Silicon Superstitions

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We live in a technological age. Even most individuals on this planet who do not have TV or cellular telephones know about such gadgets of technology. They are artifacts made by us and for us. You'd think, therefore, that it would be part of our common heritage to understand them. Their insides are open to inspection, their designers generally understand the principles behind them, and it is possible to communicate this knowledge—even though the “theory of operation” sections of manuals, once prevalent, seem no longer to be included. Perhaps that's not surprising considering that manuals themselves are disappearing, leaving behind glowing Help screens that too often are just reference material for the cognoscenti rather than guides for the perplexed.

This loss of information is unfortunate, as any activity involving the exact same actions can have different results—that is, wherever there's “random reinforcement” (as the psychologists say) is fallow ground in which superstitions rapidly grow. Fishing is a good example. When out angling for rock fish, you generally use the same lure as everybody else. There is not much technique to it, so the number of fish you catch is proportional to the time your lure is in the water. Those who spend time fiddling with the equipment beforehand catch fewer fish. It's a mathematical certainty. I choose my equipment with one aim in mind: Eliminate hassle. So while my fishing companions use fancy reels and fight the occasional tangle, I use the closed-cap kind you give to youngsters because they seldom foul. On every trip I have fished to the limit as fast or faster than anybody else has on the boat. They don't laugh at my “primitive” equipment anymore, but they do ask me if there's some special stuff I rub onto my lures to get the fish to bite or if I have some other “secret.” They don't believe the true explanation, which I am happy to share. It's too simple, and there's no “secret” stuff or device behind my success.

In fact, people love mysteries and myths so much that they create them when an explanation seems too simple or straightforward. “Why is Windows so hard to use?” I am asked.

“Because it was designed badly in the first place and has grown by repeatedly being patched and adjusted

When we don't

UNDERSTAND A PROCESS,

WE FALL INTO MAGICAL

THINKING ABOUT RESULTS.

rather than being developed from the ground up.”

“But, “say the inquisitive, “there must be more to it,” thinking that some

deep problems inherent to computers force the outward complexity. The only forces involved are what Microsoft mistakenly thinks the market wants—and inertia.

In particular, superstitions grow rampant when testing is subjective, difficult, and (usually) not performed at all. There is a purely magical belief in the idea that you can hear the difference between different brands of audio cables, for example. You can buy a simple one-meter audio cable with gold-plated RCA connectors at both ends for a few bucks, or you can buy one with “time-correct windings” that the manufacturer claims will “provide accurate phase and amplitude signal response for full, natural music reproduction.” Price? \$40. Or, if you are especially insecure, purchase a one-meter cable that has “3-Way Bandwidth Balanced® construction for smoother, more accurate sound” for a mere \$100 from Monster Cable (<http://www.monstercable.com>). I've had the fun of testing if people could tell the difference—they couldn't. At audible frequencies small differences in capacitance, inductance, and resistance in a cable will make no audible difference, and there are no significant differences in the pertinent electrical parameters among popular brands. One ad, also from Monster Cable, says, “Choosing the right cables can be a daunting task” (especially if you read the ad copy) and it explains that “Underbuying is all too common.” This last claim is true, as far as the marketing department is concerned.

I e-mailed Monster Cable and challenged the company to conduct a simple test with its choice of equipment and listeners. My proposed setup was simple: a CD player, an audio cable to a power amplifier, and a set of speakers. All I would do is change the cables between the CD player and the power amplifier, flipping a coin to determine which cable I'd attach for the next test. All the listeners had to do was to identify which was the inexpensive Radio Shack cable and which was the Monster cable. I would videotape the experiment so that a viewer could see

what cable I was using and hear what the listener(s) said.

We had a friendly exchange of e-mails, but when I proposed this experiment, I got no further replies. It seems to me that if there were a real difference, the company had nothing to fear.

All testimonials and most magazine reviews are based on situations in which the reviewer knew what audio equipment was being used. Owners and magazine reviewers have a vested interest; the former needs to justify the money spent, the latter needs to preserve ad revenue.

One claim that is obviously false without requiring testing involves weighted rims that are sold for audio CDs. The makers claim that the added mass will help the CD spin at an unvarying rate. This is true. People who know a bit of physics are aware that a greater mass is accelerated less by a given force, so any disturbing force will have less effect on the rate of spin of a heavier disk. The makers also claim that this will make the CD sound better with less “wow” or “flutter,” which on tape recordings or vinyl records was the result of uneven motion of the recording medium. The claim for better sound is false and relies on the ignorance of owners of CD players. Ignorance is superstition’s guide.

What the suckers who purchase these rims don’t know is that the CD player reads ahead of where it is playing and stores the musical data in semiconductor memory, which acts as a buffer. The information in memory is clocked out by an unvarying crystal oscillator. Any unevenness in the speed of rotation of the CD (so long as it is sending data to the buffer faster than it’s being played) is simply irrelevant to the sound. In fact, this was one of the points of genius in the design of the CD player, making the quality of sound independent of the mechanical quality of the rotation of the media. With the introduction of CDs, flutter and wow instantly vanished to inaudible levels. Weighted rims are simply irrelevant.

When I was a graduate student I did the simplest possible experiment. I placed a pair of amplifiers on a table: one fancy and expensive, and the other plain and cheap. Both had wires that ran to a switch box. The switch was clearly labeled as to which amp corresponded to which position. Subjects were allowed as much time as they wanted; they operated the switch themselves, and all they had to do was to report in which position of the switch the system sounded better. All but a few reported that they could tell the difference, and almost all preferred the more expensive unit. One person said that as far as he was concerned, the switch “wasn’t doing anything at all.” That person was right: I was using only one amplifier and the switch was not connected to anything. The results

were statistically significant, and showed that people can fool themselves with alarming ease.

Computer systems exhibit all the behaviors best suited to create superstitious responses. You will try something, it won’t work, so you try it again—the exact same way—and this time it works, or not. That’s random reinforcement. The effectiveness of many programming and management practices thus are not measurable. Most of the principles of “extreme programming,” for example, seem reasonable to me, and I was using many of them long before they had acquired their present absurd name. The people who promulgate the idea, however, are also those who created the paradigm. Most reported results aren’t even single-blind, much less double-blind. We rarely understand, in any detail, the processes going on behind the tasks we do with computers. We’re using megabytes of code written by others, code that is indifferently documented and inadequately tested, and which is being used in ways and in combinations unforeseen by its creators.

No wonder we tend to act as if computers are run by magic. Many of us (including me) use the exact sequence of operations for a task because it worked once and we don’t dare to vary it (even when somebody suggests a different method). The now obsolescent SCSI (small computer system interface) bus was that way, too: Some configurations worked, whereas others that seemed to obey the rules on cable length, termination, and device addresses did not. Once we had a setup working, we wouldn’t change it; it was as if we had achieved some heavenly arrangement.

I invite readers to share examples of superstitious behavior in the technological world with me. Meanwhile, be a skeptic: Ask yourself if what you’re doing is based on fact, on observation, on a sound footing, or if there is something dodgy about it—if there’s a touch of superstition in your interaction with technology. Q

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JEF RASKIN is best known for his book, *The Humane Interface* (Addison-Wesley, 2000), and for having created the Macintosh project at Apple. He holds many interface patents, consults for companies around the world, and is often called upon as a speaker at conferences, seminars, and universities. His current project, *The Humane Environment* (<http://humane.sourceforge.net/home/index.html>), is attracting interest both in the computer science and business worlds.

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