The Computer Revolution: Establishing the Players

BY MICHAEL NORTON

In the May 1998 "Evolutions" column, I examined the evolution of computer systems and how they revolutionized the way we do business. This month's column continues that discussion and establishes who the players were and how we got where we are today.

The ENIAC proved the viability of a general purpose electronic calculating machine. In the years immediately following World War II, numerous computers appeared, including the Colossus and the UNIVAC. The UNIVAC (Universal Automatic Computer) bridged the gap between tube and transistor technologies. After success — and failure — with the ENIAC, the team of J. Presper Eckert and John Mauchly decided to leave the Moore School of Engineering and form their own computer company, the Eckert-Mauchly Computer Company. Their first client was the U.S. Census Bureau, who invested $300,000 in development of the UNIVAC in 1946.

By 1948, the project was stalled, with cost overruns reaching proportions that threatened the financial viability of the Eckert-Mauchly Computer Company. An electronic razor manufacturing company, Remington-Rand, came to the rescue, absorbing the failing company into the "UNIVAC division of Remington Rand." With the legal muscle of a large company, Remington Rand attempted to renegotiate the original Census Bureau contract — unsuccessfully. In 1951, the first UNIVAC was delivered to the Census Bureau at a development cost of more than $1 million dollars.

Remington Rand soon had competition from IBM. In 1953, IBM developed the 701 EDPM. The UNIVAC I utilized mercury delay lines for memory, which was slower but more reliable than the electrostatic memory used in the IBM 701 EDPM. However, IBM soon introduced the 650 model, which used even slower drum memory, a technology licensed from Remington Rand. Ultimately, economics prevailed, and the IBM 650, which sold for $200,000 to $400,000 in comparison with the $1 million it cost for a UNIVAC, was a huge commercial success. In response, Remington Rand was forced to release its next generation computer, however, the company made a huge tactical mistake.

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In 1952, the Philadelphia division of UNIVAC began developing a computer for the Air Force Cambridge Research Center (the AFCRC), which was completed in 1956. The research for that project yielded the UNIVAC Solid State, but the St. Paul division of UNIVAC had already developed the UNIVAC File Computer, which was released in 1956 and was used by Northwest Airlines for reservations. The UNIVAC File Computer series was hampered by delivery delays: The first version could only be programmed via plug board. However, fearing the superior UNIVAC Solid State would seriously cut into sales of the File Computers, Remington Rand released in 1958 the UNIVAC Solid State in the European market, where it was called the Universal Card Tabulating (UCT) machine.

This was an appropriate name, considering that two versions of the UNIVAC Solid State were released, the Solid State 80 and Solid State 90. The latter handled the standard UNIVAC 90 column punch cards; the former handled the IBM 80 column cards. The release of two different versions reveals how rapidly IBM technologies were becoming the standard.

Pressured by IBM and customers demanding the same technology available in Europe, the UNIVAC Solid State was released in the United States in 1959. The CPU had 20 vacuum tubes, 700 transistors, and 3,000 FERRACTOR amplifiers. Like the IBM 650, the UNIVAC Solid State utilized drum memory. The manuals detailed to programmers how to optimize their code to take advantage of the rotation of the drum, much like later files systems programmers would take advantage of interleavening on hard drives.

The UNIVAC Solid State had three arithmetic registers: A, X and L, none of which were index registers. Index registers were an option on the UNIVAC Solid State which cost an additional $7,500. For the money, customers received three additional registers, B1, B2 and B3, each of which could contain a four-digit value, which was adequate considering the address field of an instruction was only four digits. The 16MB line was much lower in those days. Since many customers chose not to purchase the index register option, programmers often overlaid the address field of the instruction, a technique which would seem quite alien today since instructions are "read only" for obviously good reasons (Can you imagine

attempting to analyze a dump where the instructions may have been altered?). Humorously, the UNIVAC Solid State manual claimed this capability was a "feature" of the computer. It is almost comforting to know that even in the early days of marketing people were putting a spin on technological shortcomings.

The UNIVAC Solid State utilized a scheme called biquinary coded decimal, meaning it was particularly suited to business arithmetic as opposed to scientific calculations. Indeed, in the early days of hardware there was a clear division between business and scientific computers, with business computers utilizing some form of coded decimal and scientific computers providing instructions for fixed and floating point arithmetic. The UNIVAC III, first delivered in 1962, and IBM 360 ended this bifurcation, at least for a moment, providing a full range of arithmetic instructions for both business and scientific applications. Nevertheless, the segregation between business- and scientific-oriented machines continues to this day.

The fact that the UNIVAC Solid State utilized coded decimal, putting it squarely in the business machine camp, did not prevent customers from using it for scientific applications. The U.S. Army Corp of Engineers used a UNIVAC Solid State not only for payroll and accounting, but for mathematical and statistical tasks as well. Shell Oil used its UNIVAC Solid State for engineering calculations.

Choices were fewer then, and the UNIVAC Solid State, which sold for $350,000 (or just $7,000 per month on a lease), was quite successful in head-to-head competition with the IBM 650. Indeed, in 1959 Remington Rand released an IBM 650 emulation program to minimize the pain of migration. Unfortunately, for the UNIVAC, Remington Rand's delays getting the machine into the marketplace while it waited for the UNIVAC File Computer to establish itself proved to be a costly mistake. Although the UNIVAC Solid State was a superior computer to the IBM 650, it proved to be no match for the IBM 1401, which was released in October 1959.

Meanwhile, the Philadelphia division of UNIVAC, which had produced the Solid State, was way behind schedule and over budget on development of the LARC computer for the Atomic Regulatory Commission. This meant that work on a successor for the UNIVAC Solid State was seriously delayed. Remington Rand's response to the IBM 1401 was the STEP computer, which utilized the same CPU but offered customers a variety of memory options and a lower price tag. This marketing ploy allowed Remington Rand to compete with IBM for new customers, but did nothing for their existing customer base. The absence of a clear and reliable upgrade path eventually caused many UNIVAC customers to bite the bullet and go with IBM.

Although variations of the UNIVAC continued to sell into the '60s, it was clear that IBM had become the dominant market force. What went wrong? How could the proud lineage of the ENIAC end up playing second fiddle to a maker of the tabulating machines the computer was supposed to replace? It seems obvious that Remington Rand never quite obtained that precarious balance between the individual sale and mass marketing. High ticket items, such as cars, homes, and computer hardware and software almost always involve tailoring a core product to meet individual needs. Like most Research and Development departments, Remington Rand not only seriously underestimated the effort involved but convinced the business people that the cost of development was justified by the promise that the results could be translated into a product for mass consumption. Thus, they could afford to lose money on any individual project, such as the LARC project for the Atomic Regulatory Commission. Unfortunately, for Remington Rand, the gamble that paid off on the original UNIVAC system for the Census Bureau did not pay off on the LARC project. The losses prevented Remington Rand from effectively marketing its wares, and the project did not produce enough technological advances to leapfrog the UNIVAC over IBM's offerings.

Even more importantly, the "special projects" caused Remington Rand to lose focus, which created a perceptual problem with their customers. Product after product was delayed (sound familiar?), causing fledgling IS departments to worry that their investment in the technology was in vain. The 90 vs. 80 column card acquiescence and IBM 650 emulator were symptomatic of how Remington Rand and the rest of the world perceived IBM, who with a consistent rollout of products was defining the standards and creating the perception that would lead to the old saw, "No one ever got fired for recommending IBM." ts

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