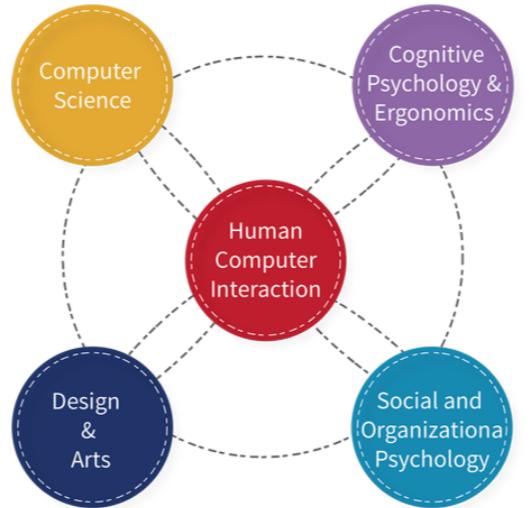


History & State of the Art of HCI

What is HCI?

HCI (human-computer interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings.

What is HCI?



HCI != Usability

A usable system is easy to learn, easy to remember how to use, effective, efficient, safe, and enjoyable to use.

Usability is only one part of HCI, but has been one of the main goals

HCI != Usability

For example, HCI has contributed to the **development of guidelines and standards** that support designers

HCI != Usability

HCI has also developed **methods of evaluation** that help us to evaluate the usability of a given product/system (and other aspects of the user experience)

HCI != Usability

In addition, HCI uses **mathematical models** to predict users' performance with a system (e.g., Fitt's law to predict mouse movement time, or models that predict search time or mental effort)

HCI != Usability

HCI also investigates new **interaction paradigms** or new ways of integrating technology in our daily lives (think smart clothes, touch displays, VR/AR, Voice-based interfaces ...)

Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved / or new solutions that address those breakdowns

Why do we do HCI in CSE?

Tacoma Narrows (nicknamed "Galloping Gertie")



- a suspension bridge in the U.S. state of Washington that spanned the Tacoma Narrows strait of Puget Sound between Tacoma and the Kitsap Peninsula.
- The design of the bridge caused it to sway vertically even in mild winds that were common in the area, but on Nov. 4 1940, the wind caused it to sway horizontally as well as vertically causing it to twist until it collapsed.

Why do we do HCI in CSE?

Tacoma Narrows (nicknamed "Galloping Gertie")



- The bridge's collapse has been described as "spectacular" and in subsequent decades "has attracted the attention of engineers, physicists, and mathematicians".

2-minute activity

Can you find a technology analogue to the collapse of the Tacoma bridge?

- The bridge's collapse has been described as "spectacular" and in subsequent decades "has attracted the attention of engineers, physicists, and mathematicians".

2-minute activity



<https://www.reuters.com/investigates/special-report/myanmar-facebook-hate/>

- Myanmar = mee-an-maar

Why do we do HCI in CSE?

Understanding how and why human interaction breaks down is fundamental to designing better computing systems

This study must include computer scientists, as we are the ones creating the technology

HCI is an extension of traditional CS disciplines

We design, scale, and evaluate computing systems for particular tasks (e.g., parallel programming, network routing)

HCI is an extension of traditional CS disciplines

HCI incorporates humans into the computing system

Humans as an additional constraint

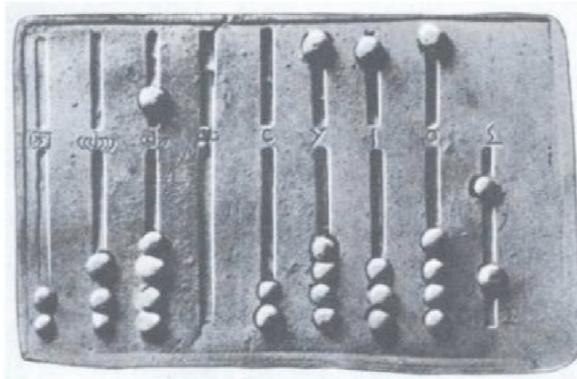
HCI is an extension of traditional CS disciplines

Any computer system must be designed taking into account:

- the physical constraints of the machine (e.g., processor speed, networking capabilities)
- the human physical and mental constraints (e.g., attention, memory)
- (should we add, social level constraints?)

History of HCI

Calculating devices in antiquity



Konrad Zuse (1910-1995)

Invented the world's first programmable computer
(in 1941)

This remained the only working computer in Europe
up to 1951

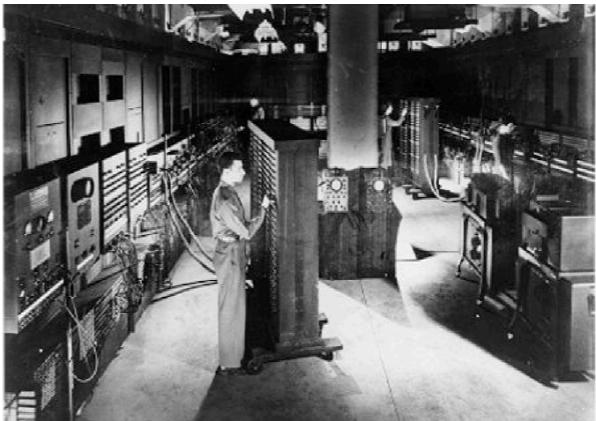


ENIAC (~1946)

First electronic numerical integrator and computer in the US

Construction contract was signed in 1943

The first programmers of the ENIAC were six women ("Refrigerator Ladies")

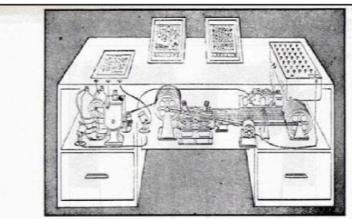


Memex (1945)

Memex [memory expansion]

"would use microfilm storage, dry photography, and analog computing to give postwar scholars access to a huge, indexed repository of knowledge any section of which could be called up with a few keystrokes."

Wardrip-Fruin, Noah; Montfort, Nick, eds. (2003). *The New Media Reader*. MIT Press.

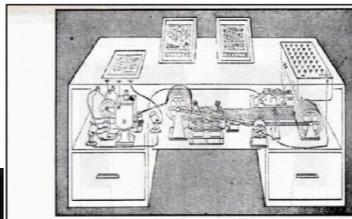
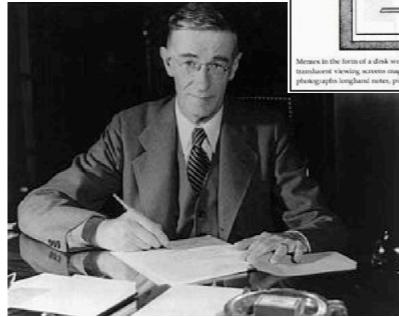


Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Shifting microfilm viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (IIE 1931), p. 123.

Vannevar Bush

Memex (1945)

"wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them..."



Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Shifting microfilm 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 (IIE 1931), p. 123.

Vannevar Bush

Memex (1945)

"If the user wishes to consult a certain book, he taps its code on the keyboard..."

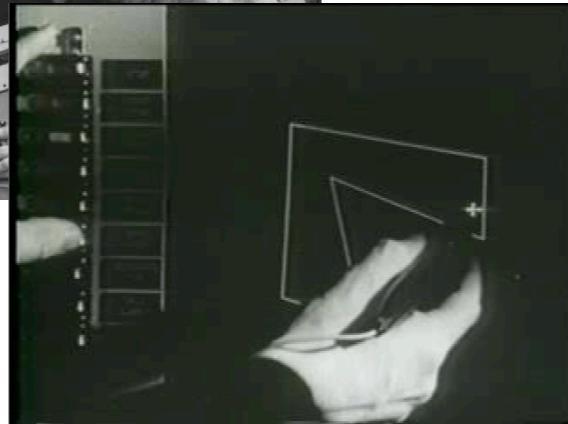
"Frequently-used codes are mnemonic, so that he seldom consults his code book;"

"He can add marginal notes and comments ... even ... by a stylus scheme"

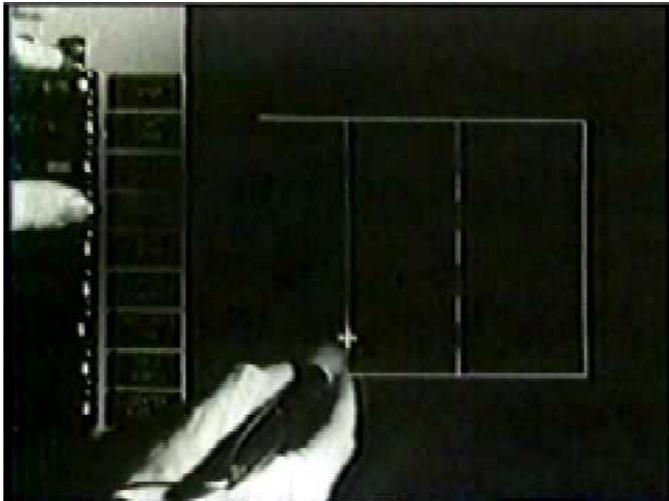
"All this is conventional..."

- What does this remind you of?

SketchPad by Ivan Sutherland at MIT (1962)



SketchPad by Ivan Sutherland at MIT (1962)



SketchPad by Ivan Sutherland at MIT (1962)

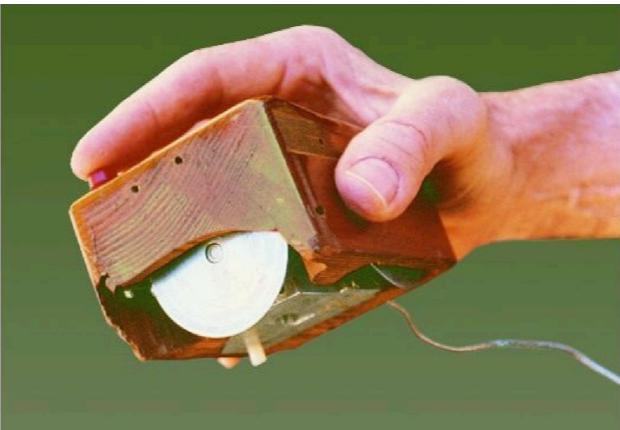
Direct manipulation of objects

SketchPad paved the way for the Graphical User Interface

Sutherland's PhD thesis also defined the terms "objects" and "instance"

SketchPad is the first object-oriented programming system

First mouse by Engelbart at Stanford (1963)



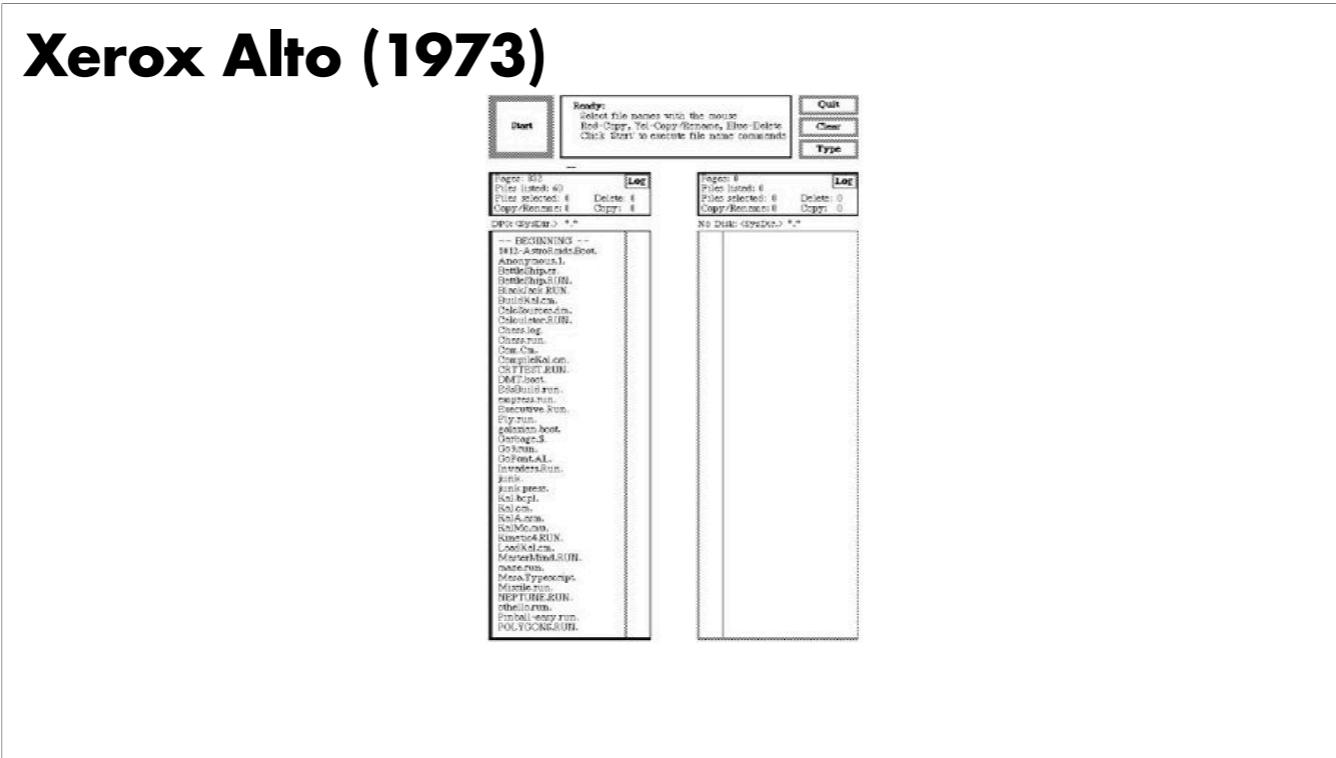
Nothing eventful happened in the next 10 years...

Xerox Alto (1973)



- The first personal computer!
- It features a graphical user interface (GUI), a mouse, Ethernet networking, and the ability to run multiple applications simultaneously. It is one of the first computers to use a WYSIWYG (What You See Is What You Get) text editor and has a bit-mapped display.
- The Alto became well known in Silicon Valley and its GUI was increasingly seen as the future of computing. In 1979, Steve Jobs arranged a visit to Xerox PARC, during which Apple Computer personnel received demonstrations of Xerox technology in exchange for Xerox being able to purchase stock options in Apple.[9] After two visits to see the Alto, Apple engineers used the concepts in developing the Lisa and Macintosh systems.

Xerox Alto (1973)



- ## - The displays

VisiCalc (1979)

C11 (L) TOTAL				C1 25
1	A ITEM	B NO.	C UNIT	D COST
2	MUCK RAKE	43	12.95	556.85
3	BUZZ CUT	15	6.75	101.25
4	TOE TONER	250	49.95	12487.50
5	EYE SNUFF	2	4.95	9.90
6				-----
7			SUBTOTAL	13155.50
8			9.75% TAX	1282.66
9			-----	-----
10			TOTAL	14438.16
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

VisiCalc was the Killer App for Personal Computers

Turned the microcomputer from a hobby for nerds into a serious thing

Because of it, IBM introduced the IBM PC 2 years later

Suddenly, small and large businesses bought computers

With the emergence of personal computing in the late 1970s, everyone became a potential computer user

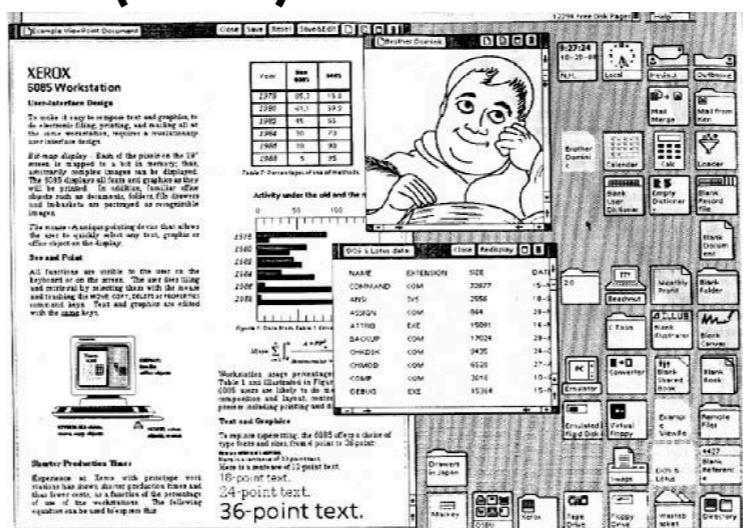
With the emergence of personal computing in the late 1970s, everyone became a potential computer user

... but computer users still had to deal with arcane commands and system dialogs

Xerox Star (1981)



Xerox Star (1981)



Apple Lisa (1981)



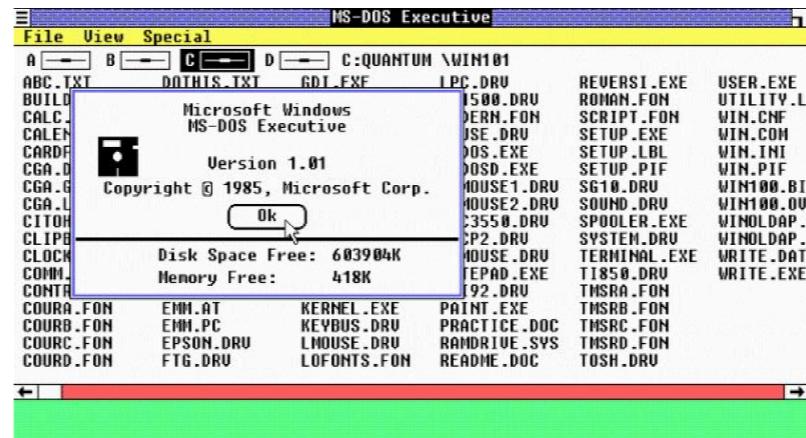
Apple Lisa (1981)



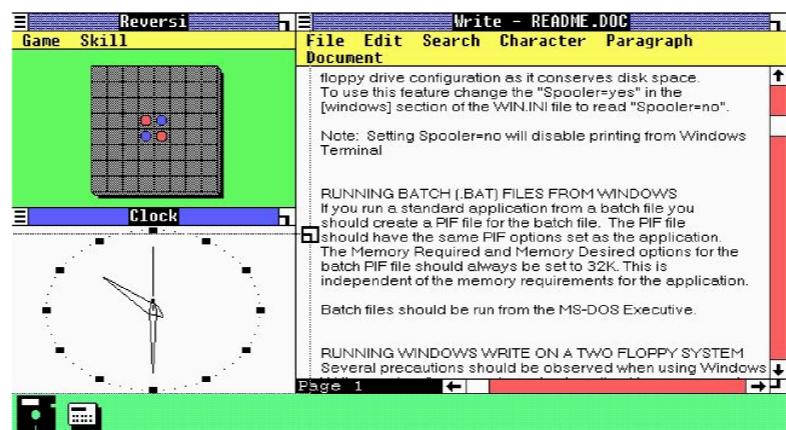
Apple Mac (1984)



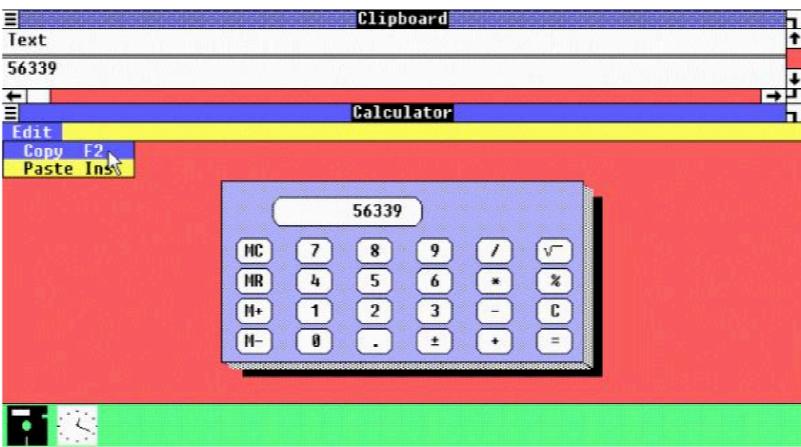
Windows 1.0 (1985)



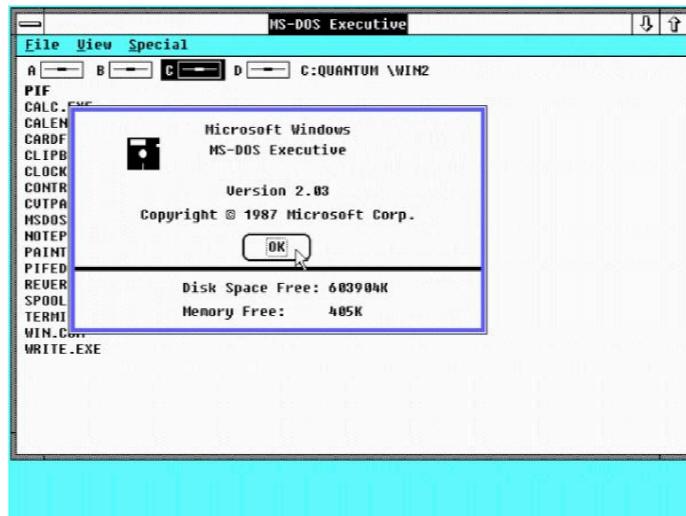
Windows 1.0 (1985)



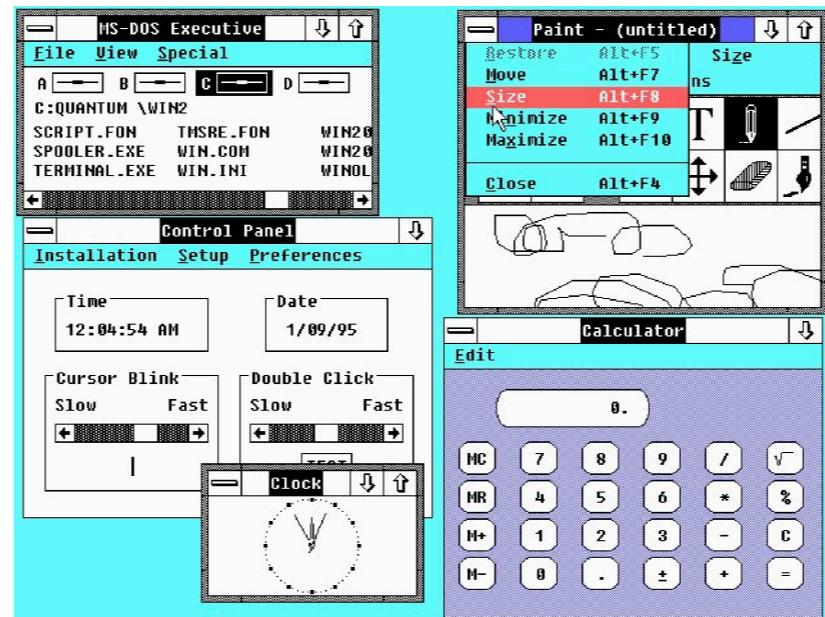
Windows 1.0 (1985)



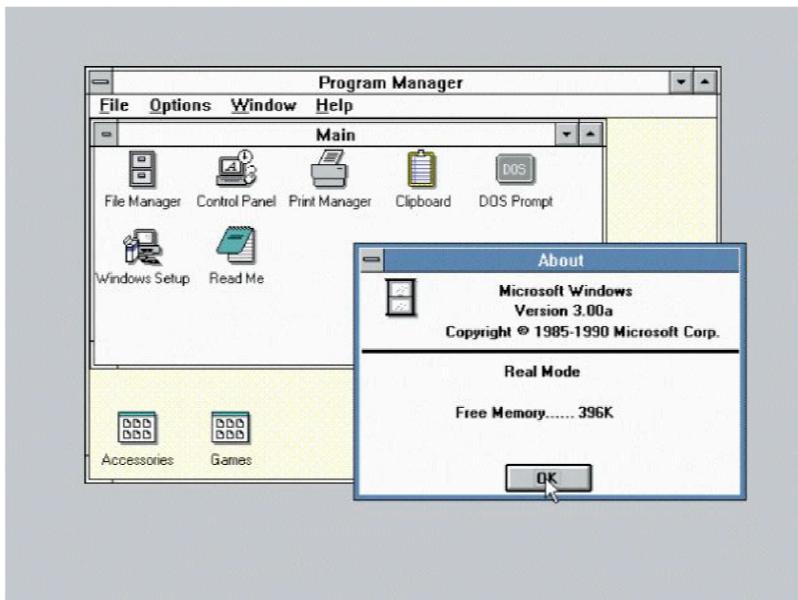
Windows 2.0 (1987)



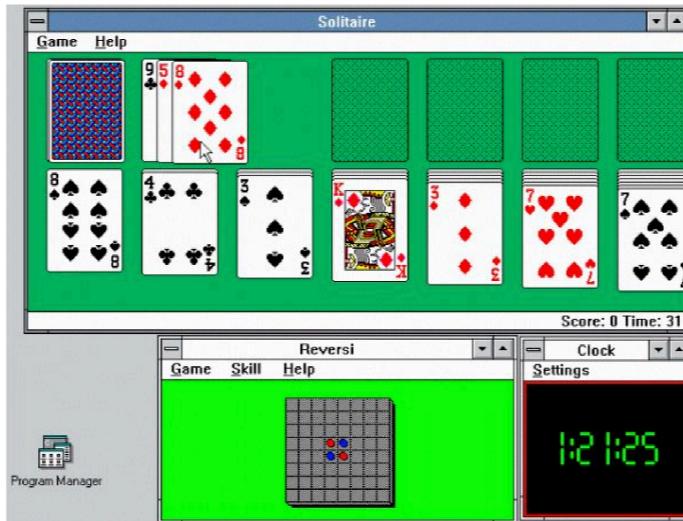
Windows 2.0 (1987)



Windows 3.0 (1990)



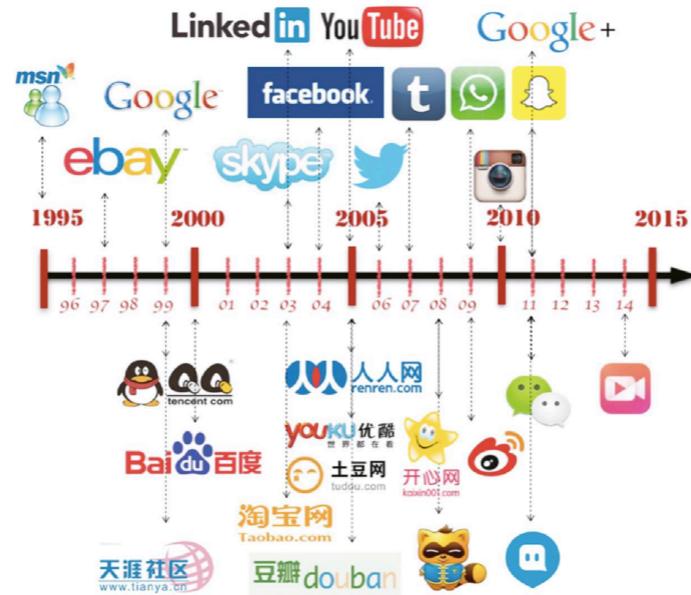
Windows 3.0 (1990)



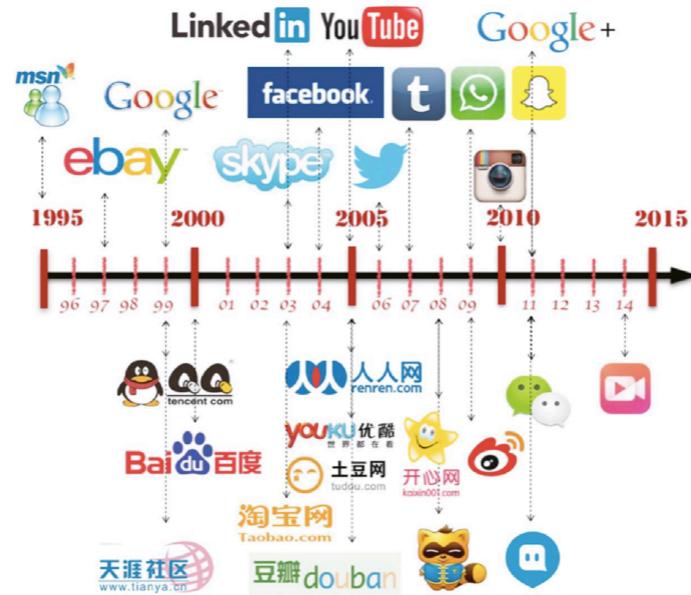
World Wide Web (1990)



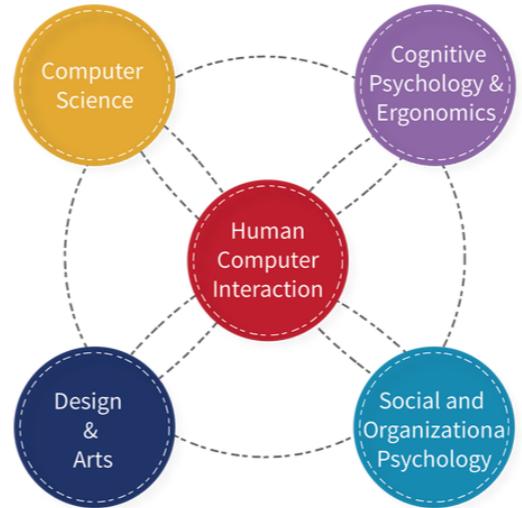
World Wide Web (1990)



World Wide Web (1990)



"HCI is concerned with understanding the influence technology has on how people think, value, feel, and relate and using this understanding to inform technology design."
Wright & McCarthy (2008)



HCI's impact on society

We can now use computers as an every-moment-partner

Less and less training is required for most application
and devices



HCI's impact on society

Some examples:

- Touch screen: direct interaction with objects
- Voice control: for some people the only way to interact with computers



HCI's impact on society

Smartphones have changed how we spend our "empty times": should we read the news? answer emails? chat with friends? play "2 Dots"? should we just be bored?



HCI's impact on society

Social Media have influenced how we stay in touch with each other and how find new friends and lovers.



HCI's impact on society

Games, more than entertainment, can be used as social and even productive tools.



HCI's impact on society

Massive increase in productivity

HCI found how to speed up input and reduce its complexity

HCI's impact on society

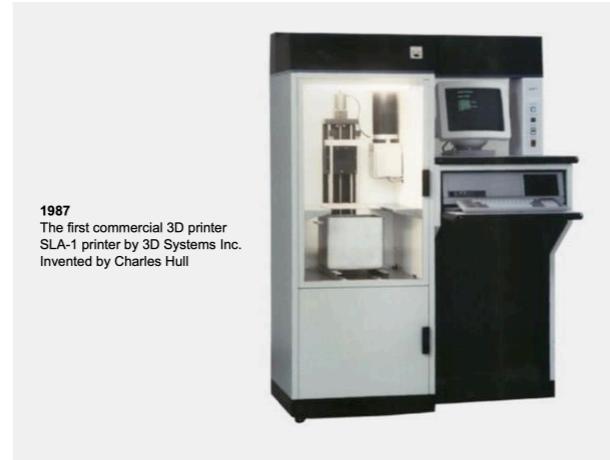
People can perform tasks faster than they used to

Reduced need for training

More people can use technology than ever before

What now??

Fabrication (3D Printing) in HCI



1987
The first commercial 3D printer
SLA-1 printer by 3D Systems Inc.
Invented by Charles Hull

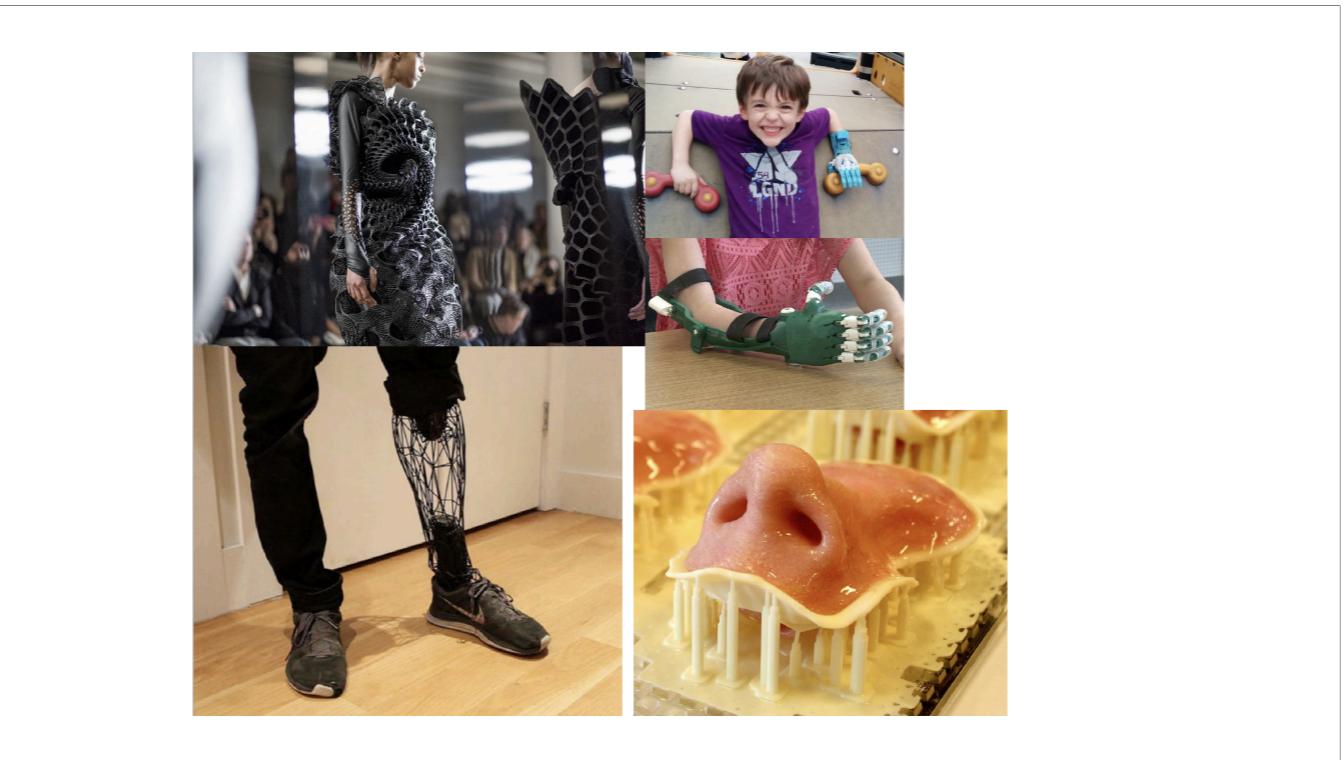


1992
The first commercial FDM printer
3D Modeler by Stratasys, Inc.
Invented by Scott & Lisa Crump

Fabrication (3D Printing) in HCI

"The idea for the technology came to Crump in 1988 when he decided to make a toy frog for his young daughter using a glue gun loaded with a mixture of polyethylene and candle wax. He thought of creating the shape layer by layer and of a way to automate the process. In April 1992, Stratasys sold its first product, the 3D Modeler."





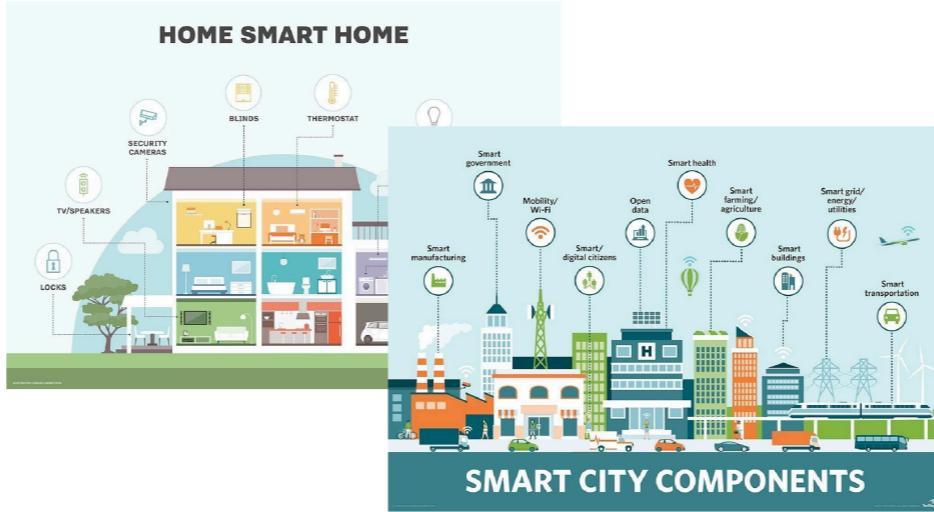
3D Printing houses using FDM



3D Printing pancakes using FDM



Society as the next platform



And beyond (VR/AR)



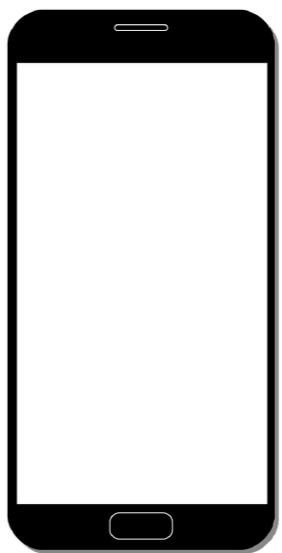
Activity (10 minutes)

In groups of 2...

How would you change this thing?

Make sure your idea is innovative!

Sketch out your design on a piece of paper and
write your names on it



Reflection

What did you come up with?

What were the challenges?

What process did you follow?

