Computer Science 1400: Part #4

Getting Here:

THE DAWN OF PERSONAL COMPUTERS
THE COMPUTER USABILITY REVOLUTION
What *is* a Computer? (Take III)
Computing in 1970: The State of the Art

- Mainframe computers (government / business / scientific)
- Minicomputers (business / scientific)
- Consolidation of the computer industry (IBM and BUNCH)
- Most computers operate in isolation from their human users and other computers
Computing for the People (Take II)

- **Time-sharing** = switching computer between group of users such that each user thinks it owns computer.
- IPTO funds prototype time-sharing system, Project MAC, at MIT in 1963; supports up to 30 users over 160 terminals.
- Various large-scale academic (Multics) and commercial (Telcomp, Keydata, Tymshare: “computer utility”) systems underway by 1967; almost all such efforts collapse by 1970 due to software development problems.
- Small time-sharing systems survive at universities; many such systems based on versions of UNIX created at Bell Labs in 1970 in the wake of the Multics fiasco.
The Computing Counterculture

- Computers as alternative technology for promoting liberty, knowledge, and happiness ("New Communalists").
- Key documents were *Whole Earth Catalog* (Stewart Brand) and *Computer Lib* (Ted Nelson); latter proposed hypertext.
- Communalists and hobbyists envision computing as low-cost computer utilities and minicomputers, respectively.
Community Memory Public Terminal (San Francisco, 1973–1975) [FINDing: free / ADDing: 25 cents]

CM Terminal (CRT version)
Making Computers Personal: Hardware

- Intel co-founded by Noyce and Moore in 1968; made chip-sets for implementing personal calculators.
Instead of being a little mainframe, the PC is, in fact, more like an incredibly big chip. – Robert X. Cringely

- The microprocessor was invented by Ted Hoff in 1971.
- Manufactured massively and marketed cheaply as per Noyce policy; widely available after calculator collapse.
Making Computers Personal: Hardware (Cont’d)

Ed Roberts (1941-2010)

- Computer kit produced by Micro Instrumentation Telemetry Systems (MITS); I/O hardware and software provided by other companies, e.g., Micro-soft BASIC.
- Dozens of companies in microcomputer market by 1976.
Making Computers Personal: Hardware (Cont’d)

Steve Wozniak (1950–) and Steve Jobs (1955-2011)
• In high school, Wozniak and Jobs build and market “blue boxes” for making free long-distance phone calls; Wozniak designs computer that self-destructs at demo.

• In early 1975, when Wozniak at HP and Jobs at Atari, Wozniak designs and builds microprocessor-based Apple I; demos to acclaim at Homebrew Computer Club.

• Manufacture of 200 Apple I’s in Job’s parent’s garage financed by sale of Jobs VW Microbus and Wozniak’s calculator.
Apple I (1975) [$666.66]
Wozniak designed Apple II in 1976; Jobs obtained venture capital for manufacture from Mike Markkula.

Originally retailed for $1298 (basic: 4K memory) and $2638 (full: 48K memory).

New versions created until 1988; most popular model was Apple IIe (1984).

Apple II series remained major (∼80%+) source of Apple revenue into 1990s.
First Portable Personal Computer: Osborne I (1981) [$1795]
Making Computers Personal: Hardware (Cont’d)

- Developed over 18 mths starting in 1980.
- In break with tradition, uses all off-the-shelf hardware components (except BIOS chip), all software contracted out, and sold by others (Sears, ComputerLand).
- Demand dramatically exceeds expectations, due in large part to insightful advertising and IBM reputation.
- Rapidly becomes standard industry personal computer.
Making Computers Personal: Hardware (Cont’d)

- Despite IBM copyright and publishing of BIOS code, BIOS chip legally reverse engineered, allowing creation of fully IBM PC compatible “clones” by other manufacturers.

- Driven by innovative sales strategies, e.g., custom mail-order PCs (Dell), increasing sales of clones drove hardware component prices and clone prices lower, resulting in mid-late 1980’s “clone wars”.

Compaq DeskPro (1985)
Making Computers Personal: Software

- PC software market not cost-effective for traditional firms; early companies focus on systems software, e.g., CP/M.
- Most early PC software free, *cf.*, Bill Gate’s 1975 open letter.
- By late 1970’s, thousands of PC software companies.

- Early PC software successes cluster into three markets: games, business (spreadsheets (VisiCalc), word processing, and databases), and education.
- "Killer apps" crucial to sales of PCs and PC software.
Making Computers Personal: Software (Cont’d)

Paul Allen (1953–) and Bill Gates (1955–)
• In high school, Allen and Gates develop class scheduling and traffic simulation software for Traf-O-Data.

• In early 1975, develop BASIC for Altair 8800. Move to Albuquerque, NM, to develop other Altair software as Micro-soft.

• On sale of MITS in 1977, establish Microsoft in Seattle, WA; build on BASIC expertise to create compilers for other languages like FORTRAN and COBOL.
Making Computers Personal: Software (Cont’d)

• Kildall develops first PC OS, CP/M, in 1973-74 and BIOS in 1975; founds (Intergalactic) Digital Research.

• Though CP/M is first choice for IBM PC OS in 1980, Kildall and IBM fail to make deal.

• Microsoft ends up providing both compilers and MS-DOS OS for IBM PC; MS-DOS is actually re-written QDOS purchased for $30K cash from Seattle Computer Company, who based QDOS on CP/M.
By early 1980’s, MS-DOS is standard OS for both IBM and IBM-compatible PCs; Microsoft is now a billion-dollar company based on $10-50 fee per copy (on compatibles!).

Application-software market consolidating to a few large companies; many early companies that do not adopt polished business and advertising strategies perish.
Advertising the Personal Computer

Altair 8800 (1975)  
Apple I (1976)  
IBM PC (1981)

- Early advertising targeted hobbyists; subsequently moved on to individuals and businesses. Latter arguably primary until truly easy-to-use computers available in late 1980s.
Advertising the Personal Computer (Cont’d)

- For the first time, advertising computers involved the creation of publicly-recognizable corporate heroes, often by over-simplifying corporate history, e.g., Wozniak and Allen.
People weren’t about to buy $2,000 computers to play a video game, balance a checkbook, or file gourmet recipes as some suggested. The average consumer simply couldn’t do something useful with a computer. Neither could the home market appreciate important differences in computer products. Computers largely looked alike and were a mystery for the average person: they were too expensive and too intimidating. Once we saturated the market for enthusiasts, it wasn’t possible for the industry to continue its incredible record for growth.

John Sculley (1939--) in his 1987 book
Doug Engelbart (1925-2013)

Computer Mouse (1965)

- Engelbart founds Augmentation Research Center (ARC) at Stanford in 1963; key computer usability technologies, e.g., graphical user interface (GUI) and computer mouse, developed at ARC in mid-1960s
Making Personal Computers Usable (Cont’d)

“The Mother of All Demos” (1968)
Making Personal Computers Usable (Cont’d)

- Xerox creates Palo Alto Research Center (PARC) in 1969 with aim of establishing competitive advantage.
- Half of $100M budget in 1970s spent on hiring top computing personnel and developing advanced personal computing technologies (“office of the future”).
Making Personal Computers Usable (Cont’d)

Xerox Alto (1973) [$25K (est)]

- Alto was first modern GUI-driven PC; also incorporated local-area networking and laserjet printers (WYSIWYG).

Xerox Star (1981) [$75K]

- Star intended for use in large corporations.
Making Personal Computers Usable (Cont’d)

- Following invitation by Xerox Head Office to view PARC innovations in 1979, Jobs starts Lisa project to re-create GUI-based functionality of Alto and Star.
- Development of special-purpose hardware boosts price of Lisa.

Apple Lisa (1983) [$16,695]
Making Personal Computers Usable (Cont’d)

- Macintosh development started in 1979 by Jeff Raskin (1943-2005); taken over by Jobs in 1981.
- Built on re-engineered Lisa technologies.
- Job’s management style splits Apple tech division, leading to Job’s removal from Apple in 1985.

Apple Macintosh (1984) [$2,500]

- Part of Macintosh application and OS development sub-contracted to Microsoft starting in 1981; by 1987, half of Microsoft revenue derived from products for Macintosh.
• Microsoft releases Windows v1.0 (built on top of MS-DOS) in 1985; legally emulated portions of Mac look.

• Microsoft releases Windows v2.0 in late 1987; is not only much faster but (now illegally) identical to Mac look.


• By late 1980s, Windows has 90% market-share in GUI-based PC computing.
Personal Computing: The Beginning Ends