

The Computer Industry: Early 1960s

The early 1960s represent what some have called the “second generation” of computers (where the first generation is 1945 to 1956, the second generation is 1956 to 1963, the third generation is from 1964 to 1971, and the fourth generation starting in 1971 and continuing to the present day.)¹ The computers of the early 1960s were of solid-state design and used transistors instead of vacuum tubes, and included most of the basic components of the computers of today, such as printers, tape and disk storage, memory, operating systems, and programs that could be stored.

In 1960 Digital Equipment Corp released the first small, interactive minicomputer using all transistors, with its own keyboard and monitor. Its use of transistors made it faster and smaller than other computers of that time. The term computer was not used, however, because of government restrictions that listed specific attributes a machine must have in order to be called a computer. Therefore DEC called it a “Programmed Data Processor”: the PDP-1. It sold for between \$125,000 and \$150,000. In 1962 International Telephone and Telegraph bought 15 of the units, and by the end of that year DEC had sold nearly \$7 million worth of the machines.²

Probably the primary example of the computer of this era is the IBM 1401, which is often called the “Model T of the computer industry.”³ The IBM 1401 was revolutionary because it was the first mass-produced, digital, fully transistorized business computer that many businesses could afford. (IBM also put together the first mass

¹ Computers: History and Development. Jones Telecommunications and Multimedia Encyclopedia. http://www.digitalcentury.com/encyclo/update/comp_hd.html

² Brandel, M., 1999. Flashback 1957. From Computerworld, May 12, 1999, reprinted on CNN.com: <http://www.cnn.com/TECH/computing/9905/12/1957.idg/>

³ Computers: History and Development. Jones Telecommunications and Multimedia Encyclopedia. http://www.digitalcentury.com/encyclo/update/comp_hd.html

production facility for transistors in 1960.⁴) The machine was five feet high and about three feet across – about the size of a bookcase. Its memory capacity was about four kilobytes. David Nichols, who worked with the 1401 at the time, is quoted in Wired magazine as saying “The printers and check sorters would roar like machine guns all through the night...It was deafening. If you stood next to them you couldn't hear a thing in the morning. It was a very physical experience you don't get today.”⁵

Computers were well established by 1960:

By 1960, the computer was king. Companies hired armies of technicians and programmers to write its operating programs and software, fix it, and allocate the precious computer time. The capability of the machines was more than a mere mortal could fathom, but gathering raw data and "keying" it in so the computer could "crunch the numbers" was a complicated and time-consuming task. Frustrations abounded...and the phrases "garbage in/garbage out" ...[and] "Do not fold, spindle or mutilate," [were] coined.⁶

It was in 1960 that the first computerized transaction-processing system was begun: the Sabre airlines reservation system. The project was a joint undertaking by programmers from American Airlines and IBM. American Airlines invested \$150 million in the system at a time when each of its 707 jets cost just over four million dollars.⁷ The company could literally have bought a large fleet of new planes and had money left over rather than pay for an enormous system that most people could not even comprehend. But they had faith in the computer's usefulness.

It took five years before the system was operating, but most of the key development work was done between 1960 and 1962. The Sabre system today is still

⁴ Silicon Spirits. History of Computing from 1946 to 1997. <http://www.siliconsprits.com/comphist.htm>

⁵ Kahney, L., 2000. From Old Big Blue to ASCII White. Wired Magazine, July 5, 2000. Online edition: <http://www.wired.com/news/technology/0,1282,37347,00.html>

⁶ Personal Computers: History and Development. Jones Telecommunications and Multimedia Encyclopedia. http://www.digitalcentury.com/encyclo/update/pc_hd.html

basically the same, but with expansion and modification. Today the system “connects more than 30,000 travel agents and 3 million registered online consumers with more than 400 airlines, 50 car-rental companies, 35,000 hotels and dozens of railways, tour companies, ferries and cruise lines. Hardly a single IT shop supporting today's online transaction processor-driven call center systems can deny its debt to the programmers of 1960.”⁸

1960 was also an important year in the development of artificial intelligence. In that year Jim Slagel at MIT produced a computer program “that could get an A on an MIT calculus test.”⁹ This program was far more complicated and intelligent than an ordinary arithmetic program because “unlike simple arithmetic, to solve a calculus problem - and in particular to perform integration - you have to be smart about which integration technique should be used: integration by partial fractions, integration by parts, and so on.”¹⁰

Programming made other advances in 1960 as well. In 1960 Cobol began to run on Univac II and RCA 501 computers, a significant development because it meant that programming no longer had to be done separately for each computer brand.¹¹

The year 1960 was also important to computing from an Internet or pre-Internet standpoint. The word “hypertext,” a familiar word to millions of Internet users, can be traced to the 1960 conception of Ted Nelson, who coined it while doing a doctorate in sociology at Harvard. Nelson was doing a computer course for the humanities and for his

⁷ Goff, L., 1999. Sabre takes off. Computerworld. March 22, 1999. Online edition: http://www.computerworld.com/cwi/story/0,1199,NAV47_STO34992,00.html

⁸ *ibid.*

⁹ Stork, D., ed., 1996. Hal's Legacy: 2001's Computer as Dream and Reality. Chapter Two, An Interview with Marvin Minsky. MIT Press. <http://www-mitpress.mit.edu/e-books/Hal/chap2/two1.html>

¹⁰ *Ibid.*

¹¹ Goff, *op cit.*

term project he attempted to develop a text-handling system that would allow multiple writers to collaborate on works, sharing, comparing, revising, undoing work easily. His project fell short of completion but he has continued work on his hypertext dream project, which he calls Xanadu. “hypergrams (branching pictures), hypermaps (with transparent overlays), and branching movies, such as the film at the Czechoslovakian Pavilion at Expo '67. The modular layout of this book attempts to impart the interconnectedness of knowledge which hypertext can convey.”¹² The World Wide Web today employs many of the concepts Nelson described in 1960.

Another important innovation of 1960 was in the world of early supercomputers. Seymour Cray, the famous supercomputer builder, produced in 1960 the CDC 1604, “one of the fastest and most versatile computers of the time” and also one of the least expensive: the CDC cost about half that of comparable systems of the time.¹³ Instead of competing against the business machines that were gaining in popularity at the time, “CDC sought to capture the small but lucrative market for fast scientific computers. The Cray-designed CDC 1604 was one of the first computers to replace vacuum tubes with transistors and was quite popular in scientific laboratories.”¹⁴

Finally, also of note in 1960, Honeywell Regulator Co. introduced the H-800, another large, solid-state system using transistors. A distinguishing feature of the H-800 is that it was one of the earliest parallel processing computers. The machine had hardware time-sharing of 8 symmetric virtual processors and 16 I/O controllers.¹⁵

¹² Keep, C., McLaughlin, T., and Parmar, R., 1993. Ted Nelson and Xanadu. The Electronic Labyrinth. <http://jefferson.village.virginia.edu/elab/elab.html>

¹³ Seymour Cray Computers. Microsoft Research Utility. <http://research.microsoft.com/users/GBell/craytalk/tsld005.htm>. Also see Goff, op cit.

¹⁴ Encyclopedia Britannica. Supercomputer. <http://www.britannica.com/eb/article?eu=72220&tocid=93019>

¹⁵ Smotherman, M., 2000. Computer professor, Clemson University. Architecture sketch of H800. <http://www.cs.clemson.edu/~mark/h800.html>