

# 1955

Throughout the history of computers, there have been tremendous developments, improvements and inventions with the passage of time. Computers and the computer industry have completely transformed our society whether it is for the best or the worst. Every year within every decade brought with it new products into the forefront of computer development. The decade of 1950's was considered the era of major computer developments such as the ENIAC (the first modern digital computer) or the Integrated Chip, every year within this period had to its credit various innovations and advances in the Computer and Information Technology sector. Technology has affected virtually every aspect of human endeavor: private and public institutions, economic systems, communication networks, political structures, and the condition of human lives. To fully understand and appreciate the impact computers have on our lives and promises they hold for the future, it is important to understand their evolution and how they came about to be so important. Doing research on my respected given year of **1955**, I was able to observe some key developments and innovations in this time period. Some of the key themes in this era were the evolution of the transistor, the launch of the TRADIC, and the development of Artificial Intelligence.

Like most of the major technological advances considered in the volume of transistors, they and their associated innovations were complex systems of technologies. Such advances that frequently relied heavily on incremental improvements in individual components. By the end of 1954 and beginning of 1955, the invention of the transistor greatly changed the computer's development. The transistor replaced the large, cumbersome vacuum tube in televisions, radios and computers. As a result, the size of electronic machinery has been shrinking ever since. The transistor was fully at work in the computer by middle of **1955**. Coupled with early advances in magnetic-core memory, transistors led to second generation computers that were smaller, faster, more reliable and more energy-efficient than their predecessors. The first large-scale machines to take advantage of this transistor technology were early supercomputers, Stretch by IBM and LARC by Sperry-Rand. These computers, both developed for atomic energy laboratories, could handle an enormous amount of data, a capability much in demand by atomic scientists. ( **Riordan, Oddeson, p. 112-123**)

Continued growth in demand for transistor and semiconductor components required a new class of products whose price and features would expand application opportunities in systems. Jack Kilby invented the Integrated Circuit, during this time at Texas Instruments. This invention

drew on several stages of innovations in diffusion and oxide-masking technologies that had initially been developed for the manufacture of silicon junction transistors. The development of the Integrated Circuit made possible the interconnection of large numbers of transistors on a single device, and its commercial introduction spurred growth in industry shipments. **(David C. Mowery, 124-128)**

Kilby's search for the Integrated Circuit was motivated by the perceived desirability of a device that could expand the military and commercial market for semiconductor devices. The U.S. military supported his innovations; the military's greatest contribution to the early development of the Integrated Circuit industry was its demands for highly reliable components. In other words, the demands of military computer designers for high reliability and ruggedness in components ensured that these systems would offer the first opportunities to apply Integrated Circuits. **(Mowery, Rosenberg, p. 124-128)**

If the vacuum tube was the grandfather, then the transistor was described as the parent of today's computers. Transistors were appreciated so much due to their small size and reliability as compared to a vacuum tube. Transistors worked in basically the same manner as vacuum tubes. A small voltage to one pole controlled a larger voltage on the other poles. The

difference between a transistor and a vacuum tube was that a transistor used a sandwich of silicon instead of tube filled with gas to do the switching.

(Groth, Newland, p 8-10)

Transistors overcame most of the limitations of vacuum tubes. They generated very little heat, and they were much smaller than vacuum tube.

With transistors, computer that fit into a single room could be made. As manufacturing techniques have become more precise, transistors had gotten smaller and smaller. Today, five million transistors can fit into an area smaller than a thumbnail. **(Groth , Newland, p. 8-10)**

Transistors, which were to be used for high-speed applications were necessarily low –power device. As a consequence, certain advantages and disadvantages accrued. Lower power systems were possible but problems arised in integration with high-power devices, in transmission of pulses over long distances in sensitivity to noise and in providing d-c voltages. The transistors did seem to offer reliability while the present costs are not very much more than equivalent vacuum tubes. The speed of transistors devices is ever increasing and at present approaches that of vacuum tubes. The research was supported jointly by the Army Navy and Air Force under contract with the Massachusetts Institute of Technology. **(Edmund U. Cohler,p 27-29)**

Within the domains of transistors, an application that relied on the principles of transistors was the MONROBOT, an electronic calculator developed by Monrobot Corporation. The MONROBOT was a general-purpose digital computer, compact, ruggedized, reliable and reasonably priced calculator all in one. IT was regarded as a complete in one desk-size unit, ready to be plugged in and perform anywhere. They were supplied with capacities to suit special requirements, avoiding excess investment for unnecessary facilities. In addition to that, MONROBOT's printed out result on 8-1/2" wide paper roll, or perforated a paper tape as desired. (**James Monroe, p 45**)

After the successful development of transistors, many companies tried to utilize them within the manufacturing of computers and other related products. The most notable of these companies that successfully made use of these transistors was Bell Laboratories by AT&T. AT&T Bell Laboratories announced the first fully transistorized computer, TRADIC. It contained nearly 800 transistors instead of vacuum tubes. Transistors – completely cold, highly efficient amplifying devices invented at Bell Labs -- enabled the machine to operate on fewer than 100 watts, or one-twentieth the power required by comparable vacuum tube computers. (**William Bailey, p 87-92**)

The American physicists Walter Houser Brattain, John Bardeen, and William Bradford Shockley developed the transistor at Bell Telephone Laboratories. For this achievement, the three shared the 1956 Nobel Prize in physics. Shockley is noted as the initiator and director of the research program in semi conducting materials that led to the discovery of this group of devices; his associates, Brattain and Bardeen, are credited with the invention of an important type of transistor. **(Riordan, Oddeson, p. 40-85)**

Transistors played a pivotal role in the advancement of electronics, their small size, low heat generation, high reliability and relatively small power requirements making possible the miniaturization of complex circuitry such as required by computers. Giving a brief description on the nature of transistors, there are two types of transistors: (1) the bipolar junction transistor (BJT), and (2) the field effect transistor (FET). The BJT is bipolar in that both electrons and holes are involved in the conduction process. IT is readily a able to deliver a change in output voltage in response to a change in input current. This type of transistor is widely used as an amplifier and is also a key component in oscillators, high-speed integrated circuits, and switching circuits. In contrast to the BJT, the FET is a unipolar device- i.e., its conducting process primarily involves only one kind of charge carrier. IT can be built either as a metal-oxide semiconductor

field effect transistor (MOSFET) or as a junction field effect transistor (JFET). It is the reasoning of many including myself that the computer revolution will continue to grow rapidly into the twenty first century as long as researchers find ways to make transistors faster and smaller. **(Riordian, Oddeson, p. 11-23)**

**1955** was also particularly important as it launched the whole perspective on the field of Artificial Intelligence. Herbert Simon and Allen Newell unveiled Logic Theorist software that supplied rules of reasoning and proved symbolic logic theorems. The program, representing each problem as a tree model, would attempt to solve it by selecting the branch that would most likely result in the correct conclusion. The impact that the logic theorist made on both the public and the field of AI has made it a crucial stepping-stone in developing the AI field. The release of Logic Theorist marked a milestone in establishing the field of artificial intelligence. What does Artificial Intelligence AI mean and what are its implications towards its development? **(Larry long, Nancy Long, p. 20-35)**

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. In other words, AI today is as the study of was to build machines that combine the power of humanlike thinking with the massive data

processing and computational power associate with modern computers. Early investigators quickly recognized the potential of computing devices as a means of automating thought processes. Researchers are creating systems, which can imitate human thought, understand speech, beat the best human chess player, and countless other feats never before possible. (**William Bailey, p 87-91**)

Developments in artificial intelligence are expected to provide robots and other “intelligent” machines with the ability to communicate with humans and to accept very high-level instructions rather than the detailed step-by-step programming statements typically required of today's programmable machines. For example, a robot of the future able with artificial intelligence might be capable of accepting and executing the command “assemble the product.” Present-day industrial robots must be provided with a detailed set of instructions specifying the locations of the product's components, the order in which they are to be assembled, and so forth. (**Edward, Feidman, p. 4-31**)

The turning point in the field of Artificial Intelligence in the year 1955 occurred where Logic Theorist, the first AI program, was written by Allen Newell, Herbert Simon, and J.C. Shaw. It proved theorems using a combination of searching, goal-oriented behavior, and application of rules. It

used a list-processing technique in a new computer language, IPL (Information Processing Language) that they developed to write Logical Theorist. IPL provided pointers between related pieces of information to mimic associative memory; and catered to creating, changing, and destroying interacting symbolic structures on the fly. (Stuart Russell, p 24-41)

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Machine Intelligence was first believed to be a problem of hardware, but for most of this history AI research has dealt with it by writing programs that run on the same stored-program digital computers that were made and sold for other applications. As such, Artificial Intelligence spanned a wide range—from fierily prosaic applications in daily commercial use to philosophical questions about the nature of humanity. What defined AI research was constantly changing: cheap pocket chess-playing machines

were not, AI, for example, but advanced chess playing by computer still is.

**(Ceruzzi, p. 9-10)**

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