

Infrastructure Inattention

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Information superhighway. It was already a cliché in 1995. Was it even a good analogy? In at least one important way, the Internet does resemble a real superhighway: the infrastructure required to support it gets little attention from those whose support is critical. We're not talking about engineers, of course. Engineers, whether by nature or by training, understand the critical importance of maintaining what they build. But maintenance is at the low end of the glamour scale. It is a tedious, dirty, niggling business. Done well, it is often invisible. Think of the loyal employee who is never sick over his 40-year career with the company. Finally, management takes note of his extraordinary achievement at retirement time with a plaque or a gold watch. Oh, boy!

It's the same with the elevator that always runs, the gas main that never leaks, the database that's always online: we give little thought to those feats of reliability, unless we occupy the space that separates the system from the rest of the world. Only the tire knows both the car and the road, only the oil knows both the piston ring and the cylinder wall. The driver, unless he is also a mechanic, gives little thought to either when they're doing their jobs.

Potholes and Politics

Atlanta's new mayor garnered some goodwill shortly after the election by forming a "pothole posse" and deputizing all the citizens. She was shown shoveling asphalt into a pothole downtown. Never mind that revenues are disappearing at a ferocious pace, and that she had just spent an extraordinary sum on an inauguration bash. Potholes are just the beginning, we can hope. Still, infrastructure remains a hard sell when its failings are not obvious. Dr. Jon Wren, Managing Engineer at Exponent Failure Analysis Associates, Inc., told members of the Inland Marine Underwriters Association in 1998 that about 30 percent of the nation's bridges are rated structurally deficient or functionally obsolete. The IMUA also noted that between 1988 and 1998, there were more than 200 documented dam failures in the U.S. In a

report dated July, 2001 report the American Society of Civil Engineers said, "Currently, there are more than 2,100 unsafe dams in the United States, which have deficiencies that leave them highly susceptible to failure."

Market-driven companies are more likely to ignore infrastructure, and what company doesn't want to think of itself as market driven, whether it is or not? Marketing people are wonderfully creative; they crank out new and exciting ideas daily. But you can bet there has never been a brainstorming session where someone in marketing said, "Hey! Let's sell our customers on improving our infrastructure so everything we already do just keeps working!"

It's the Little Things

Can anyone think of a recent case where infrastructure was ignored for years, resulting in massive and costly reworking to correct the oversight? Right: the Y2K mess. In this case, the "infrastructure" was laughably simple: allocate four characters to store and process the year instead of two. And it wasn't as if the coming of 2000 was a big secret or a big surprise. Nevertheless, most companies and government agencies did the equivalent of waiting until the night before the exam to start studying. (Incidentally, the director of the federal government's Y2K task force told an audience at the National Press Club that the Social Security Administration had done the best job of preparing in advance for Y2K. Score one for the accountants.) As taxpayers, we would do well to keep in mind how our government did in handling this *known* data processing problem — not very well — when we listen to proposals for a missile defense system that must face thousands of *unknown* problems without a single failure.

Gone Fission

Another example in the news: nuclear waste and Yucca Mountain. We created tons of toxic nuclear waste before we created a reliable and safe infrastructure to handle it. Now we face an immense crisis, and whatever path we choose will have consequences for at least 10,000 years. Think about that. Ten thousand years ago, our ancestors were just stumbling from a hunter-gatherer culture to one based on agriculture, and Babylonian cuneiform was still thousands of years in the future. Do you really think a society that can't

predict the Y2K problem twenty years in advance can make reliable 10,000-year predictions involving toxic nuclear waste? Heck, we can't even accurately predict an earthquake or tornado 24 hours in advance.

There's Never Time To Do It Right, But There's Always Time To Do It Over

An I.T. technician at Delta Air Lines told me in 1989 that he and his partners believed, when installing computer equipment, that it would probably have to be moved or changed soon, so no time was devoted to making the cabling neat. As a result, it was a mess everywhere and technicians spend a lot of time on each trouble call untangling that rat's nest before they could remove or replace something. Finally, someone in charge decreed that any technicians answering any service call that involved hardware would also be expected to clean up, bundle and label any cables connected to the equipment. Likewise, any new equipment would be installed with all cabling bundled and labeled. Within two or three years, this devotion to improving infrastructure had paid off by reducing average service call times, *even though the technicians were spending time on cabling that they had not spent before*. They had always believed it would be a net loss; it turned out to be a net gain.

Docu-structure

Alas, here's where software engineers often slip. An essential part of maintaining a robust infrastructure is having accurate, detailed and understandable documentation for the system you have to maintain. I once worked on a project for MCI that involved modifications to a complex billing system. The first day I asked a manager with some years of experience in the system where I could find a data dictionary for the system. "They don't have data dictionaries here," he said. "Anything?" I asked. "You might try calling Sara in such-and-such department, and you could try looking in those file cabinets over there," he said, pointing to a wall full of 'em. Sara was no help, but I did find some documentation, consisting mainly of e-mail snippets that referred to pieces of the database. From that, and examining the code, and pestering developers in another city who had once worked on the system, I eventually was able to piece together an imperfect picture of what I had to

modify. What a waste. No one seemed confident that any of their work was based on sound footing; as a result, the company spent tons of money for the I.T. staff to create or re-create documentation, then tons more for testing to make sure the results of their research were valid. How much cheaper it would have been to do it right in the first place! One afternoon, a colleague who shared my frustration noted that he had found only one company in his career that devoted adequate resources to planning and documentation in sufficient detail: Exxon, though he qualified his comments by saying he didn't know if that was a part of the corporate-wide culture or just the way things were done in the local office. But he did make it clear what a pleasure it was to work under those conditions, and how much more efficient it was in the long run.

I'm Going to Huff, and Puff

Another client (out of mercy they will remain anonymous) occupied a new building in which all the circuit breakers were located on a wall in the employee break room — and they weren't even behind metal doors. The switches were sticking out where anyone could flip them, either accidentally or deliberately. The projects being developed by the company included a data center that was sold to the customers as a 24x7 operation.

After I pointed out this shocking oversight, someone installed switch guards. But that didn't help when, next spring, a tornado roared past, leveling trees and knocking out power for miles. The small UPS units in the data center lasted for about six hours before they died and the systems went down. There was no power available from any other source, so the systems remained down for a day. Not a very good showing for a place that housed at least a score of electrical engineers!

Plugging Away

In 1976, I called the phone company to get a new line installed in an apartment I was renting. The installer replaced the screw-down-the-wires jack we all knew from the '60s with the RJ-11 plug-in jack we all know now. It was the first time I had seen that done, and I found her comment interesting: "Yeah, we're putting ourselves out of work." The breakup of AT&T and cheap

phones was still years in the future. Whatever other faults it had and still has, at least AT&T understood the importance of the physical plant. I had that impression reinforced when I was talking with an independent contractor who had worked for both sides: phone and cable. I was commenting to him about the difference I observed between the roadside boxes that housed cable equipment (kind of flimsy and easy to knock open) and the boxes that housed telephone equipment (much more robust, and often equipped with remote alarm systems). "Yeah, the phone company does a much better job with that," he said.

Mirror, Mirror

How is the infrastructure in your own organization? Consider one aspect: the software development process. Here's a simplified outline of how development should go, though it rarely does:

1. Plan (and document your plan in detail)
2. Build
3. Test

If the test results are not perfect, they should feed back into Step 1, not Step 2. In other words, no coding changes should be made until the specifications on which the code is based have been changed first. It's painful, but it pays off in the long run. After some number of iterations through these three steps, you finally get your reward by proceeding to...

4. Deploy

Do new projects get planned with the cooperation of all affected departments? Are there turf wars? It may be painful, but the most reliable way of ensuring success is to set aside time — a full day, a full week, or even a full month — for hammering out an agreement among departments about what needs to be done, who is going to do it, who is going to pay for it, and when it is due. The critical component in these sessions is the continuous presence of the executive (president or CEO) who can resolve any intramural

squabbling. At the end of that session, the project can begin with little or no ambiguity in anyone's mind about exactly who will do what.

If you see evidence of infrastructure inattention in your organization, you can be a force for change. Document what you have observed. Describe its effect on the bottom line. Then start building support for your plan, within your group, then others, to establish an orderly planning process. When you begin to produce results on a small scale, then spread the gospel, it will become difficult for the rest of the organization to ignore your successes. Maintain an inclusive attitude. "Come join us" will take you a lot further than "See how smart I am." Lead without dominating, and you're on your way!

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