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## **Twisted Forms of Internet Reality and the Engineering Skeptic**

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In order to create, support, and manufacture the countless products that we're involved in, engineers need to be analytical, quantitative, and have the ability to separate reality from creative fantasy.

One of the interesting things about the information age, is the capability for anybody to get their message out to the world with minimal effort. In the space of an hour, you can build a web site, get a domain name and publish absolutely anything you want the entire world to see. In addition there are a myriad of blogging sites where you can set up a web page about as quickly as you can type. As well, many sites that claim to be news sources present a biased perspective on things with little regard to facts or history. My perspective is generally one of being a skeptic, if you want me to pay attention cite your sources so I can examine them, and draw my own conclusions. However, the number of people who give credence to junk information is a little frightening.

Creating so-called "information sources" that tells the viewer a false message in order to get money, influence votes or "muddy the waters" around an issue has become a very common and unchecked process. In addition, the multitude of sources does not allow comprehensive or peer reviewed critiques. Back in the era of three major television networks, and print media, if something was not correct, it would generally get enough scrutiny that errors were noticed and a correction would be issued. Now in the 21<sup>st</sup> century, with thousands of sources available, scrutiny and correction are spotty at best. As for sites that are trying to run some form of scam? These can quickly disappear when they become noticed, take their scam to a new web site location, set up shop in a new virtual location, and keep repeating the process. The information age has created a jumbled mix of useful gems and worthless junk, and many people don't bother to determine the difference. I can't count the number of times I have seen some posting on social media with a disturbing graphic and some bold statement that gets forwarded and re-posted ad infinitum with no factual backing.

It's not all junk however. One of the gems can be the capability to gather "group wisdom" which can be a powerful and useful thing. For pretty much any topic, there is a forum, web site, or news group that deals with the subject. Bringing your questions to such a group and the collective knowledge and opinions can help steer you to a solution or answer your question pretty rapidly. It is an imprecise thing with a need to carefully filter content because some self-proclaimed experts may be very vocal with their vast wealth of knowledge, but the reality may be something different.

Crowdsourcing of knowledge has been turned into a number of profitable businesses as well. One example is in the area of patent law. One of the most tedious and time consuming parts of prior art research in patent law is now done through a web site, where the desired targets are defined and people can provide prior art examples for financial incentives. There are a number of patents out there where a wealth of prior art exists and the collective research can bring that material to light quickly. By crowdsourcing the search to many researchers via the web, a comprehensive prior art search can happen quickly.

One particular area of crowdsourcing that I have mixed opinions on is the area of crowd-funding. There are a number of web sites that allow you to define a fundraising campaign for pretty much anything and raise money to supposedly achieve that goal.

The merits of crowd-funding are many but there are also some concerns that I have. Where I see crowd-funding working well is in areas that are difficult to find conventional sources of backing, or where the project is so niche that a special interest group needs to be appealed to. One area that I see this works well in is the creation of limited volume specialty items. For EE's and people involved in hobby level electronics, there have been a number of devices crowd-funded that appeal to certain groups. This includes add on accessories for Arduino and Raspberry Pi devices, driver and controller boards for robotics, and similar.

Another recent crowdfunding campaign involved raising the money to re-start an observational satellite that NASA no longer had the money to keep running, but felt that could still do some useful work.

<http://spacecollege.org/isee3/>

A crowd funded effort was able to get the 36 year old space probe up and running again, with hopefully some useful data to be obtained. The appeal for funding was well defined the limitations and risks were laid out in a factual, honest manner, so people were properly informed and not deceptively pumped for money. Launched in 1978, the satellite is well past its original mission so NASA did not have the money to keep this alive. For this sort of effort I am a big supporter, if NASA can't fund it but enough people are willing to provide the money, hopefully some useful observational data will be the outcome.

Other crowdfunding topics with promise includes appeals for research money where the goals, limitations, possible rewards and possible failures are all laid out clearly as part of the funding appeal. However, crowd funding of the strange, bizarre and deceptive also happen. As I write this one crowdfunding campaign has raised over \$50 thousand dollars to make potato salad.

<https://www.kickstarter.com/projects/324283889/potato-salad>

Things like this I see a certain humor in. The person who set up the campaign was not out to deceive or defraud, but rather set up a campaign with a modest goal of \$10, and social media of various forms got a hold of it and it and the result snowballed into something much bigger. Seems silly, but there is no intentional deception going on, so people are free to spend their money as they see fit. It does clearly demonstrate the power of crowd sourcing combined with viral social media however.

I think that having alternative paths to fundraise are a good thing, but it is pretty obvious that due diligence on the fundraiser, or the viability of their goals generally does not happen. I have been approached by several groups that crowd-funded a project, knew nothing about the electronics needed in the project and had already spent most of the money elsewhere. I have heard of several of these “campaigns” where the people took the money and did not use it for the stated goals, or the thing that they were trying to fund will never work in reality.

Using the word “never” is something I try to avoid, but some examples came to my attention recently when people asked me about the viability of the idea.

Solar Roadways raised over 2 million dollars on an idea that most engineers will quickly see as impractical for many reasons. The whole idea centers around putting down solar panels embedded in the road. These devices are going to (magically) power the grid, melt ice off of the roads, provide lighted street markers, drain water from the streets, and provide a path for underground cables.

<https://www.indiegogo.com/projects/solar-roadways>

This is one of those ideas where marketing wins out over realistic engineering. They put together a very persuasive set of material to sell the idea while ignoring all the practical and quantitative issues. Most engineers can see problems with energy storage, reliability of interconnects, more cost effective options to deploy solar, and many other issues that make this a non starter for the widespread deployment they propose. Keep in mind I don’t say “never” to teleportation, moving faster than light, or time travel. This however is never going to happen as described. Cover the roof of every building in the country with solar energy before you start putting it under our tires. This effort shows the power of good marketing, but no practical engineering.

How about a device that claims to charge your cell phone 92% faster? This is a fundraiser for devices that sit in line with a USB port, and a cell phone. It is not a charger but merely an in-line device that sits between the phone and the charger. They have raised over \$400,000 dollars for something that I know will not do what is claimed.

<https://www.kickstarter.com/projects/plxdevices/legion-meter-charge-your-smartphone-92-faster>

This is one of those dubious projects with wild claims that raises a number of red flags. The charging rate for the battery in a phone is set by the charge controller in the phone, not by something outside the phone. The USB device can communicate its power capabilities to the phone and the phones internal charger can adjust accordingly.

<http://www.usb.org/developers/powerdelivery/>

However, the USB power delivery protocol is between the charger and the device being charged, and something in the middle will not magically create more power. They claim that the device “modifies the D+ and D- to signal your mobile device to charge at the fastest possible setting no matter what USB port you're connected to” which is what the USB compliant power source is supposed to already be doing. When you read the fine print on this crowd funding campaign, the claims are carefully worded and enough disclaimers are buried in the fine print to render the title claim of being 92% faster as worthless. However, people read the 40 point title fonts a lot more than the fine print.

So what does all of this have to do with electronics and engineers in general? In order to create, support and manufacture the countless products that we are involved in, engineers need to be analytical, quantitative, and separate reality from creative fantasy as a core part of our engineering skills. Both engineers and scientists develop critical thinking skills to deal with unknowns and discern the important items from a flood of irrelevant and unimportant issues. As a community we can be an advocate for the real, and wave the red flags over the questionable.

Sometimes it just takes a polite question: What are your sources on that? Could you explain how that is going to work? Do you have any data to support that? Frequently engineers don't realize that many around them don't have the analytical skills that they have been trained for or that their scientific literacy has been developed well beyond the average person. Consequently, both engineers and scientists can be useful advocates in separating the wheat from the chaff of the information age. Without being confrontational, you can be a skeptic and ask the right questions. Don't be afraid to do so in a friendly and positive manner.