

User Interface Design

Engineering Considerations

What is a web page anyway? (1990-2005)

- The Web is young and was visually based on desktop operating system UIs
- Web "pages" were essentially a document format (like Microsoft Word)
- Web pages were static
 - No JavaScript or limited/buggy JavaScript capabilities.
 - Could not make network requests
 - Most complex user interactions required a new web page to be generated and loaded by the user
- Visual customization was limited
 - Flow was the only layout mode, designed for text -- so businesses and individuals started using "hacks" to achieve particular designs:
 - Misusing the <table> element to create a grid layout
 - Using multiple decorative or spacer images to create 3D effects, etc.

YAHOO! LIGANS!

the Web guide for kids

COOL



Cool Chat, Games & Prizes!

HEADBONE Zone

Virtual Pets

Veterans Day

NEW

Club

Help!



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Yahoo!igans.com in 1997


What is a web page anyway? (2005-2015)

- The initiative to introduce CSS began in part because HTML hacks degraded screen reader user accessibility
- CSS became widespread by around 2005
 - Font styling
 - Float-based layouts
- CSS3 became widespread by 2009
 - Rounded corners (border-radius)
 - Gradients (linear-gradient())
 - Media Queries to make web pages visually respond to screen size
- Predecessor to Fetch API was widespread by around 2005
- Predecessor to DOM API was widespread by 2005
- Suddenly web pages felt more like dynamic applications


facebook
home search browse invite help login

Mark Zuckerberg's Profile
Harvard

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Study where you want.



View More Photos of Mark (181)

View All Mark's Friends


Send Mark a Message

Poke Him!

Add Mark as a Friend




Report this Person

Status

 Mark isn't receiving Facebook texts right now.

Harvard Friends

146 friends at Harvard [See All](#)

Information

Account Info

Name: Mark Zuckerberg [\[add to friends\]](#)

Networks: Harvard Facebook San Francisco, CA

Last Update: August 14, 2006

Basic Info

Sex: Male

Relationship Status: In a Relationship

Residence: Kirkland

Birthday: May 14, 1984

Hometown: Dobbs Ferry, NY

Contact Info

Email: mzuckerb@fas.harvard.edu

Personal Info

Activities: lots of facebook

Interests: information flow, exponential growth, minimalism, meditation, driving, writing, making things, social dynamics, domination

Favorite Music: green day, franz ferdinand, weezer, fall out boy, my chemical romance

Favorite Books: mostly biographies and textbooks

Favorite Quotes: never run out of ammo.

About Me: i make things that increase information flow between people.

Education Info

College: Harvard

Facebook.com in 2005

What is a web page anyway? (2015-Present)

- New layout modes in CSS made it easier to match visual designs
 - Flexbox widespread by 2015
 - Constraint-based auto layout
 - Allowed vertical centering
 - Grid widespread by 2017
 - Replaced <table> hacks
 - Subgrid widespread by 2023
 - Simple, consistent grid systems
- Web Application Manifest API was standardized recently
 - Installable Web Apps on Android, iOS, Windows, MacOS
- Improved JS ergonomics:
 - Web components, standardized DOM API, standardized Fetch API



Suggested accounts

**stellanspice**

Stella 'n Spice 🌶️

**cookwithdana**

cookwithdana

**carolinagelen**

carolinagelen

**cookingwithayeh** ✓

Cooking with Ayeh

**poppycooks** ✓

Poppy O'Toole

[See all](#)

Following accounts

**king.asante**

Asante

**scottkress_**

scottkress

**pepperonimuffin** Kirsten

#3minutemakeupchallenge I need a redo

🎵 original sound - Kirsten

Following



131.2K



543



102

TikTok.com in 2024



Why has the Calculator app looked different over time?

Operating System Design - 1970s

- **Text interfaces with limited graphics**
- Complex processing would be performed by a single **mainframe** computer
- Users would connect to the mainframe through one of many **terminals** and send text commands as instructions
- Today terminals are **emulated** and provide a way to send instructions to the operating system or to other computers over a network
- Terminal emulators are still used by programmers:
 - Bash, GitBash
 - Windows Command Prompt, Windows PowerShell

```

[jim@palatinate:~]$ ls -l
total 36
drwxr-xr-x  2 jim jim 4096 Aug  3 19:42 bin
drwx----- 29 jim jim 4096 Oct 26  2021 chromium
drwxr-xr-x  3 jim jim 4096 Oct  8 09:16 Downloads
drwx-----  7 jim jim 4096 Oct  7 13:35 Dropbox
drwxrwxr-x 12 jim jim 4096 Sep 29 20:47 hobby
lrwxrwxrwx  1 jim jim   21 Oct 25  2021 Log -> /home/jim/Dropbox/Log
drwxr-xr-x  9 jim jim 4096 Jul 29 09:43 Records
drwxr-xr-x  9 jim jim 4096 Aug  3 19:31 Resources
drwx----- 11 jim jim 4096 May 22 11:43 snap
drwxr-xr-x 11 jim jim 4096 Aug  7 15:57 Writing

[jim@palatinate:~]$ ls Writing/TheCodedMessage/
archetypes  content  public  run.sh  TECH_WRITING.md  themes  WRITING.md
config.toml layouts  resources static  TECH_WRITING_OLD.md upload.sh WRITING_OLD.md

[jim@palatinate:~]$ uname -a
Linux palatinate 5.14.0-1024-oem #26-Ubuntu SMP Thu Feb 17 14:35:50 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux

[jim@palatinate:~]$ ping thecodedmessage.com
PING thecodedmessage.com (45.79.152.153) 56(84) bytes of data:
64 bytes from lil251-153.members.linode.com (45.79.152.153): icmp_seq=1 ttl=56 time=12.2 ms
64 bytes from lil251-153.members.linode.com (45.79.152.153): icmp_seq=2 ttl=56 time=12.8 ms
64 bytes from lil251-153.members.linode.com (45.79.152.153): icmp_seq=3 ttl=56 time=14.1 ms
64 bytes from lil251-153.members.linode.com (45.79.152.153): icmp_seq=4 ttl=56 time=15.8 ms
^C
--- thecodedmessage.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 12.234/13.721/15.797/1.372 ms

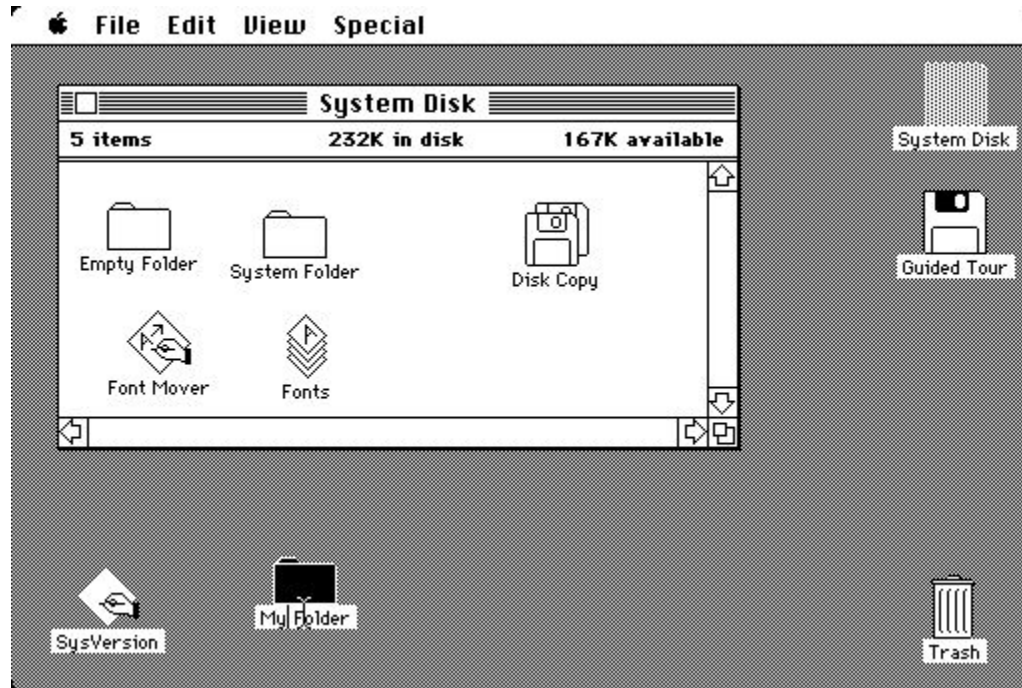
[jim@palatinate:~]$ █

```

Terminal Emulator (Bash)

Operating System Design - 1980s

- **First Graphic Interfaces**
- **Monitors were limited** in size, shape, number of pixels/colors, etc.
- Graphics had limited pixel grid space and a grayscale color palette
- Desktop metaphor popularized by original Macintosh (1984) by Apple
 - **WIMP: Windows, Icons, Menus, Pointer**
- Apple made the first attempt to standardize human-computer interaction
 - "Not very long ago, most users of personal computers were also programmers."
 - [Apple provides] "a consistent and familiar computer environment to perform all kinds of tasks that were formerly done without computers."
 - **"People aren't trying to *use* computers—they're trying to get their jobs done."** -- from Apple's Human Interface Guidelines (1987)



Macintosh Operating System (1984)

Operating System Design - 1990s

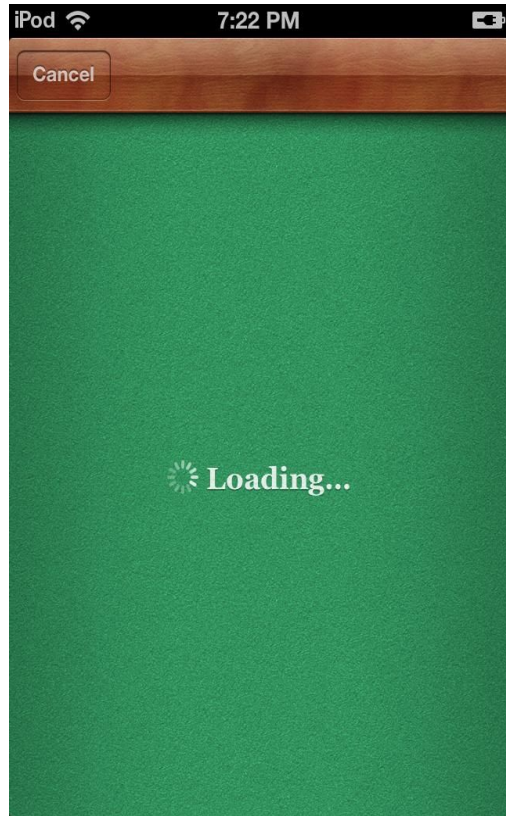
- **Improved Monitor Hardware**
- **3D Effects** were often purposeful, i.e., to make a button look raised
- Rounded corners, drop shadows, soft edges, crisp typography
- Popularized by Windows 95 and Windows XP
- Iterative improvements over 1980s designs
- Wider color palette encouraged neon/funky designs



Windows XP (2001)

Operating System Design - 2000s

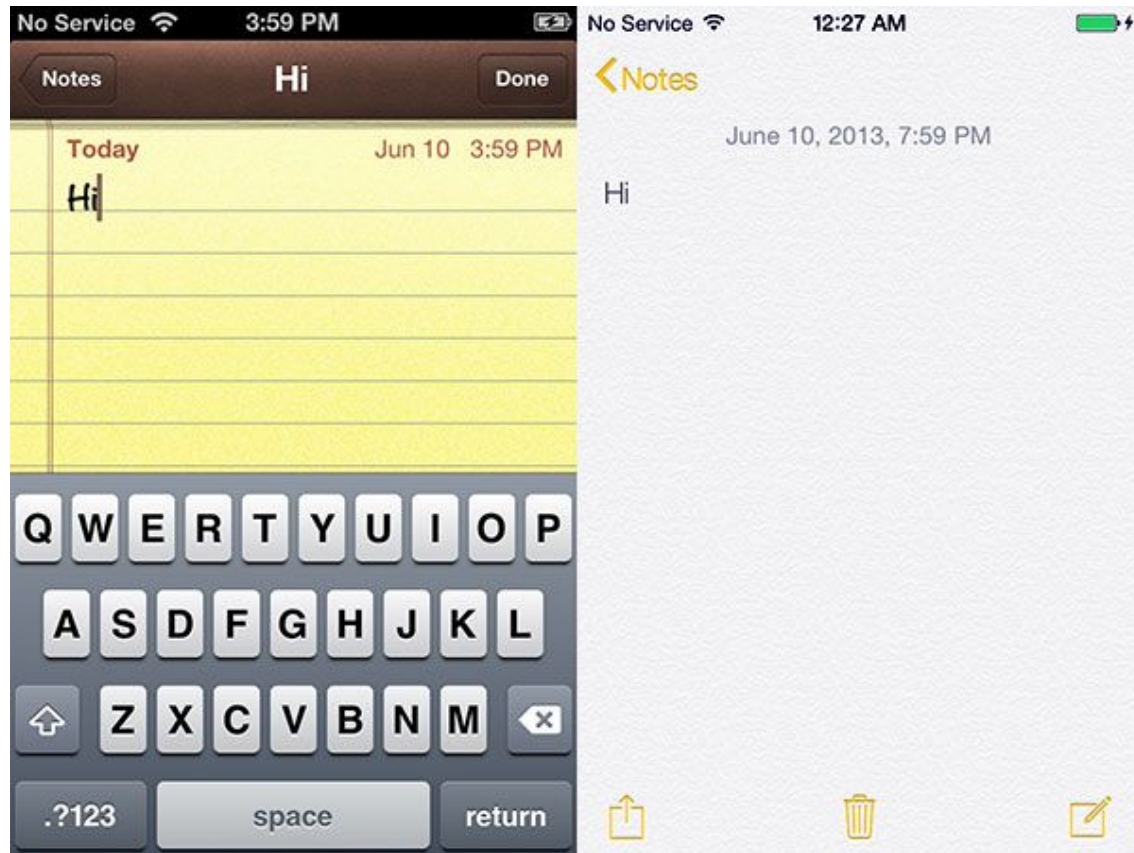
- **Mobile devices were a new form factor**
 - Everyone was suddenly using a new kind of computer with a touch interface, even people who had not used desktop computers
 - Interfaces needed to be **familiar and instructional**
- **Skeuomorphism**
 - To hint an app's concept to the user, interfaces emulated or took cues from **real-world objects**
 - Stitched, textured, or patterned interface elements
 - Referenced familiar objects, like a billiard table for Games app
 - iPhone OS 1 - iOS 6
 - Android 1 - Android 4



iOS 6 - Game Center, Books, Voice Memos

Operating System Design - 2010s

- Skeuomorphism lessened over time, as more users became familiar with how to operate mobile devices
- **Flat Design**
 - Apple Human Interface Guidelines for iOS and iPadOS
 - Apple iOS 7 - iOS 18
 - Google Material Design v1-v3
 - Google Android 5 - Android 15
 - Microsoft Design Language / Fluent Design System
 - Microsoft Windows 8 - 11



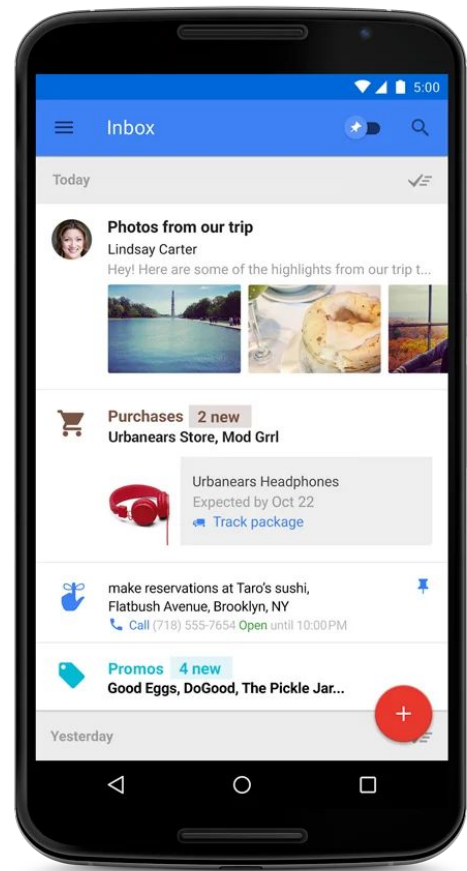
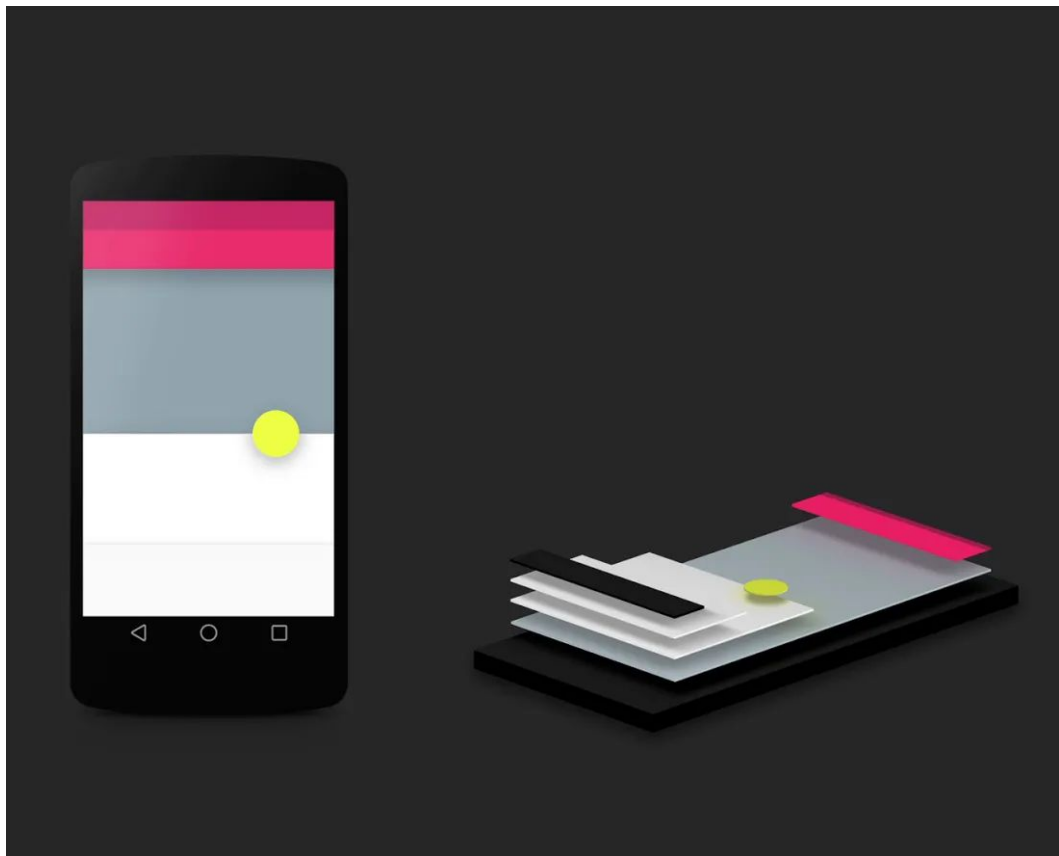
Apple Notes App (iOS 6, iOS 7)

Design Systems and Standards

- **Design systems promote consistency, usability, and accessibility** across different platforms and applications
- The default UI elements when building an app are themed by the OS
- Examples of influential design systems:
 - **Google Material Design:** Emphasizes the concept of space and depth
 - **Apple's Human Interface Guidelines:** Emphasizes clean design, clarity, and user-friendliness (Apple's operating system for desktop and for mobile/tablet are different)
 - **Microsoft Design Language / Fluent Design System:** Prioritizes adaptable design across a range of devices (Windows on small tablets is the same operating system as Windows on desktop)

Google Material Design

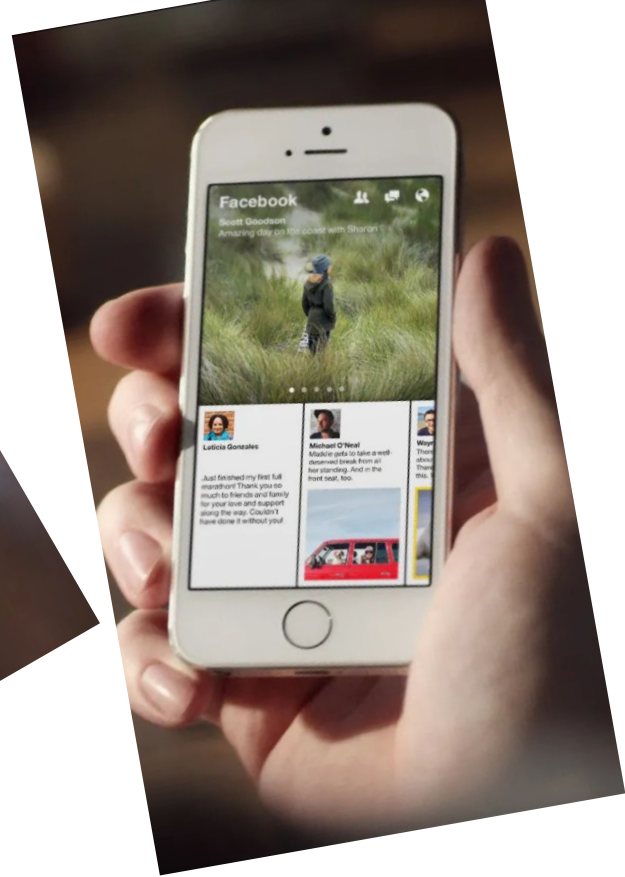
- <https://m3.material.io>
- Originally "Quantum Paper"
 - Hinting at both "Quantum Physics" and "Paper"
 - What is the digital world "made of"?
 - Do the physics of our world need to always reflect in the digital world?
 - <https://www.youtube.com/watch?v=Y0UEGsvcYvk>
 - <https://www.youtube.com/watch?v=rrT6v5sOwJg>
- Inbox for Gmail by Google (Now defunct)
 - <https://www.youtube.com/watch?v=bzNTjpUMOp4>
 - "It's called Inbox. Years in the making, Inbox is by the same people who brought you Gmail, but it's not Gmail: it's a completely different type of inbox, designed to focus on what really matters."



Google Material Design and Google Inbox (2014)

Paper for Facebook by Meta (Now Defunct)

- <https://about.fb.com/news/2014/01/introducing-paper-stories-from-facebook>
- https://www.youtube.com/watch?v=Ne2uHFi_e_M
- <https://www.youtube.com/watch?v=U1Xx1v6232E>
- "Everything responds to your touch so you can **pick up or thumb through stories with simple, natural movements**"
- "**Articles unfold** in the app and appear fullscreen for a focused reading experience"
- "Paper makes storytelling more beautiful with an **immersive design** and fullscreen, distraction-free layouts."



Paper from Facebook (2014)

Color Swatch Generator Demo

<https://www.w3.org/TR/WCAG20-TECHS/G17.html>

<https://readtech.org/ARC/tests/visual-readability-contrast/?tn=criterion>