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Life has gotten even shorter in digital age Technology raises issues of obsolescence, data 'rot'.

If Moses had been handed the Ten Commandments on floppy disks, would word from on high have survived through the ages?

Literal interpretations of the Bible aside, the answer, quite possibly, is no.

In the digital era, consumers worry about the staying power of their sacred possessions. They fret about the permanence of computers and electronics gear. They read about "CD rot," short-lived iPod batteries and pricey plasma TVs with traces of static images "burned into" the display. And they pray that the most prized digital treasures -- family photographs -- will last from one generation to the next.

Sometimes, as with digital TV, the latest gear really is the next big thing. But often a new product merely reflects powerful market forces, like changing styles or planned obsolescence. Businesses require regular turnover to generate profit. Never mind that what exists might not need fixing.

Digital longevity is a contradiction in terms. As consumers eye their aging PCs or pine for the latest camera or cellphone gadgetry, they must worry about the legacy of stuff left behind. Professional and consumer archivists grapple with how to preserve documents, music and images produced by no-longer-relevant machines. At the same time, shoppers worry that the money they spend on a camera today might buy them a more sophisticated one next month as prices fall.

There are no easy solutions. But there are key questions, and perhaps some surprising answers.

Isn't the machine obsolete the moment I schlep it home? That's a perennial fear, especially when talking about PCs. Now the concern is raised across product lines.

Dean Glatt, who directs computer systems for the state of North Dakota, postponed buying a high-definition TV until recently because he wanted to make sure models he was considering had the latest digital interfaces or connectors. Since he finally bought a Sony, sets with other connectors have appeared. "If I was buying today, I would have waited for the new connectivity choices to settle down," he says.

But consumers may have less to worry about than they fear. Old TVs, after all, generally just end up in other

rooms of the house. And while the possibility of "burn-in" on plasma screens underscores the risks early adopters assume, TVs have always included parts that ultimately gave way, notably bulbs and tubes.

Manufacturers are addressing the plasma problem. Anthony Fonzo of Philips Electronics says Philips' digital TVs are rated to last 40,000 to 60,000 hours. Put in perspective, someone watching four hours a day for seven years would accumulate just over 10,000 hours.

On average, consumers expect color TVs to last more than 11 years and home stereos more than nine, according to a 2002 survey for the Consumer Electronics Association. They were less sanguine about the longevity of cellphones and PDAs: about 4 1/2 years each.

More often than not, a product's shortened lifespan has less to do with mechanical failure than with something "better" coming along to supplant it. Think reel-to-reel and 8-track tapes, 78-rpm records or 5-inch floppy disks. Kodak will stop making 35mm slide projectors later this year. And digital cameras are putting their film counterparts on notice.

Yet computer buyers have demonstrated their willingness to eke out extra years from a home machine.

Replacing PCs every few years because of rapid advances in technology used to make sense, but "that is no longer the case," says Donald Norman, author of *Emotional Design: Why We Love (or Hate) Everyday Things*.

Adds Plano, Texas, computer consultant Steve Stovall: "I'm willing to bet that there are still millions of PCs in businesses and homes that run Microsoft Windows 3.1 and Windows 95. The fact that both operating systems are hopelessly out of date does not make a difference to those still using them."

How long will digital data last? That's tricky. The inherent strength behind the 1's and 0's that make up computer code is the ability to produce virtual clones of files. Back up the bits, and your documents, pictures or music files will always be easy to reach. But there's a big if: You must have something to play or view them on.

The 2003 editions of Microsoft Word and Excel aren't designed to handle documents and files created by versions of the software that predate Office 97. David Stork, chief scientist at Ricoh Innovations, wonders what value can be placed on future compatibilities: "How

many people want to pay more for a word processor now, knowing it's going to make it easier 30 years from now? That's a business proposition that's going to be thrashed around in the marketplace."

Indeed, format obsolescence is the toughest challenge, says Rand Corp. senior computer scientist Jeff Rothenberg. Even a simple text file includes code that must be interpreted.

It is tempting to think that a clever future digital archaeologist could decode such a file, Rothenberg says. More likely, it will be as impossible as it was "for us to read hieroglyphics before the Rosetta Stone was discovered," he says.

Rothenberg doesn't believe migrating from one format to another is the answer, because data will inevitably be lost or corrupted. A better strategy, he says, is "emulation," in which future machines impersonate obsolete ones. Not only are digital artifacts saved, but also the software used to interpret them.

The current popular file standard for digital photos -- JPEG -- isn't likely to disappear soon. But other standards are evolving. Still, "You might want to keep JPEG around forever," says Xerox research fellow Robert Buckley, an expert on the standard. "I would worry more about the medium it's on than the format."

Now, small businesses help people preserve memories by transferring old 8mm movies, slides and VHS tapes to DVDs. But eventually, DVDs and CDs as we know them also will be replaced.

Indeed, it's unclear how the discs themselves will hold up over time.

Dan Koster, Web content manager for Queens University of Charlotte in North Carolina, became a minor celebrity after reporting in the spring that 15% to 20% of the 2,000 CDs in his properly stored collection suffered from what has loosely been called CD rot and would no longer play.

Jerry Hartke of Marlborough, Mass.-based Media Sciences, a company that tests the integrity of the discs, thinks the hysteria is overblown.

Slapdash manufacturing can reduce longevity. And discs are affected by humidity, scratches and the ketchup your kid spills on them. Disc type (rewriteable or otherwise) is also a factor. But CDs have built-in error correction, and Hartke believes the discs are formidable, if not immortal. "I can take a CD and drill a 2-millimeter hole into it and still read it," he says.

The Library of Congress and National Institute of Standards and Technology are running "accelerated aging" tests on CDs and DVDs after Congress in 2000 appropriated \$100 million for preservation efforts.

Though results are premature, Michele Youket, a preservation specialist at the Library of Congress, says the poorest-quality CDs may last only four or five years; the best, more than 100.

What can people do to preserve digital data? A lot more. Many consumers take a lax approach to safeguarding data. Only 24% of respondents surveyed in May by research firm InfoTrends/CAP Ventures indicated they upload digital pictures to an online photo service to back them up. Pictures stored only on a hard drive are toast if the drive becomes permanently corrupted.

"We don't think that consumers realize how hard it will be to retrieve their digital photos in 10 or 20 years, much less 50 or more," says InfoTrends founder Kristy Holch.

Photographic prints are a tangible archive, at least. But how well they endure depends on exposure to light, humidity, pollution (e.g., cigarette smoke) and, most of all, by the combination of ink and paper used.

In one accelerated aging test, a Hewlett-Packard inkjet printer using high-quality paper could produce prints that would last more than 70 years when exposed to light on display, says Henry Wilhelm, president of Wilhelm Imaging Research. Results dropped to just two or three years for the same printer using cheaper paper by a different manufacturer.

The testing field is controversial. Epson sells a snapshot printer that can produce water-resistant prints it claims will last a century, according to Wilhelm's tests. On its most expensive line of inkjet papers, Ultima, Kodak promises "brilliant color photos that last over 100 years," with any printer, provided the latest inks are used. But Wilhelm, whose independent lab has conducted tests for Epson, Fuji, H-P and Lexmark, says Kodak's claims are misleading because its tests use less intense light than others in the industry.

Kodak says it considers factors Wilhelm ignores, such as heat, air pollution and moisture. "We're confident the testing we do and standards are most appropriate for gauging the longevity of our papers," says Kodak spokesman Gerard Meuchner.

Both sides agree impartial testing standards need to be adopted. How that plays out in the long term is an open debate.

Already, most experts of the digital age concur on one principle: Nothing lasts forever.