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President's Corner

How Reliable is Reliable Enough?

by Greg Skalka, President, Under the Computer Hood User Group

www.uchug.org

president (at) uchug.org

Google defines reliability as consistently good in quality or performance; able to be trusted. We all want our technology to perform well, as we depend on it more and more in our lives. In placing a call, turning on our lights, driving to the store, checking our bank balance, or taking a commercial flight, we all want (and perhaps expect) 100% reliability in our experiences with technology. Nothing can be completely dependable, however, and no matter what we expect, tech failures happen. Reliability can be regulated by government agencies, specified by standards, or simply provided “as-is” by the manufacturer. In the end, it is up to each of us to decide if the reliability levels we get meet our needs.

Most large companies now use an ISO 9000-based quality management system to demonstrate their ability to provide quality products and services that consistently meet their customer’s needs. The basics boil down to ‘say what you do’ and ‘do what you say’. Unfortunately, for the customer, the issue is often that not enough is said, and the only standard the customer has is their expectations about quality and reliability; these usually wind up being different from the vendor’s.

I have a lot of smart home devices. Many companies make and support products and systems to remotely control lights and devices in your home. You can control them remotely through an app on your smartphone or tablet, or through an Amazon Alexa or Google Home Assistant device. In addition to immediate control, your items can be programmed to turn on and off in a scheduled manner. The manufacturers portray these smart devices as simple and easy to use, so the consumer might assume they are reliable. Unfortunately, they are fairly complex and sometimes not so reliable.

I’m typically up and out of the house to work well before my wife is awake. To make my workday mornings easier (and safer, especially in the darker mornings of winter), I program lights downstairs to come on just before I would come out of our bedroom. This gives me a little bit of light to help me see when going down the stairs before dawn. I use a Belkin Wemo smart plug, with a family room lamp plugged into it, to give me some of that light. I’ve programmed the ON time in the Wemo app so that at my selected time the Belkin servers send a message over the internet and through my Wi-Fi to the smart plug to turn on. Once I get downstairs, I turn the light off manually with our Amazon Echo Show as quietly as possible, using the screen icons rather than voice control. In this case, the OFF command is sent from my Show over the internet to Amazon’s servers, and then passed to the Belkin servers and back over the internet to my Wemo smart plug.

This seems like a lot of complex communications, but it has worked very reliably over the four months since I set this up. Last week, however, it didn’t do so well, failing to turn off correctly on two different days. On the first day, Alexa could not turn the light off; I had to go into the Wemo app to do it. On another day, even the Wemo app could not turn the light off, as the smart plug appeared as inactive in the app. I finally had to resort to pressing the button on the smart plug to shut it off. In both cases, everything worked fine again after a short time. I was happy to see it working, but was reminded of the engineering saying “Problems that go away by themselves can come back by themselves."

Though I was not happy that the smart plug worked unreliably those two days, was there anyone I could blame? Perhaps not, as Belkin and Amazon had said I could control my light in this way, but they didn’t say it was guaranteed to work 100% of the time. That it had worked reliably all but two days in four months is in reality pretty good, considering the plug cost only $20 (and the Echo Show cost $50).

This brings up one key factor in the reliability equation: high reliability generally costs more. The successful landing of the NASA Perseverance Mars rover last week was a tremendous technical achievement, but it came at a cost of around $2.5 billion. That kind of money can buy a lot of reliability, however. The NASA Opportunity rover, launched in 2003, cost $400 million and had a planned mission duration on Mars of around 90 days, yet it continued exploring and communicating until 2018. NASA’s Curiosity rover has been operating on Mars for the last 8.5 years, far exceeding its original 2-year mission life. Hopefully, Perseverance can demonstrate a similarly high level of reliability.

Money can’t buy total reliability, however. Since its inception in 1958, NASA has spent over $650 billion (perhaps $1.2 trillion after inflation). It has had many great successes, putting 12 men on the moon, exploring all our system’s planets with robotic probes, and currently has put five rovers successfully on Mars. It has had some tremendous reliability successes, such as the Voyager 1 and 2 probes that are still providing communications as they leave our solar system. It has also endured tragic failures, the worst of which are the losses of crews of the Space Shuttles Challenger and Columbia, and Apollo 1.

Not everything needs to be as reliable as a spacecraft, but many things, especially where failure would involve loss of life or a high economic loss, require high reliability. Structural items such as buildings, bridges, and tunnels, and transportation items like aircraft, trains, ships, and cars, all need higher safety and reliability standards. You may sit in both, but you justifiably have greater concerns and expectations about safety and reliability for your automobile than for your La-Z-Boy recliner.

One way to mitigate risks when reliability and safety are not deemed sufficient is through back-up systems. Hospitals may add back-up power generators to compensate for a power grid that is not totally reliable. There probably are measures that should have been taken (and now likely will) to harden the Texas power grid against the extreme cold weather it experienced recently.

Our computers hold information internally in rotating magnetic platter hard drives and SSDs, but these are not immune to failure, so prudent users back up that information. Automobile tires can fail for a variety of reasons, so automakers offer several back-up systems, including a spare tire and changing tools, puncture sealant, and run-flat tires. Tire pressure monitoring systems are now required for all automobiles, as a safety backup.

We have continued to add safety features to motor vehicles over the years to reduce the number and severity of accidents. Safety glass, power steering and brakes, seat belts, airbags, energy-absorbing bumpers, and rear back-up cameras all add safety to cars through technology. Despite these enhancements, however, over 16500 Americans died in motor vehicle traffic crashes in 2020. Now automakers are looking to add self-driving technology to our highways; will it be safe and reliable enough?

Sometimes reliability is not as important as other factors, such as cost or convenience. Often new technologies are not as reliable initially, but in time may improve (or wind up being shunned by consumers). I like my Amazon Alexa devices, but I don't always get the responses I expect. Considering the complexity of the system, low cost to me and less than a critical need for the information, a less than perfect performance is acceptable. Alexa may not always provide the information I’m looking for, but I’m easily able to recognize this and so am not really harmed by her “incompetence”.

Some kinds of unreliability are more acceptable than are others. If your smart home lock is unreliable, it might be better if it occasionally fails to unlock when you get home, rather than sometimes not locking when you leave. It is the same with computer security; it is better to err on the side of being too restrictive than too permissive. Users can put up with only so much in unreliable access, however. New technologies such as fingerprint scanning and facial recognition for login, though more convenient than passwords, won't gain wide acceptance if valid users are not reliably recognized. If the convenience difference is great enough, however, users might be willing to accept having to scan multiple times for access.

Reliability in our technology is important, but the need for it varies with the product and the potential downsides. Our sensitivity to quality issues should be greater for a Boeing 737 MAX airplane than for a wireless router. We as individuals and as a society will have to weigh the cost, quality, and risk trade-offs to determine in each case how much reliability is enough.