

25 Years of the Personal Computer

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Computers have been around since the early 1940's. Called mainframes, they were big, cumbersome expensive machines, owned and maintained by large companies and universities. Occupying from one to several rooms of a building, a mainframe computer was seen by most people solely from behind glass. With limited processing power and high overhead for both maintenance and programming, machine time was highly prized and coveted. Corporations benefited from these machines, rarely individual people pursuing their own interests. Alas, many technically-inclined people dreamed of having their own machine; a computer that would serve no one but themselves.

The idea of a computer cheap and small enough for the average person to own was "pie in the sky" until miniaturization and manufacturing processes evolved. First, electrical circuits had to be designed in incredibly small reliable packages (i.e. the invention of integrated circuit board). Then, a cheap capable processing unit (CPU) was needed. Microprocessors were already in large scale production by the early 1970's. Companies like Intel built and designed processing chips for calculators and traffic lights. By the mid 1970's, these micro-processors had enough power to run a small computer, although at this point in time no single processor company had the vision to put them in a consumer computer.

By the mid 1970's, all the components for the personal computer were available "off the shelf", but it took a visionary person to bring those pieces together and assemble the very first "personal computer". The revolution started in 1975 with a man named Ed Roberts. Roberts owned a company (MITS) that built calculators and calculator kits. When the calculator market fell apart in 1974, Ed Roberts and his company were faced with possible bankruptcy. At that particular moment, Robert's friend Les Soloman (technical editor for Popular Electronics magazine) was looking for a personal computer to promote in his magazine. As a result, Roberts decided to design a commercially viable computer "kit".

Soloman and Roberts spent many nights hashing out the exact components for desktop computer that could sell for under \$500. Roberts wanted his computer to be expandable like the new minicomputers being used in businesses (i.e. a computer that consists of individual circuit boards each designed for a specific task that could communicate with each other). The MITS Altair computer was thus born, and was the first commercially successful personal computer. It was designed as a kit for hobbyists and professionals to build and use in their homes or work areas. The first of the Altair machines came with only 256 bytes of memory. Although extremely limited in what they could do, the development of this machine jump-started an entire industry.

Computer clubs formed around the Altair, and the first task was to get this machine to do something. The Altair had no speakers, no video display, no keyboard, no printer, no disk drives. All it had was a series of switches on the front panel and a few lights. Anything

that a person wanted the machine to do took a painstakingly long time to enter. When done, there was (at first) no way to save your work, and at most, all you received back in terms of a response was a couple blinking lights indicating an outcome of your instructions. In today's terms the Altair was not much of a computer; in fact it looked more like lab equipment. Yet to the community of people who had waited so long to own their own computer, it was simply marvelous.

A young university student, Bill Gates, saw the Altair computer on the cover of Popular Electronics, and jumped to action. To his dismay, the personal computer industry was starting without him. Sensing he could not wait until he graduated to act, Gates and a few programming friends assembled the first computer language that would run on the Altair. It was a modified and condensed version of the language known as "Basic". The result of this endeavor was a company called Microsoft.

A man by the name of Steve Wozniak worked for Hewlett Packard (the calculator manufacturer) by day, and played computer hobbyist by night, tinkering with early computer kits like the Altair.

"The computer kits that were being touted to hobbyists in 1975 were square or rectangular boxes with non understandable switches on them", claimed Wozniak.

While attending a Home Brew Computer Club meeting (based in Palo Alto, California) and demonstrating one of his own home-made machines, he was approached by Steve Jobs. Fascinated with the capabilities of Wozniak's relatively advanced computer, Jobs asked Wozniak if he would consider marketing it as a kit.

On April Fool's Day, 1976, Steve Wozniak and Steve Jobs released the Apple I computer kit. The Apple I was the first single circuit board computer. It came with a video interface, 8k of RAM, and a keyboard. A local computer dealer (The Byte Shop) ordered 100 units, with the stipulation that Wozniak and Jobs had to assemble the kits for it's customers. Approximately two hundred Apple I's were built and sold over a ten month period, at a cost of just over \$650 U.S. each.

Luckily for the consumer, the next round of home computers would prove to be more usable. In 1977, Apple Computers was incorporated and the Apple II computer model was released. It was at the first West Coast Computer Faire that the public witnessed the debut of the Apple II (available for \$1298 U.S.). The Apple II was based on the same 6502 processor as the Apple I, but it had color graphics (a first for a personal computer), and used an audio cassette drive for storage. Its original configuration came with 4 kb of RAM, but a year later this was increased to 48 kb of RAM and the cassette drive was replaced by a floppy disk drive.

Meanwhile, a company named Commodore released the PET (Personal Electronic Transactor, or maybe rumored to be named after the "pet rock" fad). Designed by Chuck Peddle, it was first presented at the 1977 Winter Consumer Electronics Show and later at the West Coast Computer Faire. The Pet Computer also ran on the 6502 chip, but it cost only \$795, half the price of the Apple II. It included 4 kb of RAM, monochrome graphics

and an audio cassette drive for data storage. Included was a version of BASIC in 14k of ROM. Microsoft developed its first 6502-based BASIC for the PET and then sold the source code to Apple for use in "AppleBASIC". The keyboard, cassette drive and small monochrome display all fit within a single self contained box. The Commodore PET was seen at the time to be a chief rival of the Apple.

In 1977, Radio Shack introduced its TRS-80 microcomputer, also nicknamed the "Trash-80". It came with 4 kb of memory and 4 kb of ROM (stands for "Read Only Memory" -hard coded data) which contained the BASIC operating system. An optional expansion box enabled memory expansion, and audio cassettes were used for data storage, similar to the PET and the first Apples. Over 10,000 TRS-80s were sold during the first month of production. The later TRS-80 Model II came complete with a disk drive for program and data storage. At that time, only Apple and Radio Shack had machines with disk drives. With the introduction of the disk drive, software titles for the personal computer proliferated as distribution of software became easy.

It wasn't long before Apple (and other) personal computers started showing up on the desktops of IBM employees. Apparently, small personal computers and available software titles were filling needs that IBM mainframes were not. Shortly thereafter, IBM ceased to think of the personal computer as a "play thing" and started a pc development program of its own. IBM's mandate was to create a personal computer from the bottom-up, in a single year. No IBM initiative ever got off the ground in that little time. In order to create a machine quickly, IBM assembled a pc from parts that were already available in the marketplace (rather than designing, building, and placing patents on all internal components). Obsessed with a timely release for their PC, IBM also bought software "off the shelf" from a company called Microsoft. When Microsoft realized that they did not, in fact, have all the software needed by IBM, Microsoft went out and purchased OUTRIGHT—a version of the disk operating system it needed, for the sum of \$50,000 U.S. In turn, Microsoft turned around and licensed their "now complete" software package to IBM. Some people today call Microsoft's \$50,000 purchase the "deal of the century".

The industry started gearing up for the release of the IBM PC. In 1981, it finally hit store shelves with a starting price of \$1,565 (U.S). Arguably not much better than any other computer on the market, it proved to be an immediate success. Apparently, the IBM name on a computer brought legitimacy to the fledgling industry; no longer was the pc dominated by nerds and counterculture hippies. Now, it was acceptable for companies and business executives all over the world to buy and use personal computers. With the release of the IBM PC, personal computers ceased to be a toy and became an industrial tool.

Computers would not be successful without software to run on them. It is often said the software has to be so beneficial that it warrants the customer buying the entire machine. Visi-Calc, the first computer spreadsheet program, was the "killer app" that caused the wide adoption of computers in the business community. The success of any new computer was dependent upon the timely release of plentiful, useful software.

The IBM PC was a huge success. Unfortunately for IBM however, the decision to use off-the-shelf hardware for its PC meant that the technology was easy to copy (in addition, Microsoft's software could be licensed to anyone as IBM did not own it). As a result, anyone could virtually grab the raw parts needed to assemble an IBM machine. Only one essential part of the IBM PC was patented: something called the ROM BIOS, which controls how all the parts of the computer talk to each other. Shortly after the IBM PC was released a small company called Compaq set out to "clone" the IBM PC. To do it, they had only one large task ahead of them: Write a ROM bios that did exactly what the IBM chip did, while NOT violating the IBM patent. To do this, the people chosen to write the Compaq code had to swear in a court of law that they had never seen the contents of the IBM ROM bios. Once a team of people had been formed, they set to work writing the code (a process known as "reverse engineering"). Once this legally acceptable ROM bios was achieved and tested, the computer companies could then legally "duplicate" (i.e. "clone") the IBM PC. Compaq was but the first in a line of companies to emerge and build "IBM Compatible" personal computers.

In the early 1980's, the Apple II was still keeping Apple in business. However, Apple executives saw the writing on the wall for this model. To compete, Apple attempted to create new computer platforms, namely the Apple III and the Lisa. Lisa was highly evolved, but proved too expensive to sell, so the race was on to take the best of Lisa and make a more cost-competitive machine. In 1984 the "Macintosh" hit the market. It became the world's first affordable mass-produced machine which operated using a Graphic Operating System. Called a GUI, the graphical desktop seen on the screen was controlled by a pointing device called a mouse. The graphical computer interface was seen by Steve Jobs as critical in making computers easy for anyone to use. In 1984, during the NFL Super Bowl game, millions of viewers saw their first glimpse of the Macintosh computer.

Today, the Macintosh is synonymous "Graphic User Interface", although Apple did not invent it. The GUI was actually invented by Xerox (the photocopier company) in their Palo Alto Research Center. Frustrated Xerox researchers, tired of presenting their inventions to Xerox executives and receiving only silence in return, allowed Apple a peek. Among the items shown to Apple by Xerox were the first networked office computers ("the paperless office"), and Ethernet. But it was the GUI (and the mouse which controlled it) that virtually blinded Steve Jobs to everything else he saw. Steve jobs himself later said that Xerox could have owned the personal computer industry had they seen the genius in their own products and marketed them. But instead it is Apple who lays claim to first marketing the GUI.

Like Apple, Commodore also released several new computers into the market to compete in the early 1980's. Notable machines were the Commodore Vic-20, 64/128, and Amiga line. While popular among home users for a while, Commodore failed to make significant inroads into the business market. Commodore later attempted a line of IBM PC compatible computers, but this was short lived as Commodore was but a late contender in a sea of better established clone brand names. While Apple hung on as an alternative

platform to the IBM PC, the Commodore name disappeared from the personal computer market in the early 1990's.

Since those early days of the PC, a thriving computer industry has evolved. Huge sales numbers and rapid technological advancements and manufacturing processes have formed a rather unique industry where technology improves while prices stay the same or fall. Machine obsolescence comes quickly as software vendors continuously push computer hardware to perform more and more graphically.

Today the IBM PC architecture reigns supreme on the desktops of both home and office, with all other brands occupying small niches. Apple has managed to hold a consistent 5% market share (closer to 10% on our university campus) in desktop computing. This is due mostly to the Macintosh's historic dominance and perceived superiority in graphics and excellence in typesetting. As well, Apple has traditionally been perceived as 'always one step ahead' in terms of ease in use.

Latest Trends

In the early 1990's the popularity of local area networks and the internet exploded, which created yet another boom for the pc hardware and software. The promise of global connectivity and unlimited information and communication resources has lured countless millions of people into using/owning personal computers. Faculty, staff, and students at universities such as ours use personal computers and the internet each day to undertake research, analyses, projects, assignments, and communication.

Another revolution currently underway is that of "convergence". Convergence essentially means the unification of all types of human communication (video, music, mail, bill payments, photographs, books, etc) into zero's and ones, the binary language of computers. The significance of convergence is that a personal computer can now do more for a user than ever before. As we saw above, convergence is but the latest chapter in the unfolding story of the personal computer. In its brief 25 year history, the personal computer has revolutionized the way people communicate, express, and organize themselves. The personal computer of today is the single most versatile tool humankind has ever created. Anyone care to guess what tomorrow will bring?