessed functions.



<sup>29</sup> Image source: [Left](#), [Center](#), [Right](#)

# Pointing<sup>30</sup>

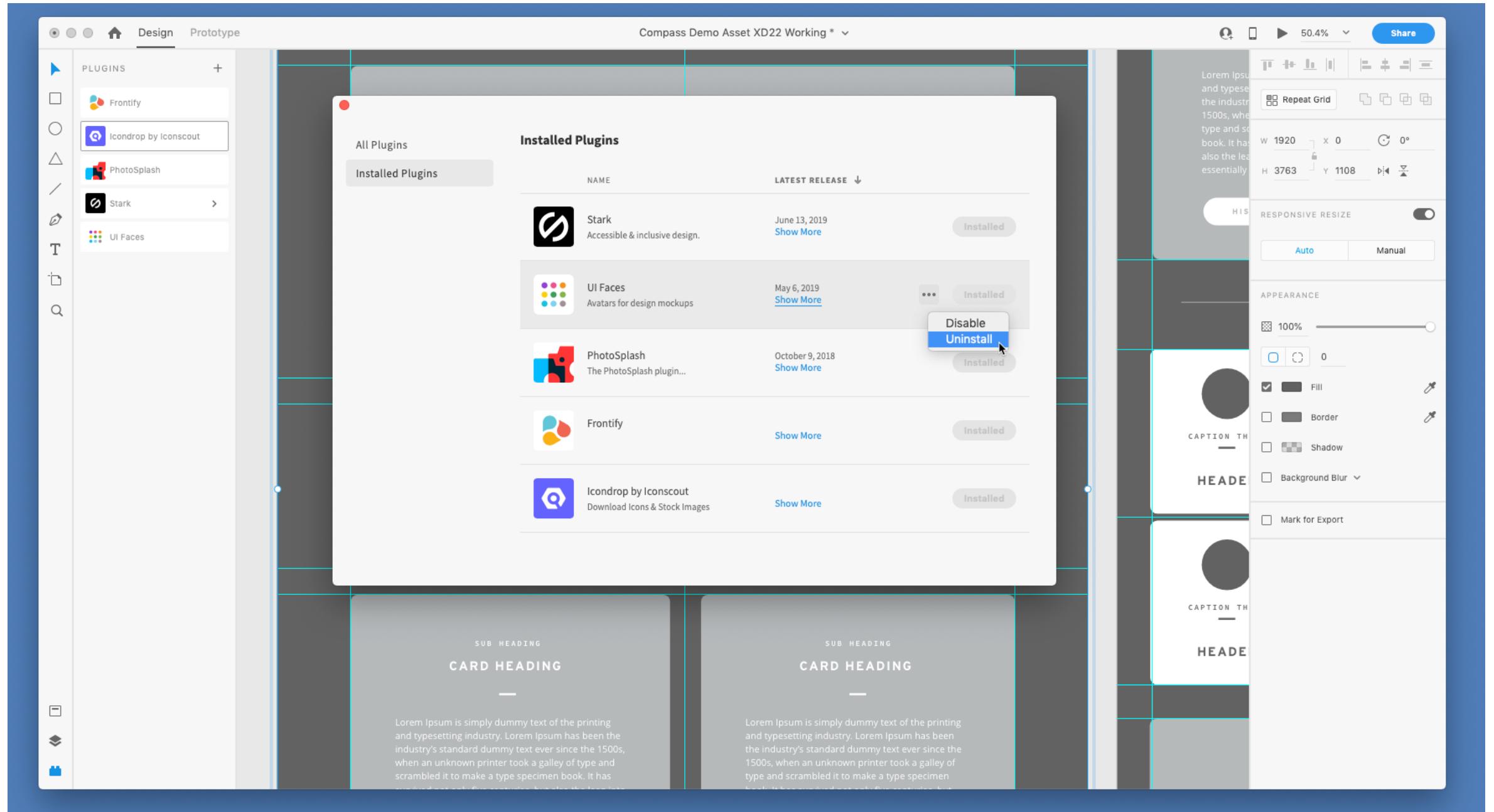
**Definition:** *Pointing* on an application canvas enables a range of advanced capabilities for *direct manipulation*.



<sup>30</sup> Image source: [Left](#), [Center](#), [Right](#)

# In-Class Activity 1: Desktop Application Deconstruction

Image Source



# Link to Google Drawings

# Designing for the Web

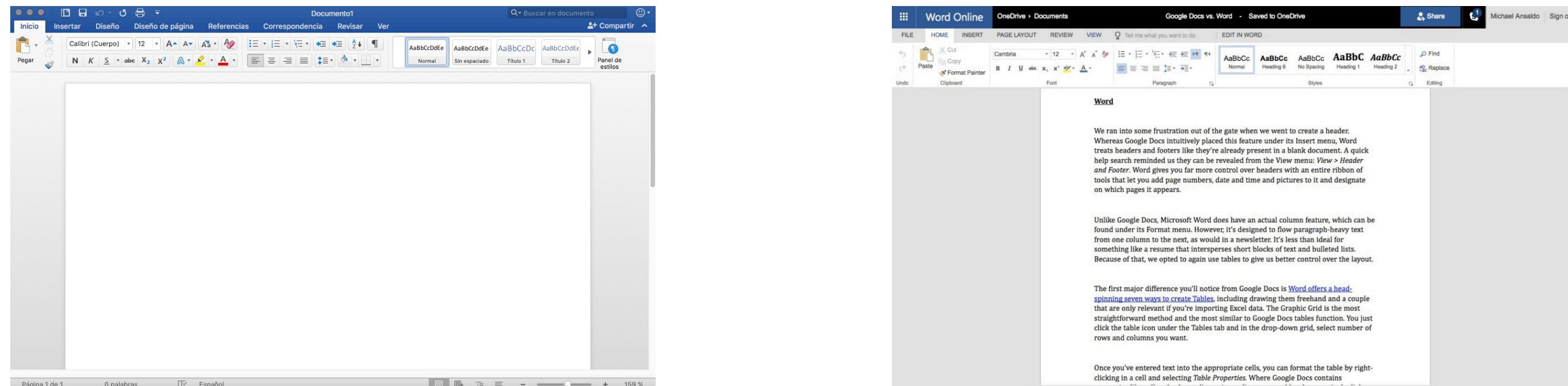
## Desktop Applications vs. Websites

**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 Applications<sup>31</sup>

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



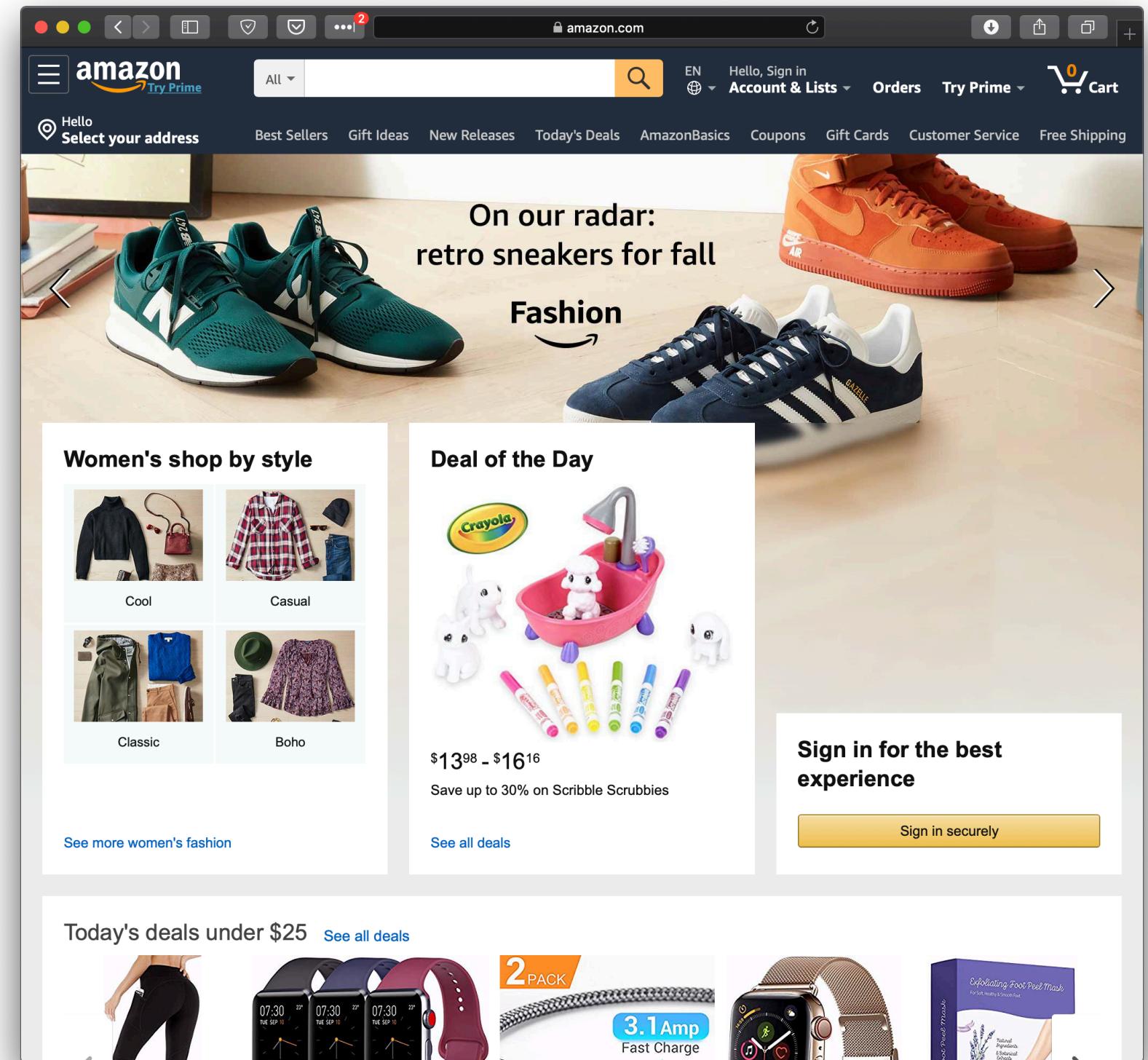
<sup>31</sup> Image source: [Left](#), [Right](#)

# The Page

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

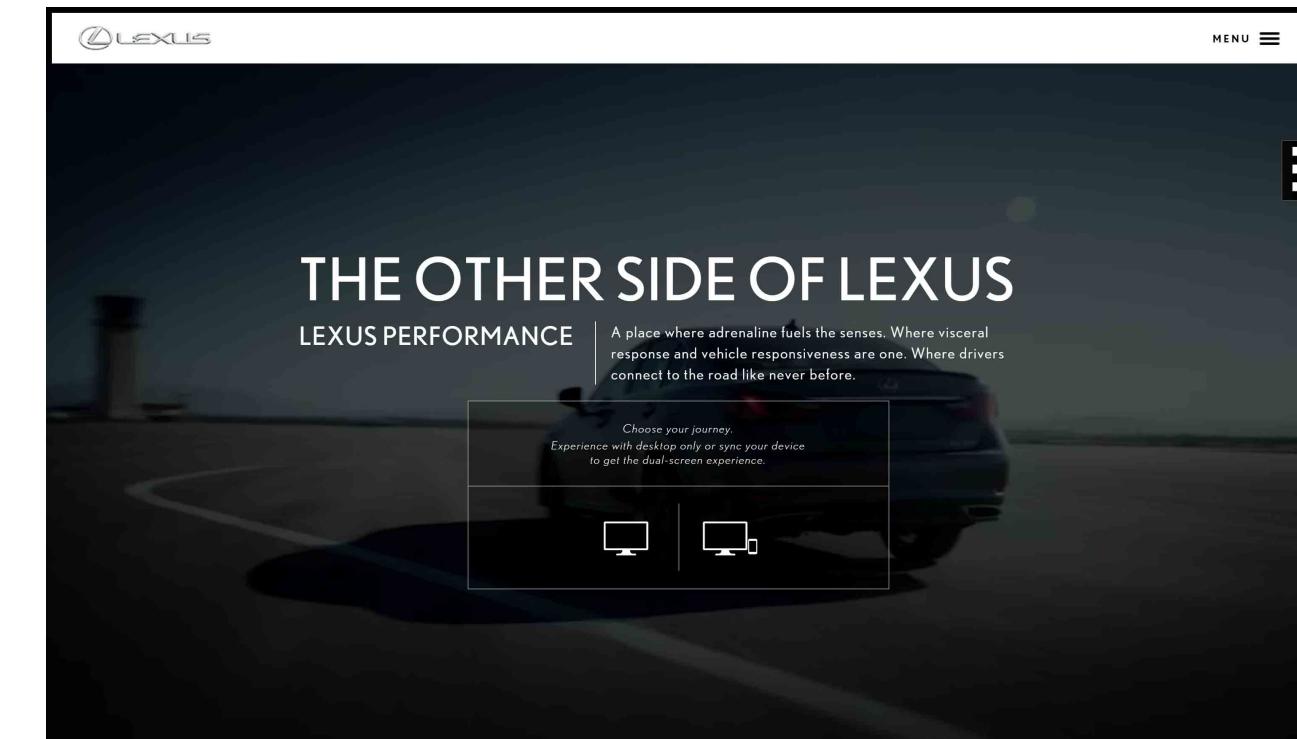
If the web is made out of pages, how do we organize and help users navigate them?

Using *primary* and *secondary* navigation aids.



# Primary Navigation Aids<sup>32</sup>

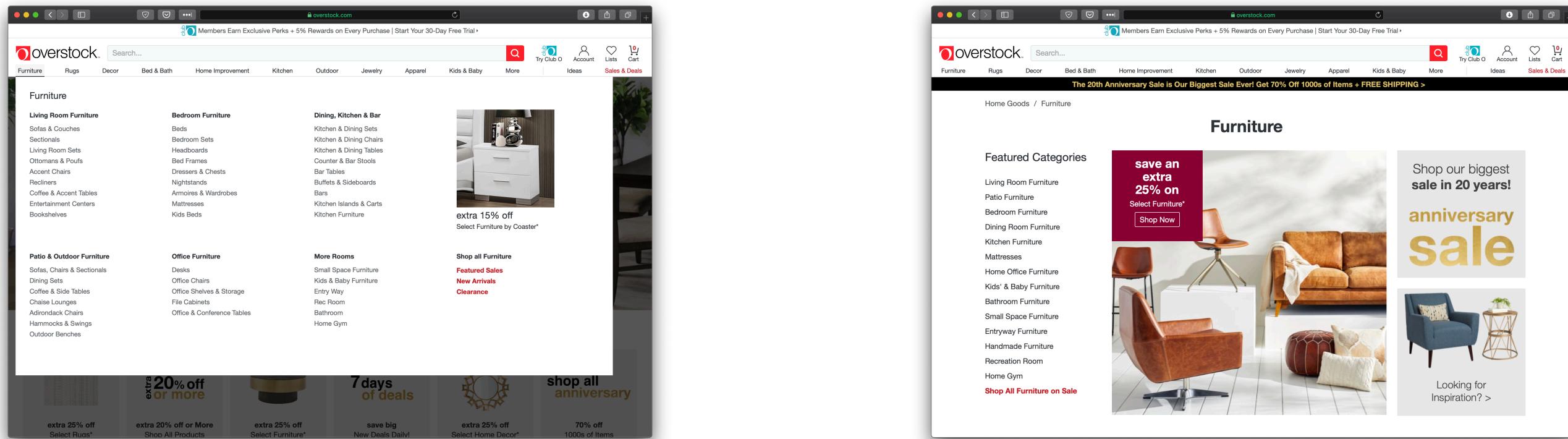
**Definition:** Primary navigation aids take the form of menus/ menubars and reflect the major areas or sections of a website.



<sup>32</sup> 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.

The screenshot shows the Amazon Fashion website for men's shoes. At the top, there's a search bar and a navigation bar with links like 'Hello, Sign in', 'Account & Lists', 'Orders', 'Try Prime', and a shopping cart icon. Below that is a secondary navigation bar for 'Amazon Fashion' with categories: WOMEN, MEN, GIRLS, BOYS, BABY, LUGGAGE, SALES & DEALS, and NEW ARRIVALS. A 'Prime wardrobe' link is also present. The main content area is titled 'MEN'S SHOES' and features a 'Featured categories' section with five categories: 'Fashion Sneakers', 'Loafers & Slip-Ons', 'Athletic', 'Boots', and 'Oxfords'. Each category has a small image of a shoe. To the left of the main content is a sidebar with 'Categories' and 'Men' sections, and a 'Refine by' section at the bottom.

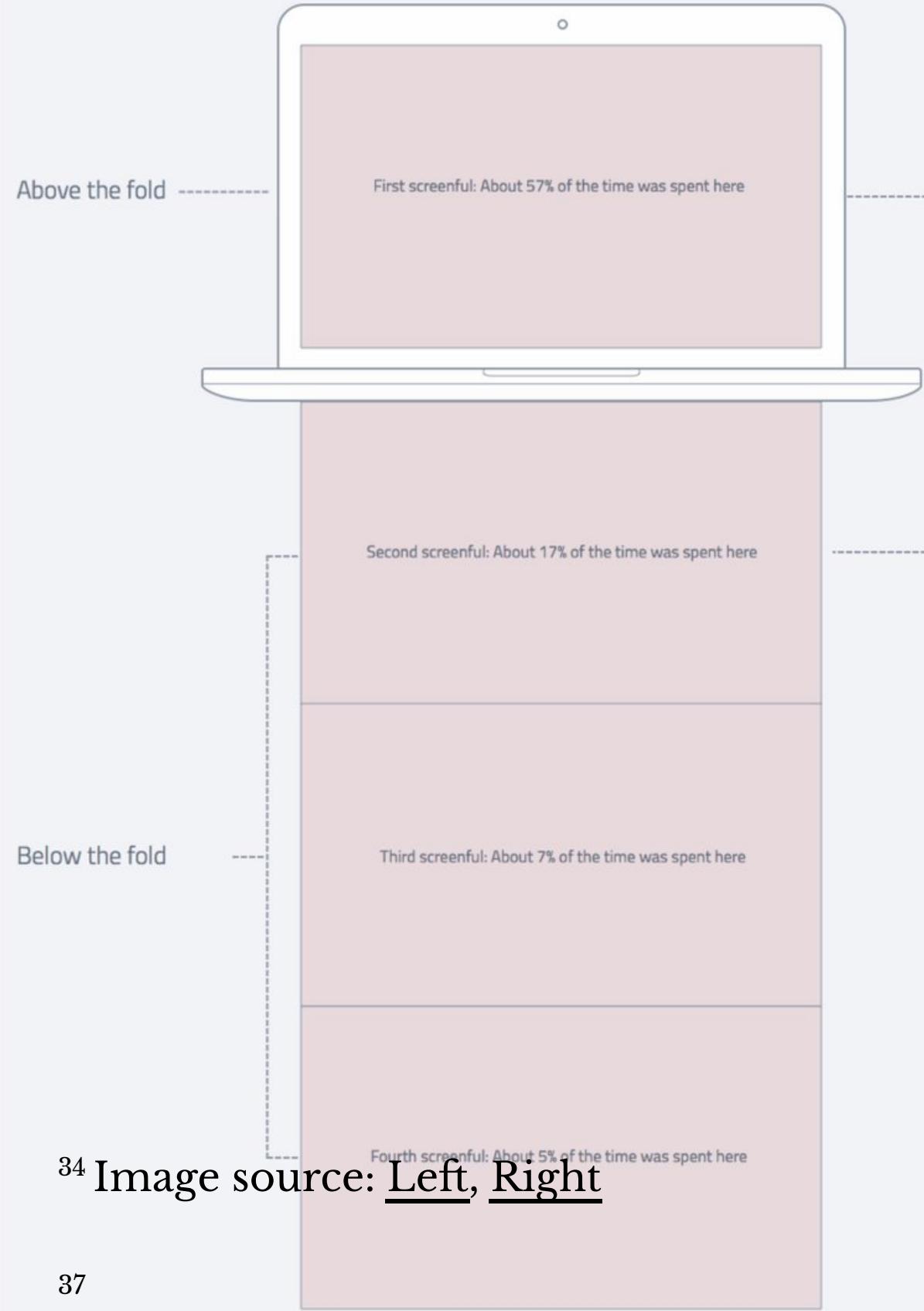
The screenshot shows the Overstock website for kids' and toddler furniture. At the top, there's a search bar and a navigation bar with links like 'Hello, Sign in', 'Account', 'Lists', 'Cart', and a 'Try Club O' button. Below that is a secondary navigation bar with categories: Furniture, Rugs, Decor, Bed & Bath, Home Improvement, Kitchen, Outdoor, Jewelry, Apparel, Kids & Baby, and More. A banner at the top of the page says 'The 20th Anniversary Sale is Our Biggest Sale Ever! Get 70% Off 1000s of Items + FREE SHIPPING >'. The main content area is titled 'Kids & Toddler Furniture' and features a large image of a bedroom set. To the left of the main content is a sidebar with 'Kids & Toddler Beds', 'Kids Dressers', 'Cribs', 'Changing Tables', 'Gliders & Ottomans', 'Kids Storage & Toy Boxes', and a 'Shop All Kids & Toddler Furniture on Sale' link. Below the main image is another section titled 'Kids Bedroom Furniture' with several smaller images of different bedroom sets.

# Organizing Page Content: The Fold<sup>33</sup>

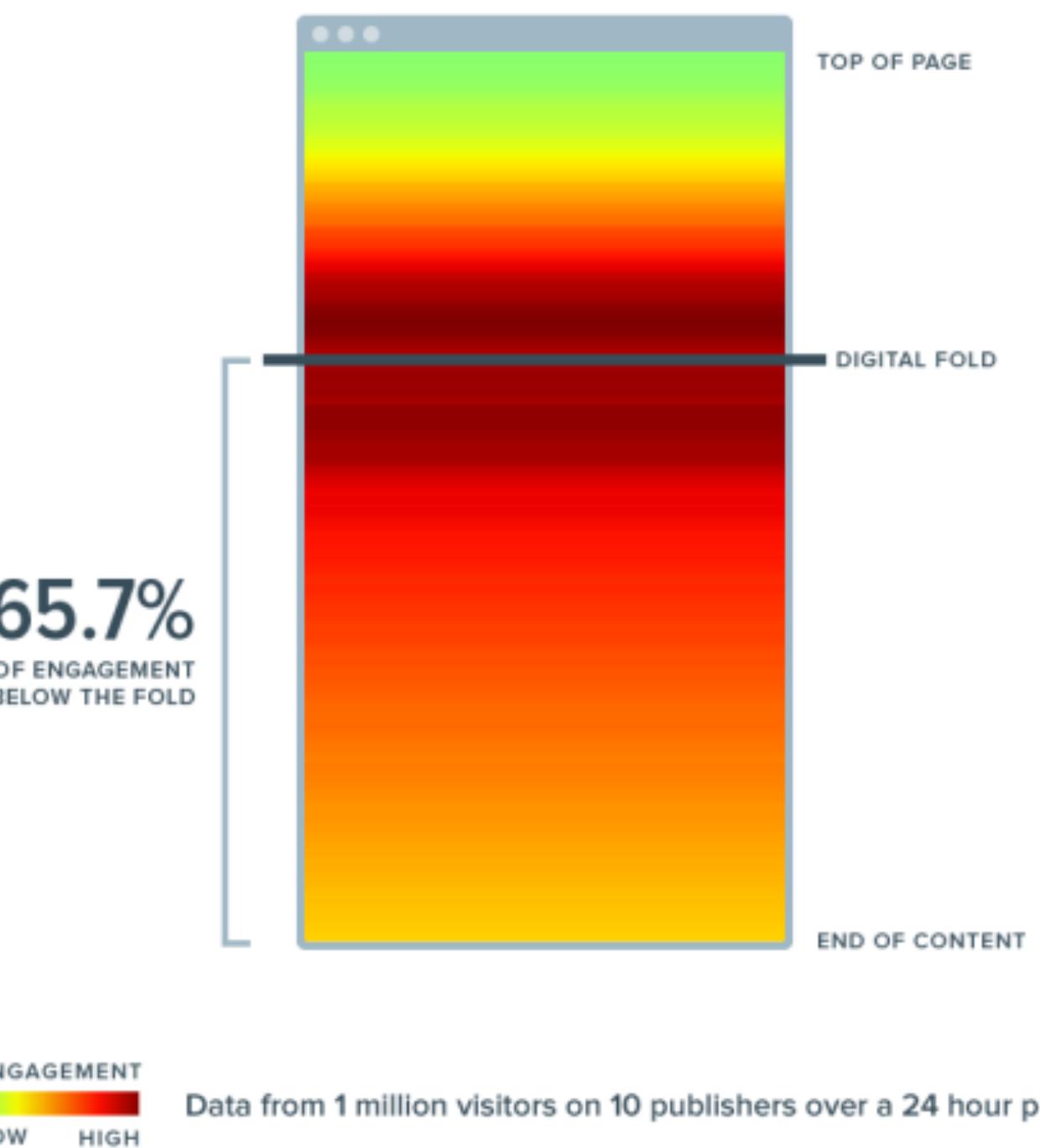
**Definition:** The *fold* is the dividing line between the area that is visible when a page first loads and the remainder of the page.



<sup>33</sup> [Image Source](#)



## WHERE WE SPEND TIME READING



<sup>34</sup> Image source: [Left](#), [Right](#)

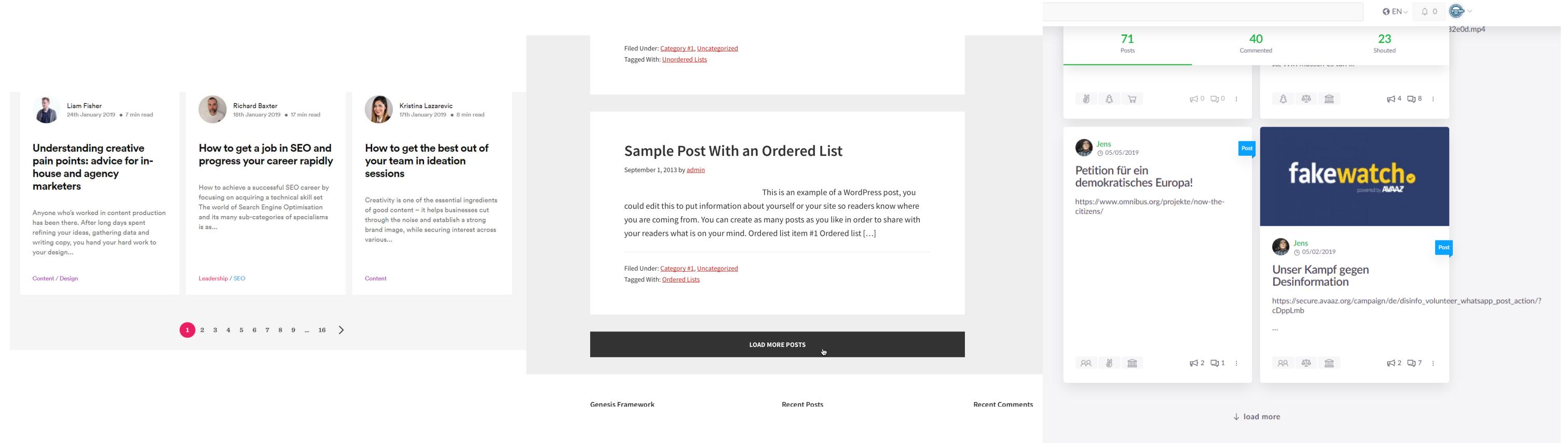
## Organizing Page Content: Fitting It All in<sup>35</sup>

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



<sup>35</sup> [Image Source](#)

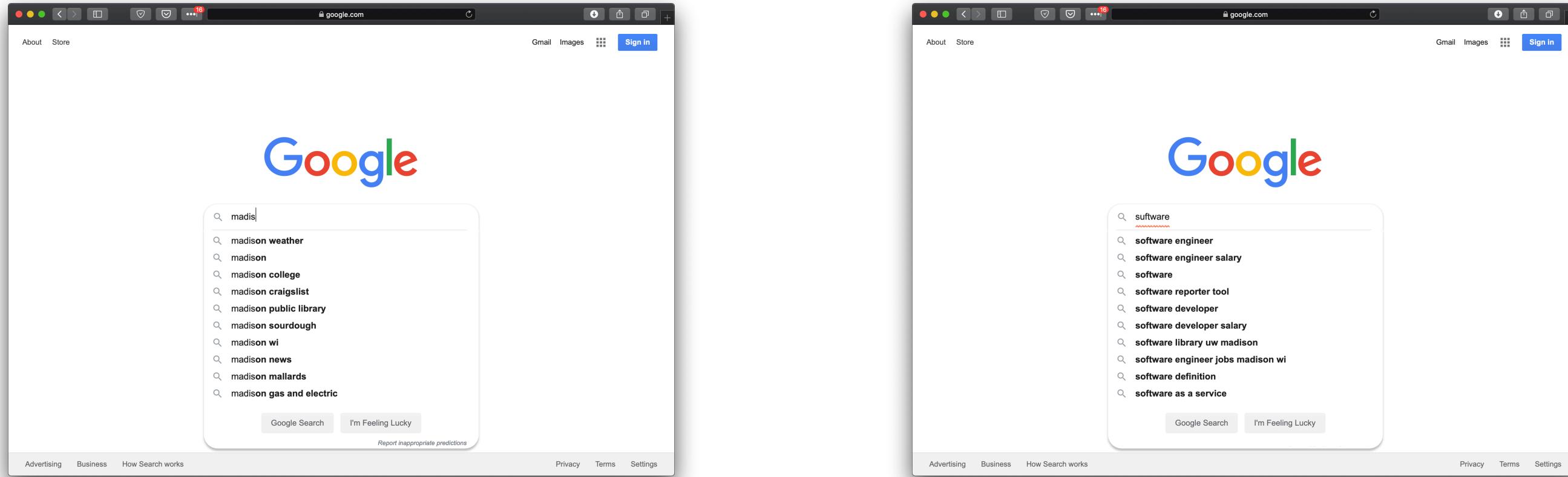
# Examples of pagination and infinite scroll:<sup>36</sup>



<sup>36</sup> 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 search interface for "Best Restaurants near South Campus, Madison, WI". 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, there are category filters: "Restaurants", "Home Services", "Auto Services", "More", "Write a Review", and "For Businesses". A "Sort By" dropdown is set to "Recommended". The main content area displays a map of Madison, WI, with numbered pins indicating restaurant locations. A callout for "1. Asian Noodle" shows a photo of a bowl of ramen and its details: "(608) 467-6210", "902 Regent St", "South Campus", "3 reviews", and "Noodles". Below the map, there are sections for "All Results" and "More Neighborhoods". The bottom of the page includes a "Map data ©2019 Google" and "Terms of Use" link.

The screenshot shows the Zappos search interface for "Running Shoes". At the top, there's a blue header with "Customer Service", a phone number "(800) 927-7671", and a message about free shipping. Below the header, there are navigation links for "Women", "Men", "Kids", "Departments", "Brands", and "Sale". A "Sort By" dropdown is set to "Relevance". The main content area displays a grid of four running shoes. Each item has a thumbnail, a title ("Newton Running Distance 8"), a price (\$155.00), a rating (4.5 stars), and a count (79). To the left of the grid, there are sections for "Narrow Choices" (Gender: Women 2725, Men 2109, Boys 658, Girls 653; Product Type: Shoes 5626, Clothing 97, Bags 3, Sporting Goods 1; Brand: Search Brand, 361 Degrees 30, Acorn 3, adidas 10, adidas by Stella McCartney 3), and a section for "Customers Who Searched This Also Bought".

# 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 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





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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	<b>#5</b>  <b>LEGO City Advent Calendar 60268 Playset, Includes 6 City Adventures TV Series...</b> <b>★★★★★ 122</b>	<b>#6</b>  <b>Tara Toys Ariel Necklace Activity Set - Amazon Exclusive</b> <b>★★★★★ 16,371</b>	<b>#7</b>  <b>The First Years Stack Up Cup Toys</b> <b>★★★★★ 28,092</b>	<b>#8</b>  <b>SunWorks Heavyweight Construction Paper, 9 x 12 Inches, Black, 100 Sheets</b> <b>★★★★★ 5,228</b>
HOZZQ DIY Halloween Party Supplies PVC 3D Decorative Scary Bats Wall Decal Wall... <b>★★★★★ 1,800</b> <b>\$11.99</b>				
Play-Doh Modeling Compound 10 Pack Case of Colors, Non-Toxic, Assorted Colors, 2 Oz... <b>★★★★★ 12,356</b> <b>\$7.99 - \$22.99</b>				
LeapFrog 100 Animals Book <b>★★★★★ 18,031</b> <b>\$9.47 - \$59.99</b>				

# 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