

Backgrounder



Some things at CES never go out of style – HP’s 12c hits 25-year mark in 2006

The first business “personal computer” was unveiled, Pac-Man was the blockbuster video game, and Chariots of Fire was a box office hit when HP introduced a \$150 pocket-sized device that revolutionized financial calculations for people on the move. The big hits of 1981 are now history, but the HP 12c financial calculator is still going strong.

Instantly recognized for its unique horizontal layout, the HP 12c financial calculator has sold in the millions to investors, real estate professionals, accountants, loan officers, business students and teachers.

The HP 12c financial calculator, the product of a vision by HP’s labs and an Iowa farm boy with a love for physics, is an iconic consumer electronics product that is still sold virtually unchanged under its original name and model number 25 years after it was introduced. The HP 12c that’s sold today acts and looks just like it did when it was first snapped up by thousands of financial and real estate students and professionals at its worldwide debut. Few other products of industrial design have achieved such a classic distinction.

“A certain amount of luck” was involved, acknowledges Dennis Harms, the former farm boy who was the project manager for the 12c and who still works at HP’s Corvallis, Ore., facility. But he believes the 12c’s success was the result of uncompromising quality and enormous amount of work and forethought.

In fact the HP 12c sealed itself as a classic right out of the gate. It serves as a role model for the perfect product, with the perfect features, with perfect manufacturing launched at the perfect time with the perfect execution of distribution.

When floppy disks were still floppy and 5.25 inches square, and a computer’s memory was still measured in kilobytes instead of megabytes, making a financial calculator that could be used by loan officers and bond brokers was a high tech endeavor. The HP 12c was started at HP’s Advanced Product Division in Cupertino, Calif. Everybody at HP knew that co-founder Bill Hewlett had a warm spot for calculators. It wasn’t unusual to have him drop in at the labs and punch buttons of test models to see how they were coming along.

Harms, who joined HP fresh from Iowa State with a Ph.D. in numerical analysis, was put in charge of creating a financial calculator that would fit in a shirt pocket, be reliable and have a long battery life.

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“The predecessor to the HP 12c was the HP 80,” says Harms. “It had LEDs and required a big recharging unit that plugged in the wall.” And it wasn’t close to fitting into a shirt pocket.

In order to save power and be more readable outdoors, Harms and his team selected the then-new liquid crystal display (LCD) instead of light emitting diodes (LEDs). The calculator would also use another cutting-edge technology called the complementary metal oxide semiconductor (CMOS) which would reduce power requirements. In fact, the design team moved from Cupertino to HP’s plant in Corvallis in 1978 where the company was building a CMOS fabrication operation.

Harms and his staff chose to use Reverse Polish Notation as the way the user would input formulae into the calculator. RPN was a technique HP refined for its engineering and scientific calculators that was more efficient than standard algebraic notation. Using RPN (two plus two is entered [2 Enter 2 +] instead of [2+2 =]) calculators could compute faster and didn’t need big screens required by complex algebraic entry. Engineers loved it, but RPN wasn’t a method that financial people were used to. Harms says that the one-line screen size limitation on the 12c and the limited computing power in those days left little choice as to what to do.

It was a decision that would cause today’s marketing people – who constantly demand that products be “no brainers” – to gasp.

“We decided to force it,” Harms says. It never became an issue with the customers. People were so glad to get the 12c and the power that it gave them that they taught themselves to use RPN, he says.

The designers decided to lay out the calculator in a horizontal position, partly because it would accommodate all the keys and many adding machines were oriented horizontally. The gold-on-brown colors gave the little calculator an air of seriousness and value that made it a status symbol sitting on a desk.

The HP 12c team concluded that they would design the calculations in the 12c to be so precise that the calculator could receive certification by the federal Bureau of Standards (now the National Institute of Standards and Technology). Hence, HP 12c’s results were legally accurate for the banking industry.

“Real estate lenders used to have to carry around these big books with them to do amortizations,” Harms says. “If we could eliminate the books with a calculator that gave them the same certified results we knew we had something.”

The algorithms used to perform calculations such as bond interest and partial payments on home mortgages were critical if the calculator was to be trusted by the financial world and meet the U.S. standards. HP consulted with experts in Canada, the U.S. and Europe to be certain that the calculator would work in markets using different methods of calculation all over the world. HP worked with William Kahan, UC Berkeley’s renowned professor of mathematics, electrical engineering and computer science, to develop and test the

complex algorithms.

The 12c even has its own version of the legendary “HP Drop Test,” which dictated that certain HP products had to withstand a fall from a desktop onto a concrete factory floor. Harms recalls that Dick Moore, division manager, took the 12c prototype to Japan to show it to an electronics company there that HP had chosen to supply the LCDs. When the Japanese engineers expressed concern that the calculator’s design may not adequately protect the LCD screen, Moore, “who was a tall man,” says Harms, held the calculator shoulder high and dropped it onto the hard floor. It bounced a few times, but when he picked it up, it was still working. The hosts, Harms says, were duly impressed.

An important decision was made in the final stages of development that sealed the 12c’s reliability reputation and had a secondary effect of introducing an unintended feature. Harms says that the first prototype laid flat on a desk and had two button batteries. But the design team wasn’t happy with the battery life. In “worst case scenario” the calculator could possibly exhaust its batteries in a week. The solution was to add a third battery in series, but it would mean redesigning the chip layout and the case to compensate.

Harms says that the team’s vow that it would not compromise on quality made it an easy decision. They would do the redesign. One engineer came up with the idea of thickening the case at the back just enough to allow the extra battery. Not only did the 12c get a worst case scenario of battery depletion in six months, but the case’s tilt when laid on a desk made it easier to read and use.

Many users have reported using the 12c for years without ever replacing batteries. One woman financial officer quipped in a letter to HP’s CEO a few years ago that she used her 12c every day for years before it needed a battery and it “had certainly been a lot more reliable than her ex-husbands.”

All the while Harms and his team were perfecting the design, a crack marketing team set out to make the HP 12c the “calculator to have” by finance students, real estate professionals, brokers and financial experts all over the world. Harms said the marketing of the 12c was exceptionally well executed and created instantaneous demand by a huge part of the target markets. In those days, bookstores were the major outlets for quality calculators, which is a very narrow retail channel compared to today’s mass consumer electronics warehouses.

The final stroke of the 12c’s success came down to perfectly executed manufacturing and distribution with delivery on time and at volume. HP had a few hiccups with earlier models of calculators, Harms says. “We had announced them and production ran into problems that didn’t meet the demand.” Frustrated distributors and retailers had become conditioned to this so they typically ordered double the amount of units they thought they could sell.

“They did the same for the 12c,” Harms recalls with a chuckle. But this time HP had its manufacturing kinks ironed out and the 12cs were rolling off the lines

with almost no defects.

“When we shipped, the stores got all they had ordered,” Harms says. That probably caused more than a few to worry about overstocked inventories. But those fears were soon put to rest. “They sold every one of them,” Harms says with a tone of satisfaction.

In 2003, HP launched the HP 12c Platinum, an enhanced version of the original HP 12c. Although the original 12c remains popular and is still being sold, the Platinum version has added the choice of algebraic or RPN data entry, has four times more memory, is up to six times faster and has extra financial functions.

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